KU-RING-GAI FLYING-FOX RESERVE PLAN OF MANAGEMENT

KU-RING-GAI COUNCIL

Executive summary

The Ku-ring-gai Flying-fox Reserve, owned and managed by Ku-ring-gai Council, is located along Stoney Creek in Gordon covering an area of approximately 15.34 hectares. It is bounded by Governor Phillip Reserve, Bushranger Reserve and approximately 100 residences.

The Reserve contains a number of plant communities, including the Critically Endangered Ecological Community Sydney Turpentine Ironbark Forest. These communities provide habitat for a range of fauna. It is a nationally important camp for the Grey-headed Flying-fox, a species listed as vulnerable under both New South Wales and Commonwealth legislation. Eleven other listed species have also been recorded in the Reserve, which includes a known Powerful Owl nest site.

Council has managed the Reserve and its values since before the first Ku-ring-gai Bushland Reserve Plan of Management was developed in 1984. Community involvement has been ongoing, with particular support of the Ku-ring-gai Bat Conservation Society and Ku-ring-gai Flying-fox Reserve Bushcare Group. Tens of thousands of volunteer hours, along with Council staff and contractor time, have been invested in the Habitat Restoration Program to ensure the sustainability of the Reserve.

In 1991, Ku-ring-gai Council entered into a Conservation Agreement with the New South Wales government to ensure the continued protection of native flora and fauna within the KFFR, in particular the Grey-headed Flying-fox.

Flying-foxes are considered ‘keystone’ species given their contribution to the health, longevity and diversity of vegetation communities through long-distance seed dispersal and pollination. These ecological services ultimately protect the long-term health and biodiversity of Australia’s bushland and wetlands.

Living or working near a flying-fox camp can be challenging for communities, with noise, odour and faecal drop impacts, damage to vegetation, fruit loss and concern about potential health risks. These can lead to secondary impacts, such as anxiety and sleep deprivation, and can significantly impact on people’s mental health and wellbeing.

Between 2000 and 2009 the flying-fox camp moved northwards and closer to private properties, which increased conflict with some residents. Council responded by updating the Reserve Management Plan to increase focus on the needs of adjoining residents. Key additional actions since adoption of the 2013 plan include vegetation management at property boundaries, a subsidies program for residents to install double-glazed windows to reduce noise impacts, and development of the 2018-2028 Site Management and Roosting Habitat Plan to encourage roosting further from residents. Implementation of the Habitat Plan is underway with close to 2,000 mature phase rainforest seedlings planted in low conflict locations to date.

Progress on all actions from the 2013 Plan is detailed in Appendix 4. Of the 39 actions: 35 were completed and 4 are underway.

This Plan of Management provides a framework for the ongoing management of the Reserve. Objectives of the Plan are to:

- ensure compliance with relevant legislation and meet Council's responsibilities as manager of the Reserve
- contribute to Council's broader environment and sustainability goals and vision
- conserve the flying-fox camp and other ecological values of the Reserve
- reduce impacts for affected residents
- ensure consistent management that supports a unified approach to meeting a variety of environmental and community needs
- guide land managers and stakeholders in implementing appropriate management actions
- define roles and responsibilities
- provide a framework for adaptive management.

It has been prepared to meet specific requirements of:

- a flying-fox camp management plan as set out in the New South Wales Flying-fox Camp Management Policy 2015 and Flying-fox Camp Management Code of Practice 2018
- a reserve plan of management for community land comprising threatened species habitat under the *Local Government Act 1993.*
- the Ku-ring-gai Flying-fox Reserve Conservation Agreement.

During development of this revised Plan, the community and other stakeholders were invited to provide input and feedback via:

- an online survey open to all Ku-ring-gai Council residents, focussing on flying-fox-specific management
- a workshop with residents living near the Reserve
- a workshop with other key stakeholders
- public exhibition of the draft Plan.

Consultation results are detailed within. Overall the community values the ecological values of the Reserve and appreciates the importance of flying-foxes. While residents living near the Reserve generally support the flying-fox camp, many have expressed a desire for buffers and encouraging flying-foxes to roost further from residents. The top five concerns for residents living near the camp were: excrement, fear of disease, noise, flying-fox habitat protection and smell. Impacts on mental health were expressed in open-ended survey questions and in the resident workshop.

Many consultation participants also wanted to ensure the Reserve is being managed as a whole for all of its values, and to ensure the community is protected against bushfire and tree

fall risks.

With consideration of all values of the Reserve, Council's responsibilities, management issues, and feedback from the community and other stakeholders, management objectives for the Reserve are to:

1. Protect biodiversity, habitat values, flora and fauna, Stoney Creek and the instream environment, and other ecological values of the site.
2. Ensure flying-fox conservation, welfare, and protection of the nationally important GHFF camp.
3. Manage bushfire risk.
4. Reduce flying-fox impacts on the surrounding community.
5. Protect human health and safety.
6. Implement and promote education programs.
7. Support research and best practice management for flying-fox conservation and resident impact minimisation.

Actions to meet these management objectives are summarised in the table below. Further detail along with performance measures and responsibilities are provided in Section 5.

Action	Action timeframe
Continue to implement complementary plans including the 2018-2028 KFFR Habitat Plan and Hornsby Ku-ring-gai Bush Fire Risk Management Plan 2016-2021.	Ongoing
Investigate feasible solutions to address pollution, nutrient, stormwater and erosion issues within the KFFR.	Commence investigation by June 2021 Implementation ongoing (this is recognised as a process of continual improvement)
Continue to support the work of environmental, conservation and research groups including KBCS and KFFR Bushcare Group, where their objectives align with this management plan..	Ongoing
Survey the KFFR biennially to determine threatened fauna presence and identify potential habitat areas to ensure these areas are conserved.	Biennially In line with requirements from the Habitat Plan.
Manage Key Threatening Processes in accordance with Threat Abatement Plans and other guidelines.	As required
Incorporate appropriate and feasible feral animal control measures into Council's annual feral animal control program and consult with relevant agencies about potential involvement in regional pest management programs.	As required
Regularly review research findings and data to inform management in the KFFR and ensure health and educational information is up-to-date.	At least annually
Continue education and awareness programs, with increased efforts during periods of greatest community concern.	Ongoing (with at least annual events)

Action	Action timeframe
Collaborate with relevant agencies, organisations, councils and flying-fox experts on best practice management within the KFFR, and support research in the KFFR.	Ongoing
Implement a subsidies program to assist impacted residents funded by Council and grants when available.	Ongoing and funding dependent
Implement the following to avoid issues and minimise impacts: · flying-fox rescue protocol · site-specific HSE response based on best practice guidelines · processes to minimise disturbance to flying-foxes when granting entry into the KFFR for Council teams or external parties · processes to investigate and manage incidents (e.g. camp disturbance) through educational material and regulatory action if required · create a centralised database to maintain registers of visits / visitors to the KFFR.	Audited annually
Install signage within the KFFR to reduce unintentional disturbance.	Installed by September 2021
Refine and continue to monitor Council's tree canopy decline areas, and maintain 2020 plantings in storm damage/HSE affected areas. Consider additional plantings if required.	Monitored and evaluated at least annually
Using mapping by Eby et al 2019, protect and enhance native foraging habitat within the LGA critical to the survival of the GHFF.	Foraging habitat and tenure identified by end of 2021
Consider sprinklers or drip systems if research finds these to be a safe and effective method to reduce HSE impacts.	As related research progresses
Investigate canopy-mounted sprinklers to increase buffers in conflict locations at appropriate times of the year.	Commence feasibility assessment by July 2021, report by end of 2021 with an implementation guideline if deemed appropriate
In addition to measures to reduce primary impacts on nearby residents, consider options to further assist with mental health and wellbeing impacts resulting from primary impacts.	Reviewed at least annually
Strategic tree pruning where branches from canopy trees within KFFR are overhanging private property. Council will also consider any application to manage trees on private property.	As required and audited annually
Investigate a tree replacement program where weed species (e.g. Cocos palms, Chinese celtis) attract flying-foxes to private properties to reduce faecal drop impacts.	Investigated by end 2021
Support fruit growers by providing information about state/federal netting subsidy/offset programs, low interest loans and possible grants that may assist with the cost of netting, and connect land managers with relevant industry contacts if required.	Review annually
Investigate ways to incorporate flying-fox information into the planning scheme and individual property documentation to avoid future conflict.	Investigated by end 2021

Acknowledgements

Ku-ring-gai Council acknowledges the Traditional Owners of this country and pays respect to all Aboriginal people. We acknowledge the Elders in the past and in the present and acknowledge the spirits and ancestors of the Clans that lived in this area.

This document is a review and update of the 2013 Ku-ring-gai Flying-fox Reserve Management Plan (KFFRMP, Ku-ring-gai Council 2013), incorporating changes to the environment, changes in legislation, current stakeholder views, recent research on flying-foxes and current best practice.

This Plan of Management was prepared with reference to the Ku-ring-gai Flying-fox Reserve 10 Year Site Management and Roosting Habitat Plan 2018-2028, and relevant information is repeated or summarised.

Council gratefully acknowledges the many groups and individuals who contribute to the conservation of the KFFR and its values, in particular the Ku-ring-gai Bat Conservation Society and the Ku-ring-gai Bushcare and their members.

Acronyms and abbreviations

ABLV	Australian Bat Lyssavirus
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BCT	Biodiversity Conservation Trust
BFF	Black Flying-fox (*Pteropus alecto*)
CEEC	Critically Endangered Ecological Community
Council	Ku-ring-gai Council
DAWE	Department of Agriculture, Water and Environment (Commonwealth)
DPIE	Department of Planning, Industry and Environment (NSW)
EEC	Endangered Ecological Community
EPA	Environment Protection Authority
EP&A Act	*Environment Planning & Assessment Act 1979* (NSW)
EBPC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
the Guideline	Referral guideline for management actions in Grey-headed and Spectacled Flying-fox camps 2015 (Commonwealth)
GHFF	Grey-headed Flying-fox *(Pteropus poliocephalus*)
GIS	Geographic Information System
the Habitat Plan	Ku-ring-gai Flying-fox Reserve 10 Year Site Management and Roosting Habitat Plan (Ku-ring-gai Council 2018)
HeV	Hendra virus
HSE	Heat stress event
KBCS	Ku-ring-gai Bat Conservation Society Inc
KFFR	Ku-ring-gai Flying-fox Reserve
KTP	Key threatening processes (listed under the BC Act or EPBC Act)
LG Act	*Local Government Act 1993* (NSW)
LGA	Local Government Area
LRFF	Little Red Flying-fox (*Pteropus scapulatus*)
NFFMP	National Flying-fox Monitoring Program
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
NPWS	National Parks and Wildlife Service
the Policy	Flying-fox Camp Management Policy 2015 (NSW)
the PoM	Ku-ring-gai Flying-fox Reserve Plan of Management (this document)
RBG	Sydney Royal Botanic Gardens and Domain Trust
STIF	Sydney Turpentine Ironbark Forest

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1 Introduction

The Ku-ring-gai Flying-fox Reserve Plan of Management (PoM) has been prepared in accordance with the Ku-ring-gai Flying-fox Reserve (KFFR) Conservation Agreement between Ku-ring-gai Council (Council) and the New South Wales (NSW) Government. The Conservation Agreement was entered in to in 1991 to ensure the continued protection of native flora and fauna within the KFFR, in particular the Grey-headed Flying-fox (*Pteropus poliocephalus*; GHFF).

The GHFF is listed as vulnerable to extinction under both the NSW *Biodiversity Conservation Act 2016* (BC Act) and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and the KFFR constitutes a nationally important camp for this threatened species.

The KFFR also contains Sydney Turpentine Ironbark Forest (STIF), a Critically Endangered Ecological Community (CEEC) under both NSW and Commonwealth legislation, and provides habitat for other threatened species such as the Powerful Owl (*Ninox stenua*).

Living near a flying-fox camp can be challenging for communities, with impacts associated with noise, odour, faecal drop, damage to vegetation and concern about potential health risks. While there is strong community support for the camp, there has also been increased amenity impacts in recent years for some residents living close to the KFFR.

The Plan provides a framework for Council to effectively manage the KFFR and its values in line with relevant legislation, and reduce amenity impacts of flying-foxes on nearby residents.

1.1 Legislative framework

The *Local Government Act 1993* (LG Act) requires a PoM be prepared for all public land classified as 'community land' under the Act. Some types of community land cannot be included in a generic PoM and require a site-specific PoM. These include areas of land:

- that have been identified to be of Aboriginal, historical or cultural significance
- comprising the habitat of threatened or endangered species
- with significant natural features or land that provides a wildlife corridor.

All native wildlife is protected under the BC Act. In recognition of impacts for people living near a flying-fox camp, the NSW Camp Management Policy 2015 was developed to allow land managers to work with their communities to manage flying-fox camps.

Matters of National Environmental Significance, such as the nationally vulnerable GHFF, are also protected under the EPBC Act.

Further information on the management framework for the KFFR is provided in Appendix 1.

The PoM is consistent with this legislation, and has been prepared to meet specific

requirements of:

- a flying-fox camp management plan as set out in the NSW Flying-fox Camp Management Policy 2015 and Flying-fox Camp Management Code of Practice 2018
- a reserve plan of management for community land comprising threatened species habitat under the *Local Government Act 1993*
- the KFFR Conservation Agreement administered by the Biodiversity Conservation Trust (BCT)
- the National Recovery Plan for Grey-headed Flying-foxes *Pteropus poliocephalus.*

1.2 Plan objectives

Objectives of the PoM are to:

- ensure compliance with relevant legislation and meet Council's responsibilities as manager of the KFFR
- contribute to Council's broader environment and sustainability goals and vision
- conserve the flying-fox camp and other ecological values of the KFFR
- reduce impacts for affected residents
- ensure consistent management that supports a unified approach to meeting a variety of environmental and community needs
- guide land managers and stakeholders in implementing appropriate management actions
- define roles and responsibilities
- provide a framework for adaptive management.

1.3 Description and tenure

The KFFR is located along Stoney Creek in Gordon covering an area of approximately 15.34 hectares (Table 1 and Figure 1).

It is bounded by Governor Phillip Reserve and Bushranger Reserve to the east, residential properties on Illeroy Avenue, Maytone Street, Bell Street and Nelson Street to the south. Houses on Edward Street border the KFFR to the west, and Taylor Street, Glenview Street and Waugoola Street form the northern boundary (Ku-ring-gai Council 2018).

There are no specific recreational features in the KFFR, however informal walking tracks are used by bush regenerators and fauna such as swamp wallabies. Furthermore, Sydney Water require access to the KFFR to operate and maintain existing sewer infrastructure located near Stoney Creek.

Most of the KFFR has steep slopes (over 18 degrees) which are potentially susceptible to erosion and slip. There are also several rock scarps / cliff lines onsite. These areas have

implications for site access, work health and safety and reserve management, including hazard reduction and regeneration practices.

Table 1 Reserve size, tenure, catchment and zone. Source Ku-ring-gai Council 2018.

Reserve/Site size (ha)	15.34
Lot and DP number	Composed of 18 Lots: Lot 158 DP 17131, Lot 1 DP 38541, Lot 2 DP 38541, Lot 3 DP 578212, Lot 101 DP 578212, Lot 1 DP 578212, Lot 1 DP 204102, Lot 2 DP 200605, Lot 10 DP 23994, Lot 34 DP 1079802, Lot A DP 212698, Lot 156 DP 17131, Lot 1 DP 179532, Lot 5 DP 1099395, Lot 154A DP 17131, Lot 35 DP 16006, Lot 7 DP 1132073, Lot 103 DP 17647
Council Ward	Gordon
Catchment / Sub Catchment	Rocky Creek catchment / Stoney Creek sub catchment
Planning Zone	E2 - Environmental Conservation
Planning Instrument	Ku-ring-gai Local Environmental Plan 2015
Assigned category/categories	Natural Areas: Bushland, Watercourse (Figure 1)

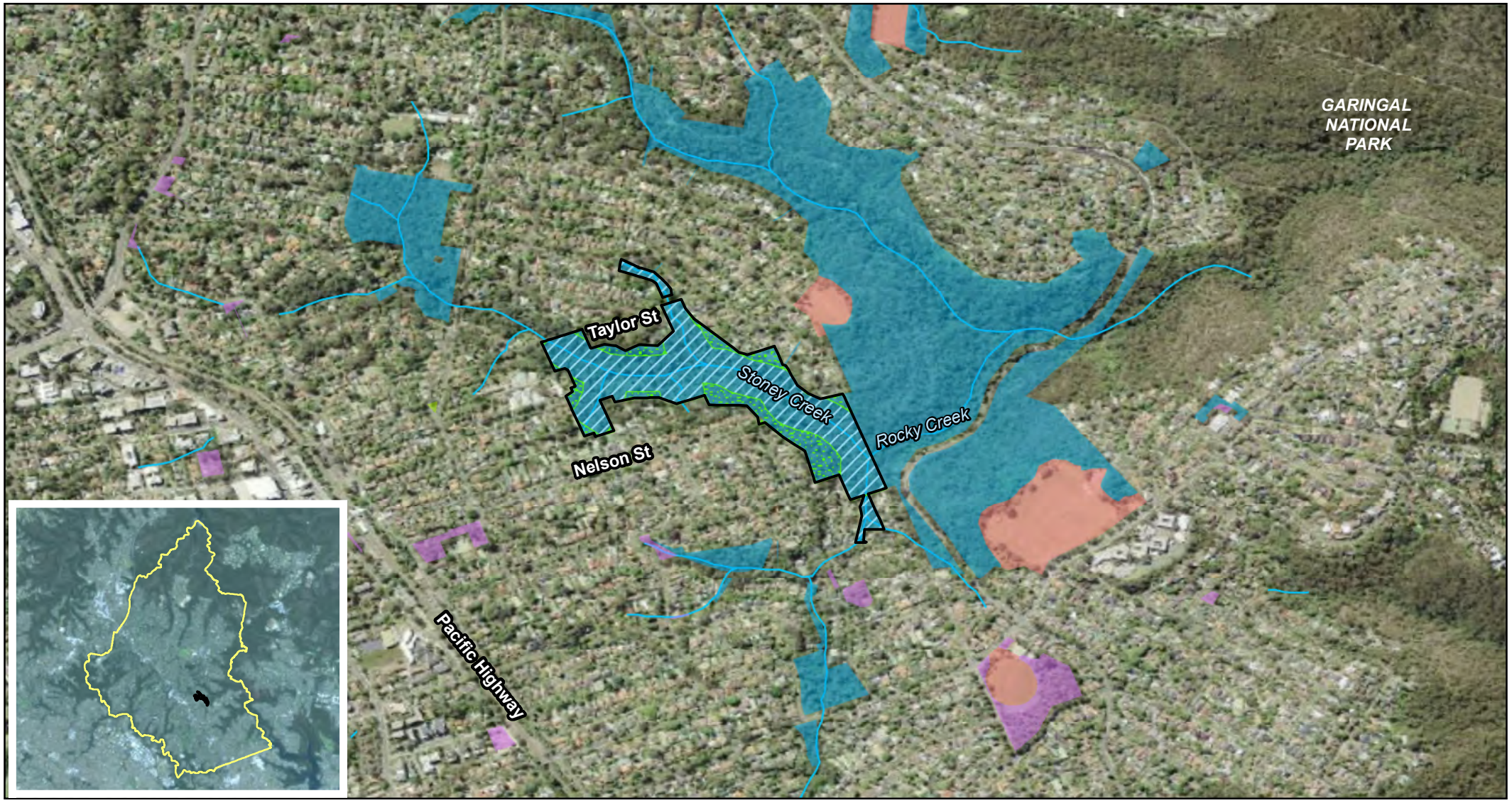


Figure 1: Ku-ring-gai Flying-fox Reserve location and land categories

Ku-ring-gai Council

Ku-ring-gai Flying-fox Reserve Management Plan

Ku-ring-gai Council LGA

Ku-ring-gai Flying-fox Reserve boundary

Natural Area

Public Garden

Sports Reserve

Urban Park

Natural Area Subcategories

Bushland

Watercourse

Creeks

ecosure

Job number: PR5821
Revision: 0
Author: EK
Date: 8/03/2021

0 50 100 200
Metres

GCS GDA 1994
Datum: GDA 1994
Units: Degree

Data Sources: Ecosure Pty Ltd, 2021; Image: .

PR5821_MP1_ReserveLocationsandLandCategories
A4

1.4 Stakeholders

There are a range of stakeholders with interests in the KFFR and/or the flying-fox camp (Table 2).

Table 2 Stakeholders

Stakeholder group	Stakeholder	Interest/reported impacts
Community	Traditional Custodians	The Darramuragal People are the traditional custodians of the local government area, including the KFFR. Traditional owners have a general interest in flying-foxes, including the ecological services they provide and the potential for sustainable harvesting for food or medicinal purposes. The area falls within the boundaries of the Metropolitan Local Aboriginal Land Council.
	Residents	246 residents responded to the online survey. 46.89% have had generally positive experiences with flying-foxes, 28.22% had a generally negative experience relating to flying-foxes and 24.90% of participants experience neither positive nor negative impacts associated with flying-foxes in Gordon (see Section 3.1).
	Business owners	Four of the community survey respondents identified as business owners, two in Gordon and two from elsewhere in the LGA. Of these two had positive views of flying-foxes, one had negative (reporting economic loss) and one was neutral.
	Orchardists and fruit growers	Fruit loss at orchards was a concern for some community members (15.74%) and fruit growers may be impacted by flying-foxes. Council will support growers by providing information about state/federal netting subsidy / offset programs if available, and can assist connecting land managers with relevant industry contacts if required.
	Hospitals	Any helicopter operator associated with Hornsby Ku-ring-gai Hospital/James Park (where helicopters currently land) must be made aware of flying-foxes in the area and follow risk mitigation measures (especially during dusk or dawn operations). Note other than this helipad there are no aerodromes within 13 km of the KFFR.
	Horse owners and managers	Horse owners, equine facility managers and local vets should be aware of Hendra virus risk associated with foraging flying-foxes (e.g. risk is present across the entire flying-fox range), and appropriate mitigation measures.
	Aerodromes	There are no aerodromes in the Ku-ring-gai Council area. Sydney Airport is located 19.6 km to the south. Council will provide airport managers with flying-fox count data if considered relevant to assist managing strike risk.
Government	Ku-ring-gai Council	Council is the owner of the KFFR and is responsible for managing the KFFR in accordance with relevant legislation to meet management objectives in Section 1.2.
	Biodiversity Conservation Trust (BCT)	The BCT is a statutory body developed to maximise biodiversity conservation outcomes achieved with public and private resources, including the protection of land through conservation agreements. The KFFR Conservation Agreement is administered by the BCT.
	Department of Planning, Industry and Environment (DPIE)	DPIE is the NSW state department responsible for administering legislation relating to (among other matters) the conservation and management of native plants and animals, including threatened species and ecological communities.
	Commonwealth Department of Agriculture, Water and	DAWE is responsible for administering federal legislation relating to matters of national environmental significance. This includes the

Stakeholder group	Stakeholder	Interest/reported impacts
	the Environment (DAWE)	GHFF, its nationally important camp in the KFFR and critically endangered Sydney Turpentine Ironbark Forest found in the KFFR.
	Local Government NSW (LGNSW)	LGNSW is an industry association that represents the interests of councils in NSW. LGNSW also administers funds under the NSW Flying-fox Grants Program.
State-owned Corporation	Sydney Water	Sydney Water operate and maintain existing sewer infrastructure assets within the KFFR.
Non-government organisations	Ku-ring-gai Bat Conservation Society (KBCS)	The KBCS formed in 1985 (as the Ku-ring-gai Bat Colony Committee) to protect the GHFF maternity camp. This was the founding group of Sydney Bats, which now covers the greater Sydney region. The KBCS and its members are instrumental in community education programs (including regular 'Bat Talks' and a quarterly 'Friends of Bats' newsletter), release of rehabilitated flying-fox pups, monthly monitoring of the camp and research within the KFFR.
	Ku-ring-gai Flying-fox Reserve Bushcare Group	KFFR Bushcare volunteers work with Council's bush regeneration team to protect and restore habitat in the KFFR. The KFFR Habitat Restoration Program commenced in 1987 by the KBCS in cooperation with Council (Pallin 2000). More than 150 volunteer bush regenerators have contributed to restoration within the KFFR estimated at around 1,000 hours per year (KBCS 2017).
	Other community groups	Other community groups with specific interests in the KFFR include (but are not limited to): · STEP - a community-based environmental organisation with over 500 members with a primary aim to conserve bushland in northern Sydney. · Friends of Ku-ring-gai Environment (FOKE) - established in 1994 by a group of Ku-ring-gai residents with like concerns about threats to the natural and built environment of Ku-ring-gai. · Australian Plants Society NSW North Shore Group – interests include bush care and conservation of native plants, and the group participates in Ku-ring-gai Bushcare activities.
	Researchers	Researchers have an interest in various aspects of ecology, including flying-fox behaviour, biology, and conservation, and many research projects have included the KFFR.

1.5 History and management to date

Aboriginal and Torres Strait Islander people have lived in Australia for at least 65 000 years, and the Ku-ring-gai area was home to the Darramuragal people long before the arrival of European settlers (Ku-ring-gai Council 2021).

It is certain that Traditional Owners would have had stories about the GHFF and how it first appeared in the landscape. Unfortunately we no longer have these cultural and environmental insights.

First available records of GHFF roosting in Stoney Creek indicate the camp established in the 1960s, believed to be a result of bushfires at a camp in Lane Cove River Valley. The camp began in the grounds of the Lady Gowrie Nursing Home (now the Anglican Retirement Village) and 18 Edward St, adjacent the KFFR (McWilliam 1984).

By 1972 around 2,000 GHFF were roosting at the site, and it had become an important

breeding site in Sydney (KBCS 2017).

In 1983 a subdivision of 18 Edward St threatened loss of habitat. Ku-ring-gai Council and NSW Government jointly purchased two lots of the subdivision to protect the camp and other natural values of the reserve.

In 1991 the reserve was formally named Ku-ring-gai Flying-fox Reserve, and Ku-ring-gai Council entered into a Conservation Agreement with the NSW government to protect its flora and fauna, in particularly the GHFF, in perpetuity. The Conservation Agreement commits Ku-ring-gai Council to restoring and maintaining GHFF habitat, and the Minister to providing scientific advice as necessary to ensure its protection, and advice and financial assistance to provide education opportunities for the public regarding the GHFF camp (see Appendix 2).

Council has monitored and managed the KFFR and its values since before the first Ku-ring-gai Bushland Reserve Plan of Management was developed in 1984 (Ku-ring-gai Council 2013). Community involvement in the management of the KFFR has been ongoing, with members of the KBCS providing Council with valuable advice and assistance with on-ground works since 1985.

The KFFR Habitat Restoration Project, undertaken by Council, the KBCS and the KFFR Bushcare Group, has been ongoing since 1987. Tens of thousands of volunteer hours along with Council staff and contractor time has been invested to ensure the sustainability of the KFFR. This includes controlling weeds, planting trees and other restoration and maintenance programs. Multiple hazard reduction and ecological burns have also occurred within and around the KFFR (further detailed in the Habitat Plan).

Additional land was acquired by Council and the NSW government in 1987 and again in 2007 to increase the size of the KFFR.

Regular monitoring and mapping of the GHFF camp has been undertaken by Council, the KBCS and Royal Sydney Botanic Gardens since the 1990s, with some records going back to the 1970s. This is one of the longest standing and most comprehensive flying-fox camp datasets in Australia.

In 1999 the revised KFFR Management Plan was adopted to ensure the protection of the KFFR and its values.

Between 2000 and 2009 the GHFF camp moved northwards and closer to private property, which increased conflict with some residents. Council responded by updating the Reserve Management Plan to increase focus on the needs of adjoining residents (Pallin 2019).

The Reserve Management Plan was reviewed in 2013, which included a focus on reducing the increased impacts to the community associated with movement of the GHFF camp within the KFFR (see also Section 2.3.3). Key additional actions since adoption of the 2013 plan include:

- Educational and awareness programs have been ongoing in partnership with the KBCS, including regular Bat Talks, signage at multiple locations and current information on Council's website.
- In March 2014, KBCS removed a flying-fox release cage from within the KFFR and a new release cage was constructed outside of the reserve to allow for the release of rehabilitated flying-foxes away from residential areas.
- In 2015, 10 trees (including 3 dead) were removed and an additional 8 pruned within a 10 m buffer adjacent to the most affected residents' properties in Taylor and Waugoola Streets (under a s91 licence).
- Council offered an incentive program which offered free tree removal assessments under Tree Preservation Order program.
- In 2018 the Ku-ring-gai Flying-fox Reserve 10 Year Site Management and Roosting Habitat Plan (Ku-ring-gai Council 2018) (the Habitat Plan) was developed to protect the camp (including during extreme weather, see Section 4.2), and encourage roosting towards the centre of the KFFR further from residents.
- Also in 2018, Council obtained a grant through the NSW government to assist affected residents to install double-glazed windows to reduce noise impacts (DPIE 2019). Two rounds of grant funding were taken up by residents between 2018 and 2020.
- In 2019, residents were provided an opportunity to participate in a trial to reduce odour impacts associated with the camp.
- Supporting research within the KFFR, including a noise monitoring project to assess the effectiveness of different management methods (e.g. buffers, building insulation) on mitigating noise impacts to assist impacted residents (Pearson and Cheng 2018).
- Close to 2,000 mature phase rainforest species seedlings were planted (away from residences) in July 2020 to assist restoration of the KFFR following a severe storm event in November 2019 (see Section 4.2.1.2). This was agreed at the KFFR Technical Advisory Group meeting as the fastest way to replace lost canopy. The planting was supported through Local Government NSW, DPIE and the KBCS.

A full history of the KFFR is provided in Appendix 3.

Progress on all actions from the 2013 Plan are detailed in Appendix 4. Of the 39 actions: 35 were completed and 4 are underway.

2 Values of the KFFR

2.1 Cultural

2.1.1 Aboriginal heritage

The GHFF has significance to Aboriginal people as a food source, a clan totem, an art subject, and as an indicator of habitat associations and climatic changes, both seasonal and in the dreaming cycle (Ecobiological 2009). Aboriginal people had an intimate understanding of many aspects of flying-fox ecology, such as breeding and movement patterns, and traditionally they carefully managed habitat to protect these important species (Ecobiological 2009).

Aboriginal people moved throughout their country in accordance with the seasons (AHO 2015). The D'harawal calendar (BOM 2016) shows how the annual arrival of flying-foxes represented a change in seasons (Figure 2).

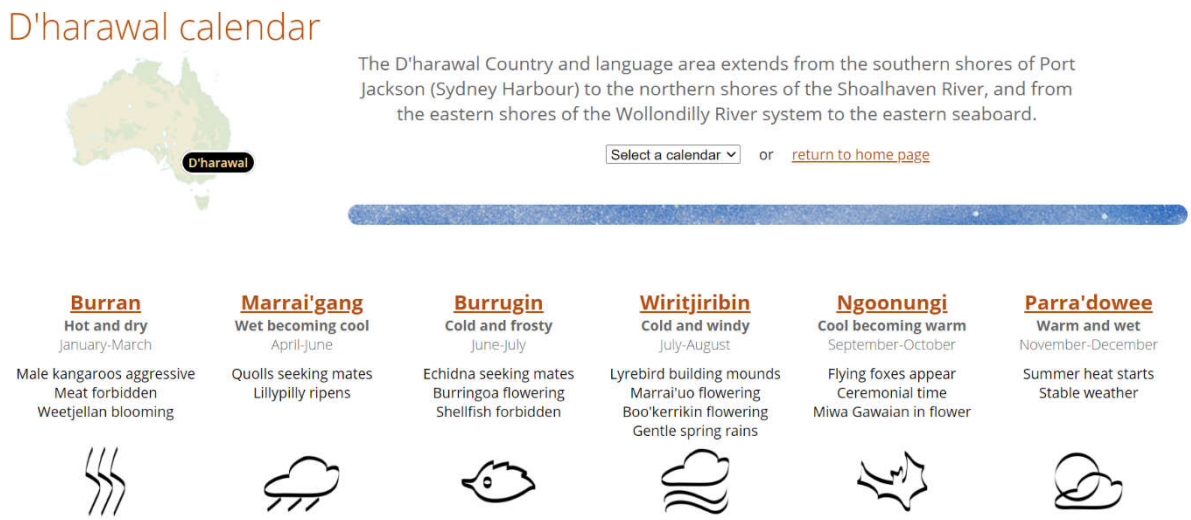


Figure 2 D'harawal seasonal calendar. The annual arrival of flying-foxes indicated a change in seasons. Source: BOM 2016.

While there are no known Aboriginal heritage sites in the KFFR, there is potential for them to occur which should be considered when implementing this PoM (Ku-ring-gai Council 2018). In this area the top of ridges can contain rock engravings if in Hawkesbury Sandstone, or open campsites if in shale. On the slopes most evidence is associated with cliffs and scarps where overhangs have formed. Rock art, shell middens and stone tools have all been found in these contexts nearby, as well as axe sharpening grooves where water is present.

2.1.2 European heritage

There are no known European heritage sites within the KFFR and it is considered unlikely for them to occur. However some private gardens adjoining the KFFR may have heritage value (Ku-ring-gai Council 2018).

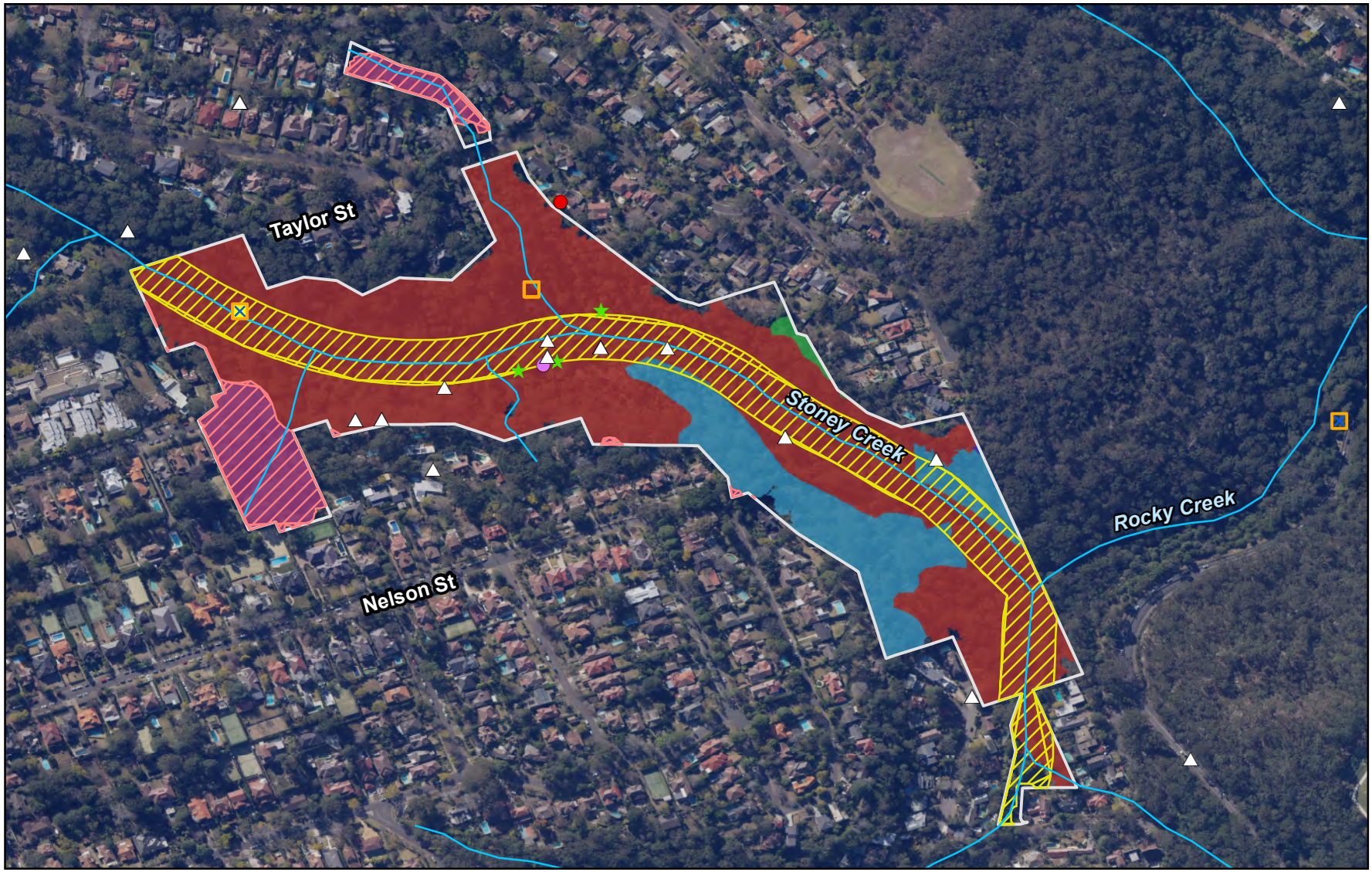
2.2 Vegetation

The KFFR contains several plant communities and associations which vary with topography, aspects, and soil type. The majority of the site is dominated by sandstone flora associations within Sydney Sandstone Gully communities. Riparian vegetation dominates the banks of the creek in sheltered areas. The upper and more exposed slopes contain more sclerophyll dominated vegetation. Sydney Turpentine Ironbark Forest (Turpentine – Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion) (STIF), critically endangered under the BC Act and EPBC Act, occurs where the soils are clay influenced on the upper southwest slopes.

