VML:MB
Vicki Lukritz
3810 6221

15 March 2018

Sir/Madam

Notice is hereby given that a Meeting of the **CONSERVATION AND ENVIRONMENT COMMITTEE** is to be held in the **Council Chambers** on the 2nd Floor of the Council Administration Building, 45 Roderick Street, Ipswich commencing at **10.30 am** ***or 10 minutes after the conclusion of the Works, Parks and Sport Committee, whichever is the earlier*** on **Monday, 19 March 2018**.

MEMBERS OF THE CONSERVATION AND ENVIRONMENT COMMITTEE	
Councillor Silver **(Chairperson)** Councillor Bromage **(Deputy Chairperson)**	Councillor Antoniolli **(Mayor)** Councillor Wendt **(Deputy Mayor)** Councillor Morrison Councillor Martin

Yours faithfully

ACTING CHIEF EXECUTIVE OFFICER

CONSERVATION AND ENVIRONMENT COMMITTEE AGENDA

10.30 am *or 10 minutes after the conclusion of the Works, Parks and Sport Committee, whichever is the earlier* on **Monday,** 19 March 2018

Council Chambers

Item No.	Item Title	Officer
1	Bremer River Rock-Ramp Fishway Monitoring – Divisions 8 and 10	PO(B)
2	Draft Brush-Tailed Rock Wallaby Recovery Plan	PO(B)
3	Wildlife of Ipswich Book Series	PO(B)
4	Request for Council to Consider Contribution to the Catchment Investment Program as Part of the Resilient Rivers Initiative	A/SRNRM
5	Trees for Mum Day 2018 Community Planting Event	PO
6	** Proposed Solar Farm – Whitwood Road Landfill – Division 3	A/COO (WPR)

** Item includes confidential papers

CONSERVATION AND ENVIRONMENT COMMITTEE NO. 2018(03)

19 MARCH 2018

AGENDA

1. BREMER RIVER ROCK-RAMP FISHWAY MONITORING – DIVISIONS 8 AND 10

With reference to a report by the Planning Officer (Biodiversity) dated 26 February 2018 concerning monitoring of the Berry's Weir Fishway on the Bremer River.

RECOMMENDATION

That the report be received and the contents noted.

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2. DRAFT BRUSH-TAILED ROCK WALLABY RECOVERY PLAN

With reference to a report by the Planning Officer (Biodiversity) dated 26 February 2018 concerning the draft Brush-Tailed Rock Wallaby Recovery Plan.

RECOMMENDATION

That the draft Brush-Tailed Rock Wallaby Recovery Plan as detailed in Attachment A be adopted to inform the future management of brush-tailed rock wallaby habitat within the Flinders-Goolman Conservation Estate and to support conservation efforts within the Little Liverpool Range, as detailed in the report by the Planning Officer (Biodiversity) dated 26 February 2018.

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3. WILDLIFE OF IPSWICH BOOK SERIES

With reference to a report by the Planning Officer (Biodiversity) dated 26 February 2018 concerning the creation of a Wildlife of Ipswich book series.

RECOMMENDATION

A. That Council adopt the draft Wildlife of Ipswich book series for printing and distribution to Conservation Partners and through Council's customer contact centres, as detailed in the report by the Planning Officer (Biodiversity) dated 26 February 2018.

B. That Council promote the Wildlife of Ipswich book series as an illustrative representation of the rich and varied diversity of wildlife in Ipswich.

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4. REQUEST FOR COUNCIL TO CONSIDER CONTRIBUTION TO THE CATCHMENT INVESTMENT PROGRAM AS PART OF THE RESILIENT RIVERS INITIATIVE

With reference to a report by the Acting Sport Recreation and Natural Resources Manager dated 27 February 2018 concerning a request for Council to consider a contribution to the Catchment Investment Program as part of the Council of Mayors (SEQ) Resilient Rivers Initiative.

RECOMMENDATION

That Council initiate discussion with the Council of Mayors to investigate opportunities for Council's contribution to the Catchment Investment Program in 2019–2020.

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5. TREES FOR MUM DAY 2018 COMMUNITY PLANTING EVENT

With reference to a report by the Partnerships Officer dated 19 February 2018 concerning the Trees for Mum Day planting event to be held on Sunday, 13 May 2018.

RECOMMENDATION

That Council approve the Trees for Mum Day planting event in 2018 to be held at George Palmer Park, Silkstone on Sunday, 13 May 2018.

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6. **PROPOSED SOLAR FARM – WHITWOOD ROAD LANDFILL – DIVISION 3

With reference to a report by the Acting Chief Operating Officer (Works, Parks and Recreation) dated 6 March 2018 concerning a proposal to establish a solar farm on Council's Closed Landfill situation at Whitwood Road, New Chum.

RECOMMENDATION

A. That Council enter into a Deed of Variation with LMS Energy Pty Ltd ACN 059 428 474 to vary the scope of the existing contract No: 11808, as detailed in the report by the Acting Chief Operating Officer (Works, Parks and Recreation) dated 6 March 2018.

B. That the Chief Executive Officer be authorised to finalise the terms of the Deed of Variation to the existing contract Number 11808 with LMS Energy Pty Ltd ACN 059 428 474 and do any other acts necessary to implement Council's decision in accordance with section 13(3)(c) of the *Local Government Act 2009*.

C. That the Chief Executive Officer be authorised to negotiate and finalise the proceeds from the Deed of Variation to be executed by Council, and to do any other acts necessary to implement Council's decision in accordance with section 13(3) (c) of the *Local Government Act 2009*.

** Item includes confidential papers

and any other items as considered necessary.

Conservation and Environment Committee	
Mtg Date: 19.03.18	OAR: YES
Authorisation: Bryce Hines	

TS: TS
H:\departmental\committee reports\1802TS Bremer River Rock-ramp Fishway Monitoring CR.doc

26 February 2018

M E M O R A N D U M

TO: SPORTS RECREATION AND NATURAL RESOURCES MANAGER

FROM: PLANNING OFFICER (BIODIVERSITY)

RE: BREMER RIVER ROCK-RAMP FISHWAY MONITORING
DIVISION 8 AND DIVISION 10

INTRODUCTION:

This is a report by the Planning Officer (Biodiversity) dated 26 February 2018 concerning monitoring of the Berry's Weir Fishway on the Bremer River.

BACKGROUND:

Construction of Berry's Weir partial width rock-ramp fishway on the Bremer River in Ipswich was completed in October 2016 in order to improve life cycle dependent movements of various fish species. One condition of development approval prior to construction of the fishway was to monitor and assess its performance in facilitating fish movement. This report summarises findings from the second round of monitoring.

The first round of monitoring occurred in December 2016 and was presented to City Works, Parks, Sport and Environment Committee No. 2017(03) of 20 March 2017 and Council Ordinary Meeting 28 March 2017 (Attachment A).

METHOD:

Round two of the fishway monitoring of the Berry's weir rock-ramp fishway was conducted over five days from the 18 – 22 December 2017 by fish ecologists and fishway experts, Catchment Solutions. Monitoring was conducted through use of fish traps positioned at the top of the fishway to capture fish that had ascended to the top of the rock ramp. All individual fish captured in the fishway trap were identified to species level, counted and measured to the nearest millimetre.

RESULTS:

Across five days of fishway monitoring a total of 16,401 individual fish were captured ascending the fishway at an overall rate of approx. 4075 fish per trapping day. This was made up of 16 species in total, comprised of 15 native species and one introduced species.

The most abundant species were:

- ∑ Empire Gudgeon - 8131 individuals
- ∑ Striped Gudgeon - 5166 individuals
- ∑ Sea Mullet - 1273 individuals
- ∑ Freshwater Mullet - 1073 individuals

The smallest fish recorded successfully ascending the fishway was a:

- ∑ 19 mm flathead gudgeon
- ∑ 21 mm empire gudgeon,
- ∑ 21 mm striped gudgeon
- ∑ 22 mm Australian smelt

The largest fish species recorded was a:

- ∑ 1200 mm long-finned eel
- ∑ 385 mm tilapia (exotic species)
- ∑ 234 mm sea mullet
- ∑ 204 mm bony bream

DISCUSSION:

The results of the fishway monitoring demonstrate that the rock-ramp fishway is successfully passing different fish species, size classes and life-stages of fish. Significantly, the fishway was successful at passing juvenile diadromous and small bodied fish species which possess the weakest swimming abilities.

Significant numbers of economically important commercial fishery species such as sea mullet were able to successfully ascend the fishway. When extrapolated across an entire recruitment season, the numbers of juvenile sea mullet observed utilising the fishway and accessing upstream nursery habitats would in time have significant contribution to the sea mullet fishery output in south-east Queensland.

Results also showed that extremely low numbers of non-native fish utilise the fishway. This is an extremely positive result, as the fishway is demonstrating its ability in assisting native fish access to previously inaccessible habitat, where the native fish can help mediate pest fish numbers through competition.

CONCLUSION:

All of the results obtained suggest the fishway is functioning as designed. Flow velocities of each pool and ridge of the fishway sit well within suitable ranges for upstream movement of juvenile and small-bodied native fish. There are no current deficiencies in fishway performance.

ATTACHMENTS:

Name of Attachment	Attachment
City Works, Parks Sports and Environment Committee report 20 March 2017	 Attachment A
Bremer River Rock-Ramp Fishway Monitoring Report	 Attachment B

RECOMMENDATION:

That the report be received and the contents noted.

Tim Shields
PLANNING OFFICER (BIODIVERSITY)

I concur with the recommendation/s contained in this report.

Kaye Cavanagh
ACTING SPORT RECREATION AND NATURAL RESOURCES MANAGER

I concur with the recommendation/s contained in this report.

Bryce Hines
ACTING CHIEF OPERATING OFFICER (WORKS, PARKS AND RECREATION)

City Works, Parks Sport and Environment Committee	
Mtg Date: 20.03.17	OAR: YES
Authorisation: Craig Maudsley	

PS:PS
H:\Departmental\Commitee Reports\1701 PS Fishway constructionand initial results CR.doc

5 February 2017

M E M O R A N D U M

TO: SPORTS RECREATION AND NATURAL RESOURCES MANAGER

FROM: WATERWAY HEALTH OFFICER

RE: BREMER RIVER FISHWAY INITIAL SURVEY RESULTS

INTRODUCTION:

This is a report by the Waterway Health Officer dated 5 February 2017 concerning the Fish ladder constructed at Berry's weir on the Bremer River and the results of the initial survey.

BACKGROUND:

In December 2016 Ipswich City Council in partnership with Catchment Solutions and Stanwell Corp completed work on retrofitting the longest fish way in Queensland to aid the movement of native fish along the Bremer. Prior to construction, fish including Australian Bass, were unable to migrate up or down the river to breed or disperse.

Upon completion, Catchment Solutions worked with SEQWater to survey the numbers and type of fish using the fish way and also tested the functionality of the structure.

METHOD:

Net traps were placed across the last pool at the top of the fish way in such a configuration as to only capture fishes which had moved up the structure. This net was left for set periods after which the contents' was collected, identified, counted and data recorded.

As well as looking at the use of the fishway by the existing native fish, additional juvenile native Bass and Murray Cod were electronically tagged and released at the tow of the structure. The intent here was to see if they could and would move up the structure replicating their natural migration.

RESULTS:

The numbers and types of fish collected are provided in the table in attachment A. A summary is provided below:

- ∑ **3,514** fish captured successfully migrating through the fishway (5 days of monitoring)
- ∑ Catch rate of **690.4 fish per day** ascending the fishway
- ∑ **21** species, 19 native, 2 alien
- ∑ **99.94%** of the catch consisted of **native** fish - Only **2** individual **alien** fish
- ∑ smallest fish **15 mm** long Gudgeon
- ∑ longest fish **550 mm** long-fin eel
- ∑ Potentially 3 new fish species recorded for the 1st time in the freshwater reaches of the upper Bremer River, being: Forked tail catfish, speckled goby, yellow-fin bream

Both the Bass and the Mary River Cod released downstream were recorded in the trap at the top of the fishway.

FURTHER WORK:

Further survey work is planned for next year which will include electro fishing the river and lagoon at the top of the fishway and comparing this with baseline data collected before the fishway was completed.

The tagged fish stocked at the bottom of the fishway will be able to be identified for over three years using unique identifier number and an electronic tag reader.

There is also ongoing investigation into the potential to address further blockages to passage upstream on the Bremer and Warrill Creek.

CONCLUSION:

The completed fish way has been very successful and has begun to allow the free movement of fish almost immediately. Large numbers of native fish were recorded moving through the fishway over the course of a number of days in December, this included 3 species not found in this part of the river before. Very low numbers of pest fish were found.

Tagged Bass and Murray Cod were stocked downstream of the fishway and recaptured at the top further proving its effectiveness.

Further investigation and monitoring will continue into next year.

ATTACHMENT:

Name of Attachment	Attachment
Bremer River Fishway Catch Summary	

RECOMMENDATION:

A. That ongoing monitoring and survey be undertaken to record the number and diversity of fish using the Bremer River fishway, as outlined in the report by the Waterway Health Officer dated 5 February 2017.

B. That Council continue to investigate opportunities for future fish passage opportunities on local creeks and rivers.

Phil Smith
WATERWAY HEALTH OFFICER

I concur with the recommendation/s contained in this report.

Bryce Hines
SPORT, RECREATION & NATURAL RESOURCES MANAGER

I concur with the recommendation/s contained in this report.

Craig Maudsley
CHIEF OPERATING OFFICER (WORKS, PARKS AND RECREATION)

Bremer River (Berry's Weir) Rock-ramp Fishway Catch Summary

- **3514** fish captured successfully migrating through the fishway (5 days of monitoring)
- Catch rate of **690.4 fish/day** ascending the fishway
- **21** species, 19 native, 2 alien
- **99.94%** of the catch consisted of **native** fish - Only **2** individual **alien** fish representing two sp.; tilapia & platy
- **15 mm** long Hypseleotris sp. - smallest fish, **550 mm** long-fin eel - longest
- **Median size** of all fish was just **34 mm**!! – catch predominantly consisted of juvenile fish…
- Hypseleotris species (both *H. galii* and *H. klunzingeri*) were the most abundant species representing 36.1% of the catch, followed by crimson-spotted rainbowfish, empire gudgeon, striped gudgeon and sea mullet with 25.7%, 16.5%, 11.6% and 5.7% respectively.
- **Diadromous** species represented **32%** of the total species captured, and **36%** of total individuals. The smallest size diadromous species included; empire gudgeon 19 mm, striped gudgeon 21 mm, Australian bass 30 mm, bullrout 35 mm, sea mullet 38 mm
- Potentially 3 new fish species recorded for the 1st time in the Bremer River; Forked tail catfish, speckled goby, yellow-fin bream
- Fishway research trail demonstrated that juvenile PIT tagged endangered Mary River Cod (1 in fway @ 64 mm, released 40 D/S) and Australia bass (smallest 30 mm, 41 in fway trap - released 103 D/S) were able to successfully ascend the fishway

Migration Classification	Common Name	Species Name	Size			Total Individuals	CPUE (fish/day)
			Min (mm)	Median (mm)	Max (mm)		
Diadromous	Empire Gudgeon	*Hypseleotris compressa*	19	35	52	581	114.1
	Striped Gudgeon	*Gobiomorphus australis*	21	35	52	407	80
	Sea Mullet	*Mugil cephalus*	38	65	72	198	38.9
	Australian Bass#	*Macquaria novemaculeata*	30	35	48	41	8.1
	Bullrout	*Notesthes robusta*	35	54	58	8	1.6
	Longfin Eel	*Anguilla reinhardtii*	70	255	550	14	2.8
	Yellowfin Bream*	*Acanthopagrus australis*	254	254	254	1	0.2
Potamodromous	Crimsonspotted Rainbowfish	*Melanotaenia duboulayi*	18	31	74	903	177.4
	Hypseleotris species	*Hypseleotris sp.*	15	23	41	1219	248.1
	Firetail Gudgeon	*Hypseleotris galii*	31	31	33	5	1
	Western Carp Gudgeon	*Hypseleotris klunzingeri*	26	30	39	44	0.4
	Bony Bream	*Nematalosa erebi*	110	118	254	6	1.2
	Speckled Goby	*Redigobius bikolanus*	25	29	33	12	2.4
	Flathead Gudgeon	*Philypnodon grandiceps*	20	31	51	52	10.2
	Australian Smelt	*Retropinna semoni*	24	32	40	10	2
	Fork-tailed Catfish	*Neoarius graeffei*	230	298	350	6	1.2
	Pacific Blue Eye*	*Pseudomugil signifer*	32	32	32	1	0.2
	Eel-tail Catfish*	*Tandanus tandanus*	34	34	34	1	0.2
	Agassiz's Glassfish	*Ambassis agassizii*	40	47	53	2	0.4
	Mary River Cod*#	*Maccullochella mariensis*	62	62	62	1	0.2
Pest Fish (Potamodromous)	Tilapia*	*Oreochromis mossambicus*	72	72	72	1	0.2
	Platy*	*Xiphophorus maculatus*	25	25	25	1	0.2
Overall min, median, max, total individuals/CPUE (fish/hour)			**15**	**34**	**550**	**3514**	**690.4**
Total Species			**21**				

#Fishway research stocking *Alien sp.

