

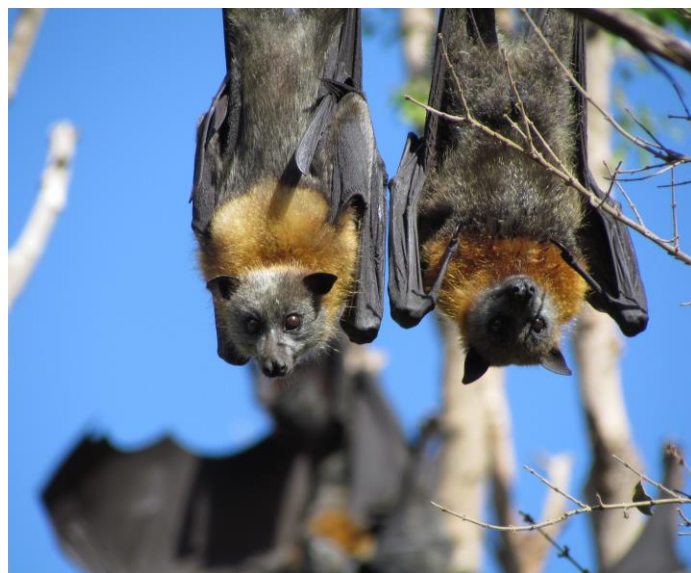
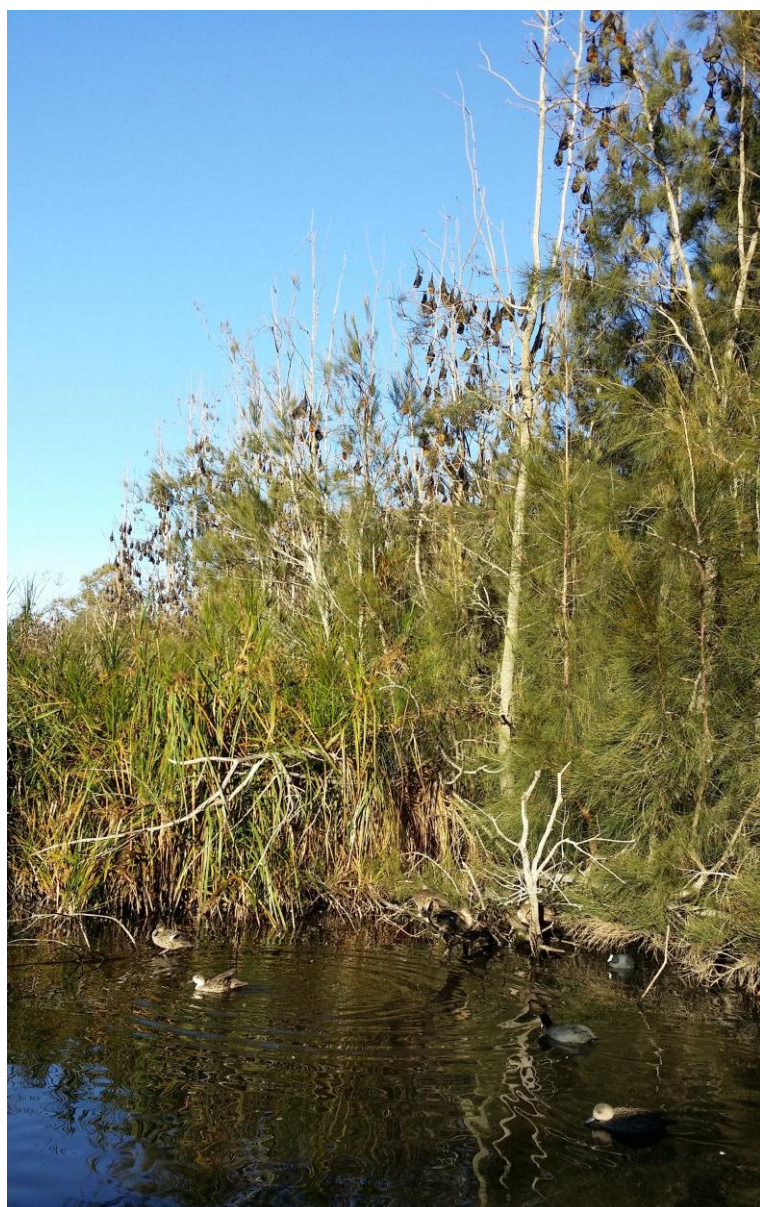


Water Gardens Grey-headed Flying-fox Camp

Draft Management Plan

Prepared for
Eurobodalla Shire Council

19 October 2015



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Template 24/07/2015

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Abbreviations

Abbreviation	Description
CR&BBHS	Clyde River and Batemans Bay Historical Society
DOE	Commonwealth Department of the Environment
ELA	Eco Logical Australia
EPBC	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
GHFF	Grey-headed Flying-fox
LALC	Local Aboriginal Land Council
LGA	Local Government Area
NPW	NSW <i>National Parks and Wildlife Act 1974</i>
OEH	NSW Office of Environment and Heritage
TSC	NSW <i>Threatened Species Conservation Act 1995</i>
WIRES	Wildlife Information, Rescue and Education Service

Executive summary

Eurobodalla Shire Council commissioned Eco Logical Australia to prepare the Water Gardens Flying-fox Camp Management Plan. The plan has been developed using information specific to the Water Gardens as well as drawing on experience from management of a wide range of other flying-fox camps. The plan has also been informed by community opinions and ideas.

Flying-foxes have been recorded in high numbers at the Water Gardens since 2013. Numbers of flying-foxes fluctuate significantly, subject to the season and availability of food in the region. Peak numbers recorded at the Water Gardens exceed 20,000 individuals, primarily Grey-headed Flying-foxes (GHFF) (*Pteropus poliocephalus*).

The GHFF is protected under the *National Parks and Wildlife Act 1974* (NPW Act), and listed as vulnerable to extinction under the *NSW Threatened Species Conservation Act 1995* (TSC Act) and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The GHFF is also listed as vulnerable on the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species. The species plays an important ecological function and is regarded as a 'keystone' species for its role in pollination and seed dispersal for forests.

Residents and businesses near the Water Gardens camp have experienced distressing levels of noise, odour and faecal droppings. Concerns have also been raised about health and amenity.

A range of views have been expressed by the community about how the site should be managed, and some of these opinions are strongly held. These views ranged from culling and dispersal to 'do nothing'. However, the majority of feedback from the community received via the face-to-face discussions and meetings, written correspondence and the 'Flyingfoxengage' survey favoured flying-fox camp management measures that:

- provide a long term solution
- do not move the camp to sites near other residents or businesses
- do not harm the flying-foxes
- do not degrade the natural values of the site.

Actions recommended in the Plan have been identified because they are:

- likely to be effective in targeting the areas that are most significantly impacted by noise, odour and faecal drop
- relatively low cost
- relatively low risk to the community and to flying-foxes
- simple and quick to implement because they do not require further detailed studies or approvals
- supported by most of the community based on the wide range of feedback received.

The recommended suite of actions are to:

- maintain the buffer zones that Council created in August 2015
- subsidise services and building modifications such as free rental access to a high pressure cleaner, and car and washing line covers for selected residents
- remove exotic palm trees in surrounding areas

- enhance facilities at the Water Gardens e.g. remove rubbish and weeds, clean and repair the boardwalk, install signage
- provide ongoing community support and advice.

Culling and dispersal of the camp were not supported because experience from other sites shows that these approaches are not effective in the long term, and they are very expensive and require lengthy approvals with uncertain outcomes. These options would probably shift the camp to one or more other locations, which Council would then be responsible for managing under the conditions of approval. Finally, these options have significantly higher risks for the community and flying-foxes compared to the actions recommended in this plan.

1 Overview

This plan will guide future management of the flying-fox camp at the Water Gardens, Batemans Bay. It has been prepared on behalf of Eurobodalla Shire Council (ESC or Council) in consultation with the relevant agencies and the community. It is consistent with the NSW Office of Environment and Heritage (OEH) Camp Management Plan Template and Policy to facilitate licensing of camp management actions over the next five years.

Figure 1 shows the location of the camp and its proximity to surrounding residences and businesses.

1.1 Objectives

In 2015, OEH released the *Flying-fox Camp Management Policy*, which includes the following objectives for flying-fox camp management:

- address the potential impacts of flying-fox camps on human health and amenity
- minimise the impact of camps on local communities
- provide a balance between conservation of flying-foxes and their impacts on human settlements
- clarify roles and responsibilities for OEH, local councils and other land managers such as managers of Crown Lands
- provide options for land managers to obtain upfront five year licensing to improve flexibility in the management of flying-foxes
- enable land managers and other stakeholders to use a range of suitable management responses to sustainably manage flying-foxes
- require land managers to consider the behaviours, habitat and food requirements of flying-foxes when developing and implementing camp management plans
- improve understanding of the relationship between new development and existing flying-fox camps
- implement an adaptive management approach to camp management based on evidence collected as a result of the policy
- enable long term conservation of flying-foxes in appropriate locations by encouraging land managers to establish and protect sufficient food supplies and roosting habitat.

1.2 Purpose and intention

This plan has been commissioned to identify and prioritise management options that Council can implement, subject to available funding and resources, to reduce the distress experienced by some residents and businesses when large numbers of flying-foxes are present at the Water Gardens. The plan is consistent with the OEH policy objectives set out in **Section 1.1** and other legislative obligations.



Figure 1: Location of the Water Gardens camp at Batemans Bay

2 Context

2.1 Camp area

As illustrated in **Figure 1**, the Water Gardens camp comprises an open water area surrounded by vegetation. The total site, based on cadastral boundaries, is about 10.7 ha. The boundaries of the camp are usually within the Water Gardens, however, the camp has spread into trees in the nearby residential and business areas when flying-fox numbers have peaked.

2.2 Regional context

The National Flying-fox Monitoring Program (NFFMP) was developed by the CSIRO and is being implemented by Commonwealth and state governments. The census is undertaken on specific days every four months over a number of years to deliver an accurate estimation of the entire population across eastern Australia. Monitoring provides insight into the status of the species over time which informs management responses.