A total of 273 plant species have been recorded in the KFFR, including 248 species previously recorded in Appendix C of the Habitat Plan (Ku-ring-gai Council 2018) with an additional 25 species detected through the annual Biodiversity Assessment Methodology (BAM) plot monitoring undertaken between 2018-2020.

The STIF and GHFF habitat are key vegetation values of the KFFR, and managing them both in the context of the other is critical to ensure their long-term sustainability.

Vegetation communities and land features are mapped in Figure 3. A description of each community as it occurs within the KFFR is provided in the Habitat Plan (Ku-ring-gai Council 2018).



Threatened fauna records (past 10 years)

- Dusky Woodswallow
- Glossy Black-Cockatoo
- Little Bent-Winged Bat
- Little Lorikeet
- Powerful Owl
- White-Bellied Sea-Eagle
- Rufous Fantail

Plant Community Type (PCT)

- Dwarf Apple - Broad-leaved Scribbly Gum - Sydney Peppermint low open woodland on sandstone ridges with subtle enrichement in northern Sydney (ID 1782)
- Red Bloodwood - Scribbly Gum / Old-man Banksia open forest on sandstone ridges of northern Sydney and the Central Coast (ID 1783)
- Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast (ID 1776)
- Smooth-barked Apple - Turpentine - Blackbutt tall open forest on enriched sandstone slopes and gullies of the Sydney region (ID 1841)
- Turpentine - Grey Ironbark open forest on shale in the lower Blue Mountains, Sydney Basin Bioregion (ID 1281)

Figure 3: Ecological values of the KFFR

Ku-ring-gai Council

Ku-ring-gai Flying-fox Reserve Management Plan

Ku-ring-gai Flying-fox Reserve boundary

Creeks

Biodiversity Values

Protected Riparian Land

Threatened species or communities with potential for serious and irreversible impacts

ecosure

Job number: PR5821
Revision: 0
Author: EK
Date: 23/03/2021

0 50 100 200
Metres

GCS GDA 1994
Datum: GDA 1994
Units: Degree

2.3 Flying-foxes in the KFFR

The GHFF is protected under the EPBC Act as a MNES. The Referral guideline for management actions in GHFF and Spectacled Flying-fox (SFF) camps (DAWE 2020a) (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 2,500 GHFF permanently or seasonally every year for the last 10 years.

The KFFR meets both these criteria and is therefore also protected as a nationally important GHFF camp.

The KFFR is important to the GHFF by providing:

- a resting site
- a breeding site
- access to food in both urban landscapes and extensive native forests
- stopover habitat for migrating animals
- a site for long-term research, including the longest population monitoring of any flying-fox camp in Australia.

Flying-fox ecology, species profiles and roost characteristics are provided in Appendix 5.

2.3.1 Regional context

Flying-foxes are highly nomadic, moving across their east coast range between a network of camps. Camps may be occupied continuously, annually, irregularly or rarely (Roberts 2005), and numbers can fluctuate significantly on a daily (up to 17% daily colony turnover; Welbergen et. al 2020) and seasonal basis. The KFFR forms part of a network of 546 known camps sites for GHFF across its range (Welbergen et al. 2020). Known camps within 50 km of the KFFR are shown in Figure 4.

The number of flying-foxes within a region is generally tightly linked to flowering and fruiting of foraging trees (Eby 1991). Typically, the abundance of resources within a 20–50 km radius of a camp site will be a key determinant of the size of a camp (SEQ Catchments 2012). However, understanding the availability of foraging resources is difficult because flowering and fruiting are not reliable every year and vary between locations (SEQ Catchments 2012).

Between 2019 and 2020, flying-foxes experienced significant population impacts across the east coast of Australia due to a range of extreme weather events. Prolonged drought caused a mass food shortage from Coffs Harbour to Gladstone, in which thousands of flying-foxes perished from starvation (Cox 2019; Huntsdale and Millington 2019). Following this, bushfires across the country resulted in the loss of large areas of native forest that provides natural foraging habitat for flying-fox populations.

The total number of flying-foxes lost in these events is impossible to quantify, but is likely to have been more than 100,000 individuals (M. Mo pers. comm. with Ku-ring-gai Council 2019).

With these types of events severely impacting natural areas, foraging and roosting resources in locations such as Ku-ring-gai become even more important for flying-fox conservation.

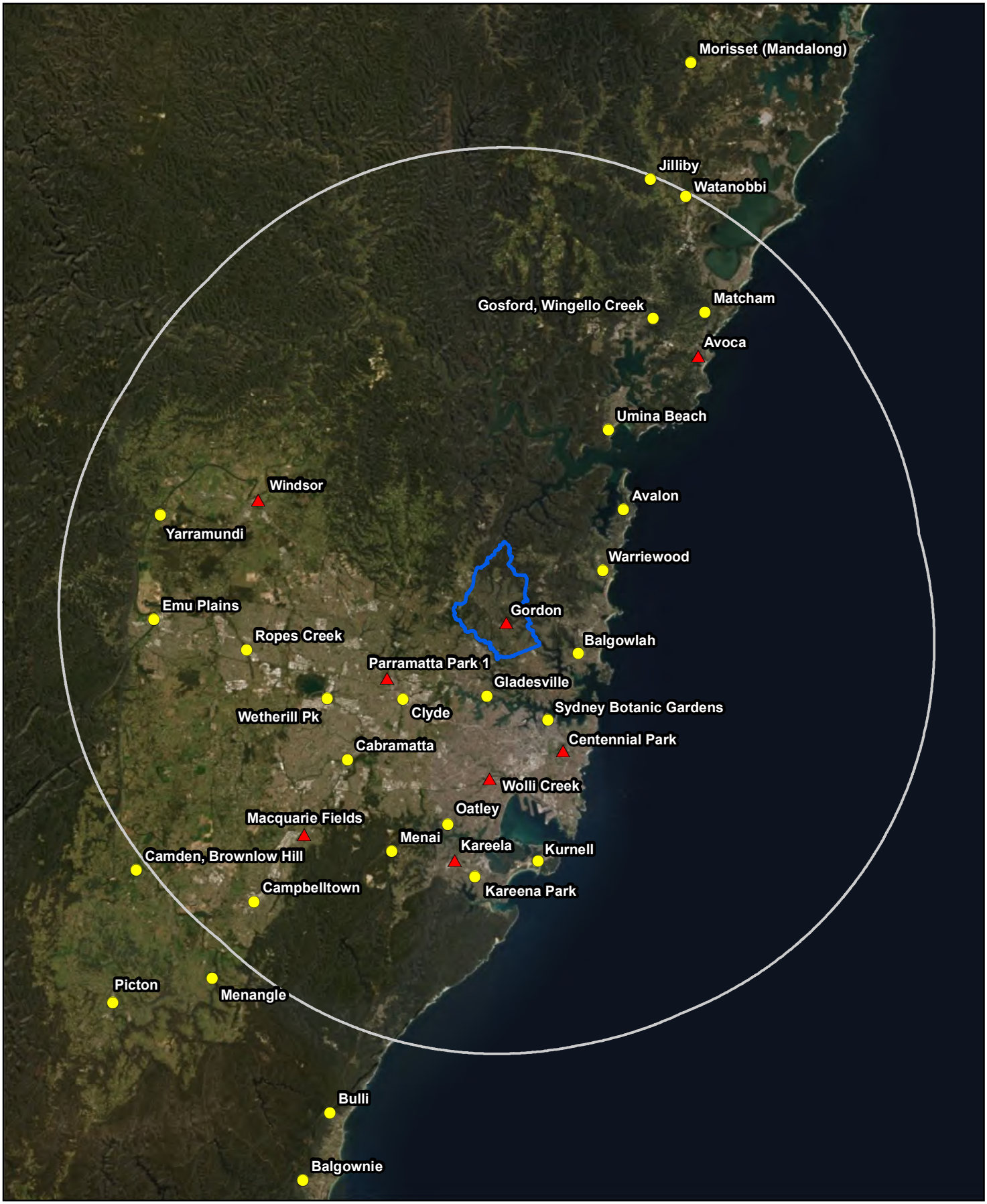


Figure 4: Regional context

Ku-ring-gai Council

Ku-ring-gai Flying-fox Management Plan

- Ku-ring-gai Council LGA
- 50 km buffer
- Nationally Important Flying-fox Camp
- Other Flying-fox Camp

ecosure

Job number: PR5821
Revision: 0
Author: EK
Date: 23/03/2021

0 3 6 12
Kilometers

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

PR5821_MPX_RegionalContext
A4

2.3.2 Flying-fox counts and seasonal trends

Three species of flying-foxes occur in NSW: the GHFF, Little Red Flying-fox (*Pteropus scapulatus*; LRFF) and Black Flying-fox (*P. alecto*; BFF) (see Appendix 5).

The KFFR is primarily occupied by GHFF. A small number of BFF (<50), including females with dependent young, are occassionally observed in the KFFR, particularly in recent years. LRFF have not been observed in the KFFR in recent years, with only two records of this species occuring over a six week period in the summer of 1980-1981 (Puddicombe 1981) and again in 1983 (Ku-ring-gai Council unpub.).

Regular counts by Council, the KBCS and the Sydney Royal Botanic Gardens Domain and Trust (RBG) between 1995 and 2021 show annual and seasonal variations from zero to 70,000 GHFF (Figure 5).

Numbers of 60,000 or more animals have been recorded only three times – in 1996 (60,010 in April); 2000 (69,000 in January) and 2009 (70,000 in February). The camp more commonly peaks between 20,000 and 40,000 animals during summer and the mating season (around March). During winter, the camp usually reduces in numbers and is often empty.

The data indicates a trend of decreasing average numbers of GHFF in the KFFR (Figure 5). In recent years the camp has been more commonly empty (at least 17 months since 2012 compared with four between 1996 and 2011).

Figure 6 shows natural flying-fox foraging habitat in the Ku-ring-gai area (mapping Eby et al. 2019, building on Eby and Law 2008). Further detail about communities, their value as flying-fox foraging habitat and indicative flowering times can be found in spatial data and literature available from these studies.

Urban plantings and orchards also attract flying-foxes at times. It should be noted that flying-foxes are highly nomadic and that KFFR is used as they move around their national camp network (546 known camps sites for GHFF across 85 LGAs; Welbergen et al. 2020).

Factors influencing the number of flying-foxes at KFFR are summarised by Eby (2017):

- “Substantial spikes in population occur when preferred food plants, such as Red Bloodwood *Corymbia gummifera*, flower well in local forests.
- The size of the population falls rapidly and the camp generally empties when highly preferred diet plants flower well in other areas (e.g. when Spotted Gum *C. maculata* flowers hundreds of kilometres from Sydney).
- Urban camps and feeding areas are becoming increasingly important to flying-foxes during winter. For example, the total number of flying-foxes roosting in eastern Sydney during warmer months has been relatively stable over the past 22 years. However, there has been a 10-fold increase in the number present during winter.
- During periods of widespread drought (e.g. 2002-2009), flying-foxes and birds use urban habitats as refuge and population size during these periods may be greater than at other times.

- The number of flying-fox camp sites in Greater Sydney varies through time due to changes in behaviours of the animals and dispersal actions that exclude animals from established camps. Changes in local roost density influence the size of the population in KFFR."

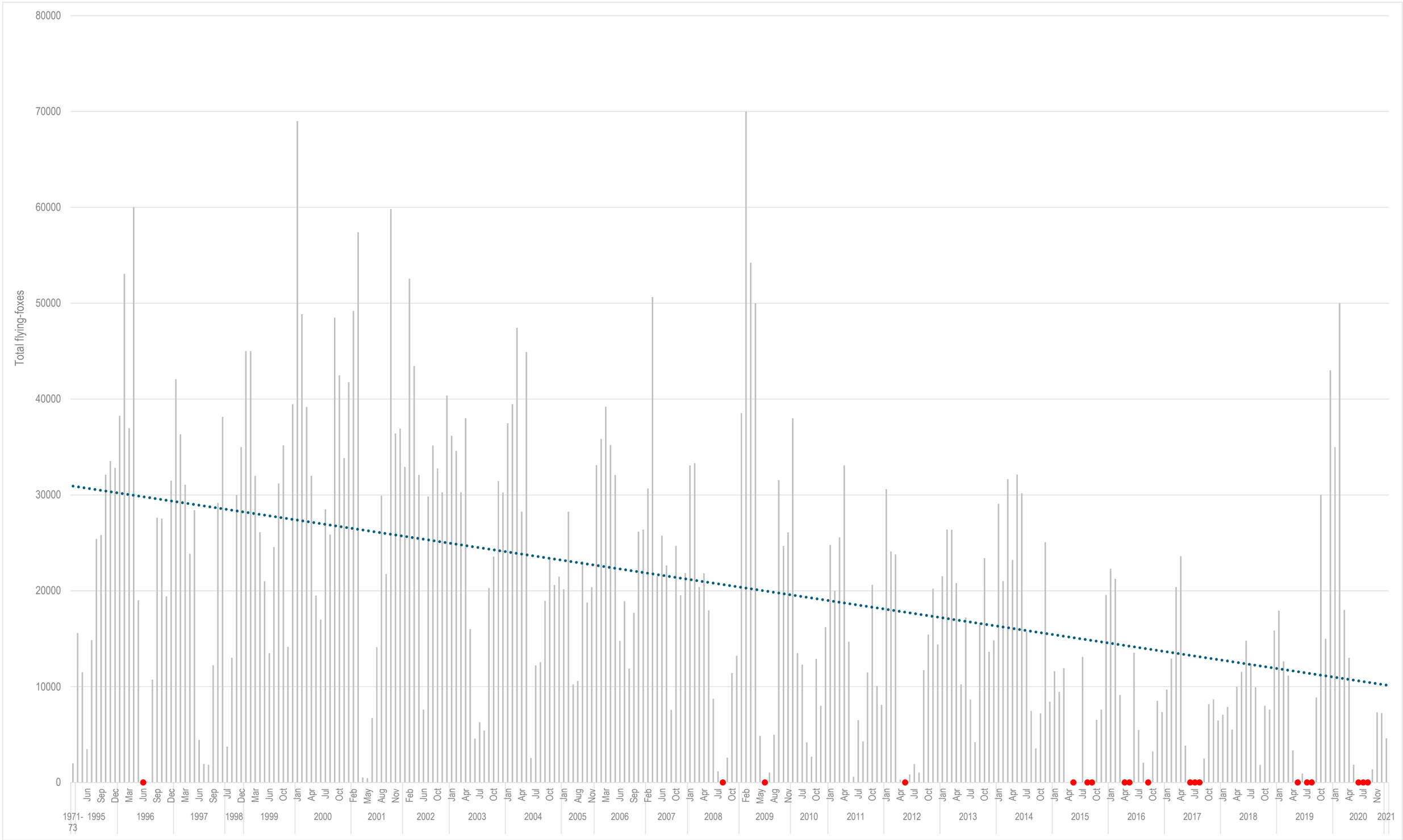


Figure 5 Ku-ring-gai flying-fox counts 1995 – 2021 (data sources: Council, KBCS, RBG). In months with multiple counts the average is shown, except months with counts over 50,000 when the maximum is graphed to show peak numbers. Trendline is shown in blue. Months where no flying-foxes were observed are shown with a red dot.

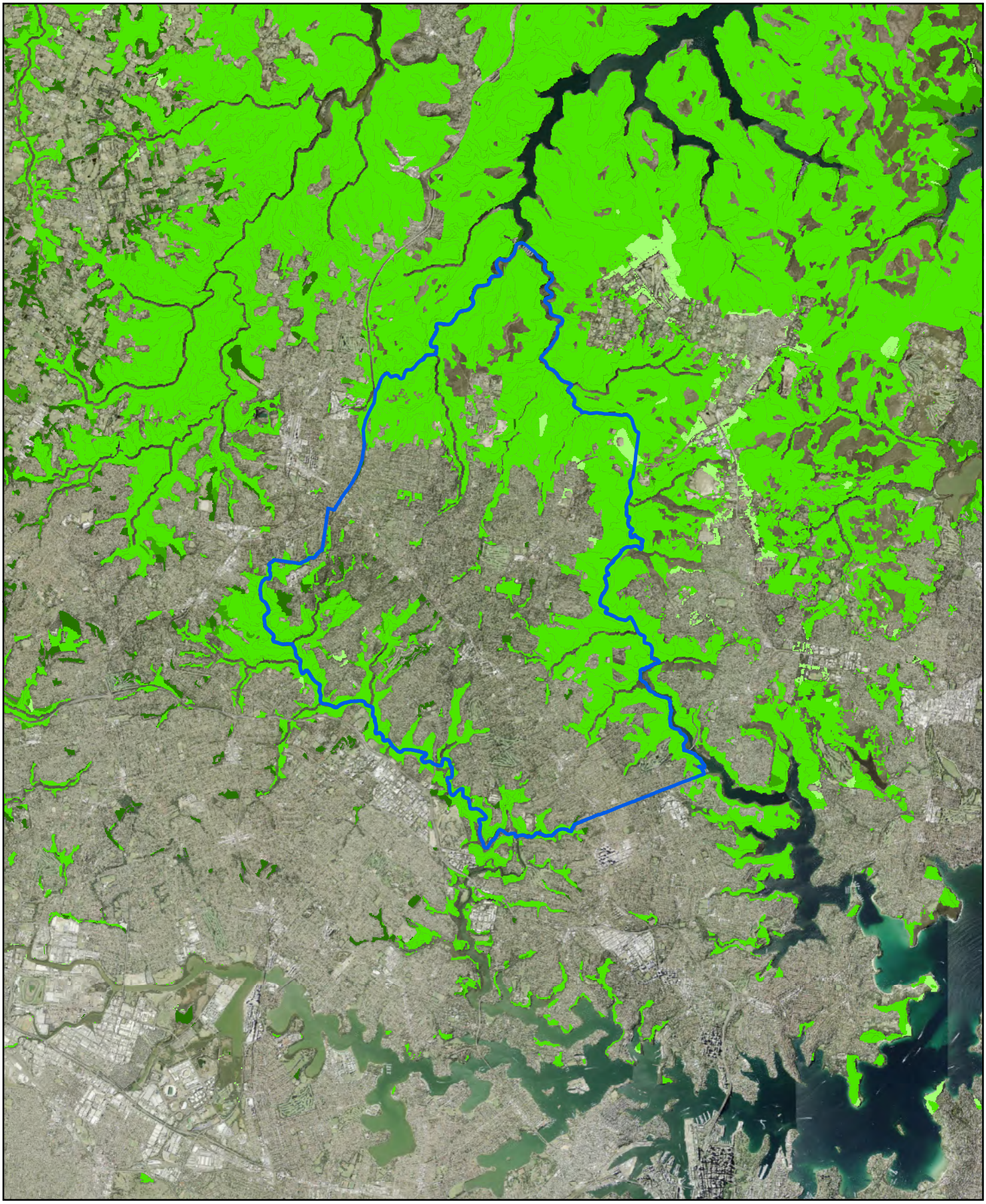


Figure 6: Natural foraging habitat in Ku-ring-gai Council area and surrounds

Ku-ring-gai Council

Ku-ring-gai Flying-fox Management Plan

Ku-ring-gai council LGA

Total habitat score *

0 - 0.01

0.01 - 0.2

0.21 - 0.4

0.41 - 0.6

0.61 - 0.8

0.81 - 1

* Habitat score = weighted productivity * reliability scores of flying-fox diet plants (nectar habitat). Data source: Eby et al. 2019

ecosure

Job number: PR5821
Revision: 0
Author: EK
Date: 23/03/2021

0 0.5 1 2
Kilometers

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

2.3.3 GHFF movement within the KFFR

The location of the camp within the KFFR varies annually and seasonally and in response to weather conditions (see Appendix 6 for historical seasonal camp extents). Records show the camp was originally in the western end of the KFFR, and in the 1990s slowly shifted to the lower slopes at the centre of the reserve (Figure 7 and Appendix 6).

Core roosting habitat has been divided into the Stoney Creek area towards the centre of the KFFR, and the Taylor Street area (Eby 2017) (Figure 8).

In 2000 during the peak number of up to 70,000, the camp expanded closer to residents on Taylor and Waugoola Streets. As numbers reduced again, flying-foxes mainly returned to the Stoney Creek area. However in 2009 when the second peak of 70,000 was recorded, the camp again expanded to these areas. From that point the Taylor Street area has been more commonly occupied compared with the Stoney Creek area, resulting in increased impacts for neighbouring residents.

The periodic shifting of the camp is possibly in response to disturbance at the KFFR or other camps in Sydney, roost tree damage, and a range of other factors. The camp extent is similarly expected to change again in the future. A key objective of the Habitat Plan is to restore and improve habitat along Stoney Creek to encourage roosting in the centre of the KFFR and further from residents. These movements will need to be considered by Sydney Water in their maintenance activities as they require access to infrastructure which runs through the centre of the KFFR near Stoney Creek.

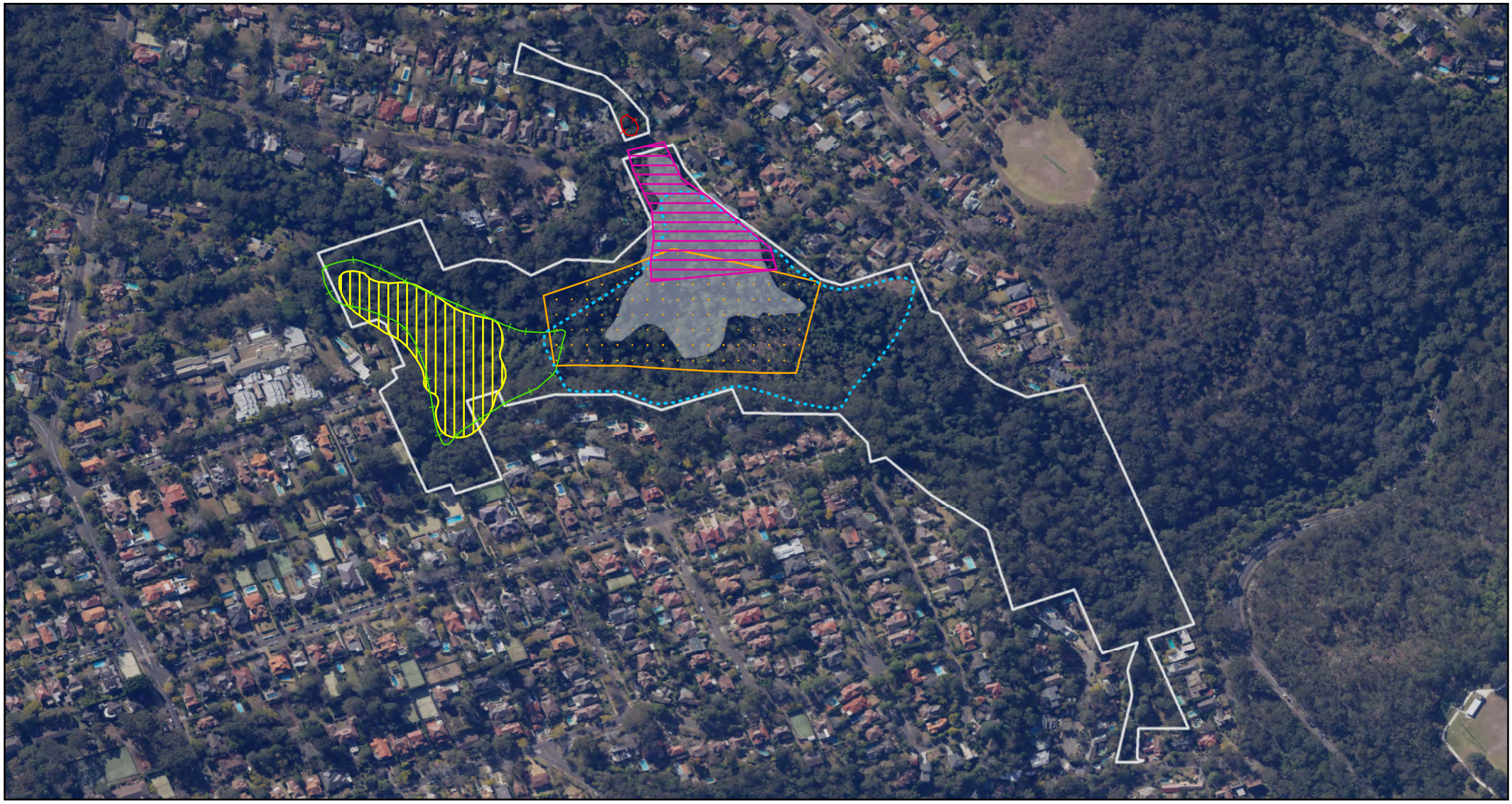


Figure 7: Roost extents showing progressive movement of the camp over time (adapted from Pallin 2001)

Ku-ring-gai Council

Ku-ring-gai Flying-fox Reserve Management Plan

ecosure

Job number: PR5821
Revision: 0
Author: EK
Date: 8/03/2021

0 50 100 200
Metres

GCS GDA 1994
Datum: GDA 1994
Units: Degree

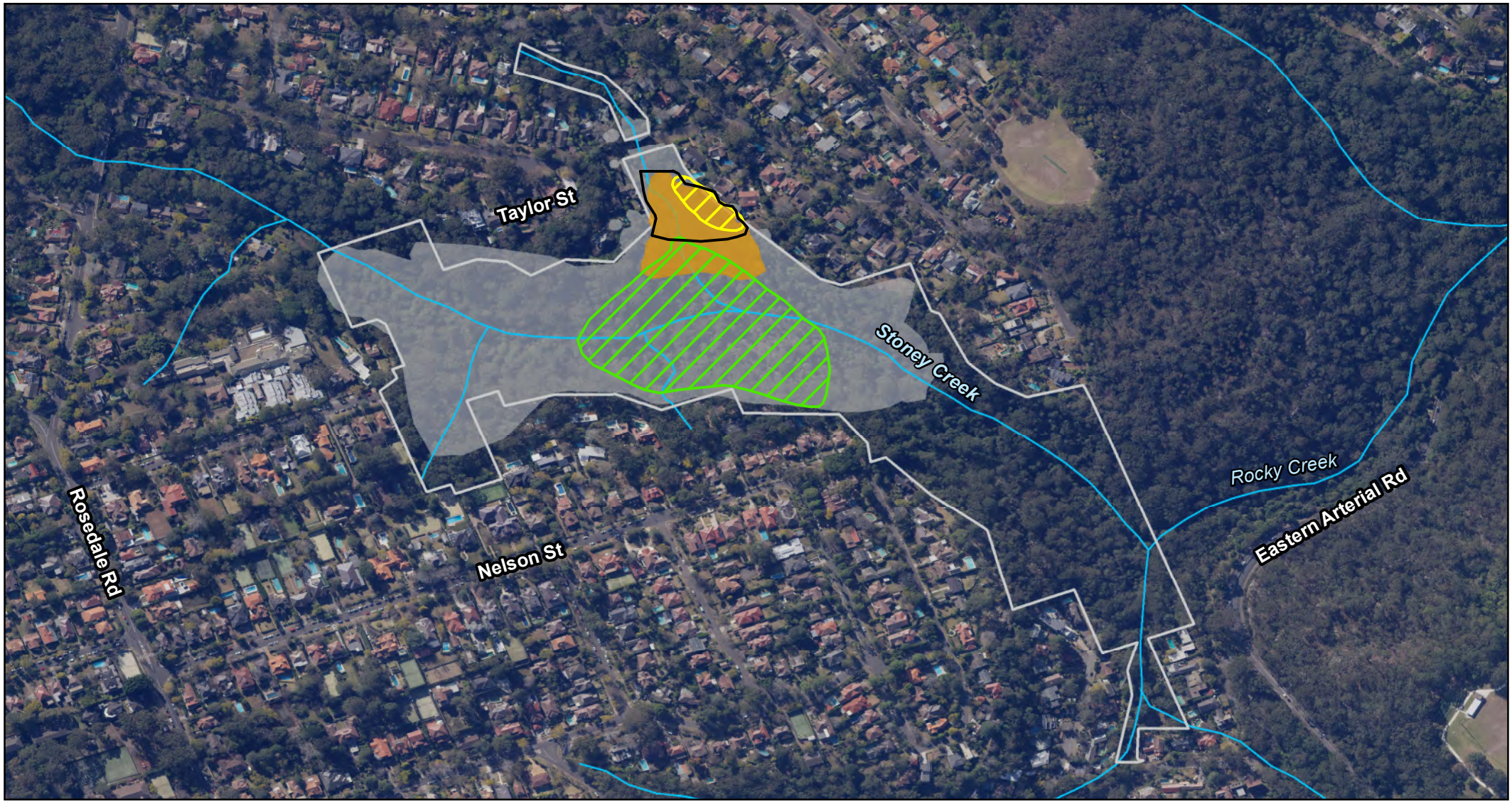


Figure 8: Camp extents and core roost habitat

Ku-ring-gai Council

Ku-ring-gai Flying-fox Reserve Management Plan

Ku-ring-gai Flying-fox Reserve boundary
Maximum footprint
Camp extent Jan 2021
Taylor Street core area
Stoney Creek core area
Taylor Street roost area
Creeks

Core areas as identified by Eby (2017)

ecosure

Job number: PR5821
Revision: 0
Author: EK
Date: 23/03/2021

0 50 100 200
Metres

GCS GDA 1994
Datum: GDA 1994
Units: Degree

PR5821_MPX_Flying-foxCampExtent
A4

2.4 Other fauna

The KFFR supports a diverse array of fauna, with a total of 169 native species recorded.

In addition to the GHFF, the following threatened species have been recorded within the KFFR.

Recent records (past 10 years, mapped in Figure 3):

- Powerful Owl (*Ninox strenua*), vulnerable under the BC Act, including a nesting site located between Nelson and Edward Street.
- White-bellied Sea-eagle (*Haliaeetus leucogaster*), vulnerable under the BC Act and listed as marine under the EPBC Act
- Little Lorikeet (*Glossopsitta pusilla*), vulnerable under the BC Act
- Glossy Black Cockatoo (*Calyptorhynchus lathami*), vulnerable under the BC Act
- Rufous Fantail (*Rhipidura rufifrons*), listed as migratory under the EPBC Act
- Little Bent-winged Bat (*Miniopterus australis*), vulnerable under the BC Act.

Historical records:

- Varied Sittella (*Daphoenositta chrysoptera*)
- Eastern Pygmy-possum (*Cercartetus nanus*), vulnerable under the BC Act
- Eastern Free-tail Bat (*Micronomus norfolkensis*) vulnerable under the BC Act
- Red-crowned Toadlet (*Pseudophryne australis*) vulnerable under the BC Act
- Giant Burrowing Frog (*Heleioporus australiacus*) vulnerable under the BC Act and EPBC Act.

3 Stakeholder engagement

During development of the PoM Council sought to consult with all stakeholders with an interest in the KFFR and flying-foxes in general. The community and other stakeholders were invited to provide input and feedback via:

- an online survey open to all Ku-ring-gai Council residents, focussing on flying-fox-specific management
- a workshop with residents living near the KFFR
- a workshop with other key stakeholders
- public exhibition of the draft Plan.

3.1 Online survey results

The community online survey was advertised via social media and Council marketing and was open for two weeks (15 January – 28 January 2021[1]). Survey results are summarised in Appendix 7.

The survey was completed by 244 people. 56.71% of respondents live in close proximity to the Ku-ring-gai Reserve flying-fox camp, with 25.23% of the remaining respondents occasional visitors to Gordon (see also Appendix 7).

Overall, the Ku-ring-gai community is well-informed and interested about flying-fox conservation. The majority of respondents were aware that Ku-ring-gai is home to a Nationally Important flying-fox camp (81.40%) and that flying-foxes are native mammals, protected under legislation (89.75%). Similarly, the majority of respondents 'strongly agreed' or 'agreed' that flying-foxes are a crucial part of Australia's ecosystem (68.6%) and that flying-foxes and humans should be able to live together harmoniously (63.9%). The majority of respondents also 'strongly disagreed' or 'disagreed' (65%) with the statement that 'flying-foxes are pests and should be removed from the area'.

[1] Six surveys were received 29-30th January which have been included in results.

The community was asked to rate their experience or interactions with flying-foxes in Gordon. 46.89% of all respondents rated their experience as generally positive, 29.05% as generally negative, and 24.07% responded as neither positive nor negative. There was a slightly higher negative experience for people living near the camp. Of the 131 respondents living near the camp, 43.51% responded as having a mainly negative experience, 41.98% responded as positive, and 14.50% as neutral (Figure 9).

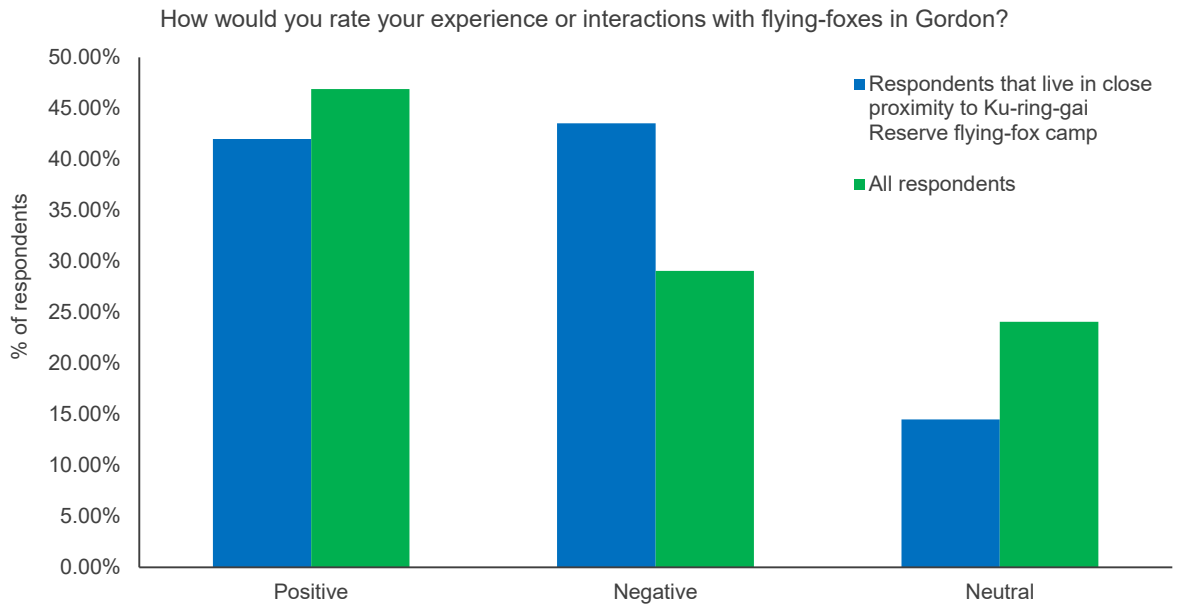


Figure 9 Resident experiences or interactions with flying-foxes; all residents vs. residents that live in close proximity to Ku-ring-gai Reserve flying-fox camp.

Respondents that felt positively about flying-foxes appreciate their role in the ecosystem as pollinators (71.02%) and enjoy watching them at the camp/flying out (70.45%).

When asked which topics concerned residents most regarding flying-foxes, conservation-related topics formed four of the top five concerns: flying-fox habitat protection (47.23%), flying-fox conservation (45.11%), misinformation and misconceptions about flying-foxes (43.83%), and flying-fox welfare (42.98%) (10). Of the negative impacts, excrement (45.11%), fear of disease (42.55%), and noise (34.04%) were the three areas of most concern for Gordon residents (Figure 10). Note multiple responses could be selected for questions such as this which accounts for >100% total.

The top five concerns for residents living near the camp were: excrement (58.78%), fear of disease (54.20%), noise (47.33%), flying-fox habitat protection (40.46%) and smell (40.46%) (Figure 11).

