Office of Environment & Heritage

Flying-fox Camp Management Plan

Machattie Park and Kings Parade, Bathurst

Camp Management Plan

June 2018

Bathurst Regional Council

DOCUMENT TRACKING

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Acknowledgements

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Contents

Acronyms and abbreviations

ABLV	Australian bat lyssavirus
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BRC	Bathurst Regional Council
DoE	Commonwealth Department of the Environment
DPI	Department of Primary Industries (NSW)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EPA	Environment Protection Authority (NSW)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
GHFF	Grey-headed Flying-fox (*Pteropus poliocephalus*)
the Guideline	Referral guideline for management actions in grey-headed and spectacled flying-fox camps 2015 (Commonwealth)
HeV	Hendra virus
LGA	local government area
LGNSW	Local Government NSW
LRFF	Little Red Flying-fox (*Pteropus scapulatus*)
MNES	matters of national environmental significance
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
NPWS	National Parks and Wildlife Service (NSW)
OEH	Office of Environment and Heritage (NSW)
PEPs	protection of the environment policies
the Plan	Camp Management Plan
POEO Act	*Protection of the Environment Operations Act 1997* (NSW)
the Policy	Flying-fox Camp Management Policy 2015 (NSW)
SEPPs	State Environmental Planning Policies
SIS	species impact statement
TEC	threatened ecological community
TSC Act	*Threatened Species Conservation Act 1995* (NSW)

Executive Summary

The Grey-headed Flying-fox (*Pteropus poliocephalus*; GHFF) is a nomadic mammal that moves in response to fluctuations in food availability. Due to a wide range of ongoing threats to the species survival, including habitat loss and degradation and conflict with humans the population has declined by up to 30%. GHFF are listed as a vulnerable species under the NSW *Biodiversity Conservation Act 2016* and the Federal *Environment Protection Biodiversity Conservation* Act 1999.

It is not known how long flying-foxes have been visiting Bathurst, however, due to the Bathurst climate, GHFF within Machattie Park are believed to be only temporary residents, residing over summer and moving on in the cooler months. GHFF were first formally recorded in 2009 roosting in Willows along the Macquarie River west of the Waste Water Treatment Plant, approximately 3 km from the central business district. Although some residents have observed flying-fox camps much earlier than this. In 2009 the camp was estimated to be about 2000 individuals. The following year, GHFF and Little Red Flying-foxes (*Pteropus scapulatus*; LRFF) returned, with population estimates peaking at over 20,000 individual GHFF and up to 50,000 LRFF. In 2011, flying-foxes returned but were located 700 m downstream of the original location. Flying-fox activity was not observed again until November 2017 with GHFF and LRFF residing in Machattie Park (Lot 1, Section 6, DP758065) in the centre of Bathurst CBD.

Machattie Park (2.7 ha; located on Keppel and George St) and Kings Parade (1 ha; located on Russell St and George St) are both heritage listed 19th Century Victorian country town parks located in the middle of Bathurst. Machattie Park was formally opened in 1890 upon the site of the old Bathurst Gaol and is a valuable collection of mature and majestic non-native trees, such as Elms, Oaks, Cedars, Beeches Weeping Cherries and Pines. Whilst flying-foxes are not currently occupying Kings Parade, this area is also included in this Management Plan due to its close proximity to Machattie Park (less than 30 m) and its similar habitat. Both areas are used by the community for local events, are popular places for weddings and memorials.

In January 2018 the population of Flying-foxes within Machattie Park was estimated to be between 800 and 2000 individuals (Dr David Goldney, January 2018) residing in approximately a third of the park with the majority of species being GHFF. Whilst there are currently signs of canopy decline there is concern that the trees within the Park will be greatly affected if the population of flying-foxes were to reach the population size of that observed in 2010. An increase in numbers could result in the BRC closing the Park increasing negative sentiment towards flying-foxes. A population of approximately 3000 individuals is the threshold that the Park is likely to sustain before irreversible damage is done to the trees within Machattie Park.

Bathurst Regional Council (BRC) commissioned Eco Logical Australia (ELA) to prepare this Management Plan and to facilitate the associated community consultation. The Management Plan has been prepared using the NSW Office of the Environment and Heritage (OEH) template and developed under guidance of the NSW Flying-Fox Camp Management policy (OEH 2015).

ELA Ecologists visited Machattie Park and Kings Parade on the 28th March 2018 and potential relocation sites were also inspected. Community consultation was undertaken as part of the development of this Management Plan, to gain an understanding of the history of the camp and flying-fox activity in the region, to understand community concerns and to develop appropriate management strategies. Community consultation activities targeted both stakeholders and the wider community. Outcomes identified a range of community issues with the camp, including:

- Damage to the trees within the heritage listed park
- Concern the population will multiple over time
- Urine and faecal material falling onto park users

- Council workers spending too much time undertaking additional maintenance activities within the park
- Flying-fox odours
- Disease and health concerns
- Park becoming unusable

Management actions were developed to address the community response to the camp based on strategies approved by OEH consistent with the NSW Flying-fox Camp Management Policy (OEH 2015). The Flying-fox Camp Management policy encourages a hierarchy management approach beginning with Level 1 actions (lowest form of intervention) through to Level 3 (disturbance and dispersal). BRC are already implementing Level 1 actions such as signage, community awareness and cleaning the Park. There is more opportunity for BRC to expand the education program to reduce the fear surrounding Flying-foxes.

The recommended management actions include:

- **Level 1** ongoing community education highlighting the ecological value of flying-foxes and alleviating fears. Continue cleaning park grounds, paths and infrastructure. On-going consultation prior to, during and following implementation of management actions with residents and WIRES. Rehabilitation, restoration and protection of flying-fox habitat in suitable locations across the LGA particularly along the Macquarie River. BRC have already implemented many of these actions identified as Level 1 and the issues within the Park have not been resolved.
- **Level 2** installation of passive deterrents (such as canopy sprinklers, inflatable men, lights etc) within trees in Machattie Park and Kings Parade prior to the bats returning in November 2018. This action is to prevent the flying-foxes re-establishing a camp within the Machattie Park or establishing in Kings Parade. This action may require approval by OEH. It is recommended that BRC plan for this action as the next step in the management of flying-foxes in Machattie Park.
- **Level 3** active dispersal from Machattie Park. Level 3 actions will commence if Level 2 actions are not successful and the population establishes within the Park. Responding earlier to undertake a dispersal action is more desirable than a “wait and see” option as moving a small population of flying-foxes is likely to be more successful and less stressful on the flying-foxes. If this action is implemented, then it is likely that it should be scheduled to avoid sensitive periods in the life cycle. This action will require approval by OEH. An Ecologist will need to assess the population for pregnant females and pups and determine if dispersal should proceed or not. These actions should only be considered if Level 1 and Level 2 actions are unsuccessful and undertaken with care to avoid harm to animals. Please note that there is no guarantee of where the flying-foxes will disperse to and they may relocate to less desirable areas. It is essential that BRC clearly communicate to the community the possible outcomes of this action.

The impact of the above planned management actions on flying-foxes and other ecological values are identified; and detailed protocols for work in and around flying fox camps to ensure the safety of workers, neighbouring residents and flying foxes have been included. The Plan also includes a flow-chart to assist Council to identify when specific management options should be considered based on the measure of success of management actions and includes triggers for further community or agency consultation. It is suggested that this Management Plan is an adaptive document to be reviewed and updated by Council as situations change or further research improves the understanding of flying-foxes and effective management options.

1. Overview

Bathurst Regional Council (BRC) commissioned Eco Logical Australia (ELA) to prepare this Management Plan in response to the presence of a flying-fox camp located within the heritage listed Machattie Park in Bathurst. Whilst no flying-foxes were observed in Kings Parade, this area is also included in the Plan due to the similar composition of the vegetation and its close proximity to Machattie Park.

1.1 Objectives

The objectives of this Camp Management Plan (the Plan) are to:

- minimise impacts to the community, while conserving flying-foxes and their habitat
- provide a reasonable level of amenity for the surrounding community
- manage public health and safety risks
- clearly define roles and responsibilities
- enable land managers and other stakeholders to use a range of suitable management responses to sustainably manage flying-foxes
- effectively communicate with stakeholders during planning and implementation of management activities
- enable long-term conservation of flying-foxes in appropriate locations
- ensure management is sympathetic to flying-fox behaviours and requirements
- improve community understanding and appreciation of flying-foxes, including their critical ecological role
- ensure flying-fox welfare is a priority during all works
- ensure camp management is consistent with broader conservation management strategies that may be developed to protect threatened species/communities
- ensure camp management does not contribute to loss of biodiversity or increase threats to threatened species/communities
- clearly outline the camp management actions that have been approved and will be utilised at the camp
- ensure management activities are consistent with the NSW Flying-fox Camp Management Policy (OEH 2015b)
- implement an adaptive management approach to camp management based on evidence collected.

2. Context

2.1 Camp area

The Machattie Park camp is located on the corner of George Street and Keppel Street, in the central business district of Bathurst (Figure 1). The camp was first observed in December 2017 and surveyed in January 2018 by Dr David Goldney (Wildlife Ecologist). At this time, the camp was occupying less than one third of the park with mostly the same trees being used regularly. Ecologists from ELA visited the park on 28 March 2018 and whilst the population was smaller than in January (Stevie Armstrong, pers comm 2018), the same trees were being used as roost habitat.

The camp currently covers 2794 m^2 (0.28 ha), with approximately 2.4 ha of contiguous potential habitat remaining.

Whilst flying-foxes have not been recorded at Kings Parade (Figure 1), this location is included within the management plan as both Machattie Park and Kings Parade are heritage listed, have similar habitat and are close to each other.

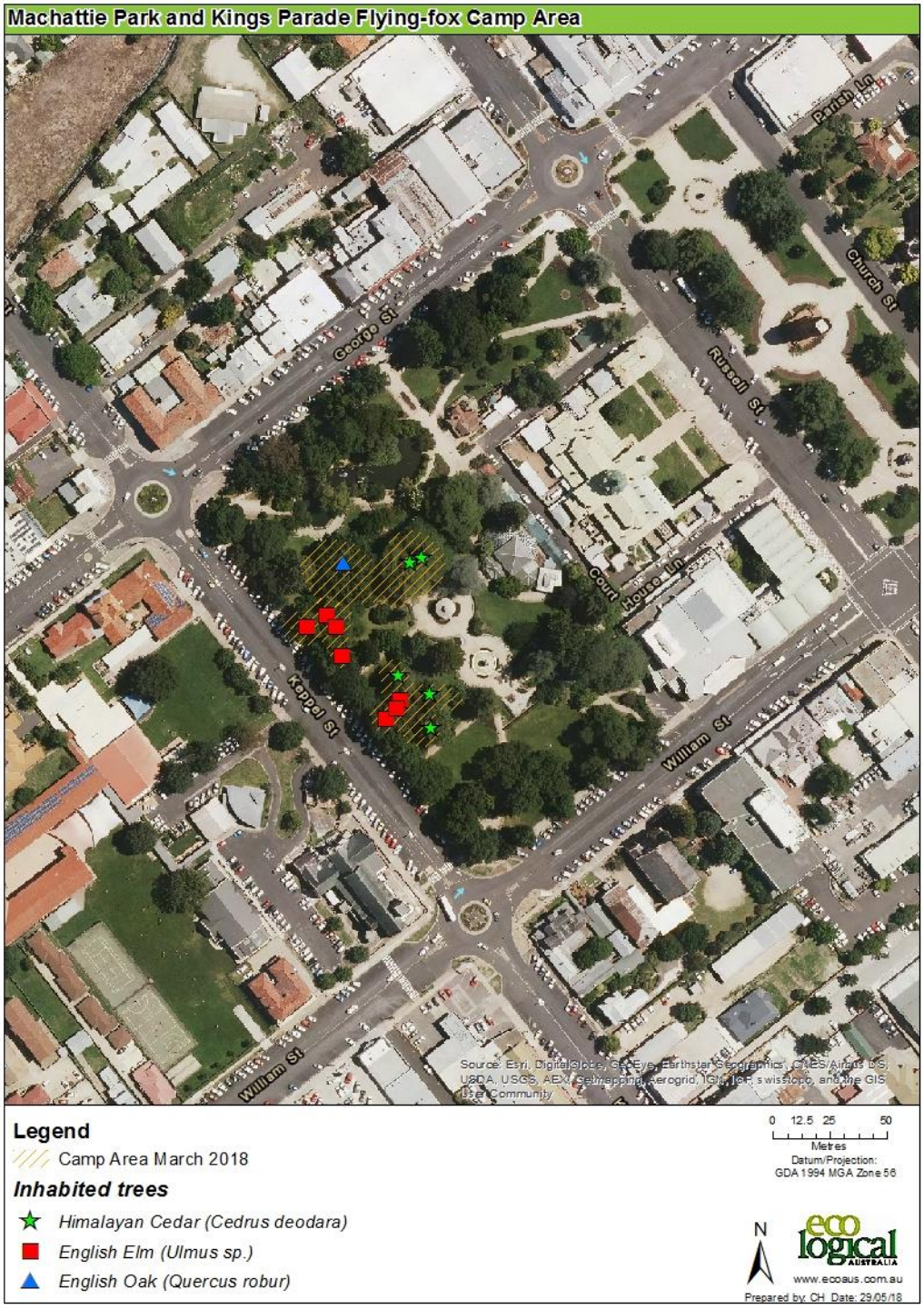


Figure 1: Location of Bathurst flying-fox camp (March 2018)

2.1.1 History of the camp

Flying-fox activity was first noted in Bathurst in 2009 when a visiting population of Grey-headed Flying-foxes (*Pteropus poliocephalus*; GHFF) and Little Red Flying-foxes (*P. scapulatus*; LRFF) was observed in residing in Willows along the Macquarie River west of the waste water treatment plant, 3 km from the central business district. The population was estimated to be about 2000 individuals and the population moved on during the cooler months. In 2010 flying-foxes arrived in larger numbers with counts reaching 70,000 individuals; 20,000 being GHFF with the remainder being LRFF.

The Bathurst climate is seasonally variable with frosts common during cooler months. As such, the camps are unlikely to be used year-round with flying-foxes generally first observed in the area in December and usually departing by the following April.

An online comment made by a local resident of Bathurst suggests that flying-foxes have been in and around Bathurst (including Machattie Park) since the late 1950s.

> "*The flying foxes have been a part of and a problem for Bathurst for as long as I can remember. They were hunted around the local orchards and spotlighted in the cathedral tower and Machattie Park from the late 1950s well into the 1960s as there were thousands of them.*" Anon.

A Willow tree removal program along the Macquarie River was implemented in 2011 which resulted in the removal of many of the roosting trees that were occupied by GHFF and LRFF in 2009 and 2010 (S. Armstrong. pers comm 2018). Willow removal programs are an adopted weed control strategy for BRC to protect the various environmental concerns that willows present to riverine ecosystems. A 500 m stretch of willows was retained which was occupied by GHFF in 2011, 700 m downstream of the original location. No estimates of population size were recorded in 2011. Flying-foxes were not noted in Bathurst again until November 2017 when the camp was observed in Machattie Park in the centre of Bathurst. In March 2018 ELA Ecologists visited the camp locations and it was noted that the Willows along this section of river were in poor health possibly due to insect activity.

Machattie Park and Kings Parade are both 19th Century Victorian parks that are planted with a variety of English ornamental plants including avenues of Elms, hedges, Cedars, Pines, Beeches and English Oaks. The parks are also conservation areas, preserving the oldest settlement west of the Blue Mountains, and are often used for ceremonies and community gatherings.

The population of flying-foxes at Machattie Park was independently assessed over 5 successive days in January 2018 by Dr David Goldney (Wildlife Ecologist). The population was estimated to be between 800-2000, with the majority being GHFF. Representatives from WIRES did not note the presence of LRFF in Machattie Park and have only observed GHFF (P. Dury WIRES pers comm April 2018).

The population currently occupies approximately one third of the park, roosting in Himalayan Cedars, English Elms and English Oak. They have also been observed roosting in the Bunyan Pine particularly on extremely hot days. Dr David Goldney noted that the GHFF, when disturbed, spread over a greater area of the park but returned to their core area utilising about 18.5% of the available taller trees. A few of the roosting trees are showing signs of canopy damage, particularly the Elms, and there is concern that these trees may be significantly affected if the camp continues to use the park or if the flying-foxes return in large numbers.

There are currently no other records of locations or camps in the Bathurst region either permanently or seasonally occupied by Flying-foxes in recent times. Additionally, there are no records of flying-foxes roosting in the Bathurst LGA recorded on the National Flying-fox Monitoring Program (NFFMP) web viewer. The closest recorded camp is at Portland, approximately 45 km east of Bathurst, however, surveys in 2017 did not locate any individuals

(Figure 2). GHFF have also been recorded at Cooks Park, Orange (47 km NE from Bathurst), Cowra Golf course (97 km SE from Bathurst) and along the Cudgegong River in Mudgee (90 km north of Bathurst). It is possible that there are other locations within the Central West.

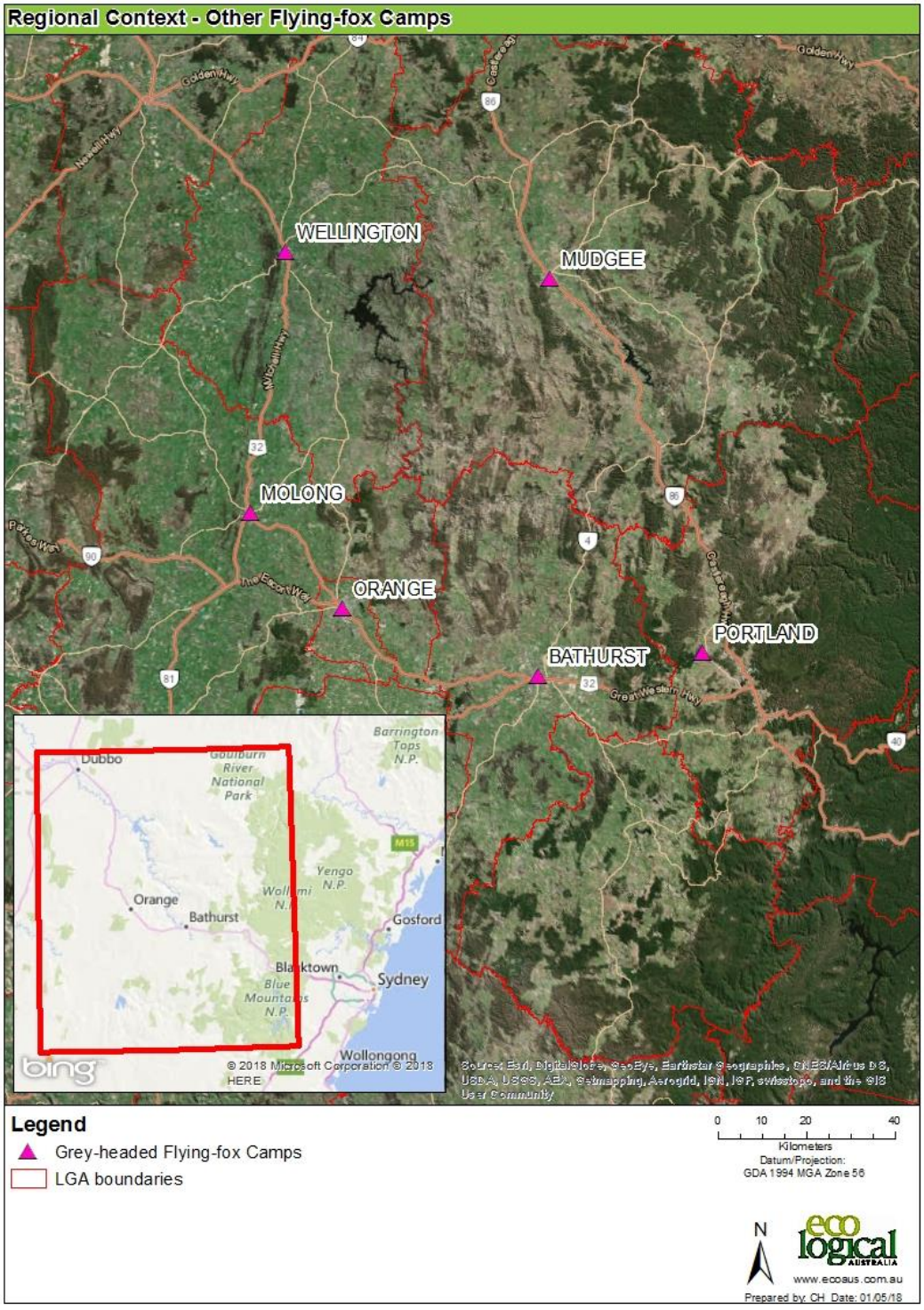


Figure 2: Known populations of flying-fox camps in the Central West

2.2 Land tenure

Machattie Park and Kings Parade are located on Crown Land and managed by BRC as the reserve trust. Both are in the central business district surrounded by retail shops, churches, a school, the Bathurst Court House and Bathurst Regional Council offices (Figure 3). Machattie Park and Kings Parade are separated by Russel St.