In September 2014 there were 262 known flying-fox camps in NSW. There are a number of permanent and temporary camps in the Batemans Bay region, as well as areas of potential habitat (**Figure 2**). There is an intermittent camp at Catalina, less than 1 km from the Water Gardens. Camps have also been recorded less than 25 km from Water Gardens at Kiola, Moruya Heads, Broulee and in Budawang National Park (J. Bentley OEH pers com).

2.3 History and features of the camp

2.3.1 Development history

The Clyde River and Batemans Bay Historical Society Inc (CR&BBHS) is a volunteer organisation that has documented the recent development history of the Water Gardens. The Society is based at the Old Courthouse Museum, which is located next to the Water Gardens and near the Batemans Bay Community Centre.

In 1989, the Batemans Bay Historical Society requested that Council form a steering committee to redevelop the wetland at Batemans Bay into a Town Park. The Batemans Bay Water Gardens Management Committee was formed in 1992 and led development of a plan for the area. In 1997, the committee received grant funds from the NSW Government Coastcare program and Council to assist with the reserve. The Water Gardens was officially opened in 1999. In recent years, the gazebo has been burnt down and the playground was removed due to ongoing vandalism.

The CR&BBHS has provided photographs that illustrate the condition of parts of the site in the 1990s. **Figure 3** and **Figure 4** show the before and after conditions at the lower end of the wetland, looking north to the current site of the museum. **Figure 5** shows the wetland and fringing vegetation, and **Figure 6** shows the newly constructed boardwalk through the Swamp Oak (*Casuarina glauca*).

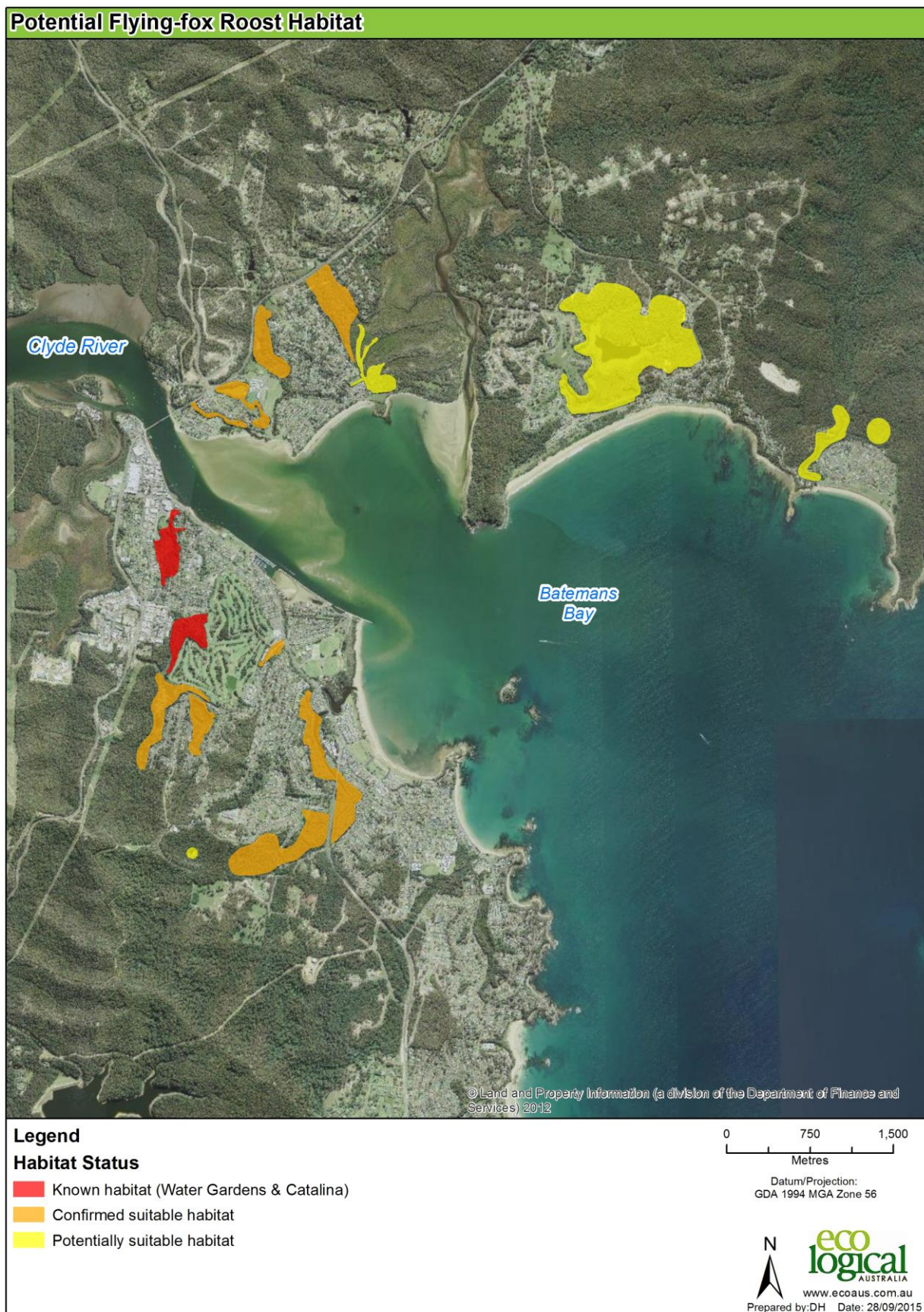


Figure 2: Known and potential flying-fox habitat around Batemans Bay (J. Bentley OEH pers com)



Figure 3: Prior to reconstruction (Copyright CR&BBHS)



Figure 4: Reconstruction in 1990s (Copyright CR&BBHS)



Figure 5: Wetland prior to reconstruction (Copyright CR&BBHS)

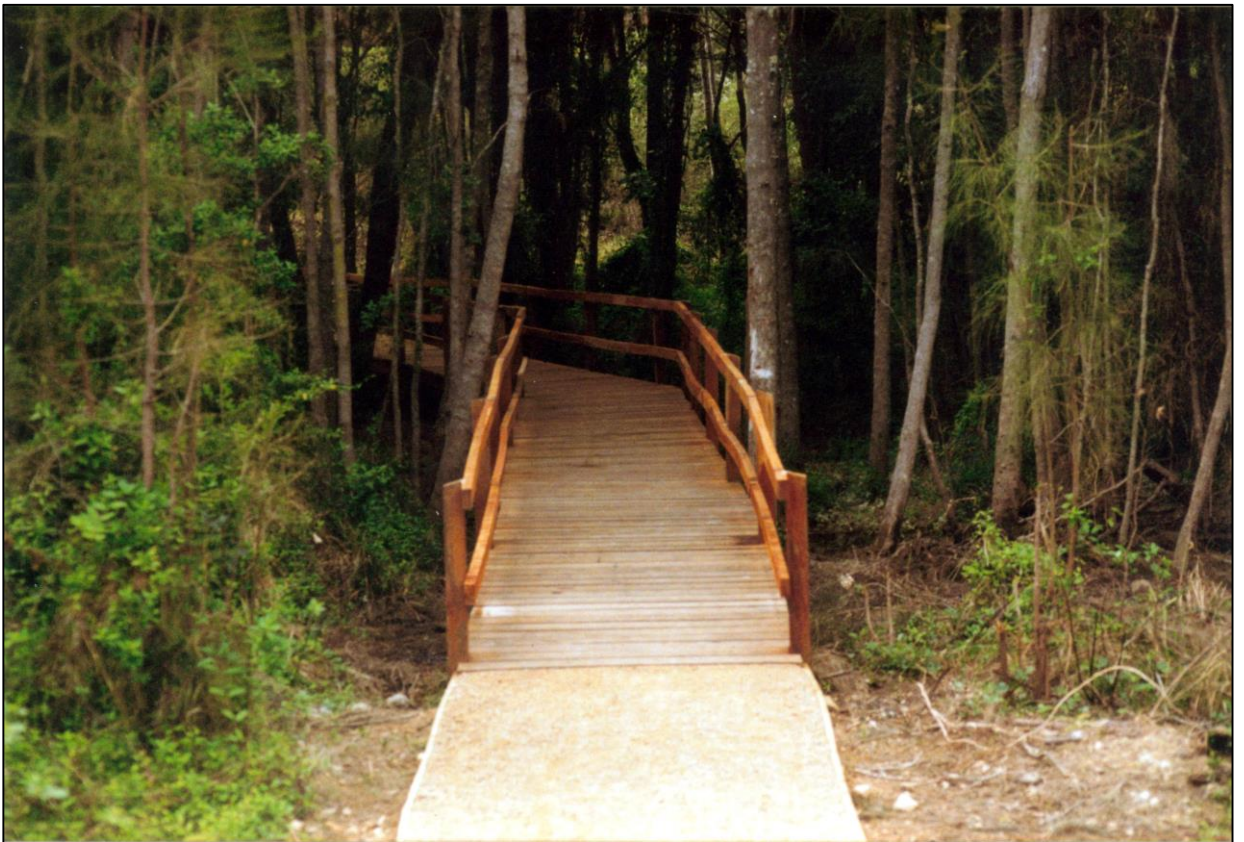


Figure 6: Boardwalk through Casuarinas (Copyright CR&BBHS)

2.3.2 Flying-fox numbers

Like all flying-fox camps, the number of flying-foxes at the Water Gardens fluctuates over time depending on weather conditions and availability of food. For example, weather conditions in an area may favour extensive flowering of *Corymbia maculata* (Spotted Gums) which will attract the flying-foxes as it is a preferred source of food. The camp population is dominated by *Pteropus poliocephalus* (Grey-headed Flying-fox).

The Water Gardens Grey-Headed Flying-Fox camp is part of the National Flying-fox Monitoring Program and census data has been collected since 2012 (**Figure 7**). The census represents a snapshot in time and it is noted that flying-foxes began arriving in large numbers at the Water Gardens only days after the February 2015 estimate of 1,200 animals. Estimates outside the census suggest that the numbers in March and April 2015 were the highest observed at the Water Gardens camp.