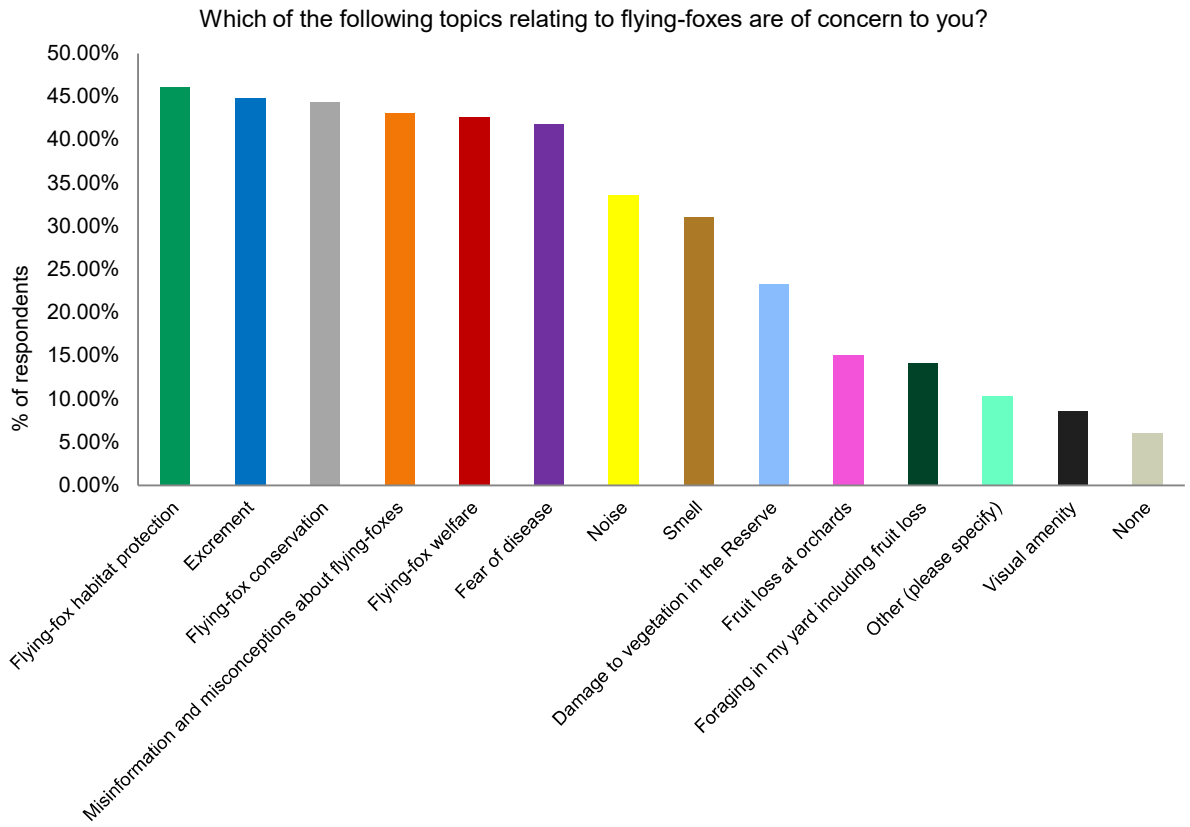


Figure 10 Areas of concern for residents across Ku-ring-gai

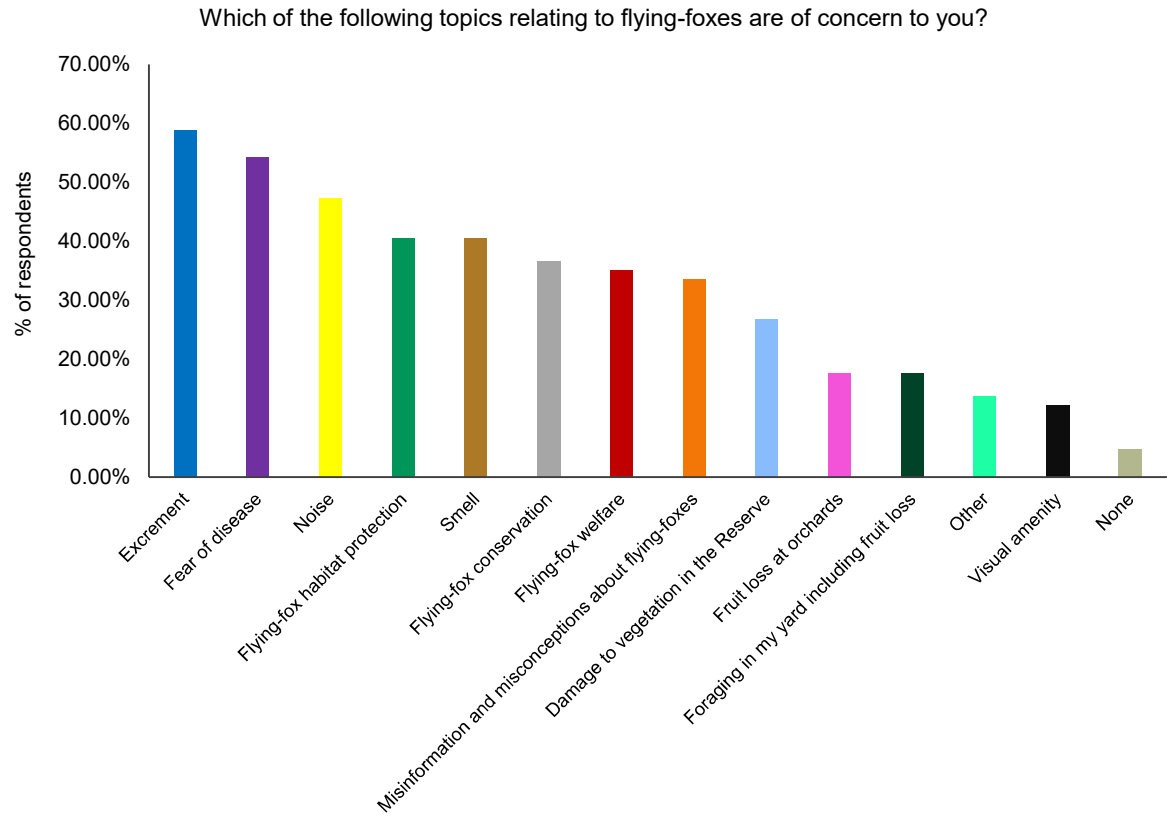


Figure 11 Areas of concerns for residents living near the camp

Smell, noise, and excrement, along with impacts on mental health, were also concerns expressed by respondents in open ended questions. Many of the respondents understood the importance of flying-foxes in the environment, though still believed they should be managed to reduce negative impacts. Many respondents expressed similar concerns for flying-fox welfare and concerns over a lack of awareness or appreciation for the species. In addition, multiple respondents felt that flying-foxes were the original occupants of Ku-ring-gai and deserve protection.

Respondents living in close proximity to the camp were asked if receiving subsidies would help to reduce the impacts on their property. 34.65% responded 'yes'. Of those subsidy assistance options, the top three responses were double glazing/insulation (54.76%), car covers (52.38%) and fruit tree netting (50.00%).

Survey participants were asked 'which of the following management options are you interested in learning more about?'. The top four favoured management options were land use planning including zoning of flying-fox camps (53.13%), managing introduced pest animals in the KFFR (52.08%), restoration of existing habitat (51.04%) and routine maintenance including bushfire management (50.52%).

3.2 Workshops

Residents near the KFFR and other key stakeholders were invited to workshops held remotely (due to COVID-19) via Zoom on March 4th 2021. Workshops were separated into:

- Resident Workshop – residents within 300 m of the KFFR were invited to attend this workshop.
- Stakeholder Workshop – other key stakeholders were invited to attend this workshop.

Workshops were separated to accommodate different focus areas of concern between groups.

Both workshops were facilitated by Ecosure with Council presenting background to the KFFR and PoM. Summary results of the community survey were shared, and draft actions were presented for discussion and feedback. Following workshops a feedback form was provided to participants and anyone who expressed interest but was unable to attend to allow for additional feedback.

Feedback is summarised below, and has been incorporated where possible into the PoM.

3.2.1 Residents near the KFFR

Twenty-two residents participated in the resident workshop. In summary:

- Mixed response to subsidies program with some interest, but others feeling subsidies are not sufficient to mitigate impacts.

- Ecosure presented about ABLV, HeV and COVID-19 (including that no viruses close to COVID-19 have been detected in Australian wildlife). Concerns were raised during discussion about surveillance of KFFR flying-foxes, remaining concern about living near flying-foxes, and potential novel diseases. Discussed that extensive surveillance occurs across Australia (and that all flying-fox species have a single national population so directly relevant regardless of location), and that people have been working with and living near flying-foxes for many years without issue. Referred to Wildlife Health Australia for further information.
- Several participants experiencing mental health and wellbeing impacts. Discussed that Council acknowledges these real impacts, and that previous and future impact mitigation strategies are aimed at assisting with issues that lead to these impacts. For example, double-glazing previously offered was to reduce noise impacts and sleep deprivation, which can contribute to mental health and wellbeing impacts. Welcomed any further suggestions residents feel would assist reducing these impacts.
- Discussion about many residents wanting flying-foxes to be encouraged further into the centre of the KFFR away from residents. Explained this is the primary objective of the 10 year habitat plan, and significant planting has been done, with funds secured for additional planting, to make these lower conflict areas more attractive. Planting with large tube stock was identified by the Flying-fox Technical Advisory Committee as the fastest way to achieve this. There will be gradual improvements in habitat quality over time, and other impact reduction actions are aimed to assist in the interim.
- A lot of emphasis on community desire for buffers. Discussion about why tree removal was not a feasible or desirable option given ecological values of the KFFR, and many community members highlighted in the survey that they do not find this an acceptable option. Discussed the action to investigate canopy-mounted sprinklers to provide a buffer, but that a feasibility assessment is required as there are potential issues. Still a new tool, and the assessment will draw on previous trials of this method, and assess site-specific feasibility.
- Community feedback following the workshop included a question about whether sonic devices may be useful for buffers. Sonic devices have been trialled on other animals with mixed reports, being ineffective for kangaroos (Bender 2003), but reportedly effective to deter domestic cats (Crawford et al. 2018). Previous trials of ultrasonic deterrents to deter foraging flying-foxes have been ineffective (DPIF n.d.) As flying-foxes hear in a similar range to humans, and their tendency to quickly habituate to other static devices, it is considered unlikely to be effective and this option has not be recommended for further trials. Appendix 9 provides further detail on camp management options.
- Several residents expressed their desire to have Council commit to timeframes for actions. Timeframes have been added to actions in Section 5.

3.2.2 Other key stakeholders

In addition to Council and Ecosure, 10 stakeholders attended the workshop representing:

- DPIE
- BCT
- KBCS
- Bushcare
- STEP
- Research organisations.

In summary:

- Reducing trend in flying-fox numbers at KFFR. All agreed this is in line with more camps in the Sydney region. KFFR has been empty when other camps in Sydney occupied.
- The 2020 planting is going well, very high survival rate. Watering may be required if rain lessens.
- Funding secured for additional planting.
- Subsidies should be tailored to impacts of concern for individual communities. Double glazing has been beneficial however is costly. Ku-ring-gai Council subsidies for double-glazing highest amount in the state over two rounds of rebates, and high acceptance rate (14 residents). Some residents have inquired about the potential for a third round.
- Council had an incentive program which offered free tree removal assessments under Tree Preservation Order program, but there was low uptake.
- NSW netting subsidy has finished however low interest loans through Rural Assistance Authority available to assist impacted growers with netting costs. Biodiversity Conservation Trust (BCT) grant funding program also available (see BCT website).
- Concerns regarding canopy-mounted sprinklers for buffers including potential to make microclimate unsuitable, water destablising tree root systems, uncertain effectiveness, potential to exacerbate HSEs, reducing available roost space and forcing flying-foxes to less suitable habitat, potential for conflict elsewhere. If used need to have first flush system to avoid burning flying-foxes. Highlighted community was interested in this option. Feasibility assessment required in consultation with experts.
- Concerns about unintentional disturbance from dog walkers accessing. Discussed additional signage and monitoring.
- Intentional unauthorised disturbance does not seem to be an issue at present.
- KBCS and Bushcare happy with Council support and working relationship.

- KBCS to continue working together on rescue/HSE processes.
- Resourcing can be an issue for HSE response. Normally organised through KBCS members (with Wires) on the day. Monitoring equipment in the KFFR assists.
- Central database would be useful for maintaining register of visits and work in the KFFR.

4 Key issues

4.1 Protecting vegetation and maintaining habitat quality

The KFFR supports a diverse array of native flora and several ecological communities, including a CEEC (Section 2.2). This vegetation provides nationally important habitat for the GHFF (Section 2.3) and supports a range of other fauna (Section 2.4).

The narrow shape of the reserve and valley setting leaves the reserve highly vulnerable to edge effects along the ridges at residential boundaries. Pressures on vegetation include:

- degrading processes at residential boundaries including unauthorised bushland dumping and encroachments, pool discharge and weed incursions from garden escapees (also a Key Threatening Process, KTP, see Appendix 1)
- roosting flying-foxes increase soil nutrients, introduce weed species, break branches and defoliate vegetation (which can lead to tree loss)
- vegetation recruitment heavily compromised by wallaby overgrazing and limited opportunity for burning
- storm events (see Section 4.2.1.2)
- proliferation of weeds associated with more open canopy from roosting damage and storm events
- climate change (KTP, see Appendix 1).

The KFFR Habitat Restoration Project, undertaken by Council, the KBCS and the KFFR Bushcare Group, has been ongoing since 1987 and has been critical to the long-term sustainability of vegetation in the KFFR.

The Habitat Plan 2018-2028 (Ku-ring-gai Council 2018) details how on-ground habitat restoration works, tree replacement and an ecological burn regime will maintain vegetation structure for habitat conservation. The Habitat Plan also includes strategic weed control recognising that weeds provide important habitat, refuge from extreme weather and predators, and protection from disturbance.

4.2 Protecting flying-foxes and other fauna

4.2.1 Extreme weather impacts

4.2.1.1 Heat

Heatwaves can cause mortality in any fauna, and mass die-offs in a number of species has been reported (e.g. Gordon et al. 1988; Saunders et al. 2011).

Flying-foxes are especially susceptible to extreme heat. Temperatures above 38ºC,

consecutive hot days, lactation, age and other weather variables such as high humidity contribute to the likelihood of a Heat Stress Event (HSE) (Bishop 2015, Collins 2014, Welbergen et al. 2008). Mass mortality commonly occurs when temperatures exceeds 42°C (Welbergen et al. 2008; Bishop et al. 2019). Thirty-five HSEs have occurred in Australia since 1994 (Lab of Animal Ecology 2020) including the largest on record, 45,500 deaths across 52 South East Queensland (SEQ) camps in the summer of 2014 (Welbergen et al. 2014).

Flying-foxes may die of either heat stroke, or dehydration associated with saliva spreading used for evaporative cooling.

Historically habitat in the KFFR provided good protection and heat related mortality was generally limited to small numbers of flying-foxes. However, following significant loss of vegetation in a severe storm event in 2019 (see Section 4.2.1.2), a HSE led to the death of 7,000 flying-foxes in the KFFR. More severe impacts of heat are likely to continue until regeneration areas and plantings mature.

Flying-foxes in the KFFR respond to high temperatures by moving to areas where the temperature is lower and the humidity higher (KBCS). Weather data loggers in the KFFR have shown that on hot days it is typically 2-3° C cooler, with 5-10% higher humidity, in the centre of the KFFR near the creek (KBCS 2017).

Council and KBCS has mapped movement of flying-foxes in the KFFR at different temperatures (Figure 12).

Heat-proofing camps (see also Parry-Jones 2018) with sufficient canopy and midstorey for animals to seek refuge during severe heat is the most effective way of minimising mortality. This is a key objective of the Habitat Plan to protect flying-foxes and other fauna in the KFFR, and works to achieve this are detailed in that Plan (Ku-ring-gai Council 2018).

Damage to the canopy from the 2019 storm event (see Section 4.2.1.2) has made many areas of the KFFR hotter and drier, including main refuge areas for bats during extreme heat.

A range of intervention methods are used by wildlife rescue and carers to reduce mortality in camps, including direct spraying of affected animals by hand, or using ground-based or canopy-mounted sprinklers/hoses to simulate a rain shower. These methods were reviewed by Mo and Roache (2020) who found that evaluation of the efficacy of heat stress interventions has been largely anecdotal rather than empirical. Intervention also has the potential to exacerbate HSEs through disturbance, or increasing humidity with spraying. To address this lack of empirical data, the NSW government approved a scientific trial of various methods in combination with flying-fox behaviour and temperature monitoring (currently underway).

Council and KBCS will continue to respond to HSEs in accordance with the current NSW guidelines, and results of this study will be used to inform intervention suitable for the KFFR.

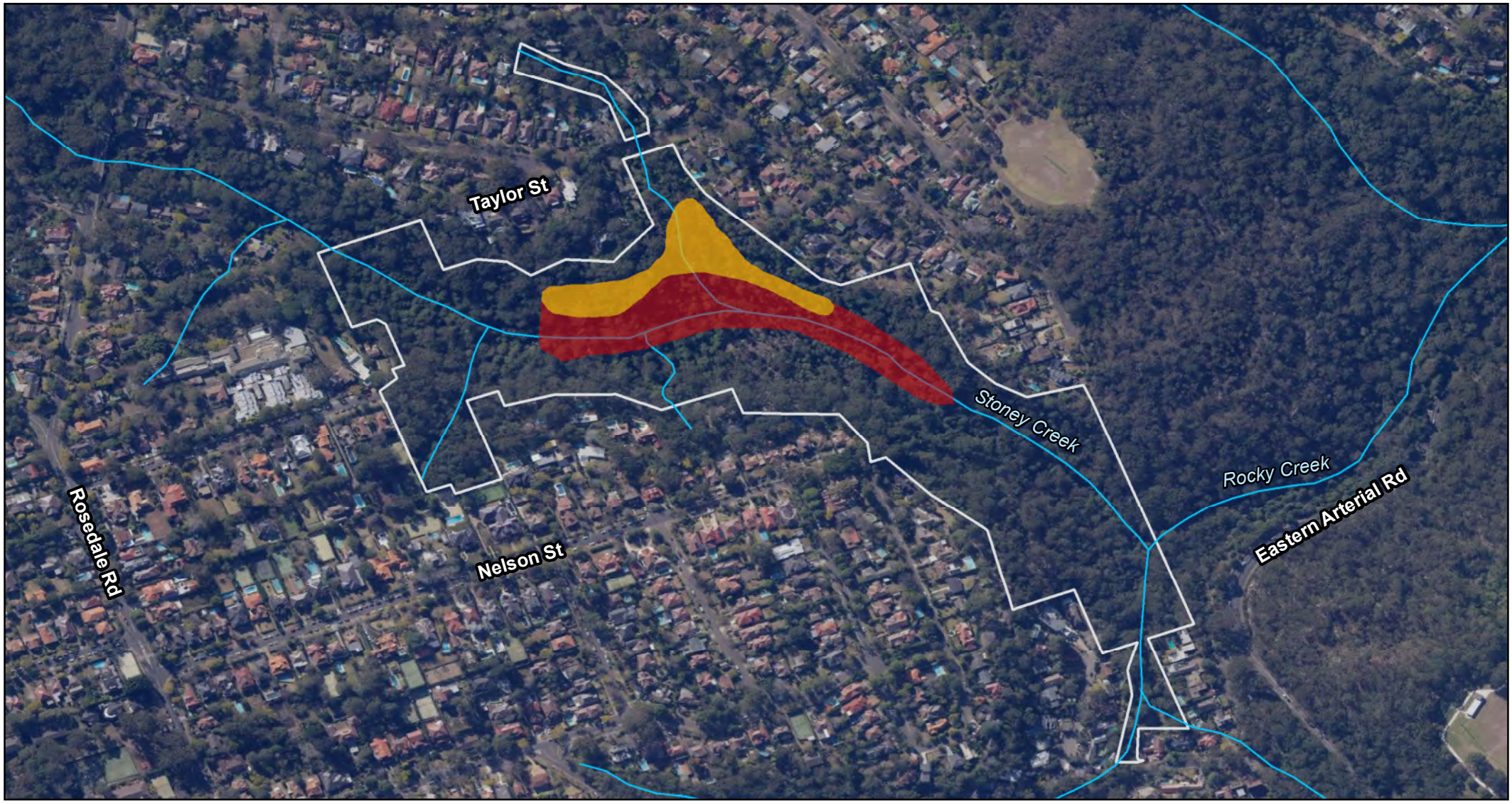


Figure 12: Flying-fox movement on high-heat days

Ku-ring-gai Council

Ku-ring-gai Flying-fox Reserve Management Plan

Ku-ring-gai Flying-fox Reserve boundary
Creeks
Early in day
Later in day (peak temperatures)

ecosure

Job number: PR5821
Revision: 0
Author: EK
Date: 23/03/2021

0 50 100 200
Metres

GCS GDA 1994
Datum: GDA 1994
Units: Degree

4.2.1.2 Storms

Wildlife rescue must only occur when it is safe for human access.

Storm events result in tree loss and damage to vegetation, and resulting fauna habitat loss including roost space for the GHFF.

A severe storm in November 2019 caused extensive damage across Gordon, including uprooting many mature trees within the KFFR (e.g. Figure 13), which also damaged understorey vegetation. Significant loss to the crowns of many trees has opened up the canopy in a number of areas. This has resulted in these areas becoming hotter and drier, including main refuge areas for the GHFF during extreme heat. Increased sunlight and drier soils also favour weed proliferation which can further degrade the habitat.

Storms can also result in injury and mortality in flying-fox camps, particularly when flightless young are present (during summer, which coincides with storm season).

Habitat restoration is critical to ensure sufficient recruitment over time to allow such canopy losses to be replaced as soon as possible.

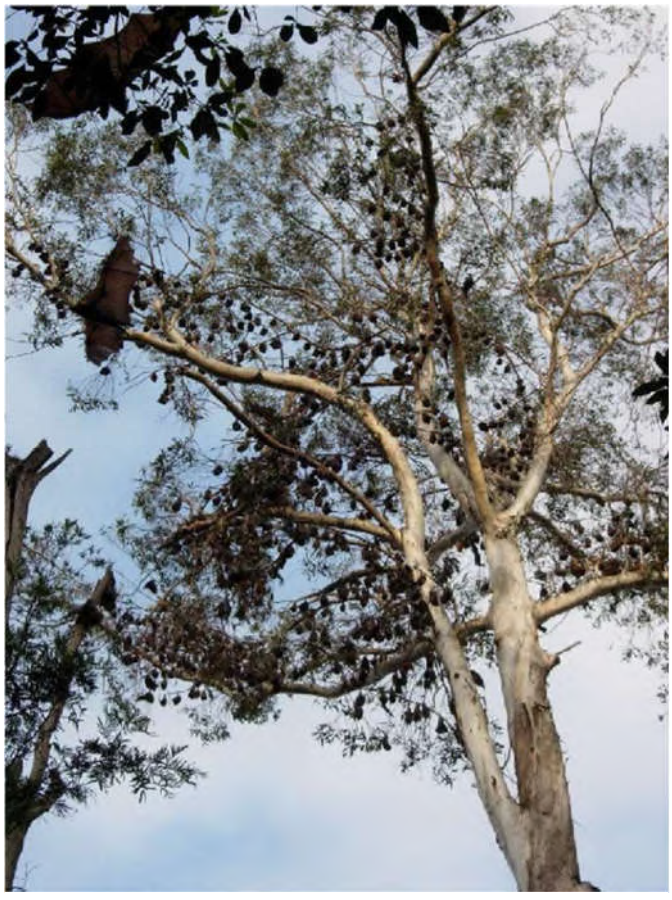


Figure 13 A tall blackbutt which provided roosting space for many GHFF in the KFFR in 2009 (pictured) was felled by the November 2019 storm (Source KBCS 2017).

4.2.1.3 Drought

Drought and associated lack of natural food sources for flying-foxes can lead to mass mortality and pup abandonment events (see also Section 2.3.1).

Urban camps with varied and consistent food sources provided by urban parks, street plantings and residential areas become more important during these times.

Continued protection of urban camps, such as the KFFR, will be important to limit impacts of more frequent drought under climate change.

4.2.1.4 Bushfires

Management of bushfire risks for the community is outlined in Section 4.3.

In addition to the risk to communities around Australia, bushfires may threaten both the KFFR, and important GHFF foraging habitat across eastern Australia.

Flying-foxes and their camps are particularly susceptible to the adverse impacts from bushfire (and associated smoke), particularly during the breeding season. Therefore, bushfire exclusion is required through most of the year.

A key objective of the Habitat Plan is to manage the KFFR to minimise bushfire risk, and actions on how this will be achieved are detailed within that Plan (Ku-ring-gai Council 2018).

4.2.2 Public access

Given the topography and steep nature of the KFFR, public access points are fairly limited. People accessing the reserve are generally limited to Council staff and volunteers, contractors, researchers, with minimal recreational use. However there is some access (e.g. by dog walkers) that can cause flying-fox distress, and potential harm. Associated disturbance also increases noise and faecal droop impacts to neighbouring residents.

There is potential for neighbouring properties and those higher in the catchment to impact on the KFFR. These potential impacts include disposing of stormwater pollutants, growing invasive introduced plants and not controlling companion animals.

The colony is particularly vulnerable during the birthing and rearing months when flightless young are present (October to December/January). Programs implemented as part of this PoM will continue aiming to satisfy public interest in ways which directs attention from the site and provides educational opportunities off site.

4.2.3 Impacts of companion and feral animals

Vertebrate pest animals recorded in the KFFR include:

- European Red Fox (*Vulpes vulpes*)
- Black Rat (*Rattus rattus*)

- Common Myna (*Acridotheres tristis*)
- Domestic animals (cats and dogs).

Predation on native wildlife by the European Red Fox is listed as a Key Threatening Process (KTP) under both the BC Act and EPBC Act (see Appendix 1).

The Common Myna is not currently an issue in the KFFR. However this species is ranked the third most invasive species (Global Invasive Species Database 2021), and if it becomes an issue Council will support regional control programs.

Companion and domestic animals, such as cats and dogs, are occasionally seen in the KFFR. Cats and dogs can disturb and kill fauna such as small birds, small mammals and reptiles. It is unlikely that their activities would have a major detrimental impact on healthy flying-foxes, but they may scavenge sick or dead animals or take young during the breeding season. With the recent identification of disease-causing viruses in flying-fox populations there is some concern, though considered unlikely, by scientists, that these viruses might in time be transmitted from flying-foxes to other mammals.

The Conservation Agreement does not permit domestic animals or pets within the KFFR. Council will undertake measures to control or limit the impacts of introduced pest and feral animals, as resources allow, on regional control programs in conjunction with other agencies such as DPIE and Local Land Services.

4.3 Managing bushfire risks

Council has a responsibility to manage bushfire on Council owned land, but works in collaboration with fire agencies, private landholders, community groups and utility services. Fuel management activity is guided by environmental legislation and codes. No single method of management used in isolation will appropriately reduce the risks of bushfire. A variety of methods may need to be applied including burning, works on the residential bushland interface including fuel reduction activities, and community education.

Council manages bushfire risk with the Hornsby Ku-ring-gai Bush Fire Management Committee in accordance with the Hornsby Ku-ring-gai Bush Fire Risk Management Plan 2016-2021.

As flying-foxes and their camps are particularly susceptible to the adverse impacts from bushfire (and associated smoke) it is critical that fire management within and nearby to the KFFR is tailored to the needs of the camp and the need for hazard reduction.

Even though the KFFR is mapped as Category 1 Bushfire Prone land, the camp area is considered very mesic, in terms of both vegetation associations and resulting microclimate. Considering the large riparian zone, it is considered that much of the KFFR is not highly prone to bushfire impacts, and that the spread of bushfire passage may be very limited within the reserve.

Ecoburns (low intensity burns for biodiversity and hazard reduction purposes) may be

undertaken in accordance with the 10 Year Habitat Plan (while the camp is vacated to minimise any smoke impacts to individuals) and under suitable conditions for a low intensity burn. Ecoburns will not impinge upon the vegetation extent of the camp area, being largely adjacent to the main camp site. Low intensity ecoburns effectively minimise 'edge fuel loads', assisting in limiting any potential larger 'bushfire runs' from the larger bushland tracts to the east (i.e. Rocky Creek catchment), while having no adverse impacts on the KFFR.The Habitat Plan further details fire hazard reduction history and planned burn areas within the KFFR.

4.4 Managing community interaction and impacts

4.4.1 Community concerns

The KFFR is within an urban residential area and bounded by approximately 100 residential properties.

Living near a flying-fox camp can be challenging. Noise, odour, faecal drop and damage to vegetation are some of the common direct impacts. These lead to secondary impacts, such as anxiety and sleep deprivation, and can significantly impact on people's mental health and wellbeing. Fear of disease can also be a serious concern for people which can lead to stress and anxiety.

The following is a ranked list of concerns for people living near the KFFR camp (further detail in Section 3). Council acknowledges these challenges, and has responded by ensuring impact reduction is a focus of the PoM. Reducing impacts, while also protecting flying-fox conservation and welfare (as is also ranked highly by the community) are core management objectives of the PoM, and both are a focus of management actions in Section 5.

1. Excrement
2. Fear of disease
3. Noise
4. Flying-fox habitat protection
5. Smell
6. Flying-fox conservation
7. Flying-fox welfare
8. Misinformation and misconceptions about flying-foxes
9. Damage to vegetation in the KFFR
10. Fruit loss at orchards
11. Foraging in yards including fruit loss
12. Other
13. Visual amenity
14. No concerns.

5 Management objectives and actions

5.1 Management objectives

Management objectives for the KFFR are to:

1. Protect biodiversity, habitat values, flora and fauna, Stoney Creek and the instream environment, and other ecological values of the site.
2. Ensure flying-fox conservation, welfare, and protection of the nationally important GHFF camp.
3. Manage bushfire risk.
4. Reduce flying-fox impacts on the surrounding community.
5. Protect human health and safety.
6. Implement and promote education programs.
7. Support research and best practice management for flying-fox conservation and resident impact minimisation.

5.2 Management actions

Table 3 outlines management actions planned during the life of this PoM. Ongoing actions from the 2013 Plan (Appendix 4) are included, along with additional actions to meet management objectives in Section 5.1.

Management options available under the NSW flying-fox camp management framework were assessed with consideration to site suitability, management issues, likely effectiveness, feasibility and community feedback provided during engagement. This assessment is summarised in Appendix 9.

Table 3 Management actions for the life of the PoM.

Theme	Objectives	Action	Action timeframe	Performance measures	Responsibility
Broad KFFR focus	1, 2, 3, 4, 5, 6	Continue to implement complementary plans including the: · 2018-2028 KFFR Habitat Plan · Hornsby Ku-ring-gai Bush Fire Risk Management Plan 2016-2021.	Ongoing	Evaluate against performance criteria in relevant plans. Habitat in Stoney Creek roost area improved and more commonly occupied.	Environment and Sustainability, Open Space Services
	1, 2, 3	Investigate feasible solutions to address pollution, nutrient, stormwater and erosion issues within the KFFR.	Commence investigation by June 2021 Implementation ongoing (this is recognised as a process of continual improvement)	On-ground works or education programs implemented (funding dependent).	Environment and Sustainability, Open Space Services
	1, 2, 6, 7	Continue to support the work of environmental, conservation and research groups including KBCS and KFFR Bushcare Group, where their objectives align with this management plan.	Ongoing	KBCS and Bushcare Group supported and activities aligned with management objectives.	Environment and Sustainability
	1	Survey the KFFR biennially to determine threatened fauna presence, including targeted searches for species not recorded in recent years. Identify potential habitat areas to ensure these areas are conserved through the restoration program and protected during tree maintenance works.	Biennially In line with requirements from the Habitat Plan.	Threatened species mapping updated biennially. Records provided for inclusion in relevant state databases (e.g. Bionet).	Environment and Sustainability
	1, 2	Manage Key Threatening Processes (Appendix 1) in accordance with Threat Abatement Plans and other guidelines.	As required	Appropriate and feasible measures implemented through Council programs (e.g. annual feral animal control program)	Environment and Sustainability, Open Space Services
	1	Incorporate appropriate and feasible feral animal control measures into Council's annual feral animal control program and consult with relevant agencies about potential involvement in regional pest management programs.	As required	Appropriate and feasible feral animal control measures are implemented through Council's annual feral animal	Environment and Sustainability, Open Space Services

Theme	Objectives	Action	Action timeframe	Performance measures	Responsibility
				control program Report to Council about involvement in regional programs.	
	1, 2, 3, 4, 5, 6, 7	Regularly review research findings and data to inform management in the KFFR and ensure health and educational information is up-to-date.	At least annually	Research findings reviewed at least annually and incorporated into management actions and educational materials.	Environment and Sustainability
Flying-fox focussed	1, 2, 3, 4, 5, 6	Continue education and awareness programs, with increased efforts during periods of greatest community concern (e.g. during influxes, including but not limited to the following: · how to mitigate (low) health risks associated with flying-foxes and reduce amenity impacts in urban areas · flying-fox population fluctuations and trends · the value of flying-foxes and the KFFR · wildlife-friendly netting and plant lists for people who want to either encourage or discourage flying-foxes from foraging in their property. · the release program · encourage residents to participate in monthly counts · encourage surrounding landholders to reduce bushfire fuel load on private property and remove weeds to prevent incursions into the KFFR.	Ongoing (with at least annual events)	Information provided to interested residents and available on Council's web site. Continue to support quarterly newsletter, including progress on all PoM actions (flying-fox and broader KFFR actions). Delivery of at least annual educational events. Resident satisfaction with community engagement efforts during periods of greatest community concern.	Environment and Sustainability, Community and Business Engagement (supported by KBCS)
	1, 2, 4, 5, 7	Collaborate with relevant agencies, organisations, councils and flying-fox experts on best practice management within the KFFR, and support research in the KFFR.	Ongoing	Quarterly collaborative processes are maintained with key stakeholders. Research opportunities promoted through Council channels.	Environment and Sustainability
	4, 7	Implement a subsidies program to assist impacted residents funded by Council and grants when available.	Ongoing and funding dependent	Subsidies evaluated and reported on annually.	Environment and Sustainability
	2, 4	Implement the following to avoid issues and minimise impacts:	Audited annually	Protocols developed, records maintained and audited	Environment and Sustainability

Theme	Objectives	Action	Action timeframe	Performance measures	Responsibility
		· flying-fox rescue protocol (template provided in Appendix 10) including how Council will respond to severe weather events (e.g. creating safe access for rescuers to access the KFFR) · site-specific HSE response based on best practice guidelines (www.environment.nsw.gov.au/animals/flying-fox-heat.htm) · processes to minimise disturbance to flying-foxes when granting entry into the KFFR for Council teams or external parties · processes to investigate and manage incidents (e.g. camp disturbance) through educational material and regulatory action if required · create a centralised database to maintain registers of visits / visitors to the KFFR.		annually. HSE data shared with DPIE and researchers to inform future management of HSEs.	(supported by KBCS and KFFR Bushcare)
	2, 4, 6	Install signage within the KFFR to reduce unintentional disturbance.	Installed by September 2021	Signage installed and reports of unintentional disturbance reduced.	Environment and Sustainability (in collaboration with KBCS and KFFR Bushcare), Open Space Services
	1, 2, 4	Refine and continue to monitor Council's tree canopy decline areas, and maintain 2020 plantings in storm damage/HSE affected areas. Consider additional plantings if required – where possible care is to be taken to avoid planting above or near Sydney Water assets.	Monitored and evaluated at least annually	Tree canopy decline areas monitored annually and additional plantings if required.	Environment and Sustainability (in collaboration with KBCS and KFFR Bushcare)
	1, 2	Using mapping by Eby et al 2019, protect and enhance native foraging habitat within the LGA critical to the survival of the GHFF.	Foraging habitat and tenure identified by end of 2021	Key foraging habitat and tenure identified, programs underway to protect and enhance foraging habitat on Council-managed land. Foraging habitat value considered in development applications. Private landholders with high value foraging habitat invited to consider a covenant or stewardship agreement.	Environment and Sustainability

Theme	Objectives	Action	Action timeframe	Performance measures	Responsibility
	2, 7	Consider sprinklers or drip systems if research finds these to be a safe and effective method to reduce HSE impacts.	As related research progresses	If supported by research, permanent heat stress intervention infrastructure installed.	Environment and Sustainability
	4	Investigate canopy-mounted sprinklers to increase buffers in conflict locations at appropriate times of the year.	Commence feasibility assessment by July 2021, report by end of 2021 with an implementation guideline if deemed appropriate	Suitability assessed. If considered suitable, management plan prepared for the installation and operation of canopy-sprinklers.	Environment and Sustainability (in consultation with KBCS)
	4	In addition to measures to reduce primary impacts on nearby residents, consider options to further assist with mental health and wellbeing impacts resulting from primary impacts.	Reviewed at least annually	Options reviewed at least annually and offered to the community	Environment and Sustainability
	4, 5	Strategic tree pruning where branches from canopy trees within KFFR are overhanging private property. Council will also consider any application to manage trees on private property.	As required and audited annually	Tree growth adjacent to private properties monitored annually, or investigated in response to community requests.	Environment and Sustainability
	1, 2, 4	Investigate a tree replacement program where weed species (e.g. Cocos palms, Chinese celtis) attract flying-foxes to private properties to reduce faecal drop impacts.	Investigated by end 2021	Feasibility of a tree replacement program assessed and implemented if appropriate.	Environment and Sustainability
	4, 7	Support fruit growers by providing information about state/federal netting subsidy/offset programs, low interest loans and possible grants that may assist with the cost of netting, and connect land managers with relevant industry contacts if required.	Review annually	Information provided to interested growers and available on Council's webpage.	Environment and Sustainability
	4, 6, 7	Investigate ways to incorporate flying-fox information into the planning scheme and individual property documentation to avoid future conflict.	Investigated by end 2021	Relevant information incorporated into property documentation if feasible.	Environment and Sustainability

6 Plan administration

6.1 Evaluation and review

A full review of the PoM, including stakeholder consultation and expert input, is scheduled five years from being adopted by Council. The PoM shall remain in force until it is revised and the revised version is adopted by Ku-ring-gai Council.

The following may trigger an earlier Plan update:

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

Progress and priority of management actions in the PoM will be evaluated annually by Council.

6.2 Reporting

An annual report will be prepared by Council evaluating progress of actions in the PoM, and will meet reporting obligations under any relevant licences or certificates.

6.3 Responsibilities

Ku-ring-gai Council is the owner of the KFFR and has legal responsibility for its management. Council is supported in implementation of the PoM by the KBCS, KFFR Bushcare Group and other stakeholders.

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Appendix 1 Management framework

State

Conservation Agreement

This PoM is consistent with the purpose, terms and conditions of the Ku-ring-gai Flying-fox Reserve Conservation Agreement (Appendix 2) administered by the BCT, in accordance with the provisions of s. 72 (1) of the *National Parks and Wildlife Act 1974 (NSW).*

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 DPIE 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.

Flying-fox Camp Management Code of Practice 2018

DPIE has prepared a Code of Practice under the Biodiversity Conservation Regulation 2017 authorising camp management actions on public land. The code defines standards for effective and humane management of flying-fox camps.

Camp management actions can only be implemented under the Code in accordance with a Camp Management Plan endorsed by the Environment Agency Head (i.e. DPIE).