The Cathedral Catholic Primary School is located on George Street, within 85 m of the camp. It is a privately-operated K-6 school with a large outdoor play area with few trees. It joins St Michaels Cathedral along its southern boundary. There are a few trees in the carpark and given the lack of suitable habitat, it is unlikely that these centres would be affected by flying-foxes. There have been no reported incidents regarding flying-foxes at the school or within Church grounds.

Both William and George Streets are occupied by local businesses with cafes and food premises located directly opposite the camp. There are no trees or overhanging branches along these areas. There is a possibility that these businesses may be affected by flying-foxes noise and odour, however, it is not known if complaints were received as the public were advised to call OEH environmental hotline for advice.

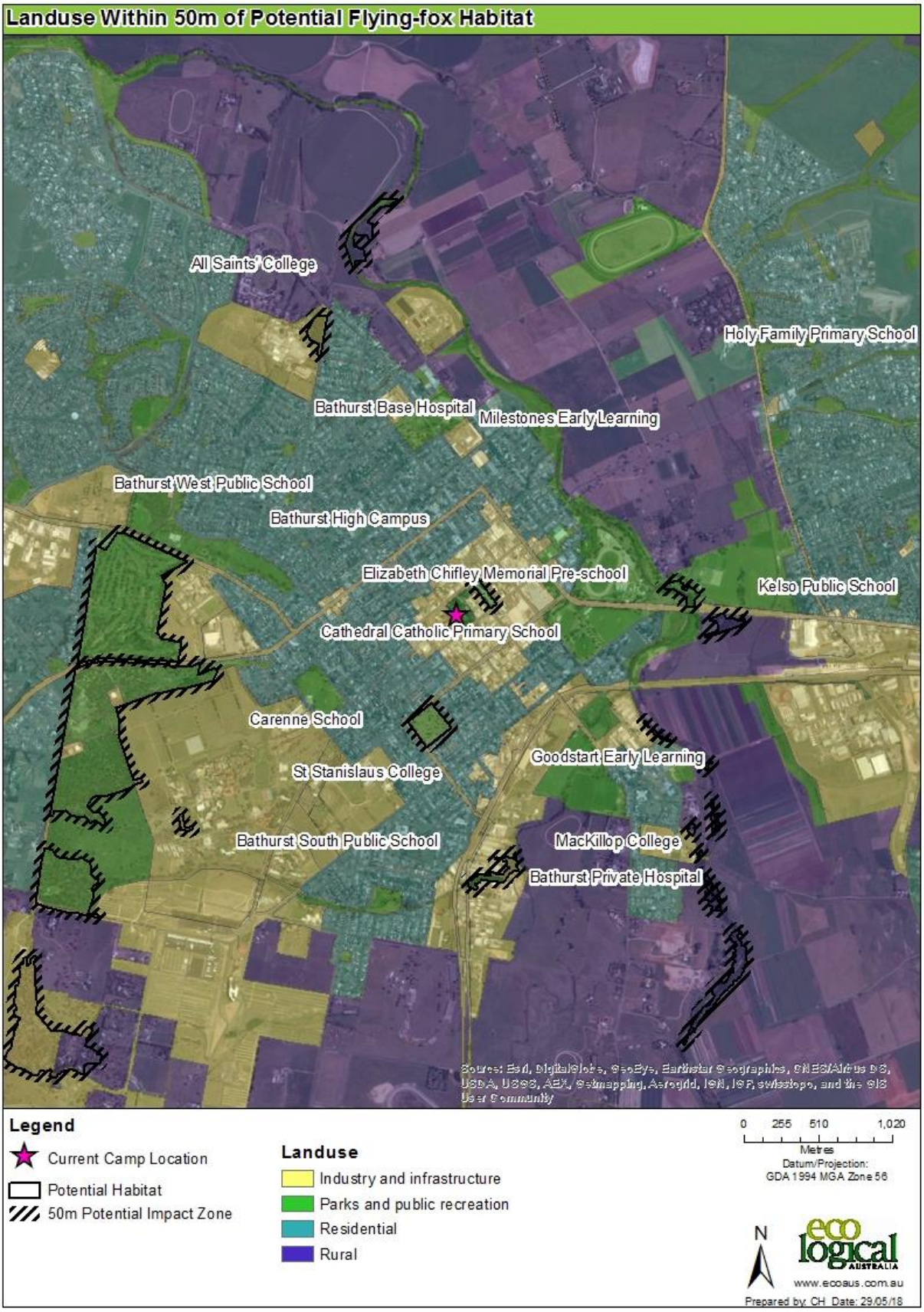


Figure 3: Landuse within 50 m of potential flying-fox habitat

2.3 Reported issues related to the camp

Concerns were raised by community members, Council's park maintenance staff, and Councillors in December 2017 when flying-foxes began roosting in Machattie Park.

The following list is a collation of the issues related to the camp that have been reported by the community. The list has been compiled from information collected via a range of reporting and consultation methods. Further discussion about community engagement efforts and outcomes can be found in Section 3.

Reported negative issues include:

- damage to vegetation and canopy dieback
- faecal and urine drop on park users
- size of future populations and probable impacts on the vegetation
- flying-fox odours
- fear of disease
- reduced general amenity.

Most issues related to the camp were recorded around December and January, coinciding with summer holiday activities and ceremonies that usually occur within the park. The 2018 Australia Day ceremony was relocated to another location as the area was deemed unsuitable due to the presence of GHFF.

A total of 127 responses have been captured by the "Your Say" online survey. Of these, 56 respondents don't like the GHFF occupying the Park, 52 respondents enjoy the camp, 30 think Council should do more to protect flying-foxes, and 40 respondents think Council should create alternative flying-fox habitat.

Positive feedback stems from people who:

- recognise the landscape-scale benefits flying-foxes provide through seed dispersal and pollination
- acknowledge the need to conserve flying-foxes as an important native species
- enjoy watching flying-foxes at the camp and/or flying out or in
- appreciate the intrinsic value of the camp
- see the value of the camp as a tourism opportunity/attraction
- appreciate the natural values of the camp and habitat
- feel the camp does not negatively impact on their lifestyle
- value the opportunity the camp provides for them and their family to get close to nature
- recognise the need for people and wildlife to live together.

2.4 Management response to date

BRC has implemented management actions to ensure visitor amenity and safety are maintained and the park is able to be utilised by the community, including:

- Council applied and was awarded a grant from Local Government NSW to assist with additional maintenance and cleaning to reduce the impact the flying-foxes were having on the usability of Machattie Park. The aim was to reduce negative sentiment towards the flying-foxes and ensure that the park remained open to demonstrate and educate the community that there is a possibility for cohabitation with the flying-fox colony. The funding was used to engage contractors to carry out the following:
    - Clean urine and faecal material off the park seats on a twice weekly basis.
    - Rake up and remove leaves and canopy debris from the lawns and paths on a weekly basis.
- Tables and chairs that were located under roosting trees were relocated to other sections of the park.
- Lawns are watered to wash away faecal material
- Signs installed at the main entrance to the park highlighting the presence of bats
- Information was placed on Council's website, social media, local papers, and brochures were distributed to educate the community about flying-foxes and Council's management activities.

Given the historical nature of the parks, vegetation removal and / or trimming has not been considered a viable option.

3. Community engagement

3.1 Stakeholders

There are a range of stakeholders who are directly or indirectly affected by the flying-fox camp, or who are interested in its management. Stakeholders include those shown in Table 1.

Table 1: Stakeholders in the camp and Plan

Stakeholder	Interest/reported impacts
Residents	• Residents of properties located in direct proximity to Machattie Park or Kings Parade • Community members utilising Machattie Park or parking adjacent to the park • Wider community noting Flying-fox foraging on or near their properties
Business owners	Including food premises along George Street
Schools	Cathedral Catholic Primary School, Bathurst Catholic Church and Catholic Diocese of Bathurst are all neighbouring properties – less than 85 m from the colony.
Hospitals • Bathurst Base Hospital • Bathurst Private Hospital	Bathurst Base Hospital is located 1.6 km Northwest of Machattie Park and Bathurst Private Hospital is 2 km southeast. Interests include health / wellbeing / disease, noise from foraging animals. The hospital grounds also have a few large trees.
Airports • Bathurst Regional Airport	Airport managers have a responsibility to reduce the risk of wildlife–aircraft strike. Bathurst regional airport is located just over 7 km east of Machattie Park. Reported impacts / interest specific to airports include bat strike, bat detection, hazard communication and landscaping management.
Equine facilities and vets • Harness Racing Club • Thoroughbred Racing Club • Stables	Bathurst Harness Racing facility is located 3.5 km south of Machattie Park. Stabling on a permanent or casual basis is provided at the Bathurst Show Grounds (1 km east of Machattie Park) which is also home to the Thoroughbred racing club. Equine facility managers and local vets should be aware of Hendra virus risk and appropriate mitigation measures. Where feasible, all horse owners within 20 km of the camp should be included in such communications.
Orchardists and fruit growers	Fruit growers may be impacted by flying-foxes raiding orchards. There have been government programs and subsidies provided to this industry to protect crops in the form of netting since 2011. There is no overarching body for fruit growers in Bathurst. However, reported impacts / interests specific to fruit growers include crop protection, bat conservation, noise, smell, faecal drop and property devaluation.
Other/adjoining landholders; these may include government departments such as Crown Lands, Transport for NSW / Roads and Maritime Services, or neighbouring councils	Currently the camp resides on Council owned / managed land. Adjoining landholders include private citizens and local business whose concerns have already been addressed. Simplot, a private agricultural company NNW of the site, has some large trees.

Stakeholder	Interest/reported impacts
Civic leaders and influencers (including local, state and federal politicians) • Paul Toole State Member for Parliament • Hon John Cobb Federal Member for Parliament • 9 regional councillors	Resident concerns and complaints include bat conservation, health / wellbeing / fear of disease, noise, smell, faecal drop, and tree damage.
Local Government • Bathurst Regional Council	Local government has responsibilities to the community and environment of the area for which it is responsible in accordance with the *Local Government Act 1993*. Council is also responsible for administering local laws, plans and policies, and appropriately managing assets (including land) for which it is responsible.
Local Government NSW (LGNSW)	LGNSW is an industry association that represents the interests of councils in NSW.
NSW Office of Environment and Heritage (OEH) • NSW National Parks and Wildlife Services (NPWS)	OEH is responsible for administering legislation relating to (among other matters) the conservation and management of native plants and animals, including threatened species and ecological communities. NPWS manage over 850 NSW national parks and reserves and are committed to the conservation of NSW biodiversity and cultural heritage. Interests include bat conservation and preservation of native bushland and waterways.
Commonwealth Department of the Environment (DoE) (relevant to camps with grey-headed flying-foxes or other matters of national environmental significance)	DoE is responsible for administering federal legislation relating to matters of national environmental significance, such as the Grey-headed Flying-fox and any other federally-listed values of the camp site.
Wildlife carers and conservation organisations • NSE Wildlife Information Rescue and Education Service (WIRES) • Bathurst Community Climate Action Network	Wildlife carers and conservation organisations have an interest in flying-fox welfare and conservation of flying-foxes and their habitat.
Researchers/universities/CSIRO • Charles Sturt University	Researchers have an interest in flying-fox behaviour, biology and conservation.

3.2 Engagement methods

Effort has been made to engage with the community regarding the flying-fox camp to:

- understand the issues directly and indirectly affecting the community
- raise awareness within the community about flying-foxes
- correct misinformation and allay fears
- share information and invite feedback about management responses to date
- seek ideas and feedback about future management options

The types of engagement that have been undertaken include:

- promotion of contact details of responsible officers

- telephone conversations to record issues and complaints
- face-to-face meetings and telephone calls with adjacent residents
- media (print, social media)
- brochures and other educational material provided by OEH
- website pages and links
- direct contact with adjacent residents via letter or via emails
- on-site signage
- feedback from public meeting / workshop
- online surveys.

It is strongly recommended that Council post regular statements regarding progress against the Plan online and via the mailing list. Posts could include actions undertaken to secure funding for the implementation of ongoing management, notifications to the community of planned actions and the completion of planned actions at Machattie Park, articles of interest regarding flying foxes, notifications of quarterly counts and links to the NFFMP web viewer. BRC are also encouraged to use media if anything occurs, publish a feature article in local paper, radio interviews, and use traditional and social media to allay fears and increase understanding.

3.3 Community feedback – management options

A community consultation session was held on the 23rd April 2018 by BRC and ELA at the Rotunda in Machattie Park. An information table was set up and over the three hours, ELA and BRC representatives spoke with 17 community members and representatives from stakeholders including WIRES and Animal Justice Party.

An online survey was developed consisting of 13 questions ranging from how often people use the park to ranking how important a list of proposed management actions to manage the GHFF camp in Machattie Park and their concerns (Appendix 8). The survey went live on the 15 April and closed on the 30 April.

A summary of the main feedback received is as follows:

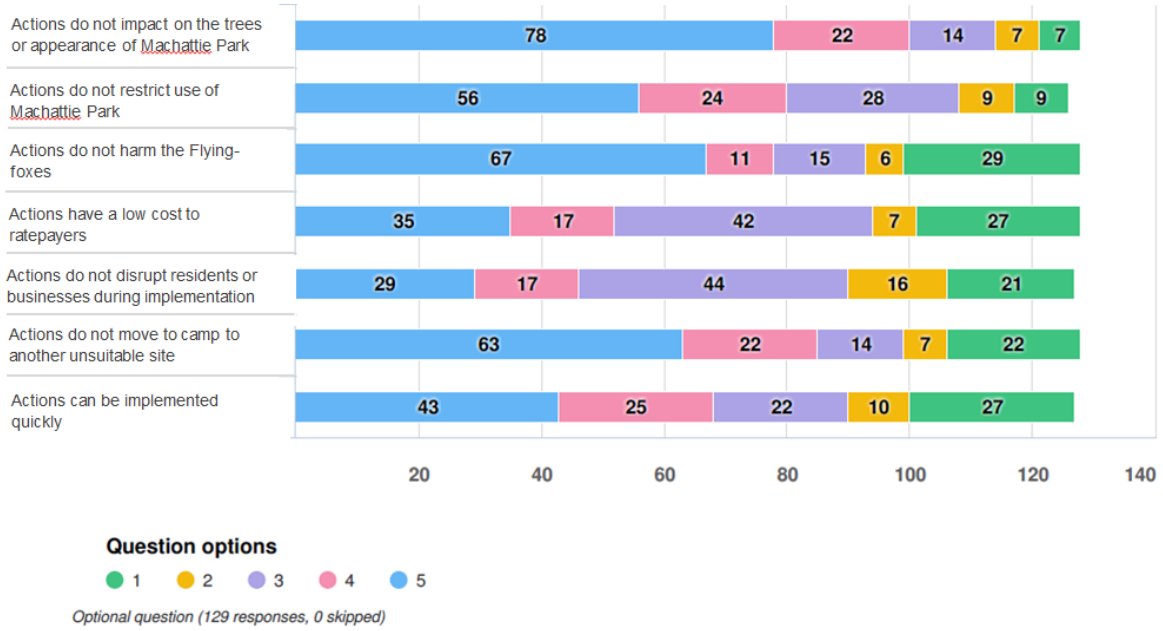
- 127 submissions were made on BRC ‘Your Say” online survey
- 17 submissions were verbally made to ELA representatives during the community session held at Machattie Park.
- 1 written submission from the Bathurst Community Climate Action Network

The overall feedback from the community received via engagement favoured flying-fox camp management measures that:

- do not harm the Flying-foxes
- do not impact on the trees or appearance of Machattie Park
- do not move the camp to another unsuitable site
- ensure the risk of transmission of flying-fox pathogens, viruses and disease remains low
- reduce the impact of noise and odour on nearby residents and businesses

- reduce the impact of flying-fox excrement
- would not/would be unlikely to disrupt residents and businesses during implementation
- would not restrict recreational opportunities currently undertaken at the site.

Actions to manage flying-foxes



Do you have any concerns?

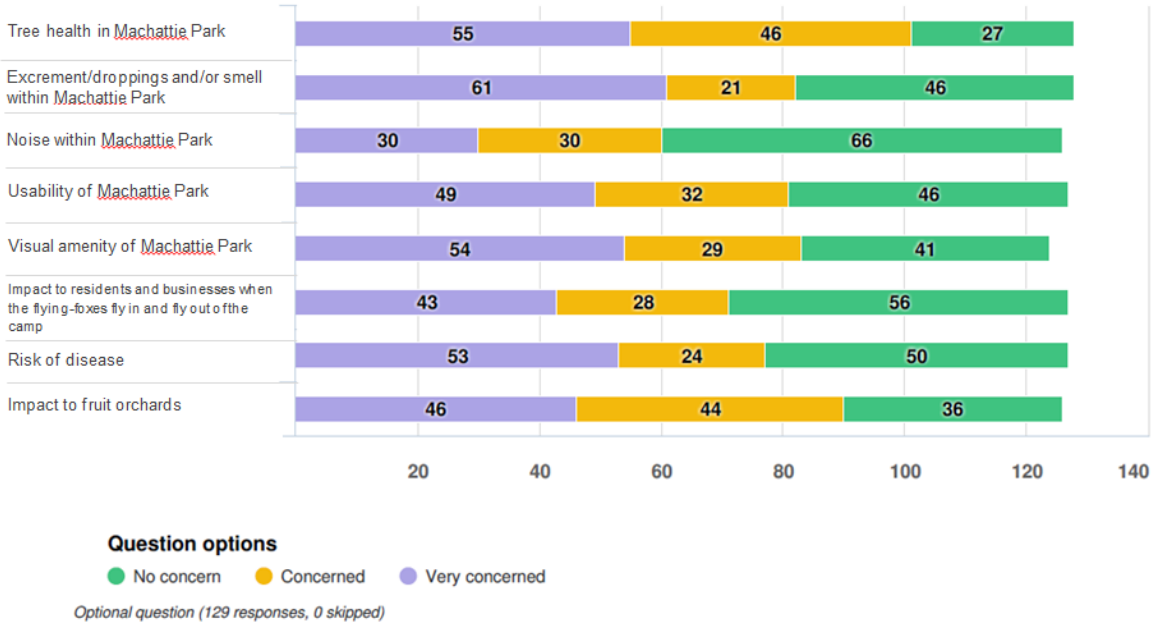


Figure 4: Results of actions and concerns from community survey

Examples of community comments are as follows:

“Please don’t harm them. They are extremely important to the environment and we should try our best to protect them” Anon

“I have seen first hand the long term devastation to the trees in Singleton. They said that the bats here in Bathurst would go when it got cold, March, April at the latest and yet here we are. They got rid of them effectively in the Botanic Gardens in Sydney. We must do more to protect our beautiful park!” Anon

“With a reduction in other areas for the foxes to feed and camp it is not surprising they have taken up camp in Machattie Park. Council should use influence with local land care and others to establish more sites where they can camp. This is a long-term amelioration. I see the foxes as similar to homeless people if you keep moving them on that doesn’t solve the basic issue. Education is also important. I am a member of Charlotte Vale Landcare” SEFA Partnerships.