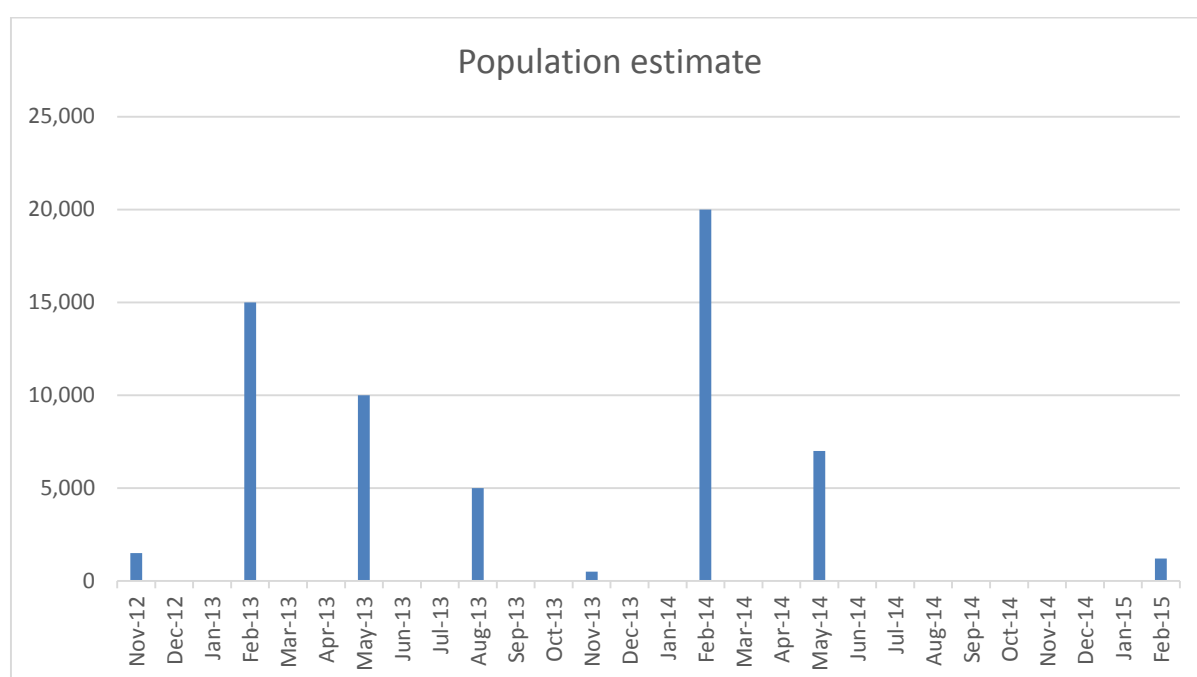


Figure 7: Results of flying-fox census counts at the Water Gardens

2.3.3 Soils, drainage and landform

The majority of the site comprises a natural wetland that has been modified to manage stormwater and reduce the risk of flooding in the Batemans Bay CBD. The site drains northward to the CBD and bay.

Council's mapping¹ indicates that the low lying areas within the Water Gardens have potential acid sulfate soils. If undisturbed and waterlogged, these soils generally pose no or low risk.

¹ Eurobodalla Shire Council GIS maps viewed 30/9/15

<http://maps.esc.nsw.gov.au/mapguide2010/europublic/EuroMap.aspx>

2.3.4 Habitat

Flying-foxes are increasingly moving into urban areas in search of food and shelter, as a result of destruction of their natural habitat. They roost in a variety of trees and vegetation communities. In general, flying-fox camps tend to be located close to water in protected gullies or river flats, with tall dense canopy trees. Areas of suitable habitat in the region are mapped in **Figure 2** based on investigations by OEH. However, there are some camps that are not found in these types of habitats.

Casuarina dominated vegetation in the lower-lying areas (<10 m above sea level) of the Water Gardens provides core roosting habitat for the GHFF. This vegetation is classified as Swamp Oak Floodplain Forest, which is an Endangered Ecological Community listed under the NSW *Threatened Species Conservation Act 1995*. The OEH² states that the remaining area of Swamp Oak Floodplain Forest is likely to represent much less than 30% of its range prior to European settlement. Ongoing threats to this vegetation community include:

- clearing for urban and rural development, and the subsequent impacts from fragmentation
- flood mitigation and drainage works
- grazing and trampling by stock
- grazing and trampling by feral animals
- activation of acid sulfate soils through disturbance
- landfilling and earthworks associated with industrial development
- pollution from urban and agricultural runoff
- rubbish dumping
- climate change
- localised areas, particularly those within urbanised regions, may also be exposed to frequent burning which reduces the diversity of woody plant species
- weed invasion, particularly vines and Lantana.

Vegetation in higher areas of the Water Gardens is dominated by Eucalypt species. Flying-foxes also roost in these areas.

Flying-foxes strip leaves and branches off the roost trees. This destructive behaviour can lead to the death of some roost trees. There is evidence of this occurring at the Water Gardens, with some trees displaying damage. Flying-foxes will continue to roost in dead trees if there is healthy vegetation in the surrounding area.

2.4 Identification of flying-fox issues

Conflict arises when flying-fox numbers are high and they roost close to residences and businesses. When flying-fox numbers are relatively small, neighbours have tolerated the camp. However, sudden large influxes of flying-foxes greatly increases impacts and neighbours' concerns. The negative impacts on those residing next to or near the Water Gardens is reflected in written complaints and phone enquiries, and informally via councillors and the media.

² Swamp Oak Floodplain Forest profile on the OEH website viewed 15/10/2015
<http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10945>

The issues for residents and the community in the main include:

- excessive noise impacting on the local residents particularly on sleeping patterns
- odour entering local residents' homes
- faecal droppings on vehicles, washing, roofs and impact on water quality in water tanks and swimming pools
- perceived health risks associated with potential transmission of Hendra virus and Australian Bat Lyssavirus
- reduced lifestyle amenity from noise, odour, faecal drop and defoliation of vegetation
- general well-being of residents (irritability, sleep deprivation, lack of control)
- vegetation damage caused by roosting flying-foxes
- perceived lack of management or care for the local residents and businesses by Council and government authorities.

Council has also received formal submissions relating to the ecological importance of flying-foxes, the positive impact on tourism, and concerns that misinformation regarding flying-foxes and their impacts has been disseminated within the community. There is also concern that any actions at the Water Gardens may create other issues elsewhere, particularly the relocation of the flying-foxes to another camp or camps in another urbanised area. Concerns have also been raised that the flying-fox camp may negatively impact on local tourism.

2.5 Classification of the land

The Water Gardens is zoned E2 Environmental Conservation under the Eurobodalla Local Environmental Plan 2012.

As depicted in **Figure 8**, approximately 60% of the Water Gardens is owned and/or managed by Council and the remaining 40% is in private ownership:

- 0.26 ha crown land
- 2.61 ha crown land managed by Council
- 2.95 ha freehold owned and managed by Council as operational land
- 4.19 other freehold (primarily the Batemans Bay Local Aboriginal Land Council
- crown 'paper roads'

2.6 Management responses to date

All management responses to date have been undertaken by Council and OEH. This has involved:

- extensive community consultation and education (refer to **Appendix B** for further details), including:
 - public meetings
 - face-to-face meetings and telephone calls
 - written correspondence
 - brochures
 - website and media
- vegetation clearing to create a physical buffer between the roosting habitat and adjacent residents to reduce direct impacts from the camp on those residents where branches were overhanging private property such as car parks, washing lines and backyards (refer to **Figure 9** and **Figure 10**):
 - pruning of Casuarina and Pittosporum on Council land near South Street

- removing and pruning Acacia and Casuarinas on private property near Crown Street
- removing Robina on NSW Land and Housing property near High Street
- pruning Eucalypts, removing Grevilleas and some trees on Batemans Bay Local Aboriginal Land Council land near Short Street

The cost to Council to create the buffers was approximately \$40,000. This work was performed in August 2015.

2.7 Stakeholders

There are a range of stakeholders directly or indirectly affected by the Water Gardens camp or interested in its management. **Table 1** summarises the types of stakeholders and their relevance to the plan. All stakeholders were invited to join the Water Gardens Steering Committee. Members of the Steering Committee are listed in **Appendix A**.

Extensive effort has been made, particularly by Council and OEH, to engage with the community regarding the Water Gardens to:

- gain an appreciation of the issues directly and indirectly affecting the community
- educate the community about flying-foxes – their ecological importance, legal status, health risks and experience of management at other camps
- seek ideas and feedback about possible management options
- invite people to join the Water Gardens Steering Committee.

As outlined in **Appendix B**, consultation has involved:

- face-to-face meetings and telephone calls with residents living adjacent to the camp
- media (radio, television, print, social media)
- letters, brochures and emails
- public meetings
- face-to-face meetings in shopping centres, Community Centre and markets
- online survey, including access via the Batemans Bay Community Centre and libraries.

The results of all consultation have been taken into account when developing this management plan.



Figure 8: Land ownership



Figure 9: Location of buffer areas



Figure 10: South Street buffer (left) and High Street buffer (right) created in August 2015

Table 1: Stakeholders

Stakeholder	Comment
Residents and businesses	Reside or work directly adjacent to the camp or in the wider area
Tourists and visitors to the area	Temporary visitors to the area
Eurobodalla Shire Councillors, Members of Parliament, political groups	Community representation
Eurobodalla Shire Council	Land owner, lead agency to develop and implement the management plan
Office of Environment and Heritage (OEH)	Administer NSW TSC Act and policies
Crown Lands Division of NSW Trade and Investment	Land owner
NSW Department of Health	Public health
NSW Land and Housing Corporation	Community housing
Batemans Bay Local Aboriginal Land Council (BBLALC)	Land owner and community representative
Wildlife Information, Rescue and Education Service (WIRES)	Rescue and rehabilitate injured flying-foxes
Commonwealth Department of Environment	Administer EPBC Act and policies
Eco Logical Australia	Expert flying-fox consultant

2.8 Legislation and policy

2.8.1 Status

Flying-foxes were once common and widespread across much of eastern Australia. Since European settlement, many flying-fox species have suffered considerable range and population declines (Westcott et al. 2011) due to destruction of foraging and roosting habitats through forestry, agriculture and urbanisation, intra-species competition and persecution (DECCW 2009, Westcott et al. 2011). Ongoing threats to flying-foxes are identified in **Section 4.3**.