The objective of the code is to enable camp managers to act quickly if flying-fox camps are causing a concern on public land. If camp management actions are consistent with the code, a Biodiversity Conservation licence will not be required.

Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) replaced the *Threatened Species Conservation Act 1995* on 25 August 2017.

The purpose of the BC Act includes to conserve biodiversity at the bioregional and state scales. Under this Act, a person who harms or attempts to harm an animal of a threatened species, an animal that is part of a threatened ecological community, or a protected animal, is guilty of an offence.

The following Key Threatening Processes under the BC Act may apply to the KFFR:

- Aggressive exclusion of birds from woodland and forest habitat by abundant noisy miners, *Manorina melanocephala*
- Anthropogenic climate change
- Bushrock removal

- Clearing of native vegetation
- Competition and grazing by the feral European rabbit, *Oryctolagus cuniculus*
- Forest eucalypt dieback associated with over-abundant psyllids and bell miners
- High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition
- Importation of red imported fire ants, *Solenopsis invicta*
- Infection of frogs by amphibian chytrid causing the disease chytridiomycosis
- Infection of native plants by *Phytophthora cinnamomi*
- Introduction and establishment of exotic rust fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae
- Invasion and establishment of exotic vines and scramblers
- Invasion and establishment of scotch broom, *Cytisus scoparius*
- Invasion and establishment of the cane toad, *Bufo marinus*
- Invasion of native plant communities by African olive, Olea europaea subsp. cuspidata
- Invasion of native plant communities by *Chrysanthemoides monilifera*
- Invasion of native plant communities by exotic perennial grasses
- Invasion, establishment and spread of Lantana, *Lantana camara*
- Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants
- Loss of hollow-bearing trees
- Predation by the European red fox, *Vulpes vulpes*
- Predation by the feral cat, *Felis catus*
- Removal of dead wood and dead trees.

The Grey-headed Flying-fox is listed as threatened under the BC Act.

A biodiversity conservation licence under Part 2 of the BC Act may be required if the proposed action is likely to result in one or more of the following:

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

If the DPIE assesses a biodiversity conservation licence application and determines that a significant impact is unlikely, a biodiversity conservation licence will be granted (the appendix

to the Policy lists standard conditions for flying-fox management approvals).

DPIE regulates flying-fox camp management through two options provided to land managers:

1. authorisation under the Flying-fox Camp Management Code of Practice for public land managers
2. licensing for public and private land managers.

The Code of Practice provides a defence under the BC Act for public land managers, as long as camp management actions are carried out in accordance with the Code of Practice.

Proposed actions that would otherwise constitute an offence under the BC Act can be authorised under another law.

Rural Fires Act 1997

The Bushfire Environmental Assessment Code for NSW (*Rural Fires Act 1997*) applies to the management of the KFFR, specifically the guidelines for hazard reduction work on land that contains a threatened species or populations and / or an EEC (as detailed in the Habitat Plan)

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.

Section 35 of the *Local Government Act 1993* (LG Act) provides that community land can only be **used** in accordance with:

- the plan of management applying to that area of community land, and
- any law permitting the use of the land for a specified purpose or otherwise regulating the use of the land, and
- the provisions of Division 2 of Chapter 6 of the Act.

Section 36 of the Act provides that a plan of management for community land must identify the following:

a) the category of the land,

b) the objectives and performance targets of the plan with respect to the land,

c) the means by which the council proposes to achieve the plan's objectives and performance targets,

d) the manner in which the council proposes to assess its performance with respect to the plan's objectives and performance targets, and may require the prior approval of

the council to the carrying out of any specified activity on the land.

A plan of management that applies to just one area of community land:

a) must include a description of:
   (i) the condition of the land, and of any buildings or other improvements on the land, as at the date of adoption of the plan of management, and
   (ii) the use of the land and any such buildings or improvements as at that date, and
b) must:
   (i) specify the purposes for which the land, and any such buildings or improvements, will be permitted to be used, and
   (ii) specify the purposes for which any further development of the land will be permitted, whether under lease or licence or otherwise, and
   (iii) describe the scale and intensity of any such permitted use or development.

Land is to be categorised as one or more of the following:

a) a natural area
b) a sportsground
c) a park
d) an area of cultural significance
e) general community use.

Land that is categorised as a natural area is to be further categorised as one or more of the following:

a) bushland
b) wetland
c) escarpment
d) watercourse
e) foreshore
f) a category prescribed by the regulations.

Additionally, under section 36 of the LG Act, a site-specific PoM must be made for land declared:

- as critical habitat, or directly affected by a threat abatement plan or a recovery plan under threatened species laws (sections 36A(2) and 36B(3))
- by council to contain significant natural features (section 36C(2))
- by council to be of cultural significance (section 36D(2)).

The KFFR is considered critical habitat for the GHFF and objectives and actions of this PoM

are aligned with the GHFF draft recovery plan (DoEE 2017). The land is categorised under the LG (General Regulation) 2005 as Natural Area - Bushland and Natural Area - Watercourse. Core objectives for these categories of land are incorporated into Management Objectives in Section 5.1.

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. The Act protects Aboriginal objects and declared Aboriginal Places. An Aboriginal Heritage Impact Permit may be required under this Act to authorise camp management actions that may harm Aboriginal objects a declared Aboriginal Places.

This PoM is consistent with the purpose, terms and conditions of the Ku-ring-gai Flying-fox Reserve Conservation Agreement, in accordance with the provisions of s. 72 (1) of the *National Parks and Wildlife Act 1974* (NSW).

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.

Environmental Planning and Assessment Act 1979

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

The objectives of the *Environmental Planning and Assessment Act 1979* (EP&A Act) are to encourage proper management, development and conservation of resources, for the purposes 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.

Development control plans under the EP&A Act should consider flying-fox camps so that planning, design and construction of future land uses 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, landowners are not eligible to apply for development under Part 5 of the EP&A Act. Private landowners should contact council to explore management options for camps that occur on private land.

State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017

This policy aims to protect the biodiversity, and amenity values of trees, and other vegetation in non-rural areas of the State. A person must not cut down, fell, up root, kill, poison, ringbark, burn or otherwise destroy the vegetation, or lop or otherwise remove a substantial part of the vegetation to which this Policy applies without a permit granted by council, or in the case of vegetation clearing exceeding the biodiversity offset thresholds (as stated in Part 7 of the Biodiversity Conservation Regulation 2017), approval by the Native Vegetation Panel.

Proponents will need to consider whether the SEPP (Vegetation in Non-Rural Areas) applies to their proposal, and if any approvals under the BC Act.

Commonwealth

Environment Protection and Biodiversity Conservation Act 1999

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

The GHFF is listed as a vulnerable species under the EPBC Act, meaning it is an MNES. It is also considered to have a single national population. The Referral guideline for management actions in GHFF and SFF camps (DAWE 2020a) (the Guideline) was developed 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 2,500 GHFF permanently or seasonally every year for the last 10 years.

The KFFR meets both these criteria and is considered a nationally important GHFF camp.

Provided that management at nationally important camps follows the mitigation standards below, DAWE has determined that a significant impact to the population is unlikely, and referral is not likely to 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 (HSE, cyclone event), or during a period of significant food stress.
- 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 assess 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.

If actions cannot comply with these mitigation measures, referral for activities at nationally important camps is 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 PoM. 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 DAWE will be required.

There is a national recovery plan for the GHFF (DoAWE 2021) to set out the management and research actions necessary to stop the decline of, and support the recovery of the Grey-headed flying-fox over the next ten years. This PoM is consistent with actions in the recovery plan.

The following Key Threatening Processes under the EPBC Act may apply to the KFFR:

- Aggressive exclusion of birds from potential woodland and forest habitat by over-abundant noisy miners (*Manorina melanocephala*)
- Competition and land degradation by rabbits
- Dieback caused by the root-rot fungus (*Phytophthora cinnamomi*)
- Infection of amphibians with chytrid fungus resulting in chytridiomycosis
- Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants
- Novel biota and their impact on biodiversity
- Predation by European red fox
- Predation by feral cats.

National Recovery Plan for Grey-headed Flying-fox Pteropus poliocephalus

The Recovery Plan for the Grey-headed Flying-fox *Pteropus poliocephalus* was prepared by the Australian Government and has been jointly made under the EPBC Act with the South Australian Government as the national recovery plan for this species.

The Recovery Plan sets out the management and research actions necessary to stop the decline of, and support the recovery of the GHFF over the next 10 years. Actions under this plan aim to improve the national population trend; identify, protect and increase key foraging and roosting habitat; improve the community's capacity to coexist with flying-foxes; and increase awareness about flying-foxes, the threats they face and the important ecosystem services they provide as seed dispersers and pollinators.

Appendix 2 Conservation Agreement

CONSERVATION AGREEMENT

Between TIMOTHY JOHN MOORE

Minister for the Environment

And THE COUNCIL OF THE MUNICIPALITY OF KU-RING-GAI

The Owner

of Ku-ring-gai Flying Fox Reserve

Lots 1 and 3 in DP 578212; Lot 101 in DP 714935; Lots 154A, 156 and 158 in DP 17131; Lots 1 and 2 in DP 38541; Lot 10 in DP 23994; Lot A in DP 212698; Lot 35 in DP 16006; Lot 2 in DP 200605; Lot 2 in DP 204102; Lot 1 in DP 179532; Lot Part 7 Section 2 in DP 979271; Lot 103 in DP 17647, Lot 5 Section 1 DP 979271; and the section of unmade road off the eastern end of Nelson Street north of Lot 35 DP 16006 and Lot 7 Section 2 DP 979271. Parish of Gordon, County of Cumberland and Municipality of Ku-ring-gai, as shown on diagram annexed hereto.

Dated: 7th February, 1991 ~~1990~~

This is a true and accurate copy of the original document held by Council.

TOWN CLERK

Director

NSW National Parks and Wildlife Service

43 Bridge Street

HURSTVILLE NSW

THIS AGREEMENT made the seventh day of February
One thousand nine hundred and ninety one
BETWEEN THE HONOURABLE TIMOTHY JOHN MOORE,
the Minister for the Environment
of the State of New South Wales being
the Minister for the time being administering the
National Parks and Wildlife Act 1974 ("the Minister"
which expression shall where the context admits be deemed
to include his successors in office) of the one part
AND THE COUNCIL OF THE MUNICIPALITY
OF KU-RING-GAI
("The Owner")
of Council Chambers
818 Pacific Highway Gordon NSW 2072
of the other part the parties agree as follows

1. INTERPRETATION

In this Agreement unless the contrary intention appears:-

"the Act" means the National Parks and Wildlife Act 1974 and any regulations from time to time in force thereunder.

"the Minister" means the Minister for the time being administering the Act and where not repugnant to the context includes the servants and agents of the Minister.

"the Owner" includes the Owner and successors in title as defined by the Act.

"the Director" means the Director of National Parks and Wildlife appointed under the Act and includes any person for the time being acting as such.

"the subject land" means the land hereinbefore described and where the context so admits any part of the land.

"development" has the same meaning as the definition in Section 69A of the Act.

"plan of management" means a written document/plan prepared by the Owner within a period of 12 months from the date of this Agreement containing details of proposed management of the subject land for a period of five years, to give effect to the purpose of the agreement.

Words importing the singular number shall include the plural and masculine gender the feminine or neuter and vice versa.

Any reference to a person shall be deemed to include a corporate body and vice versa.

Any covenant or agreement on the part of two or more persons shall be deemed to bind them jointly and severally.

2 A. The Owner is registered as the holder of that parcel of land known as Ku-ring-gai Flying-Fox Reserve which includes Lots 1 and 3 in DP 578212; Lot 101 in DP 714935; Lots 154A, 156 and 158 in DP 17131; Lots 1 and 2 in DP 38541; Lot 10 in DP 23994; Lot A in DP 212698; Lot 35 in DP 16006; Lot 2 in DP 200605; Lot 2 in DP 204102; Lot 1 in DP 179532; Lot Part 7 Section 2 in DP 979271; Lot 103 in DP 17647; Lot 5 Section 1 DP 979271 and the section of unmade road off the eastern end of Nelson Street north of Lot 35 DP 16006 and Lot 7 Section 2 DP 979271. Parish of Gordon, County of Cumberland and Municipality of Ku-ring-gai in the State of New South Wales comprising 14.589 hectares plus unmade road.

B. The subject land forms a major part of the catchment of Stoney Creek, from off the eastern end of Edward Street to the boundary with Governor Phillip Reserve and straddles Taylor Street in the north and extends south to Illeroy Avenue, Gordon. It is in a relatively natural condition so far as native plant species are concerned and is described as urban bushland. It includes a variety of wildlife habitats and contains the only Sydney colony of the Grey-headed Flying-fox *(Pteropus poliocephalus)* which is the largest and most important maternity colony of this species in southern New South Wales.

C. The Minister wishes steps to be taken to ensure the protection and preservation of native flora and fauna, in particular the Grey-headed Flying-fox colony and all elements of its habitat, on the subject land.

D. The Owner has agreed with the Minister to enter into these presents pursuant to section 69B of the Act for the purpose of protecting and preserving the natural scenery and the native flora and fauna on the subject land upon the terms and conditions hereinafter appearing.

3. USE OF THE SUBJECT LAND

The Owner covenants with the Minister as follows:-

3.1 Unless the prior written consent of the Director is obtained, no development shall be carried out on the subject land which is inconsistent with the preservation of native flora and fauna according to the intent of this agreement other than is necessary for essential services.

3.2 The Owner shall retain the soils, water courses, native flora and fauna as far as possible in an undisturbed condition.

3.3 The Owner shall take such action as is necessary to restore and maintain the habitat of the Grey-headed Flying-fox Colony as consistent with the purpose of this agreement.

3.4 The Owner shall not permit domestic animals or pets on the subject land.

3.5 Unless the prior written consent of the Director is obtained, the Owner shall not undertake or permit controlled burning for bushfire hazard reduction purposes.

3.6 The Owner shall not construct or permit any recreation facilities on any part of the land or formalise access other than those required for the provision of education opportunities and interpretation for the public regarding the Grey-headed Flying-fox colony.

3.7 The Owner will manage the subject land in accordance with an adopted plan of management.

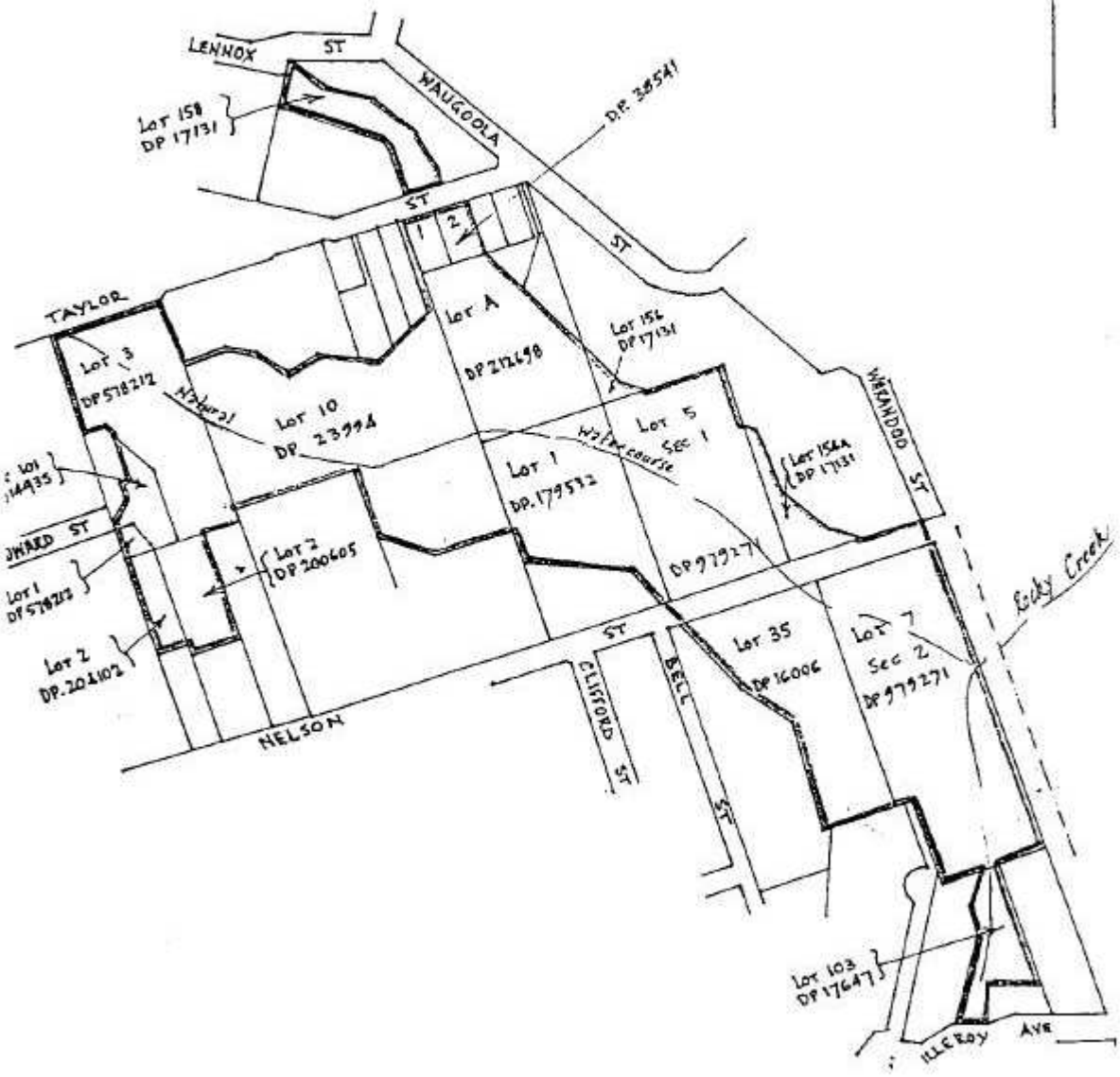
4. RIGHT TO INSPECT

The Minister, the Director and their servants and agents may at all times enter upon the subject land to ensure due compliance with this Agreement.

DIAGRAM

PART LANDS OWNED BY KU-RING-GAI MUNICIPAL COUNCIL
AT GORDON

PARISH OF GORDON: COUNTY OF CUMBERLAND



5. OBLIGATIONS TO THE MINISTER

The Minister covenants with the Owner as follows:-

5.1 The Minister will arrange for the provision of such technical and scientific advice and assistance to the Owner as the Minister deems necessary to ensure the protection and preservation of the native flora and fauna, in particular, the Grey-headed Flying-fox colony and all elements of its habitat, on the subject land.

5.2 The Minister will arrange for the provision of technical advice and financial assistance to the Owner as the Minister deems necessary to ensure the provision of education opportunities and interpretation for the public regarding the Grey-headed Flying-fox colony on the subject land.

VARIATION OF
CONSERVATION AGREEMENT

BETWEEN

THE MINISTER FOR THE ENVIRONMENT OF THE STATE OF NEW SOUTH WALES

AND

Ku-ring-gai Council

For the

Ku-ring-gai Flying Fox Reserve

May 2011

John McKee
General Manager
Ku-ring-gai Council

Minister

VARIATION TO CONSERVATION AGREEMENT UNDER PART 4 DIVISION 12 OF THE NATIONAL PARKS AND WILDLIFE ACT 1974

THIS AGREEMENT made the 5th day of July, Two thousand and Eleven, **BETWEEN** the Minister for the time being administering the *National Parks and Wildlife Act, 1974* ("**the Minister**" which expressions shall where the context admits, be deemed to include his successors in office) of the one part and Ku-ring-gai Council ("**the Owner**") of Ku-ring-gai Flying Fox Reserve , Gordon of the other part.

BACKGROUND

A An agreement dated 7 February 1991, Registered Dealing Number Z915953 was duly executed between the Minister and the Owner ("**the Principal Agreement**") relating to Lots 1 and 3 in DP578212; Lot 101 in DP 714935; Lots 154A, 156 and 158 in DP17131; Lots 1 and 2 in DP38541; Lot 10 in DP 23994; Lot A in DP 212698; Lot 35 in DP 16006; Lot 2 in DP 200605; Lot 2 in DP 204102; Lot 1 in DP 179532; Lot Part 7 Section 2 in DP 979271 (now known as Lot 7 in DP 1132073), Lot 103 in DP 17647; Lot 5 Section 1 in DP 979271 (now known as Lot 5 in DP 1099395), and the section of unmade road of the eastern end of Nelson Street north of Lot 35 in DP 16006 and Lot 7, Section 2, in DP 979271 , Parish of Gordon, County of Cumberland ("**the Land**").

B The Owner is the registered proprietor of the Land.

C The Owner and the Minister agree that the Principal Agreement be varied to include Lot 34 DP 1079802.

D Accordingly, the Owner and the Minister have agreed to vary the Principal Agreement in accordance with this agreement ("**Variation Agreement**").

E This Variation Agreement will have effect from the day of execution and will continue until terminated by the parties in accordance with the *National Parks and Wildlife Act, 1974*.

VARIATION

1 The Minister and the Owner agree to vary the Principal Agreement as follows:

a) In the description of the lots comprising Ku-ring-gai Flying Fox Reserve on page one of the Principal Agreement, replace the words "Lot Part 7 Section 2 in DP 979271", with the words "Lot 7 in DP 1132073 (formerly known as Lot Part 7 Section 2 in DP 979271)".

b) In the description of the lots comprising Ku-ring-gai Flying Fox Reserve on page one of the Principal Agreement, replace the words Lot 5 Section 1 in DP 979271, with the words "Lot 5 in DP 1099395 (formerly known as Lot 5 Section 1 in DP 979271) and Lot 34 in DP 1079802."

c) In clause 2A of the Principal Agreement, replace the words "and Lot Part 7 Section 2 DP 979271", with the words "Lot 7 in DP 1132073 (formerly Lot 7 Section 2 DP 979271)".

d) In clause 2A of the Principal Agreement, replace the words Lot 5 Section 1 in DP 979271, with the words "Lot 5 in DP 1099395 (formerly known as Lot 5 Section 1 in DP 979271) and Lot 34 in DP 1079802."

e) In clause 2A, of the Principal Agreement, replace "14.589" with "15.025".

f) Replace the Diagram attached to the Principal Agreement entitled, "Diagram Part Lands Owned by Ku-ring-gai Municipal Council at Gordon Parish of Gordon: County of Cumberland," with the Diagram at page 4 of this Variation Agreement marked "Diagram A" and entitled "Ku-ring-gai Flying Fox Reserve Conservation Agreement Area".

IN WITNESS WHEREOF the parties hereto have executed this Agreement the day and year first above written.

SIGNED by)
The Honourable)
NAME OF MINISTER)
as such Minister)
for the Environment and for the)
purpose of rendering liable the)
Government of the State of New)
South Wales (but not so as to incur)
any personal liability) hereunder in)
the presence of :)

Robyn Parker
MINISTER

5/7/11
Date

K O'Reg
Witness

5/7/11
Date

SIGNED by the **OWNERS**
KU-RING-GAI COUNCIL

John McKee
General Manager, Ku-ring-gai Council

24/5/2011
Date

in the presence of

Carmel Hughes
Witness signature

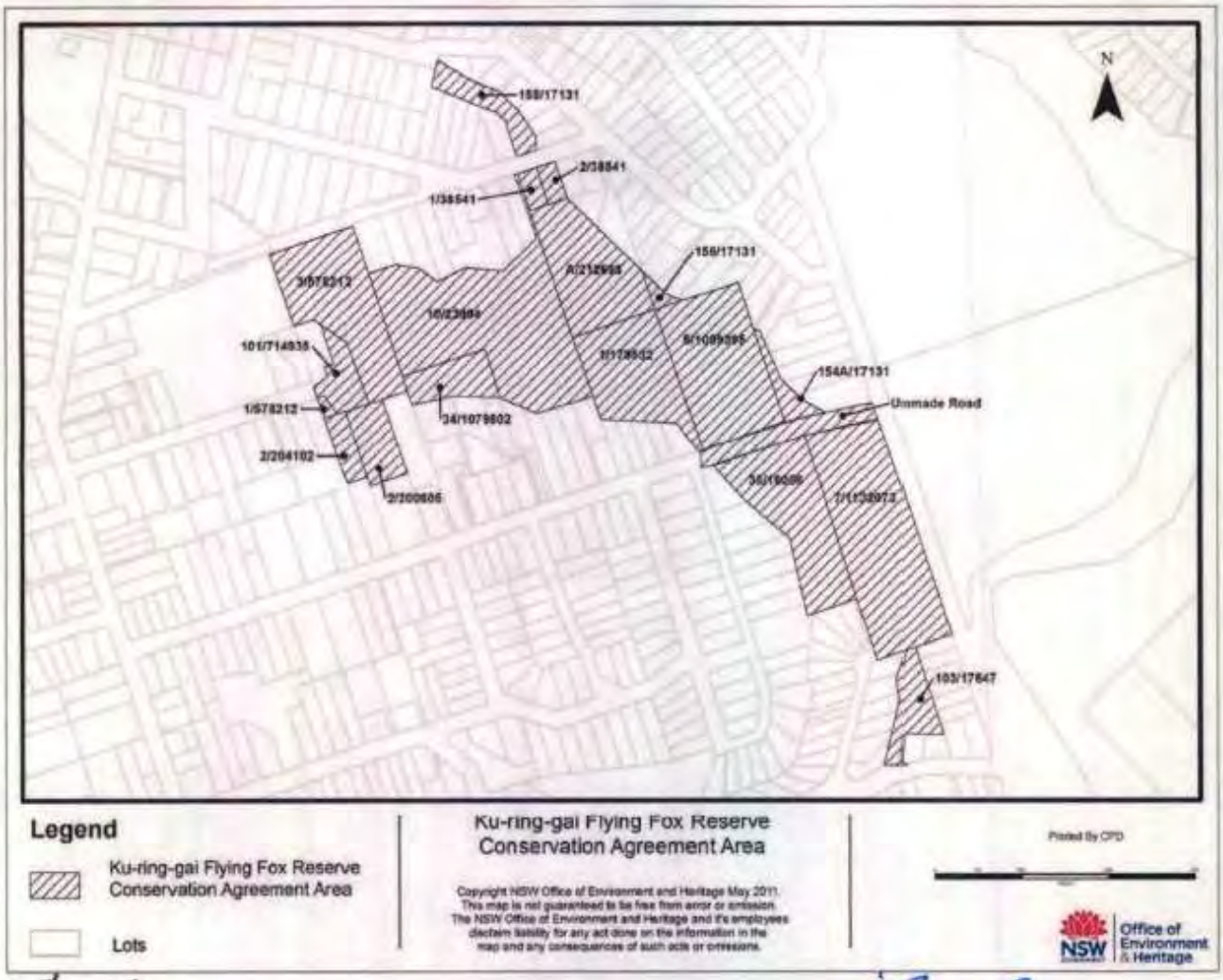
CARMEL HUGHES

818 PACIFIC HIGHWAY, GORDON
Witness Name and address

24/5/2011
Date

Landowners Name and address for service of notices:
Ku-ring-gai Council
Locked Bag 1056, Pymble NSW 2073

DIAGRAM A.



Ku-ring-gai Council

Minister

Appendix 3 Site history of the KFFR

Early 1900s	Oral history indicates that there was a flying-fox camp near Browns Waterhole or further upstream in the upper Lane Cove River valley.
1950s - 1965	Flying-fox camp located near Browns Waterhole, in Lane Cove River Valley (approximately six kilometres west of its current position). Flying-foxes used Stony Creek valley seasonally.
1960s	Grey-headed flying-foxes established permanent camp in Stony Creek valley due to disturbance of Lane Cove River valley habitat by bush fire and urban development.
1983	Municipality of Ku-ring-gai Bushland Management Survey Report issued. Stony Creek Reserve listed as a Reserve of Highest Ecological Value. Following public opposition to a Council subdivision approval in Edward St, an Interim Conservation Order was issued on the site to permit an investigation.
1984	Report by Dr A.N. Williams regarding the Gordon Bat Colony issued to NSW National Parks and Wildlife Service.
1985	Ku-ring-gai Council and the NSW Government purchased two lots of the subdivision at 18 Edward Street to protect the flying-fox camp. Ku-ring-gai Bat Colony Committee (now Ku-ring-gai Bat Conservation Society Inc.) established at the behest of the Mayor and a formal relationship between the Committee and Council was defined. Site Assessment of the Gordon Bat Colony - Weed Control and Restoration of Native commissioned by the Ku-ring-gai Bat Colony Committee and completed. An ecological assessment by R Buchanan identified that flying-fox roosting habitat was threatened by the death of canopy trees and by weeds preventing the germination and survival of new canopy trees. Without intervention there would not be suitable habitat for the flying-foxes within 15 to 30 years (Buchanan 1985 in KBCS 2017).
1986	GHFF became a protected species under the *National Parks and Wildlife Act 1974* (NSW).
1987	Habitat Restoration Project commenced with volunteer labour by the Ku-ring-gai Bat Colony Committee Inc. Grant funding later in the year allowed for the preparation of a simple plan of management based on the Site Assessment Report and employment of a bush regeneration team to work one day per week.
1991	Voluntary Conservation Agreement for Ku-ring-gai Flying-fox Reserve was signed by the Mayor of Ku-ring-gai and the NSW Minister for Environment in accordance with provisions of the *National Parks and Wildlife Act 1974 (NSW).* The name "Ku-ring-gai Flying-fox Reserve" adopted by Geographical Names Board.
1992 - 1997	Ku-ring-gai Bat Colony Committee Inc. received grants from the NSW Environmental Rehabilitation and Restoration Trust to employ a contract team, one day per week, to continue the Habitat Restoration Project

1992	A Fruit Crop Protection Seminar held in Hornsby. NSW National Parks and Wildlife Service and Ku-ring-gai Bat Colony Committee Inc. jointly arranged this seminar.
1995	Plan of Management for Ku-ring-gai Flying-fox Reserve was adopted by Council.
	Interpretive signs erected on Rosedale Road Bridge.
	Grant funding received by Council for the implementation of research, interpretation and catchment management actions in Ku-ring-gai Flying-fox Reserve.
1996	Ku-ring-gai Municipal Council adopted the Bushland Plan of Management under the provisions of the *Local Government Act 1993* covering the Flying-Fox Reserve.
1998	Ku-ring-gai Bat Conservation Society Inc. received funding for habitat restoration from the Natural Heritage Trust.
1999	The 1995 Management Plan was reviewed and updated as a result of changes to legislation, local government policy and scientific research developments.
2006	Ku-ring-gai Municipal Council adopted the Bushland Reserves Plan of Management under the provisions of the *Local Government Act 1993* covering the Ku-ring-gai Flying-Fox Reserve.
2007	An additional 0.44 hectares of land (previously Department of Planning) was added to the reserve.
2007	Size of the KFFR increased by 4.3 ha by NSW government acquisition and transfer to Council of privately owned bushland (Pallin 2019)
2008	KFFR habitat restoration project was Highly Commended by the Global Restoration Network (KBCS 2017).
2009	Ku-ring-gai Municipal Council adopted the Bushland Reserves Plan of Management under the provisions of the *Local Government Act 1993* covering the Flying-Fox Reserve.
2011	Council received $12, 000 funding from the Office of Environment and Heritage for bush regeneration for KFFR Conservation Agreement land.
2011	Voluntary Conservation Agreement for Ku-ring-gai Flying-fox Reserve updated to include additional land. Agreement signed by the Mayor of Ku-ring-gai and the NSW Minister for Environment in accordance with provisions of the National Parks and Wildlife Act 1974 (NSW).
2012	Council allocates $40,000 from Environmental Levy 2 funds (until 2019) a year, for bush regeneration at KFFR.
2013	KFFR Management Plan reviewed and updated.

2015	10 trees (including 3 dead) were removed and 8 pruned within a 10 m buffer adjacent to the most affected residents' properties in Taylor and Waugoola Streets under a s91 licence.
2017	Advice on roosting habitat for GHFF provided by Dr Peggy Eby to inform the 10 Year Site Management and Roost Habitat Plan.
2018	KFFR 10 Year Site Management and Roost Habitat Plan 2018 -2028 adopted.
2019	Severe storm event in November caused extensive damage across Gordon, including tree and canopy loss in the KFFR.
2020	Heat Stress Event 4th January 2020, an estimated 7,000 deaths with majority being juveniles.
2020	Close to 2,000 mature phase rainforest species seedlings planted (away from residences) in July to replace vegetation lost in the 2019 storm event and assist restoring heat refuge habitat.
2021	KFFR Management Plan reviewed and updated.

Appendix 4 Progress on 2013 actions

The table below shows management objectives and actions from the 2013 Plan, and progress during the life of the 2013 Plan. A traffic light system is used in the progress column: green indicates all actions completed in accordance with performance measures; yellow indicates actions are underway; orange indicates actions not progressed due to redundancy or on hold for reasons beyond Council's control; red indicates actions were not achieved. Ongoing actions, or any not achieved that remain relevant, are included in Section 6.

Progress on management actions in the 2013 Plan are shown in the table below. In summary, of the 39 actions:

- 35 were completed (green below)
- 4 are underway (yellow below)
- 0 were not yet achieved.

Objective	Actions	Performance measures	Responsibility	Progress (as of early 2021)
1. Manage the KFFR to ensure the protection of threatened species and endangered ecological communities, and the maintenance or improvement of habitat quality within the KFFR.	Develop and implement a 10-year roosting habitat / tree canopy replacement plan that identifies replacement areas and suitable methods and species and established and maintains understorey vegetation where Flying-foxes can escape extreme heat, that is, temperatures above 40℃.	Plan developed and implemented by June 2014	Environment and Sustainability, Open Space Services, KBCS	Advice on roosting habitat to inform the 10 year plan by Dr Peggy Eby May 2017. 10 year Site Management and Roosting Habitat Plan (Habitat Plan), which includes tree canopy replacement, prepared in 2017 and adopted by Council in 2018.
	Develop and implement a 3-year Bush Regeneration Site Management Plan, including site monitoring and a bush regeneration, habitat restoration and weed control works program	Bush Regeneration Site Management Plan developed and implemented by September 2013	Environment and Sustainability, Open Space Services, KBCS	
	Annually assess and report on program outcomes of the 3-year Bush Regeneration Site Management Plan	Annual review and reporting of Bush Regeneration Site Management Plan works undertaken	Open Space Services	Annual reports prepared since adopting the 2018-2028 Habitat Plan.

Objective	Actions	Performance measures	Responsibility	Progress (as of early 2021)
	Investigate feasible solutions to address pollution, nutrient, and stormwater issues within the Reserve	On-ground works or education programs implemented (funds dependant)	Environment and Sustainability	On-ground works and education programs regularly implemented with assistance from the KBCS and KFFR Bushcare Group.
	Encourage and support Council's volunteer Bushcare program and align works to support the 3-year Bush Regeneration Site Management Plan	Bushcare volunteer support delivered and on-ground works support Bush Regeneration Site Management Plan program	Environment and Sustainability	Bushcare volunteer support delivered and on-ground works supported, guided by the Habitat Plan as of 2018.
	Refine Council's existing vegetation mapping of the KFFR	Mapping of vegetation communities and tree canopy decline within the Reserve refined by September 2013	Environment and Sustainability	Vegetation communities and tree canopy decline mapped in Habitat Plan.
	Refine and continue to monitor Council's tree canopy decline areas	Tree canopy decline areas monitored annually	Environment and Sustainability	Vegetation monitored annually using the Biodiversity Assessment Methodology.
	Survey the Reserve for the presence of potential Powerful Owl nesting trees and Powerful Owls. If present, ensure protection of nesting trees during tree maintenance works	Annual review of the location of any nesting trees implemented	Environment and Sustainability	Regular consultation with BirdLife Powerful Owl Project Officer during breeding season to ensure Council mapping up to date and no disturbance to breeding pair.
2. Investigate and implement strategies to reduce the impacts of the Flying-foxes on residents and their properties, especially those adjacent to the KFFR	Collaborate with relevant agencies, organisations, councils and Flying-fox experts on best practice Flying-fox management for implementation within the KFFR	Quarterly collaborative processes are maintained with key stakeholders	Environment and Sustainability, KBCS	Council engages with NSW state government, flying-fox experts, habitat restoration experts and local stakeholder groups to develop and implement KFFR plans and programs. Collaboration with key stakeholders (e.g. Bushcare, KBCS) is ongoing and regular (at least quarterly).