Catchment Solutions

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catchmentsolutions.com.au

Bremer River Rock-Ramp Fishway Monitoring Report

SDA-0516-030273

February 2018

Jack McCann and Matt Moore

Information contained in this document is provided as general advice only. For application to specific circumstances, professional advice should be sought.

Catchment Solutions has taken all reasonable steps to ensure the information contained in this document is accurate at the time of publication. Readers should ensure that they make appropriate enquiries to determine whether new information is available on the particular subject matter.

For further information contact:
Matt Moore
Senior Fisheries Biologist
Catchment Solutions – Fisheries and Aquatic Ecosystems
Ph: (07) 4968 4214

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General Manager
Catchment Solutions Pty Limited
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Tel: +617 4968 4200
Email: info@catchmentsolutions.com.au

Front Cover Image: Top; Berrys Weir fishway, Bottom from left to right, fish successful at ascending fishway: adult and juvenile bullrout, typical trap catch, juvenile sea mullet (top) and freshwater mullet (bottom) & juvenile eel species, freshwater mullet, sea mullet and smelt.

Contents

Background

Construction of Berry's Weir partial width rock-ramp fishway on the Bremer River in Ipswich was completed in October 2016. The fishway was constructed on a 2.4 m weir (Berry's weir) that was constructed in the 1960's to impound water for power generation (Swanbank Power Station). The weir was identified as a priority fish barrier in a recently completed fish barrier prioritisation process; 'Greater Brisbane Urban Fish Barrier Prioritisation' (Moore, 2016) which identified and ranked Berry's Weir as the 7th most important fish barrier requiring remediation in South-East Queensland. Significantly, the weir impacted important life-cycle dependant migrations between downstream estuarine environments and upstream freshwater habitats for a range of economically important fish species, such as Australian bass, sea mullet and long-finned eels. The fishway now allows native fish species the opportunity to access habitat upstream of the weir and complete their life-cycle as necessary. The nature-like rock ramp fishway was designed and constructed by fish passage specialists; Catchment Solutions (CS).

The fishway was constructed under State Development Approval (SDA-0516-030273) and was subject to various development conditions. One of the conditions required the implementation of a monitoring program by a '*person or entity that is suitably qualified and experienced in fish passage biology, fish passage design and construction*', to analyse the performance of the fishway. The monitoring program was developed by Catchment Solutions in November 2016, which included the first round of fishway monitoring in December 2016. The monitoring report, including an 'alert and action component', was forwarded to Fisheries QLD in March 2017. This report was accepted as the first round of monitoring. To satisfy the development conditions, the monitoring program requires one more round of fishway monitoring and a monitoring report, again including an 'alert and action component'.

Specifically, the monitoring program must:

- Be developed and implemented by a person or entity that is suitably qualified and experienced in fish passage biology, fish passage design and construction in order to demonstrate the performance of the fishway/s,
- Involve monitoring of fishway performance on low, medium and high flows during the wet season; and during base flows during the dry season to ensure the fishway will work on all expected flow ranges,
- Involve the provision of monitoring reports to notifications@daf.qld.gov.au at 6-month intervals for a total 12 months from the completion of works, and
- Include an alert and action component, which will enable changes to be made to any deficiencies in the fishway promptly and no later than prior to the commencement of the following wet season.

Catchment Solutions successfully completed the required second round of monitoring from December 18th - 22nd 2017, and this report will present the results and findings from this monitoring. Detailed analysis will be made on fishway utilisation, fishway pool and ridge flow velocities as well as water quality observations. Monitoring of other identified barriers within the catchment was also conducted during this period, however these results will be presented in a separate report.

Methods

Fishway Trapping

Round two of the fishway monitoring of the Berry's weir rock-ramp fishway was conducted over five days from the 18th – 22nd December, 2017. Fishway monitoring was undertaken to validate the success of the fishway at passing the entire community of fish species and size classes expected to move within the Bremer River catchment. The fishway trap used for sampling consisted of a single cone entrance configuration, constructed from 8 mm round bar with shade cloth (4.0 mm mesh size) covering the frame. The trap dimensions were 1400 mm x 1000 mm x 1100 mm. Shade cloth wing walls were used to prevent fish from swimming around and underneath the trap, whilst sand bags were used to secure the trap and wing walls in place (Figure 1). Habitat in the form of complex woody branches (*Callistemon sp.*) were added to the inside of the trap to enable small fish to feel safe and assist them in evading any potential larger predators which may enter the trap, such as forked-tail catfish and long-fin eels.

The fishway trap was positioned within the upper most pool of the fishway in order to capture fish that had successfully ascended the rock ramp. Sand bags were used along the nib wall of the fishway to ensure all fish ascending the fishway had to enter the trap, and could not exit the fishway at any other point. Once the trap was correctly set at 9:00am on December 18th, it was left in place until 4:30pm on the 22nd, with multiple trap checks each day and trap set periods ranging between 2.5 - 14 hours.

All individual fish captured in the fishway trap were identified to species level, counted and measured to the nearest millimetre (fork length for forked-tailed species, total length for all other species). When more than 25 individuals of a single species were captured in any single trapping event, a randomised subset of 25 fish were measured and the remainder only counted to contribute to abundance data. All native fish were then released upstream of the fishway, whilst pest fish species were euthanised as per Biosecurity Queensland legislation and ANZCCART procedures and disposed of in an appropriate manner.

Figure 1. Berry's weir rock ramp fishway trap in place, sampling for fish ascending the fishway (left), and the fishway trap full of fish upon retrieval from a trap set period (right)

Flow Velocity

In order to evaluate the flow velocities through the fishway, flow velocity measurements were taken using a Global Water flow meter (GWFP111). Flow velocity data was taken on two occasions across the sampling period, once on Wednesday December 20th at 12:00PM and once again on Friday December 22nd at 5:00PM.

Flow velocity data was obtained for every ridge and every pool of the fishway, by taking a reading of each of the three ridge slots, and three replicates in the following pool. In order to take slot flow velocities, the flow meter was placed into the centre of the ridge slots, and the velocity averaged over a 20 second period. Pool velocity measurements were recorded by positioning the flow meter at six-tenths the depth of the pool and averaging the velocity over a 20 second period (Figure 2). Average velocities for each of the 34 pools and ridges of the fishway were then calculated and used to develop visual outputs for results.

Figure 2. Image displaying locations of flow velocity replicates when taking fishway flow velocity readings, with one replicate in each of the three ridge slots and three replicates in each pool

Water Quality

Water quality parameters were measured in situ using a YSI – Pro Plus multiprobe. Parameters monitored include;

- Temperature (°C)
- pH
- Dissolved oxygen (% saturation and mg/L), and
- Electrical conductivity (µs/cm).

The water quality sampling method involved placing the probe into the water at a depth of 0.1m and waiting for a short period of time for the readings to stabilise. After stabilisation, values were recorded for each of the water quality parameters. When conducting water quality measurements, three replicates were taken; the first being upstream of the fishway, the second in the middle pool of the fishway (pool 17) and the third immediately downstream of the last ridge of the fishway (**Figure 3**). Water quality parameters were measured three times out of the five- day monitoring period.

Figure 3. Fishway showing points of water quality readings which were upstream and downstream of the fishway, and also in the middle pool of the fishway

Results

Fishway Trapping

A total of 16, 401 individual fish were captured ascending the fishway in 98.58 hrs at an overall catch rate of 4075.5 fish per day. This was made up of 16 species in total, comprised of 15 native species and one introduced species. Native fish individuals represented 99.99% of the catch, with only a single introduced fish (tilapia, *O. mossambicus*) recorded ascending the fishway. Significantly, diadromous species represented 96.12% of the total individuals captured (Table 1).

Empire gudgeon (*H. compressa*) were the most abundant species (n=8131) making up 49.6% of the total catch, followed by striped gudgeon (*G. australis*) (n=5166), sea mullet (*M. cephalus*) (n=1273) and freshwater mullet (*T. petardi*) (n=1073) which made up 31.5%, 7.8% and 6.5% of the catch respectively. The smallest fish recorded successfully ascending the fishway was a 19 mm flathead gudgeon (*P. grandiceps*), followed by a 21 mm empire gudgeon, a 21 mm striped gudgeon and a 22 mm Australian smelt (*R. semoni*). The largest fish species recorded was a 1200 mm long-fined eel (*A. reinhardtii*), followed by a 385 mm tilapia, a 234 mm sea mullet and a 204 mm bony bream (*N. erebi*). The median size of all fish captured successfully migrating through the fishway equated to 34 mm (Figure 4).

Note, four juvenile eels were captured ascending the fishway (*Anguilla sp.*) and could not be identified to species level. These individuals could potentially be either of the long-finned eel (*A. reinhardtii*) or the southern shortfin eel (*A. australis*) which are both known from within the Brisbane catchment. As juveniles, both species share many morphological traits, making field identifications difficult.

Table 1. Species captured ascending the Berry's weir fishway, separated into migratory classifications, and displaying the minimum, maximum and median sizes (mm) as well as the total captured and catch per unit effort (fish/day)

Migration Classification	Common Name	Species Name	Size		Total Individuals		CPUE (fish/day)
			Min (mm)	Median (mm)	Max (mm)		
Diadromous	Bullrout	*Notesthes robusta*	28	35	165	112	27.8
	Eel sp.	*Anguilla sp.*	50	57.5	65	4	1.0
	Empire gudgeon	*Hypseleotris compressa*	21	30	64	8131	2020.5
	Freshwater mullet	*Trachystoma petardi*	51	62	79	1073	266.6
	Long-finned eel	*Anguilla reinhardtii*	400	750	1200	6	1.5
	Sea mullet	*Mugil cephalus*	34	51	234	1273	316.3
	Striped gudgeon	*Gobiomorphus australis*	21	30	83	5166	1283.7
Potamodromous	Australian smelt	*Retropinna semoni*	22	33	54	487	121.0
	Barred Grunter	*Amniataba percoides*	110	110	110	1	0.2
	Bony bream	*Nematalosa erebi*	39	104	204	85	21.1
	Crimson-spotted rainbowfish	*Melanotaenia duboulayi*	36	38.5	41	2	0.5
	Firetail gudgeon	*Hypseleotris galii*	28	32.5	42	51	12.7
	Flathead gudgeon	*Philypnodon grandiceps*	19	22	25	2	0.5
	Spangled perch	*Leiopotherapon unicolor*	165	180	195	2	0.5
	Unspecked hardyhead	*Craterocephalus fulvus*	35	38	56	5	1.2
Pest Fish	Tilapia	*Oreochromis mossambicus*	385	385	385	1	0.2
Overall Min., Median, Max., Total Individuals and CPUE			**19**	**34**	**1200**	**16401**	**4075.5**
Total Species			**16**				

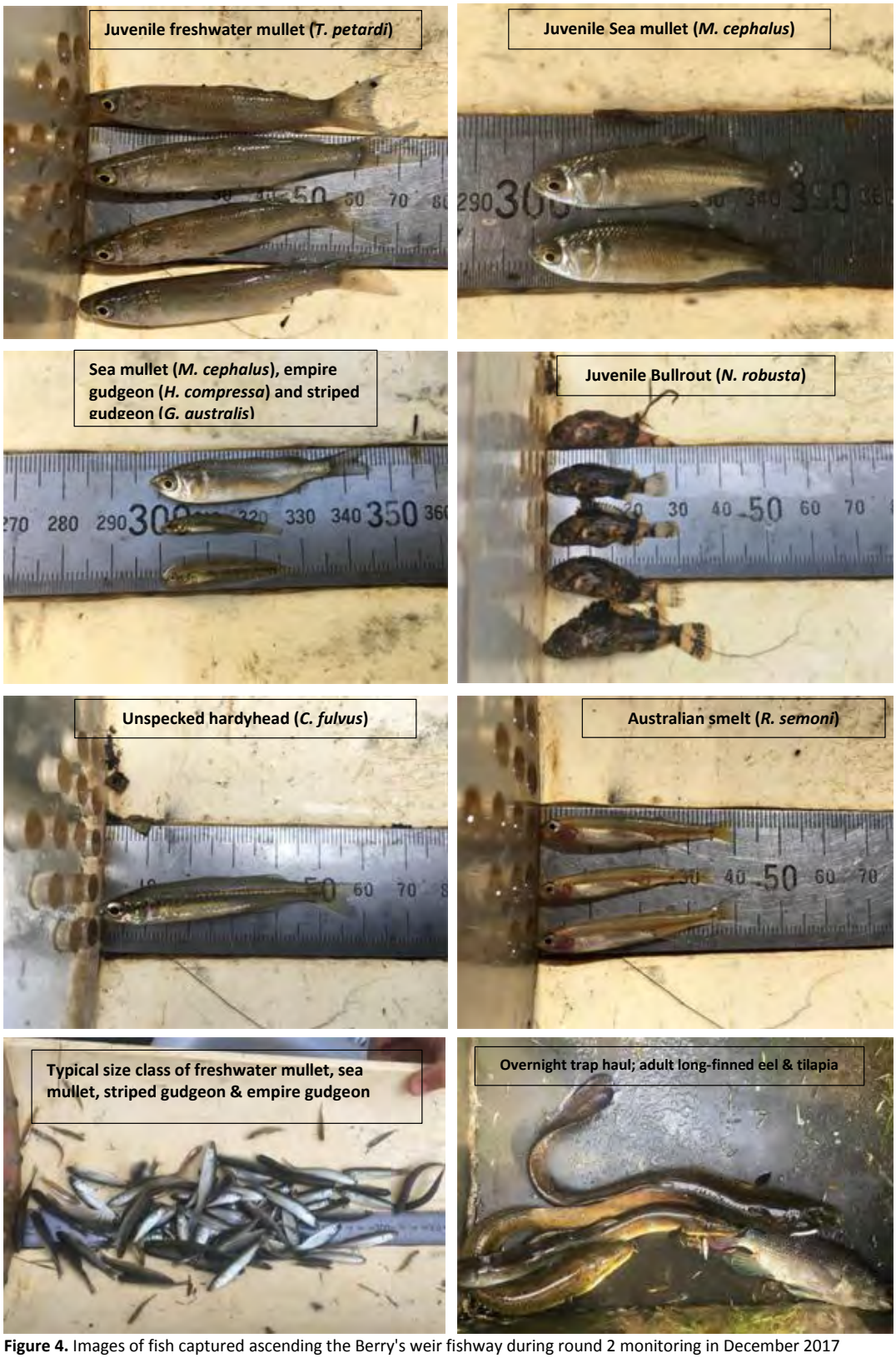


Figure 4. Images of fish captured ascending the Berry's weir fishway during round 2 monitoring in December 2017

Flow Velocity

River flow conditions during the fishway monitoring period, indicated as the period between the red lines in Figure 5, varied little over the five-day monitoring period. River height data gauged at intervals of one minute upstream of Berry's weir for the monitoring period showed an average height of 7.62 m, ranging between 7.47 and 7.66 m (**Figure 5**). Fishway velocity measurements were recorded on two occasions during the monitoring period. Firstly, on the 20th December at 12:00pm and secondly on the 22nd December at 5:00pm.