“*Create more habitat closest to the CBD”* Anon

“They're disgusting, get rid of them”. Anon

“I think it’s really important that we protect threatened species. And also try & help shift people’s thinking into caring for the natural / native species, rather than just our here & now needs & wants; I think this is important for not only now, but future generations. I realise this is complex, and where my house is located, I am relatively unaffected, however I think overall we need to become more mindful of our natural environment & its needs”. Anon

4. Legislation and policy

Legislation and policies that are applicable to flying-fox management is provided below.

4.1 State

4.1.1 Flying-fox Camp Management Policy 2015

The Flying-fox Camp Management Policy 2015 (the Policy) has been developed to empower land managers, primarily local councils, to work with their communities to manage flying-fox camps effectively. It provides the framework within which OEH will make regulatory decisions. In particular, the Policy strongly encourages local councils and other land managers to prepare Camp Management Plans for sites where the local community is affected.

4.1.2 *Biodiversity Conservation Act 2016*

The objects of the *Biodiversity Conservation Act 2016* (BC Act) include to conserve biological diversity and protect the critical habitat of threatened species, populations and ecological communities. The GHFF is listed as threatened under the BC Act (see also Why the Grey-headed Flying-fox is listed as a threatened species).

Part 2 of the BC Act provides for the application of licences if the proposed action is likely to result in:

a. harm to an animal that is a threatened species or part of an ecological community
b. picking a plant that is a threatened species or part of an ecological community
c. damage to a habitat of a threatened species or ecological community
d. damage to a declared area of outstanding biodiversity conservation value

The BC Act lists factors to assess whether a proposed action is likely to have a significant effect on any threatened species or their habitats, population or ecological community (note, this is therefore not just applicable to flying-foxes). If a significant effect is likely, OEH may require a species impact statement (SIS) to be prepared and publicly exhibited. Depending on the outcome of the assessment, OEH could grant a Threatened Species Conservation licence under Part 2 of the BC Act, with or without conditions, or OEH could refuse the application

4.1.3 *National Parks and Wildlife Act 1974*

The *National Parks and Wildlife Act 1974* (NPW Act) provides for the conservation of nature, objects, places or features of cultural value and the management of land reserved under this Act. All native animals and many species of native plants are protected under the NPW Act. All native fauna, including flying-foxes, are specifically protected under section 98.

Under this Act, licences can be issued for actions such as harming or obtaining any protected fauna for specified purposes, picking protected plants or damaging habitat of a threatened species, population or ecological community. Note that the definition of 'harm' includes to *hunt, shoot, poison, net, snare, spear, pursue, capture, trap, injure or kill*. The definition of 'pick' includes to *gather, pluck, cut, pull up, destroy, poison, take, dig up, crush, trample, remove or injure the plant or any part of the plant*.

4.1.4 *Prevention of Cruelty to Animals Act 1979*

It may be an offence under this Act if there is evidence of unreasonable/unnecessary torment associated with management activities. Adhering to welfare and conservation measures provided in Section 10.3 will ensure compliance with this Act.

4.1.5 *Environmental Planning and Assessment Act 1979*

The objects of the *Environmental Planning and Assessment Act 1979* (EP&A Act) are to encourage proper management, development and conservation of resources, for the purpose of the social and economic welfare of the community and a better environment. It also aims to share responsibility for environmental planning between different levels of government and promote public participation in environmental planning and assessment.

The EP&A Act is administered by the NSW Department of Planning and Environment.

Development control plans under the Act should consider flying-fox camps so that planning, design and construction of future developments is appropriate to avoid future conflict.

Development under Part 4 of the Act does not require licensing under the BC Act.

Where public authorities such as local councils undertake development under Part 5 of the EP&A Act (known as 'development without consent' or 'activity'), assessment and licensing under the BC Act may not be required. However a full consideration of the development's potential impacts on threatened species will be required in all cases.

Where flying-fox camps occur on private land, land owners are not eligible to apply for development under Part 5 of the EP&A Act. Private land owners should contact Council to explore management options for camps that occur on private land.

4.2 Commonwealth

4.2.1 *Environment Protection and Biodiversity Conservation Act 1999*

The Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides protection for the environment, specifically matters of national environmental significance (MNES). A referral to the Commonwealth DoE is required under the EPBC Act for any action that is likely to significantly impact on an MNES.

MNES under the EPBC Act that relate to flying-foxes include:

- world heritage sites (where those sites contain flying-fox camps or foraging habitat)
- wetlands of international importance (where those wetlands contain flying-fox camps or foraging habitat)
- nationally threatened species and ecological communities.

The GHFF is listed as a vulnerable species under the EPBC Act, meaning it is an MNES. It is also considered to have a single national population. DoE has developed the Referral guideline for management actions in GHFF and SFF[1] camps (DoE 2015) (the Guideline) to guide whether referral is required for actions pertaining to the GHFF.

The Guideline defines a nationally important GHFF camp as one that has either:

- contained ≥10,000 GHFF in more than one year in the last 10 years, or
- been occupied by more than 2500 GHFF permanently or seasonally every year for the last 10 years.

[1] spectacled flying-fox (*P. conspicillatus*)

Provided that management at nationally important camps follows the mitigation standards below, DoE has determined that a significant impact to the population is unlikely, and referral is not likely to be required.

Referral will be required if a significant impact to any other MNES is considered likely as a result of management actions outlined in the Plan. Self-assessable criteria are available in the Significant Impact Guidelines 1.1 (DoE 2013) to assist in determining whether a significant impact is likely; otherwise consultation with DoE will be required.

Mitigation standards

- The action must not occur if the camp contains females that are in the late stages of pregnancy or have dependent young that cannot fly on their own.
- The action must not occur during or immediately after climatic extremes (heat stress event[2], cyclone event[3]), or during a period of significant food stress[4].
- Disturbance must be carried out using non-lethal means, such as acoustic, visual and/or physical disturbance or use of smoke.
- Disturbance activities must be limited to a maximum of 2.5 hours in any 12 hour period, preferably at or before sunrise or at sunset.
- Trees are not felled, lopped or have large branches removed when flying-foxes are in or near to a tree and likely to be harmed.
- The action must be supervised by a person with knowledge and experience relevant to the management of flying-foxes and their habitat, who can identify dependent young and is aware of climatic extremes and food stress events. This person must make an assessment of the relevant conditions and advise the proponent whether the activity can go ahead consistent with these standards.
- The action must not involve the clearing of all vegetation supporting a nationally-important flying-fox camp. Sufficient vegetation must be retained to support the maximum number of flying-foxes ever recorded in the camp of interest.

These standards have been incorporated into mitigation measures detailed in Section 11.3. If actions cannot comply with these mitigation measures, referral for activities at nationally important camps is likely to be required.

[2] A 'heat stress event' is defined for the purposes of the Australian Government's Referral guideline for management actions in GHFF and SFF camps as a day on which the maximum temperature does (or is predicted to) meet or exceed 38°C.

[3] A 'cyclone event' is defined as a cyclone that is identified by the Australian Bureau of Meteorology (www.bom.gov.au/cyclone/index.shtml).

[4] Food stress events may be apparent if large numbers of low body weight animals are being reported by wildlife carers in the region.

5. Other ecological values of the site

Vegetation in Machattie Park and Kings Parade was inspected by ELA in March 2018.

Machattie Park and Kings Parade are an example of a 19th Century Victorian park, featuring plants typical of the Victorian period in form and layout. Plants at this site include English Elms, English Oaks and a variety of Cedar trees with hedges and roses creating a formal garden. Infrastructure includes the Bandstand, Caretakers cottage, Crago Fountain, a Fernery, Lake Spencer (small duck pond) and the Munro Drinking Fountain. There are very few native tree species occurring on site.

A BioNet Atlas search and an EPBC Act Protected Matters Search identified 16 fauna, five flora and two threatened ecological communities recorded within a 10 km radius of Machattie Park. A list of threatened species known to occur within 10 km of the site is provided in Table 2, including the likelihood of each occurring on site.

Table 2: Threatened species and ecological communities that may occur at the site

Species name	Common name	Status	Likelihood of occurring
Fauna			
Litoria aurea	Green and Golden Bell Frog	V*	Unlikely. No habitat within Machattie Park or Kings Parade
Litoria booroolongensis	Booroolong Frog	E*	Unlikely. No habitat within Machattie Park or Kings Parade
Litoria castanea	Yellow-spotted Tree Frog	E	Unlikely. No habitat within Machattie Park or Kings Parade
Anseranas semipalmata	Magpie Goose	V	Unlikely. No habitat within Machattie Park or Kings Parade
Phaethon rubricauda	Red-tailed Tropicbird	V	Unlikely. No habitat within Machattie Park or Kings Parade
Falco subniger	Black Falcon	V	Unlikely. No habitat within Machattie Park or Kings Parade
Callocephalon fimbriatum	Gang-gang Cockatoo	V	Unlikely. No habitat within Machattie Park or Kings Parade
Ninox connivens	Barking Owl	V	Unlikely. No habitat within Machattie Park or Kings Parade
Climacteris picumnus victoriae	Brown Treecreeper	V	Unlikely. No habitat within Machattie Park or Kings Parade
Anthochaera phrygia	Regent Honeyeater	E	Unlikely. No habitat within Machattie Park or Kings Parade
Melithreptus gularis gularis	Black-chinned Honeyeater	E	Unlikely. No habitat within Machattie Park or Kings Parade
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	Unlikely. No habitat within Machattie Park or Kings Parade
Stagonopleura guttata	Diamond Firetail	V	Unlikely. No habitat within Machattie Park or Kings Parade
Dasyurus maculatus	Spotted-tailed Quoll	V	Unlikely. No habitat within Machattie Park or Kings Parade
Phascolarctos cinereus	Koala	V	Unlikely. No habitat within Machattie Park or Kings Parade

Species name	Common name	Status	Likelihood of occurring
Pteropus poliocephalus	Grey-headed Flying-fox	V	Present on site roosting in English Elms, English Oaks and Himalayan Cedars.
Flora			
Lepidium hyssopifolium	Aromatic Peppercress	E	Unlikely. No habitat within Machattie Park or Kings Parade
Swainsona sericea	Silky Swainson-pea	V	Unlikely. No habitat within Machattie Park or Kings Parade
Eucalyptus aggregata	Black Gum	V	Unlikely. No habitat within Machattie Park or Kings Parade
Eucalyptus pulverulenta	Silver-leafed Gum	V	Unlikely. No habitat within Machattie Park or Kings Parade
Euphrasia scabra	Rough Eyebright	E	Unlikely. No habitat within Machattie Park or Kings Parade
Threatened ecological communities			
Natural temperate grassland of the south eastern highlands		CE*	No. Exotic manicured lawn occurs throughout the site
White Box-Yellow Box-Blakely's Red Gum grassy woodland and derived native grassland		CE	No. Exotic dominated vegetation with only one Eucalyptus tree, (*Eucalyptus* sp) recorded on site on the northern boundary

**V = vulnerable, E = Endangered and CE = Critically Endangered.*

Areas within 6 km of the current camp location were also investigated to determine the likelihood of potential locations and to identify other areas where flying-foxes may relocate (Figure 5). A habitat potential rating was determined based on size of vegetation and its suitability to be used by flying foxes as a camp site. There are large patches of remnant vegetation to the west of the current location. There are also smaller patches to the north (Simplot agricultural property). Whilst these have high suitability ratings these areas are not identified as preferred locations. It is not possible to predict where replacement camps will form.

A patch of mature Casuarinas (*Casuarina cunninghamii*) exists along the Macquarie River behind the Quarry, 2.7 km south east of the current camp location. This area has also been identified by BRC as an area proposed for restoration and rehabilitation. It is not known if GHFF would utilise Casuarina trees but given that they roosted within Cedars and Pines at Machattie Park, they could possibly use the area as a camp. GHFF prefer locations with water, humidity and large shade trees which this area could provide. GHFF have been observed roosting in Casuarina trees at many other camps across NSW.

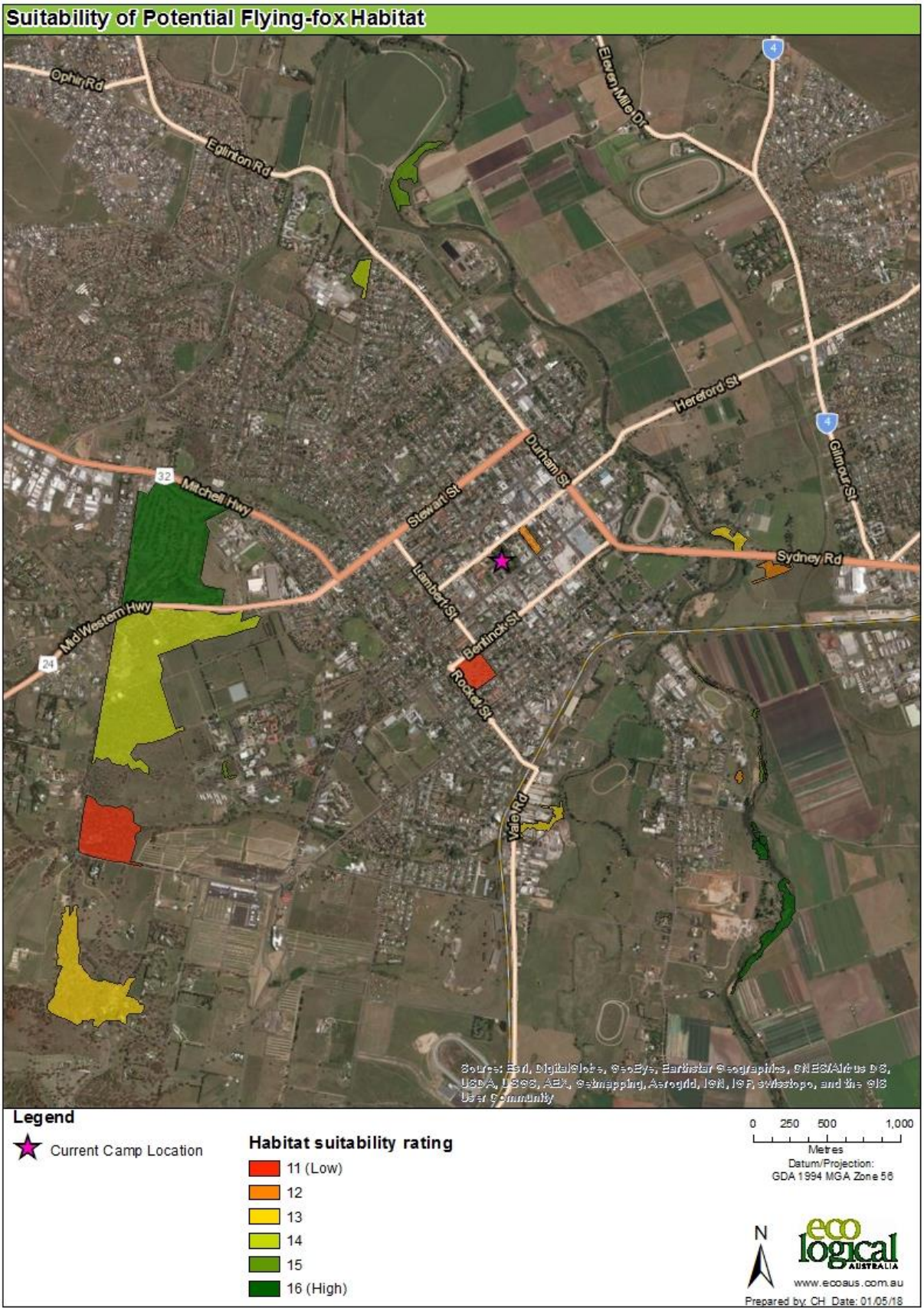


Figure 5: Sites that could potentially be utilized by flying-foxes based on available habitat (these areas have not been identified as preferred locations)

6. Flying-fox ecology and behaviour

6.1 Ecological role

Flying-foxes, along with some birds, make a unique contribution to ecosystem health through their ability to move seeds and pollen over long distances (Southerton et al. 2004). This contributes directly to the reproduction, regeneration and viability of forest ecosystems (DoE 2016a).

It is estimated that a single flying-fox can disperse up to 60,000 seeds in one night (ELW&P 2015). Some plants, particularly *Corymbia* spp., have adaptations suggesting they rely more heavily on nocturnal visitors such as bats for pollination than daytime pollinators (Southerton et al. 2004).

Grey-headed flying-foxes may travel 100 km in a single night with a foraging radius of up to 50 km from their camp (McConkey et al. 2012), and have been recorded travelling over 500 km in two days between camps (Roberts et al. 2012). In comparison bees, another important pollinator, move much shorter foraging distances of generally less than one kilometre (Zurbuchen et al. 2010).

Long-distance seed dispersal and pollination makes flying-foxes critical to the long-term persistence of many plant communities (Westcott et al. 2008; McConkey et al. 2012), including eucalypt forests, rainforests, woodlands and wetlands (Roberts et al. 2006). Seeds that are able to germinate away from their parent plant have a greater chance of growing into a mature plant (EHP 2012). Long-distance dispersal also allows genetic material to be spread between forest patches that would normally be geographically isolated (Parry-Jones & Augee 1992; Eby 1991; Roberts 2006). This genetic diversity allows species to adapt to environmental change and respond to disease pathogens. Transfer of genetic material between forest patches is particularly important in the context of contemporary fragmented landscapes.

Flying-foxes are considered ‘keystone’ species given their contribution to the health, longevity and diversity among and between vegetation communities. These ecological services ultimately protect the long-term health and biodiversity of Australia’s bushland and wetlands. In turn, native forests act as carbon sinks, provide habitat for other fauna and flora, stabilise river systems and catchments, add value to production of hardwood timber, honey and fruit (e.g. bananas and mangoes; Fujita 1991), and provide recreational and tourism opportunities worth millions of dollars each year (EHP 2012; ELW&P 2015).

6.2 Flying-foxes in urban areas

Flying-foxes appear to be roosting and foraging in urban areas more frequently. There are many possible drivers for this, as summarised by Tait et al. (2014):

- loss of native habitat and urban expansion
- opportunities presented by year-round food availability from native and exotic species found in expanding urban areas
- disturbance events such as drought, fires, cyclones
- human disturbance or culling at non-urban roosts or orchards
- urban effects on local climate
- refuge from predation
- movement advantages, e.g. ease of manoeuvring in flight due to the open nature of the habitat or ease of navigation due to landmarks and lighting.