Objective	Actions	Performance measures	Responsibility	Progress (as of early 2021)
	Prepare and submit licence and referral applications to initiate strategic tree removal and vegetation modification works in the KFFR close to residential housing on Taylor Street and Waugoola Street	Licence and referral applications submitted by September 2013, or as advised by the Office of Environment and Heritage (OEH)	Environment and Sustainability, Open Space Services	In 2015, 10 trees were removed and an additional 8 pruned within a 10 m buffer adjacent to the most affected residents' properties in Taylor and Waugoola Streets (under a s91 licence).
	Conduct approved strategic tree removal and vegetation modification works in the KFFR close to residential housing on Taylor Street and Waugoola Street	Approved strategic tree removal and vegetation modification undertaken by November 2013, or as advised by the Office of Environment and Heritage (OEH)	Open Space Services	
	Formalise community engagement processes to ensure that local community groups and residents are consulted and updated on management activities within the KFFR.	Community engagement processes are formalised and maintained	Environment and Sustainability	Quarterly email update to resident group established 2019. Council reviewed how it involves community members in planning and decision-making in 2019 and endorsed its first Community Participation Plan in 2019, which was revised and publicly exhibited in 2020.
	Elevate community engagement efforts during periods of greatest community concern, for example, when Flying-foxes numbers are at their highest during the breeding season	Resident satisfaction with community engagement efforts during periods of greatest community concern	Environment and Sustainability	Council support at KBCS educational events held twice per year in peak periods. Quarterly email updates provided to resident group.
	Review and determine the feasibility of potential Flying-fox management options on an annual basis, for implementation within the KFFR before the breeding season commences, including, but not limited to: · Providing information and / or securing funding for sound insulation in dwellings adjacent to the KFFR · Strategic tree removal and vegetation modification works at the boundary between	Current management options reviewed in September each year	Environment and Sustainability	In January 2018, Council received grant funding under the DPIE Flying-fox Grants Program to implement the 2013 Management Plan and 10-year Habitat Plan 2018–2028. A subsidy program for double-glazing of windows was included in this implementation. The subsidy program focused on the

Objective	Actions	Performance measures	Responsibility	Progress (as of early 2021)
	the KFFR and private property where there is a risk to life or property or where there is significant noise disturbance to residents over prolonged periods (that is, over a number of breeding seasons) · Effective, humane and legal methods to nudge the Flying-fox camp away from the Reserve edges (where Flying-foxes are less than 50m from habitable dwellings and causing significant noise disturbance to residents over prolonged periods).			installation of double-glazing on windows to reduce flying-fox noise penetrating nearby homes. Subsidies were taken up by 11 residences. Strategic tree removal was undertaken in 2015 within a 10 m buffer adjacent to the most affected residents' properties in Taylor and Waugoola Streets (under a s91 licence).
	Implement feasible Flying-fox management options within the KFFR on an annual basis, before the breeding season commences	Feasible Flying-fox management options are implemented on an annual basis during non-critical periods in the Flying-fox breeding cycle	Environment and Sustainability, Open Space Services	
	Investigate ways to incorporate Flying-fox information or guidelines into 149 certificates	Relevant information is incorporated into 149 certificates if feasible by December 2013	Environment and Sustainability	Ongoing and will be considered in line with new planning scheme.
	Engage with proponents of any activities which may impact the KFFR (such as planned dispersals)	Council is engaged with proponents of activities which may impact the KFFR and participates in consultation opportunities	Environment and Sustainability	Development Applications are reviewed with consideration of measures to minimise any potential impact on KFFR. Council liaise with proponents undertaking works within KFFR e.g. Sydney Water maintaining assets.
3. Support the implementation of educational events to assist in the management of the KFFR	Support the delivery of educational events to increase awareness and understanding of: · Flying-fox population fluctuations and trends · The value of Flying-foxes and the KFFR · Managing the impacts of Flying-foxes in urban areas.	Delivery of educational events supported by Council	KBCS, Environment and Sustainability	Council support at KBCS 'Meet a Bat night' education events, approximately two per year during the peak season.

Objective	Actions	Performance measures	Responsibility	Progress (as of early 2021)
4. Minimise disturbance to the Flying-foxes and their habitat by restricting access and educating residents and/or visitors	Review content of regulatory signs at the KFFR access points.	Review of existing signs completed by December 2013	Environment and Sustainability, Open Space Services	No regulatory signs are installed at access points. Council have focused on educational signage at more appropriate locations (Rosedale Bridge). Maintaining signage is ongoing, and Council will consider the need for regulatory signage in future.
	Install new, or replace existing signs as necessary (funds dependant)	New signs installed or replaced as necessary	Environment and Sustainability, Open Space Services	Educational signage installed on Rosedale Bridge in October 2019.
	Identify and close inappropriate access points	Inappropriate entry points identified and closed by December 2013	Environment and Sustainability, Open Space Services	Monitored in accordance with the 10 Year Habitat Plan.
	Investigate and deal with incidents of unnecessary habitat disturbance to the camp, through educational material and regulatory action if required	Incidents are investigated and dealt with according to Council's policies and processes	Environment and Sustainability, KBCS	Council support at KBCS educational events to increase community awareness of sensitivity of the KFFR. Information regularly updated on Council's Flying-fox web page. Incidents of bushland dumping and encroachment investigated by Environment & Sustainability. Incidents of intentional camp disturbance reported to DPIE and investigated.
	Ensure that KBCS and authorised animal care groups keep registers of visits / visitors to the KFFR for the release of rehabilitated Flying-foxes and / or research	Records are maintained and collated by KBCS	KBCS	Records maintained by KBCS.
	Include conditions to minimise the disturbance to Flying-foxes when granting entry into the KFFR for external parties, in consultation with the	Conditions are included when granting entry permission to the KFFR	Environment and Sustainability	Research approvals include conditions to minimise disturbance to the camp. Conditions include presence of

Objective	Actions	Performance measures	Responsibility	Progress (as of early 2021)
	KBCS			either Council staff or KBCS representative to monitor flying-fox behaviour and no entry to the reserve on forecasted high heat days. Risk assessment undertaken by contractors working in the reserve.
5. Minimise the impacts from feral animals on the KFFR	In consultation with relevant stakeholders, investigate appropriate and feasible feral animal control measures to implement within the KFFR	Appropriate and feasible feral animal control measures are identified in consultation with stakeholders	Environment and Sustainability, Open Space Services	Fox baiting determined to be inappropriate due to proximity to private residences. Future investigation will include alternative methods such as trialling cage trapping if needed. Ongoing monitoring and action by Council's Pest Species Team Leader.
	Incorporate appropriate and feasible feral animal control measures into Council's annual feral animal control program	Appropriate and feasible feral animal control measures are implemented through Council's annual feral animal control program	Environment and Sustainability, Open Space Services	
6. Effectively manage the KFFR for bushfire risk	Investigate the bushfire hazard potential of the KFFR on an ongoing basis and respond to any hazard complaints	Bushfire hazard potentials are investigated, and all hazard complaints are responded to, in accordance with Council's Customer Service Standards	Environment and Sustainability, Open Space Services	Bushfire hazard and hazard reduction program detailed in the Habitat Plan. Council has communicated with concerned residents in accordance with Council's Customer Service Standards.
	Conduct approved hazard reduction works in a way that minimises negative impacts on the Flying-foxes and other known threatened species, through Council's hazard reduction works program (as per the Hornsby Ku-ring-gai Bushfire Risk Management Plan)	Approved hazard reduction works are completed through Council's hazard reduction works program	Environment and Sustainability, Open Space Services	Bushfire hazard and hazard reduction program detailed in the Habitat Plan which is underway.
7. Contribute to and utilise research on Flying-fox biology, behaviour, and camp	Provide potential topics and support for research related to Flying-foxes or their habitat to local universities and TAFE, in consultation with the KBCS	Research topics provided to tertiary institutions on an annual basis	Environment and Sustainability, KBCS	Council supports research undertaken by universities and TAFE with conditions to minimise disturbance to the camp.

Objective	Actions	Performance measures	Responsibility	Progress (as of early 2021)
/ habitat management	Encourage and support residents, tertiary students, and researchers to assist the KBCS with monthly Flying-fox counts	Research opportunities are promoted through Council's promotional channels	Environment and Sustainability, KBCS	Council supports research in the KFFR (e.g. Pearson and Cheng in prep) and provided an opportunity for residents to trial odour neutralising product.
	Utilise current research conducted, and data collected on Flying-foxes to inform current and future management actions in the KFFR	Current Flying-fox research and data is monitored and reviewed by Council and reported to the community	Environment and Sustainability	Up to date count data is available on Council's webpage. New research findings are shared in regular updates of Council's webpage and in the KBCS newsletter (available on KBCS webpage, which is also linked on Council's webpage).
8. Manage the release of injured or orphaned Flying-foxes into the KFFR	Investigate and secure an alternative location for the Flying-fox release cage (away from residential housing), as part of the KFFR release program.	Alternative location secured and new Flying-fox release cage constructed, as part of the KFFR release program.	KBCS	In March 2014, KBCS removed the Flying-fox release cage from within the KFFR and a new release cage was constructed outside of the reserve, away from residential areas.
	Supervise the collection, rehabilitation and release of injured or orphaned Flying-foxes into the KFFR	Flying-fox rehabilitation and release program implemented	WIRES, Sydney Wildlife, KBCS, Environment and Sustainability	Flying-fox rescue and rehabilitation is managed by WIRES and Sydney Wildlife rescue organisations. Release of rehabilitated flying-foxes is managed by KBCS, following strict protocols and WHS procedures.
	Provide residents with information on the rehabilitation and release program at the start of the program each year	Residents are provided with information on the Flying-fox rehabilitation program through formal stakeholder engagement processes at the start of the program each year	KBCS, WIRES	Release program managed by KBCS following the relocation of the release cage outside of the KFFR. Statistics and reporting provided to WIRES in accordance with release protocols.

Objective	Actions	Performance measures	Responsibility	Progress (as of early 2021)
	Review the "Draft Protocol for the Release of Flying-foxes into the KFFR" (see Appendix 5) and continue to review and update the Protocol as required	Draft protocol is reviewed and updated by October 2013	KBCS, Environment and Sustainability	Release protocol managed by KBCS (no longer within KFFR). Rehabilitation of flying-foxes undertaken by rescue organisations outside KFFR.
	Ensure that rehabilitated Flying-foxes are housed and released as per Protocol for the Release of Flying-foxes into the KFFR".	Periodic checks are completed to ensure compliance with Release	Environment and Sustainability	
9. Reduce the potential impacts from more extreme and frequent heat events and drought, as a result of climate change, on the Flying-foxes	Develop a heat stress event protocol for the Flying-foxes	Heat stress protocol developed by June 2014	KBCS, Flying-fox experts, Environment and Sustainability	Council has information for the public on what to do if an injured, distressed or deceased bat is encountered via Council's Flying-fox web page. Council implements internal procedures responding to HSEs and follows NSW best practice guidelines.
10. Manage the potential health risks associated with Flying-foxes roosting in the KFFR	Utilise current research on the potential health risks associated with Flying-foxes roosting in the KFFR to inform the information provided to the community	Current research on the potential health risks associated with Flying-foxes is monitored and reviewed by Council, for provision to the community	Environment and Sustainability, KBCS, OEH and Flying-fox experts	Council monitors health information and engages with health experts and agencies to update the community as required (e.g. information about bats and COVID-19 on Council's webpage). Health risks are discussed at educational events by KBCS to improve community awareness.
	Provide information on the potential health risks associated with Flying-foxes via Council's website and educational activities	Information on the potential health risks associated with Flying-foxes is provided via Council's website and educational activities and updated as necessary	Environment and Sustainability	

Appendix 5 Flying-fox ecology and behaviour

Ecological role

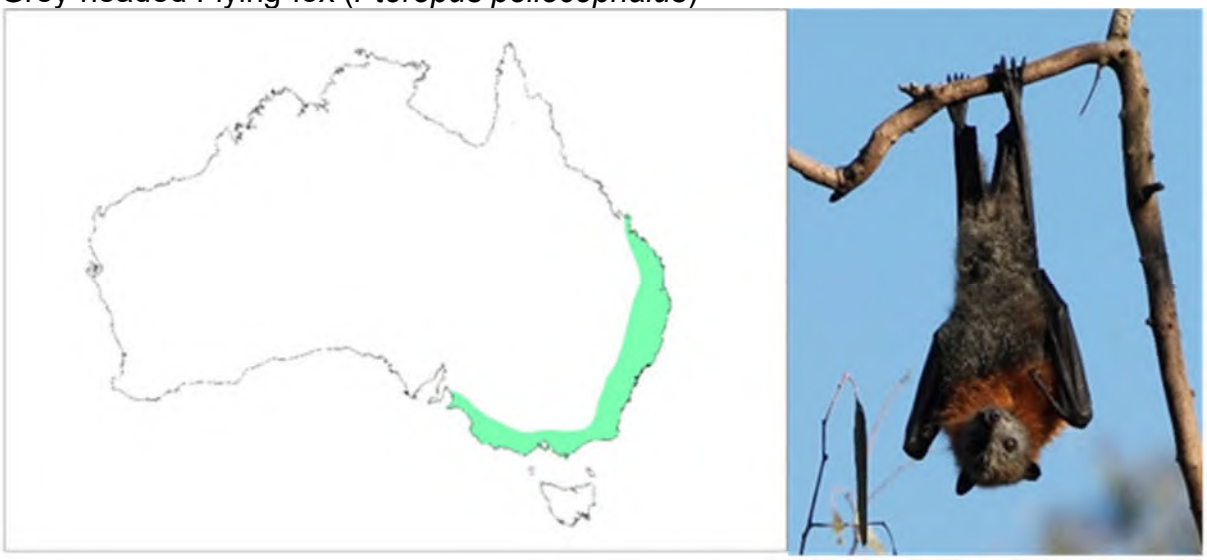
Flying-foxes, along with some birds, make a unique contribution to ecosystem health through their ability to move seeds and pollen over long distances (Southerton et al. 2004). This contributes directly to the reproduction, regeneration, and viability of forest ecosystems (DAWE 2020b). It is estimated that a single flying-fox can disperse up to 60,000 seeds in one night (DELWP 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).

GHFF 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, and provide recreational and tourism opportunities worth millions of dollars each year (EHP 2012; ELW&P 2015).

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



Grey-headed Flying-fox indicative species distribution, adapted from DPIE 2019

The GHFF is found throughout eastern Australia, generally within 200 kilometres of the coast, from Finch Hatton in Queensland to Melbourne, Victoria (DPIE 2020). This species now ranges into South Australia and has been observed in Tasmania (DAWE 2020b). 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 2015).

All the GHFF in Australia are regarded as one population that moves around freely within its entire national range (Webb & Tidemann 1996; DAWE 2020a). 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 2011). 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.

Little Red Flying-fox (*Pteropus scapulatus*)

Little Red Flying-fox indicative species distribution, adapted from DPIE 2019

The LRFF 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).

Black flying-fox (*Pteropus alecto*)

Black flying-fox indicative species distribution, adapted from DPIE 2019

The BFF has traditionally occurred throughout coastal areas from Shark Bay in Western Australia, across Northern Australia, down through Queensland and into NSW (Churchill 2008; OEH 2015). Since it was first described there has been a substantial southerly shift by the BFF (Webb & Tidemann 1995). This shift has consequently led to an increase in indirect competition with the threatened GHFF, which appears to be favouring the BFF (DAWE 2020b).

They forage on the fruit and blossoms of native and introduced plants (Churchill 2008; OEH 2015), including orchard species at times.

BFFs are largely nomadic animals with movement and local distribution influenced by climatic variability and the flowering and fruiting patterns of their preferred food plants. Feeding commonly occurs within 20 km of the camp site (Markus & Hall 2004).

BFFs usually roost beside a creek or river in a wide range of warm and moist habitats, including lowland rainforest gullies, coastal stringybark forests and mangroves. During the breeding season camp sizes can change significantly in response to the availability of food and the arrival of animals from other areas.

Reproduction

Grey-headed and Black Flying-foxes

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

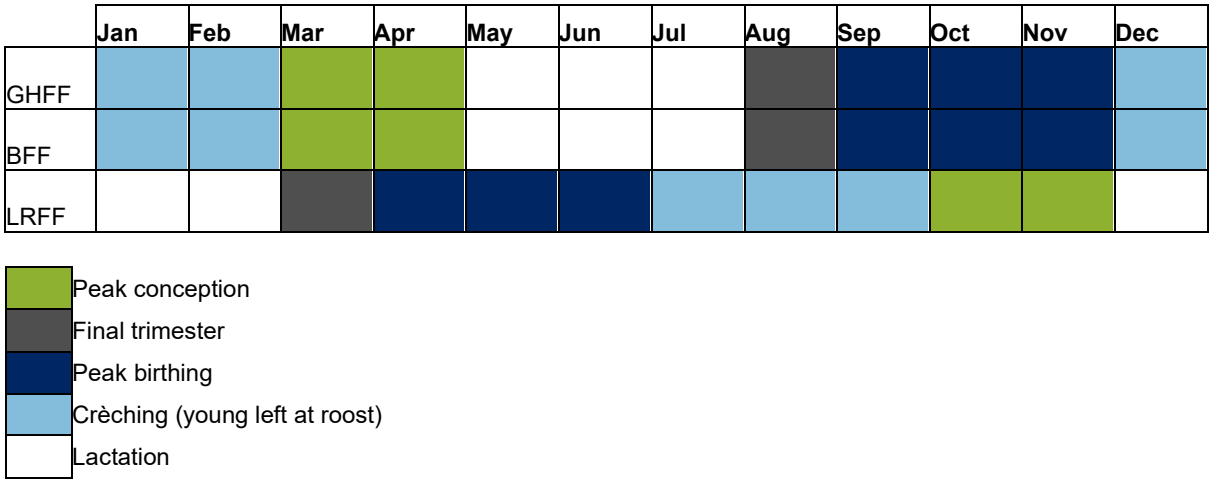
is common with births occurring later in the year.

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.

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). 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).



Indicative flying-fox reproductive cycle.

Note that LRFF rarely birth and rear young 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.

Flying-foxes in urban areas

Flying-foxes appear to be roosting and foraging in urban areas more frequently. During a study of national flying-fox camp occupation, almost three quarters of the 310 active GHFF camps (72%) were located in urban areas, 22% on agricultural land and only 4% in protected areas (Timmiss 2017). Furthermore, the number of camps increased with increasing human population densities (up to ~4,000 people per km2) (Timmiss 2017).

There are many possible drivers for this urbanising trend, as summarised by Tait et al. (2014):

- destruction 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 camps or orchards
- climate change
- 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.

Appendix 6 Historical extents

Flying-fox camp extent 1970-79 (one extent; 1978)

Ku-ring-gai Flying-fox Reserve boundary

Ku-ring-gai Council

Ku-ring-gai Flying-fox Reserve Management Plan

ecosure

Job number: PR5821
Revision: 0
Author: EK
Date: 11/03/2021

0 50 100 200
Metres

GCS GDA 1994
Datum: GDA 1994
Units: Degree

Flying-fox camp extents 1980-89

Ku-ring-gai Flying-fox Reserve boundary

Ku-ring-gai Council

Ku-ring-gai Flying-fox Reserve Management Plan

ecosure

Job number: PR5821
Revision: 0
Author: EK
Date: 11/03/2021

0 50 100 200
Metres

GCS GDA 1994
Datum: GDA 1994
Units: Degree

Flying-fox camp extents 1990-99

Ku-ring-gai Flying-fox Reserve boundary

Ku-ring-gai Council

Ku-ring-gai Flying-fox Reserve Management Plan

ecosure

Job number: PR5821
Revision: 0
Author: EK
Date: 11/03/2021

0 50 100 200
Metres

GCS GDA 1994
Datum: GDA 1994
Units: Degree

PR5821_MPX_DecadeCampExtents_trials
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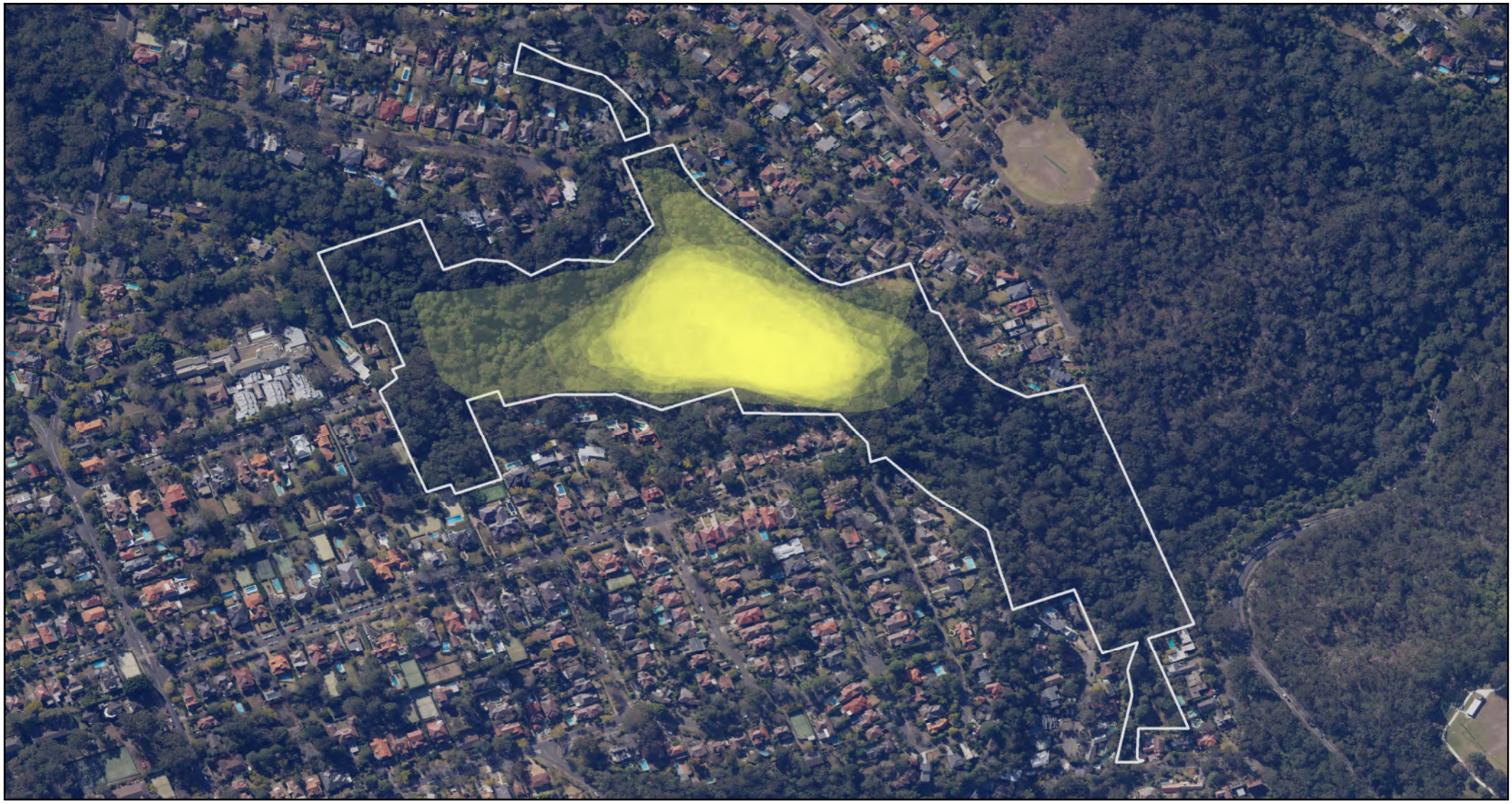

Flying-fox camp extents 2000-09

Ku-ring-gai Flying-fox Reserve boundary

Ku-ring-gai Council

Ku-ring-gai Flying-fox Reserve Management Plan

ecosure

Job number: PR5821
Revision: 0
Author: EK
Date: 11/03/2021

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Metres

GCS GDA 1994
Datum: GDA 1994
Units: Degree

Flying-fox camp extents 2010-19

Ku-ring-gai Flying-fox Reserve boundary

Ku-ring-gai Council

Ku-ring-gai Flying-fox Reserve Management Plan

ecosure

Job number: PR5821
Revision: 0
Author: EK
Date: 11/03/2021

0 50 100 200
Metres

GCS GDA 1994
Datum: GDA 1994
Units: Degree

Flying-fox camp extents 2020-21

Ku-ring-gai Council

Ku-ring-gai Flying-fox Reserve Management Plan

Ku-ring-gai Flying-fox Reserve boundary

ecosure

Job number: PR5821
Revision: 0
Author: EK
Date: 11/03/2021

0 50 100 200
Metres

GCS GDA 1994
Datum: GDA 1994
Units: Degree

Appendix 7 Community survey results

Ku-ring-gai Flying-fox Community Survey

Summary

Total questions: 23

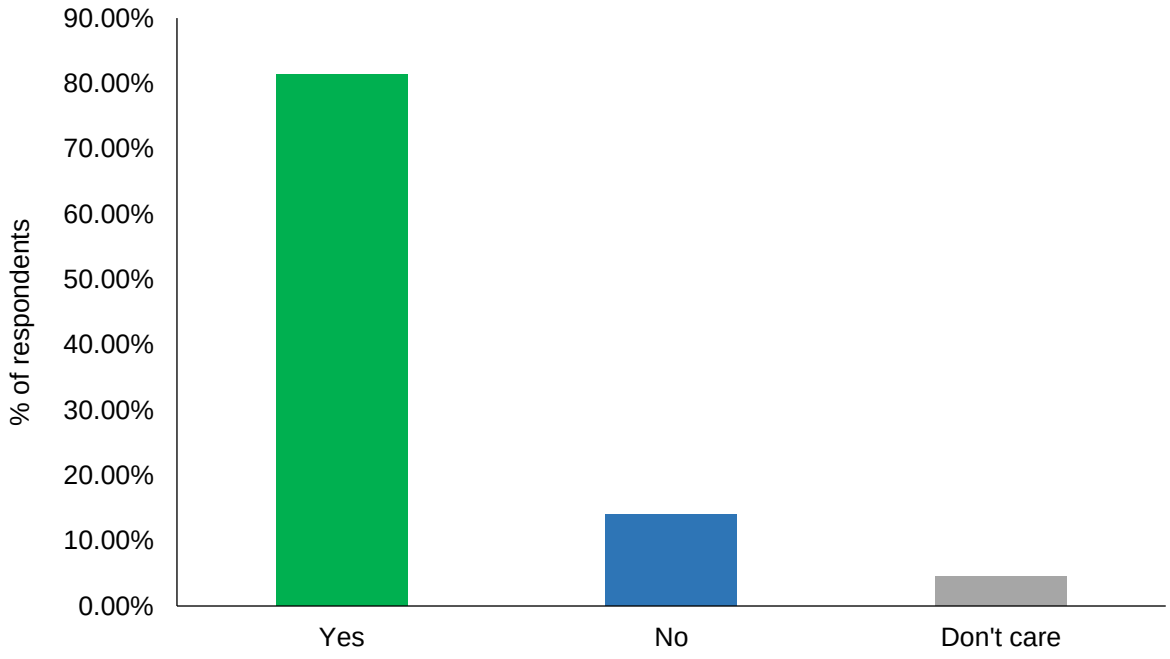
Total responses: 244

Completion rate: 87%

Typical time spent: 9:56 minutes

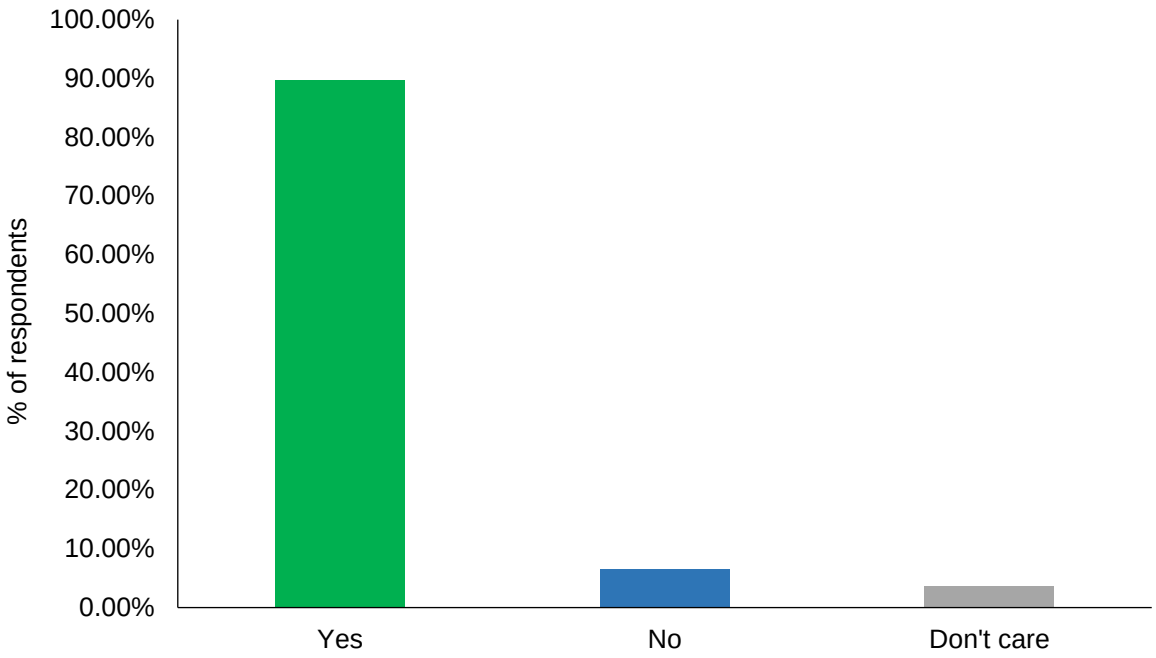
1. Did you know Ku-ring-gai is home to a Nationally Important flying-fox camp providing critical habitat for the threatened grey-headed flying-fox?

Answer choices	Responses	
Yes	81.40%	197
No	14.05%	34
Don't care	4.55%	11
	Answered	**242**
	Skipped	**2**



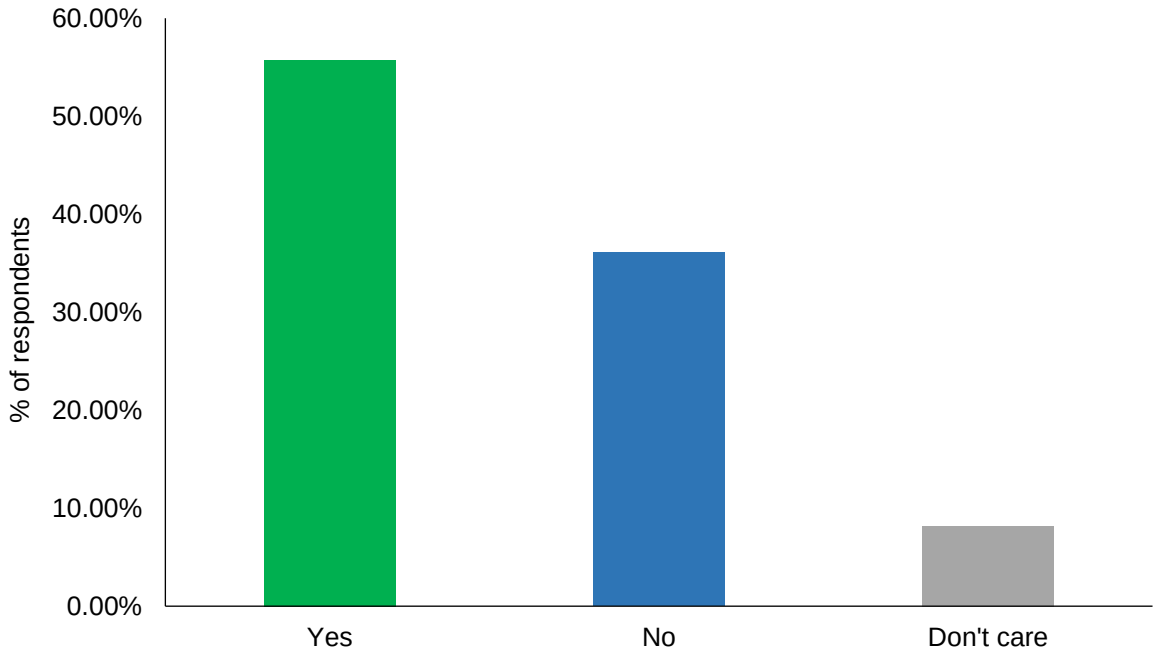
2. Did you know that flying-foxes are native mammals, protected under legislation?

Answer choices	Responses	
Yes	89.75%	219
No	6.56%	16
Don't care	3.69%	9
	Answered	**244**
	Skipped	**0**



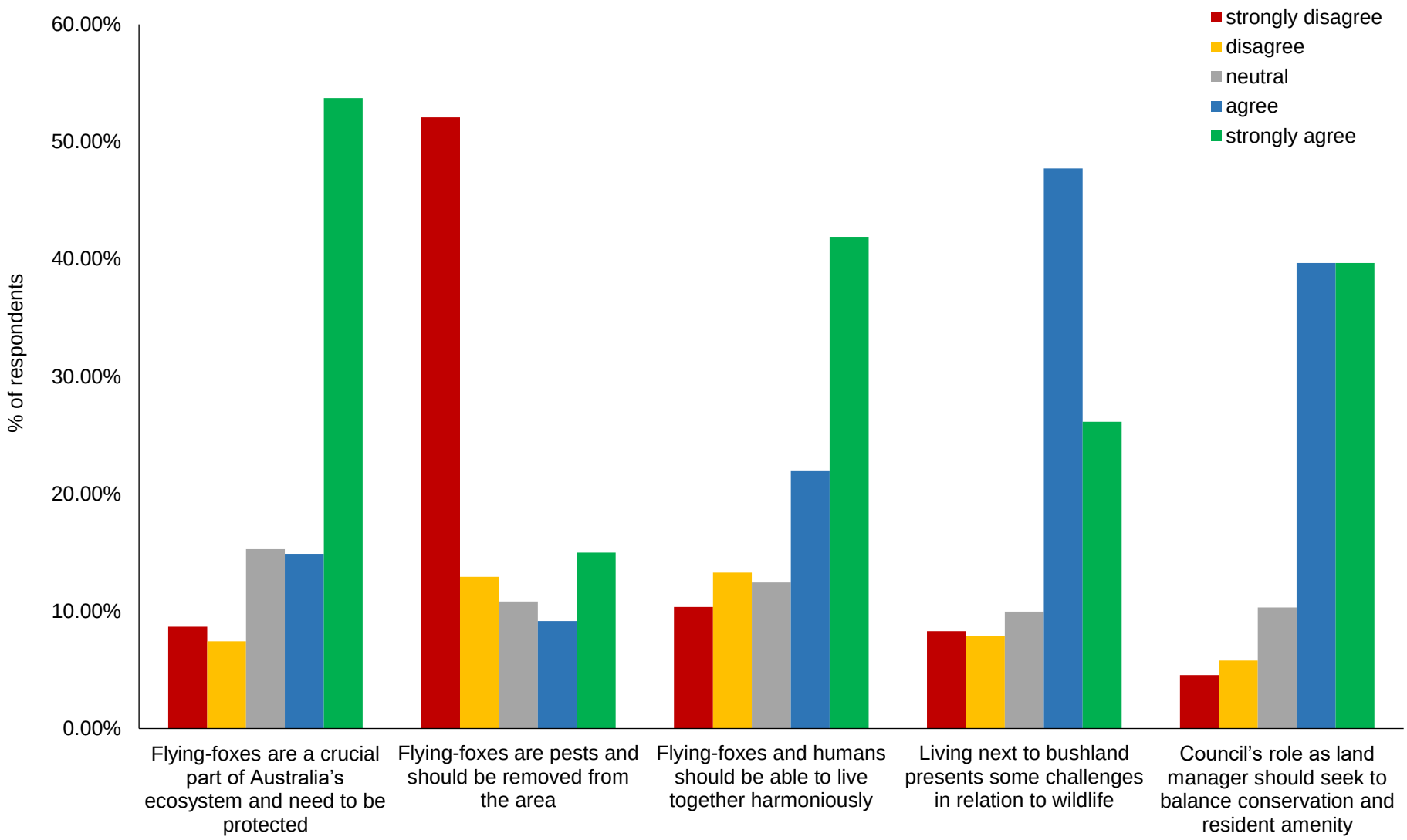
3. Did you know the grey-headed flying-fox is a threatened species having undergone a population decline of more than 30% in recent years?