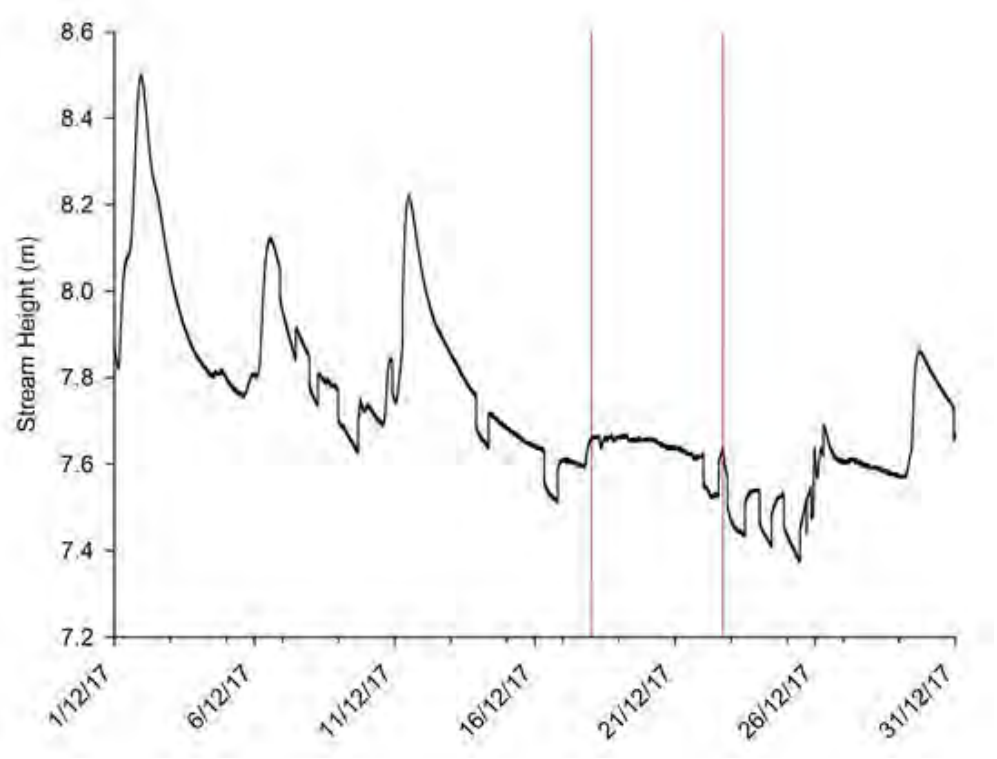


Figure 5. Hydrograph of stream height gauged at Berry's weir for the entire month of December 2017, with the sample period outlined by two red lines (Source: Stanwell, Swanbank Power Station, December 2017)

A high degree of variability in velocity measurements was recorded within each pool and ridge (Figure 6). A conservative approach has been taken to determine the minimum velocity fish had to negotiate through each ridge in order to reach the next upstream pool. This approach entailed identifying the slot within each ridge with the lowest velocity reading, and using this as the 'minimum velocity' fish had to negotiate to ascend to the next pool. For example, velocity readings through the three slots of ridge 14 on December 20th from left to right consisted of 1.2 m/sec, 1.5 m/sec and 1.3 m/sec, therefore 1.2 m/sec was determined to be the minimum velocity fish had to swim through to reach the next pool. Fish may have ascended through the 1.5 m/sec slot; however, this is unknown.

0n the 20th December (elevated base flow, river height = 7.64 m) the minimum slot velocity fish had to negotiate while ascending the fishway was 1.7 m/sec through the right-hand slot of ridge 5. The minimum pool velocity fish had to negotiate (or rest in) was 0.2 m/sec recorded in both pool 7 and pool 16.

0n the 22nd December (elevated base flow, river height = 7.63 m) the minimum slot velocity fish had to negotiate while ascending the fishway was 1.3 m/sec through ridges 3, 6, 15, 24, 28 and 30. The

minimum pool velocity fish had to swim through (or rest in) was 0.2 m/sec recorded in pool 15 (Figure 6). Insufficient data was able to be recorded at pool 1 and ridge 1 when samples were being taken, and thus the plot commences at pool 2.

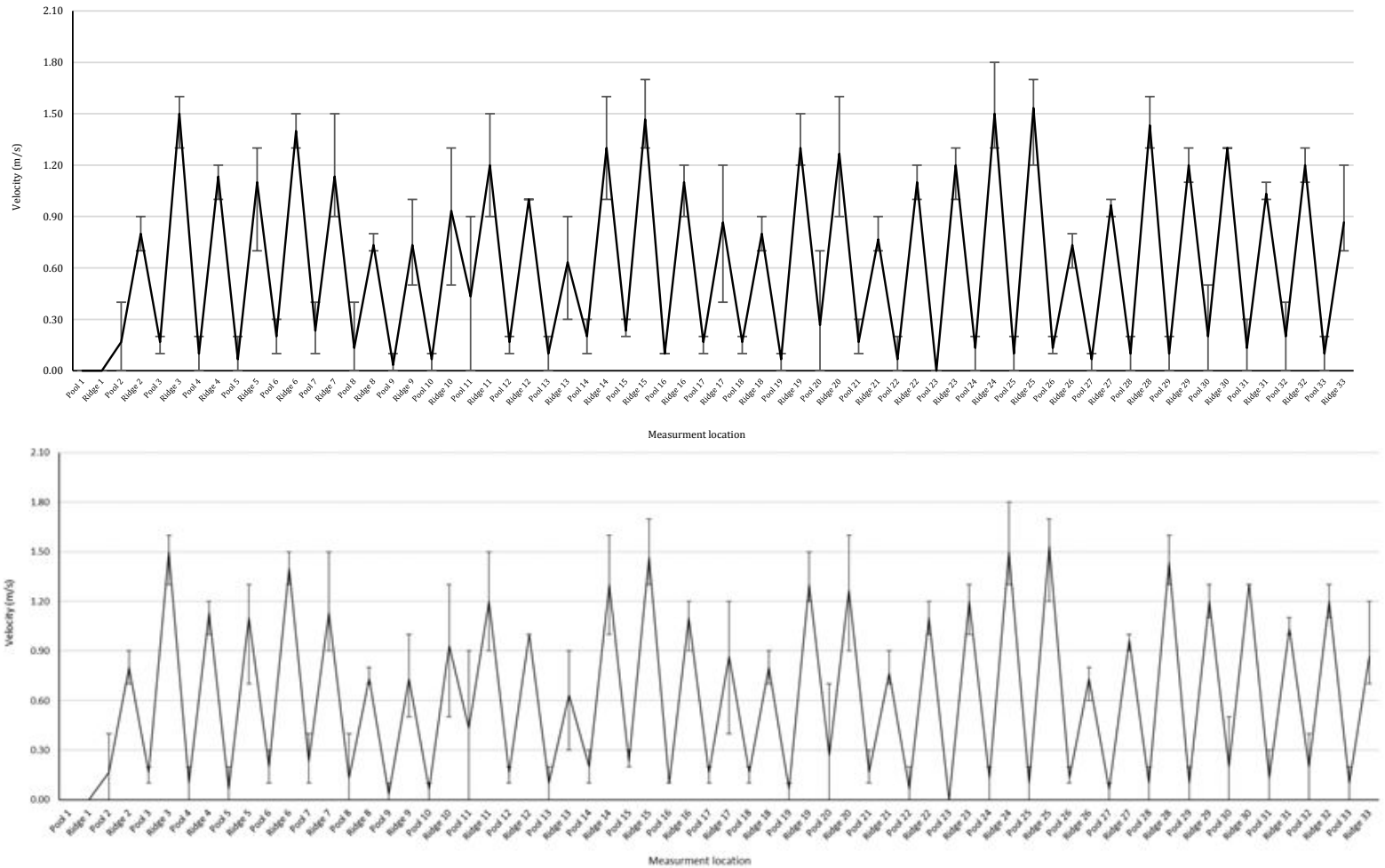


Figure 6. Fishway flow velocities during the monitoring period with flow velocities recorded at 12:00PM on the 20/12/17 (top) and 5:00PM on the 22/12/17 (bottom). Note pool 1 is the first pool at the base of the fishway whilst ridge 33 is the final ridge at the exit of the fishway on the upstream side

Water Quality

Water quality readings varied little between days in which observations were made throughout the monitoring period (Table 2). Observed measurements recorded were typical of the seasonal conditions of the region and characteristic of the habitat type. Temperature ranges across the sample period varied little, between 26°C and 27.1°C, with variation between replicates on sample days of .1°C. The pH range varied between 7.37 and 8.22, with a general trend observed of decreasing pH from upstream to downstream of the fishway. Dissolved oxygen concentrations ranged between 38.3% and 71% saturation and 3.18 and 5.62 mg/L, with an observed trend towards increasing dissolved oxygen concentrations moving from upstream to downstream of the fishway. Electrical conductivity readings also showed very little variation, ranging between 543 and 609 µs/cm, and variation in measurements on days surveyed of only 3 µs/cm.

Table 2. Water quality readings measured on three occasions over the monitoring period upstream and downstream of the fishway, as well as in the middle pool of the fishway

Date & Time	Temp (°C)			pH			DO (% sat.)			DO (mg/L)			EC (µs/cm)		
	U/S	Mid	D/S	U/S	Mid	D/S	U/S	Mid	D/S	U/S	Mid	D/S	U/S	Mid	D/S
18/12/17 9:00	26.3	26.2	26.2	8.22	7.75	7.64	48.2	61.3	64.8	3.86	4.96	5.16	546	543	543
19/12/17 7:15	26.1	26.1	26	7.87	7.61	7.54	42.1	59.4	63	3.41	4.78	5.1	550	548	549
22/12/17 7:45	27	27.1	27.1	7.55	7.37	7.38	38.3	62.2	71	3.18	4.96	5.62	609	609	609

Discussion

Fishway Trapping

The results of the fishway monitoring demonstrate that the rock-ramp fishway is successfully passing different fish species, size classes and life-stages of fish in the Bremer River. Significantly, the fishway was successful at passing juvenile diadromous and small bodied fish species which possess the weakest swimming abilities. Flathead gudgeon (*P. grandiceps*) as small as 19 mm were able to ascend the fishway, whilst long-finned eels (*A. reinhardtii*) as long as 1200mm were also able to ascend the fishway. In total, 16,401 fish moved through the fishway over the monitoring period, at a rate of 4075.5 fish/day. This was dominated by juvenile diadromous fish, with juvenile empire gudgeon (*H. compressa*), juvenile striped gudgeon (*G. australis*), juvenile sea mullet (*M. cephalus*) and juvenile freshwater mullet (*T. petardi*) contributing to 95.4% (n=15,643) of the total overall catch. This highlights the importance of the Berry's weir fishway in facilitating connectivity to important upstream nursery habitats for juvenile diadromous fish, which are required to move upstream to complete their life-cycle (Pusey, Kennard and Arthington 2004).

Significant numbers of economically important commercial, recreational and indigenous fishery species such as sea mullet, freshwater mullet and eel species were able to successfully ascend the fishway. Of these economically important fish, juvenile sea mullet were the most abundant with 1273 individuals recorded during sampling at a catch rate of 316.3 individuals per trapping day, followed by freshwater mullet (1073) and eel species (10) at catch rates of 266.6 and 2.5 individuals per day respectively. Sea mullet form one of the most important commercial fishery resources in south-east Queensland, where all of the fish is harvested and utilised for varying purposes. When extrapolated across an entire recruitment season, the numbers of juvenile sea mullet observed utilising the fishway and accessing upstream nursery habitats would in time have significant contribution to the sea mullet fishery output in south-east Queensland.

As the entire period of fishway monitoring was conducted during slightly elevated base flows, the results obtained give valuable insight into the species and number of individuals migrating upstream under normal flow conditions at the time of year sampled. Figure 7 below displays the hydrograph of stream height (m) at Berry's weir for the period monitored, with median fish length (mm) for each trap set period represented by a small circle and error bars representing the 10th and 90th percentile. Of the 14 individual trap set periods, 11 have very similar results with relatively consistent average median and 10th percentile fish sizes ascending the fishway. The first, fourth and seventh trap sets however have noticeably higher 90th percentile fish sizes. These trap sets do not correspond to any noticeable peaks or troughs in the hydrograph, so it is likely that these are simply indicative of larger fish moving upstream at random times as opposed to responses to changes in flow conditions.

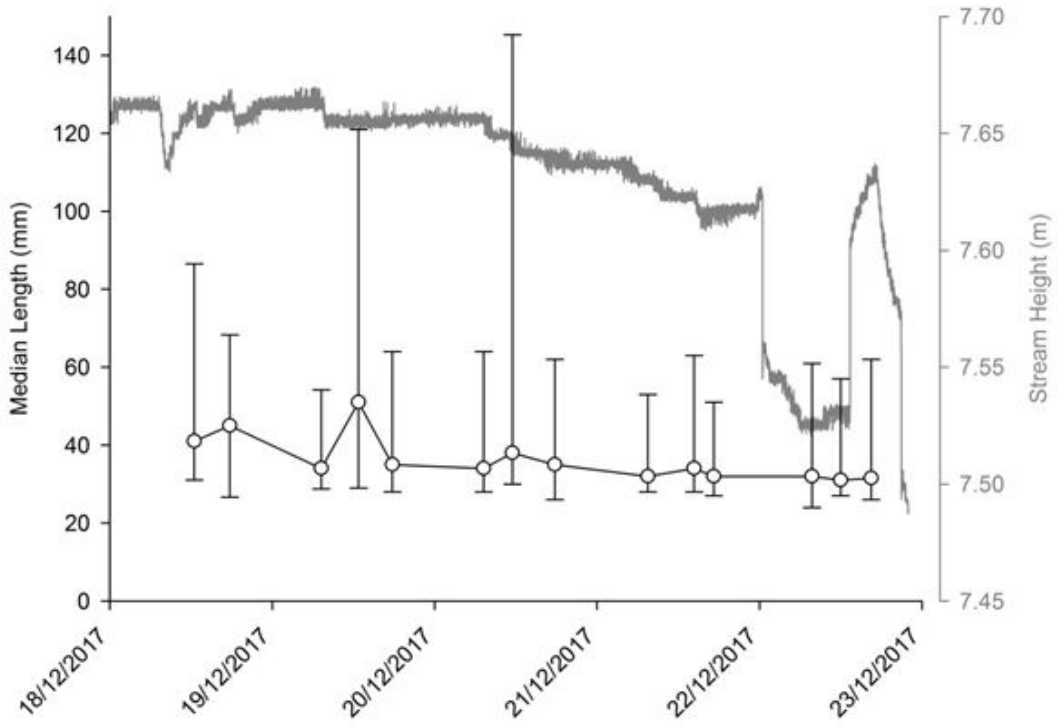


Figure 7. Hydrograph of stream height (m) at Berry's weir for period monitored, with median fish length (mm) for each trap set period represented by a small circle, and error bars representing the 10th and 90th percentile

Comparison to Monitoring Round 1, December 2016

As round 2 monitoring was carried out at an identical time to the first round of monitoring in December 2016, meaningful comparisons can be drawn as to the trends in fishway utilisation over the two monitoring rounds. Table 3 displays a breakdown of unique species which were captured during round 1 monitoring and not captured in round 2 monitoring, and also new species captured in round 2 monitoring which were not observed in round 1 monitoring. Note that Australian bass (*M. novemaculeata*) and Mary River cod (*M. mariensis*) captured during round 1 monitoring have been omitted from this breakdown as they were artificially stocked fish at the time of monitoring.

