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MANAGEMENT

REVIEW OF FLYING-FOX MANAGEMENT

HINCHINBROOK SHIRE COUNCIL

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1. Introduction

Biodiversity Australia was engaged by Hinchinbrook Shire Council (HSC) to undertake a review of flying-fox management within the township of Ingham, QLD.

The primary aim of this report is to provide supporting information for the effective ongoing management of flying-foxes in HSC based on a review of flying-fox management in the region.

1.1 Project Objectives

Biodiversity Australia understands that HSC's primary objectives for the project are as follows:

- To provide an independent summary of all existing information and reports pertaining to flying-foxes within HSC
- To provide a review of current management strategies and their effectiveness in maintaining Hinchinbrook Shires urban footprint clear of flying-foxes
- To provide clear information on the distribution, habitats and roost/camp dynamics of flying-foxes within the region
- To provide evidence-based recommendations for improving current flying-fox management strategies in the region

1.2 Background

HSC is unique in that all four of Australia's mainland species of flying-foxes occur in the region. Historically, HSC has been a permanent home to the black flying-fox *(Pteropus alecto)*, the grey-headed flying-fox *(Pteropus poliocephalus)* and the spectacled flying-fox *(Pteropus conspicillatus)*, and a periodic home to the little red flying-fox *(Pteropus scapulatus)*. The presence of the spectacled flying-fox and grey-headed flying-fox, which are listed as Endangered and Vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), respectively, adds a layer of complexity to flying-fox management in the region.

Flying-foxes in HSC have experienced large fluctuations in population numbers. Seasonal influxes of flying-foxes are common in and around Ingham especially during the summer months. The large roost in the Ingham Memorial Gardens has historically recorded flying-fox numbers in excess of 500,000 individuals, leading to vegetation damage in the gardens, reduction in amenity for the surrounding community and a community fear of disease. As such, their presence is a contentious and long-running issue in HSC. As a result, HSC has implemented a Flying-fox Relocation Strategy to manage urban flying-fox roosts in a way that accommodates both community expectations and the long-term conservation of flying-foxes.

2. History of Flying-foxes in Hinchinbrook

According to the National Flying-fox Monitoring Viewer (2024) there are three known flying-fox roosts in Hinchinbrook Shire Council area. One of which is considered a nationally important roost. The nationally important flying-fox roost is located at the Ingham Memorial Gardens within the township of Ingham. Prior to 2020 flying-foxes had reportedly been roosting in the Memorial Gardens for a number of years. The presence of flying-foxes in Ingham has been a long-running and contentious issue within the community.

Prior to 2015 a population comprised of several thousand black flying-fox *(Pteroptus Alecto)* and a small number of grey-headed flying-foxes *(Pteroptus poliocephalus)* and spectacled flying-foxes *(Pteroptus scapulatus)* were known to roost in Ingham Memorial Gardens (Ecosure 2015). Little red flying-foxes *(Pteroptus scapulatus)* were also known to frequent the area in large numbers (Ecosure 2015). There were no attempts to manage the Ingham Memorial Gardens roost prior to 2015.

During February 2015 the Ingham Memorial Gardens roost received a large influx of little red-flying-foxes (Ecosure 2015). Based on the density and duration of fly-out, it was estimated that the roost population had increased to approximately 500,000 (Ecosure 2015). The significant increase in flying-foxes within the township resulted in conflict with the community. The main issues identified were a reduced amenity for nearby residents, businesses and park users, fear of disease and damage to vegetation in the gardens (Ecosure 2015). Subsequently, the Council employed Ecosure to assess the roost. When the assessment was undertaken the little red-flying-foxes had already left the roost, leaving approximately 30,000 black flying-foxes and 200 grey-headed flying-foxes (Ecosure 2015). No spectacled flying-foxes were identified during the assessment, however information from the Council indicates there were usually 200-300 individuals present so it was assumed that a small population was still present (Ecosure 2015).

In 2018 Ecosure undertook vegetation remediation works in Ingham Memorial Gardens where a section of the gardens had become damaged, overgrown and weedy due to the presence of flying-foxes. The works primarily consisted of vegetation removal and modification such as the removal of fallen vegetation, dead/dying trees and debris, and slashing/ mowing overgrown vegetation. (Ecosure 2018). When the works were undertaken the majority of the colony (~15,000 flying-foxes) were roosting in Lee Park along Palm Creek which is situated on Council and private land. A smaller proportion of the colony (~16,100 flying-foxes) were located within the Memorial Gardens near McIlwraith Street. The roost consisted of approximated 16,000 black flying-foxes, 54 spectacled flying-foxes and 61 grey-headed flying-foxes (Ecosure 2018). It was noted that the majority of the black-headed flying foxes in the Ingham Memorial Gardens roost were young bats, most likely young from that year and the previous year.