Answer choices	Responses	
Yes	55.74%	136
No	36.07%	88
Don't care	8.20%	20
	Answered	**244**
	Skipped	**0**



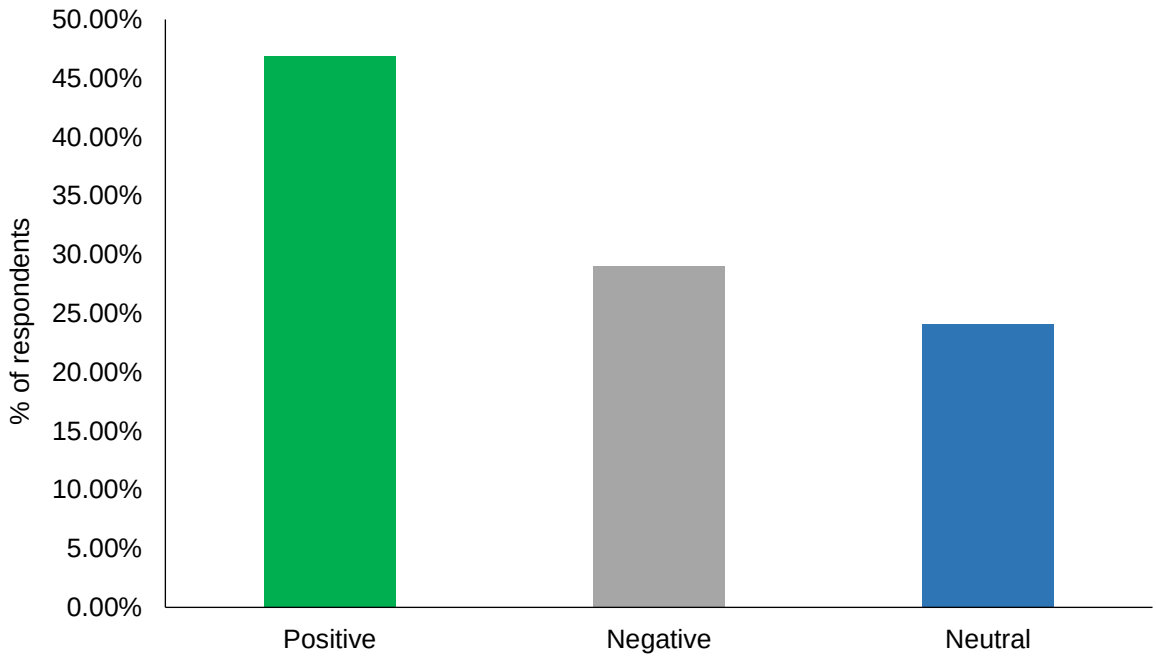
4. Please indicate how strongly you agree or disagree with the following statements:

Answer choices	strongly disagree		disagree		neutral		agree		strongly agree	
Flying-foxes are a crucial part of Australia's ecosystem and need to be protected	8.68%	21	7.44%	18	15.29%	37	14.88%	36	53.72%	130
Flying-foxes are pests and should be removed from the area	52.08%	125	12.92%	31	10.83%	26	9.17%	22	15.00%	36
Flying-foxes and humans should be able to live together harmoniously	10.37%	25	13.28%	32	12.45%	30	21.99%	53	41.91%	101
Living next to bushland presents some challenges in relation to wildlife	8.30%	20	7.88%	19	9.96%	24	47.72%	115	26.14%	63
Council's role as land manager should seek to balance conservation and resident amenity	4.55%	11	5.79%	14	10.33%	25	39.67%	96	39.67%	96
								Answered		**242**
								Skipped		**2**


60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
% of respondents
strongly disagree
disagree
neutral
agree
strongly agree
Flying-foxes are a crucial part of Australia's ecosystem and need to be protected
Flying-foxes are pests and should be removed from the area
Flying-foxes and humans should be able to live together harmoniously
Living next to bushland presents some challenges in relation to wildlife
Council's role as land manager should seek to balance conservation and resident amenity

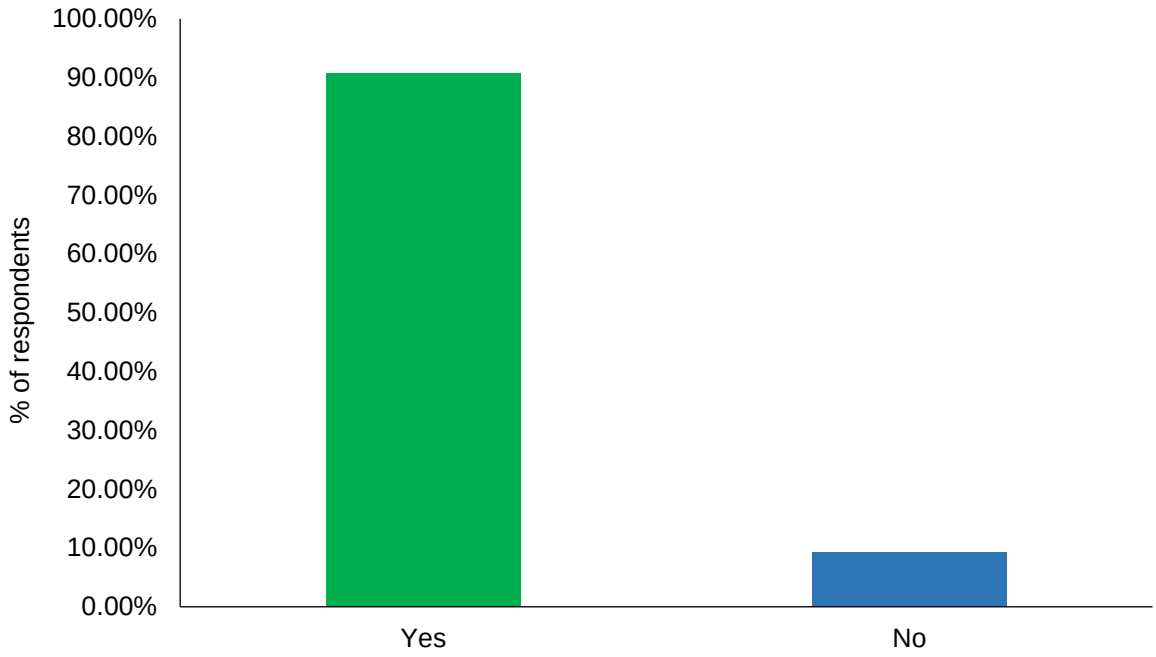
5. How would you rate your experience or interactions with flying-foxes in Gordon?

Answer choices	Responses	
Positive	46.89%	113
Neutral	24.07%	58
Negative	29.05%	70
	Answered	**241**
	Skipped	**3**



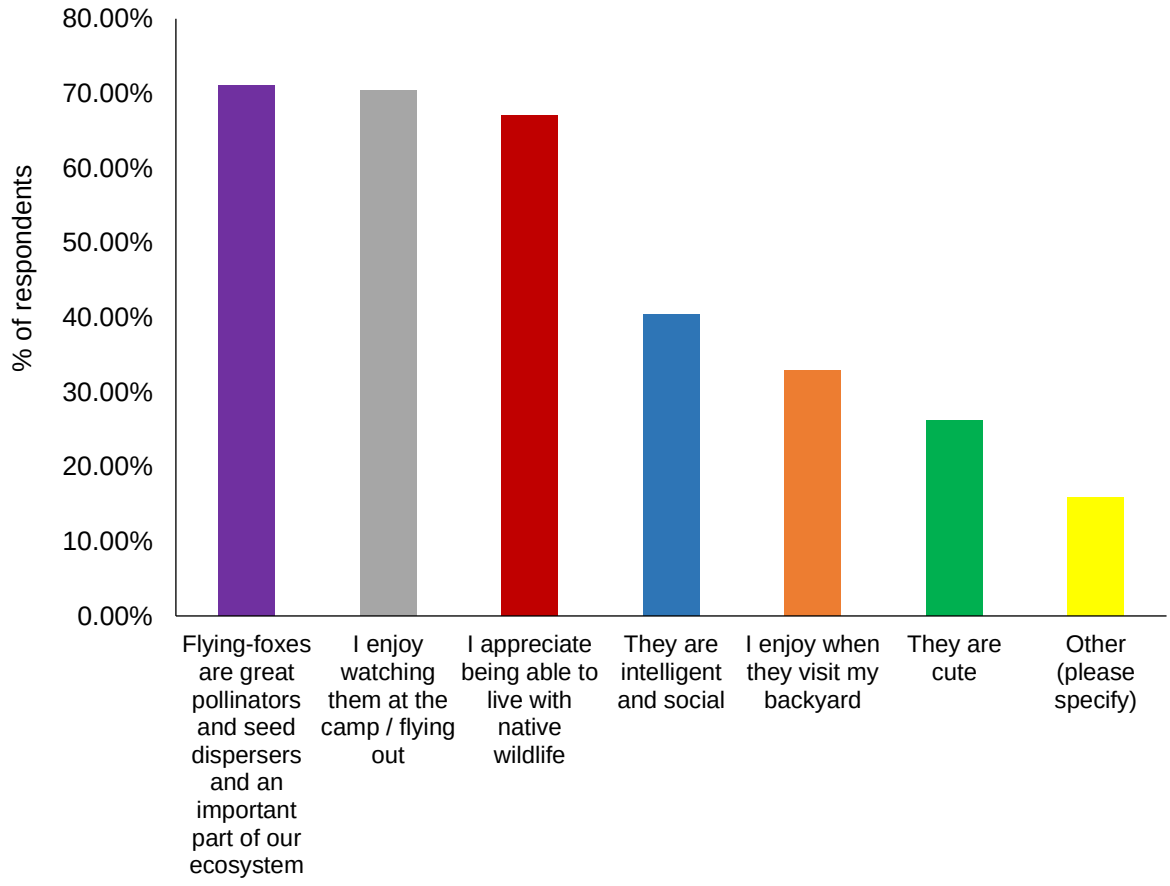
6. Did you know that living near a flying-fox camp can be challenging, with impacts such as noise, odour and faecal drop? Noise and odour fluctuate depending on the time of year (e.g. increased during the breeding season), and faecal drop varies depending on where flying-foxes are foraging.

Answer choices	Responses	
Yes	90.76%	216
No	9.24%	22
	Answered	**238**
	Skipped	**6**



7. If your experiences with flying-foxes are positive, what do you like about them?

Answer choices	Responses	
They are cute	26.14%	46
They are intelligent and social	40.34%	71
I enjoy watching them at the camp / flying out	70.45%	124
I enjoy when they visit my backyard	32.95%	58
I appreciate being able to live with native wildlife	67.05%	118
Flying-foxes are great pollinators and seed dispersers and an important part of our ecosystem	71.02%	125
Other (please specify)	15.91%	28
	Answered	**176**
	Skipped	**68**



8. If your experiences with flying-foxes are negative:

Answer choices	Responses	
How are you being impacted?	98.00%	98
Where are you being impacted (home, work, recreational area, etc.)?	90.00%	90
Please provide location of impacts (street address)	84.00%	84
What time(s) of day are you impacted?	87.00%	87
	Answered	**100**
	Skipped	**144**

Responses (location removed)

How are you being impacted?	Where are you being impacted?	What time(s) of day are you impacted?
droppings..poo	home garden and terrace	night
Excrement dropped, smell, noise	home	Early morning + all day when bats feeding
Previously faecal drop from feeding and noise however pruning a tree back has improved the situation. Currently no real impact		
once impacted by flying foxes when I had a fruitful peach tree.		
The main reason is they wake us up before dawn with their loud noise and it can continue all day. The odour and bat droppings can be a pest as well	Home	Generally before sunrise but it can be all day
Noise, smell, dropping, tree decimation	Home, local area	Dusk and Early morning.
Noise and smell	home	early morning when they return to camp and mating season
noise and droppings		
Noise, odour, droppings.	Home	Afternoon and evening
I am afraid of bats because I know bats carry various virus such as corona-virus, etc. If they bite people, it could be deadly. Also they are very noisy in the evening.	Flying-fox flying over my home, some times they stop on the gum trees	Evening 6:00pm - 12:00pm
Constant noise, heavy odour, faecal droppings on outdoor areas	home and garden (which is also work space and recreational area)	4am until 9pm. Untenable noise especially between 4 and 7 am.
Noise, smell, Damage to property (house, car, etc...), lack of sleep leading to anxiety and depression amongst residents, house depreciation, unable to use outdoor areas at home	Home	24/7
Droppings on the house/clothes/cars particularly after a visit to fruit farms	Home	I don't watch them all day!!!
Once noise. Now no flying foxes at any time. They’re gone	Not any mor. Flying foxes each night have gone. Where to. Why?? Construction noises so extreme & massive overhead cranes swinging round seem likely to have impacted. Businesses have hired rooms & flats because often noises meant unable to have employees working from home. A nightmare,	Not any more by bat noise. Only construction noise , heavy equipment etc

How are you being impacted?	Where are you being impacted?	What time(s) of day are you impacted?
Noise and conservation requirements on residents	home	Sunset onwards in warmer months
constant noise and faecal matter	Home	All day/night
Noise, faecal matter, severe mental health issues, unable to have guests or use our outdoor areas	Home (inside and outside)	All day and night.
Not troubled by them		
I'm not. Don't live in that area	See above	I'm not
See previous comment	Home	Evening and night
Smell, faecal dropping, damage to surrounding trees, roofs of houses, spread of disease, damage to property by droppings.	Home	Dusk. During summer around 8pm
unpleasant odour	home	Generally, mornings
Not impacted negatively		
Odour noise fecal matter	Home	Day
Defoliation, noise, smell	home	early AM
bat droppings on hard surfaces and cars. Concern that our children dog may pick up bacteria from bat poo	home	daylight - once grandchildren and dog go outside
noise	Home	Early morning
		Evening
Noise, droppings which could contain deadly viruses	Home	Mostly evenings
Health Hazard Bats carry hazardous viruses that can kill humans and animals.	home and recreational areas	evenings
As stated in previous questions the noise, smells , droppingss all over the house and yard and cars etc, & links to health issues and bats I find them rather hard to tolerate.	Home	early evening through to early morning is when they fly around the area and cleaning up their mess is daily
Noisy, smelly and over populated	Everything they are near	
		Dusk
real estate values, droppings, health hazzard	home	evening
My experience is positive but I live with them and am very aware of noise and smell but have learned to ignore it because of the importance of these creatures.	Droppings covering road and cars, Noise and smell at home	24 hours. BUT WE DON'T MIND AT ALL. Really.
Droppings from overhead, effect on real estate values	Home	Early evening and morning with regard to droppings
noise smell droppings flight times	home	5.00 am until 8.00 pm
Bat's droppings	Home	Evening
Noise, faeces	Home	Evening
After rain it smells a bit and a bit of poor to clean occasionally	Home	Evening

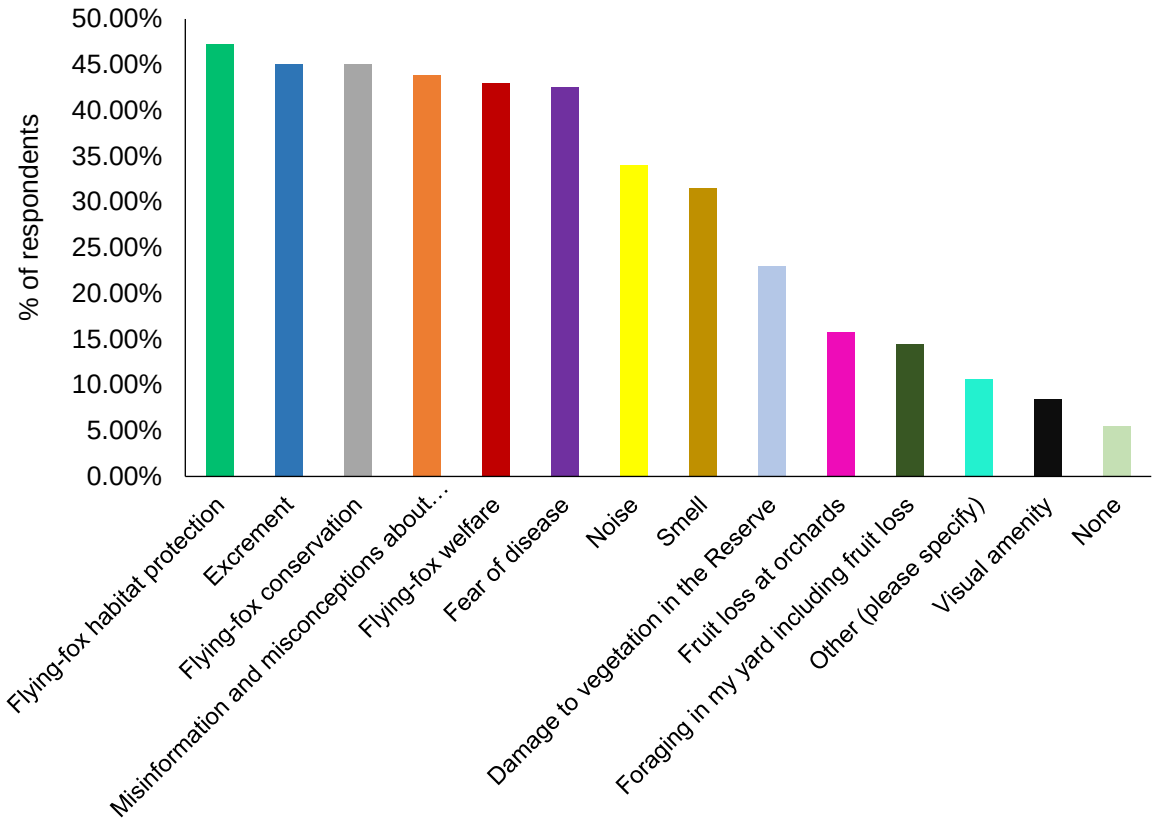
How are you being impacted?	Where are you being impacted?	What time(s) of day are you impacted?
Noise; Dropping	Home	4 -7am
noise, smell, polution	home	24 x 7
Poo, especially on cars. Difficult to remove (dark purple), theft of fruit from trees in garden?	Home	???
feeding all night on flowering gum near me making a lot of noise	home	night
Gusno droppings	Home	evenings
Noise and dirt	Home	Evening time
Noise, mess, loss of amenity	Home	Evening
clothes ruined if left out on the line, bat poo on house, around and in the pool, on paths	home	effects observed and impacts us during the day, but feaces usually dropped in the early morning hours
Noise, smell, droppings, eating fruit from my trees, pests, lice, send dogs wild!	Home, local area	evenings,
sometimes noise	home	sunset
Dropping around the house. Eating fruit.	Home and nearby bush.	Evening and morning.
Noise, smell, destruction	Home at night mostly	Evenings mostly
I don't like the idea of them		
Occasionally drop poo on to the clothes. No biggy		
Not really impacted, just stay indoors in February at night	Home	Only in February from about 7pm to 9pm
Smelly, faecal matter is hard to clean up, carry ticks and diseases	Home	Dusk, mornings
Damaging poo on car surface. Does not wash off and eats away the paint.	Home	
Screeching sound at nights above all when mating		At night, cannot remember probably after midnight
noise	home	morning and evening
Some home grown fruit is eaten and some is spoiled with being pooped on. Can't grow food plants under trees where the flying foxes eat because it becomes contaminated with faeces. Faeces on washing, house walls, windows and cars.	Home	Faeces remain 24/7 until you wash it off.
Just splotches of crap on my house I don't like... but it's a very small annoyance really	Home	I suppose when they fly over... no idea of time
Very occasionally they drop poo on our paved areas, but it is only a mild nuisance which is outweighed by the positives of living with nature	home	

How are you being impacted?	Where are you being impacted?	What time(s) of day are you impacted?
noise, sleep deprivation, smell, droppings, cleanliness of property, socially as are unable to utilise areas of property and various times, time spent cleaning property and cars, concern of impact on pets as dead bats have been found in the garden,	all of these areas	early morning and early evening when moving, through day due to noise and smell
noise, faecal dropping and strong odour	home and recreational areas	early mornings (5am approx) and evenings (from dusk for a few hours)
Faecal droppings in our pool and backyard	Home	Early evening
I'm not	N/a	N/a
fecal mess, noise,	home	night time
Smelly poo and urine when they visit my garden	Home	Night
Droppings car, house , pavements	Home	Between 8pm and morning
When they fly over the local houses, including mine, they leave their crap on our house and we have to hose it down every time they fly over.	Home	Over night. And it appears to be seasonal when there are berries on certain trees.
they destroy citrus fruit	home	around 8.00pm
loss of income	work	Night
They drop faces and half eaten figs all over our roof and paths	Home	At night, they can be very noisy as well.
noise, droppings, foraging in garden trees, smell	Home , garden and local streets	early morning and night time
Significant mess to home - animals feeding on neighbors palm trees (dates), then eating/messing over my house	Home	Dusk till around 11pm
There are large colonies of flying foxes feeding on the fig tree outside our house.	Home	Night
Bad press from Wuhan & dead carcases	Electrocuted bats on high voltage lines	
Noise and droppings on and around the house	Home	Dusk to dawn
They can bring disease	General area of Gordon	
Smells, constant noise, damage to cars from bat poo, unable to sit outside	Home	4.30 till 5.30 am. 7.30 pm. Often throughout the day.
Noise and fear of viruses	Home and Gordon friend's house	early eeving and very early AM dawn hours
noise, constant feacal dropping and strong odour	home, work (wfh due to covid) and recreational	early morning 3.30-5am, evening and late evening sometimes until midnight
The smell the noise. The devaluation of my house. Numbers grew significantly higher when the bats were moved on from the botanical gardens	Home sleep being able to sit outside. I can’t open my bedroom window in the night.	All day long and most of the night

How are you being impacted?	Where are you being impacted?	What time(s) of day are you impacted?
Noise, smell, bat poo constantly on cars, balconies. Often cannot sit outside because of smell and noise.	Home	4.30 till 5.30 am. 7.30 pm. Often throughout the day.
noise, smell, damaged property including cars, roofs and drying washing and reduced property value. the impact is both physical and phycological and I hold council directly responsible due to their inaction.	home and recreation	All day
Servere noise & odour, constantly having to clean up droppings	home, which is also my workplace	24/7 during the breeding season
Noise, faeces, sleep	Recreational area, Home	Night
Noise get woken up very early and it doesn't stop, odour prevents us from using outdoor areas, faecal matter, destruction of property. Need to keep windows closed, no washing on line, no outdoor furniture left uncovered	Home	The mornings for noise and faecal matter. The whole day from odour. The whole day having to keep windows closed
Noise, smell, fouling, disease threat	Home, work, recreational, house paint, car paint, pool water, drying laundry	Noise all day, often into night. Fouling when bats fly over
sleep deprived, quality of life is affected, real estate value.	Home, recreation, the ability as a human to seek fresh air and	24/365 days of the year.
1. The noise can be unbearable, getting woken up in early monrings when they roost. 2. the smell especially after rain is pervasive and pungent. 3. We have had dead bats in our garden at times, and fear the viuses/diseases they carry	Home	In summer, can be 24 hours. Worst time is early morning when they roost.
Smell. Noise. Fear of virus. Fear of bacteria.	Home.	24/7
We do have noise and odour	Home - noise decreased with double glazing	Noise - Early morning (5am)
Noise	Home	Morning
noise, smell, pool contamination, destroy paintwork on house and car	home, work (during covid), pool, eating outside etc	noise from 4am (varies) smell in early morning and late night, bat droppings everywhereguana,
No negative impact	No negative impact	
Mental health from noise, smell, social isolation, anxiety, sleep disturbance	Home	24 hours a day. Impact varies dependent on time of day
Noise	Home	Early morning and early evening when they depart and return

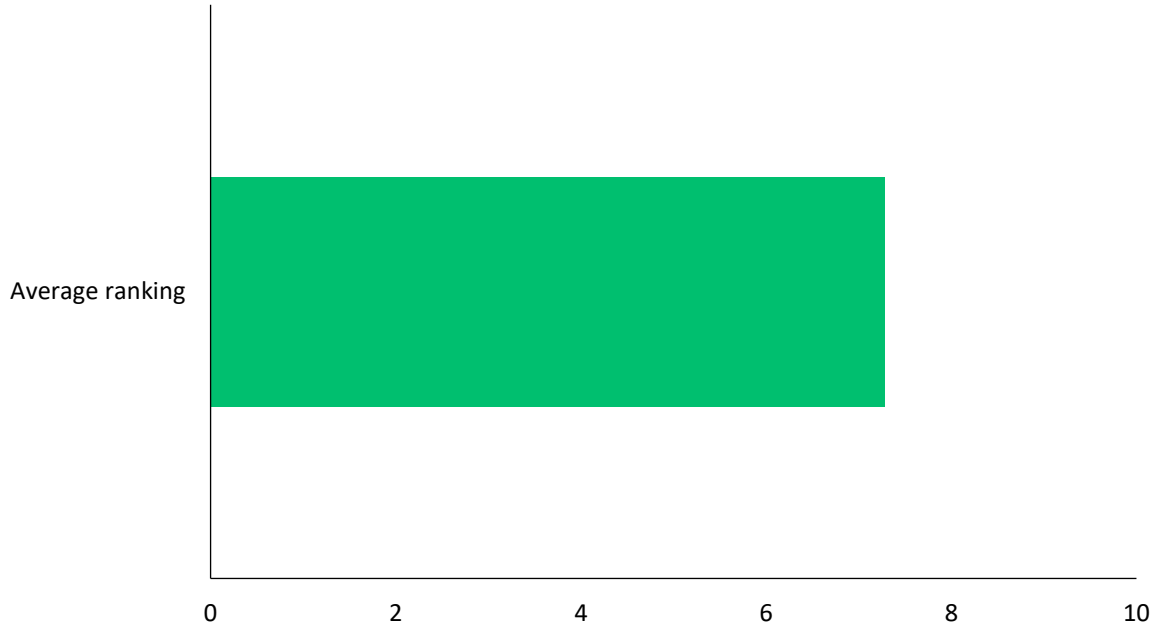
9. Which of the following topics relating to flying-foxes are of concern to you?

Answer choices	Responses	
Noise	34.04%	80
Flying-fox habitat protection	47.23%	111
Fear of disease	42.55%	100
Excrement	45.11%	106
Misinformation and misconceptions about flying-foxes	43.83%	103
Damage to vegetation in the Reserve	22.98%	54
Fruit loss at orchards	15.74%	37
Flying-fox welfare	42.98%	101
Visual amenity	8.51%	20
Foraging in my yard including fruit loss	14.47%	34
Flying-fox conservation	45.11%	106
Smell	31.49%	74
None	5.53%	13
Other (please specify)	10.64%	25
	Answered	**235**
	Skipped	**9**



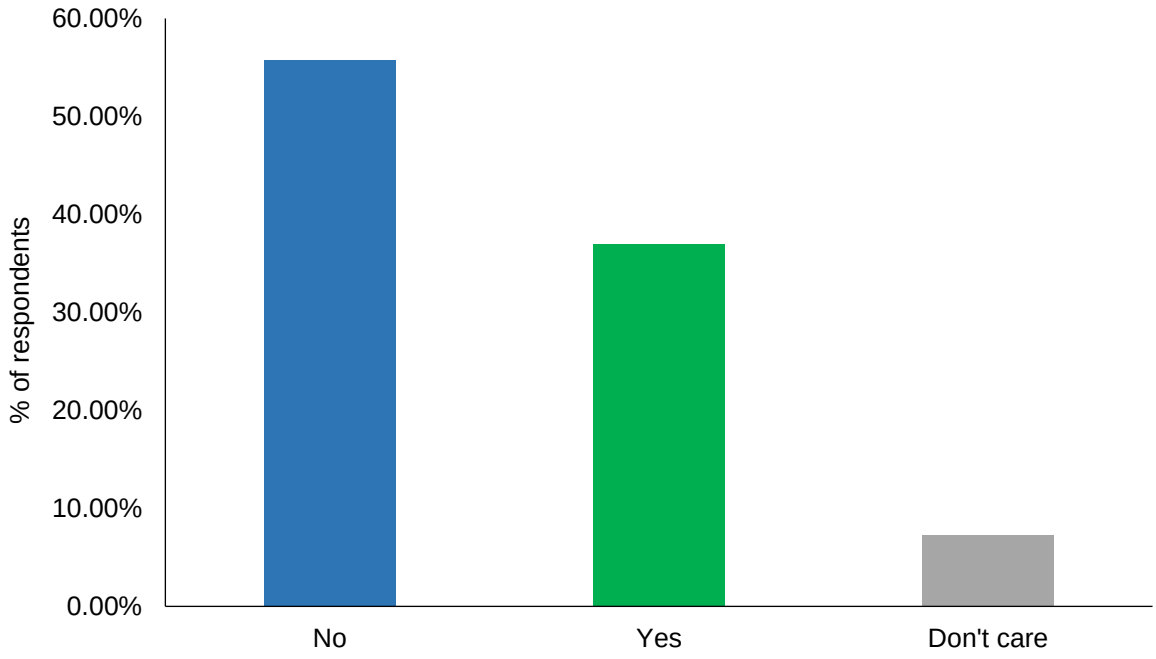
10. How important is it to you that management actions by Council protect flying-fox welfare?

Answer choices	Average ranking	
1 (least important) – 10 (most important)	7.284444444	
	Answered	**225**
	Skipped	**19**



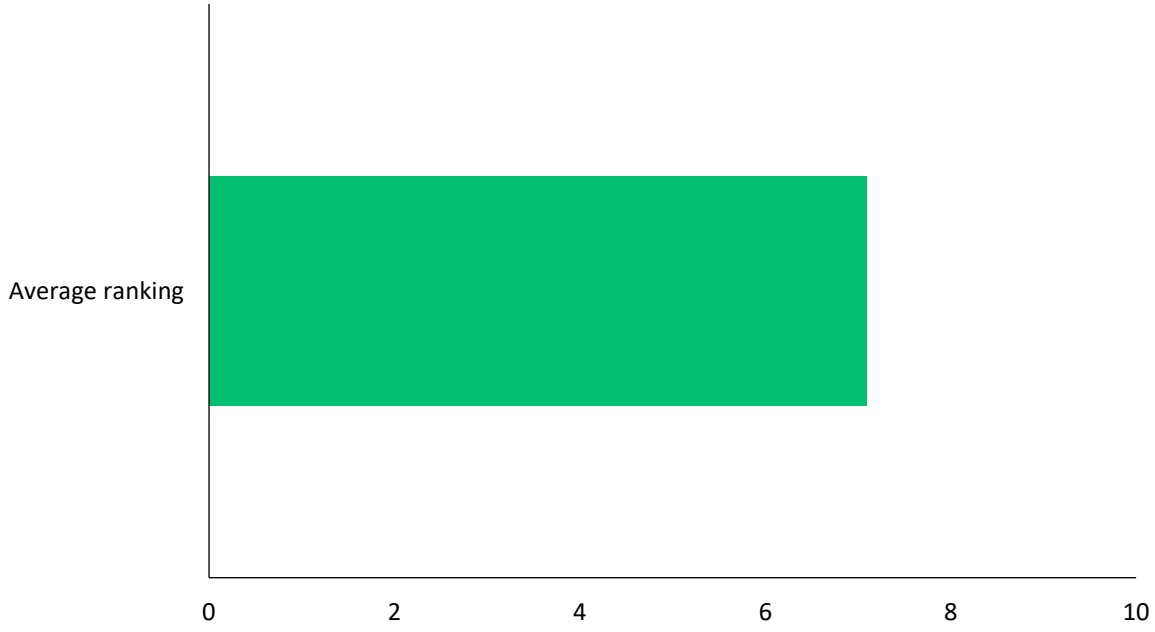
11. Did you know Ku-ring-gai Flying-fox Reserve is subject to a long-term Conservation Agreement with the NSW Government?

Answer choices	Responses	
Yes	37.02%	87
No	55.74%	131
Don't care	7.23%	17
	Answered	**235**
	Skipped	**9**



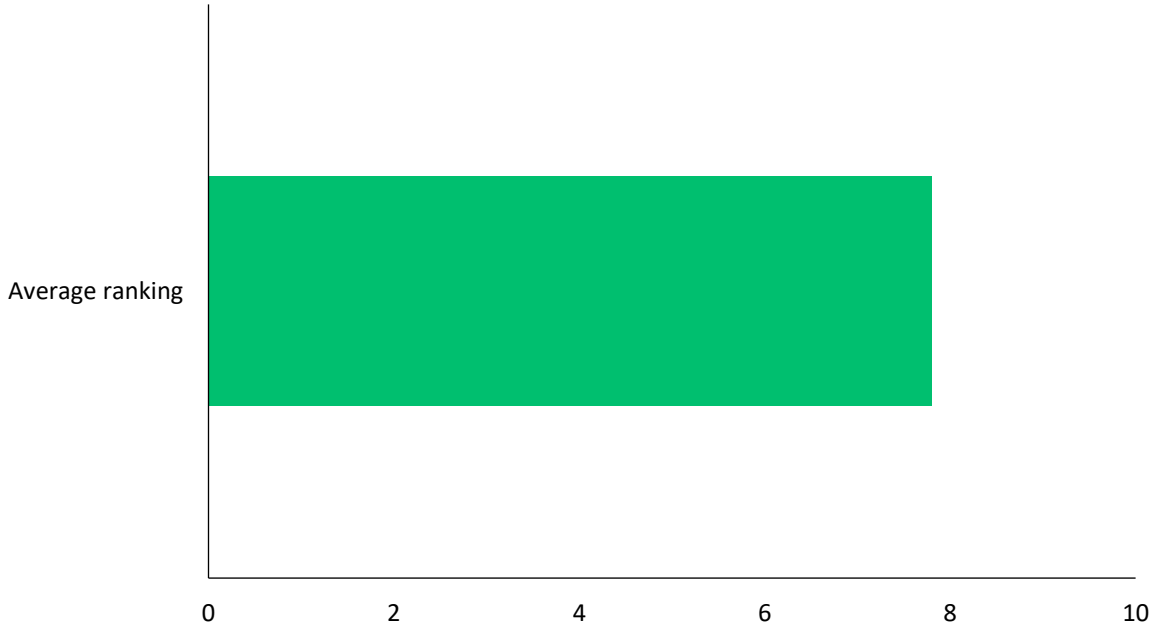
12. How important is it to you that management in the Reserve does not disturb flying-foxes, which may cause the camp to splinter to multiple locations in the local government area?

Answer choices	Average ranking	
1 (least important) – 10 (most important)	7.090497738	
	Answered	**221**
	Skipped	**23**



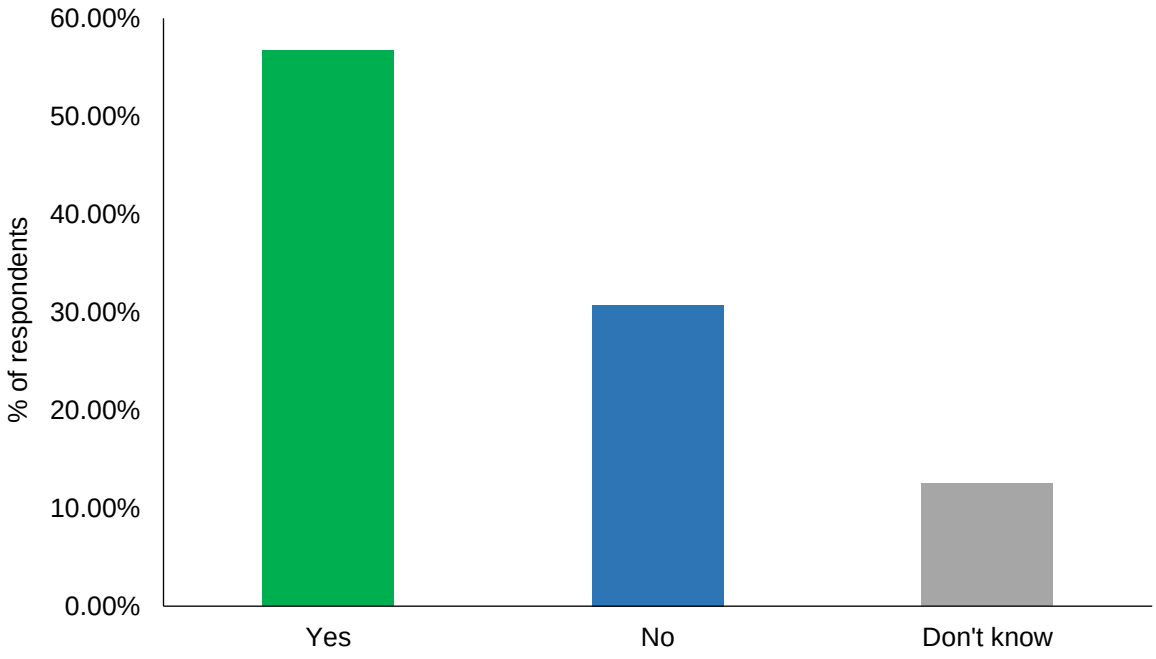
13. How important is it to you that Council management actions protect the vegetation (including an Endangered Ecological Community), and other values of the Reserve?

Answer choices	Average ranking	
1 (least important) – 10 (most important)	7.803571429	
	Answered	**224**
	Skipped	**20**



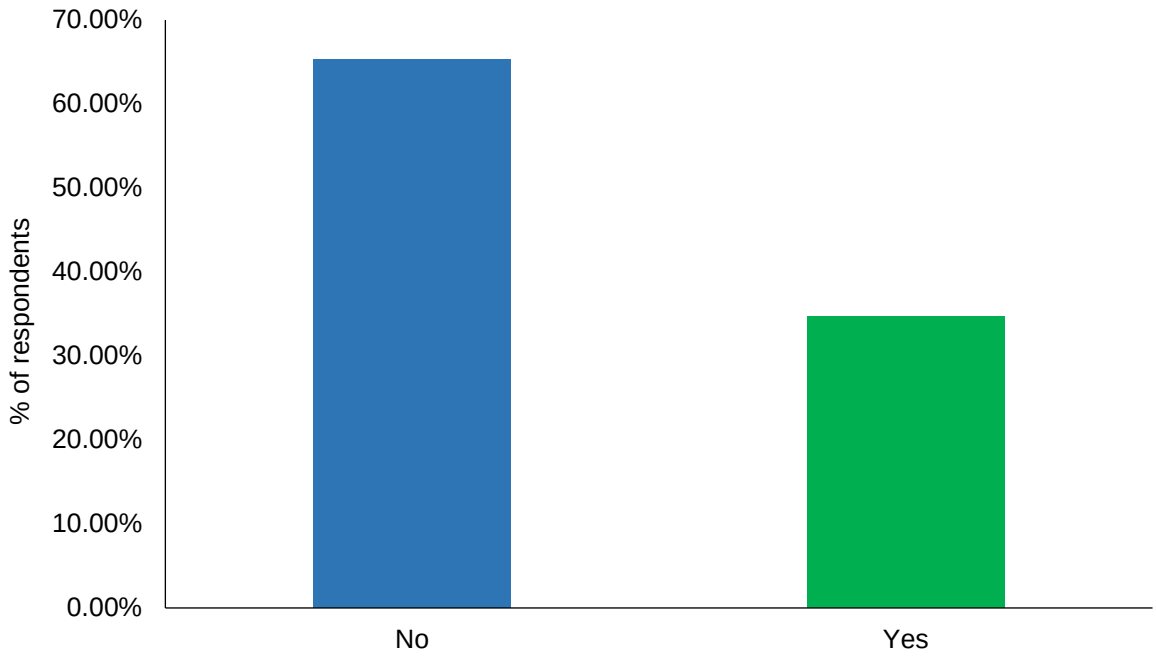
14. Do you live in close proximity to the Ku-ring-gai flying-fox camp?