The high mobility of flying-foxes means that all camps are considered to be part of the same dynamic population. A large number of flying-foxes at one camp at one time, for example, needs to be taken in the context that another camp at the same time may have no or few flying-foxes. As seasons and food sources change, the populations at different camps will change.

The national flying-fox monitoring program gathers data on population trends according to a method devised by the CSIRO (Westcott et al 2013). Results of this monitoring program, which includes the surveys of the Water Gardens camp (**Figure 7**), contribute to understanding of the abundance and distribution of flying-foxes across Australia. This information is used to determine the conservation status and management requirements of the species.

State and Federal Government Scientific Committees undertake rigorous assessments of all available information (such as results of the National Flying-fox Monitoring Program) against the following criteria when providing advice to the ministers on the threat status of a species:

- size of a species' population
- changes in the population size over time
- extent of its distribution
- changes in distribution
- the number of populations
- current and future threats to the species and its habitat.

In 2001, the Federal Threatened Species Scientific Committee³ recommended the GHFF be listed as vulnerable under the EPBC Act because surveys conducted in 1989 and during 1998-2001 indicate a rate of decline in abundance of the species in the order of 30%. Similarly, the NSW Scientific Committee⁴ made a final determination to list the GHFF as vulnerable under the TSC Act because projected rates of decline estimate that the population will continue to decrease by at least 20% in the next three generations given the rate of habitat loss and culling (Martin 2000).

The GHFF is currently protected under the NPW Act, and listed as vulnerable to extinction under the NSW TSC Act and Commonwealth EPBC Act. Further management requirements are set out in the *Draft EPBC Act Policy Statement - Camp Management Guidelines for the Grey-headed and Spectacled flying fox* (Department of Environment 2014) and *Flying-fox Camp Management Policy* (OEH 2015).

The GHFF is also listed as vulnerable on the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species.

2.8.2 Federal approvals

Environmental Protection and Biodiversity Conservation Act

The EPBC Act aims to protect the environment, in particular Matters of National Environmental Significance (MNES). The GHFF is listed as a threatened species under the EPBC Act and is therefore a MNES. Under the Act, any action which 'has, will have, or is likely to have a significant impact' on a MNES is defined as a 'controlled action'. An action includes a project, development, undertaking, activity or series of activities that may affect a MNES. Actions that may have a significant impact on one or more MNES need referral to the Department of the Environment.

Under the 2015 EPBC Act Policy Statement, the Water Gardens camp is recognised as being 'nationally important' because it contained more than 10,000 GHFF in more than one year in the last ten years. The Policy Statement indicates that Federal Government approvals under the EPBC Act are likely to be needed for management action if it involves more than 'routine maintenance'. Activities that are considered routine camp management are:

³ Department of Environment website viewed 7/10/15 <http://www.environment.gov.au/node/16466>

⁴ OEH website viewed 7/10/15

<http://www.environment.nsw.gov.au/determinations/GreyheadedFlyingFoxVulSpListing.htm>

- mowing of grass and similar grounds-keeping actions
- application of mulch or removal of leaf litter or other material on the ground
- weed removal, minor trimming of understorey vegetation or the planting of vegetation
- removal of tree limbs or a small proportion of the whole trees in a camp if they are significantly damaged and pose a health and safety risk, as determined by a qualified and experienced arborist
- minor habitat augmentation for the benefit of the roosting animals
- installation of signage or similar scale infrastructure
- passive recreation (i.e. low noise recreation)
- educational activities such as study or observation of roosting flying-foxes.

Any action that is likely to have a significant impact on GHFF must not commence until the Minister gives approval. An EPBC Act referral may be required, depending upon the potential impacts of the action proposed.

The Federal Government recommends that dispersal is considered as a last resort because it has been demonstrated to be unsuccessful and costly. In situ camp management and assisting neighbours to co-exist with camps are the recommended alternative strategies.

2.8.3 NSW Government approvals

Threatened Species Conservation Act

In 2015, the NSW Government released a Flying-fox Camp Management Policy and Camp Management Plan template to facilitate licensing of camp management actions for a five year period. The policy provides the framework within which the OEH will make regulatory decisions and the guidelines for land managers to consider in the development of a Plan. As a minimum, Council will need to obtain a section 91 licence under the TSC Act to harm a threatened species, population or ecological community, or damage habitat. The licence will be issued for five years to cover routine camp maintenance activities such as mowing, bush regeneration, and infrastructure maintenance.

This management plan should be submitted to OEH for approval with a completed section 91 licence application form.

Council sought and received OEH approval (section 91 licence) to clear the vegetation buffer in August 2015.

Prevention of Cruelty to Animals Act 1979

The NSW *Prevention of Cruelty to Animals Act 1979* (POCTA Act) is the core legislation in protecting the general welfare of animals. The objectives of the Act are to:

- prevent cruelty to animals
- promote the welfare of animals by requiring a person in charge of an animal to:
 - provide care for the animal
 - treat the animal in a humane manner
 - ensure the welfare of the animal.

Section 91 licence conditions will take into account the welfare of flying-foxes.

The Department of Primary Industries (DPI) is responsible for administering the Act, but officers from the DPI do not have enforcement powers. Therefore, complaints associated with acts of animal cruelty are directed to the Royal Society for the Prevention of Cruelty to Animals (RSPCA) or the NSW police.

3 Community considerations

There are a number of concerns that the community has raised regarding the Water Gardens camp. Most of these are commonly experienced where camps are situated adjacent to residences.

3.1 Disease

Potential health issues associated with flying-foxes include infections from viruses borne by flying-foxes. Human infections with these viruses are extremely rare and to date there have only been three confirmed cases of Australian Bat Lyssavirus in humans, all in Queensland. There have been seven confirmed cases of Hendra virus in humans, also all in Queensland.

NSW Health maintains a series of detailed fact sheets that give the most up-to-date advice on managing human health risks associated with flying-foxes:

- Australian Bat Lyssavirus
<http://www.health.nsw.gov.au/Infectious/factsheets/Pages/Rabies-Australian-Bat-Lyssavirus-Infection.aspx>
- Hendra virus
http://www.health.nsw.gov.au/Infectious/factsheets/Pages/Hendra_virus.aspx

3.1.1 Flying-fox faeces, urine and blood

The latest information from the NSW Department of Health is that there are no reports of Australian Bat Lyssavirus being spread by contact or exposure to flying-fox faeces, urine or blood. The only cases of human infection with the virus have been caused directly by flying-fox bites and scratches during handling of infected animals. Living, playing or walking near bat roosting areas also poses no risk of the disease as long as flying-foxes are not handled. Using soap and water to wash hands after accidental touching of flying-fox faeces, urine or blood is an adequate hygiene standard.

3.1.2 Horses and Hendra virus

There is no evidence of human-to-human, bat-to-human, bat-to-dog, or dog-to-human transmission of Hendra virus. It is thought that horses may contract Hendra virus infection from eating food recently contaminated by flying-fox urine, saliva or other body fluids. All confirmed cases of human infection to date have been caused by exposure to high levels of virus in body fluids from infected horses, including performing necropsies on horses without adequate personal protective equipment and nasal mucous spray from live horses during handling and examination. In 2011, there was one case of a dog that tested positive for virus antibodies but did not proceed to develop clinical disease, so there could be potential for horse-to-dog transmission.

Detailed NSW Department of Primary Industries advice on managing equine health risks associated with Hendra virus is available at:

<http://www.dpi.nsw.gov.au/agriculture/livestock/horses/health/general/hendra-virus>

Recent research by (Edson et al 2015) suggests that transmission of the Hendra virus to horses occurs when there is direct contact with the naturally infected urine of Black and Spectacled Flying-foxes.

3.1.3 Bitten or scratched by a flying-fox

It is recommended that people should not handle flying foxes unless they are vaccinated and trained to do so. If a person is bitten or scratched by a flying-fox the wound should immediately be washed gently but thoroughly with soap and water for at least 5 minutes, an antiseptic, such as povidone-iodine should be applied, and a doctor should be consulted as soon as possible.

3.2 Noise

Flying-foxes make a lot of noise as they leave their camp early in the evening to feed and when they return in the early morning. They continue being noisy as they fly around trying to find a roost.

During the day they can squabble noisily, especially if there are a lot of flying-foxes competing for a roost. When flying-foxes are stressed or frightened they make a lot more noise. Colonies tend to be noisiest when they are disturbed (e.g. mowing or walking the dog nearby) and least noisy when left alone.

Flying-foxes may make noise when feeding at night in fruiting or flowering trees and shrubs, including palm trees. Feeding at that location will be ongoing until the fruit is finished.

3.3 Smell

Humans have different sensitivities to smells. Not all people will find the smell of a flying-fox camp difficult to live with, whereas others will find the smell overpowering. The main odour associated with flying-foxes is the scent male flying-foxes use to mark their territory and is strongest at the camp. It is not reported as being associated with the faeces dropped during flight. The most important thing to note is that the odour is not a risk to human health.

The smell is usually at its strongest during hot, humid and still or low-wind days.

3.4 Faeces

Flying-foxes excrete either during flight or by turning heads-up and holding onto a branch by their wing claws. The flying-fox digestive system is much faster than a human system (12 to 30 minutes between eating and excretion) and they often don't physically chew and swallow their food – they crush it against the roof of their mouth and spit it out after swallowing the juice. This primarily liquid diet contributes to their quick digestive system.

The greatest impact from faecal droppings occurs as the flying-foxes leave their camp at dusk or arrive at dawn. The faeces often contains colouring from fruit consumed by the flying-foxes. This can cause staining of some surfaces. If faeces is left to dry, it is more likely to peel off or strip a surface, especially if the underlying paint is old.

Flying-fox faeces on roofs will be washed into rainwater tanks when it rains. NSW Health recommends against drinking water from rainwater tanks where there is public drinking water available. Advice on safely managing rainwater for drinking purposes where there is no alternative supply is available on the NSW Health website at <http://www.health.nsw.gov.au/environment/water/Pages/rainwater.aspx>

Water from the tank should be used for the garden, toilet flushing and car washing. However, the water will contain the faeces, including any fruit-colouring, unless a 'first-flush' system prevents the first portion of roof run-off from entering the tank.