In late 2019, the size of the flying-roost in Ingham Memorial Gardens led to a variety of human-wildlife conflict-related issues (Biodiversity Australia 2020a). These included a number of school closures, loss of revenue for businesses located in the vicinity of the roost, and a number of public health and safety concerns (Biodiversity Australia 2020a). As such, a reactive flying-fox camp management program was undertaken in February 2020 to temporarily remediate the issue (Biodiversity Australia 2020a). Biodiversity Australia had undertaken a flying-fox count in late January of 2020 and recorded numbers were in excess of 250,000.

At the commencement of relocation activities reports detail approximately 25,000 flying-foxes present at the Ingham Memorial Gardens roost (Biodiversity Australia 2020a). Anecdotal information from Biodiversity Australia Principal Consultant, recalls numbers of approximately 60,000. Morning relocation activities commenced pre-dawn and continued for a maximum of two hours to avoid excessive stress on the animals as per the flying-fox roost management guideline (Department of Environment and Science, 2020). The primary methods utilised to discourage flying-fox presence at the existing camp and surrounding roost trees were the pool noodle, ThunderBird-100 gas gun, destress whistle, high intensity lights and exaggerated physical movements of the technicians (Biodiversity Australia 2020a). Temporary flood lighting was utilised at selected sites including the eastern portion of Tyto Wetlands to discourage

flying-foxes from settling close to the Ingham township and direct them towards the western end of the wetlands. (Biodiversity Australia 2020a). Following relocation activities on the second day of works, almost all flying-foxes in Ingham were observed to have moved to the desired location at the western end of Tyto Wetlands (Biodiversity Australia 2020a).

After the successful relocation of the Ingham Memorial Gardens roost in February 2020, Biodiversity Australia was engaged to develop a long-term relocation strategy for the Ingham Memorial Gardens roost (Biodiversity Australia 2020b). This included an in-depth habitat suitability analysis to assess areas of alternative habitat for flying-foxes in the township to deter flying-foxes from returning to the Ingham Memorial Gardens roost and start preferentially using alternative roosting sites outside of anthropogenic areas (Biodiversity Australia 2020b).

Biodiversity Australia was engaged again in early 2021 (January) to assist with the relocation of an establishing flying-fox camp found within remnant bushland on the western border of the Apex Senior Citizens Village (Biodiversity Australia 2021). Upon arrival a camp assessment and 'fly out count' determined that approximately 15,000 black flying-foxes were roosting onsite (Biodiversity Australia 2021). A large population of Little red flying-foxes were also present but self-dispersed before relocation activities commenced (Biodiversity Australia 2021). Relocation activities were undertaken for 18 days to ensure the roost and subsequent splinter roosts were deterred from high conflict areas (Biodiversity Australia 2021). As required, Pool noodles, the ThunderBird-100 gas gun, and pyrotechnics were used to disturb flying-foxes attempting to settle within the Apex Village Roost and other roost sites and redirect them towards an alternative roost site at the western end of the Tyto Wetlands (Biodiversity Australia 2021).

At the request of HSC a number of council field technicians were enrolled into the reactive management plan to assist and be upskilled in the flying-fox management techniques (Biodiversity Australia 2021). Council field technicians have continued to apply these techniques during daily field activities.

3. Current Flying-fox Management

3.1 Management Responsibilities

Hinchinbrook Shire Council recognises the need to manage urban flying-fox roosts in a way that accommodates both the expectations of the community and the long-term conservation of flying-foxes. The location of a flying-fox roost determines who is responsible for management activities.

Where the roost is located on Council land, the Council is responsible for management activities. Under section 41A of the Nature Conservation (Wildlife Management) Regulation 2006 there is a flying-fox roost management regulatory framework that gives local government an 'as-of-right' authority to manage 'problem' flying-fox roosts in Urban Flying-Fox Management Areas (UFFMA). This means that HSC can undertake non-lethal management actions in accordance with the *Code of Practice – ecologically sustainable management of flying-fox roosts* (The Code) (DES 2020a) without requiring a permit.