Table 3. Breakdown of species unique to each round of monitoring, including median fish size (mm) total number of individuals and catch per unit effort (fish/day)

	2016 Monitoring			2017 Monitoring		
Migration Classification	**Common name**	**Species name**	**Total Individuals**	**Common name**	**Species name**	**Total Individuals**
Diadromous				Freshwater mullet	*Trachystoma petardi*	1073
				Eel sp.	*Anguilla sp.*	4
Marine Vagrant	Yellowfin bream	*Acanthopagrus australis*	1			
Potamodromous	Agassizi's glassfish	*Ambassis agassizii*	2	Barred grunter	*Amniataba percoides*	1
	Eel-tailed catfish	*Tandanus tandanus*	1	Spangled perch	*Leiopotherapon unicolor*	2
	Fork-tailed catfish	*Arius graeffei*	6	Unspecked hardyhead	*Caterocephalus fulvus*	5
	Hypseleotris specie	*Hypseleotris sp.*	1263			
	Pacific blue-eye	*Pseudomugil signifer*	1			
	Platy	*Xiphophorous maculatus*	1			
	Speckled goby	*Redigobius bikolanus*	12			
		Median fish size	**34mm**		**Median fish size**	**34mm**
		Total Number of Individuals	**3,514**		**Total Number of Individuals**	**16,401**
		CPUE (Fish/day)	**690.4**		**CPUE (Fish/day)**	**4,075.5**

In total, there was eight species detected in round 1 monitoring of December 2016 which were not detected in round 2 monitoring in December 2017. Of these species, seven were captured in abundances of ≤ 12 individuals, with only a single individual captured of the eel-tailed catfish (*T. tandanus*), Pacific blue-eye (*P. signifer*), Platy (*X. maculatus*) and yellowfin bream (*A. australis*). Two individual Agassizi's glassfish (*A. agassizii*), six fork-tailed catfish (*A. graeffei*) and 12 speckled goby's (*R. bikolanus*) were also caught uniquely to 2016 monitoring. The only species caught unique to 2016 monitoring in significant abundances was the Hypseleotris specie (comprised of firetail gudgeons, *H. galii*, and the western carp gudgeon, *H. klunzingeri*) in which 1,263 individuals were captured at a rate of 248.1 fish per trapping day.

Throughout monitoring round 2, five new species were captured, again with four of these species caught in very low abundances of ≤ five individuals. A single barred grunter (*A. percoides*), two spangled perch (*L. unicolor*), four eel sp. (*Anguilla sp.*) and five Unspecked hardyhead (*C. fulvus*) were captured across the trapping period. The only species caught in significant numbers in round 2 which was not present in round 1 was the freshwater mullet (*T. petardi*) in which 1073 were captured at a rate of 266.6 fish per trapping day.

Interestingly, almost all of the unique species detected in each monitoring round were potamodromous, meaning that they can complete their entire life-cycle in freshwater, and besides natural dispersal, have no obligate necessity to move throughout systems (Koehn and Crook 2013). This could explain the low numbers of these unique species detected in each of the two monitoring rounds, and also help explain why they may have been detected in one round and not another. The detection of an individual yellowfin bream in round 1 could also be explained by similar dispersal. Yellowfin bream are known to be a marine vagrant species which can tolerate low salinities, and at times will move freely into freshwater habitats to feed (Allen, Midgley and Allen 2002).

Freshwater mullet and eel sp. were the only unique diadromous fish species detected amongst the two monitoring rounds. Furthermore, along with unspecked hardyhead, this is the first-time freshwater mullet have been detected in the upper Bremer River catchment, with neither of these species detected throughout Healthy Waterways (EHMP) fish community surveys over the past 14 years on over 90 occasions. This emphasises the necessity of fishways, in allowing diadromous fishes free passage between upstream and downstream habitats. Previous to fishway installation, recruiting juvenile freshwater mullet would have been unable to access significant expanses of upstream nursery habitat (Allen, Midgley and Allen 2002).

The numbers of fish caught in round 2 monitoring (n=16,401) were substantially higher than that of round 1 monitoring (n=3,514), with over four times as many fish captured. Catch rates for each trapping period went from 690.4 fish per day in December 2016, to 4075.5 fish per day in December 2017 (see Appendix 1 for detailed breakdown of round 1 catch results). This substantial increase in fishway utilisation could potentially be due to the elevated base flow conditions experienced during the time of round 2 sampling in December 2017. The river height data hydrograph (Figure 5) shows a sustained period of consistent flow during the monitoring period of December 2017 averaging 7.62m, and was the most stable point of the hydrograph for the entire month. There were three flow peaks which appear on the hydrograph earlier in the month when flows reached 8.4, 8.1 and 8.2 m which potentially cued diadromous fishes to migrate upstream, and then the steady period of flow during the sample period provided suitable conditions for upstream fish movements.

Alert & Action

All of the results obtained during the second round of fishway monitoring in December 2017 suggest the fishway is functioning as designed. In total, 16 fish species were detected utilising the fishway, at a rate of 4075.5 fish ascending the fishway per day over the sampling period. Over the elevated base flow conditions monitored, flow velocities of each pool and ridge of the fishway sit well within suitable ranges for upstream movement of juvenile and small-bodied native fish. There are no current deficiencies in fishway performance.

References

Allen, G.R., Midgley, S.H. and Allen, M. (2002) *Field guide to the freshwater fishes of Australia*, Western Australia Museum, Perth.

Koehn, J.D. and Crook, D.A. (2013) '*Movements and migration*', Ch. 5, pp. 105- 129 in Humphries, P and Walker, K.F. (Eds) (2013) '*Ecology of Australian Freshwater Fishes*', CSIRO Publishing.

Pusey, B., Kennard, M. and Arthington, A. (2004) *Freshwater fishes of north-eastern Australia*, CSIRO Publishing, Victoria.

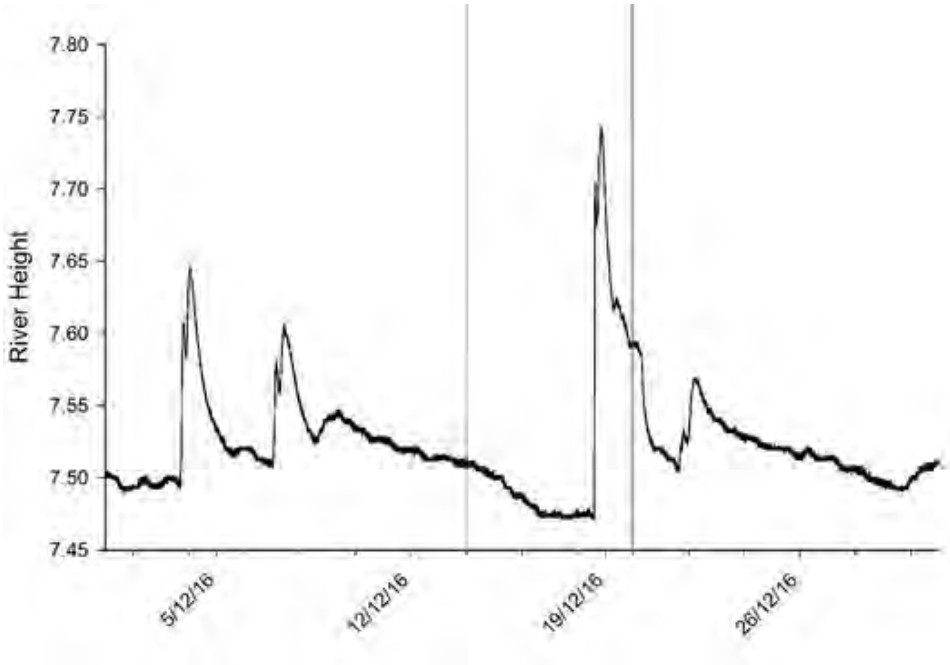
Appendix 1- Round 1 Monitoring Fishway Trapping Results

Overall fish catch data during round 1 monitoring in December 2016, separated into migratory classifications and displaying the minimum, maximum and median sizes (mm) as well as the total number of individuals captured and catch per unit effort (fish/day).

Migration Classification	Common Name	Species Name	Size			Total Individuals	CPUE (fish/day)
			Min (mm)	Median (mm)	Max (mm)		
Diadromous	Empire gudgeon	*Hypseleotris compressa*	19	35	52	581	114.1
	Striped gudgeon	*Gobiomorphus australis*	21	35	52	407	80
	Sea mullet	*Mugil cephalus*	38	65	72	198	38.9
	Australian bass#	*Macquaria novemaculeata*	30	35	48	41	8.1
	Bullrout	*Notesthes robusta*	35	54	58	8	1.6
	Long-finned eel	*Anguilla reinhardtii*	70	255	550	14	2.8
Marine Vagrant	Yellowfin bream*	*Acanthopagrus australis*	254	254	254	1	0.2
Potamodromous	Crimson-spotted rainbowfish	*Melanotaenia duboulayi*	18	31	74	903	177.4
	Hypseleotris species	*Hypseleotris sp.*	15	23	41	1263	248.1
	Bony bream	*Nematalosa erebi*	110	118	254	6	1.2
	Speckled goby	*Redigobius bikolanus*	25	29	33	12	2.4
	Firetail gudgeon	*Hypseleotris galii*	31	31	33	5	1
	Flathead gudgeon	*Philypnodon grandiceps*	20	31	51	52	10.2
	Australian smelt	*Retropinna semoni*	24	32	40	10	2
	Fork-tailed catfish	*Arius graeffei*	230	298	350	6	1.2
	Pacific blue-eye*	*Pseudomugil signifer*	32	32	32	1	0.2
	Eel-tailed catfish*	*Tandanus tandanus*	34	34	34	1	0.2
	Agassiz's glassfish	*Ambassis agassizii*	40	47	53	2	0.4
	Mary River cod*#	*Maccullochella mariensis*	62	62	62	1	0.2
Pest Fish (Potamodromous)	Tilapia*	*Oreochromis mossambicus*	72	72	72	1	0.2
	Platy*	*Xiphophorus maculatus*	25	25	25	1	0.2
Overall min, median, max, total individuals/CPUE (fish/hour)			**15**	**34**	**550**	**3514**	**690.4**
Total Species			**21**				

Appendix 2- Round 1 Monitoring Hydrograph

River height readings from Berry's Weir (fishway site), during round 1 monitoring in December 2016. The area between the red lines represents the period of fishway monitoring. (Source: Stanwell, Swanbank Power Station, December 2016).



Conservation and Environment Committee	
Mtg Date: 19.03.18	OAR: YES
Authorisation: Bryce Hines	

TS: TS
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26 February 2018

M E M O R A N D U M

TO: SPORT RECREATION AND NATURAL RESOURCES MANAGER

FROM: PLANNING OFFICER (BIODIVERSITY)

RE: DRAFT BRUSH-TAILED ROCK WALLABY RECOVERY PLAN

INTRODUCTION:

This is a report by the Planning Officer (Biodiversity) dated 26 February 2018 concerning the draft Brush-Tailed Rock Wallaby Recovery Plan.

BACKGROUND:

The Brush-tailed rock wallaby (BTRW) is the faunal emblem of Ipswich and one of three animals selected within the Nature Conservation Strategy 2015 as an iconic species. The species is also listed as vulnerable to extinction within Queensland and nationally.

Within Ipswich, BTRW populations are found within the Flinders-Goolman and the Little Liverpool Range areas, on a mix of Council-owned and private land. In the late 1990's, Council purchased approx. 2,200 hectares of core BTRW habitat as the Flinders-Goolman Conservation Estate. However, little is known about this shy animal, and as a result of the 2012 fires through the area anecdotal evidence suggested that the Flinders-Goolman population was at significant risk. To assist in the long-term survival of the species locally, a draft Brush-Tailed Rock Wallaby Recovery Plan (The Plan) has been prepared.

VISION AND OBJECITVES OF THE RECOVERY PLAN:

The vision is *that Ipswich remains a population stronghold for the brush-tailed rock wallabies to prevent declines in the northern part of the species range*. *That Flinders-Goolman Conservation Estate provides a leading example of coexistence between rock wallaby conservation and visitor usage.*

To achieve this vision, the Plan seeks to consolidate and expand local knowledge of brush-tailed rock wallabies and their habitats, in order to improve their habitat and reduce the impact of local threats. In addition, the Plan seeks to identify actions to manage the coexistence of wallabies with recreation users, particularly on the peaks and cliffs within the Flinders-Goolman Conservation Estate.

THREATS:

Rock wallaby habitat is naturally fragmented and often highly isolated. Most colonies in SEQ consist of a small group of individuals commonly numbering less than 12 wallabies. To enhance their survival success, the key focus of management will be to reduce the impact of threats including wildfire, competition with feral animals, predation by fox and wild dog, disturbance from recreation users, and further fragmentation of habitat.

RECOVERY ACTIONS:

The Plan has identified a suite of recovery actions, including:

- Reduction of pest plants (primarily lantana) from foraging areas
- Increase connectivity between neighbouring rock wallaby habitat areas
- Monitor and mitigate potential impacts from recreational use
- Monitor and reduce the impact of predators, working in partnership with neighbouring land holders
- Work in partnership with Queensland Trust for Nature to support conservation efforts within the Little Liverpool Range.

CONSULTATION:

The plan was developed in consultation with external stakeholders, including:

- Healthy Land and Water
- The Brush-tailed rock-wallaby expert panel, including members from CSIRO, Universities, Parks and Wildlife and other state government agencies
- Adjacent local government areas
- Queensland Trust for Nature.

CONCLUSION:

The Brush-tailed rock wallaby is Ipswich's faunal emblem and an iconic species listed in Council's Nature Conservation Strategy 2015. Through Enviroplan, Council has secured approx. 2,200 hectares of core habitat for BTRW in the Flinders-Goolman Conservation Estate.

Council is now seeking to gain a better understanding of this species habitat and life-cycle needs in order to manage its long-term survival and ensure coexistence with recreation use of these areas. To guide Council's efforts a draft Brush-Tailed Rock Wallaby Recovery Plan has been developed, in consultation with key stakeholders.

ATTACHMENT:

Name of Attachment	Attachment
Brush-tailed rock-wallaby Recovery Plan	Attachment A

RECOMMENDATION:

That the draft Brush-Tailed Rock Wallaby Recovery Plan as detailed in Attachment A be adopted to inform the future management of brush-tailed rock wallaby habitat within the Flinders-Goolman Conservation Estate and to support conservation efforts within the Little Liverpool Range, as detailed in the report by the Planning Officer (Biodiversity) dated 26 February 2018.

Tim Shields
PLANNING OFFICER (BIODIVERSITY)

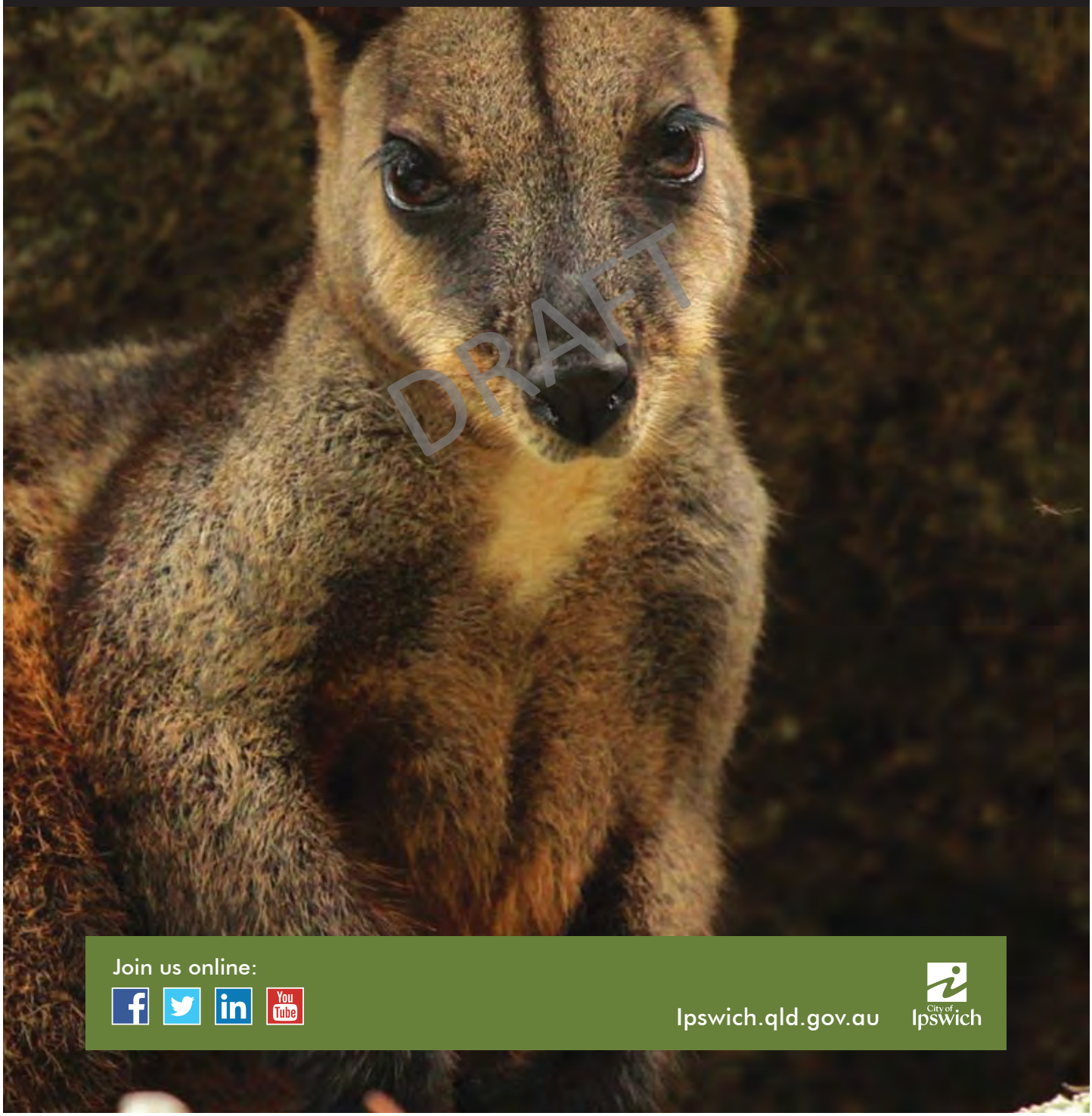
I concur with the recommendation/s contained in this report.