There is no evidence that a flying-fox camp has any impact on publicly available drinking water provided by local authorities. The water continues to be treated and this eliminates any contamination from additional flying-fox faeces in the catchment.

3.5 Pets

NSW Health reports that there is no evidence of dog-to-human transmission of Hendra virus. According to the Australian Animal Health Laboratory in Victoria there have been no reports of illness in pets caused by eating deceased flying-foxes. However, pets should be kept away from flying-foxes to reduce likelihood of scratches or bites. Pets should also be kept away from sick horses. If a pet becomes sick after contact with a flying-fox or a sick horse, seek immediate advice from a veterinarian.

3.6 Allergens

Some residents in the vicinity of the Water Gardens have reported that their asthma is worse when flying-foxes are present. Wild animals such as flying-foxes are not identified by Asthma Australia⁵ as a trigger. However, it is possible that the allergens associated with flying-foxes would be similar to pets. Animal allergens are found in saliva, sweat, hair, urine or dead skin flakes (dander).

Pets are the second most common trigger of asthma (after viruses). Asthma Australia notes that, *it's almost impossible to completely avoid furry pet allergens, as the allergens are everywhere and can be found in many environments outside the home.*

During community consultation undertaken as part of the development of other flying-fox camp management plans, asthma has not been raised as an issue with OEH, the Department of Health or ELA consultants. Further studies would be needed to assess any possible link between flying-foxes and increased incidence of asthma in humans.

3.7 Weeds, rubbish and amenity

Unmanaged flying-fox camps in urban areas often become infested with weeds and rubbish. This environmental degradation contributes to a loss of amenity. A number of people in the community that were consulted during preparation of this plan commented that weeds and rubbish at the Water Gardens gives the impression that the site is neglected and not meeting its potential as a natural, recreational and tourism asset.

⁵ Asthma Australia website <http://www.asthmaaustralia.org.au/Pets.aspx> Viewed 29/9/2015

4 Ecological considerations

4.1 Ecological importance

The GHFF (*Pteropus poliocephalus*) is Australia's largest bat and only endemic pteropidid. They are distributed across eastern Australia, primarily in the wetter coastal regions. The communal camps are generally located within 20 km of a regular food source and are commonly found near water in vegetation with a dense canopy. The camps provide a suitable location for roosting, resting, areas for social interactions such as reproduction (mating, conception and births), to raise young, and for protection against predation and climatic extremes.

Flying-foxes are highly mobile and travel large distances during their nightly and seasonal foraging forays. There is considerable variation in the migratory patterns of individual GHFFs in terms of distances travelled, time spent within and between different roosts regions. The migratory patterns of GHFF are closely associated with reliance on food resources that have irregular seasonal and temporal patterns of production, mating opportunities and exchange of social information.

This ability to move over vast distances (e.g. Victoria to Queensland) enables them to spread genetic and reproductive material (pollen in their fur and seeds in faeces) between forest patches that would normally be geographically isolated. Therefore, flying-foxes are a 'keystone' species because they have beneficial outcomes to the health, longevity and diversity among and between vegetation communities, especially those that are fragmented and/or isolated.

4.2 Life and reproductive history

GHFFs have been recorded living up to 20 years in the wild and 30 years in captivity (Roberts 2006). They are highly seasonal and synchronised breeders with relatively low reproductive rates (DECCW 2009). As outlined in **Table 2**, mating behaviour among GHFF commences in January with conception occurring in April and May, which is followed by a six month gestation period and the birth of a single pup in spring.

When the young are born they are highly dependent on their mother for food, care and thermo-regulation. The young remain dependant on the mother until they are six months old and are carried during her night foraging activities for the first three weeks of their lives (Roberts 2006). The young remain flightless and confined to the camp for the first three to four months. They are weaned at six months of age. GHFF do not become sexually mature until they are two to three years old and tend not to raise young until they are three to four years old, after which they generally raise one young per year (Roberts 2006).

Table 2 sets out the stages in the GHFF life cycle and highlights periods of susceptibility to impacts of disturbance.

Table 2: GHFF life cycle sensitivities

Season	Month	GHFF activities and camp dynamics	Potential impacts
Summer	January	Juvenile GHFFs are becoming independent, but some juveniles have restricted flight capabilities. Some individuals may leave maternal camps and migrate elsewhere, whilst others will remain in maternal camp.	Juvenile GHFF may be stressed, there is a risk they could fall to the ground where they are at risk of starvation and predation.
	February	Lead up to postnatal juvenile dispersal. Males begin forming territories before the mating period begins.	Low risk of disruption to normal reproductive / camp activities.
Autumn	March	Creation, maintenance of male territories, mating and conception.	Potential disruption to normal camp dynamics. Management actions are unlikely to cause a significant impact.
	April		
Winter	May	Gestation / pregnancy extends across a 6 month period (includes March – August).	There might be some short term disruption to normal camp dynamics. Management actions are unlikely to cause a significant impact.
	June	Heavily pregnant females will be present in camp in August and into September.	
	July	Some individuals become nomadic and move between camps. The level of movement depends on the location and level of productivity of localised winter food resources.	
	August		Stress could impact pregnant adult females.
Spring	September	Birth and lactation. Dependant young are carried by mothers during foraging movements for at least three weeks.	When not attached to their mother, stressed young are at risk of falling to ground where they become vulnerable to starvation and predation.
	October		
	November	Dependant young may remain at camps through the night while parents leave to forage, returning through the night.	The juveniles may become stressed, there is a low risk they could can fall to the ground where they become vulnerable to starvation and predation.
Summer	December	Dependant young remain at camp while parents leave to forage, returning through the night.	The juveniles may become stressed, there is a low risk they could can fall to the ground where they become vulnerable to starvation and predation.

4.3 Key threatening processes

As discussed in Section 2.8.1, flying-foxes were once common and widespread across much of eastern Australia. The total population has declined significantly in recent years. The NSW OEH and Commonwealth Department of Environment (DoE) state that GHFF face ongoing threats by:

- destruction of roosting and foraging habitat
- electrocution on powerlines, and entanglement in netting and barbed wire
- heat stress
- conflict with humans including unregulated shooting and / or culling
- predation by species such as *Haliaeetus leucogaster* (White-bellied Sea-eagle), *Haliastur indus* (Brahminy Kite), *Ninox strenua* (Powerful Owl), snakes, dingoes, domestic dogs and feral cats
- competition and hybridisation with *Pteropus alecto* (Black Flying-foxes).

4.3.1 Weed infestation and habitat loss

Flying-foxes will often defoliate and break branches while landing and flying within their roosts. Tree deaths are common in densely populated camps or during prolonged periods of camp occupation. The loss of canopy, combined with increased levels of sunlight reaching the lower vegetation strata and increased nutrient loadings may lead to a proliferation of weeds.

A camp will be sustainable if there is sufficient habitat for the GHFF to shift into new roost trees and allow old roosts to recover or revegetate. However, loss of canopy trees due to defoliation and competition from weeds, may result in habitat loss as well as loss of amenity.

4.3.2 Electrocution or entanglement

GHFF can be injured or killed when they become entangled in fruit tree netting. Similarly, flying-foxes can be electrocuted by power lines.

4.3.3 Heat stress

Heatwaves over 38°C can harm or kill GHFF. A single heat stress event can kill up to thousands of flying-foxes in a camp. Contributing factors that might increase / decrease the impacts of heat stress include:

- access to or absence of adequate understorey vegetation – dense understorey vegetation provides a refuge to escape intense heat
- timing and age of GHFFs in the camp – during the birthing season or presence of juveniles in camp (juveniles are most susceptible to heat stress events)
- the numbers of GHFF in camp (more bats will lead to competition for cool roost locations and potentially more deaths)
- condition of GHFFs in camp – if they are already under stress from other factors (noise, low food resources, disease or a combination of these things), they will be more prone to heat stress events.

Further information about how Council and the community (e.g. WIRES) can manage heat stress events is given in McDonald and Collins (2013).

A heat stress event has occurred at the Water Gardens. During this event, the Water Gardens was closed and Council worked with OEH and WIRES to remove the dead animals and assist with rehabilitation of dehydrated flying-foxes. This process worked well and would be applied in future heat-stress events.

5 Identification and assessment of camp management actions

5.1 Community feedback

As outlined in **Appendix B**, there has been extensive community consultation in relation to the Water Gardens camp. A range of views have been expressed by the community about how the site should be managed, and some of these opinions are strongly held. A summary of the main feedback received is as follows:

- 122 valid online submissions were made to Flyingfoxengage. Overall, respondents favoured flying-fox camp management measures that provide a long term solution, do not move the camp to sites near other residents or businesses, do not harm the flying-foxes and do not degrade the natural values of the site. There was a strong division between the views of respondents, with some favouring culling or dispersal, and some favouring 'do nothing' or manage the camp in situ.
- More than 60 people/groups attended the face-to-face consultation session in August-September 2015. Many respondents expressed sympathy for people who live next to the camp because of their loss of amenity (odour, noise and faecal drop), but opinion was strongly divided between those who wanted the flying-foxes to be dispersed or culled and those who want to 'leave the bats alone' or did not want the camp dispersed in case flying-foxes moved closer to their homes. A number of people just wanted more information (e.g. fact sheet on health risks and tips for living in areas affected by flying-foxes). Another common theme was that the Water Gardens appears neglected and the camp could be a tourism asset.

The overall feedback from the community received via the face-to-face discussions and meetings, written correspondence and the Flyingfoxengage survey favoured flying-fox camp management measures that:

- provide a long term solution
- do not move the camp to sites near other residents or businesses
- do not harm the flying-foxes
- do not degrade the natural values of the site.

It is noted that some people in the community were in favour of a 'do nothing' approach because of limited Council funds and potential impacts to the flying-foxes or other communities. However, the Water Gardens Steering Committee was not supportive of this approach because it would not address the conflict between residents and the flying-fox camp.

5.2 Typical management options

The OEH identifies three levels of action that may be taken to manage a flying-fox camp. **Table 3** lists typical options that are recommended by OEH for management of flying-fox camps. These were incorporated in the online Flyingfoxengage questionnaire for the Water Gardens community consultation. Importantly, Level 1 actions should be attempted and the effectiveness reviewed before deciding if higher level actions are necessary.