It is likely that the population of flying-foxes at Machattie Park has expanded their feeding range due to the prolific Eucalypt flowering resulting from the spring rains and will depart for warmer climates once the nights cool and frosts arrive.

6.3 Under threat

Flying-foxes roosting and foraging in urban areas more frequently can give the impression that their populations are increasing; however, the Grey-headed Flying-fox is in decline across its range and in 2001 was listed as vulnerable by the NSW Government through the TSC Act (now the BC Act).

At the time of listing, the species was considered eligible for listing as vulnerable as counts of flying-foxes over the previous decade suggested that the national population may have declined by up to 30%. It was also estimated that the population would continue to decrease by at least 20% in the next three generations given the continuation of the current rate of habitat loss and culling.

The main threat to Grey-headed Flying-foxes in NSW is clearing or modification of native vegetation. This threatening process removes appropriate roosting and breeding sites and limits the availability of natural food resources, particularly winter–spring feeding habitat in north-eastern NSW. The urbanisation of the coastal plains of south-eastern Queensland and northern NSW has seen the removal of annually-reliable winter feeding sites, and this threatening process continues.

There is a wide range of ongoing threats to the survival of the GHFF, including:

- habitat loss and degradation
- conflict with humans (including culling at orchards)
- infrastructure-related mortality (e.g. entanglement in barbed wire fencing and fruit netting, power line electrocution, etc.)
- predation by native and introduced animals
- exposure to extreme natural events such as cyclones, drought and heat waves.

Flying-foxes have limited capacity to respond to these threats and recover from large population losses due to their slow sexual maturation, small litter size, long gestation and extended maternal dependence (McIlwee & Martin 2002).

6.4 Camp characteristics

All flying-foxes are nocturnal, roosting during the day in communal camps. These camps may range in number from a few to hundreds of thousands, with individual animals frequently moving between camps within their range. Typically, the abundance of resources within a 20–50 m radius of a camp site will be a key determinant of the size of a camp (SEQ Catchments 2012). Therefore, flying-fox camps are generally temporary and seasonal, tightly tied to the flowering of their preferred food trees. However, understanding the availability of feeding resources is difficult because flowering and fruiting are not reliable every year, and can vary between localities (SEQ Catchments 2012). These are important aspects of camp preference and movement between camps, and have implications for long-term management strategies.

Little is known about flying-fox camp preferences; however, research indicates that apart from being in close proximity to food sources, flying-foxes choose to roost in vegetation with at least some of the following general characteristics (SEQ Catchments 2012):

- closed canopy >5 m high
- dense vegetation with complex structure (upper, mid- and understorey layers)
- within 500 m of permanent water source

- within 50 km of the coastline or at an elevation <65 metres above sea level
- level topography (<5° incline)
- greater than one hectare to accommodate and sustain large numbers of flying-foxes.

Optimal vegetation available for flying-foxes must allow movement between preferred areas of the camp. Specifically, it is recommended that the size of a patch be approximately three times the area occupied by flying-foxes at any one time (SEQ Catchments 2012). Many of these characteristics are present at Machattie Park. The area is particularly cool due to regular irrigation.

6.5 Species profiles

6.5.1 Grey-headed Flying-fox (*Pteropus poliocephalus*)

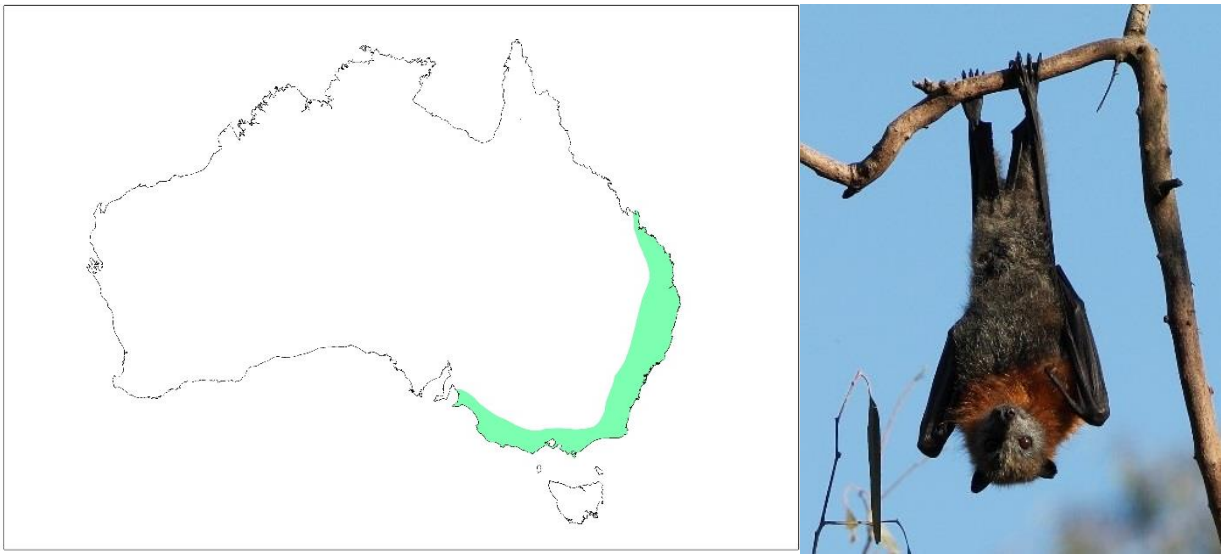


Figure 6: Grey-headed Flying-fox indicative species distribution, adapted from OEH 2015a

The Grey-headed Flying-fox (GHFF) (Figure 6) is found throughout eastern Australia, generally within 200 kilometres of the coast, from Finch Hatton in Queensland to Melbourne, Victoria (OEH 2015d). This species now ranges into South Australia and has been observed in Tasmania (DoE 2016a). It requires foraging resources and camp sites within rainforests, open forests, closed and open woodlands (including melaleuca swamps and banksia woodlands). This species is also found throughout urban and agricultural areas where food trees exist and will raid orchards at times, especially when other food is scarce (OEH 2015a).

All the GHFF in Australia are regarded as one population that moves around freely within its entire national range (Webb & Tidemann 1996; DoE 2015). GHFF may travel up to 100 kilometres in a single night with a foraging radius of up to 50 kilometres from their camp (McConkey et al. 2012). They have been recorded travelling over 500 kilometres over 48 hours when moving from one camp to another (Roberts et al. 2012). GHFF generally show a high level of fidelity to camp sites, returning year after year to the same site, and have been recorded returning to the same branch of a particular tree (SEQ Catchments 2012). This may be one of the reasons flying-foxes continue to return to small urban bushland blocks that may be remnants of historically-used larger tracts of vegetation.

The GHFF population has a generally annual southerly movement in spring and summer, with their return to the coastal forests of north-east NSW and south-east Queensland in winter (Ratcliffe 1932; Eby 1991; Parry-Jones & Augee 1992; Roberts et al. 2012). This results in

large fluctuations in the number of GHFF in NSW, ranging from as few as 20% of the total population in winter up to around 75% of the total population in summer (Eby 2000). They are widespread throughout their range during summer, but in spring and winter are uncommon in the south. In autumn they occupy primarily coastal lowland camps and are uncommon inland and on the south coast of NSW (DECCW 2009).

There is evidence the GHFF population declined by up to 30% between 1989 and 2000 (Birt 2000; Richards 2000 cited in OEH 2011a). There is a wide range of ongoing threats to the survival of the GHFF, including habitat loss and degradation, deliberate destruction associated with the commercial horticulture industry, conflict with humans, infrastructure-related mortality (e.g. entanglement in barbed wire fencing and fruit netting, power line electrocution, etc.) and competition and hybridisation with the BFF (DECCW 2009). For these reasons it is listed as vulnerable to extinction under NSW and federal legislation (see Section 4).

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

Figure 7: Little Red Flying-fox indicative species distribution, adapted from OEH 2015a

The Little Red flying-fox (LRFF) (Figure 7) is widely distributed throughout northern and eastern Australia, with populations occurring across northern Australia and down the east coast into Victoria.

The LRFF forages almost exclusively on nectar and pollen, although will eat fruit at times and occasionally raids orchards (Australian Museum 2010). LRFF often move sub-continental distances in search of sporadic food supplies. The LRFF has the most nomadic distribution, strongly influenced by availability of food resources (predominantly the flowering of eucalypt species) (Churchill 2008), which means the duration of their stay in any one place is generally very short.

Habitat preferences of this species are quite diverse and range from semi-arid areas to tropical and temperate areas, and can include sclerophyll woodland, melaleuca swamplands, bamboo, mangroves and occasionally orchards (IUCN 2015). LRFF are frequently associated with other *Pteropus* species. In some colonies, LRFF individuals can number many hundreds of thousands and they are unique among *Pteropus* species in their habit of clustering in dense bunches on a single branch. As a result, the weight of roosting individuals can break large branches and cause significant structural damage to roost trees, in addition to elevating soil nutrient levels through faecal material (SEQ Catchments 2012).

Throughout its range, populations within an area or occupying a camp can fluctuate widely. There is a general migration pattern in LRFF, whereby large congregations of over one million individuals can be found in northern camp sites (e.g. Northern Territory, North Queensland) during key breeding periods (Vardon & Tidemann 1999). LRFF travel south to visit the coastal areas of south-east Queensland and NSW during the summer months. Outside these periods LRFF undertake regular movements from north to south during winter–spring (July–October) (Milne & Pavey 2011).

6.5.3 Reproduction

Grey-headed Flying-fox

Males initiate contact with females in January with peak conception occurring around March to April/May; this mating season represents the period of peak camp occupancy (Markus 2002). Young (usually a single pup) are born six months later from September to November (Churchill 2008). The birth season becomes progressively earlier, albeit by a few weeks, in more northerly populations (McGuckin & Blackshaw 1991), however out of season breeding is common with births occurring later in the year.

Young are highly dependent on their mother for food and thermoregulation. Young are suckled and carried by the mother until approximately four weeks of age (Markus & Blackshaw 2002). At this time they are left at the camp during the night in a crèche until they begin foraging with their mother in January and February (Churchill 2008) and are usually weaned by six months of age around March. Sexual maturity is reached at two years of age with a life expectancy up to 20 years in the wild (Pierson & Rainey 1992).

As such, the critical reproductive period for GHFF is generally from August (when females are in final trimester) to the end of peak conception around April. Dependent pups are usually present from September to March (see Figure 8). It was noted by representative of WIRES that GHFF arrived in Machattie Park either with young pups or were heavily pregnant (P. Dury, WIRES, pers comm April 2018).

Little Red Flying-fox

The LRFF breeds approximately six months out of phase with the other flying-foxes. Peak conception occurs around October to November, with young born between March and June (McGuckin & Blackshaw 1991; Churchill 2008) (Figure 8). Young are carried by their mother for approximately one month then left at the camp while she forages (Churchill 2008). Suckling occurs for several months while young are learning how to forage. LRFF generally birth and rear young in temperate areas (rarely in NSW). The breeding season of all species is variable between years and location, and expert assessment is required to accurately determine phases in the breeding cycle and inform appropriate management timing.

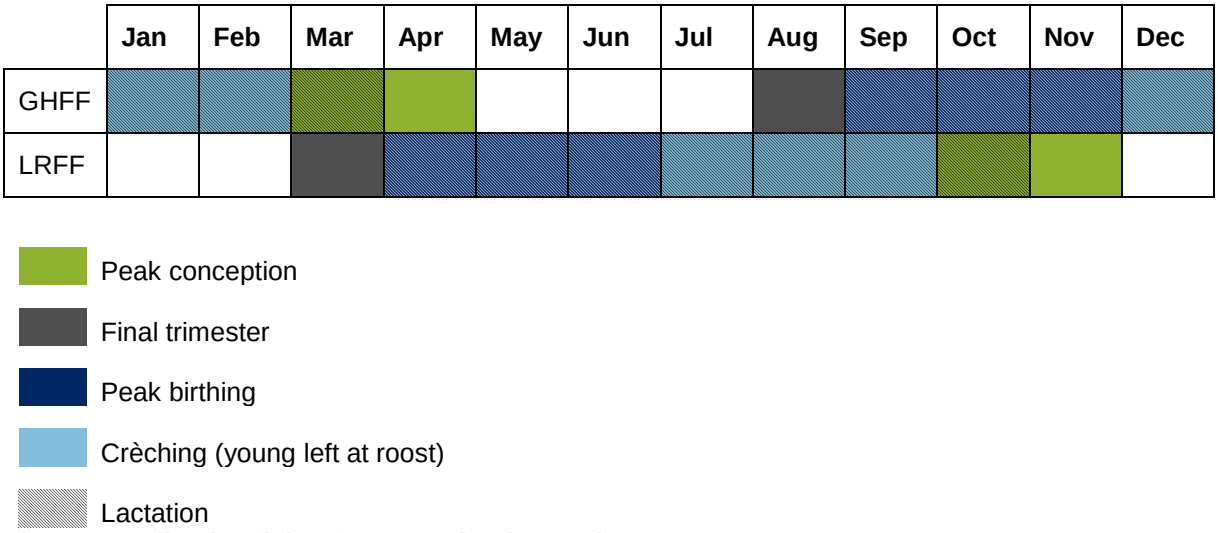


Figure 8: Indicative flying-fox reproductive cycle.

7. Human and animal health

Flying-foxes, like all animals, carry pathogens that may pose human health risks. Many of these are viruses which cause only asymptomatic infections in flying-foxes themselves but may cause significant disease in other animals that are exposed. In Australia the most well-defined of these include Australian bat lyssavirus (ABLV), Hendra virus (HeV) and Menangle virus. Specific information on these viruses is provided in Appendix 5.

Outside of an occupational cohort, including wildlife carers and vets, human exposure to these viruses is extremely rare and similarly transmission rates and incidence of human infection are very low. In addition, HeV infection in humans apparently requires transfer from an infected intermediate equine host and direct transmission from bats to humans has not been reported. Thus, despite the fact that human infection with these agents can be fatal, the probability of infection is extremely low and the overall public health risk is judged to be low (Qld Health 2016).

7.1 Disease and flying-fox management

A recent study at several camps before, during and after disturbance (Edson et al. 2015) showed no statistical association between HeV prevalence and flying-fox disturbance. However, the consequences of chronic or ongoing disturbance and harassment and its effect on HeV infection were not within the scope of the study and are therefore unknown.

The effects of stress are linked to increased susceptibility and expression of disease in both humans (AIHW 2012) and animals (Henry & Stephens-Larson 1985; Aich et. al. 2009), including reduced immunity to disease.

Therefore it can be assumed that management actions which may cause stress (e.g. dispersal), particularly over a prolonged period or at times where other stressors are increased (e.g. food shortages, habitat fragmentation, etc.), are likely to increase the susceptibility and prevalence of disease within the flying-fox population, and consequently the risk of transfer to humans.

Furthermore, management actions or natural environmental changes may increase disease risk by:

- forcing flying-foxes into closer proximity to one another, increasing the probability of disease transfer between individuals and within the population
- resulting in abortions and/or dropped young if inappropriate methods are used during critical periods of the breeding cycle. This will increase the likelihood of direct interaction between flying-foxes and the public, and potential for disease exposure
- adoption of inhumane methods with potential to cause injury which would increase the likelihood of the community coming into contact with injured/dying flying-foxes.

The potential to increase disease risk should be carefully considered as part of a full risk assessment when determining the appropriate level of management and the associated mitigation measures required.

8. Camp management options

Section 8 provides an overview of commonly used management options that are considered. They are categorised as Level 1, 2 or 3 in accordance with the Policy. BRC have already implemented many of the actions listed as Level 1 and due to the historical nature and heritage listing of Machattie Park and Kings Parade, Level 2 actions that result in vegetation removal or thinning are not recommended.

Given the recent conflicts, small size of the existing camp population and the identification of potential habitat less than 3 km from Machattie Park, Level 3 actions have been reviewed in the options below.

8.1 Level 1 actions: routine camp management

8.1.1 Education and awareness programs

Whilst BRC have implemented a community awareness program to provide accurate information to the local community about flying-foxes, there is opportunity to expand the education program. Previously held information sessions have been poorly attended and attendees are often well-informed members of environmental groups. It is recommended that BRC incorporate information about GHFF in the rate-payers newsletter to ensure information is getting to all community members to raise awareness and alleviate concerns about health and safety issues associated with flying-foxes.

Signage has already been installed at strategic vantage points around the flying-fox camp, including the entrances to the Park. It is recommended that the signage is upgraded to incorporate the value and importance of GHFF and how the community can live with them.

Figure 9: Possible components of an education program

Residents should also be made aware that faecal drop and noise at night is mainly associated with plants that provide food, independent of camp location. Staged removal of foraging species such as exotic palms from residential yards, or management of fruit (e.g. bagging, pruning) will greatly assist in mitigating this issue.

Collecting and providing information should always be the first response to community concerns in an attempt to alleviate issues without the need to actively manage flying-foxes or their habitat. Where it is determined that management is required, education should similarly be a key component of any approach. See also Section 3 and incorporate an education and awareness program into any community engagement plan. An education program may include components shown in Figure 9.

The likelihood of improving community understanding of flying-fox issues is high. However, the extent to which that understanding will help alleviate conflict issues is probably less so. Extensive education for decision-makers, the media and the broader community may be required to overcome negative attitudes towards flying-foxes.

It should be stressed that a long-term solution to the issue resides with better understanding flying-fox ecology and applying that understanding to careful urban planning and development. It has been noted that the fear and loathing from the community in Orange has greatly abated overtime (Goldney 2018).

8.1.2 Routine camp maintenance and operational activities

Examples of routine camp management actions are provided in the Policy. These include:

- removal of tree limbs or whole trees that pose a genuine health and safety risk, as determined by a qualified arborist
- weed removal, including removal of listed weeds under the *Biosecurity Act 2015*, or species listed as undesirable by a council
- trimming of understorey vegetation or the planting of vegetation
- minor habitat augmentation for the benefit of the roosting animals
- mowing of grass and similar grounds-keeping actions that will not create a major disturbance to roosting flying-foxes
- application of mulch or removal of leaf litter or other material on the ground.

Given the historical and heritage value of Machattie Park and Kings Parade removing vegetation or trimming the canopy is not a feasible option to manage the camp and is not a recommendation of the Plan. The Park is maintained as an English style garden with lawns regularly mowed, garden plants trimmed, and weeds removed.

Protocols should be developed for carrying out operations that may disturb flying-foxes, which can result in excess camp noise. Such protocols could include limiting the use of disturbing activities to certain days or certain times of day in the areas adjacent to the camp, and advising adjacent residents of activity days. Such activities could include using chainsaws, using generators and testing alarms or sirens. However, if public safety is a concern or an issue, matters will be attended to immediately. General maintenance activities such as lawn mowing and brushcutting will continue as required as they did not appear to disturb the flying-foxes.

8.1.3 Revegetation and land management to create alternative habitat

This management option involves revegetating and managing land to create alternative flying-fox roosting habitat through improving and extending existing low-conflict camps or developing new roosting habitat in areas away from human settlement.

Selecting new sites and attempting to attract flying-foxes to them has had limited success in the past, and ideally habitat at known camp sites would be dedicated as a flying-fox reserve. However, if a staged and long-term approach is used to make unsuitable current camps less attractive, whilst concurrently improving appropriate sites, it is a viable option (particularly for the transient and less selective LRFF). Supporting further research into flying-fox camp preferences may improve the potential to create new flying-fox habitat.