Kaye Cavanagh
ACTING SPORT RECREATION AND NATURAL RESOURCES MANAGER

I concur with the recommendation/s contained in this report.

Bryce Hines
ACTING CHIEF OPERATING OFFICER (WORKS, PARKS AND RECREATION)

Brush-tailed Rock Wallaby Recovery Plan



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City of Ipswich


DRAFT

Contents

Mayor's Message

The brush-tailed rock wallaby has a special place in the heart of the Ipswich community. The species is the faunal emblem and mascot for the City of Ipswich.

But like many of our native animals, its existence is under threat. Native predators, competition for food and habitat, climate change and the presence of humans have all combined to disturb life for the brush-tailed rock wallaby.

In Ipswich, they can be found in the Teviot Range and Little Liverpool Range. Protection areas have been established to improve chances of survival.

A national recovery plan for *Petrogale penicillata* was started five years ago and now focuses on Ipswich to provide a framework to facilitate the recovery and stability of brush-tailed rock wallaby populations in the region.

The first comprehensive study of brush-tailed rock wallabies in the Teviot Range occurred in 2012 following wildfires in the area. The results showed numbers were lower than expected and only emphasised the importance of doing something before it is too late.

Sightings and monitoring have provided evidence that wallabies still persist throughout the Little Liverpool Range, however work is needed to identify the number of colonies and immediate threats.

Council is managing a number of separate locations with potentially isolated populations of rock wallabies, all designed to help us learn more about improving chances of survival.

We will take whatever action is necessary to ensure the survival of our Ipswich mascot and an animal synonymous with the region and the rest of Australia.

Mayor Andrew Antoniolli
City of Ipswich

Chairperson's Message

Ipswich City Council has set about a five-year recovery plan for our favourite animal, the brush-tailed rock wallaby.

Our vision is that Ipswich remains a population stronghold for these naturally shy and isolated wallabies to prevent declines in the northern part of the species range.

To do that we must consolidate and expand local knowledge of brush-tailed rock wallabies, including population status, habitat and threats, in order to create and deliver a register of actions.

These actions will be aimed at implementing recommendations of the national recovery plan within Ipswich and adjacent local government areas.

Our five-year mission involves examining the impact of predators such as foxes and dogs; wildfires across the region; and the increase of outdoor recreational activities, such as rock climbing and hiking.

There are many factors that contribute to wallaby survival and our intervention through an extensive and thorough recovery plan could not be more vital or timely.

The council will partner with relevant stakeholders to fight for the brush-tailed rock wallabies and take what actions are required to ensure their recovery.

That could include the first captive breeding program for this species.

Councillor Kerry Silver
Chair of Conservation and Environment

Introduction

Context

Ipswich is home to two separate populations of brush-tailed rock wallaby *(Petrogale penicillata)* in the Teviot Range and Little Liverpool Range. The species is the faunal emblem and mascot for the City of Ipswich. The brush-tailed rock wallaby is also recognised as one of five iconic species for the Ipswich region in in the 2015 Nature Conservation Strategy, along with the koala, platypus, plunkett mallee and Cooneana olive. The 2,220 hectare Flinders-Goolman Conservation Estate, including 106 hectares of state-owned Protected Area, was purchased primarily for the protection of rock wallaby habitat.

Habitat and behaviour

The brush-tailed rock wallaby is a medium-sized macropod characterised by a dark brushy tail. It is the only rock wallaby endemic to south-east Australia.

Brush-tailed rock wallabies have specialised habitat requirements. Within complex rocky habitats, colonies occur in those that contain caves, crevices, steep gullies and ledges and suitable cliff faces usually having a northerly aspect. There are three major types of preferred habitat:

1. Loose piles of large boulders, also referred to as rocky scree, containing a network of underground holes and passageways;
2. Cliffs with numerous mid-level ledges, caves and overhangs; and
3. Isolated rocky outcrops.

These structures are known as shelter habitat and used as daytime resting areas. Brush-tailed rock wallabies are able to navigate through steep terrain due to the extensive granulation on the soles of their feet.

In addition to a shelter habitat, home ranges also consist of a grassy foraging area. In south-east Queensland, individual foraging ranges average between 2-3 hectares. Individuals typically move to foraging areas at dusk and return before dawn to feed. Their diet mainly consists of short grasses and forbs; however varied food items have been recorded among different populations, indicating that the brush-tailed rock wallaby has an adaptable diet. Refuge and foraging sites are linked by routinely-used commuting routes. The brush-tailed rock wallaby is a shy and reclusive animal, exhibiting highly cautious habitats around people and during weather events or high winds.

Conservation status

Populations once stretched from the Grampians in western Victoria along the Great Dividing Range to Nanango in south-east Queensland, but its distribution has rapidly contracted and has become highly fragmented. The greatest decline has occurred in the southern extent of the distribution range, particularly in Victoria, where only a tiny population in East Gippsland remains. As a result of substantial declines in range and population, the brush-tailed rock wallaby is listed as a vulnerable species under both the F*ederal Environment Protection and Biodiversity Conservation Act 1999* and *State Nature Conservation Act 1992*.

Although there are no accurate population numbers, estimations suggest there to be between 15,000 and 30,000 individuals left in the wild (Department of Environment and Climate Change NSW 2008).

Within this fragmented distribution there are three genetically distinct Evolutionary Significant Units (ESUs), including: a Southern ESU in western Victoria; a Central ESU in central New South Wales and a Northern ESU in northern New South Wales and south-east Queensland (refer to Figure 1). In the Northern ESU, numbers are estimated between 10,000 and 25,000 with the majority (80% of the national population) residing in north-eastern New South Wales, particularly the Macleay and Clarence Gorges (Department of Environment and Climate Change NSW 2008; Menkhorst & Hynes 2011).

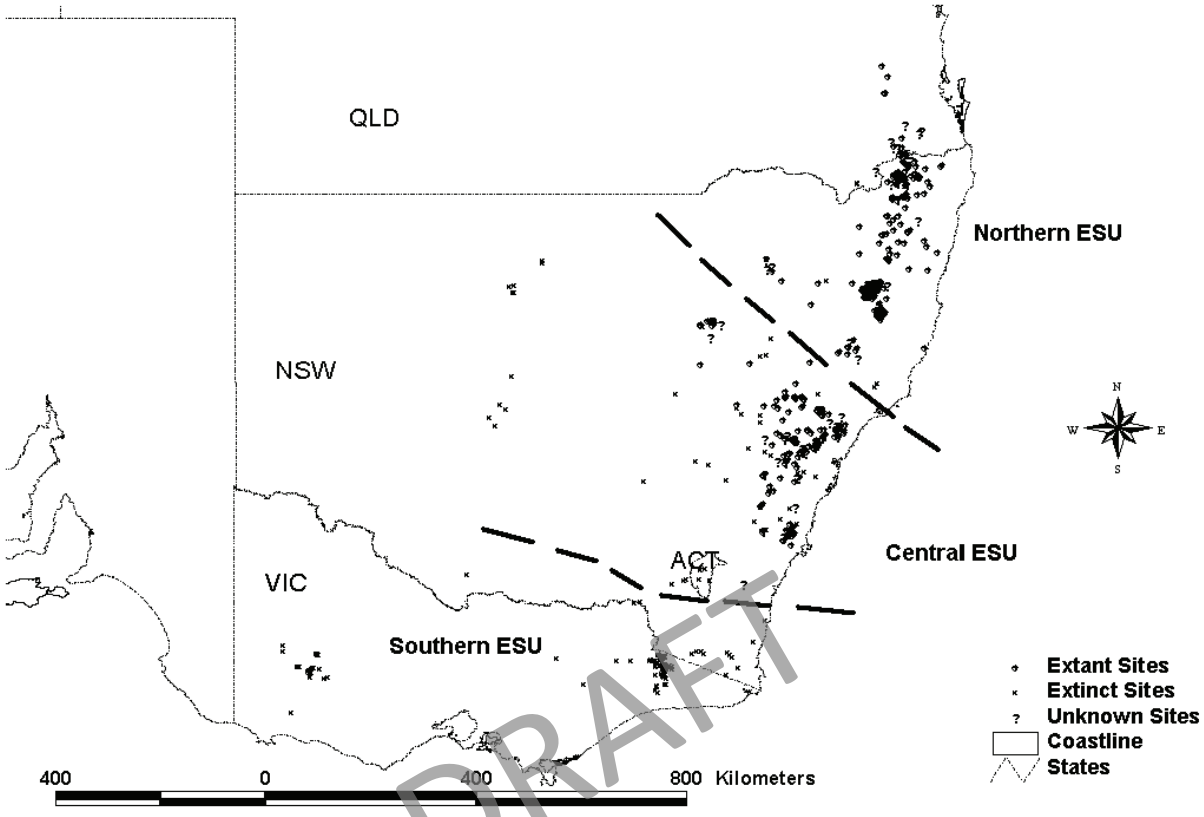


Figure 1: Approximate boundaries separating the Southern, Central and Northern Evolutionary Significant Units of brush-tailed rock wallabies (Department of Environment and Climate Change NSW 2008).

Direction of the recovery implementation plan

The 'National recovery plan for the brush-tailed rock wallaby *Petrogale penicillata*' was published in 2011 by Menkhorst and Hynes with collaboration from the Federal Government, Queensland, New South Wales and Victorian state governments as well as the ACT Government. It is the first national recovery plan for the species, and details its distribution, habitat, threats and recovery objectives and actions necessary to ensure its long-term survival.

Many of these threats, objectives and actions are relevant to Ipswich in addition to several localised threats not reflected at the national or ESU scale. The purpose of this Recovery Plan is to transpose the national recovery plan to the context of the Ipswich region and provide a framework to facilitate the recovery and stability of brush-tailed rock wallaby populations in Ipswich.

Vision

That Ipswich remains a population stronghold for the brush-tailed rock wallabies to prevent declines in the northern part of the species range. That Flinders-Goolman Conservation Estate provides a leading example of coexistence between rock wallaby conservation and visitor usage.

Overall Objective

To consolidate and expand local knowledge of brush-tailed rock wallabies, including population status, habitat and threats, in order to create and deliver a register of actions. These actions will be aimed at implementing recommendations of the national recovery plan within Ipswich and adjacent local government areas.

Known Threats and Reasons for Decline

Rock wallaby shelter habitat is naturally fragmented and often highly isolated. Permanent barriers, such as extreme distance or infrastructure and development between colonies, can lead to reproductive and genetic isolation between colonies only 2-3 km apart. Most colonies now only consist of a small number of individuals, commonly numbering less than 12 wallabies. While sufficient to persist for the long term, colonies of this size are prone to stochastic events, such as disease or wildfire, and are vulnerable to local extinction. In addition to fragmentation and isolation there are a variety of common processes that threaten brush-tailed rock wallabies at an individual, community and landscape level.

Fire

The impact of fire on brush-tailed rock wallaby populations has not been comprehensively studied. Although it has been determined that fire has the ability to impact on various rock wallaby species, the effect of large wildfires is relatively unknown. Regular low-intensity burning has been recognized as permitting the growth of suitable forage for wallaby species. In contrast to this, high intensity wildfire significantly impacts on the majority of medium-sized mammal populations, with the ability to both directly kill individuals and cause post-fire starvation through changes to the vegetation and habitat structure.

Predation

Brush-tailed rock wallabies have a number of native predators, including wedge tailed eagles, spotted tailed quolls and carpet or diamond pythons. Following European settlement, the increased pressure from introduced predators has led to declines in many small mammal species, including rock wallabies. While predation from European red foxes is suspected to be the largest threat, wild dog and feral cat predation may also be an important influence. Brush-tailed rock wallabies are particularly susceptible to predators that may learn the location of their movement corridors between shelter and foraging habitat. The impact of feral predators is such that the highly restricted habitat of rock wallabies is thought be an artefact of fox predation, meaning that fox predation has played a large role in eradicating rock wallabies from structurally less complex habitat.

Competition

Brush-tailed rock wallabies often share foraging habitat with other native herbivores, including swamp wallabies, red neck wallabies, pretty faced wallabies, common brushtail possums, mountain brushtail possums and common wallaroos. Since European settlement, other invasive species such as rabbits, goats and feral pigs have also been noted as competing with rock wallabies for food resources. If competing species reach high densities, they could pose a threat to the brush-tailed rock wallaby, through reduced food supply, reduced habitat condition, breeding success and survival. This has been most common with feral goats which have displaced rock wallabies in several areas of northern New South Wales. Digging behaviour from feral pigs and the wide spread destruction it can cause to foraging habitat has not been noted in the national recovery plan, but has been observed as a threat locally.

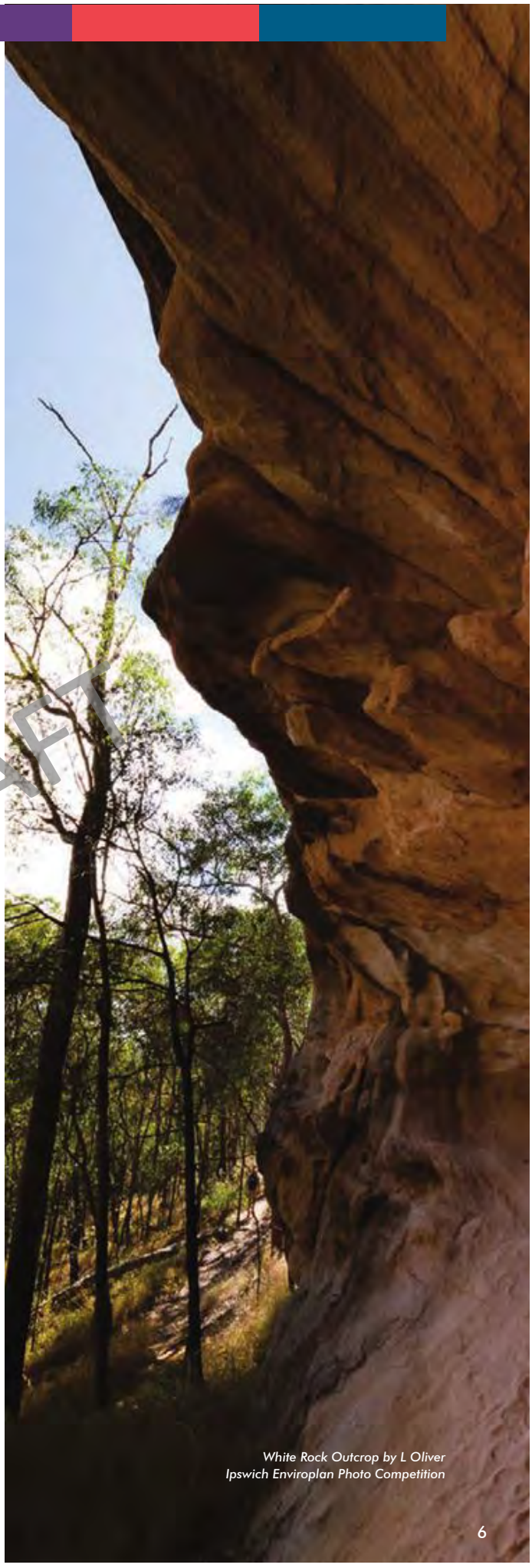
Disturbance

Most colonies of brush-tailed rock wallaby are found in rugged and complex terrain often far from human occupation. The increase in popularity of outdoor recreation activities, including rock climbing and mountain hiking, has resulted in an increase in the number of people present in rock wallaby habitat. The impact of direct human disturbance, such as flight disturbance from bushwalkers, on brush-tailed rock wallabies has not been well studied and is difficult to quantify. The brush-tailed rock wallabies reaction to other disturbances may be an indication of its potential behaviour towards humans. For example, rock wallabies are more attentive and hesitant during windy days or rainy nights in order to detect any incoming threats amidst elevated noise levels. A consistent level of human disturbance may therefore hinder or slow rock wallaby feeding behaviours and potentially compromise shelter or foraging habitat.