Level 1 management options aim to improve the amenity and safety of those most directly affected by the camp while managing the camp in situ. These actions do not disturb the flying-foxes and therefore can be conducted without State or Federal Government approval. Regular approvals through Council will be required for modifications to buildings as per Council's development controls and Local Environment Plan.

Level 2 management options aim to improve the amenity and safety of those most directly affected by the camp by increasing the buffer between the camp and adjacent properties. These actions would result in disturbance of the camp, and therefore need State and Federal approval (refer to **Section 2.8**). The time needed to prepare for and obtain approvals means that these options cannot be implemented immediately.

Level 3 management options are provided as a last resort and will not be implemented unless Level 1 and 2 actions have been attempted and failed. Other local councils and government agencies do not generally support dispersal because:

- Dispersal actions often require a consistent approach and a long-term undertaking. Many previous dispersal actions lasted over a 2-10 year period. Dispersal actions have required significant resources and considerable funding. For example, \$120,000 spent unsuccessfully attempting to remove flying foxes from Singleton. \$3,000,000 spent to successfully disperse the camp from the Melbourne Royal Botanic Gardens. However, this campsite still requires ongoing management. Other case studies are provided in **Appendix C**.
- Pre-identified campsites, even those that have been actively managed to encourage flying-fox occupancy, have never been successfully colonised.
- The distances covered by flying-foxes during the initial actions aimed at dispersal have generally been very short, often less than 900 m.
- In the majority of cases, dispersal has resulted in moving the conflict to a new area or areas.

State and Federal Government approvals (refer to **Section 2.8**) will be needed for any Level 3 action.

5.3 Identifying the preferred management actions

Actions recommended below have been identified and prioritised based on assessment of the specific conditions at the Water Gardens and relevant experiences at other flying-fox camps being managed across NSW, Queensland and Victoria. Examples of case studies from other camps are presented in **Appendix C**. Feedback and suggestions from the community and other stakeholders have been taken into account when identifying the preferred management actions for the Water Gardens.

Actions recommended in the Plan have been identified because they are:

- likely to be effective in targeting the areas that are most significantly impacted by noise, odour and faecal drop
- relatively low cost
- relatively low risk to the community and to flying-foxes
- simple and quick to implement because they do not require further detailed studies or approvals
- supported by most of the community based on the wide range of feedback received.

Table 3: Summary of possible management options identified by OEH*

Level 1	Level 2	Level 3
Land use planning (5.4.6)	Revegetating areas with plants that are unsuitable as roost habitat	Passive dispersal of a camp through selective vegetation removal (5.6.2)
Education and awareness programs (5.4.5)	Trimming vegetation at the camp boundary to create a small buffer (5.4.3)	Active dispersal of a camp using disturbance (5.6.2)
Subsidise property modification to reduce impacts of flying-foxes (5.4.1)	Early dispersal before a camp is established at a new location	Cull the flying-foxes to reduce numbers (5.6.3)
Subsidise services to reduce impacts of flying-foxes (5.4.1)	Installation of noise attenuation fencing (5.4.1)	Passive dispersal of a camp through changing water management (5.6.1)
Fully-funded property modification to reduce impacts of flying-foxes (5.4.1)	Removing vegetation to create a substantial buffer (5.5)	
Prepare health and safety protocols to manage incidents related to the camp (5.4.5)	Nudging the camp to a nearby location using smoke, light, noise (5.6.2)	
Prepare protocols for carrying out operations adjacent to the camp (5.4.5)		
Advice about property modifications to reduce the impacts of flying-foxes (5.4.5)		
Do nothing (5.1)		
Participate in research to improve knowledge of flying-fox ecology		
Revegetate and manage land to create alternative flying-fox habitat		
Routine management actions to improve the condition of the site (5.4)		
Provision of artificial roosting habitat		
Dense planting to create screens at residential boundaries		

* Includes cross-reference (in brackets) to the section of this plan where the option is discussed, where relevant

5.4 Preferred actions – Level 1

5.4.1 Subsidised services and building modifications

Council could fully or partly subsidise services or building modifications for selected residences and disadvantaged groups in the community. These would aim to reduce impacts of noise, odour and faecal drop. Faecal drop is a common complaint for residents and businesses in the wider area, not just properties adjoining the camp. The subsidised services and modifications could include:

- car covers
- outdoor area cleaning service
- installation of air conditioner to allow windows to be closed in warmer weather to reduce impacts from noise and odour
- installation of double glazed windows in bedrooms to mitigate noise
- installation of shade sails and covers over outdoor areas and clothes lines
- high pressure cleaners (e.g. Gerni, Karcher) available for rent from the Batemans Bay Council depot. Residents could 'rent' the high pressure cleaner by showing their rates notice or library card and paying a deposit that would be refunded when the equipment is returned on time and in good condition. If there is high demand for this service, Council could consider purchasing additional high pressure cleaners
- investigate possible effectiveness of noise barriers at some locations along the fence between the camp and adjacent properties. This investigation would need to be conducted by a specialist noise consultant.

5.4.2 Remove exotic palm trees in surrounding areas

Flying-foxes feeding on exotic palm trees in the urban area surrounding the camp at night can disturb residents and drop faecal matter. Palm trees are not part of the natural diet of flying-foxes and they can choke if large fruit is swallowed. It is therefore desirable for the palm trees to be removed from the landscape.

It is recommended that palm trees be removed in locations that are identified by Council as being problematic. Residents and businesses can contact Council to request an assessment and removal. An estimated cost of \$350 per tree would be borne by Council.

5.4.3 Maintain buffer zones

The buffer zones created in August 2015 (**Figure 9** and **Figure 10**) need to be maintained to provide a physical separation between roosting habitat and homes. It is noted that most of the buffers are on Batemans Bay Local Aboriginal Land Council (BBLALC) land, rather than Council land. However, it is anticipated that Council would fund the maintenance of the buffer zones in partnership with the BBLALC. This would involve:

- slashing or mowing ground cover to minimise weed infestation and prevent growth of saplings in the buffer – quarterly
- prune overhanging branches – in July every second year when flying-fox numbers in the camp are low and prior to the breeding season.

5.4.4 Enhance appearance of the Water Gardens

A frequent complaint by the community was that the Water Gardens appear neglected and could be a tourism and recreational asset if weeds and rubbish are removed, the boardwalk is cleaned and repaired if needed, and interpretive signage installed. Signs should also be provided stating 'Do not touch dead or injured flying-foxes'.

A qualified and experienced bush regeneration team (minimum Certificate II or III in Conservation and Land Management) would need to be engaged to remove weeds, including Coral trees and environmental weeds, and replace these with suitable native species. Weed removal should commence in the previously landscaped area near the site of the old playground. This approach will reduce prevalence of weeds on site, improve the appearance of the site and should be achievable with no impact to the roosting flying-foxes.

All on-ground works (rubbish and weed removal and installation of signs) should be scheduled at a time when there are no or small numbers of flying-foxes in the camp. Work should not be done in core roosting habitat areas. On ground work should be avoided when pups are most vulnerable in September and October (**Table 2**).

All on-ground works need to be performed in accordance with a Safe Work Method Statement (SWMS) that includes information about risks and working in a GHFF camp. The SWMS must state that only trained and vaccinated personnel (e.g. WIRES) can touch injured flying-foxes.

Water quality also contributes to the overall appearance and environmental quality of the Water Gardens. It is influenced by nutrients associated with the flying-foxes, water fowl and urban sources (e.g. fertiliser and car cleaning detergent in stormwater runoff), as well as the hydrologic regime (flows in and out of the Water Gardens). Water quality is also linked to sediment quality. A specialist multidisciplinary investigation would be required to identify measures that could be taken to improve water quality in the context of the site and its catchment.

5.4.5 Community support and advice

Council is heavily involved in environmental education programs in the community and has already been proactive in raising public awareness about flying-fox issues such as the risk of disease and suggested approaches to clean areas affected by faecal drop. It is recommended that information about flying-foxes continues to be provided via education activities, and on Council's website and via other methods such as feature articles in the online newsletter.

Types of information for householders available in a brochure developed by Council and OEH includes suggestions on:

- How to reduce noise disturbance at night associated with foraging flying-foxes by removing fruit or carefully netting the fruit tree to make access for the flying-foxes difficult. More information is in the brochure 'Protect your garden fruit in a wildlife friendly way'⁶.
- How to minimise the risk of stained washing by avoiding dawn and dusk when flying-foxes drop faeces as the fly to or from the camp, or having washing under cover.
- How to treat stains if they occur – treat like fruit stains i.e. soak the item as soon as possible (preferably while the stain is still wet) in a good stain remover.
- How to clean outdoor surfaces to minimise the risk of staining or surfaces peeling - wash the surface as soon as possible with soapy water.

5.4.6 Land use planning

Land use planning was an action that closely met the outcomes identified as important by the community in the Flyingfoxengage survey. This is a suitable long term option where camps are

⁶ http://www.wildlifefriendlyfencing.com/WFF/Netting_files/Download.pdf

identified and can be appropriately managed by land use controls such as excluding development near a camp. In the Water Gardens this is not a feasible solution as the area surrounding the camp is developed.

5.5 Level 2 actions

Level 1 actions should be monitored to determine if they are effective in reducing conflict and improving amenity for residents and visitors to the area. Additional funds and resources may need to be made available to support an expanded program of all or some of these actions. This could include further widening of the buffer between the camp and adjacent properties.

5.6 Level 3 actions

A variety of other options have been suggested in relation to the Water Gardens. These options are outlined below. Overall, these options were not supported because experience from other sites shows that these approaches:

- are not effective in the long term
- are very expensive
- require lengthy approvals with uncertain outcomes
- would probably shift the camp to one or more other locations, which Council would then be responsible for managing under the conditions of approval
- have significantly higher risks for the community and flying-foxes compared to the actions recommended in this plan.

5.6.1 Drain the Water Gardens

It has been suggested that the Water Gardens could be drained, filled and revegetated (e.g. with turf, flower beds and sparse trees) to remove flying-fox habitat.