When improving a site for a designated flying-fox camp, preferred habitat characteristics detailed in Section 6.4 should be considered.

Foraging trees planted amongst and surrounding roost trees (excluding in/near horse paddocks) may help to attract flying-foxes to a desired site. They will also assist with reducing foraging impacts in residential areas. Eby and Law (2008) suggested that a priority or core diet tree for flying-foxes should have one or more of the following traits:

- a tree that has the potential to be highly productive
- a tree that is annually reliable regarding its productivity (which reduces the effort used during searching behaviour, need for migration and the likelihood of being impacted upon by a food shortage)
- a tree that is productive for lengthy periods (most plants produce blossom for one to three months).

Law et al. (2002) recommended that the species to be planted for foraging habitat should match the local site conditions. Some species to be considered are plants from genera Angophora, Banksia, Corymbia, Eucalyptus, Grevillea and Melaleuca.

The location of camps is highly variable but are commonly located in closed forests, Melaleuca swamps or stands of Casuarina and generally found near rivers or creeks. Depending on the site, the potential negative impacts to a natural area will need to be considered if introducing non-indigenous plant species.

The presence of a water source is likely to increase the attractiveness of an alternative camp location. Supply of an artificial water source should be considered if unavailable naturally, however this may be cost-prohibitive.

Potential habitat mapping using camp preferences (see Section 6.4) 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.

Two sites have been identified as potential areas for future camps (Map 4). Site 1 is located approximately 2.6 km NNW of the current camp and consists of willow trees growing along the edge of the Macquarie River near the original camp of 2011. Site 2 is located upstream from the original location and is 2.1 km SE or the current camp. This area is a stand of mature and juvenile casuarina trees and is proposed for a revegetation program by BRC.

8.1.4 Provision of artificial roosting habitat

This management option involves constructing artificial structures to augment roosting habitat in current camp sites or to provide new roosting habitat. Whilst this is not recommended for Machattie Park this could be incorporated into alternative sites along the Macquarie River to increase the amount of roosting habitat. Trials using suspended ropes have been of 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.

8.1.5 Protocols to manage incidents

This management option involves implementing protocols for managing incidents or situations specific to particular camps. Incidents relevant to BRC include heat stress, canopy damage and airstrikes. Such protocols may include 'bat watch' patrols at sites that host vulnerable people, management of pets at sites popular for walking dogs or heat stress incidents (when the camp is subjected to extremely high temperatures leading to flying-foxes changing their behaviour and/or dying).

8.1.6 Participation in research

This management option involves participating in research 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. Further research and knowledge sharing at local, regional and national levels will enhance our understanding and management of flying-fox camps. BRC currently participate in the Australian Government Flying-fox Monitoring Program.

8.1.7 Appropriate land-use planning

Land-use planning instruments may be able to be used to ensure adequate distances are maintained between future residential developments and existing or historical flying-fox camps. While this management option will not assist in the resolution of existing land-use conflict, it may prevent issues for future residents. This action should be considered if an alternative camp is established along the Macquarie River as these areas should be isolated from human habitation by management zones greater than 300 m wide and comprise habitat unsuitable for roosting such as cleared land, low shrubs or isolated trees. Residential development, schools and other structures that might lead to conflict should be excluded. Potential habitat along the Macquarie River is Flood Zone and is unlikely to be developed.

8.1.8 Do nothing

The management option to 'do nothing' involves not undertaking any management actions in relation to the flying-fox camp and leaving the situation and site in its current state. However, the camp currently resides in a heritage listed park with high amenity value and some of the roosting trees are being affected. Although it is probable, given the current population size of the camp, the current level of damage is minimal, and the trees will recover. However, if the population size increases, potential exists for significant damage to occur. It has been assessed that the population threshold at Machattie Park is approximately 3000 individuals. Populations above 3000 are likely to result in irreparable damage to the trees. It is recognised that Machattie Park is not an ideal camp location and a 'do-nothing' approach is not recommended in the Plan.

8.2 Level 2 actions: in-situ management

8.2.1 Buffers

This Plan does not recommend the creation of new buffers through vegetation removal from within the current Flying-fox camp habitat. Machattie Park is a heritage listed park dominated by English trees to represent a typical 19th Century Park and is of high amenity value.

Buffers without vegetation removal - Passive Deterrents

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.

GHFF are seasonal visitors to Bathurst and it is possible to trial passive deterrents prior to their arrival in November. While many deterrents have been trialled in the past with limited success, there are some options worthy of further investigation:

- Visual deterrents – Visual deterrents such as plastic bags, Flood lights, plastic hawks, fluoro vests (GeoLINK 2012) and balloons (Ecosure 2016, pers. comm.) in roost trees have shown to have localised effects, with flying-foxes deterred from roosting within 1–10 metres of the deterrents. The type and placement of visual deterrents would need to be varied regularly to avoid habituation.
- Noise emitters on timers – Loud noise (e.g. LRAD or Long Range Acoustic Device) needs to be random, varied and unexpected to avoid flying-foxes habituating. As such these emitters would need to be portable, on varying timers and a diverse array of noises would be required. It is likely to require some level of additional disturbance to maintain its effectiveness, and ways to avoid disturbing flying-foxes from desirable areas would need to be identified. This is also likely to be disruptive to nearby residents.
- Smell deterrents – For example, bagged python excrement hung in trees has previously had a localised effect (GeoLINK 2012). The smell of certain deterrents may also impact nearby residents, and there is potential for flying-foxes to habituate.
- Canopy-mounted water sprinklers – This method has been effective in deterring flying-foxes during dispersals (Ecosure personal experience), and a current trial in Queensland is showing promise for keeping flying-foxes out of designated buffer zones. This option can be logistically difficult (installation and water sourcing) and may be cost-prohibitive. Design and use of sprinklers need to be considerate of animal welfare and features of the site. For example, misting may increase humidity and exacerbate heat stress events, and overuse may impact other environmental values of the site.

Note that any deterrent with a high risk of causing inadvertent dispersal may be considered a Level 3 action, particularly if the GHFF have arrived and settled in the Park.

The use of visual deterrents, in the absence of effective maintenance, could potentially lead to an increase in rubbish in the natural environment (ie balloons and plastic bags).

8.3 Level 3 actions: disturbance or dispersal

8.3.1 Nudging

Noise and other low intensity active disturbance restricted to certain areas of the camp can be used to encourage flying-foxes away from high conflict areas. This technique aims to actively ‘nudge’ flying-foxes from one area to another, while allowing them to remain at the camp site.

Unless the area of the camp is very large, nudging should not be done early in the morning as this may lead to inadvertent dispersal of flying-foxes from the entire camp site. Disturbance during the day should be limited in frequency and duration (e.g. up to four times per day for up to 10 minutes each) to avoid welfare impacts. As with dispersal, it is also critical to avoid periods when dependent young are present (during Nov – Feb or as identified by a flying-fox expert).

Nudging is not recommended as an action in the Plan as Machattie Park is not significantly large enough to reduce the impacts throughout the site. It was also observed that when the GHFF were disturbed by noise they spread out through the Park but eventually returned to their previous core area (Goldney 2018).

8.3.2 Dispersal

Dispersal aims to encourage a camp to move to another location, through either disturbance or habitat modification.

There is a range of potential risks, costs and legal implications that are greatly increased with dispersal (compared with in-situ management as above). See Appendix 6 for more details. These include:

- impact on animal welfare and flying-fox conservation
- splintering the camp into other locations that are equally or more problematic
- shifting the issue to another area
- impact on habitat value
- effects on the flying-fox population, including disease status and associated public health risk
- impacts to nearby residents associated with ongoing dispersal attempts
- excessive initial and/or ongoing capacity and financial investment
- negative public perception and backlash
- increased aircraft strike risk associated with changed flying-fox movement patterns
- unsuccessful management requiring multiple attempts, which may exacerbate all of the above.

Despite these risks, there are some situations where camp dispersal may be considered. Dispersal can broadly be categorised as ‘passive’ or ‘active’ as detailed below.

Passive dispersal

The Plan does not recommend Passive dispersal as it involves removing vegetation in a staged manner so that the habitat becomes less attractive overtime so that flying-foxes will disperse of their own accord with little stress (rather than being more forcefully moved with noise, smoke, etc.). Whilst this is less stressful to flying-foxes, and greatly reduces the risk of splinter colonies forming in other locations, the vegetation at Machattie Park cannot be modified.

Whilst there is also potential to make a camp site unattractive by removing access to water sources, this too is not recommended in the Plan due to the high-water requirements of the trees located within Machattie Park.

Active dispersal through disturbance

Dispersal is more effective when a wide range of tools, such as noise, spotlights, smoke and sprinklers are used on a randomised schedule with animals less likely to habituate (Ecosure pers. obs. 1997–2015). Each dispersal team member should have at least one visual and one aural tool that can be used at different locations on different days (and preferably swapped regularly for alternate tools). Exact location of these and positioning of personnel will need to be determined on a daily basis in response to flying-fox movement and behaviour, as well as prevailing weather conditions (e.g. wind direction for smoke drums).

Active dispersal will be disruptive for nearby residents given the timing and nature of activities, (early morning), and this needs to be considered during planning and community consultation.

If dispersal is successful, it is often recommended that some level of habitat modification should be considered to reduce the likelihood of flying-foxes attempting to re-establish the camp and the need for follow-up dispersal as a result. However, given the status of Machattie Park, habitat modification is not recommended.

Early dispersal before a camp is established at a new location

This management option involves monitoring local vegetation for signs of flying-foxes roosting in the daylight hours and then undertaking active or passive dispersal options to discourage the animals from establishing a new camp and an undesirable location. Even though there may only be a few animals initially using the site, this option is still treated as a dispersal activity, however it may be simpler to achieve dispersal at these new sites than it would in an established camp. It may also avoid considerable issues and management effort required should the camp be allowed to establish in an inappropriate location.

It is important that flying-foxes feeding overnight in vegetation are not mistaken for animals establishing a camp.

Maintenance dispersal

Maintenance dispersal refers to active disturbance following a successful dispersal to prevent the camp from re-establishing. It differs from initial dispersal by aiming to discourage occasional over-flying individuals from returning, rather than attempting to actively disperse animals that have been recently roosting at the site. As such, maintenance dispersal may have fewer timing restrictions than initial dispersal, provided that appropriate mitigation measures are in place (see Section 10).

8.4 Unlawful activities

8.4.1 Culling

Culling is addressed here as it is often raised by community members as a preferred management method; however, culling is contrary to the objects of the TSC Act and will not be permitted as a method to manage flying-fox camps.

8.5 Site-specific analysis of camp management options

An analysis of management options and their advantages and disadvantages are shown in Table 3 below.

Table 3: Analysis of management options; definitions and description of each management option are provided in Section 9

Management option	Relevant impacts	Cost	Advantages	Disadvantages
Level 1 actions				
Education and awareness programs	Fear of disease Noise Smell Faecal drop	$	Low cost, promotes conservation of FFs, contributes to attitude change which may reduce general need for camp intervention, increasing awareness and providing options for landholders to reduce impacts can be an effective long-term solution, can be undertaken quickly, will not impact on ecological or amenity value of the site.	Education and advice itself will not mitigate all issues and maybe seen as not doing enough. BRC have already placed signs around Machattie Park and updated their website with information on Flying-foxes.
Property modification	Noise Smell Faecal drop Health/wellbeing	$–$$	Property modification is one of the most effective ways to reduce amenity impacts of a camp without dispersal (and associated risks), relatively low cost, promotes conservation of FFs, can be undertaken quickly, will not impact on the site, may add value to the property.	May be cost-prohibitive for private landholders, unlikely to fully mitigate amenity issues in outdoor areas. BRC have already moved seating and tables from under roosting trees. Grant funding was sourced to assist with washing amenities and cleaning paths and raking vegetation from under roost trees.
Service subsidies including rate rebates	Noise Smell Faecal drop Health/wellbeing Property devaluation Lost rental return	$–$$	May encourage tolerance of living near a camp, promotes conservation of FFs, can be undertaken quickly, will not impact on the site, would reduce the need for property modification.	May be costly across multiple properties and would incur ongoing costs, may set unrealistic community expectations for other community issues, effort required to determine who would receive subsidies.
Routine camp management	Health/wellbeing	$	Will allow property maintenance, likely to improve habitat, could improve public perception of the site, will ensure safety risks of a public site can be managed. Weed removal has the potential to reduce roost availability and reduce numbers of roosting FFs. To avoid this, weed removal should be staged and alternative roost habitat planted, otherwise activities may constitute a Level 3 action.	Will not generally mitigate amenity impacts for nearby landholders. Machattie Park is maintained for high valued amenity. BRC has engaged contractors to wash and rak areas around roosting trees to ensure public safety, amenity and to ensure the park remains open for community use.
Alternative habitat creation	All	$$–$$$	If successful in attracting FFs away from high conflict areas, dedicated habitat in low conflict areas will mitigate all impacts, promotes FF conservation. Rehabilitation of degraded habitat that is likely to be suitable for FF use could be a more practical and faster approach than habitat creation.	Generally costly, long-term approach so cannot be undertaken quickly, previous attempts to attract FFs to a new site have not been known to succeed. BRC are already implementing revegetation plans along the Macquarie River which has been identified as preferred location.

Management option	Relevant impacts	Cost	Advantages	Disadvantages
Provision of artificial roosting habitat	All	$–$$	If successful in attracting FFs away from high conflict areas, artificial roosting habitat in low conflict areas will assist in mitigating all impacts, generally low cost, can be undertaken quickly, promotes FF conservation.	Would need to be combined with other measures (e.g. buffers/alternative habitat creation) to mitigate impacts, previous attempts have had limited success.
Protocols to manage incidents	Health/wellbeing	$	Low cost, will reduce actual risk of negative human/pet–FF interactions, promotes conservation of FFs, can be undertaken quickly, will not impact the site.	Will not generally mitigate amenity impacts.
Research	All	$	Supporting research to improve understanding may contribute to more effectively mitigating all impacts, promotes FF conservation.	Generally, cannot be undertaken quickly, management trials may require further cost input.
Appropriate land-use planning	All	$	Likely to reduce future conflict, promotes FF conservation. Identification of degraded sites that may be suitable for long-term rehabilitation for FFs could facilitate offset strategies should clearing be required under Level 2 actions.	Will not generally mitigate current impacts, land-use restrictions may impact the landholder.
Property acquisition	All for specific property owners Nil for broader community	$$$	Will reduce future conflict with the owners of acquired property.	Owners may not want to move, only improves amenity for those who fit criteria for acquisition, very expensive. Whilst this option is not relevant to the Machattie Park site this may need to be considered if the camp is relocated to another location.
Do nothing	Nil	Nil	No resource expenditure.	Will not mitigate impacts and unlikely to be considered acceptable by the community.
Level 2 actions				
Buffers through vegetation removal	Noise Smell Health/wellbeing Property devaluation Lost rental return	$–$$	Will reduce impacts, promotes FF conservation, can be undertaken quickly, limited maintenance costs.	Will impact the site, will not generally eliminate impacts, vegetation removal may not be favoured by the community. Vegetation removal cannot be undertaken at Machattie Park.
Buffers without vegetation removal – passive deterrents	Noise Smell Health/wellbeing Damage to vegetation Property devaluation Lost rental return	$$	Successful creation of a buffer will reduce impacts, promotes FF conservation, can be undertaken quickly, options without vegetation removal may be preferred by the community.	May impact the visual impact of the site for the short term, buffers will not generally eliminate impacts, maintenance costs may be significant, often logistically difficult, limited trials so likely effectiveness unknown.

Management option	Relevant impacts	Cost	Advantages	Disadvantages
Noise attenuation fencing	Noise Smell Health/wellbeing Property devaluation Lost rental return	$$	Will eliminate/significantly reduce noise impacts, will reduce other impacts, limited maintenance costs.	Costly, likely to impact visual amenity of the site, will not eliminate all impacts, may impact other wildlife at the site. This option is not suitable for Machattie Park as it is a heritage listed park in the centre of the CDB.
Level 3 actions				
Nudging	All	$$–$$$	If nudging is successful this may mitigate all impacts.	Costly. FFs will continue attempting to recolonise the area unless combined with habitat modification/ deterrents. Machattie Park is too small to move FF into other areas of the Park.
Passive dispersal through vegetation management	All at that site but not generally appropriate for amenity impacts only (see Section 8)	$$–$$$	If successful can mitigate all impacts at that site, compared with active dispersal: less stress on FFs, less ongoing cost, less restrictive in timing with ability for evening vegetation removal.	Costly, will impact site, risk of removing habitat before outcome known, potential to splinter the camp creating problems at other locations (although less than active dispersal), potential welfare impacts, disturbance to community, negative public perception, unknown conservation impacts, unpredictability makes budgeting and risk assessment difficult, may increase disease risk (see Section 7.1), potential to impact on aircraft safety. Machattie Park is a heritage listed park and vegetation removal is not an option for this camp.
Passive dispersal through water management	All at that site but not generally appropriate for amenity impacts only (see Section 8)	$$–$$$	Potential advantages as per with passive dispersal through vegetation removal, however likelihood of success unknown.	Potential disadvantages as per passive dispersal through vegetation removal, however likelihood of success unknown. Machattie Park is a heritage listed park and requires regular watering. Reducing water on site is not an option for this camp.
Active dispersal	All at that site but not generally appropriate for amenity impacts only (see Section 8)	$$$$	If successful can mitigate all impacts at that site, often stated as the preferred method for impacted community members.	May be very costly, often unsuccessful, ongoing dispersal generally required unless combined with habitat modification, potential to splinter the camp creating problems in other locations, potential for significant animal welfare impacts, disturbance to community, negative public perception, unknown conservation impacts, unpredictability makes budgeting and risk assessment difficult, may increase disease risk (see Section 7.1), potential to impact on aircraft safety.

Management option	Relevant impacts	Cost	Advantages	Disadvantages
Early dispersal before a camp is established at a new location	All at that site	$$–$$$	Potential advantages as per other dispersal methods, but more likely to be successful than dispersal of a historic camp.	Potential disadvantages as per other dispersal methods, but possibly less costly and slightly lower risk than dispersing a historic camp. Potential to increase pressure on FFs that may have relocated from another dispersed camp, which may exacerbate impacts on these individuals.

9. Planned management approach

9.1 Level 1 Actions

It is acknowledged that Machattie Park is not an ideal location for a flying-fox camp, given the heritage value and high community use of the park. BRC have already implemented many of the Level 1 actions identified above to manage the 2017/2018 camp at Machattie Park.

Community education as outlined in Section 8.1.1 is to be ongoing and implemented over the life of the plan. However, there is opportunity for BRC to expand the existing education program to educate the local community about why the flying-foxes are in the area and how residents could live with the colony. It is recommended that BRC install an information board containing factual information, particularly highlighting the ecological importance of GHFF and send out information in rate-payers newsletters to abate negative attitudes associated with flying-foxes.

It is recommended that BRC revegetate and manage land along the Macquarie River to create alternative flying-fox roosting habitat away from human settlement as per Section 8.1.3. Two potential sites along the Macquarie River have been identified as suitable for future camps. Species planted should provide foraging and roosting habitat for the flying foxes and match the local site conditions. Provision of artificial roosting habitat, such as provision of ropes, may also be trialled within these river sites.

9.2 Level 2 Actions

Given the heritage status of the vegetation within Machattie Park and neighbouring Kings Parade, the Level 2 option of vegetation removal creating a buffer are not considered appropriate management actions. Strategies that may deter GHFF from utilising Machattie Park in the future may mitigate some of the impacts caused by the GHFF.