Genetic diversity and small population size

The effect of the increasing isolation of brush-tailed rock wallaby colonies and degraded linking habitat has greatly decreased the species ability to move between colonies. There is very limited spread of genetic material across colonies, resulting in decreased genetic diversity. The loss of genetic variation in a population reduces the ability of the population to respond to environmental change and increases the risk of extinction, through increased inbreeding and genetic drift. This can have negative effects on individual fitness and can lead to an increase in the frequency of expression of unsuitable genes.

Rapid declines in genetic diversity have been recorded in the Southern ESU and Central ESU. Genetic status of the less studied Ipswich's brush-tailed rock wallaby and Northern ESU is not as clear.



White Rock Outcrop by L Oliver
Ipswich Enviroplan Photo Competition

Brush-tailed Rock Wallabies in Ipswich

Teviot Range

The Teviot Range extends from south-eastern Ipswich to northern parts of Scenic Rim and south west Logan. The Teviot Range is also referred to as the Flinders Peak group, as Flinders Peak is the most prominent formation within the range. Also within the group are several other mountain peaks including:

- Mount Joyce,
- Mount Blaine,
- Mount Goolman,
- Mount Elliot,
- Mount Flintoff,
- Mount Welcome, and
- Ivory's Rock.

The effect of fire on the brush-tailed rock wallaby: A case study of Flinders-Goolman Conservation Estate – 2013

The first comprehensive study of brush-tailed rock wallabies in the Teviot Range occurred in 2013 in response to high intensity wildfires that spread through Flinders-Goolman Conservation Estate and the surrounding area. In partnership with the University of Queensland, Council undertook a study to determine the effects of high intensity fire on rock wallaby distribution and assess the effectiveness of current generation motion detection cameras in monitoring population abundance.

The results from this study suggest a decline in the level of brush-tailed rock wallaby activity within and surrounding Flinders-Goolman Conservation Estate. The degree of presence recorded throughout the study was lower than expected, compared with anecdotal evidence of historical activity. Scat deposits between visits were irregular, suggesting that the sites have not been recolonised and possibly indicates that there is a small, highly mobile group of rock wallabies that exist within the conservation estate.

Degradation of foraging habitat was noted as a particularly significant factor driving wallaby presence post-fire, with many areas now thick with shrubby regrowth of *Acacia fimbriata* and *Acacia irrorata* which are not suitable as foraging species and shade out the more preferable grass layer. Similarly, increased weed abundance post-fire was also seen as a factor influencing rock wallaby abundance.

Valley of Dreams by M Hall
Ipswich Enviroplan Photo Competition

Brush-tailed rock wallaby foraging habitat assessment – 2016

The aim of this study was to identify, assess and map brush-tailed rock wallaby foraging habitat at six sites within Flinders-Goolman Conservation Estate to prioritise sites for restoration. These sites were chosen by Ipswich City Council based on previous and recent sightings, as well as indicators of presence.

Key threats identified within Flinders-Goolman Conservation Estate for the brush-tailed rock wallaby during this study include:

- Habitat destruction and disturbance from feral pigs,
- Potential competition with other pest animals,
- Loss of vegetation condition and lack of foraging species in key areas,
- Inappropriate fire regimes; and impacts associated with recreation activities.

Urgent additional measures were recommended below to encourage the re-colonisation of downslope areas, and assist in safeguarding against local extinction.

- Continue to monitor and support research on the brush-tailed rock wallaby within the estate.
- Continue to review and update the Flinders-Goolman Conservation Estate Management Plan and Conservation Works Program to integrate all aspects of threat abatement, including ecological restoration, fire management and feral animal control.
- Restore foraging habitat within the estate in order of site priority and in accordance with the site action plans.
- Increase feral pig control around brush-tailed rock wallaby habitat, and continue the management of other pest animals within the estate.
- Establish and implement appropriate fire regimes for conservation management of the species and its habitat.
- Limit public access to key shelter sites possibly through installation of additional interpretative signage.
- Continue to engage with internal and external stakeholders during the program, including liaising with surrounding landholders regarding species and habitat management advice, predator control activities and fire management.

Ipswich City Council brush-tailed rock wallaby monitoring program – 2013 - present

Sightings and monitoring between 2013 and 2017 have suggested that rock wallabies still persist in relatively high numbers in certain areas around Flinders Peak, particularly on the western to south-western ridges. Other areas are still occupied by a small number of individuals. Monitoring in den sites vacated post-fire has noted several individuals attempting to return to the area, but not recolonizing permanently. Monitoring in 2016 also noted high levels of pig activity on Flinders Peak, with widespread degradation of foraging habitat.

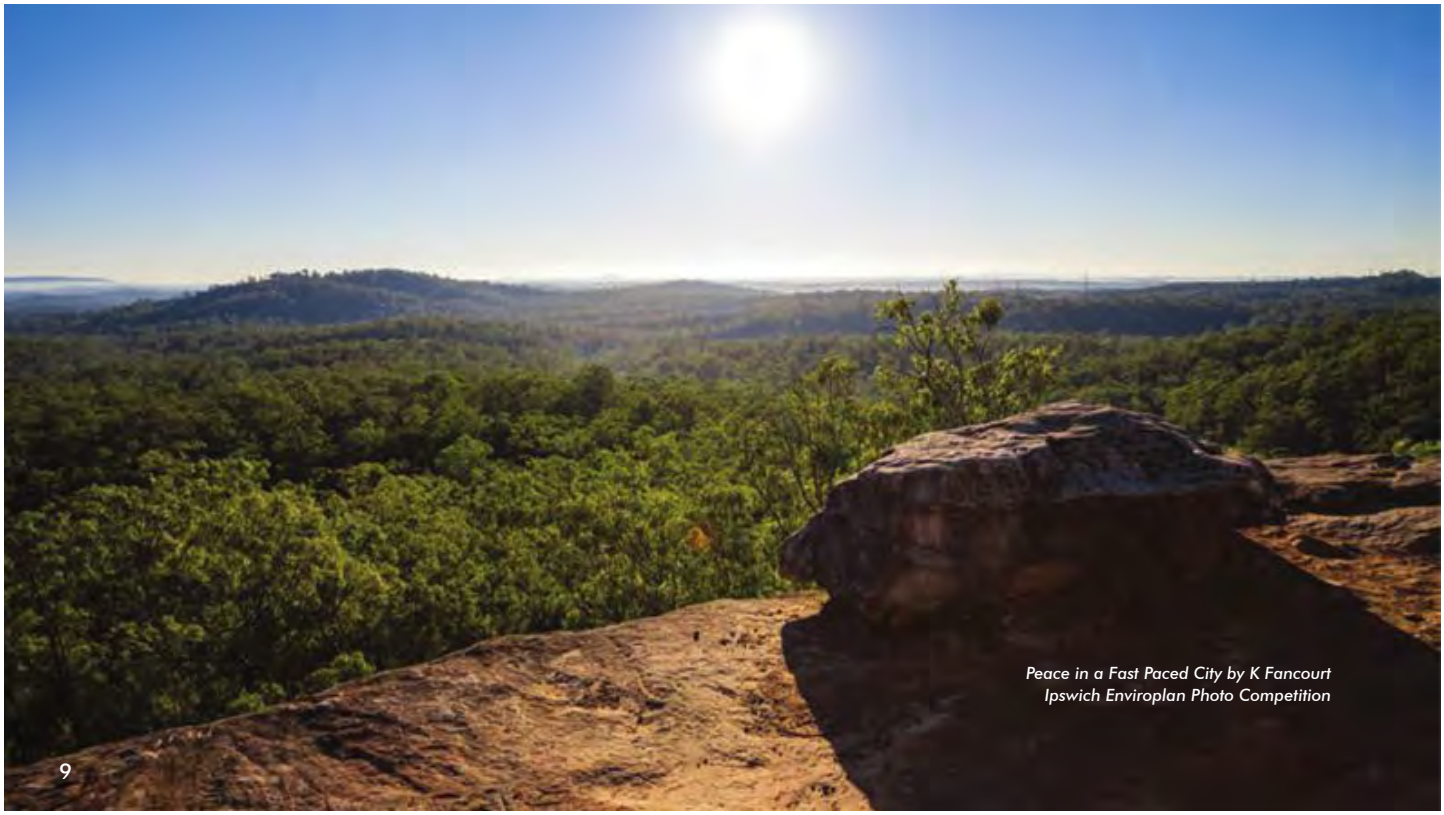
Visitation to Flinders Peak and in Flinders-Goolman Conservation Estate generally has increased markedly since the reopening of the Flinders Peak hiking track in 2013. Some rock wallaby shelter habitat occurs within 10m of the hiking track. The hiking track also regularly intersects area of high quality foraging habitat that rock wallabies would use during the evening. An average of 1,000 people per month are using the Flinders Peak track with numbers increasing to 1,500 seasonally.

Little Liverpool Range

Several records of brush-tailed rock wallabies were recorded in Mt Beau Brummel Conservation Park in 1997 by Parks and Wildlife staff. Council has since become trustee to Mt Beau Brummel on behalf of Queensland Parks and Wildlife Service. Due to accessibility issues, no further rock wallaby studies were undertaken until 2016, when Council gained access through the Queensland Trust for Nature's Aroona property. Site inspections in 2016 identified no traces of rock wallabies on Mt Beau Brummel and noted high abundance of fox scats in the area. Staff were not able to survey the large cliff system to the west of Mt Beau Brummel where several sightings have been recorded.

In 2016, Queensland Trust for Nature (QTFN) was gifted a large property stretching along the Little Liverpool Range, bordering Mt Beau Brummel to the north and south. QTFN have since discovered a population of brush-tailed rock wallabies on their property on a series of sheer cliff faces, topped by open grassy woodland.

This is evidence that brush-tailed rock wallabies still persist throughout the Little Liverpool Range and work is needed to identify the number of colonies, how they are moving through the landscape and what the most urgent threats are on a local scale.



Peace in a Fast Paced City by K Fancourt
Ipswich Enviroplan Photo Competition

Recovery Information

This section will outline specific colonies located within Ipswich, what is known about them and what actions are required to ensure their recovery. Where insufficient information exists, this section addresses what information is required and how it can be attained. For the purpose of prioritisation, most habitat areas are split into study areas, but actions cumulate to meet the overall objectives for the recovery plan.

Study areas

Given that Council is managing a number of separate locations with potentially isolated populations of rock wallabies and spatially variable threats, a number of individual study areas have been developed. Each study area is spatially distinct, typically due to variation in elevation and can therefore be treated with a different priorities based on localised threats.

Study areas are selected based on the following:

- Known records of brush-tailed rock wallabies,
- Anecdotal and trace evidence of rock wallabies,
- Distinct rocky outcrops isolated from other habitat,
- High value rock wallaby habitat that has not been surveyed.

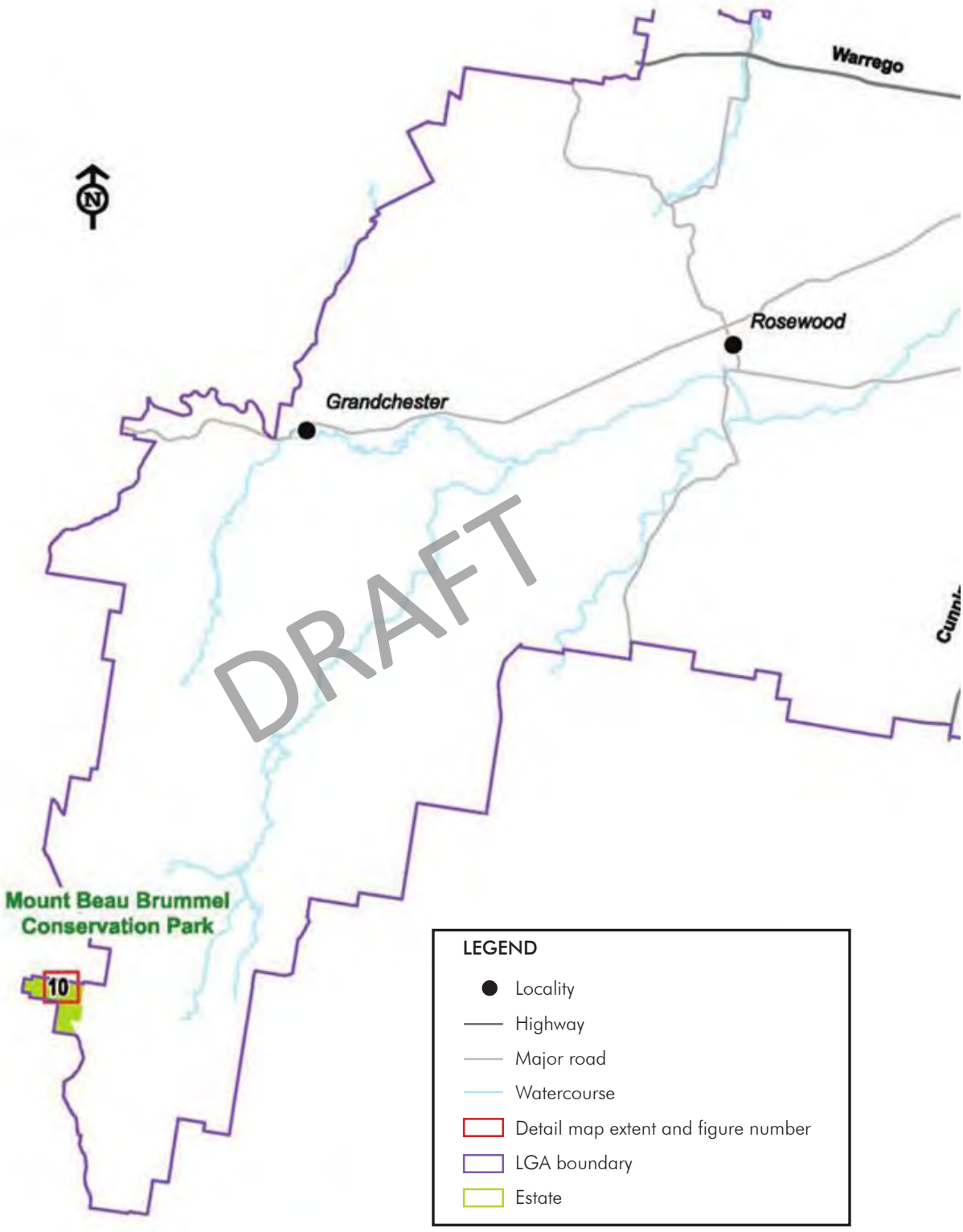
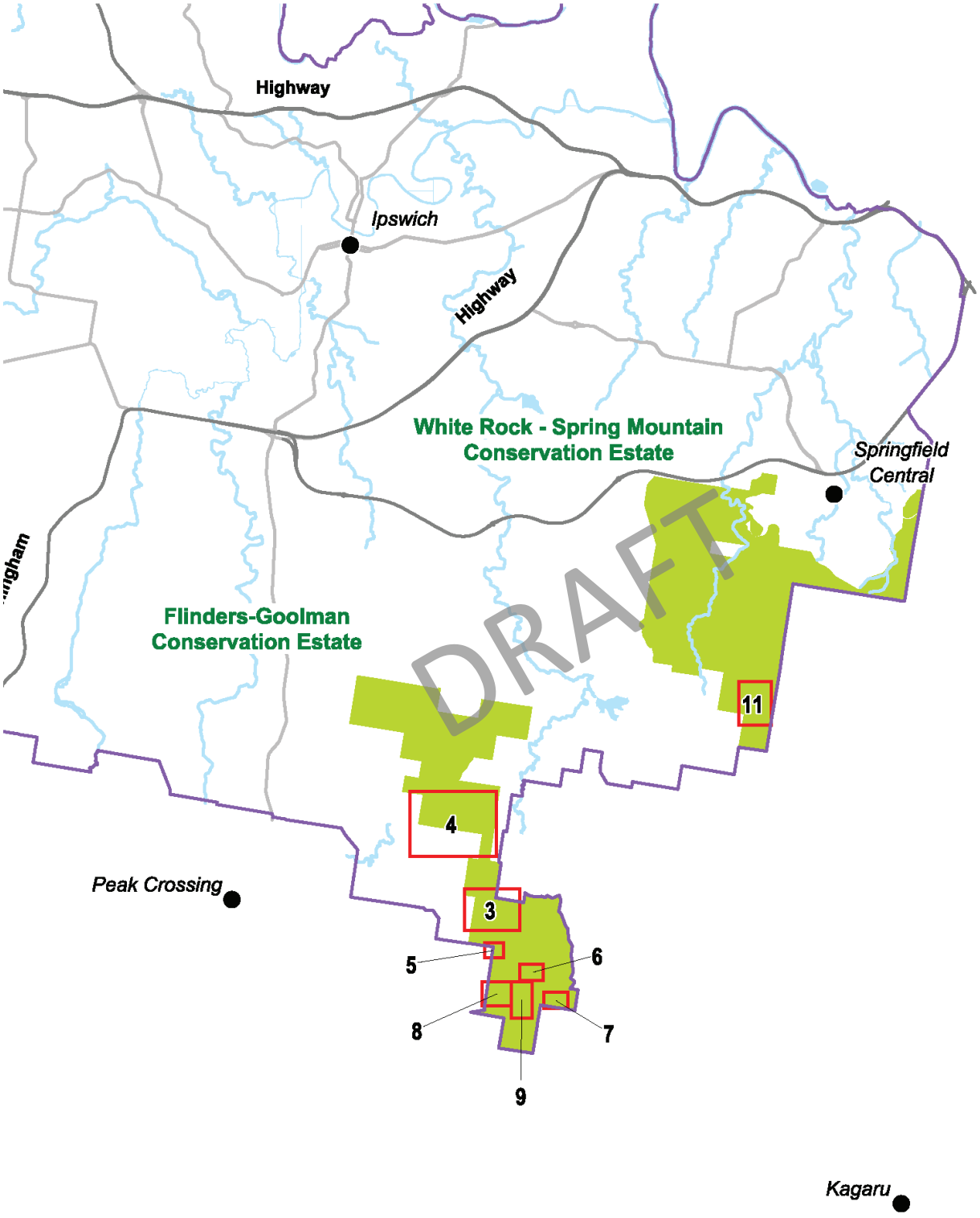