Answer choices	Responses	
Yes	56.71%	131
No	30.74%	71
Don't know	12.55%	29
	Answered	**231**
	Skipped	**13**



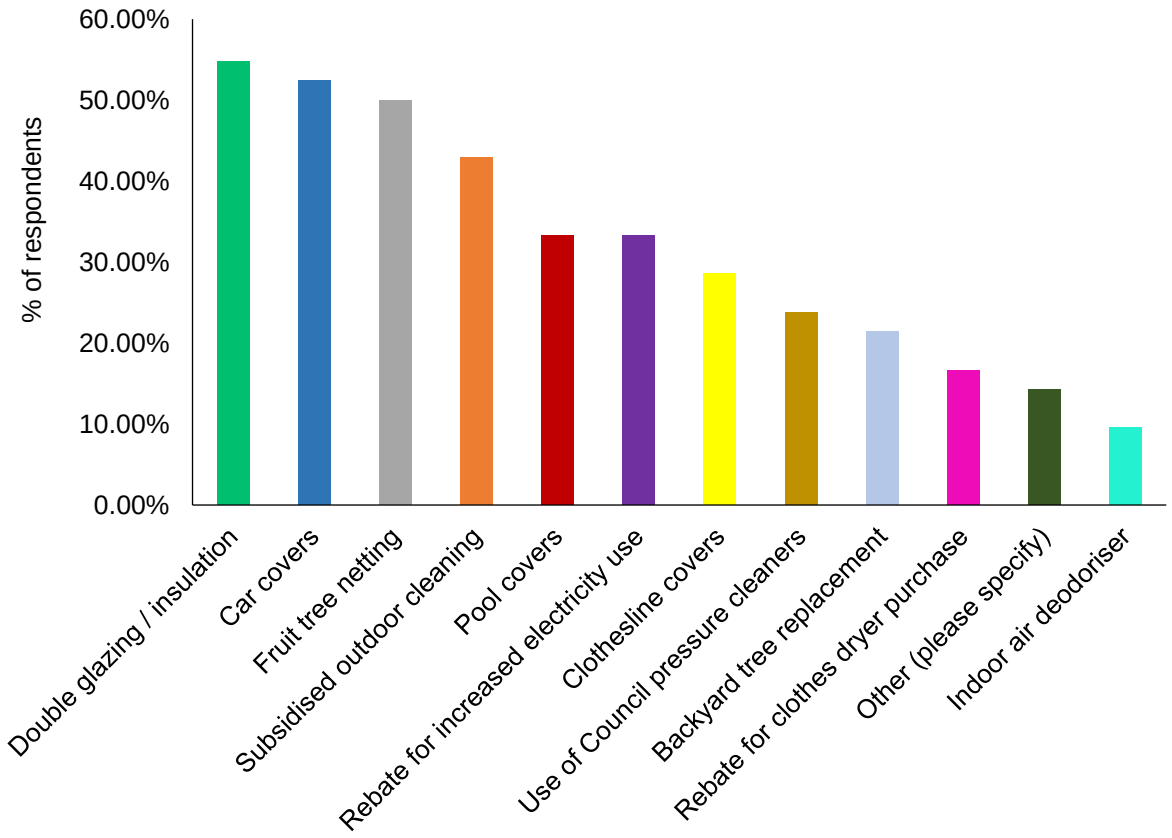
15. Would receiving funding subsidies (e.g. to contribute to double glazing, car covers, fruit tree netting) help in reducing flying-fox impacts on your property?

Answer choices	Responses	
Yes	34.65%	44
No	65.35%	83
	Answered	**127**
	Skipped	**117**



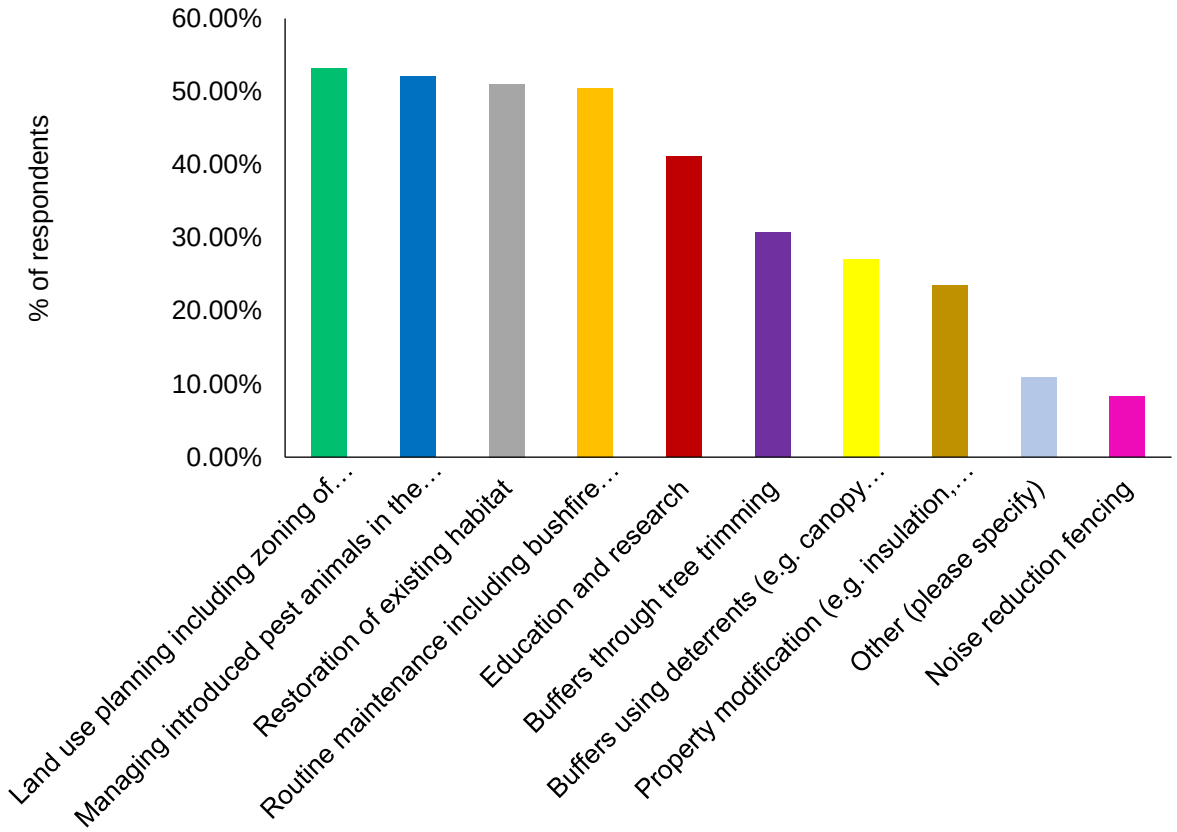
16. Select things you would like considered for a subsidies program that could assist you:

Answer choices	Responses	
Double glazing / insulation	54.76%	23
Car covers	52.38%	22
Clothesline covers	28.57%	12
Pool covers	33.33%	14
Use of Council pressure cleaners	23.81%	10
Subsidised outdoor cleaning	42.86%	18
Indoor air deodoriser	9.52%	4
Rebate for increased electricity use	33.33%	14
Rebate for clothes dryer purchase	16.67%	7
Fruit tree netting	50.00%	21
Backyard tree replacement	21.43%	9
Other (please specify)	14.29%	6
	Answered	**42**
	Skipped	**202**



17. Which of the following management options are you interested in learning more about?

Answer choices	Responses	
Education and research	41.15%	79
Land use planning including zoning of flying-fox camps	53.13%	102
Property modification (e.g. insulation, double-glazed windows, plantings)	23.44%	45
Noise reduction fencing	8.33%	16
Restoration of existing habitat	51.04%	98
Routine maintenance including bushfire management	50.52%	97
Managing introduced pest animals in the Reserve	52.08%	100
Buffers through tree trimming	30.73%	59
Buffers using deterrents (e.g. canopy mounted sprinklers)	27.08%	52
Other (please specify)	10.94%	21
	Answered	**192**
	Skipped	**52**



18. Do any of these management options not appeal to you? And if so which ones and for what reason?

Answered	**57**
Skipped	**187**

Responses:

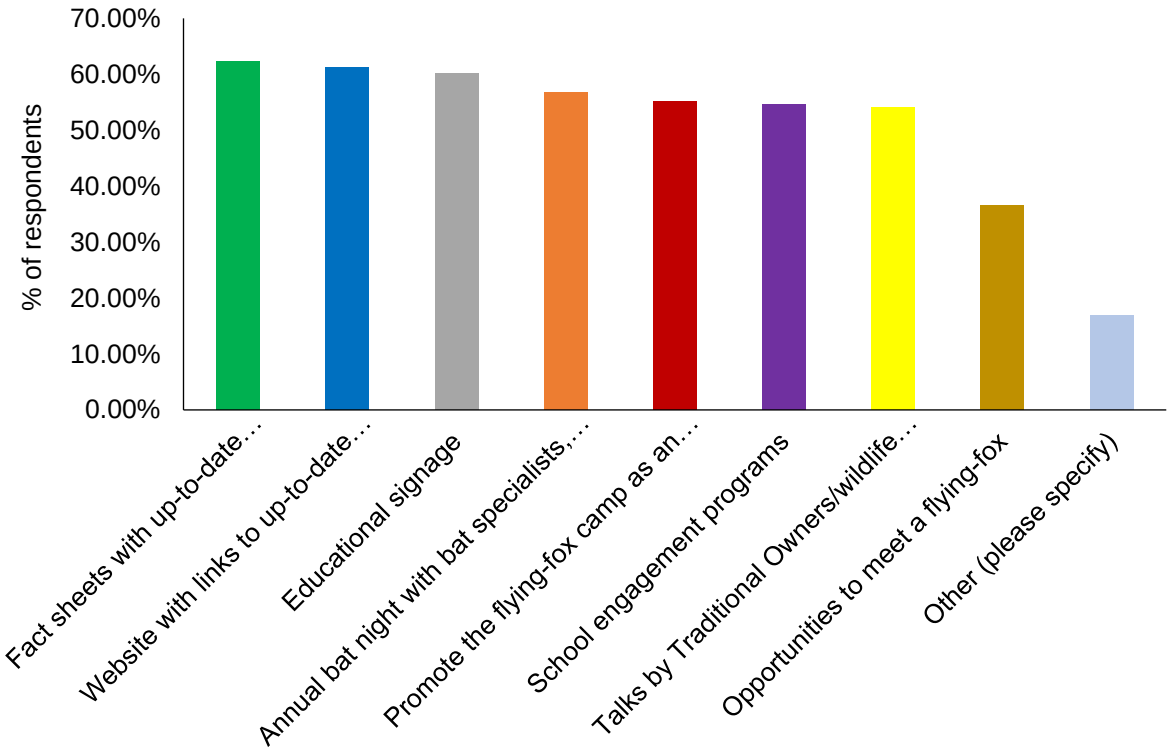
- Action plan to clear a small number of trees some totally dead near residents. Remove of staff member from the council who is encouraging the bat colony for many years. Conducting tours illegally. Any liaison with 3rd parties Bat societies engaged by the council are to be approved by the rate payers.
- Adequate buffers are important to minimise all the impacts, visual, noise and smell
- Any deterrents worry me, where else will they go. This has been their home for a very long time. Perhaps we just need to live with it, we have moved into their world, not them into ours.
- Any management option where deterrents or actions are taken towards displacing or affecting the behaviour of the flying foxes should not be considered an alternative. Residents living in the vicinity of a reserve have to understand how the Australian bushland works and do their due diligence before buying a property that is contiguous to the bush. It is not the responsibility of the Council to manage the issue in itself. I am aware that the Council is in favour of the protection of the bats and am truly very thankful for it. However, a hard stance needs to be taken against critical residents as the bats are part of the bush, the residents are not. Responsible management should consider pushing for fines under the EPBC Act and ensuring that the environment is looked after, regardless of the role residents play in funding the Council through Council rates. If they choose to live in Ku-ring-gai they should do so because they share the values and want to look after the bush so that the bush looks after them
- Any management options which do not benefit the flying-foxes would not appeal to me due to the lack of survival options flying-foxes are faced with, such as land clearing for development, moving colonies away due to people complaining of their living complications and climate change with heat days killing so many flying-foxes. Needs to be more mandatory education/information for people who decide to move close to bushland or any wildlife. Requirements for realestate to provide information that these will be the complications of living with wildlife. Three of my current neighbors have no knowledge of our wildlife and the importance they play in our Eco system. I also had no idea when I moved here in 1992, but luckily I have a great interest in all animals and have seek information over the years.
- Any option that protects the flying Fox colony & keeps nearby residents comfortable would be a win/win.
- As I stated previously. If a method will help the amenity of near-by residents, without harming the bat colony, I would be in favor of it.
- Buffers, I don't have enough information on how that would work.
- Bushfire risk reduction is a key concern. How does that interact with maintaining the habitats of the flying foxes?
- Canopy mounted sprinklers or back burning the bush, to keep the foxes away from residential areas.
- Canopy mounted water sprinklers. Concerned it might adversely affect the flying foxes.
- Canopy sprinkler systems - shown not to work if aim is to discourage GHFF
- culling

- Flying foxes are native and humans are the invasive species. We need to do more to protect them and not expect them to make way for us.
- I actually feel this is a waste of time as I find the council asks lots of questions and I see no results. My street has to be one of the most neglected streets in the suburb, it is overgrown, over planted and overlooked in the 20 odd years I have lived in it and participated in the bush care program that runs in it. Bats are the least of my worry as I have trees overhanging properties and falling without warning and when you approach council about addressing the issue you get surveys about helping bats before the people in the community. I have had to go out in storms and clear flooded drains to allow people access to their properties as the street floods from the enormous amount of plant debris that clogs the drains as a street sweeper comes once in a blue moon. My husband was the one who cleared the street in that dreadful November storm so people could return home to assess their houses and you ask me what you should do about bats! Get your priorities straight.
- I can't see the options or go back to them so can't answer. I think betting for trees has to be carefully considered so as not to entrap bats as is often the case
- I don't want to see the flying foxes disturbed or moved on. I'd like to see them flourish rather than decline as it is currently. I'd like to see harsh penalties for the people who have been disturbing the bats rather than the lack of action by the council. The flying foxes were here long before the residents and if you move into this area you have to accept that fact and enjoy the bats for what they bring.
- Just get rid of them and do what the people who elect you want not a minority of conservative environmentalists.
- Land clearing- don't need to remove vegetation for animals to live
- Management should be for the whole environment. Excessive attention to the flying fox colony over the years has contributed to an imbalance of the natural environment. LOOK AFTER THE WHOLE ENVIRONMENT
- Need to have more information about some of the management options before I can provide an opinion.
- No (x 4 responses)
- No - I am more interested in Council taking care of roads; entrances/exists from Railway stations; helping the aged and disabled
- No amount of education is going to appeal to people who live directly next to the flying foxes, at certain times of year like now we are impacted at night by the flying foxes.
- No they all sound good Flying Foxes are a vital part of the bush regeneration and pollination
- not really interested to know
- not sure what options you are referring to? But guessing, bushfire hazard reduction is more important than other land management considerations including bats. Because if there is a big bushfire, there will be no bats in the future and residence safety is at threat if bats are given preference. Afterall, bats only came to the area after residency in 1940.
- Only interesed to hear about management options that actively push the colony further into the reserve or disperse the camp.
- Only options that move the bats away from houses appeal to me.
- Only options which create a safe , viable , enduring separation between bats and humans is feasible. Bats carry disease. Bats in Wuhan have been proven to carry Coronavirus. Have these bats in Gordon ever been scientifically tested for disease? (Date of test; number of bats in survey; results???)
- Quite frankly I don't think Council has been proactive in looking for ways to lessen the impacts on residents
- Relocating the flying bats elsewhere from residential area just like what Royal Botanical Garden did a few years back

- Seek the knowledge of on-the-ground conservationists
- Sprinklers
- Subsidies water of money. Education so people who choose to live in area are aware of issues they may face
- The management options that involve whingy entitled people asking the Council to intervene do not appeal to me. The bats have been there for 20 million years.
- The only management options which appeal to me are the ones which remove the flying foxes all together from areas close to homes
- The options are located on the previous page. As a result, I now have no idea what they were and I cannot comment on them.
- There are 14 hectares of land for the flying foxes. We used to live here very happily next to the reserve. In the last 8 years,the bats have moved closer to residents. Maybe feeding them changed their dynamics. Unfortunately, This has led to restricting residents to participate in an outdoor style of living, and has decreased the value of our properties. The focus has been on preserving the bats, not of any rights of the residents.
- There no reason for the bats to be right up next to our homes. It is just nothing more than poor excuses as to why they can't be pushed back into the massive bush land away from homes where they use to be. Double glazing and air conditioning etc just makes us prisoners in our own homes.
- There was an increase in population after flying foxes were relocated from the Sydney Botanical Gardens (due to tree damage) and trees have been dying in the reserve since then and the population of flying foxes has moved closer to homes - they were mostly down the valley closer to arterial prior to this.
- Thinning of trees do not appeal to me as the canopy bearing trees is already so low in the area. The availability of habitat trees is also so important for many species not just flying foxes making the reduction of trees in an already residential dominated area devastating. The use of deterrents does not appeal to me either as flying foxes already have to deal with so many threats already including loss of habitat and increasing temperatures creating more deadly heatwave events.
- Tree trimming as the bats are utilising the edges of the reserve.
- Tree trimming could create problems
- Using any measure that drives off animals or disrupts their lives is abhorrent. Eg sprinklers. We have overdeveloped their habitat, reducing their numbers and now we should give them room to live. Note global warming will probably kill many. Or would sprinklers be used to keep them cool- I may have misinterpreted strategy. Depends on strength of sprinklers.
- Waste of rates
- We could benefit from more double glazing for a room that does not have it and pool covering is important helps to kept pool cleaner.
- We need a buffer between houses and the camp. Council has refused to do anything about it for years.
- We travel to that area bush walking at least once a week. Planning on move there from eastern suburbs.
- We want to know why the massive previous flights nightly of bats has stopped. Where are they since the retirement home massive complex started, have they all moved on because of the horrific long term noise , will they recover as it's a nearly 3 year total now since its beginning . A year to go.

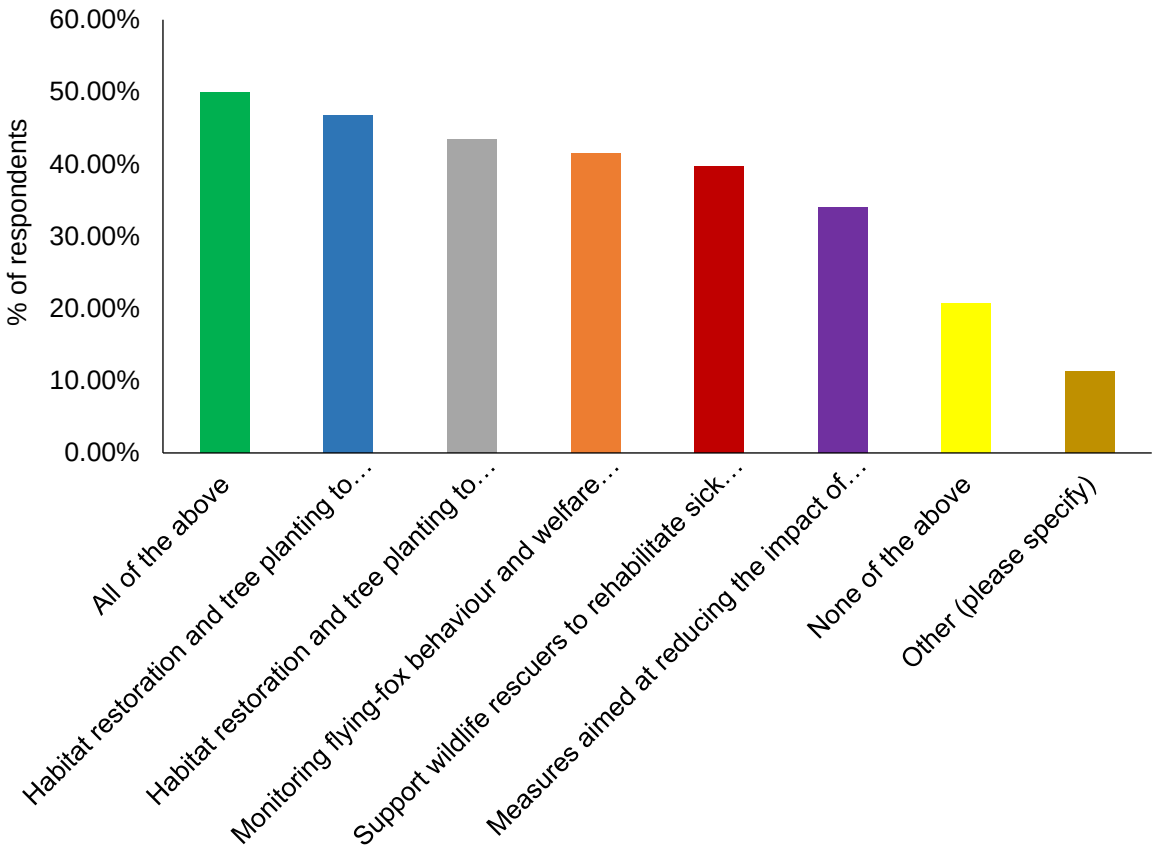
19. Select things you would like considered for a subsidies program that could assist you:

Answer choices	Responses	
Educational signage	60.11%	110
Annual bat night with bat specialists, community and local government	56.83%	104
Talks by Traditional Owners/wildlife carers/rangers/Sydney Bats/KBCS	54.10%	99
Opportunities to meet a flying-fox	36.61%	67
Promote the flying-fox camp as an asset to future residents	55.19%	101
Fact sheets with up-to-date information regarding flying-foxes or the camp	62.30%	114
Website with links to up-to-date information	61.20%	112
School engagement programs	54.64%	100
Other (please specify)	16.94%	31
	Answered	**183**
	Skipped	**61**



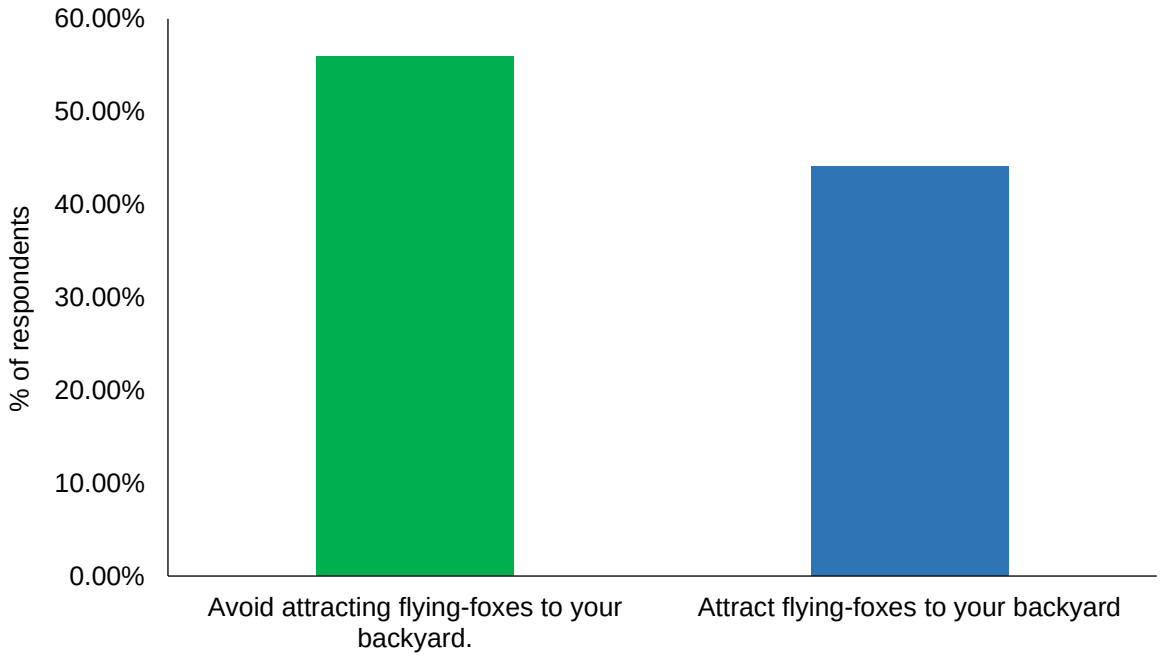
20. Which of the following actions do you feel are appropriate to protect flying-foxes in the Reserve?

Answer choices	Responses	
Habitat restoration and tree planting to protect the camp	46.70%	99
Habitat restoration and tree planting to provide more native foraging habitat	43.40%	92
Support wildlife rescuers to rehabilitate sick or injured flying-foxes	39.62%	84
Monitoring flying-fox behaviour and welfare during work in the Reserve	41.51%	88
Measures aimed at reducing the impact of heat stress events on flying-foxes	33.96%	72
All of the above	50.00%	106
None of the above	20.75%	44
Other (please specify)	11.32%	24
	Answered	**212**
	Skipped	**32**



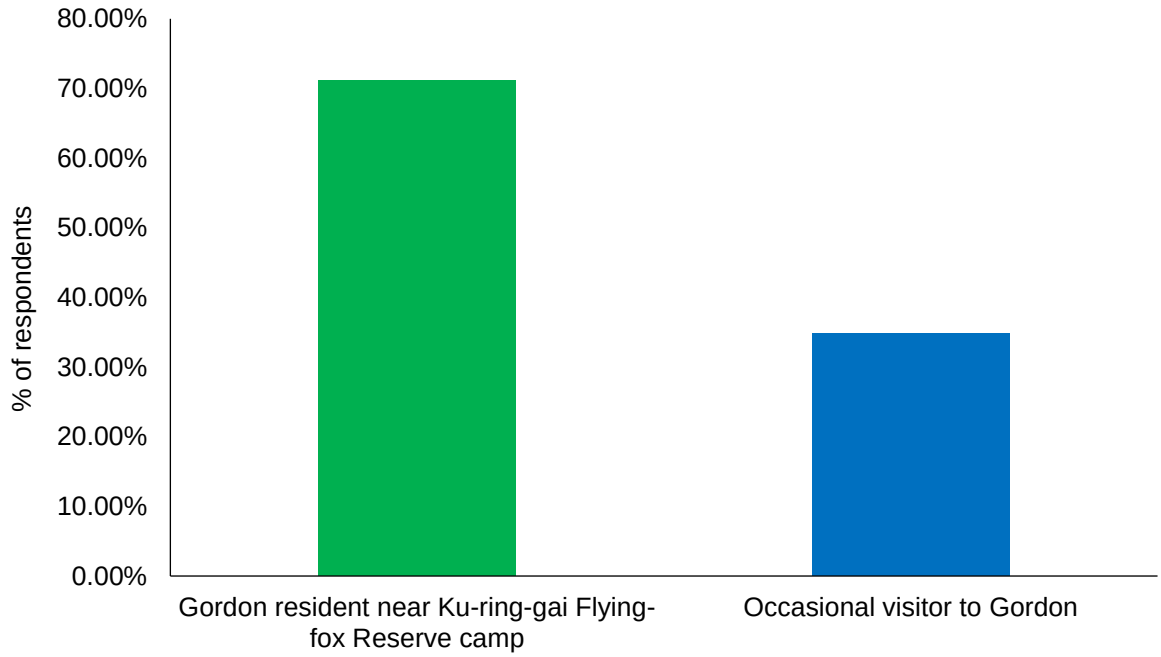
21. Would you like more information about garden plants that:

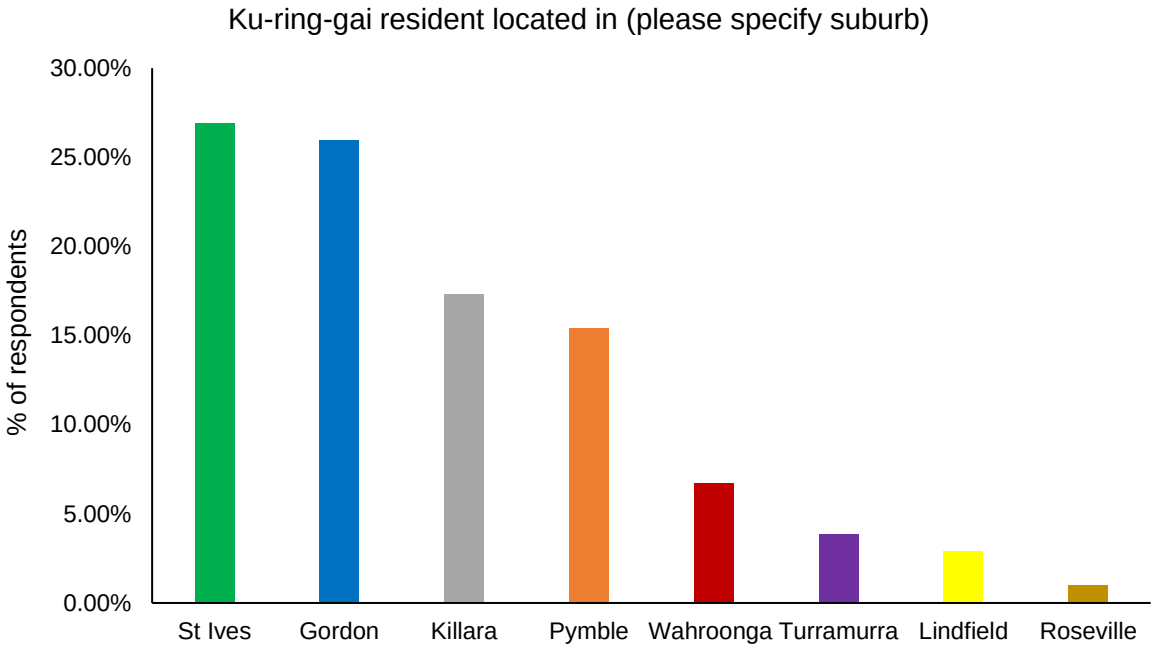
Answer choices	Responses	
Attract flying-foxes to your backyard	44.08%	67
Avoid attracting flying-foxes to your backyard.	55.92%	85
	Answered	**152**
	Skipped	**92**

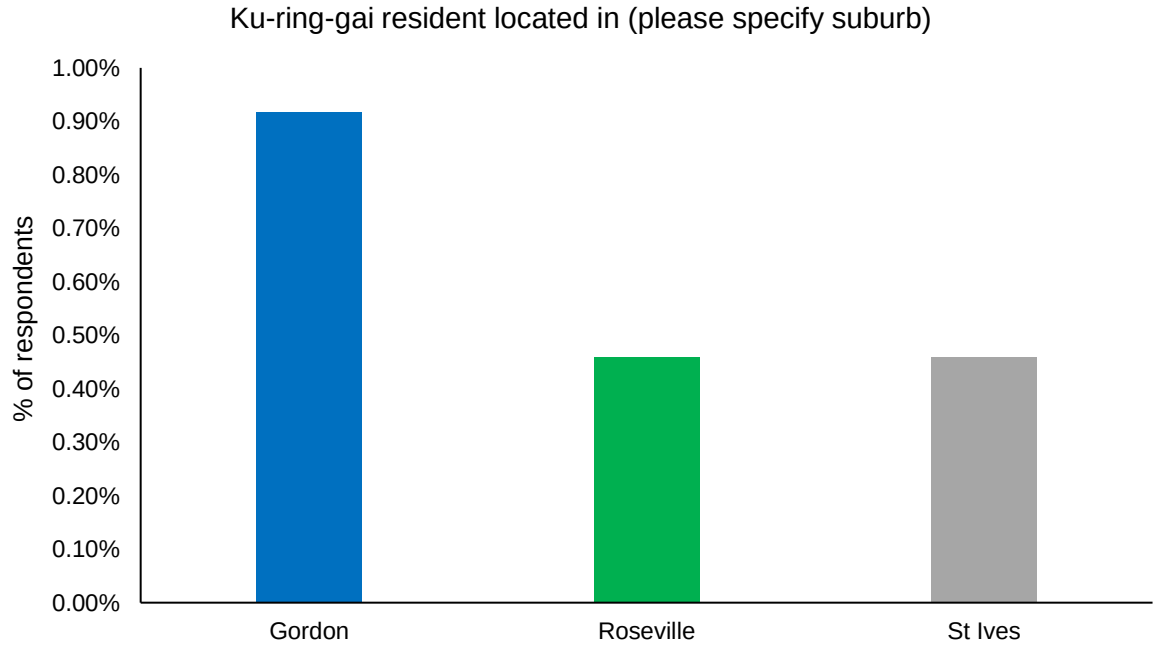


22. Which of the following best describes you? (Type in the relevant box)

Answer choices	Responses	
Gordon resident near Ku-ring-gai Flying-fox Reserve camp (yes/no)	46.33%	yes = 101 respondents
Occasional visitor to Gordon (yes/no)	25.23%	yes = 55 respondents
Ku-ring-gai resident located in (please specify suburb)	graph below	104
Ku-ring-gai business owner located in (please specify suburb)	graph below	yes = 4 respondents
Member of a club or group (please specify)	listed below	yes = 27 respondents
Other	5.05%	11
	Answered	**218**
	Skipped	**26**







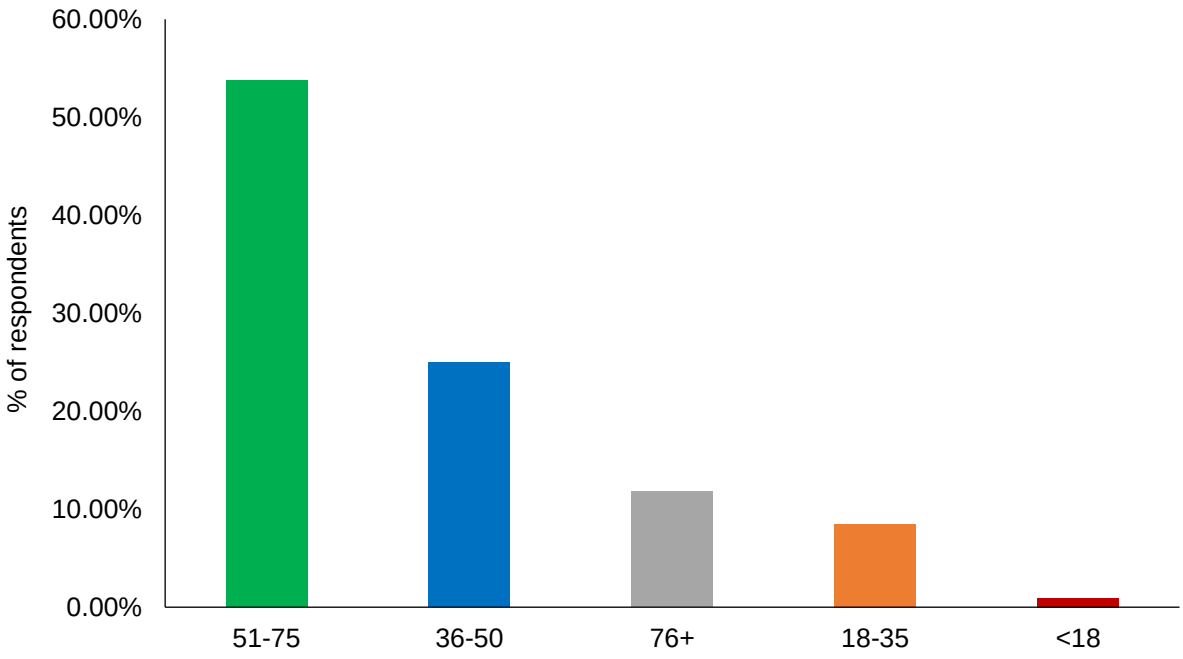
Member of a club or group (please specify):

- Friends of Ku-ring-gai Environment
- Ku-ring-gai Bat Conservation Society (**x 6 respondents**)
- I'm no longer a WIRES rescuer (expired), only virtual supporter, but did the course to understand the wildlife in my backyard
- Scouts (**x 4 respondents**)
- Sydney Wildlife
- SES

- Sustainability Ku-ring-gai
- Bush regenerator
- Probus
- StreetCare (**x 2 respondents**)
- STEP (**x 5 respondents**)
- Australian Plants Society North Shore Group
- Ku-ring-gai Community Workshop
- Ku-ring-gai Flying-fox Reserve Bushcare Group (**x 3 respondents**)
- Volunteer NPWS bush regenerator
- WildThings

23. What age group are you in?

Answer choices	Responses	
<18	0.94%	2
18-35	8.49%	18
36-50	25.00%	53
51-75	53.77%	114
76+	11.79%	25
	Answered	**212**
	Skipped	**32**



24. Other comments:

	Answered	**54**
	Skipped	**190**

Comments:

- An issue that also concerns me and haven't known who to talk to about it is the big signs real estate agents use close to the bat camps they are lit up all night and I imagine are confusing and disturbing to bats and other nocturnal Wild life. Is there anyway we could stop these signs from being lit up all night?
- I have always supported the bat colony. They deserve a home as much as we do. As for complaints about noise, you never hear them as they are sleeping during the day. In this neighbourhood I hear more noise from barking canines than noise from bats
- Love that we live close to the reserve and wildlife and know the bats are essential and beautiful creatures. Don't enjoy the noise or smell but understand that it is a part of living where we do.
- The flying fox colony seems to be continually growing. Surely, they can be shared around Sydney. Not all sent to Gordon.
- Please keep in mind how important flying foxes are to the ecological health of NSW. Make it a priority to inform buyers thinking of coming to the area that there is a preexisting, protected bat colony nearby, and they should factor that in to their decision making process. Thank you, and please support the bats.
- Well done to KMC /NSW Govt & the many. volunteers supporting the Gordon Flying Fox colony
- Flying foxes are an important part of the Australian ecosystem. However in the same way that the Flying Foxes were moved on from the Botanic Gardens because they were a pest in that environment, they should be moved on from Gordon because they are pest in a residential environment.
- Protect the Flying foxes !
- The flying foxes must be removed from areas around homes. Between the noise, the damage to property, the smell, the house depreciation, the fact that council continuously puts these animals before the welfare of the residents and seems to never do anything about this major issue in gordon is leading to extraordinary levels of anxiety and depression and general deterioration of mental health within a vast portion of residents. Yet for some reason, these animals that are in plague proportions destroying beautiful bush land and residents lives all across this country are put first every time. A simple canopy mounted sprinkler system would most likely be very effective in this area.
- Ku-ring-Gai council are actively seeking to keep the bats next to our homes as they have absolutely no compassion for the residents at all.
- I sometime struggle with thoughts that the views of the average person can be relied on as useful.
- Please keep me informed
- Public education is crucial. Only a small number of people understand the importance of grey flying foxes and the positive impact they have on our environment
- The conservation program is one of the best initiative the council has undertaken. The council should increase residents awareness re flying fox critical roles in the ecosystem.