Where the flying-fox roost is located on private land, the landholders are responsible for management activities. Unauthorised tampering with flying-fox roosts can incur significant fines and/or imprisonment under section 88C of the *Nature Conservation Act 1992*. Private landholders can apply for a permit to implement measures to reduce the impacts of flying-foxes on private land.

3.2 Management Actions

HSC has a dedicated flying-fox management team that undertake management activities each day. There's always at least one person on shift starting at 4-5am depending on the time of year for fly-in. The team conducts flying-fox checks at all the known flying-fox hotspots in and around Ingham. Where any flying-foxes are located they undertake active dispersal generally by clapping pool noodles and/or shining and rattling torches. The team only uses pyrotechnics if there is a large influx or they are having significant issues reaching them e.g. on an island, boggy swamp etc.

Daily activities depend on staff/flying-fox numbers with extra staff on shift for significant influxes. Extra staff may also be put on if the flying-foxes are reluctant to relocate. Where possible staff record flying-fox counts and other information such as species present, breeding status, weather and temperature.

3.3 Effectiveness of Management Practices

The largest influx of flying-foxes HSC has received since implementing its reactive management plan in 2021 is ~5,000 black flying-foxes in November 2024 (Figure 1). These numbers are a significant decrease from the influx of ~500,000 little red flying-foxes in 2015, ~250,000 in 2020 and even the ~16,000 individuals in 2018 or ~25,000 in 2020.

The timing of intervention is a crucial factor to the success of flying-fox management actions. Early intervention (e.g. in the first week) before a new roost firmly establishes in an undesirable location is often a key factor in successfully relocating flying-foxes (Department of Environment and Science 2020). The fact that since HSC has implemented its reactive flying-fox management it has not received significant influxes of flying-foxes to the same degree as prior to the plan does attribute confidence to the effectiveness of management practices. The major difference between HSC and other LGA's in QLD that have continued to experience significant influxes of flying-foxes since 2021 is the early intervention HSC has implemented through consistent daily dispersal efforts.

It should also be noted that all flying-fox team members interviewed during the preparation of the report all felt that the current management practices were effective. All members felt that the clapping pool noodles and/or using a torch flash and rattle were very effective at dispersing flying-foxes on a day-to-day basis. One former team member (Time period in role:

2020-2024) asserted there was a clear trend between dispersal effort and flying-fox numbers, stating the more effort the team was able to put in the lower the number of flying-foxes observed in HSC.

One team member who has been in the flying-fox program since February 2021 said he had previously seen as little as 5-6 individual flying-foxes turn into thousands within a week without intervention. This team member believes flying-fox numbers have dropped significantly due to continued dispersal efforts not allowing flying-fox to give birth to babies in the management area breaking the cycle of flying-foxes using Ingham.