It is recommended that an Action Plan be prepared to provide a detailed methodology to carry out the Level 2 Actions. The use of passive deterrents may encourage the flying-foxes to find another location to establish a camp. Deterrents could be installed prior to their usual arrival in November. Deterrents may include any of those described within Section 8.2 including:

- Visual deterrents such as plastic bags, flood lights, plastic hawks, fluoro vests, and balloons in roost trees.
- Noise emitters on timers to provide loud, random, varied and unexpected noise to avoid flying-foxes habituating
- Smell deterrents such as bagged python excrement hung in trees.
- Canopy-mounted water sprinklers within roost trees

The aim of Level 2 Actions are to deter the flying-foxes from initially using the trees within Machattie Park so that they instead establish a camp in a more preferred location such as habitat along the Macquarie River (as identified within Section 8.1.3). However, the camp may relocate to a less suitable area (ie Simplot property, hospital grounds, remnant areas to the East of the city centre (Mount Panorama) or on private property). The success of using deterrents is not known and it is possible that the camp may return in subsequent years.

9.3 Level 3 Actions

If Level 2 deterrents are unsuccessful and flying-foxes begin to establish a camp at Machattie Park or within Kings Parade then active, early dispersal may be actioned to reduce this possibility or the population increasing to an unsustainable size within Machattie Park. Responding earlier to move smaller numbers of flying-foxes will increase the likelihood of successful relocation and reduce the impacts on the individual animals. The aim of the Level

3 Actions is to prevent the flying-foxes from establishing within the Machattie Park or Kings Parade.

A licence must be approved and issued by OEH prior to undertaking any dispersal actions. An Ecologist will also need to assess the reproductive status of adults and their general wellbeing prior to undertaking any dispersal activities.

It is recommended that an Action Plan be prepared to provide a detailed methodology to carry out the Level 3 Actions. It is important that any dispersal activity is well planned and managed with involvement /supervision of an experienced ecologist. Deterrents may include any of those described within Section 8.3 including noise, spotlights, smoke and sprinklers used on a randomised schedule. If a camp appears to be establishing in a new undesirable location, early active or passive dispersal options are to be carried out in the new location. If the camp has been successfully dispersed to a more appropriate location, maintenance dispersal may be required to prevent the camp re-establishing within Machattie Park in future years.

Active dispersal activities can be extremely costly and are often unsuccessful. There is no guarantee where the Flying-foxes will disperse to and they may relocate to less desirable areas within the town. It is strongly recommended that BRC clearly communicate these factors to the community.

Table 4: Management approach overview

Issue	Management aim	Example success measures (recommend one measure only per aim)	Management actions to be considered		
			Level 1 actions	Level 2 actions	Level 3 actions
Noise	Mitigate noise impacts.	Reduce average noise to within legislated thresholds (seasonal sampling required). Reduce complaints/complainants by 70%. Reasonable level of amenity achieved based on independent assessment.	Revegetate and manage land to create alternative habitat. BRC have plans in place to revegetate areas along the Macquarie River.	Passive deterrents could encourage the GHFF to find alternative camp locations	Level 3 actions will not be considered to mitigate this issue.
Faecal drop	Mitigate impacts of faecal drop.	Reduce faecal drop by 50%. Reduction in complaints / complainants on the impacts of faecal drop	Education and awareness (e.g. managing foraging attractants and tips to reduce impacts / fear of disease). Protocols to manage incidents (e.g. cleaning prior to young children using the park, sectioning off areas under roosting trees). Support research to understand site-specific movements / trials to influence fly-out/in.	Passive deterrents could encourage the GHFF to find alternative camp locations. No tree removal or additional trimming is to be undertaken at Machattie Park or Kings Parade	Level 3 actions will not be considered to mitigate this issue.
Smell	Mitigate impacts of smell.	Reduce odour by 70% (seasonal odour sampling required to quantify). Reduce complaints/complainants by 70%. Reasonable level of amenity achieved based on independent assessment.	Education and awareness programs (e.g. ensuring community understand not associated with uncleanliness). Revegetate / rehabilitate selected suitable sites away from current location to create alternative habitat. In progress by BRC. Provision of artificial roosting habitat away from conflict areas. Support research to determine odour masking techniques.	Passive deterrents could encourage the GHFF to find alternative camp locations. No additional trimming is to be undertaken at Machattie Park or Kings Parade	Dispersal.

Issue	Management aim	Example success measures (recommend one measure only per aim)	Management actions to be considered		
			Level 1 actions	**Level 2 actions**	**Level 3 actions**
Fear of disease	Promote awareness of actual low disease risk. Reassure community	All concerned community members have received and have access to factual information on disease. Surrounding community is no longer concerned about disease (poll may be required). Reduction in complaints about disease risk.	Education and awareness programs (e.g. ensuring community understand actual low risk of disease transfer and simple mitigation measures). Protocols to prevent incidents (eg heat stress events) in partnership with WIRES.	Passive deterrents could encourage the GHFF to find alternative camp locations. No tree removal or additional trimming is to be undertaken at Machattie Park or Kings Parade	Level 3 actions will not be considered to mitigate this issue.
Health / wellbeing impacts	Mitigate health and wellbeing impacts.	Health and wellbeing impacts are not being created by the camp as assessed by an independent professional. Reduce complaints/complainants by 70%. No negative human/flying-fox interactions.	Education and awareness programs. Protocols to prevent incidents (eg heat stress events) in partnership with WIRES. Routine management actions to improve the site. BRC have implemented a cleaning program. Revegetate land to create alternative habitat in progress.	Passive deterrents could encourage the GHFF to find alternative camp locations. No additional trimming is to be undertaken at Machattie Park or Kings Parade	Level 3 actions will not be considered to mitigate this issue.
Damage to vegetation	Mitigate impacts to vegetation.	Long-term viability of vegetation not at risk / can be rehabilitated (need to assess cost/benefit of impacts associated with damage to vegetation against environmental services provided by flying-foxes and risks of other impacts if camp is dispersed).	Routine management actions to improve the site. Revegetate land to create alternative habitat. Prioritise adjacent and alternative sites for revegetation / rehabilitation away from sensitive receivers to create alternative flying fox habitat, relieving pressure on existing habitat.	Roosting trees in the park are showing signs of canopy damage. Using deterrents to prevent GHFF from using select trees (e.g. netting, wires, sprinklers, etc.) (may constitute a Level 3 action). Consideration must be given to the types of deterrents used so that these don't impact the trees.	Dispersal. Due to the heritage listing of the vegetation within Machattie Park. Trees are showing signs of damaged and this issue is unable to be mitigated any other way.

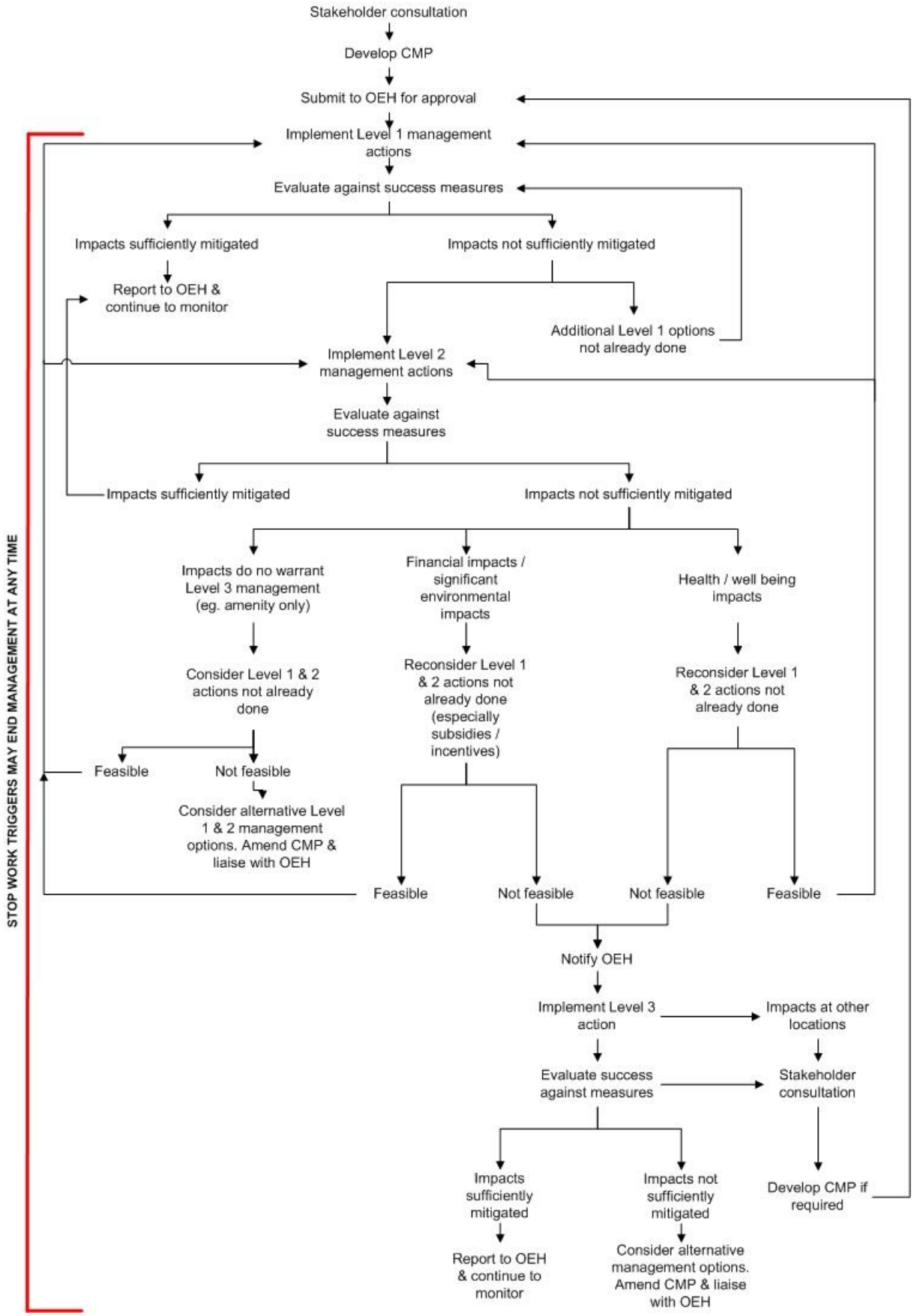


Figure 10: Example flow chart to demonstrate the planned process for management decision-making

9.4 Stop work triggers

The management program will cease and will not recommence or progress to subsequent levels without consulting OEH if:

- any of the animal welfare triggers occur on more than two days during the program, such as unacceptable levels of stress (see Table 5)
- there is a flying-fox injury or death that appears to be related to the dispersal (as determined by the Supervising Ecologist)
- two or more camps appear to be establishing
- impacts are created or exacerbated at other locations
- there appears to be potential for conservation impacts (e.g. reduction in breeding success identified through independent monitoring)
- standard measures to avoid impacts (detailed in Section 10.3) cannot be met.
- allocated resources are exhausted or there are unacceptable personal safety risks

Management may also be terminated at any time if:

- unintended impacts are created for the community around the camp
- allocated resources are exhausted.

Dispersal will cease if:

- in the opinion of the land manager or OEH, there is ongoing proliferation of splinter colonies in unsuitable locations (as determined by the land manager or OEH)
- splinter camps become established in inappropriate locations and for ecological, social or other reasons, a dispersal at the splinter location is not appropriate (as determined by the land manager or OEH).

If a dispersal program is stopped it may be permanently abandoned and other strategies considered, or reassessed and resumed in consultation with OEH.

Table 5: Planned action for potential impacts during management. (A person with experience in flying-fox behaviour, as per Appendix 1, will monitor for welfare triggers and direct works in accordance with the criteria below).

Welfare trigger	Signs	Action
Unacceptable levels of stress	If any individual is observed: • panting • saliva spreading • located on or within 2 m of the ground	Works to cease for the day.
Fatigue	In-situ management • more than 30% of the camp takes flight • individuals are in flight for more than 5 minutes • flying-foxes appear to be leaving the camp Dispersal • low flying • laboured flight • settling despite dispersal efforts	In-situ management Works to cease and recommence only when flying-foxes have settled* / move to alternative locations at least 50 m from roosting animals. Dispersal Works to cease for the day.
Injury/death	• a flying-fox appears to have been injured/killed on site (including aborted foetuses) • any flying-fox death is reported within 1 km of the dispersal site that appears to be related to the dispersal • females in final trimester • dependent/crèching young present • loss of condition evident	Works to cease immediately and OEH notified AND rescheduled OR adapted sufficiently so that significant impacts (e.g. death/injury) are highly unlikely to occur, as confirmed by an independent expert (see Appendix 1) OR stopped indefinitely and alternative management options investigated.

*maximum of two unsuccessful attempts to recommence work before ceasing for the day.

9.5 Protocols to manage incidents

Heat stress

Any flying fox camp within Bathurst LGA is susceptible to heat stress and is likely to become increasingly so with the increased temperatures and extreme weather events predicted as a result of climate change (Welbergen, et al, 2008). Council should check the Flying fox Heat Stress forecaster http://www.animalecologylab.org/ff-heat-stress-forecaster.html (Welbergen, 2017a) prior to predicted heat waves where local temperatures are likely to exceed 37^0C. This website provides mapping of camps across Australia likely to be affected by heat stress at any time up to 72 hours in the future. Council should also close public access to camps on the advice of WIRES immediately prior to, during and following such events to allow flying foxes

to recover and to reduce the risk of members of the public coming into contact with dead/injured flying foxes.

Roost Collapse and Abortion Storm / Abandonment of Young

All flying fox camps are susceptible to roost collapse, abortion storm / abandonment of dependent young. Council is required to close public access to camps on the advice of WIRES following such events. Access should not be permitted for a suitable period to allow flying foxes to recover and to reduce the risk of members of the public coming into contact with dead/injured flying foxes.

10. Assessment of impacts to flying-foxes

Standard measures to avoid impacting flying-foxes at the camp during management are provided in Section 11.3 and will be adhered to by Council during all management actions.

BRC have already implemented and are continuing Level 1 actions which are not impacting upon the Flying-foxes. Level 2 actions involving vegetation removal is not considered an appropriate management action due to the heritage value of Machattie Park. Deterring GHFF from establishing a camp in late 2018 / 2019 and/or active dispersal may mitigate the issues within Machattie Park.

10.1 Regional context

With no significant removal of vegetation recommended in the Plan, there are not expected to be any impacts upon individual flying foxes or any of the camps in the region.

10.2 Flying-fox habitat to be affected

Machattie Park (2.7 ha) and Kings Parade (1 ha) are historically significant examples of a late 19th Century Victorian Park containing a mix of European trees and shrubs. There are a few native but not locally indigenous trees planted within the park such as bottlebrushes and banksias. Flying-foxes are currently roosting in Himalayan Cedars, English Oaks and English Elms with reports of them also using the Willows lining Lake Spencer (small duck pond) and Bunya Pines particularly on hot days.

10.3 Standard measures to avoid impacts

The following mitigation measures will be complied with at all times during Plan implementation, along with any pre-existing measures to avoid impacts to other ecological values.

Timing has been set around GHFF breeding, as LRFF rarely birth and rear young in NSW. However, if LRFF are present during their normal birthing and rearing period (i.e. March – October) or are identified as being in final trimester / with dependent young, you will need to consult with OEH to determine appropriate management timing. The following mitigation measures will be complied with at all times during Plan implementation.

10.3.1 All management activities

Further information on management activities is provided in the following OEH factsheets:

Routine camp management (Level 1) actions

Creation of buffers (Level 2) actions

Camp disturbance or dispersal (Level 3) actions.

- All personnel will be appropriately experienced, trained and inducted. Induction will include each person's responsibilities under this Plan.
- All personnel will be briefed prior to the action commencing each day and debriefed at the end of the day.
- Works will cease and OEH consulted in accordance with the 'stop work triggers' section of the Plan.

- Large crews will be avoided where possible.
- The use of loud machinery and equipment that produces sudden impacts/noise will be limited. Where loud equipment (e.g. chainsaws) is required they will be started away from the camp and allowed to run for a short time to allow flying-foxes to adjust.
- Activities that may disturb flying-foxes at any time during the year will begin as far from the camp as possible, working towards the camp gradually to allow flying-foxes to habituate.
- Any activity likely to disturb flying-foxes so that they take flight will be avoided during the day during the sensitive GHFF birthing period (i.e. when females are in final trimester or the majority are carrying pups, generally August – December) and avoided altogether during crèching (generally November/December to February). Where works cannot be done at night after fly-out during these periods, it is preferable they are undertaken in the late afternoon close to or at fly-out. If this is also not possible, a person experienced in flying-fox behaviour will monitor the camp for at least the first two scheduled actions (or as otherwise deemed to be required by that person) to ensure impacts are not excessive and advise on the most appropriate methods (e.g. required buffer distances, approach, etc.).
- OEH will be immediately contacted if LRFF are present between March and October, or are identified as being in final trimester / with dependent young. LRFF are not normally present in NSW during this time.
- Non-critical maintenance activities will ideally be scheduled when the camp is naturally empty. Where this is not possible (e.g. at permanently occupied camps) they will be scheduled for the best period for that camp (e.g. when the camp is seasonally lower in numbers and breeding will not be interrupted, or during the non-breeding season, generally May to July). Normal maintenance activities within Machattie Park, such as lawnmowing and brushcutting are allowed to continue.
- Works will not take place in periods of adverse weather including strong winds, sustained heavy rains, in very cold temperatures or during periods of likely population stress (e.g. food bottlenecks). Wildlife carers will be consulted to determine whether the population appears to be under stress.
- Dispersal works will be postponed when temperatures exceed 35°C, and if overnight temperatures exceed 30°C. Dispersal activities will be conducted in the early morning (pre-dawn) before temperatures reach the daily maximum and avoided during the heat of the day. The condition of the animals in the camp will need to be assessed by an Ecologist every day to determine if individuals are stressed. If an actual heat stress event has been recorded at the camp or at nearby camps, a rest period of several weeks will be scheduled to allow affected flying-foxes to fully recover. See the OEH fact sheet on Responding to heat stress in flying-fox camps.
- If impacts at other sites are considered, in OEH's opinion, to be a result of management actions under this Plan, assistance will be provided by the proponent to the relevant land manager to ameliorate impacts. Details of this assistance are to be developed in consultation with OEH.
- Any proposed variations to works detailed in the Plan will be approved, in writing, by OEH before any new works occur.
- OEH may require changes to methods or cessation of management activities at any time.
- Ensure management actions and results are recorded to inform future planning. See the OEH fact sheet on Monitoring, evaluating and reporting.

It is the responsibility of the land manager and contractors to conduct a risk assessment and determine workplace health and safety requirements; however, minimum requirements are provided below.

Human safety

- All personnel to wear protective clothing including long sleeves and pants; additional items such as eye protection and a hat are also recommended. People working under the camp should wash their clothes daily. Appropriate hygiene practices will be adopted such as washing hands with soap and water before eating/smoking.
- All personnel who may come into contact with flying-foxes during dispersal and have the potential to be bitten or scratched will be vaccinated against Australian bat lyssavirus with current titre. Park staff who handle bats outside of the dispersal period (including the removal of injured or dead bats) should also be vaccinated.
- A wash station will be available on site during works along with an anti-viral antiseptic (e.g. Betadine) should someone be bitten or scratched.
- Details of the nearest hospital or doctor who can provide post-exposure prophylaxis will be kept on site.