Figure 2b: Overview map and study areas within Ipswich Local Government Areas.


Highway
Ipswich
Highway
White Rock - Spring Mountain
Conservation Estate
Springfield
Central
Flinders-Goolman
Conservation Estate
DRAFT
11
4
3
5
6
8
7
9
Peak Crossing
Kagaru

Actions

Each management area is assigned both objectives and actions based on the issues present within the area. Actions are assigned based on threats noted from various sources, including:

- Evidence from site inspections and monitoring,
- Findings from studies and projects,
- Threats and considerations listed in national recovery plans and strategies.

Habitat assessment matrix

A habitat assessment matrix has been developed for use in this recovery plan. The matrix is designed to highlight the overall status of a study area, including consideration of foraging habitat, shelter habitat, and threats from pest animals.

Where possible, each study area will be assessed using the matrix to show which areas have the highest priority. The results from the habitat assessment matrix have been used in combination with all other available data from studies and monitoring programs to assign appropriate actions and priorities to each study area. The matrix can then be used to determine the success of each action by comparing the status of a site pre and post action.

Each visit to a study area should include an assessment of the habitat quality using the matrix and updated in the implementation phase of this plan.

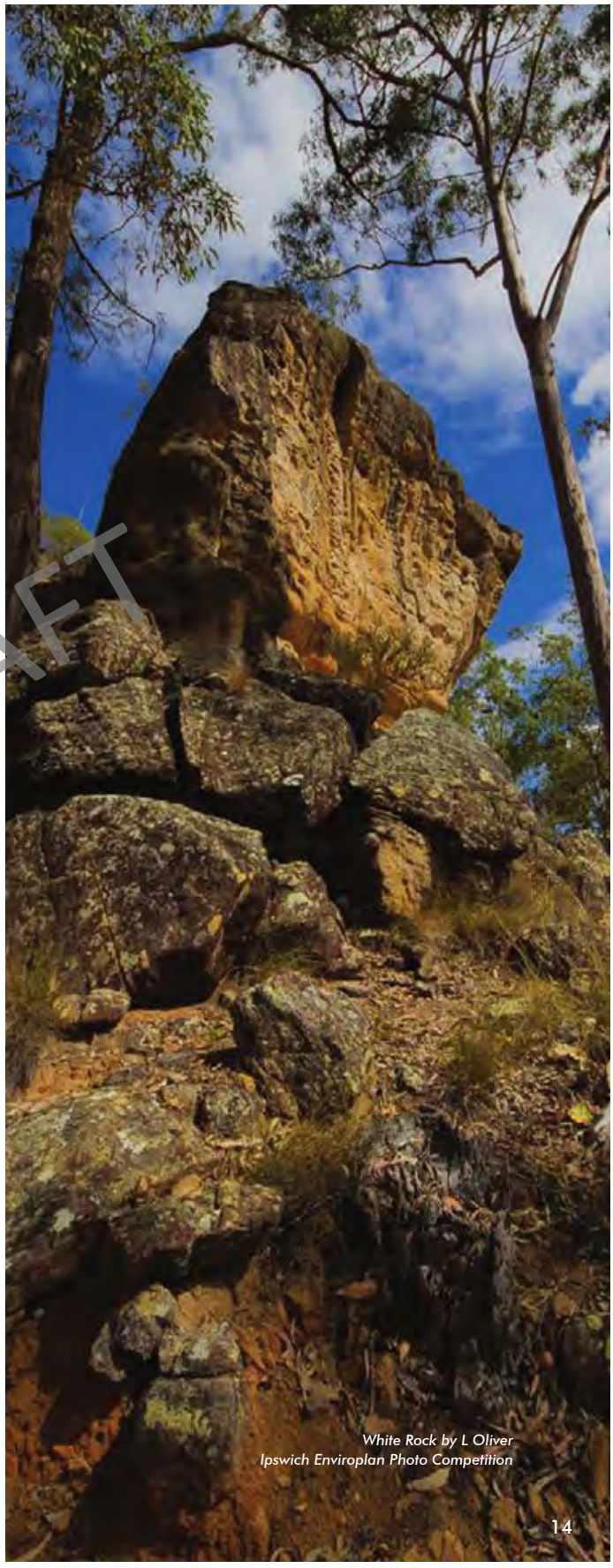
Table 1: Brush-tailed rock wallaby habitat assessment matrix

Criteria	Low	Moderate	High
Quality of shelter habitat	Unsuitable for permanent colony (temporary shelter only)	Suitable for permanent colony	Highly suitable for permanent colony or known den site
Quality of foraging vegetation	Very few native foraging species and/or high weed infestation	Some native foraging species and/or medium to high weed infestation	Abundant native foraging species and/or low to medium weed infestation
Level of isolation	Directly adjacent to trails or recreational users	Occasional disturbance from recreational users and other people	Minimal to no impact from recreational users or other people
Connectivity	Habitat likely to be isolated from other colonies or habitat areas	Potential opportunities for movement between habitat areas	Likely movement corridors and linkages between habitat areas
Predation and competition	High to medium impact from feral predators and/or high impact from feral herbivores	Low impact from feral predators and/or medium to low competition from feral herbivores	No evidence of competition or predation from feral species

Study Areas - Overview and Actions

This section will highlight each study area contained within the recovery plan. In addition to showing them mapped in relation to each other, each study area contains the following information:

- **Management objectives**
- **Regional ecosystem (RE)**
- **Approximate elevation**
- **Terrain**
- **Description**
- **Evidence of use**
- **Habitat quality**
- **Threats**
- **Actions**



White Rock by L Oliver
Ipswich Enviroplan Photo Competition

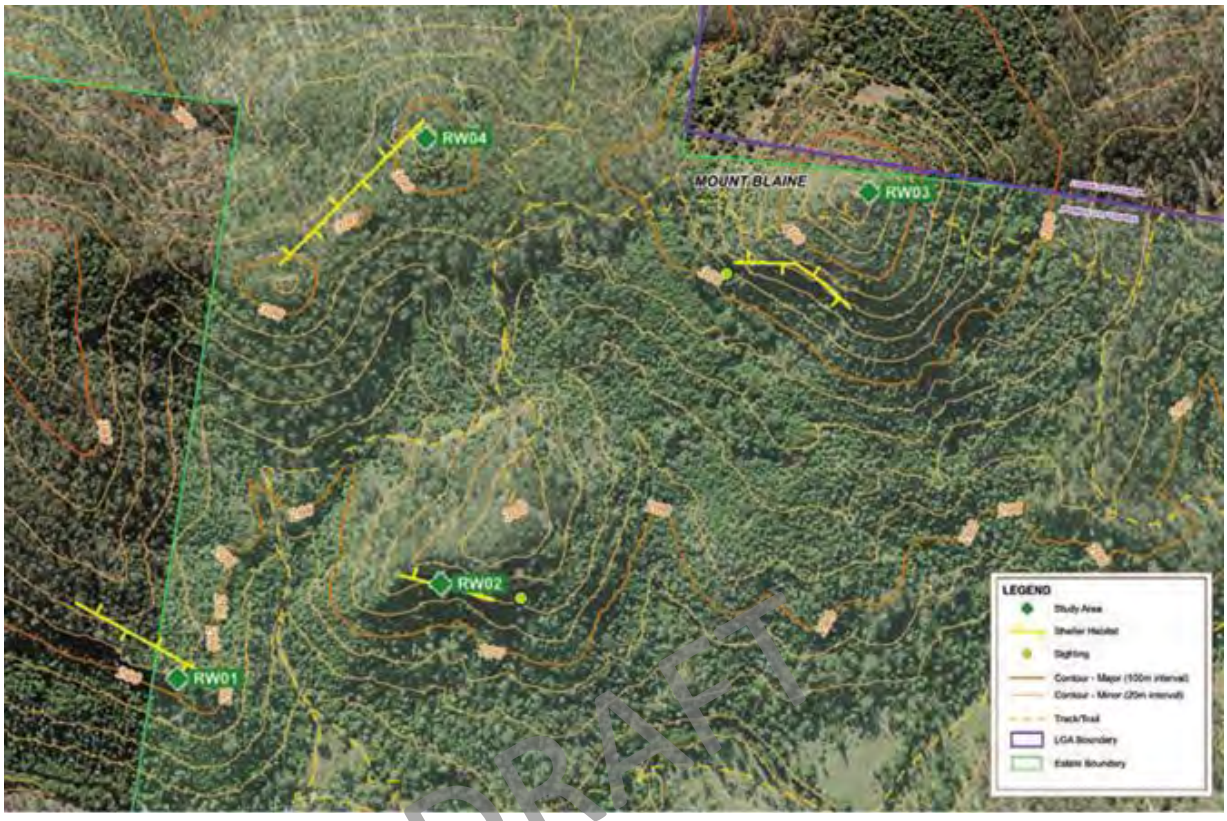


Figure 3: Study areas RW01 (Flinders Plum Overlook), RW02 (Mount Catherine), RW03 (Mount Blaine) and RW04 (Rocky Knoll Mount Blaine Track).

RW01 - Flinders Plum Overlook

Site	Assessment date	Quality of shelter habitat	Quality of foraging habitat	Level of isolation	Connectivity	Predation and competition
RW01	November 2015		lantana			

Management objectives

Control pest plants to re-establish the area as suitable rock wallaby habitat.

Increase connectivity between neighbouring rock wallaby study areas (RW01- RW04).

Regional ecosystem

12.8.20 (Shrubby woodland with *Eucalyptus racemosa* subsp. *racemosa* or *E. dura* on Cainozoic igneous rocks) and 12.8.24 (*Corymbia citriodora* subsp. *variegata* open forest on Cainozoic igneous rocks especially trachyte).

Approximate elevation

245m

Terrain

Cliff line, scree, not enough ledges or shelter.

Description

Complex rocky outcrop with scree below, just north of the Flinders Plum Picnic Area and west of Mt Catherine.

Evidence of use

No previous evidence of brush-tailed rock wallaby presence. The last visit in 2013 revealed no evidence of rock wallaby presence.

Habitat quality

The site is heavily infested with *Lantana camara* and there is limited shelter habitat.

Threats

- Infestation of *Lantana camara* supressing suitable foraging habitat,
- It is within 200m of Flinders Plum Picnic Area,
- Identified as a potentially suitable rock climbing site,
- Difficult movement corridors to other suitable habitat.

Actions

Nominate the site for lantana control under Council's Conservation Works Program, with works to commence before 2020.

Revisit the site every two years to search for evidence of brush-tailed rock wallaby.

Undertake surveys and desktop analysis to identify potential movement corridors between neighbouring study areas (RW01- RW04). The survey to be completed by June 2018.

RW02 - Mount Catherine

Site	Assessment date	Quality of shelter habitat	Quality of foraging habitat	Level of isolation	Connectivity	Predation and competition
RW02	November 2015		regenerating	Mt Catherine/ Mt Blaine Hiking Track		

Management objectives

Monitor and mitigate potential impacts from recreational use.

Increase connectivity between neighbouring rock wallaby study areas (RW01- RW04).

Regional ecosystem

12.8.19 (Heath and rock pavement with scattered shrubs or open woodland on Cainozoic igneous hills and mountains).

Approximate elevation

240m

Terrain

Cliffs and rock stacks.

Description

Small peak near Flinders Plum Picnic Area with the cliff line on the southern face. The area is largely scree, with not enough ledges or shelter for rock wallabies.

Evidence of use

Previous live sightings from pre-2000. Surveys in 2013 identified no evidence of wallabies.

Habitat quality

The site has reasonable foraging vegetation, but a lot of regeneration. Caves can be seen on the southern cliffs.

Threats

- It is within 350m of Flinders Plum Picnic Area,
- Identified as a potentially suitable rock climbing site,
- Lantana infestation surrounding the site restricting movement corridors,
- Difficult movement corridors to other suitable habitat.

Actions

Revisit the site every two years to search for evidence of brush-tailed rock wallabies.

Undertake surveys and desktop analysis to identify potential movement corridors between neighbouring study areas (RW01- RW04), with the survey to be completed by June 2018.

Undertake site inspections prior to any recreational embellishment to determine potential impacts and to propose mitigation measures.

RW03 - Mount Blaine

Site	Assessment date	Quality of shelter habitat	Quality of foraging habitat	Level of isolation	Connectivity	Predation and competition
RW03	November 2015		lantana			

Management objectives

Monitor and mitigate potential impacts from recreational use.

Increase connectivity between neighbouring rock wallaby study areas (RW01- RW04).

Regional ecosystem

12.8.4 (Complex notophyll vine forest with *Araucaria* spp. on Cainozoic igneous rocks).

Approximate elevation

455m

Terrain

Rugged, scree climbing to the top, with sheer cliffs with numerous caverns and outcrops.

Description

Pyramid shaped peak, with few large trees on the western side. Denser notophyll scrub on the eastern side. Sheer cliff line on the southern side.

Evidence of use

Previous live sightings from early 2000s. No Council surveys completed due to uncertain access.

Habitat quality

Caves visible on the southern facing cliffs with surrounding vegetation degraded with lantana infestation. The western side is thick with native holly and lantana and the eastern side is comprised mainly of patchy dry rainforest.

Threats

- Moderate levels of *Lantana camara* infestation,
- Identified as a potentially suitable rock climbing site,
- Difficult movement corridors to other suitable habitat.

Actions

Investigate the area for safe access to cliffs, with likely habitat identified by December 2017.

Conduct initial survey to determine presence and activity of brush-tailed bush-wallabies by December 2017.