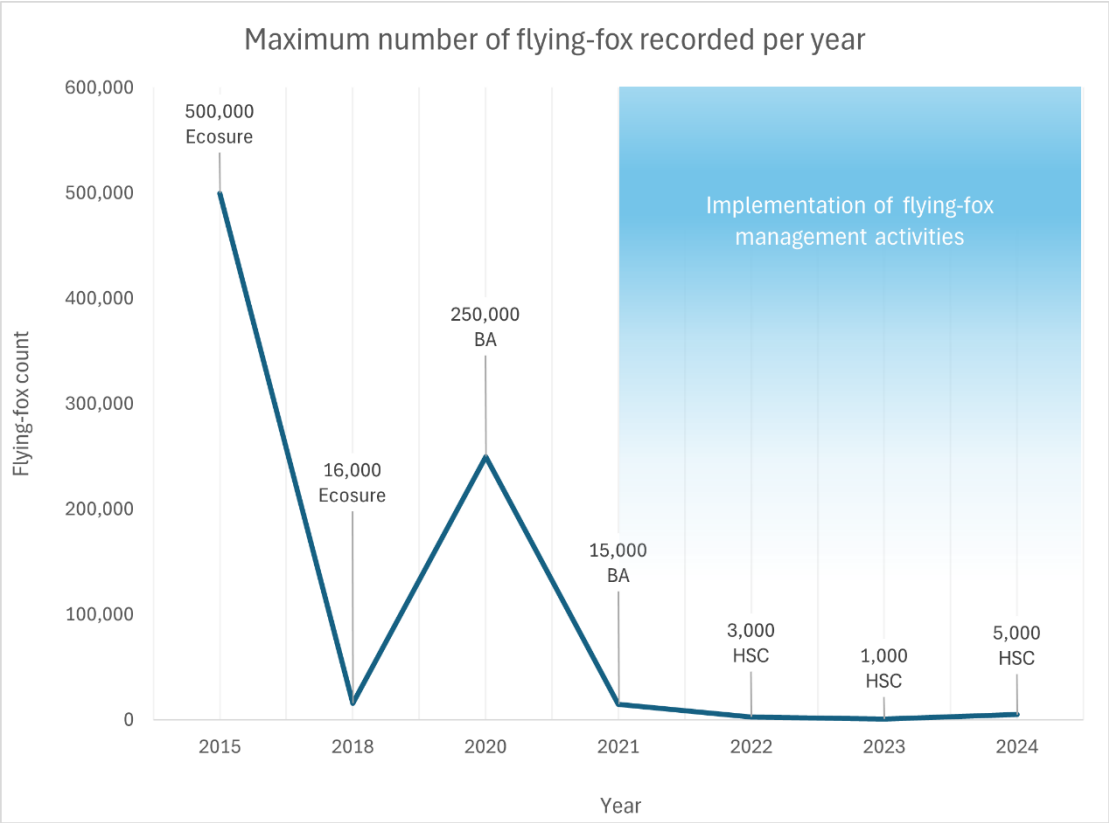

Figure 1. Maximum number of flying-foxes recorded per year in HSC between 2015 and 2024

4. Assessment of Roost Dynamics

Flying-fox roost-site selection has often been attributed to a variety of environmental factors. A major influence has often been attributed to the distribution of food resources such as flowering and fruiting plants (Westcott et al., 2015; in Macdonald et al., 2022). The boom-and-bust nature of these food resources requires flying-fox to travel vast distances in order to exploit them. This also means that flying-fox roost locations are constantly changing (Westcott et al., 2015; in Macdonald et al., 2022).

New research into little red flying-fox (*Pteropus scapulatus*) camp site selection, conducted by The Commonwealth Scientific and Industrial Research Organisation (CSIRO), has shown the following factors to be important for roost-site selection:

- High level of existing greenness. The Normalised Difference Vegetation Index (NDVI) measures the amount of green, living vegetation.
  - Most flying-fox roosts are found in areas that have substantially higher levels of NDVI values compared to the surrounding vegetation
- Marginally taller tree and shrub canopy
- Short ground cover (Macdonald et al., 2022)
- Close proximity to watercourse
  - Reduced temperature extremes
  - Higher annual rainfall

Many of the known flying-fox roost locations in and around Ingham (Figure 2) have the attributes highlighted above. These factors, combined with the knowledge that flying-fox may actively seek out urban areas for roosting (Macdonald et al., 2022, Tait et al., 2014), provides some insight into why sites such as the Ingham Memorial Gardens attract so many flying-foxes.

Data collated from the flying-fox management teams daily activities also provides insight into the dynamics of flying-fox roosts in the region. Figure 3 below shows the total count of flying-foxes between 31/12/2020-26/11/2024 per month. This data shows a steady increase in the number of flying-foxes in the area as we go into Spring with a significant increase in numbers in December and January.

A Biodiversity Australia field member visited HSC on the 28th October 2024 to assess known flying-fox locations. No flying-foxes were recorded during this visit.