Post-works

- Reports for Level 2 and 3 actions will be submitted to OEH one month after commencement of works and then quarterly for the life of the Plan (up to five years) (for all Level 3 actions and in periods where works have occurred for Level 2 actions). Each Level 3 report is to include:
    - results of pre- and post-work population monitoring
    - any information on new camps that have formed in the area
    - impacts at other locations that may have resulted from management, and suggested amelioration measures
    - an assessment of how the flying-foxes reacted to the works, with particular detail on the most extreme response and average response, outlining any recommendations for what aspects of the works went well and what aspects did not work well
    - further management actions planned including a schedule of works
    - an assessment[5] of how the community responded to the works, including details on the number and nature of complaints before and after the works
    - detail on any compensatory plantings undertaken or required
    - expenditure (financial and in-kind costs)
    - Plan evaluation and review (see Section 12).

10.3.2 All Level 2 and 3 actions

Prior to works

- Residents adjacent to the camp will be individually notified one week prior to on-ground works commencing. This will include information on what to do if an injured or orphaned flying-fox is observed, a reminder not to participate in or interfere with the program, and details on how to report unusual flying-fox

[5] A similar approach should be taken to pre-management engagement (see Section 3) to allow direct comparison, and responses should be assessed against success measures (Section 9) to evaluate success.

behaviour/daytime sightings. Relevant contact details will be provided (e.g. Program Coordinator). Resident requests for retention of vegetation and other concerns relating to the program will be taken into consideration.

- Where the Plan is being implemented by Council, information will be placed on Council's website along with contact information.
- OEH will be notified at least 48 hours before works commence.
- A protocol, in accordance with the NSW Code of Practice for Injured, Sick and Orphaned Flying-foxes (OEH 2012), for flying-fox rescue will be developed including contact details of rescue and rehabilitation organisations. This protocol will be made available to all relevant staff, residents and volunteers prior to the action commencing. See Appendix 8 for an example protocol.
- A licensed wildlife carer will be notified prior to beginning works in the event that rescue/care is required.

Monitoring

- A flying-fox expert (identified Appendix 1) will undertake an on-site population assessment prior to, during and after Level 3 dispersal works have been completed, including:
  - number of each species
  - ratio of females in final trimester
  - approximate age of any pups present including whether they are attached or likely to be crèched
  - visual health assessment
  - mortalities.
- Counts will be done at least:
  - once immediately prior to works
  - daily during works
  - immediately following completion
  - one month following completion
  - 12 months following completion.

During works

- A flying-fox expert (Appendix 1) will attend the site as often as OEH considers necessary to monitor flying-fox behaviour and ensure compliance with the Plan and the Policy whilst undertaking Level 3 actions. They must also be able to identify pregnant females, flightless young, individuals in poor health and be aware of climatic extremes and food stress events. This person will make an assessment of the relevant conditions and advise the supervisor/proponent whether the activity can go ahead.
- Deterrents in buffer areas will be assessed by a flying-fox expert so those that may cause inadvertent dispersal (e.g. canopy-mounted sprinklers) are not used during fly-in.
- At least one flying-fox rest day with no active management will be scheduled fortnightly, preferably weekly. Static deterrents (e.g. canopy-mounted sprinklers) may still be used on rest days.

10.3.3 Bush regeneration

It is recommended that Council supports ongoing bush regeneration works program along the Macquarie River.

- All works will be carried out by suitably qualified and experienced bush regenerators, with at least one supervisor knowledgeable about flying-fox habitat requirements (and how to retain them for Level 1 and 2 actions) and trained in working under a camp.
- Vegetation modification, including weed removal, will not alter the conditions of the site such that it becomes unsuitable flying-fox habitat for Level 1 and 2 actions.
- Weed removal should follow a mosaic pattern, maintaining refuges in the mid- and lower storeys at all times.
- Weed control in the core habitat area will be undertaken using hand tools only (or in the evening after fly-out while crèching young are not present).
- Species selected for revegetation will be consistent with the habitat on site, and in buffer areas or conflict areas should be restricted to small shrubs/understorey species to reduce the need for further roost tree management in the future.

10.3.4 Additional measures for Level 3 actions

Prior to dispersal

- Prepare a communications plan in relation to the program and provide a copy to OEH.
- Councils that manage camps within 50 kilometres, and airports within 50 kilometres, will be informed of the intended start date and likely duration, and encouraged to report any change in flying-fox movements.
- Council will liaise with the Environment Protection Authority (EPA) in regard to management of noise issues.

Monitoring

Additional monitoring requirements for dispersal actions (including maintenance dispersal and splinter camp dispersal):

- potential flying-fox habitat within three kilometres of the site monitored within two weeks of works commencing and at the completion of works
- daily checks of ‘potential flying-fox habitat’ within 600 metres, twice weekly checks of 'potential flying-fox habitat' within three kilometres and weekly checks of known camps within 20 kilometres of the site
- where weekly counts are already being undertaken by flying-fox experts at other camps within 20 kilometres, counts at these camps are not required, provided there is an agreement with these experts to access these data.

A count is also required at any known camp site within a 25 kilometres radius once within two weeks of works commencing and again at the completion of works.

During dispersal

- At least one person experienced in dispersal, vaccinated against ABLV and able to rescue flying-foxes if required, is to be present at all times. For maintenance dispersals only, this person may be on-call rather than on site, however maintenance dispersal personnel will still have suitable experience in flying-fox behaviour and monitoring.

- Dispersal of an occupied camp will only occur when females are not in final trimester and dependent young are not present (generally May and July). If flying-foxes in the region are recorded as being visibly pregnant dispersal will cease.
- Dispersal methods will not have the potential to harm flying-foxes and may include only noise, spotlights, laser pointers, smoke from contained fires, canopy-mounted sprinklers, and visual deterrents such as balloons.
- Dispersal may continue for up to a total of 2.5 hours in a 12-hour period, early morning and/or in the evening. Morning dispersal will not continue past sunrise. Evening dispersal will not begin before sunset. If flying-foxes are showing signs of distress or are tiring, dispersal will cease for the day as per 'stop work triggers' in the Plan.
- The duration of dispersal each day will be minimised as much as possible.
- A section of the camp will be designated as a rest area for flying-foxes during dispersal, to be progressively reduced in size over time, unless the nominated flying-fox expert justifies a reason not to do so.
- During any dispersal action, liaison with wildlife carers is required to monitor whether there is an increase in the number of flying-foxes being taken into care or showing signs of stress. If increases are apparent, OEH will be consulted before continuing the action.
- Maintenance dispersal activities (i.e. deterring flying-foxes from recolonising a dispersed or otherwise empty camp) may be undertaken. During November to February it is essential that camps are checked to ensure there are no crèched young in the camp or individuals in visibly poor health, as determined by a suitably qualified expert. While females are likely to be in final trimester or carrying young (generally August to January), maintenance dispersal will be implemented at a reduced intensity using smoke, lights, continuous noise (no sudden noises) and passive deterrents (e.g. canopy mounted sprinklers turned on prior to possible fly-in, visual deterrents, etc.).
- Residents will be notified of a maintenance action, within a timeframe as agreed to by the residents.
- Splinter camp dispersals are subject to the conditions above. Adequate consultation will be undertaken with neighbouring landowners and land managers.
- No actions are to be undertaken at any splinter camps without consulting OEH.

11. Assessment of impacts to other threatened species or communities

No management actions are proposed which would result in potential impacts to other threatened species at the site of the camp. If the situation changes and further actions are required, any developments/actions likely to affect other threatened species, populations or ecological communities (identified in Section 6), may require a species impact statement (SIS).

12. Evaluation and review

The Plan will have a scheduled review annually, which will include evaluation of management actions against measures shown in Table 4 and outlined in Section 10.

The following will trigger a reactive review of the Plan:

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

Results of each review will be included in reports to OEH (as per reporting timing outlined in Section 11.3.1).

If the Plan is to remain current, a full review including stakeholder consultation and expert input will be undertaken in the final year (May 2023) of the Plan's life prior to being re-submitted to OEH.

13. Plan administration

13.1 Monitoring of the camp

The camp was surveyed by Dr David Goldney (Wildlife Ecologist) in January and February 2018 and again by ELA Ecologists in March 2018. In January, numbers were estimated at between 800-2000 individuals, the majority of which were GHFF, with LRFF also present. Representative from WIRES did not observed any LRFF at Machattie Park. In March, whilst population size was not determined it is believed that the population was less than the 2000 individuals noted at its peak. It is unlikely that flying-foxes will remain year-round due to the cold winters with heavy frosts experienced in Bathurst.

Ongoing monitoring is required by BRC staff to determine date of departure and again in late November-December 2018 to assess the arrival of flying-foxes. If passive deterrents are to be considered these need to be installed prior to the arrival of flying-foxes in November 2018. In addition to recording flying fox numbers and species present, any changes to roosting location, area or size of the camp should be noted and recorded in Councils flying-fox database.

Increases in the camp size or number of flying foxes present could be an early warning sign of potential conflict issues. This is a particular issue for Machattie Park as at the current population size (less than 2000 individuals), there are already signs of limited vegetation damage. If the population size increases in future years then Council should seek the advice of a flying-fox expert, and other members of the OEH flying-fox forum to determine whether a wider phenomenon is occurring. Council should consider placing a news article about flying-foxes on traditional and social media platforms, discussing the role of flying-foxes and their movements in response to food availability, particularly in early spring when camps often increase in size prior to birthing of young and in autumn when mating occurs (GHFF) and noise levels are highest. Reference should be made to relevant events such as heavy flowering/blossom of locally preferred foraging species, maternity season, dispersal of nearby camps (within 100 km), or heat stress.

Each time a management action is planned to occur, Council should notify neighbouring camp residents via email, traditional or other social media platforms. Council should also inform the community in this way, once actions or works are complete.

Any reports of new camps or previously unknown roosting locations should be followed up immediately by Council staff to investigate whether flying-foxes are present, the status of the roost in terms of species mix and reproductive status of individuals. Where required, Council should seek input from WIRES, OEH, and local flying-fox experts in the development of an initial response to enquiries from the community regarding any newly established flying-fox camps. If camps are located within 300 m of sensitive receivers, further consultation with the sensitive receiver, and with OEH and local flying-fox experts should be sought. Reference to this Plan, particularly Level 1 actions, will assist in highlighting the initial steps that can be taken to minimise conflict between sensitive receivers and any newly established flying-fox roost. Progression to any Level 2 or 3 action at a newly established camp will require licences and approvals from OEH prior to implementation. Level 2 and 3 actions at any new camps are only likely to proceed if the location of the camp is deemed to be unsuitable by Council in consultation with OEH and local flying-fox experts.

13.2 Reporting

Council will report on the progress of the Plan annually as set out in Section 11.3.1 and update the Plan if new information or changes to management are required. Level 3 management

actions proposed in the Plan will require consultation and approval from OEH. There may also be additional licensing requirements prior to undertaking these higher level actions.

13.3 Management structure and responsibilities

Table 6 identifies who is responsible for each action, including specific types of contractors and experts planned to be involved in management implementation. Where specific contractors are not provided in the Plan, Council will need to detail them in relevant licence applications for OEH approval.

Council and contractors are required to develop a project health and safety plan that includes all relevant contact details prior to implementing actions in the Plan, for team reference.

Table 6: Roles and responsibilities

Role	Name	Required experience/approvals	Responsibilities/authority	Communication lines
Program Coordinator	Manager Recreation BRC	Project management Human resource management Community engagement Reporting	Inform and consult with stakeholders and interested parties Community engagement Evaluate program Submit reports to OEH/DoE Ensure all landowners have have been notified prior to works	Reports to: BRC Direct reports: Project Manager
Project Manager	Environmental Programs Coordinator	Project management Team leadership and coordination Data management	Coordinate field teams and ensure all personnel are appropriately experienced and trained for their roles Induct all personnel to the program Collect and collate data Liaise with OEH and DoE Liaise with wildlife carers/veterinarians (for orphaned/injured wildlife only)	Reports to: Program Coordinator Direct reports: Supervisor, Contractor
Supervisor	Senior Ecologist	Knowledgeable in flying-fox biology, behaviour and camp management (see Appendix 1 for detail) ABLV-vaccinated and trained in flying-fox rescue Team training, leadership and supervision	Pre- and post-management monitoring during Level 3 actions Surrounding camp monitoring Coordinate daily site briefings Coordinate daily activities Monitor flying-fox behaviour Rescue flying-foxes if required (and no carer/vet on site) Determine daily works end point Participate in management activities	Reports to: Project Manager Direct reports: Team members, Observers/support
Team member	BRC	Recommended ABLV-vaccinated (employer to assess risk) Ideally all team knowledgeable in flying-fox biology, behaviour and camp management however not required	Attend daily site briefings Participate in relevant management activities	Reports to: Supervisor Direct reports: Nil
Observer/support	WIRES, Volunteers	Approval to access site	Provide care of injured/orphaned wildlife (under licence) if required	Reports to: Supervisor Direct reports: Nil
Flying-fox expert	To be determined	See Appendix 1	On-site population assessment, monitor flying-fox behaviour and ensure compliance with the Plan.	Reports to: Supervisor Direct reports: Nil

13.4 Adaptive management

The annual review of the Plan will allow for adaptive management to occur whereby the success of management actions implemented throughout the previous year can be evaluated against objectives. Solutions to any issues will be discussed with affected parties and should also involve relevant stakeholders. Changes to the approach or implementation of management actions can then be incorporated into the updated Plan.

13.5 Funding commitment

BRC applied and were granted funding of $22,000 under the Local Government NSW Flying-fox grant program to assist with cleaning and maintenance works, and $27,000 to assist with the development of the Flying-fox Camp Management Plan.

This Plan strongly recommends BRC seek to secure ongoing funding for:

- Community education
- Passive deterrents
- Dispersal Actions
- Monitoring of population size and habitat assessment
- Revegetation activities

The Plan has not provided costs of the above actions, as detailed estimates are better provided following completion of a site-specific action plan. For information, community education programs including signage, media releases and events could cost between $2000 - $3000. Revegetation activities often cost in the range of $10,000 to $30,000. Deterrents and dispersal actions are extremely expensive and can range upwards of $150,000 to $1 million with ongoing costs.

A review of 17 recent camp dispersal attempts (Roberts and Eby 2013) found that dispersal did not reduce the number of flying-foxes, dispersed animals did not move far, repeat dispersal was generally required and in all cases, it was not possible to predict where replacement camps would form. Examples of the costs and success rates from the attempts to disperse similar sized flying fox camps are provided within Table 7. The remaining dispersal attempts had higher camp populations and/or extensive vegetation removal was used as a dispersal approach (which is not appropriate for Machattie Park). See Appendix 6 for a copy of the review.

Table 7: Summary of known documented attempts to disperse Australian flying-fox camps

Location	**Royal Botanic Gardens Sydney**	**Singleton, NSW**	**Charters Towers QLD**
Species	Grey-headed flying fox	Grey-headed flying fox & Little Red flying-fox	Little-red flying fox, Black flying-fox
Population size at time of dispersal	3000	500	Variable
Method	Lights, noise, physical deterrent, odour, water	Lights, noise, ultrasonic sound, water	Helicopter, lights, noise, physical deterrent, odour, water
Did the animals leave the area?	No	No	No
Did the local populations reduce in size?	No	No	No
How far did they move?	4km	<900m	200m
Were new camps formed?	No	No (returned to original site)	No (returned to original site)
Number of separate actions	Ongoing daily actions for 12 months	>3	Repeated since 2000
Cost	>$1million and ongoing	$117,000 and ongoing	>$500,000
Was conflict resolved at original site?	Yes	No	No
Was conflict resolved for the community?	Yes	No	No

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Appendix 1: Expert assessment requirements

The Plan template identifies where expert input is required. The following are the minimum required skills and experience which must be demonstrated by each expert.

Flying-fox expert

Essential

- Knowledge of flying-fox habitat requirements.
- Knowledge and experience in flying-fox camp management.
- Knowledge of flying-fox behaviour, including ability to identify signs of flying-fox stress.
- Ability to differentiate between breeding and non-breeding females.
- Ability to identify females in final trimester.
- Ability to estimate age of juveniles.
- Experienced in flying-fox population monitoring including static and fly-out counts, demographics and visual health assessments.

Desirable

- It is strongly recommended that the expert is independent of the Plan owner to ensure transparency and objectivity. OEH may be able to provide assistance with flying-fox experts.
- ABLV-vaccinated (N.B. This is often an essential requirement during management implementation as detailed within the template).
- Trained in flying-fox rescue (N.B. This is often an essential requirement during management implementation as detailed within the template).
- Local knowledge and experience.

Ecologist

Essential

- At least five years demonstrated experience in ecological surveys, including identifying fauna and flora to species level, fauna habitat and ecological communities.
- The ability to identify flora and fauna, including ground-truthing of vegetation mapping.
- Formal training in ecology or similar, specifically flora and fauna identification.

Desirable

- Tertiary qualification in ecology or similar.
- Local knowledge and experience.
- Accredited Biobanking Assessor under the *Biodiversity Conservation Act 2016*.
- Practising member of the Ecological Consultants Association of NSW.

Depending on the site, for example when vegetation management is proposed for an endangered ecological community or an area with a high likelihood of containing other threatened flora and fauna species, a specialist in that field (e.g. specialist botanist) may be required.

Appendix 2: Additional maps

Appendix 3: Summary of other key legislation likely to apply at some camps

Local government legislation

Local government is required to prepare planning schemes (including Environmental Planning Instruments and Development Control Plans) consistent with provisions under the *Environmental Planning and Assessment Act 1979* (EP&A Act; see Section 4.1.5 of the template).

Local Environment Plans are environmental planning instruments that are legal documents and that relate to a local government area. Other environmental planning instruments, such as State Environmental Planning Policies (SEPPs), may relate to the whole or part of the state. A development control plan provides detailed planning and design guidelines to support the planning controls in a Local Environment Plan, but they are not legal documents.

Planning schemes enable a local government authority to manage growth and change in their local government area (LGA) through land use and administrative definitions, zones, overlays, infrastructure planning provisions, assessment codes and other administrative provisions. A planning scheme identifies the kind of development requiring approval, as well as zoning all areas within the LGA based on the environmental values and development requirements of that land. Planning schemes could potentially include a flying-fox habitat overlay, and may designate some habitat as flying-fox conservation areas.

State legislation

Rural Fires Act 1997

The objects of this Act are to prevent, mitigate and suppress bushfires and coordinate bush firefighting, while protecting persons from injury or death, and reduce property damage from fire. A permit is generally required from the Rural Fire Service for any fires in the open that are lit during the local Bush Fire Danger Period as determined each year. This may be relevant for fires used to disperse flying-foxes, or for any burning associated with vegetation management.

Protection of the Environment Operations Act 1997

The main object of the *Protection of the Environment Operations Act 1997* (POEO Act) is to set out explicit protection of the environment polices (PEPs) and adopt more innovative approaches to reducing pollution.

The use of smoke as a dispersal mechanism may constitute ‘chemical production’ under Schedule 1, clause 8 of the POEO Act, so this type of dispersal activity may require a licence under Chapter 3 of the Act.

The POEO Act also regulates noise including ‘offensive noise’. The Protection of the Environment Operations (Noise Control) Regulation 2008 (Part 4, Division 2) provides information on the types of noise that can be ‘offensive’ and for which the Environment Protection Authority (EPA) can issue fines. This may include noise generated as a part of dispersal activities. It is best to discuss the types of noise makers and the sound levels and times these will be generated, along with identified noise receptors, with Council prior to any dispersal. Detailed advice and guidance on noise regulation can be found in the EPA’s *Noise guide for local government* (EPA 2013).