- Scientific advice/opinion regarding the possibility of bats being vectors for communicable disease. Is it possible to disperse the concentration of the colony to reduce its detrimental impact in a humane way?
- The biggest challenge for us is the excrement affecting solar panels. Our neighbour's panels are covered and it's difficult to remove safely. We are planning on installing solar and we're concerned about the bat excrement. Some support by council to clean solar panels would be excellent. (We live on Kardella Ave, Killara under the flight path)
- Thanks for caring enough to ask the community.
- Council need to think very carefully about wording in letters sent to residents regarding the flying foxes. Dictatorial language threatening regulatory action will get you absolutely nowhere with residents. We are not idiots.
- Its ok when its not near you. try living with them and then reassess your conservation approach.
- Urban flyingfox camps are important and the Gordon camp is an example of best practice flying fox management. I appreciate Kuring-gai Councils efforts to balance residents needs and protecting the camp. Ensuring houses are sound proof and making long term plans to rehabilitate the forest to encourage the camp to move away from residents is the best option. I look forward to being able to see a draft management plan with multiple aims that will achieve this balance.
- We must protect wildlife for future generations
- They were here before any local bought a house here. If you don’t like them, move.
- We have not been aware of any bat activity this summer and are very concerned that many of them died from heat stress last summer. Are they still in the reserve?
- We have lived here since 1980 when flying foxes gathered in huge groups on the Morton Bay fig trees next door. Today the trees are still there but there are no foxes at all They just vanished !
- Is there a reason why re-location of the bat reserve was not included as an option, as per Sydney's Botanical Gardens, as lobbied by high profile owners in adjacent apartment blocks at Circular Quay ?
- More and more signage and educational info for visitors. Patrols as checks on bat welfare? eg to stop kids going in the reserve and doing graffiti (paint smell can be disgusting to humans. Am unsure how bats feel). Better advertising of local groups that are interested in the bats and the reserve. How local residents could do more.
- Please do everything possible to help these wonderful creatures and vigorously pursue and prosecute residents (especially the new arrivals who have just fled apartments), who fell trees or poison them because they can't cope with the environment.
- It is a privilege to live within close proximity to flying foxes, i would like to support efforts in their conservation as a top priority. I believe there is too much misinformation surrounding flying foxes and that they are undervalued in their incredible role played in the ecosystem. Protect Flying foxes!!
- This survey seems very slanted in one direction and doesn't appear to really be interested in helping the residents that are impacted. The bat colony needs to be reduced and the pain shared with other viable sites. Whilst I think they are cute and like seeing them come out at night, and think they are an important species, managing their numbers is important if we are to have to put up with the impacts and hygiene issues they pose.
- Many of the survey questions are frame with a bias attitude towards bat conservation and predetermined outcomes, rather than finding out about general ideas and feelings. For example question "Flying-foxes are a crucial part of Australia’s ecosystem and need to be protected". This is a two part question and the parts do not need to go together as two independent and separate actions (clauses). It would be better if asked separately and the answers could be more precise.
- The flying foxes are incredibly important and must be protected.
- Thank you for you thoughtful care and management of these important animals. We live to watch them Fly over our house at sunset.

- So good, promising, and proud to see that I Live in a council area that cares about our wildlife and conducting such a survey Like this one. If I was to request for any immediate action, would be for more wildlife road signs for the possums, wallabies, and all birds too much road kill just on Rosedale rd alone.
- You should direct your focus more on managing dying, dead, sick trees on the natures strip that belong to you by doing yearly inspections and trimming and not relying on residents having to chase you up. Also creating a balance between development and tree growth. Saying no to a simple development on a million dollar land is not a balance. It is being barbaric.
- Whilst I don't particularly like them (I dont think they're cute etc) and I have big splotches of bat poo on my house that are difficult to remove... they're important to the ecosystem and we need to look after them. And I understand they must cause problems for those living near but were the bats there first? But if the council needs to do something to help the situation for close residents, then make it as careful/natural as possible.
- A wonderful part of choosing to live in Gordon includes sharing our environment with local wildlife. I value the work that is done to protect our local habitat.
- Kuringai must play a large part in preserving ur wildlife and making sure that development does not drive any native animals or vegetation into smaller and smaller pockets of land
- They deserve to be saved not killed
- The flying foxes have been there for a long long time. When we purchased property in the area we knew they were there. It is not acceptable to complain about flying foxes afterwards. If you don't like them don't buy property near them.
- Have the displaced flying foxes from the Botanical Gardens in Sydney found shelter in Gordon?
- Flying foxes are dangerous to our health. Please have them removed from our Council area.
- Stop protecting them clear them out.
- Please plant more native trees to increase current population and to replace the ageing ones before they die off or are damaged. I notice this need particularly in Swain Garden Killara
- Assuming none of these complain-y people bought into the area more than 20 million years ago, I'm guessing that they knew the bats were here, when they chose where to buy a house. The bats are a big asset!
- we would like to see the statistical analysis of the survey findings and to understand how the findings will be used to inform managements strategies for clear fell separations from residential properties to the camp, reducing numbers in the camp, planting foraging vegetation deeper into the vast reserve area away from residents, not simply mitigation of impacts at a resident etc nets, covers, double glazing. these are tokenistic measures that do not improve lifestyle only create more work and mean we cant use out outdoors freely.
- The flying foxes have their place in our ecosystem but they should be moved away from residents. As a start council need to create a buffer between the residents and the camp.
- Can we please have a council that works toward implementing effective measure for alleviating residents massive problems from living next to the reserve.
- One of the issues would be - how to move the flying foxes so they don't border onto homes, can they be moved to more forest not close to residential areas?
- I think some of these questions are an absolute joke. It shows the direction council is taking to the detriment of residents. There should be a warning with every house for sale that is likely to be impacted.
- This may be the 15th or 20th year that affected residents have periodically appealed (either individually or in formal meetings at the Council Chambers) to Council to enable us to enjoy our houses and gardens. Unfortunately, we have abandoned hope because nothing positive to distance us from the noise and fouling, has been done. We feel abandoned and just keep the windows shut when noise is at its peak and keep alert for fouling of all outdoor surfaces

- Enough with the surveys etc we the rate payers want action! There is a small amount of area that needs to be cleared for a mentally sane existence. If you have NEVER lived near a colony you can't ever understand what it is like to endure the smell and noise. To have fresh clean air is human right!
- Let's ensure the flying fox colony can not just survive but thrive in Gordon
- It is important to understand the weighting you will apply on your research from people who are not personally affected. NOBODY who hasn't live next to a colony can understand the impact daily living with bats can have on mental health and lifestyle.

Appendix 8 Human and animal health

Flying-foxes, like many 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 humans or 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 below.

Excluding those people whose occupations require contact with bats, such as wildlife carers and vets, human exposure to ABLV, HeV and Menangle virus, their transmission and frequency of infection is extremely rare. HeV infection in humans requires transfer from an infected intermediate equine host (i.e. close contact with an infected horse) and spread of the virus directly from bats to humans has not been reported.

These diseases are also easily prevented through vaccination, personal protective equipment, safe flying-fox handling (by trained and vaccinated personnel only) and appropriate horse husbandry. Therefore, 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 also judged to be low (Qld Health 2016).

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 management 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 or deceased 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.

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 2015).

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.

Coronaviruses

Coronaviruses are found in bats, birds and other wildlife worldwide. While SARS-CoV-1 (SARS), MERS-CoV (MERS) and SARS-CoV-2 (COVID-19) have caused serious disease in humans, coronaviruses isolated from Australian bats are not closely related to these and no human health implications have been identified (WHA 2020).

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 diseases.

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 9 Camp management options from the NSW framework

Below is an overview of management options commonly used throughout NSW and Australia which were considered in the development of the PoM. These are categorised as Level 1, 2 or 3 in accordance with the Policy.

Level 1 actions: routine camp management

Education and awareness programs

This management option involves undertaking a comprehensive and targeted flying-fox education and awareness program to provide accurate information to the local community about flying-foxes.

Such a program would include information about managing risk and alleviating concern about health and safety issues associated with flying-foxes, options available to reduce impacts from roosting and foraging flying-foxes, an up-to-date program of works being undertaken at the camp, and information about flying-fox numbers and flying-fox behaviour at the camp.

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 fruit trees and 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.

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.

An education program may include components shown in the figure below.

Possible components of an education program.

Property modification without subsidies

The managers of land on which a flying-fox camp is located would promote or encourage the adoption of certain actions on properties adjacent to or near the camp to minimise impacts from roosting and foraging flying-foxes:

- Create visual/sound/smell barriers with fencing or hedges. To avoid attracting flying-foxes, species selected for hedging should not produce edible fruit or nectar-exuding flowers, should grow in dense formation between two and five metres (Roberts 2006) (or be maintained at less than five metres). Vegetation that produces fragrant flowers can assist in masking camp odour where this is of concern.
- Manage foraging trees (i.e. plants that produce fruit/nectar-exuding flowers) within properties through pruning/covering with bags or wildlife friendly netting, early removal of fruit, or tree replacement.

- Cover vehicles, structures and clothes lines where faecal contamination is an issue, or remove washing from the line before dawn/dusk.
- Move or cover eating areas (e.g. BBQs and tables) within close proximity to a camp or foraging tree to avoid contamination by flying-foxes.
- Install double-glazed windows, insulation and use air-conditioners when needed to reduce noise disturbance and smell associated with a nearby camp.
- Follow horse husbandry and property management guidelines provided at the NSW Department of Primary Industries Hendra virus web page (DPI 2015).
- Include suitable buffers and other provisions (e.g. covered car parks) in planning of new developments.
- Turn off lighting at night which may assist flying-fox navigation and increase fly-over impacts.
- Consider removable covers for swimming pools and ensure working filter and regular chlorine treatment.
- Appropriately manage rainwater tanks, including installing first-flush systems.
- Avoid disturbing flying-foxes during the day as this will increase camp noise.

The cost would be borne by the person or organisation who modifies the property; however, opportunities for funding assistance (e.g. environment grants) may be available for management activities that reduce the need to actively manage a camp.

Property modification subsidies

Fully funding or providing subsidies to property owners for property modifications may be considered to manage the impacts of the flying-foxes. Providing subsidies to install infrastructure may improve the value of the property, which may also offset concerns regarding perceived or actual property value or rental return losses.

The level and type of subsidy would need to be agreed to by the entity responsible for managing the flying-fox camp.

Service subsidies

This management option involves providing property owners with a subsidy to help manage impacts on the property and lifestyle of residents. The types of services that could be subsidised include clothes washing, cleaning outside areas and property, car washing or power bills. Rate reductions could also be considered.

Critical thresholds of flying-fox numbers at a camp and distance to a camp may be used to determine when subsidies would apply.

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 noxious weeds under the Noxious Weeds Act 1993, or species listed as undesirable by a council
- trimming of understorey vegetation
- 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.

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 lawn-mowing, using chainsaws, whipper-snippers, using generators and testing alarms or sirens.

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.

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. Consideration should be given to tree species that will provide year-round food, increasing the attractiveness of the designated site. 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 and suitable land tenure can assist in initial alternative site selection. A feasibility study would then be required prior to site designation to assess likelihood of success and determine the warranted level of resource allocated to habitat

improvement.

Provision of artificial roosting habitat

This management option involves constructing artificial structures to augment roosting habitat in current camp sites or to provide new 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.

Protocols to manage incidents

This management option involves implementing protocols for managing incidents or situations specific to particular camps. Such protocols may include monitoring at sites within the vicinity of aged care or child care facilities, management of compatible uses such as dog walking or sites susceptible to heat stress incidents (when the camp is subjected to extremely high temperatures leading to flying-foxes changing their behaviour and/or dying).

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.

Odour neutralising trial

Flying-foxes communicate with one another using pheromones, which results in the characteristic musky smell around flying-fox roosts. Odour may be more intense during the breeding and rearing season as female flying-foxes use scent to find their pups after foraging, and males regularly mark their territories. Likewise, odour is stronger after rain as males re-mark branches in their territories. While there are no known direct human health impacts associated with this smell, it is a common cause of conflict with local communities. In research by Currey et. al. (2018) in which 43 government agencies were surveyed, odour consistently ranked as one of the most concerning for communities living with flying-foxes.

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.

Property acquisition

Property acquisition may be considered if negative impacts cannot be sufficiently mitigated using other measures. This option will clearly be extremely expensive, however is likely to be

more effective than dispersal and in the long-term may be less costly.

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.

Level 2 actions: in-situ management

Buffers

Buffers can be created through vegetation removal and/or the installation of permanent/semi-permanent deterrents.

Creating buffers may involve planting low-growing or spiky plants between residents or other conflict areas and the flying-fox camp. Such plantings can create a visual buffer between the camp and residences or make areas of the camp inaccessible to humans.

Previous studies have recommended that vegetation buffers consisting of habitat not used by flying-foxes, should be 300 m or as wide as the site allows to mitigate amenity impacts for a community (SEQ Catchments 2012). Buffers need to take into consideration the variability of use of a camp site by flying-foxes within and across years, including large, seasonal influxes of flying-foxes. The usefulness of a buffer declines if the flying-fox camp is within 50 m of human habitation.

Buffers through vegetation removal

Vegetation removal aims to alter the area of the buffer habitat sufficiently so that it is no longer suitable as a camp. The amount required to be removed varies between sites and camps, ranging from some weed removal to removal of most of the canopy vegetation.

Any vegetation removal should be done using a staged approach, with the aim of removing as little native vegetation as possible. This is of particular importance at sites with other values (e.g. ecological or amenity), and in some instances the removal of any native vegetation will not be appropriate. Thorough site assessment will inform whether vegetation management is suitable (e.g. can impacts to other wildlife and/or the community be avoided?).

Removing vegetation can also increase visibility into the camp and noise issues for neighbouring residents which may create further conflict.

Suitable experts should be consulted to assist selective vegetation trimming/removal to minimise vegetation loss and associated impacts.

The importance of under- and mid-storey vegetation in the buffer area for flying-foxes during heat stress events also requires consideration.

Buffers without vegetation removal

Permanent or semi-permanent deterrents can be used to make buffer areas unattractive to

flying-foxes for roosting, without the need for vegetation removal. This is often an attractive option where vegetation has high ecological or amenity value.

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, fluoro vests (GeoLINK 2012) and balloons (Ecosure, 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. Potential for litter pollution should be considered and managed when selecting the type and placement of visual deterrents. In the absence of effective maintenance, this option could potentially lead to an increase in rubbish in the natural environment.
- Noise emitters on timers – Noise 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 current trials in Queensland are 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.

Noise attenuation fencing

Noise attenuation fencing aims to reduce noise and potentially odour where the roost is close to residents. Noise attenuation fencing could be installed in areas where the camp is particularly close to residents. This may also assist with odour reduction, and perspex fencing could be investigated to assist fence amenity. Although expensive to install, this option could negate the need for habitat modification, maintaining the ecological values of the site, and may be more cost-effective than ongoing management.

Level 3 actions: disturbance or dispersal

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 (as identified by a flying-fox expert).

Dispersal

Dispersing flying foxes can be achieved in two ways:

- actively disturbing the roost without removing vegetation
- passively by removal of all roosting habitat.

Dispersal via disturbance has been shown to reduce complaints and improve amenity in the short term, however, roosts are usually recolonised, and the conflict remains (Roberts & Eby 2013; Ecosure 2014; Currey et al. 2018). Data from these studies show that in 95% of cases, dispersal did not reduce the number of flying-foxes from the local area. In 85% of dispersals, new camps established nearby and in 63% of dispersals, the animals moved within 600 m of the original site and the conflict was often not resolved (Roberts & Eby 2013).

Driving flying-foxes away from an established roost is challenging and resource intensive. There are a range of risks associated with roost dispersal. These include:

- shifting or splintering the roost into other locations that are equally or more problematic
- impacts on animal welfare and flying-fox conservation
- impacts on the flying-fox population including disease status and associated public health risk
- impacts to the community associated with ongoing dispersal attempts
- increased aircraft strike risk associated with changed flying-fox movement patterns
- high initial and/or ongoing resource requirement and financial investment
- negative public perception form community members opposed to dispersal.

Dispersing flying-foxes is unpredictable and there is no guarantee that flying-foxes will be successfully relocated or where they will relocate to.

Despite these risks, there are some situations where camp dispersal may be considered.

'Passive' or 'active' is described further below.

Passive dispersal

Removing vegetation in a staged manner can be used to passively disperse a camp, by gradually making the habitat unattractive so that flying-foxes will disperse of their own accord over time with little stress (rather than being more forcefully moved with noise, smoke, etc.). This is less stressful to flying-foxes, and greatly reduces the risk of splinter colonies forming in other locations (as flying-foxes are more likely to move to other known sites within their camp network when not being forced to move immediately, as in active dispersal).

Generally, a significant proportion of vegetation needs to be removed in order to achieve dispersal of flying-foxes from a camp or to prevent camp re-establishment. For example, flying-foxes abandoned a camp in Bundall, Queensland once 70% of the canopy/mid-storey and 90% of the understorey had been removed (Ecosure 2011). Ongoing maintenance of the site is required to prevent vegetation structure returning to levels favourable for colonisation by flying-foxes. Importantly, at nationally important camps (Appendix 1) sufficient vegetation must be retained to accommodate the maximum number of flying-foxes recorded at the site.

This option may be preferable in situations where the vegetation is of relatively low ecological and amenity value, and alternative known permanent camps are located nearby with capacity to absorb the additional flying-foxes. While the likelihood of splinter colonies forming is lower than with active dispersal, if they do form following vegetation modification there will no longer be an option to encourage flying-foxes back to the original site. This must be carefully considered before modifying habitat.

There is also potential to make a camp site unattractive by removing access to water sources. However, at the time of writing this method had not been trialled so the likelihood of this causing a camp to be abandoned is unknown. It would also likely only be effective where there are no alternative water sources in the vicinity of the camp.

Active dispersal through disturbance

Dispersal is more effective when a wide range of tools 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, and this needs to be considered during planning and community consultation.

This method does not explicitly use habitat modification as a means to disperse the camp, however if dispersal is successful, some level of habitat modification should be considered. This will reduce the likelihood of flying-foxes attempting to re-establish the camp and the need for follow-up dispersal as a result. Ecological and aesthetic values will need to be considered

for the site, with options for modifying habitat the same as those detailed for buffers above.

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. 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.

Unlawful activities

Culling

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

Culling was used in the early 1800’s and into the 1920s.

Site-specific analysis of camp management options

Table 4 Management options analysis.

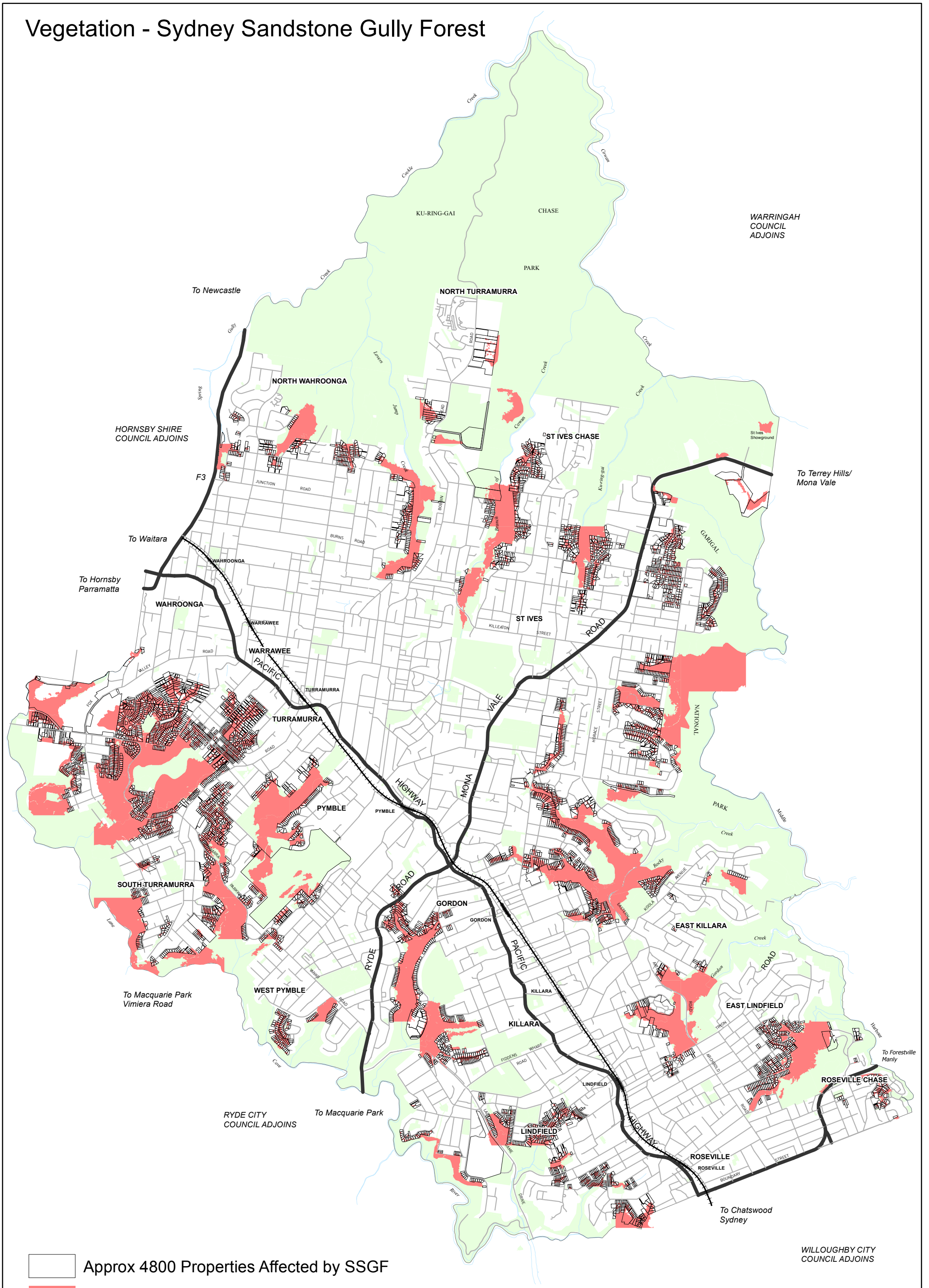
Management options	Advantages	Disadvantages	Suitability for site	Appraisal
Level 1 actions				
Education and awareness programs	Low cost, promotes conservation of flying-foxes, contributes to attitude change which may reduce general need for camp intervention and reduce anxiety, increasing awareness 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 in isolation would not be acceptable to the community.	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. Survey results indicate the community supports flying-fox conservation including in the KFFR, along with in situ measures to reduce impacts on nearby residents.	Adopt
Property modification	Property-level impact mitigation (e.g. double-glazing, noise attenuating insulation, car covers, boundary barriers such as dense plantings with fragrant flowers) is one of the most effective ways to reduce amenity impacts, and provides more certain outcomes compared with attempting to manage flying-foxes or their habitat. It is relatively low cost, can be included in building design and materials, will not impact on the camp and may add value to the property.	May be cost-prohibitive for private landholders, unlikely to fully mitigate community concerns.	Of the 131 survey respondents living near the camp, 34.65% were interested in a subsidies program to assist with property modification and other options. Interest level may be somewhat reduced based on significant program already implemented to assist with double-glazing affected properties.	Implement subsidies program
Service subsidies	Service subsidies (e.g. assistance with cleaning faecal drop) may encourage tolerance of living near a camp, promotes conservation of flying-foxes, can be undertaken quickly, will not impact on the site, would reduce the need for property modification.	Costly over a large scale which must be considered if proposed development intends to increase dwelling density around camp.		
Routine camp management	Can improve amenity at the site as well as impacts to biodiversity such as weeds on the	Will not generally mitigate amenity impacts for nearby landholders.	The Habitat Plan details how work within the KFFR and surrounds is to be implemented	Adopt

Management options	Advantages	Disadvantages	Suitability for site	Appraisal
	site and in downstream areas.	Weed removal and bushfire management has the potential to reduce roost availability and reduce numbers of roosting FFs. Removing weeds also changes the microclimate which can increase camp temperature and therefore susceptibility to HSEs.	to avoid flying-fox impacts.	
Alternative habitat creation	If successful in attracting FFs away from high conflict areas, dedicated habitat in low conflict areas will mitigate all impacts and helps 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.	Potential additional / alternative habitat in low conflict areas within and beyond the KFFR should be improved to encourage flying-foxes further from residences. Flying-fox camp habitat modelling is available via Local Government NSW that assist informing suitable locations.	Adopt
Provision of artificial roosting habitat	Artificial roosting habitat (e.g. ropes) could be considered to supplement the canopy if weed removal or camp management effects available roosting space.	No guarantee that flying-foxes would use artificial habitat but collaborating with a researcher on varying design options would increase the likelihood of success.	To date artificial habitat structures have not been effective, however these could be considered for low conflict locations in the KFFR if improved methods are identified.	Monitor research progress
Protocols to manage incidents	Low cost, will reduce actual risk of negative human/pet–FF interactions, promotes conservation of FFs, can be undertaken quickly. In some cases, infrastructure problems such as power black-outs from flying-foxes being electrocuted on powerlines may be avoided by proactive management.	Will not mitigate amenity impacts.	Council responds to incidents, such as disturbance in accordance with internal protocols. Other protocols for development include responding to HSEs (as intervention research progresses) and a flying-fox rescue protocol.	Adopt
Research	Support research that improve understanding and more effectively mitigates impacts. Develop understanding of native flowering event in area.	Generally, cannot be undertaken quickly, management trials may require cost input.	Council support relevant research projects. New research should be reviewed at least annually and incorporated into management where appropriate.	Adopt
Appropriate land-use planning	Planning for future land use where possible will reduce potential for future conflict between community and flying-fox camps.	Will not generally mitigate current impacts.	Incorporate planning controls where possible.	Investigate

Management options	Advantages	Disadvantages	Suitability for site	Appraisal
Property acquisition			Council has previously acquired properties to conserve flying-fox habitat. Additional property acquisition is cost prohibitive.	
Level 2 actions				
Buffers through vegetation removal	Can provide a buffer between the community and flying fox camps which can reduce concerns in some instances.	Removing vegetation can remove noise, odour and visual buffering which may create additional conflict. Vegetation removed may exacerbate the impacts of HSEs.	Select vegetation removal was undertaken in a 10 m buffer area in 2015. Given the ecological values of the KFFR and the Conservation Agreement of the KFFR, it is unlikely additional vegetation removal will be considered for buffers. Trimming trees overhanging private properties will be considered if a matter of safety. 60 people responding to the survey also indicated they were concerned about this type of management.	
Buffers without vegetation removal – visual deterrents, canopy mounted sprinklers	Canopy-mounted water sprinklers to create buffers have been effective at many camp sites in Queensland with no welfare impacts observed during monitoring. Visual deterrents – Visual deterrents such as plastic bags, 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.	Can be logistically difficult (installation and water sourcing) and may be cost-prohibitive. Misting may increase humidity and exacerbate HSEs, and overuse may impact other environmental values of the site. Water restriction consideration required. The type and placement of visual deterrents would need to be varied regularly to avoid habituation. May appear an eye-sore and lead to increase in rubbish in the natural environment.	Visual deterrents have low suitability and effectiveness, and are not in line with the intent for the site. 53 survey respondents said they were concerned about buffers with deterrents such as sprinklers. Several expanded that they were concerned with canopy-mounted sprinklers as they either did not have sufficient information to understand the system, or were worried it would negatively impact flying-foxes. Information should be provided to the community about how sprinklers may be used, and how impacts associated with them would be avoided (e.g. appropriate times of the day and year they could be used, heat/humidity conditions that would trigger them being inactivated, etc.).	
Noise attenuation fencing	Standard noise attenuation fencing is intended to alleviate amenity issues for residents. Advice from an acoustic consultant may provide site-specific alternatives.	Noise attenuation fencing is costly and can be considered unsightly if not cleaned of faecal drop.	Noise attenuating building materials should be considered in future land use adjacent to the camp, however fencing is not appropriate at this site.	Fencing not appropriate Noise attenuating building materials to be incorporated

Management options	Advantages	Disadvantages	Suitability for site	Appraisal
Level 3 actions				
Nudging	Can encourage flying-foxes to shift away from high conflict areas next to residential areas.	May lead to inadvertent dispersal if not done at the correct time, frequency or duration. Resource intensive with flying-foxes quickly returning to their favoured roost trees.	Actively disturbing flying-foxes from their roost space is not aligned with the Conservation Agreement or management intent.	Not suitable
Active dispersal	If successful can mitigate all impacts at that site.	Multiple studies show that dispersal is rarely successful, especially without significant vegetation removal (not suitable for this site) or high levels of ongoing effort and significant expenditure (e.g. several years of daily works and over $1M for Sydney Botanic Gardens). Flying-foxes will almost always continue to roost in the area (generally within 600 m, Roberts and Eby 2013), and often splinter into several locations which may result in more widespread impacts.	Dispersal directly contradicts the Conservation Agreement and management intent for the KFFR. Further, potential camp habitat was modelled as part of a NSW state government project (Ecosure 2018). As shown on the map below, there is expansive potential camp habitat across the LGA. It is not possible to relocate flying-foxes to a desired location, and much of this potential habitat is in high conflict locations. Dispersal of a historical camp such as Ku-ring-gai would almost certainly result in splinter camps, with flying-foxes continuing to use the KFFR along with additional newly established camp sites. This would not resolve issues at the site, instead making human/flying-fox conflict more widespread, also reducing available resources for impact mitigation which would need to be more widely shared.	Not suitable

Vegetation - Sydney Sandstone Gully Forest



Appendix 10 Example flying-fox rescue protocol

Reference documents

- Office of Environment and Heritage (OEH) 2012, NSW Code of Practice for Injured, Sick and Orphaned Flying-foxes, Office of Environment and Heritage, Sydney.
- Office of Environment and Heritage (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 licensed and ABLV-vaccinated 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 licensed bat carer.

Requirements

- Wildlife rescue personnel involved in flying-fox rescue must:
- be trained and experienced in flying-fox 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 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.

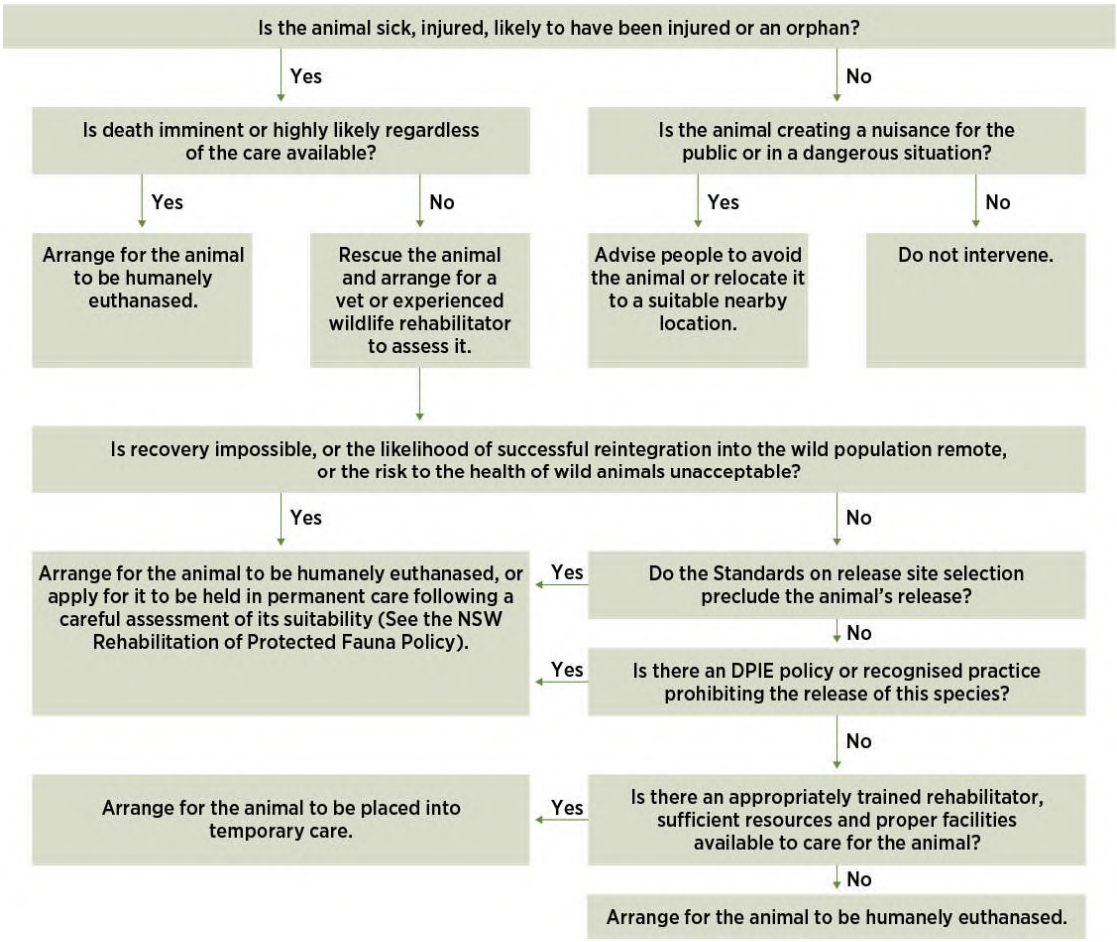
Equipment

- 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 flying-fox pups. Flying-foxes are only to be offered liquids under advice from a licensed bat carer.

Work instructions

Case assessment

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



Assessment process

- Personnel should approach stressed flying-foxes cautiously. If flying-foxes panic or fly this will waste energy; retreat and continue to monitor behaviour.
- Stressed flying-foxes can be identified by the following clinical signs:
- Dehydration: Eyes dull or depressed in skull, change to skin elasticity, skin stays pinched, animal cold, wing membranes dry, mouth dry.
- Heat stress: wing fanning, shade seeking, clustering/clumping, salivating, panting, roosting at the base of trees, on the ground, falling from tree.
- 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):
  - The objective is to rescue a flying-fox while minimising further stress and injury to the animal.
  - Before a rescue attempt, rescuers must assess the risks to the flying-fox from environmental hazards and from capture.
  - Rescuers must employ the correct rescue equipment for the condition and location of the flying-fox and be trained in its use.

Example scenarios

- Bat low in tree:
  - quickly place towel around bat before it can move away
  - grab hold of feet, toes may curl over rescuer's fingers
  - place in carry basket/transport container.
    - 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.
  - 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

- The transport container must be tall enough for the flying-fox to hang by its feet without hitting its head on the floor.
- 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.
- The container must be designed to prevent the flying-fox from escaping.
- 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.
- 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.
- The container must be ventilated so air can circulate around the flying-fox.
- The container must minimise light, noise and vibrations and prevent contact with young children and pets.
- During transport, a container holding a flying-fox must have a clearly visible warning label that says ‘Warning – live bat’.

- 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 wildlife rehabilitation group's contact details should be written on the transport container in case of an emergency.

Revision History

Revision No.	Revision date	Details	Prepared by	Reviewed by	Approved by
00	09/02/2021	Ku-ring-gai Flying-fox Reserve Management Plan DRAFT R0	Jess Bracks, Principal Wildlife Biologist Emily Hatfield, Senior Wildlife Biologist Ellie Kirke, Wildlife Biologist	Jess Bracks, Principal Wildlife Biologist	
01	21/02/2021	Ku-ring-gai Flying-fox Reserve Management Plan DRAFT R1		Ku-ring-gai Council Jess Bracks, Principal Wildlife Biologist	Jess Bracks, Principal Wildlife Biologist
02	02/03/2021	Ku-ring-gai Flying-fox Reserve Management Plan DRAFT R2		Ku-ring-gai Council Jess Bracks, Principal Wildlife Biologist	
03	11/03/2021	Ku-ring-gai Flying-fox Reserve Management Plan DRAFT R3		Ku-ring-gai Council Jess Bracks, Principal Wildlife Biologist	
04	23/03/2021	Ku-ring-gai Flying-fox Reserve Management Plan Final Draft		Ku-ring-gai Council Jess Bracks, Principal Wildlife Biologist	
05	30/06/2021	Ku-ring-gai Flying-fox Reserve Management Plan Final Draft R1		Ku-ring-gai Council	

Distribution List

Copy #	Date	Type	Issued to	Name
1	30/06/2021	Electronic	Ku-ring-gai Council	Jacob Sife, Chelsea Costello
2	30/06/2021	Electronic	Ecosure	Administration

Citation: Ecosure 2021, Ku-ring-gai Flying-fox Reserve Management Plan, Final Plan to Ku-ring-gai Council, Ecosure, Brisbane.

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