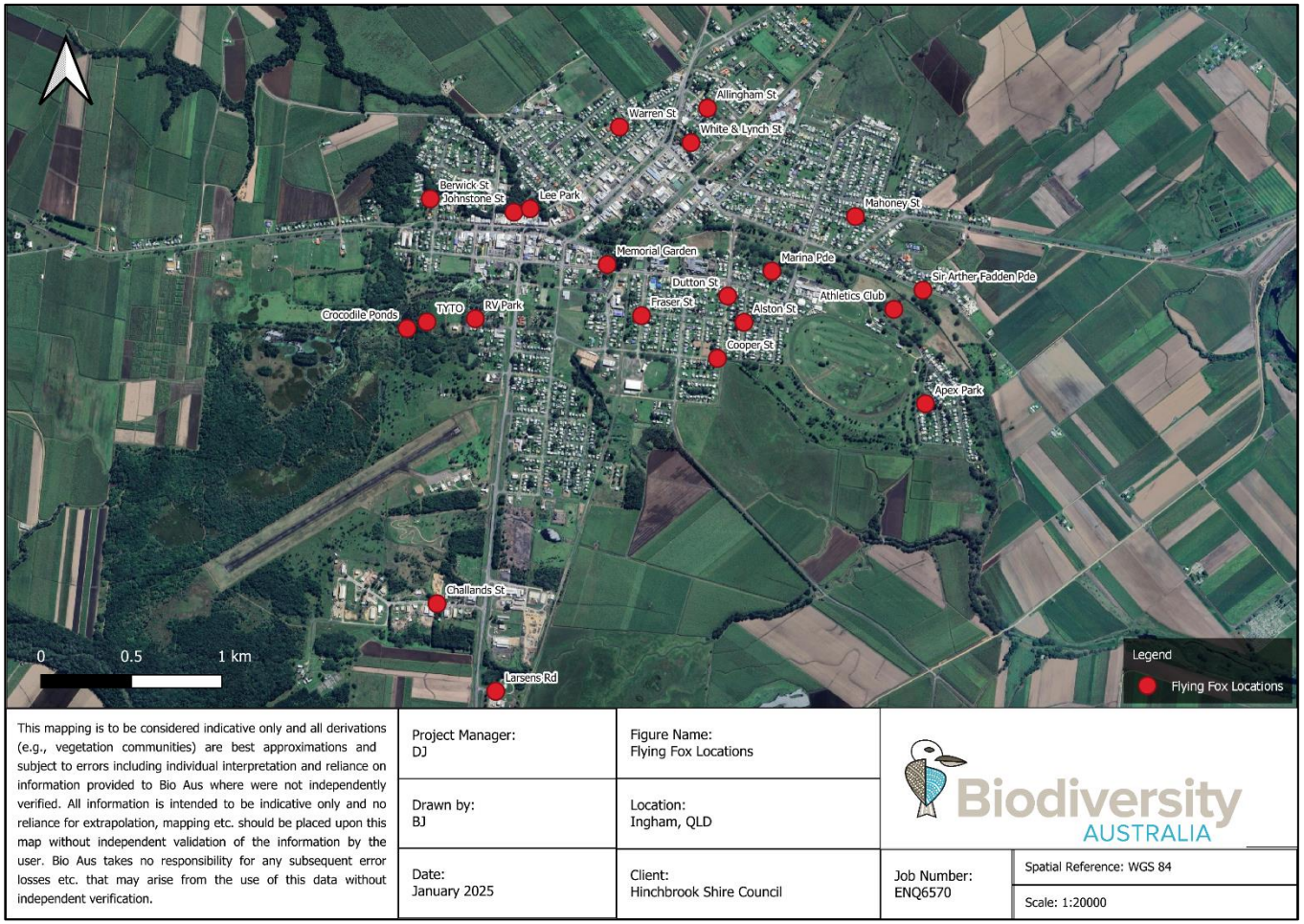

Figure 2. Known flying-fox locations in HSC

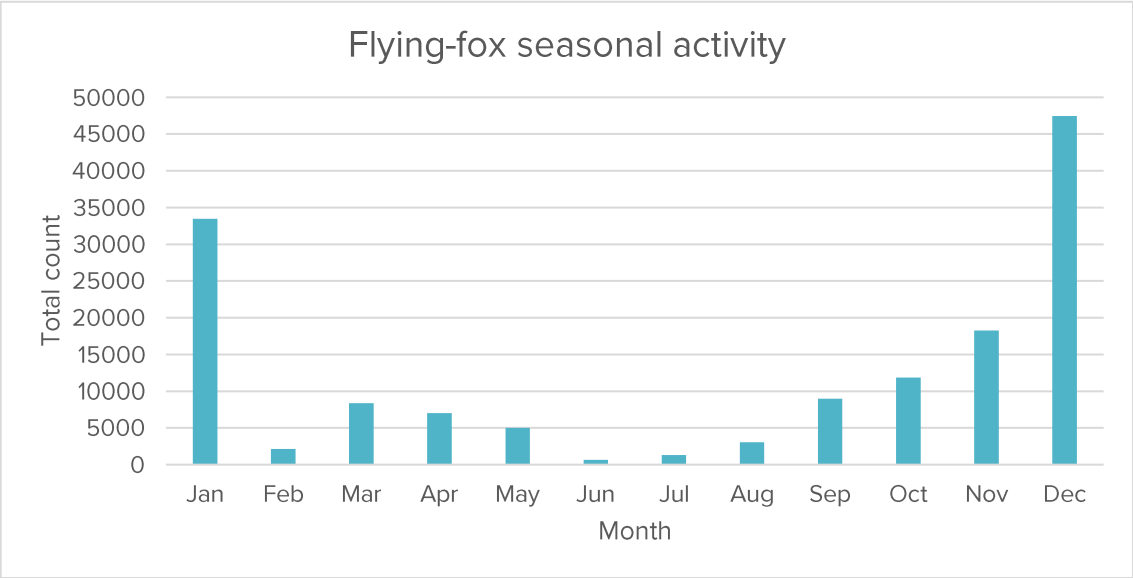

Figure 3. Total count of flying-foxes across all sites between 31/12/2020-26/11/2024 grouped by month to show seasonal activity of flying-foxes in the area