The natural wetland was modified in the 1990s (refer to photos in **Section 2.3.1**) to act as a detention basin to manage stormwater flows and minimise the risk of flooding in Batemans Bay CBD. Any change to the current water management regime, such as filling or draining the Water Gardens, would require a full catchment study. This would include investigation of water quality and quantity impacts and issues. The catchment study could inform engineering concept and detailed designs for possible redevelopment of the stormwater infrastructure, subject to approvals.

Estimated costs are as follows:

- catchment and flood studies plus redesign of infrastructure \$500,000
- reconstruction of stormwater infrastructure >\$1,000,000
- some costs to Council could be offset if they are linked to other redevelopment proposals.

Draining the Water Gardens would require a camp dispersal action. This is explained further below.

5.6.2 Disperse the camp

Dispersal of a flying-fox camp is generally considered to be a 'last resort' option because so many previous dispersals have been expensive and unsuccessful. A review of seventeen flying-fox camp dispersal actions between 1990 and 2013 by Roberts and Eby (2013) found that:

- In all cases, dispersed animals did not abandon the local area.
- In 16 of the 17 cases, dispersals did not reduce the number of flying-foxes in a local area.

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

Roberts and Eby (2013) found that there were a few exceptions to these patterns, but they only occurred when there were abundant financial and human resources (e.g. Royal Botanic Gardens (RBG) Melbourne and RBG Sydney) and/or specific landscape characteristics (e.g. isolation from neighbours (Batchelor, NT) or habitat link to 'acceptable' location (RBG Melbourne)).

Based on experience at other camps, dispersal of the Water Gardens camp would require approximately thirty staff to be positioned around the camp creating noise, light and smoke as these have been proven to be the most effective dispersal techniques. A large team would be needed due to the size and shape of the camp. The team would include OEH recognised flying-fox experts to monitor animal health and coordinate dispersal activities. The team would be rostered for an initial period (e.g. one month), then be involved in follow-up dispersal activities (e.g. for one year).

Conditions under NSW and Federal Government approval (if granted) would limit the time when dispersal could occur (e.g. up to two hours pre-dawn in certain months of the year). Other camps and potential habitat in the region would need to be monitored throughout the dispersal period. There is a high likelihood that the dispersed flying-foxes would move to vegetation at Catalina or another unsuitable location.

The cost for dispersal of the Water Gardens camp, including approvals and monitoring, is estimated between \$500,000-1,000,000. There would be lengthy approval requirements with uncertain outcomes. Animal welfare could be adversely impacted.

5.6.3 Cull the flying-foxes

Culling could be achieved by shooting or poisoning the flying-foxes. Results of culling are unpredictable because flying-foxes move around the landscape, over large distances and may occupy a variety of camps over short periods of time. Culling would only provide short-term relief to the conflicts and would need to be ongoing as other flying-foxes will continue to join the camp.

This is not a viable option because it has never been proven successful in the long-term management of flying-foxes. The activities associated with performing a cull may violate the objectives of the *Prevention of Cruelty to Animals Act* (POTAC Act). The risks associated with culling an animal in an urban environment such as Batemans Bay would be high and there would be a direct threat to humans and other species (domestic animals and wildlife), especially if dying and dead animals are found in the area. Licences/approvals required would not be granted by the Federal or State Governments for this action.

6 Implementation

6.1 Responsibilities

Eurobodalla Shire Council is responsible for the funding and implementation of this plan. Additional funds for bush regeneration activities and enhancement of tourism facilities may be available via NSW Government grants.

Opportunities to partner with the BBLALC and other community groups to deliver on-ground works or jointly apply for grant funds should be explored.

All on-ground works need to be performed in accordance with a SWMS that includes information about risks and working in a GHFF camp.

If there is a sudden influx of flying-foxes to the camp, other Councils and OEH should be consulted to determine if it is related to a dispersal or just part of normal seasonal fluctuations. If a Council disperses a camp, the approval conditions for that dispersal typically state that it is responsible for management of conflict that arises elsewhere as a result of the dispersal. Required management and associated costs could involve further dispersal action. This is part of the reason why monitoring other camps and potential habitat areas are a standard condition of approval for dispersal action.

Council will continue to advocate to the NSW Government to obtain additional resources and funds for implementation of this plan.

6.2 Consents

Licences need to be obtained prior to on-ground work commencing. Refer to **Section 2.8** for further details. Based on previous experience of managing other camps, it is expected that the NSW OEH and the Commonwealth DoE will impose restrictions on activities at the GHFF camp as part of any approvals. The restrictions will aim to reduce potential impacts on the GHFF life cycle.

Any affected land manager must also consent to proposed activities or works on their land.

6.3 Costs

Table 4 summarises the recommended high priority Level 1 actions and estimated costs. These actions are described in more detail in **Section 5**.

Table 4: Summary of Level 1 actions and costs over five years

Section	Action	Unit cost	Budget for 5 years
5.4.1	Provide subsidised services or modifications	various	\$20,000
5.4.2	Remove exotic palm trees	\$350 per tree	\$5000
5.4.3	Maintain existing buffer zones	\$5000 pa	\$25,000
5.4.4	Enhance appearance and facilities	Weed and rubbish removal \$15,000 pa Signage \$5000	\$130,000

Section	Action	Unit cost	Budget for 5 years
		Water quality investigation \$50,000	
5.4.5	Community support and advice	Covered by existing Council budgets	-
5.4.6	Land use planning	Covered by existing Council budgets	-

6.4 Monitoring and adaptive management

It is important that the flying-fox population at the Water Gardens continues to be monitored as part of the National census. The effectiveness of actions identified in this plan also need to be monitored. As indicated in **Section 5.4**, if the Level 1 actions are successful in reducing conflict, Council should continue to implement these beyond the initial five year period. If these actions are not effective then Council may decide to escalate to Level 2, and eventually Level 3 actions.

6.5 Plan review

This plan should be reviewed and updated after five years or if there has been a substantial change in the number of flying-foxes permanently inhabiting the camp. A decision to review the plan should be made by Council in consultation with OEH.

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Appendix A Steering Committee

Organisation	Name	Title
Eurobodalla Shire Council	Manager Environmental Services	Deb Lenson
Eurobodalla Shire Council	Natural Resources Supervisor	Courtney Fink-Downes
Eurobodalla Shire Council	Mayor	Councillor Lindsay Brown
NSW OEH	Team Leader, Community Engagement	Lorraine Oliver
NSW OEH	Threatened Species Officer	Joss Bentley
NSW Department of Health	Environmental Health Officer	Peter Harrington
Crown Lands Division of NSW Trade and Investment	Natural Resource Officer	Helen Wheeler
NSW Land and Housing Corporation		Kathryn O'Callaghan
Mogo Zoo	Veterinarian	Sam Young
WIRES	Chair of south-east region	Bill Thompson
Eurobodalla Concerned Citizens		Trish Hellier
Batemans Bay Local Aboriginal Land Council	CEO	Alisha Davis
Eco Logical Australia	Water Gardens Management Plan Project Manager	Beth Medway

Appendix B Consultation process

Community consultation has involved the following:

Late 2013 until March 2014

- Face-to-face meetings and telephone calls with residents living adjacent to the camp to discuss issues and provide NSW Department of Health factsheets during the period of flying-fox influx

30 March 2015

- Letterbox drop of common questions and tips from the Eurobodalla community about coping with flying-foxes living near people's homes and neighbourhoods and NSW Department of Health factsheets

March 2015 until September 2015

- Face-to-face meetings and telephone calls with residents living adjacent to the camp to discuss issues, potential management options and emergency management works to create buffer between roosting habitat and residences
- Written correspondence (letters and emails) sent to landholders, residents and other stakeholders responding to community questions and issues
- Ongoing updates on the website and regular media releases including
 - 9/6/15 Council provides funding for buffer works and preparation of a Camp Management Plan
 - 4/8/15 Community help needed for flying-fox plan
 - 17/8/15 Vegetation buffer works to commence
 - 25/8/15 Flying-fox buffer and steering committee underway
 - 1/9/15 invitation to 'have your say' and how to do so

18 May 2015

- Letter box drop and letters posted inviting attendance to the June 2 community meeting

2 June 2015

- Public meeting at Batemans Bay Community Centre to discuss managing issues associated with flying-fox camps, including issues associated with habitat modification and the difficulties associated with dispersal attempts. To discuss short and long term management options.

6 July 2015

- Letter box drop and letters posted to inform the community of Council's resolution to undertake emergency management works to create a buffer between flying-fox roosting

sites and residences and also funding to engage a consultant (Eco Logical Australia) to prepare a Camp Management Plan

6 August 2015

- Letters inviting members of the community to join the flying-fox steering committee to assist with preparing the Camp Management Plan

17 August 2015

- Letter box drop to inform the community of the scheduled emergency management works, the appointment of a consultant to prepare a Camp Management Plan and the upcoming future consultation to participate in the development of the plan

21 August 2015

- Introductory steering committee meeting and review of the Flyingfoxengage tool

31 August until 18 September 2015

- Flyingfoxengage online questionnaire including computers available at the Batemans Bay Community Centre and libraries

2 September 2015

- Letter box drop to inform the community of the opportunity to participate in the Flyingfoxengage process to contribute to the development of the Camp Management Plan

3,5,8 and 15 September 2015

- Face-to-face meetings at Batemans Bay Village Centre, Moruya Country Markets and Batemans Bay Community Centre to get community ideas and feedback for the Camp Management Plan
- Telephone hotline (02 8526 8686) and Water Gardens specific email address (watergardens@ecoaus.com.au) set up for community feedback
- Promoted in Council's online newsletter which has over 2,000 subscribers

16 October 2015

- Steering committee meeting to review the preliminary draft plan

Appendix C Case studies

Eurobodalla Shire Council (ESC) has consulted other NSW Councils to better understand how local government is managing issues relevant to flying-foxes. ESC has received 41 submissions from other councils, of which 19 have experienced conflict between the community and flying-fox habitat in their LGA. Of the submissions received, 22 Councils reported that they have not had any issues or flying-foxes are not present in their area.

This appendix presents examples of how flying-fox camps are being or have been managed in other urban areas in NSW.