Crown Lands Act 1989

The principles of Crown land management include the observance of environmental protection principles and the conservation of its natural resources, including water, soil, flora, fauna and scenic quality. Any works on land that is held or reserved under the Crown Lands Act 1989 (including vegetation management and dispersal activities) are an offence under the Act without prior authorisation obtained through the Department of Primary Industries (Lands).

Local Government Act 1993

The primary purpose of this Act is to provide the legal framework for an effective, efficient and environmentally responsible, open system of local government. Most relevant to flying-fox management is that it also provides encouragement for the effective participation of local communities in the affairs of local government and sets out guidance on the use and management of community land which may be applicable to land which requires management of flying-foxes.

Appendix 4: Desktop ecological assessment guideline

Buffer

Desktop assessments should include the camp and a suitable buffer area. The suggested buffer for ecological assessments is 10 km, however this may be reviewed on a case by case basis.

Sources of information for database searches

Depending on the location and extent of the project, the following databases may provide information on flora and fauna species and ecological communities for the site and surrounds.

Sources of ecological information

Source	Description	Links
Atlas of Living Australia	Biodiversity knowledge contributed by Australia's academic, scientific, environmental and general communities	www.ala.org.au, page provides a link to a mapping and analysis page where you can view records within an area of interest
Protected Matters Search Tool	Used to generate a list of matters of national environment significance within an area of interest	www.environment.gov.au/epbc/protected-matters-search-tool
NSW BioNet	Contains government-held information about plants and animals in NSW. The following organisations provide data: Office of Environment and Heritage; National Parks and Wildlife Service; Royal Botanic Gardens and Domain Trust; Department of Primary Industries; Forests NSW; Australian Museum. Users can register for a log-in version which provides additional detail and functionality.	www.bionet.nsw.gov.au/
Critical Habitat Register – Office of Environment and Heritage	Declarations of critical habitat and maps of these sites for species listed under the TSC Act	www.environment.nsw.gov.au/criticalhabitat/criticalhabitatprotectionbydoctype.htm
Vegetation Information System: Maps	Statewide regional scale vegetation map, and for some areas, a local fine-scale map	www.environment.nsw.gov.au/research/PlantCommunityIDsoftware.htm
OEH – Spatial data portal	Spatial datasets available for download, supplied in GDA	data.nsw.gov.au/data/dataset/nsw-oeh-spatial-data-portal
SIX maps	Provides maps showing cadastral and topographic information	six.nsw.gov.au/wps/portal/
Threatened Species Profile Database	Provides a search tool for NSW threatened species including a description and indicative distribution	www.environment.nsw.gov.au/threatenedspecies/
SEPPs 14 & 26	Available on the OEH spatial data portal	data.nsw.gov.au/data/dataset/nsw-oeh-spatial-data-portal

Other sources of data

Depending on the type of project and location, the local council, or National Parks and Wildlife Service may hold more detailed vegetation mapping than publicly available. The relevant authority should be contacted to confirm if the most detailed mapping and data records have been obtained.

Appendix 5: Additional human and animal health information

Australian bat lyssavirus

ABLV is a rabies-like virus that may be found in all flying-fox species on mainland Australia. It has also been found in an insectivorous microbat and it is assumed it may be carried by any bat species. The probability of human infection with ABLV is very low with less than 1% of the flying-fox population being affected (DPI 2013) and transmission requiring direct contact with an infected animal that is secreting the virus. In Australia three people have died from ABLV infection since the virus was identified in 1996 (NSW Health 2013).

Domestic animals are also at risk if exposed to ABLV. In 2013, ABLV infections were identified in two horses (Shinwari et al. 2014). There have been no confirmed cases of ABLV in dogs in Australia; however, transmission is possible (McCall et al. 2005) and consultation with a veterinarian should be sought if exposure is suspected.

Transmission of the virus from bats to humans is through a bite or scratch, but may have potential to be transferred if bat saliva directly contacts the eyes, nose, mouth or broken skin. ABLV is unlikely to survive in the environment for more than a few hours, especially in dry environments that are exposed to sunlight (NSW Health 2013).

Transmission of closely related viruses suggests that contact or exposure to bat faeces, urine or blood does not pose a risk of exposure to ABLV, nor does living, playing or walking near bat roosting areas (NSW Health 2013).

The incubation period in humans is assumed similar to rabies and variable between two weeks and several years. Similarly the disease in humans presents essentially the same clinical picture as classical rabies. Once clinical signs have developed the infection is invariably fatal. However, infection can easily be prevented by avoiding direct contact with bats (i.e. handling). Pre-exposure vaccination provides reliable protection from the disease for people who are likely to have direct contact with bats, and it is generally a mandatory workplace health and safety requirement that all persons working with bats receive pre-vaccination and have their level of protection regularly assessed. Like classical rabies, ABLV infection in humans also appears to be effectively treated using post-exposure vaccination and so any person who suspects they have been exposed should seek immediate medical treatment. Post-exposure vaccination is usually ineffective once clinical manifestations of the disease have commenced.

If a person is bitten or scratched by a bat they should:

- wash the wound with soap and water for at least five minutes (**do not scrub**)
- contact their doctor immediately to arrange for post-exposure vaccinations.

If bat saliva contacts the eyes, nose, mouth or an open wound, flush thoroughly with water and seek immediate medical advice.

Hendra virus

Flying-foxes are the natural host for Hendra virus (HeV), which can be transmitted from flying-foxes to horses. Infected horses sometimes amplify the virus and can then transmit it to other horses, humans and on two occasions, dogs (DPI 2014). There is no evidence that the virus can be passed directly from flying-foxes to humans or to dogs (AVA 2015). Clinical studies have shown cats, pigs, ferrets and guinea pigs can carry the infection (DPI 2015a).

Although the virus is periodically present in flying-fox populations across Australia, the likelihood of horses becoming infected is low and consequently human infection is extremely rare. Horses are thought to contract the disease after ingesting forage or water contaminated primarily with flying-fox urine (CDC 2014).

Humans may contract the disease after close contact with an infected horse. HeV infection in humans presents as a serious and often fatal respiratory and/or neurological disease and there is currently no effective post-exposure treatment or vaccine available for people. The mortality rate in horses is greater than 70% (DPI 2014). Since 1994, 81 horses have died and four of the seven people infected with HeV have lost their lives (DPI 2014).

Previous studies have shown that HeV spillover events have been associated with foraging flying-foxes rather than camp locations. Therefore risk is considered similar at any location within the range of flying-fox species and all horse owners should be vigilant. Vaccination of horses can protect horses and subsequently humans from infection (DPI 2014), as can appropriate horse husbandry (e.g. covering food and water troughs, fencing flying-fox foraging trees in paddocks, etc.).

Although all human cases of HeV to date have been contracted from infected horses and direct transmission from bats to humans has not yet been reported, particular care should be taken by select occupational groups that could be uniquely exposed. For example, persons who may be exposed to high levels of HeV via aerosol of heavily contaminated substrate should consider additional PPE (e.g. respiratory filters), and potentially dampening down dry dusty substrate.

Menangle virus

Menangle virus (also known as bat paramyxovirus no. 2) was first isolated from stillborn piglets from a NSW piggery in 1997. Little is known about the epidemiology of this virus, except that it has been recorded in flying-foxes, pigs and humans (AVA 2015). The virus caused reproductive failure in pigs and severe febrile (flu-like) illness in two piggery workers employed at the same Menangle piggery where the virus was recorded (AVA 2015). The virus is thought to have been transmitted to the pigs from flying-foxes via an oral–faecal matter route (AVA 2015). Flying-foxes had been recorded flying over the pig yards prior to the occurrence of disease symptoms. The two infected piggery workers made a full recovery and this has been the only case of Menangle virus recorded in Australia.

General health considerations

Flying-foxes, like all animals, carry bacteria and other microorganisms in their guts, some of which are potentially pathogenic to other species. Direct contact with faecal material should be avoided and general hygiene measures taken to reduce the low risk of gastrointestinal and other disease.

Contamination of water supplies by any animal excreta (birds, amphibians and mammals such as flying-foxes) poses a health risk to humans. Household tanks should be designed to minimise potential contamination, such as using first flush diverters to divert contaminants before they enter water tanks. Trimming vegetation overhanging the catchment area (e.g. the roof of a house) will also reduce wildlife activity and associated potential contamination. Tanks should also be appropriately maintained and flushed, and catchment areas regularly cleaned to remove potential contaminants.

Public water supplies are regularly monitored for harmful microorganisms, and are filtered and disinfected before being distributed. Management plans for community supplies should consider whether any large congregation of animals, including flying-foxes, occurs near the supply or catchment area. Where they do occur, increased frequency of monitoring should be considered to ensure early detection and management of contaminants.

Appendix 6: Dispersal results summary

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

1. In all cases, dispersed animals did not abandon the local area[6].
2. In 16 of the 17 cases, dispersals did not reduce the number of flying-foxes in the local area.
3. Dispersed animals did not move far (in approx. 63% of cases the animals only moved <600 m from the original site, contingent on the distribution of available vegetation). In 85% of cases, new camps were established nearby.
4. In all cases, it was not possible to predict where replacement camps would form.
5. 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.
6. Repeat dispersal actions were generally required (all cases except where extensive vegetation removal occurred).
7. 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[7] 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 Code was introduced has increased by 6250%.
- Dispersal methods included fog[8], birdfrite, lights, noise, physical deterrents, smoke, extensive vegetation modification, water (including cannons), paintball guns and helicopters.
- 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 6 km 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 that they feel this resolution is only temporary.
- The financial costs of all dispersal attempts, regardless of methods used were considerable, ranging from $7500 to more than $400,000 (with costs ongoing).

[6] Local area is defined as the area within a 20 km radius of the original site = typical feeding area of a flying-fox.

[7] This was based on responses to questionnaires sent to councils; some did not respond and some omitted responses to some questions.

[8] 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.

Appendix 7: Example flying-fox rescue protocol

Reference documents:

OEH 2012, NSW Code of Practice for Injured, Sick and Orphaned Flying-foxes, Office of Environment and Heritage, Sydney.

OEH 2011, NSW Code of Practice for Injured, Sick and Orphaned Protected Fauna, Office of Environment and Heritage, Sydney.

Purpose

These work instructions are intended for Australian bat lyssavirus (ABLV)-vaccinated fauna spotter catchers (FSCs) or wildlife rescue personnel on site during dispersal activities to monitor, capture or provide first aid treatment for sick or injured flying-foxes that may require human intervention for their survival. Flying-fox rescue must only be attempted by personnel trained and experienced in flying-fox rescue and handling.

This work instruction provides rescuers with information regarding capture and first aid until a flying-fox is in the specialist care of a veterinarian or person qualified in wildlife rehabilitation.

Requirements

FSC and wildlife rescue personnel involved in flying-fox rescue must:

- be trained and experienced in rescue and handling
- be vaccinated against ABLV (titre levels checked at least once every two years)
- be aware of the hazards and risks of coming into contact with all bats
- utilise appropriate PPE and equipment for capture, transport and treatment of flying-foxes
- undertake a risk assessment before carrying out a rescue – do not endanger yourself or others during a rescue
- have the contact details for a local veterinarian or bat carer who will accept the sick or injured flying-fox.

Human first aid

All bats in Australia should be viewed as potentially infected with ABLV. If bitten or scratched by a bat, immediately wash the wound with soap and water (do not scrub) and continue for at least five minutes, followed by application of an antiseptic with anti-viral action (e.g. Betadine), and immediate medical attention (post-exposure vaccinations may be required). Similarly medical attention should be immediately sought if exposed to an animal's saliva or excreta through the eyes, nose or mouth.

Equipment

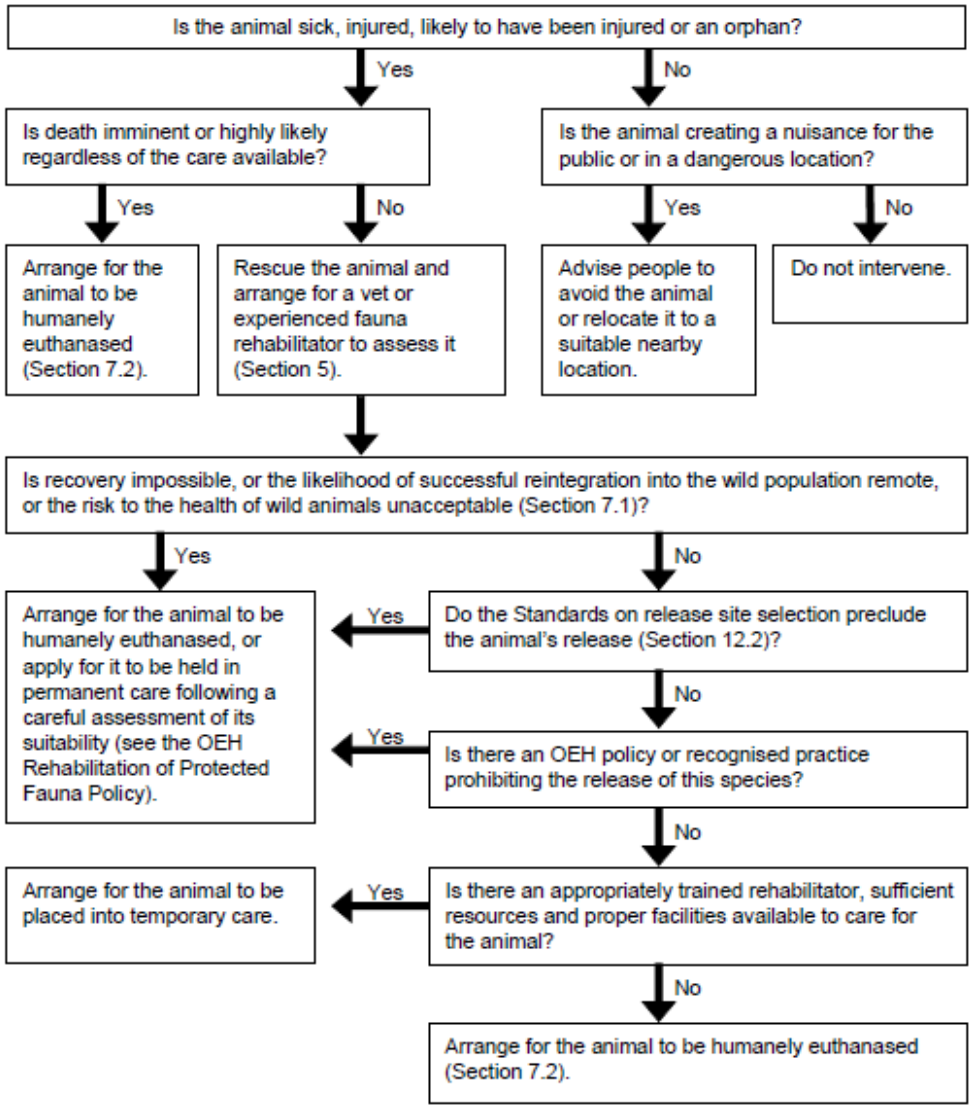
- lidded plastic carry basket or 'pet-pack' with bedding (juveniles) / transport container with hanging perch, tall enough for bat to hang without hitting its head (in accordance with Section 5.1 of the NSW Code of Practice for Injured, Sick and Orphaned Flying-foxes (OEH 2012))
- warm water bottle / cold brick
- wraps /towels
- teats for small bottle
- extension pole or broom

- bat first aid kit – juice drink/glucose powder, syringes, cloths for wounds, Betadine/saline, dummy for baby bats. FFs only to be offered liquids under advice from a licensed wildlife carer.

Work instructions

Case assessment

Observe, assess and then determine if/what intervention is required using the decision tree in the NSW Code of Practice for Injured, Sick and Orphaned Protected Fauna (OEH 2011), included below.



Personnel should approach stressed flying-foxes cautiously. If flying-foxes panic or fly this will waste energy; retreat and continue to monitor behaviour.

1. Dehydration: Eyes dull or depressed in skull, change to skin elasticity, skin stays pinched, animal cold, wing membranes dry, mouth dry.
2. Heat stress: wing fanning, shade seeking, clustering/clumping, salivating, panting, roosting at the base of trees, on the ground, falling from tree.
3. Obvious injury: bleeding, broken bones.

Rescue instructions

As per Section 4 of the NSW Code of Practice for Injured, Sick and Orphaned Flying-foxes (OEH 2012):

i. The objective is to rescue a flying-fox while minimising further stress and injury to the animal.
ii. Before a rescue attempt, rescuers must assess the risks to the flying-fox from environmental hazards and from capture.
iii. Rescuers must employ the correct rescue equipment for the condition and location of the flying-fox, and be trained in its use.

Example scenarios

1. Bat low in tree:
    - quickly place towel around bat before it can move away
    - grab hold of feet, toes may curl over rescuers fingers
    - place in carry basket / transport container.
2. Bat high in tree:
    - place pole wrapped in towel in front of bat
    - coax bat onto towel
    - once on towel, quickly move away from branches and lower to ground
    - once on ground, cover with towel and place into carry basket / transport container.
3. A bat caught on barbed wire fence:
    - two people only – one to restrain with towel, while the other untangles
    - put towels on the wire strands under or around to avoid further entanglement
    - if the membrane has dried onto wire, syringe or spray water onto wing
    - use pliers or wire cutter if necessary.

Animal first aid

Physical assessment: Keep animal wrapped and head covered, only expose one part at a time. Examine head. Unwrap one wing and extend. Wrap and extend other wing. Check legs. Examine front and back of body.

Dehydration: Offer water/juice (low acid juice only, e.g. apple/mango) orally with syringe (under supervision/advice from licensed wildlife carer ONLY).

Heat stress: Reduce temperature in heat exhausted bats by spraying wings with tepid water.

Hypothermia: May be seen in pups separated from mother – keep head covered and warm core body temperature slowly by placing near (not on) warm water bottle covered by towel.

Bleeding: Clean wounds with room temperature saline or diluted Betadine.

Transport to veterinarian / wildlife carer

See Section 5 of the NSW Code of Practice for Injured, Sick and Orphaned Flying-foxes (OEH 2012) summarised below.

Objective

To transport a flying-fox so as to minimise further stress and injury to the animal.

Standards

a. The transport container must be tall enough for the flying-fox to hang by its feet without hitting its head on the floor.

b. The container must be designed, set up and secured to prevent injuries to the flying-fox. The sides of the container must prevent the flying-fox from poking its head or wings out.

c. The container must be designed to prevent the flying-fox from escaping.

d. The flying-fox must be allowed to hang by its feet from the top of the container or if it is unable to hang, wrapped in material (e.g. sheet or flannel) and placed in a sling so its feet are higher than its head.

e. The container must be kept at a temperature which is appropriate for the age and condition of the flying-fox. A range of 25–27°C is appropriate for an adult. A temperature of 28°C is appropriate for an orphan. A cool or warm water bottle may be required.

f. The container must be ventilated so air can circulate around the flying-fox.

g. The container must minimise light, noise and vibrations and prevent contact with young children and pets.

h. During transport, a container holding a flying-fox must have a clearly visible warning label that says ‘Warning – live bat’.

i. A flying-fox must not be transported in the back of an uncovered utility vehicle or a car boot that is separate from the main cabin.

Guidelines

- Flying-fox transport should be the sole purpose of the trip and undertaken in the shortest possible time.
- The fauna rehabilitation group’s contact details should be written on the transport container in case of an emergency.

Appendix 8: Community questionnaire on BRC “Your Say” website.

Please see attached pdf file.