5. Recommendations

Early intervention through continued daily dispersal activities by the flying-fox team members has been effective at maintaining flying-fox numbers in and around Ingham as low as possible. Monitoring data from the last four years indicates a significant decrease in flying-fox activity in the region between May and August (refer to Figure 3). Given the significant decrease in flying-fox activity during these months, daily dispersal activities may not be necessary at that time as the risk of large increases is generally lower. It is recommended to decrease dispersal activities to three days per week during these months as part of an adaptive management strategy.

Adaptive management is a continuous iterative learning process that involves adjusting management actions based on monitoring and evaluation. This means that if decreasing the frequency of dispersal activities between May and August leads to a significant increase in flying-fox presence within the UFFMA then dispersal activities should immediately be returned to a daily schedule in response.

Maintaining lower numbers of flying-foxes in the UFFMA means that there is less conflict between flying-foxes and the community. It also means that roosts can be managed internally by the flying-fox management team. If HSC were to receive another significant influx of flying-foxes council resources would become overwhelmed with the numbers and external assistance would be required.

Preventative measures such as vegetation modification are also recommended to reduce available habitat for flying-foxes to roost in locations identified as unsuitable. Identifying fruiting and flowering species that occur at unsuitable known flying-fox locations during peak seasonal activity (November-January) would be a good starting point. These trees could then be assessed to determine if any vegetation modification could be undertaken.

The collection of flying-fox data in HSC provides crucial information on flying-fox population trends and other ecological factors. The information provided from monitoring efforts is crucial in assessing and measuring the effectiveness of implemented management actions. Where possible team members have been collecting data during their daily activities. While the data collected by the flying-fox team has provided a basic insight into the effectiveness of management strategies and patterns of flying-fox activity in the region, the inconsistency of the data recorded has highlighted a missed opportunity for further analysis of distribution, habitats and roost dynamics in the region.

It is recommended that data is collected routinely as a consistent part of monitoring activities. Data should be entered into a GIS platform and uploaded to Councils records to avoid the need to manually collate data. Fields such as date, time, site name, species and count should be mandatory and set fields to ensure data integrity and consistency and to prevent incomplete records. Utilising a drop-down option for data entry will also reduce inconsistencies in data entries, reduce errors and simplify the process of entering data by providing a structured and easy way to select from a predefined list of options. It is recommended that HSC engage professional data management services to effectively implement these measures. Implementing these measures will help establish data quality standards increasing the accuracy and reliability of the data collected.

Additionally, it is recommended that data collected by flying-fox team members is provided to the State Government and recorded by the National Flying-Fox Monitoring Viewer to assist in identifying flying-fox movements at a larger scale.

6. Conclusions

The presence of flying-foxes in HSC has been a long-running and contentious issue within the community. This report provides a detailed history of flying-foxes in Hinchinbrook based on all existing information and reports pertaining to flying-foxes within HSC (for more detail refer to Section 2). A review of current management strategies has shown the current practices have been effective at maintaining flying-fox numbers in and around Ingham as low as possible. Prior to implementing current management strategies, HSC received massive booms in flying-fox numbers creating massive interruptions to the community and damaging the region's economy and central services. There have been no significant influxes of flying-foxes in the region since recommendations for early intervention and continued dispersal activities were implemented in 2021.

Given the inconsistency of data recorded, there has been a missed opportunity to provide clear information on the distribution, habitats and roost/camp dynamics of flying-foxes within the region. It is recommended that data is collected routinely as a consistent part of monitoring activities utilising the measures recommended in Section 5 to ensure data integrity, prevent incomplete records, reduce errors and simplify the process of entering data. It is recommended that HSC engage professional data management services to effectively implement these measures and help establish data quality standards. Implementing adaptive management strategies to decrease the frequency of dispersal activities during identified periods of decreased flying-fox activity (May-August) will provide opportunities in the budget to reinvest in data management. Recording reliable and accurate data on flying-fox activities in the region will allow for continued analysis, evaluation and improvement of flying-fox management strategies in HSC.

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