The table at the end of this appendix summarises results of various camp dispersal attempts based on a review by Roberts and Eby (2013).

Royal Botanic Gardens

The Royal Botanic Gardens (RBG) is located adjacent to Sydney harbour and is regarded as significant cultural and botanical icon for Australia and the world. The gardens became home to a camp of GHFFs in 1989 and at its peak contained 20,000 individuals, including Black Flying-foxes and Little Red Flying-foxes.

Significant impacts were associated with the flying-foxes, with the critical issue being the damaging and killing of highly significant trees. The main objective was to disperse the entire camp to another area within Sydney and not allow any further roosting. Management action has involved:

- Noise deterrents continuously used for dispersal since June 2012. Following the first two weeks of noise pre-dawn and close to sunset, only pre-dawn deterrent activities continued for three years, with decreasing frequency.
- Ongoing monitoring of flying-fox camps around Sydney and satellite tagging of individuals to understand the dispersal of the animals from the gardens
- Daily relocation activities are conducted and will continue indefinitely.

Costs to date are approximately \$2,000,000 to cover approvals, permits, monitoring (e.g. satellite trackers), consultant fees, noise equipment, animal capture and condition assessments.

There have been no flying-foxes roosting in the RBG since mid-2013. Satellite tracking has shown the flying-foxes have moved to various camps around Sydney and across the east coast.

Source: RBG website and J. Martin (RBG) pers com 2013

Kareela

The Kareela GHFF camp comprises a north-facing 2 ha bushland gully. The camp was established when another camp in Sutherland Shire was dispersed as a result of nearby construction activities. The camp has up to 12,000 GHFF, depending on seasonal conditions.

The camp is situated with Bates Drive, Mikarie Place, Sylvanvale and Aspect Mikarie facilities to the north west; residential dwellings to the west and south west; sporting fields to the south east; and Bates Drive and Kareela Golf Course to the north east. Bates Drive Public School, Sylvanvale, Aspect and Mikarie facilities provide education and programs for children and adults with disabilities.

Sutherland Shire Council initially cleared a 10 m buffer between the camp and adjacent residents and schools. Eco Logical Australia was subsequently engaged to prepare a management plan. Actions have included increasing the buffer to 20 m followed by dispersal of the camp.

Dispersal required Commonwealth Government approval (based on a Referral under the EPBC Act) and a section 91 licence issued by OEH. Dispersal has involved disturbance using noise, smoke and light. The primary dispersal action was undertaken in mid-2015 and involved up to 12 staff on site each day (Council and consultants) plus extensive monitoring of nearby habitat and other camps. Approval conditions restrict the time and dispersal activities. Currently in the maintenance phase which requires an ongoing presence at the Kareela camp each day plus monitoring of other camps within a 20 km radius.

Approximately \$250,000 has been spent to date.

Source: Eco Logical Australia

Wolli Creek

The Wolli Creek camp is located in degraded, regrowth bushland between Wolli Creek and a railway corridor. The camp is managed by Rockdale City Council and has an area of 3.4 ha. The camp was established in 2007. The peak GHFF population recorded was in October 2012, with just over 20,000 individuals. The camp has been permanently occupied since that time.

There have been no reports of conflicts between the camp and the local community. Community volunteers with the Wolli Creek Preservation Society have conducted fly-out counts each month since 2008.

Management action is focused on weed control and camp sustainability in situ. Funds will primarily be allocated for bush regeneration. Signage, community education and fencing will also be undertaken.

A section 91 licence and section 132c licence from OEH are required for bush regeneration in proximity to the camp.

Source: Eco Logical Australia

Maclean

The flying-fox colony comprises approximately 25,000 individuals at Maclean on the far North Coast of NSW. It is centred on the Maclean Rainforest Reserve, Maclean High School, Maclean TAFE campuses and remnant vegetation along a gully to the northeast across Cameron Street. The camp has been occupied by GHFF, Black Flying-foxes and at times by Little Red Flying-foxes (Geolink 2011).

Historically the management of flying-foxes at Maclean has been reactive rather than in accordance with a proactive long term strategy. Previously the management of the Maclean flying-foxes included culling, dispersal by noise and smoke (Geolink 2011). These actions were immediately successful in dispersing the flying-foxes from the rainforest and school areas to a gully to the north east. However, following the completion of the noise disturbance and significant flowering events the flying-foxes moved back into previously occupied areas.

The key objectives of the Maclean Flying-fox Plan of Management were to address the concerns of local residents, Maclean High School & Technical and Further Education community, and the broader Maclean community whilst conserving and co-existing with the flying-fox population.

Management action to date has cost at least \$500,000 and involved:

- 1999 intensive dispersal actions
- 2010 onwards:
 - clearing of vegetation buffers and offset planting
 - community education
 - planting of alternative habitat
 - bush regeneration at Maclean Rainforest Reserve

Actions have resulted in:

- Flying-foxes have established seven new camps, three of these in inappropriate areas with further conflicts.
- Flying-foxes continue to revisit the original camp with numbers fluctuating
- Actions have reduced public outcry and calls for relocation
- Conditions on licence to disperse very restrictive and very difficult to undertake and unlikely it ever will be undertaken

Source: Rodney Wright (Clarence Council) pers. comm (2013)

Review of past dispersal actions by Roberts and Eby (2013)

Location	Species	FF population estimate at time of dispersal	Method	Did the animals leave the local area?	Did the local population reduce in size?	How far did they move?	Were new camps formed (number of new camps if known)?	Number of separate actions	Cost (if known)	Was conflict resolved at the original site?	Was conflict resolved for the community?	Source+
Barcaldine, Qld	R	>50,000	VN	no	no	≈2 km	yes (1)	trees in township felled		yes	no	1,2
Batchelor, NT	B	200	BNS	no	no	<400 m	yes (1)	2		yes	yes	3,4
Boyne Island, Qld	BR	25,000	LNS	no	no	<500 m	yes (2)	3		yes	no	5,6,7
Bundall, Qld	GB	<400	V	no	no	uk, but 4 camps were within 5 km	yes (3)	1		yes	uk	8,9,10
Charters Towers, Qld	RB	variable	HLNPOW	no	no	200 m	no (returned to original site)	repeated since 2000	>\$500,000	no	no	11,12
Dallis Park, NSW	BG	28,000	V	no	yes	300 m	yes (1)	2		yes	no	13
Duaringa, Qld	R	>30,000	VNFO	no	no	400 m	yes	1	\$150,000	yes	uk	14
Gayndah, Qld	RB	200,000	VN	no	no	600 m	yes	3 actions, repeated		yes	no	9
Maclean, NSW	BGR	20,000	NS	no	no	350 m	yes (7)	>23	>\$400,000 and ongoing	no	no	13
Mataranka, NT	BR	>200,000	BHLNOSW	no	no	<300 m	uk	>9		no	no	13
North Eton, Qld	B	4800	VNFB	uk	no	<1.5 km initially	yes (≈4 majority temporary)	2	\$45,000	yes	yes (conflict at one site)	10,15,16, 17
Royal Botanic Gardens, Melbourne, Vic	G	30,000	NS	no	no	6.5 km	yes (2)	6 mths	\$3 million	yes	yes, ongoing management required	13
Royal Botanic Gardens, Sydney, NSW	G	3,000	LNPOW	no	no	4 km	no	ongoing daily actions for 12 mths	>\$1 million and ongoing	yes	yes	13,18,19
Singleton, NSW	GR	500	LNUW	no	no	<900 m	no (returned to original site)	>3	\$117,000 and ongoing	no	no	13,20

Location	Species	FF population estimate at time of dispersal	Method	Did the animals leave the local area?	Did the local population reduce in size?	How far did they move?	Were new camps formed (number of new camps if known)?	Number of separate actions	Cost (if known)	Was conflict resolved at the original site?	Was conflict resolved for the community?	Source+
Townsville, Qld	BR	35,000	BNS	no	no	400 m	no (returned to original site)	5		no	no	13
Warwick, Qld	GRB (dispersal targeted R)	200,000	NLBP	no	no	≈1 km	no (site known to be previously occupied by GB)	5 days	\$28,000	yes	Uk (complaints persisted until migration)	8,21,22
Young, NSW	L	<5000	VN	no	no	<600 m	yes (1)	uk		yes	no	23

* G = grey-headed flying-fox; B = black flying-fox; R = little red flying-fox

B = “birdfrite”; F = fog; H = helicopter; L = lights; N = noise; P = physical deterrent; O = odour; S = smoke; U = ultrasonic sound; V = extensive vegetation removal; W = water.

+ 1 Storm Stanford (Wildlife carer, pers comm. 2013); 2 Louise Saunders (Bats Qld, pers comm. 2013); 3 Phillips *et al.* (2007) Displacement of Black flying-foxes *Pteropus alecto* at Batchelor, Northern Territory *Australian Zoologist* 34: 119-124; 4 John McCarthy (Northern Territory Government, pers comm. 2010); 5 Roberts (2006) *Management of Urban Flying-fox Camps: Issues of Relevance to Camps in the Lower Clarence, NSW*. Valley Watch Inc., Maclean; 6 Information from Gladstone Regional Council in 2010 and 2013; 7 Joe Adair (formerly DEHP, pers. comm. 2010); 8 Trish Wimberly (Australia Bat Clinic pers. comm. 2013); 9 Information obtained from Department of Environment and Heritage Protection (DEHP) in 2013; 10 Billie Roberts unpublished data; 11 Scott Sullivan (DEHP, pers. comm. 2010); 12 Information from Charters Towers Regional Council in 2010 and 2013; 13 Roberts *et al.* (2012b) and additional references within; 14 Perry Deeds (Central Highlands Regional Council, pers. comm 2013); 15 Jarmaine (2010) *Species Management Plan*, Mackay Regional Council; 16 Heidi Jarmaine (Mackay Regional Council, pers. comm. 2013); 17 Daryl Barnes (Walkerston resident, per comm. 2013) 18 Peggy Eby (Ecologist, pers comm. 2013) 19 John Martin (RBG, pers comm. 2013); 20 Singleton Council Meeting Minutes; 21 Information from the Southern Downs Regional Council in 2013; 22 Tim Low (pers. comm. 2013); 23 Young Shire Council.

uk = unknown



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