Undertake surveys and desktop analysis to identify potential movement corridors between neighbouring study areas (RW01- RW04), with a survey to be completed by June 2018.

RW04 - Rocky Knoll Mount Blaine Track

Management objectives

Control pest plants to reengage the area as suitable rock wallaby habitat.

Increase connectivity between neighbouring rock wallaby study areas (RW01- RW04).

Regional ecosystem

12.8.20 (Shrubby woodland with *Eucalyptus racemosa* subsp. *racemosa* or *E. dura* on Cainozoic igneous rocks) and 12.8.24 (*Corymbia citriodora* subsp. *variegata* open forest on Cainozoic igneous rocks especially trachyte).

Approximate elevation

325m

Terrain

Moderately difficult rocky outcrops and ridgelines.

Description

Small rocky ridge off to the west from Mt Blaine Track. While there are small rocky outcrops, there are not enough serious drops for protection.

Evidence of use

Some evidence of older scats and evidence of other large competing macropods. No live sightings of brush-tailed rock wallaby recorded and therefore overall, unclear evidence of brush-tailed rock wallaby use.

Habitat quality

Detailed habitat assessment not available.

Threats

N/A

Actions

Nominate the site for lantana control under Council's Conservation Works Program, with works to be undertaken before 2020.

Revisit site every two years to search for evidence of brush-tailed rock wallaby.

Undertake desktop surveys and desktop analysis to identify potential movement corridors between neighbouring study areas (RW01- RW04), with the survey to be completed by June 2018.

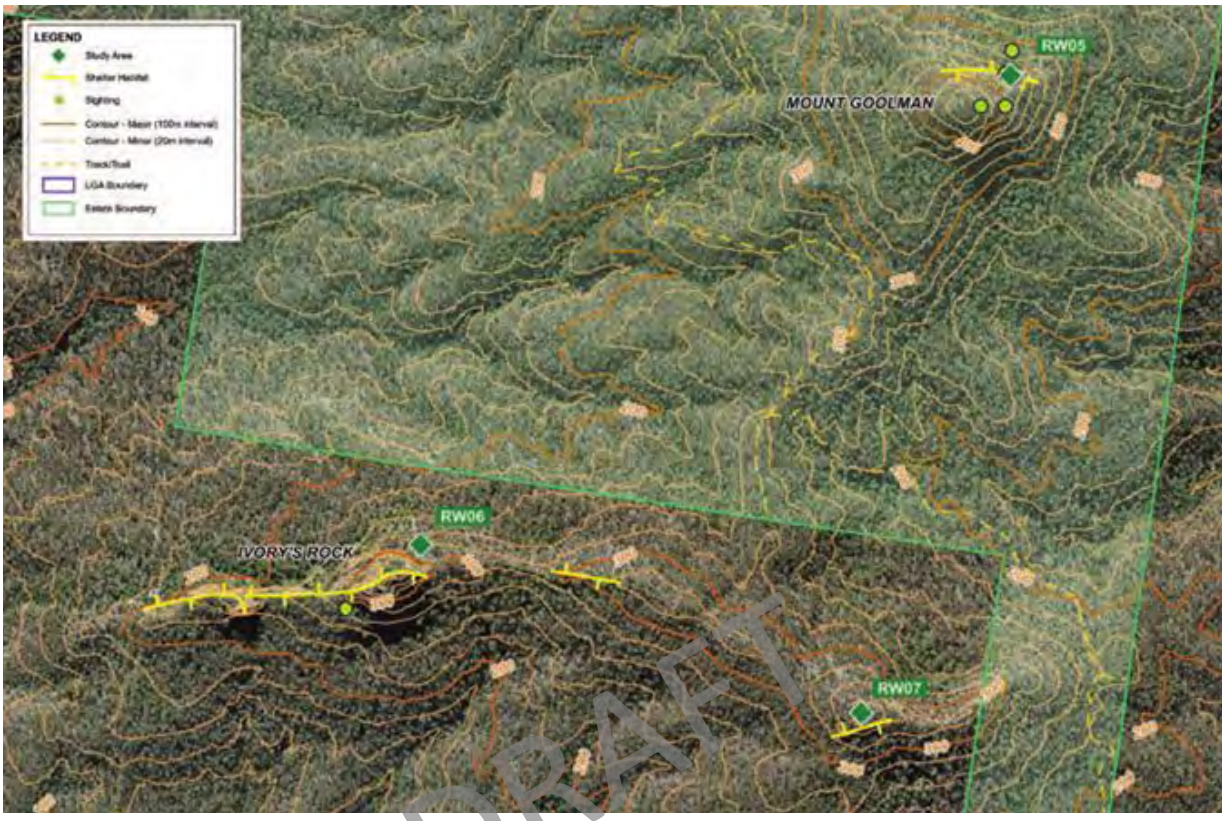


Figure 4: Study areas RW05 (Mount Goolman), RW06 (Ivory's Rock) and RW07 (The Galley).

RW05 - Mount Goolman

Site	Assessment date	Quality of shelter habitat	Quality of foraging habitat	Level of isolation	Connectivity	Predation and competition
RW05	July 2016		creeping lantana			

Management objectives

Maintain movement and connectivity between RW05 and RW06-RW07.

Improve the health of foraging habitat available on the northern face of Mount Goolman.

Investigate the need and means to improve genetic diversity within the study area.

Regional ecosystem

12.8.24 (*Corymbia citriodora* subsp. *variegata*, *Eucalyptus crebra* +/- *E. moluccana* open forest).

Approximate elevation

455m

Terrain

Steep, rugged ridges and cliffs.

Description

Northern and southern aspect with rocky cliffs, caves and outcrops. The northern face has known sightings but is infested with *Lantana montedivensis*. The southern face is rocky heath vegetation with epiphyte vegetation up the cliff face. There are caves identified on eastern face and limited public access to the site.

Evidence of use

Historic live sightings on the northern and southern faces. There have been recent live sightings from the northern face. There is also old and fresh scat evidence on the northern face, as well as numerous tracks, skulls and polished rocks.

Habitat quality

High potential for a permanent rock wallaby colony on the northern and north-eastern faces. The northern face is currently heavily degraded due to infestations of creeping lantana. The southern side infested with walls of *Lantana camara*. There is high quality shelter habitat, due to caves and overhangs on numerous aspects.

Threats

- High levels of weed infestation,
- Old evidence of fire on site, but no fire history recorded in Council system,
- Isolation, genetic diversity and potential for inbreeding depression.

Actions

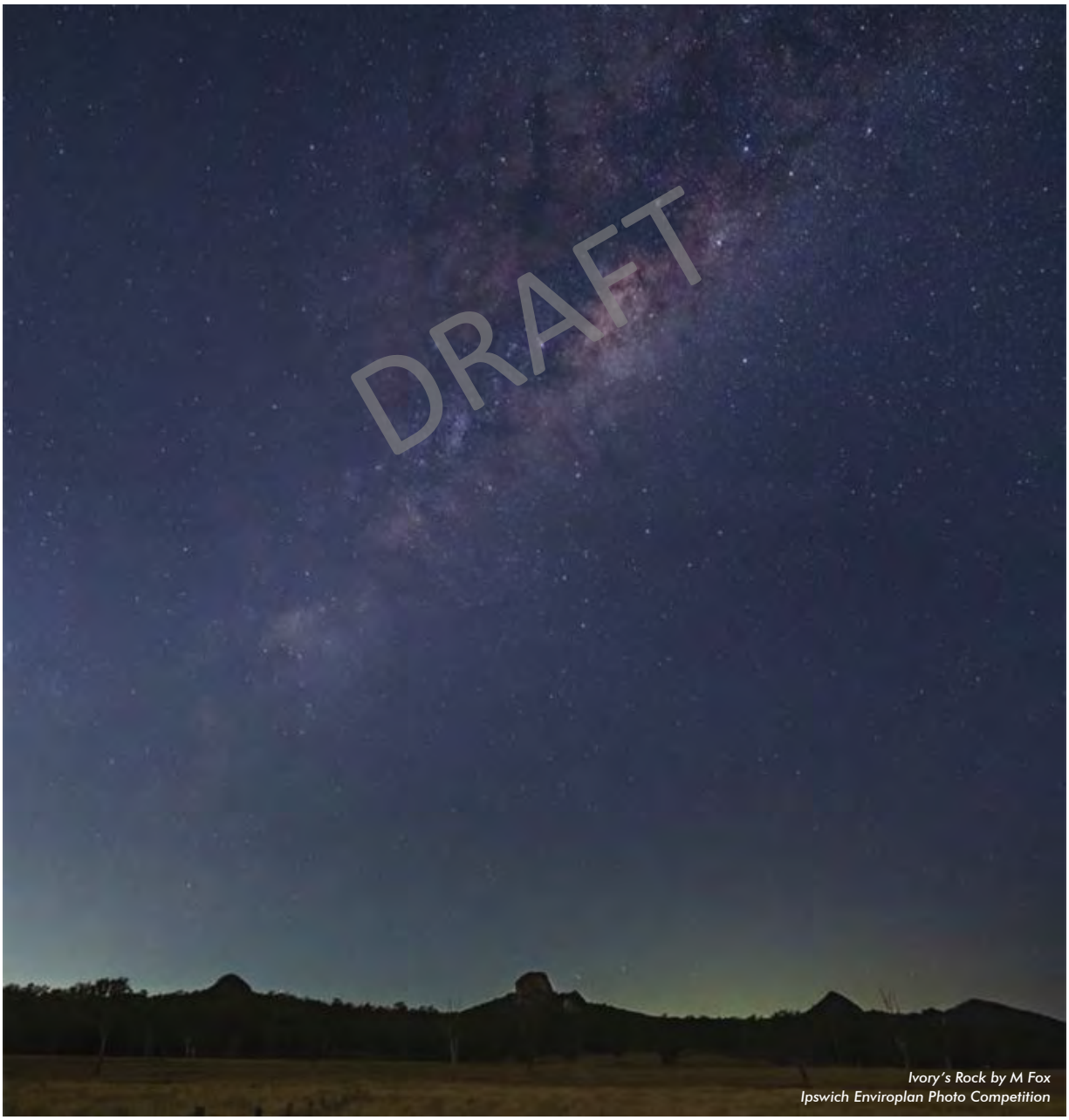
Undertake works to reduce *Lantana montedivensis* cover on the site to less than 10% by June 2019.

Continue to monitor and respond to new infestations of weed species, to facilitate the recovery of grassy understory.

Conduct a study of brush-tailed rock wallaby movement patterns around Mt Goolman to determine the level of connectivity.

RW06 - Ivory's Rock

Site	Assessment date	Quality of shelter habitat	Quality of foraging habitat	Level of isolation	Connectivity	Predation and competition
RW06	September 2013		*Lantana camara*			



Ivory's Rock by M Fox
Ipswich Enviroplan Photo Competition

Management objectives

Encourage and support regular monitoring and predator control on private land and adjoining populations.

Regional ecosystem

12.8.20 (Shrubby woodland with *Eucalyptus racemosa* subsp. *racemosa* or *E. dura* on Cainozoic igneous rocks) and 12.8.19 (Heath and rock pavement with scattered shrubs or open woodland on Cainozoic igneous hills and mountains).

Approximate elevation

360m

Terrain

Steep rocky outcrop with scree.

Description

Long rugged ridge line, cliffs and buttresses with montane heath and dry eucalypt forest. A defined ridgeline connects RW06 - RW07. The study area owned is owned by Ivory's Rock Conference Centre.

Evidence of use

Variety of scat classes observed, including fresh and old scats. One live sighting was observed in the 2013 surveys. Worn and polished rock also located in a variety of areas; however no den sites have been located.

Habitat quality

Infestations of lantana around the base of the rocky shelter, with limited forb and montane heath through the complex rocky habitat sections. There is a steep rocky ridgeline and outcrop with rocky scree, which creates complex habitat suitable for shelter.

Threats

- Limited public access,
- Evidence of feral goats on site,
- *Lantana camara* infestation

Actions

Revisit the site with the landholder every two years, to search for evidence of brush-tailed rock wallaby.

Provide support for the landholder through the Landholder Partnerships Program. Provide assistance for revegetation and habitat management through grants and assistance for pest management, through the provision of traps and technical advice.

RW07 - The Gallery

Site	Assessment date	Quality of shelter habitat	Quality of foraging habitat	Level of isolation	Connectivity	Predation and competition
RW07	September 2013		*Lantana camara*			feral goats

Management objectives

Encourage and support regular monitoring and predator control on private land and adjoining populations.

Regional ecosystem

12.8.20 (Shrubby woodland with *Eucalyptus racemosa* subsp. *racemosa* or *E. dura* on Cainozoic igneous rocks) and 12.8.19 (Heath and rock pavement with scattered shrubs or open woodland on Cainozoic igneous hills and mountains).

Approximate elevation

360m

Terrain

Steep rocky outcrop with a cliff line below ridge.

Description

Cliff line below a defined ridgeline, which connects to the main study areas in Ivory's Rock conference centre (RW06). The study area is owned by Ivory's Rock Conference Centre.

Evidence of use

There have been no live sightings recorded at this study area. Low to moderate levels of scats have been recorded during 2013 survey and fresh scat recorded on the previous search.

Habitat quality

There are infestations of lantana around the base of the rocky shelter. There is limited forb and montane heath through the complex rocky habitat sections. The steep rocky ridgeline and outcrop with rocky scree creates complex habitat, suitable for shelter.

Threats

- Limited public access,
- Evidence of feral goats on site,
- *Lantana camara* infestation.

Actions

Revisit the site every two years to search for evidence of brush-tailed rock wallaby.

Provide support for the landholder through the Landholder Partnerships Program. Provide assistance for revegetation and habitat management through grants and assistance for pest management, through the provision of traps and technical advice.

Figure 5: Study area RW08 (The Den).

RW08 - The Den

Site	Assessment date	Quality of shelter habitat	Quality of foraging habitat	Level of isolation	Connectivity	Predation and competition
RW08	July 2016		weed infestation	Flinders Peak Hiking Track		

Management objectives

Re-establish a breeding colony that permanently resides within the site.

Facilitate the recovery of foraging habitat suitable for retention of a long term population.

Maintain connectivity with RW11 and the remainder of Flinders Peak.

Regional ecosystem

12.8.9 (*Lophostemon confertus* open forest on Cainozoic igneous rocks) and 12.8.24 (*Corymbia citriodora* subsp. *variegata* open forest on Cainozoic igneous rocks especially trachyte).

Approximate elevation

595m

Terrain

Cliffs, rock stacks, caves, ledges and overhangs.

Description

A ridge running approximately west from Flinders Saddle with extensive cliffs below the western ridge and some isolated rock stacks.

Evidence of use

Widespread brush-tailed rock wallaby activity on top of the ridge, with some activity and live sightings recorded below the ridge. There is a high level historic use, with a high density of old scats and shiny rocks within the known den site. Numerous sightings of rock wallabies, including pouched young, on monitoring cameras from 2013-2017, suggest that animals in the area are not currently using the site for denning but are returning periodically to investigate the area.

Habitat quality

There is access to water and a good mosaic of vegetation types and age classes, with vine thicket moving into open eucalypt forest. There is a good diversity of dry rainforest species, germinating throughout the site and patches of native groundcover, including foraging species (e.g. *Themeda triandra*) that will support native regeneration. The site is highly resilient with a good soil seed bank, despite high levels of weed infestation. There is a high quality shelter habitat, with numerous caves and undercuts. Major overhangs have flight paths in multiple directions. There is excellent connectivity to extensive natural areas in all directions, including other rock systems, likely to support brush-tailed rock wallaby.

Threats

- High levels of weed infestation and reduced foraging amenity,
- High public access including reports of recreational rock climbing,
- Some fire impacts,
- An inactive fox den in the gully, but no other sign of fox activity recorded.

Actions

Undertake works to reduce weed infestation on site to below 10% by the end of 2018. Monitor the recovery of native fodder and prescribe further restoration actions accordingly.

Undertake regular monitoring of the den sites and of downslope foraging areas, to track changes in rock wallaby usage.

Undertake regular and targeted fox monitoring within the site. Any signs of fox predation are to be immediately followed by actions to remove foxes from the area. Any predator scats located are sent for content analysis.

Regularly monitor access points to den sites for presence of recreational users of the park and implement actions to reduce visitor impact where necessary.

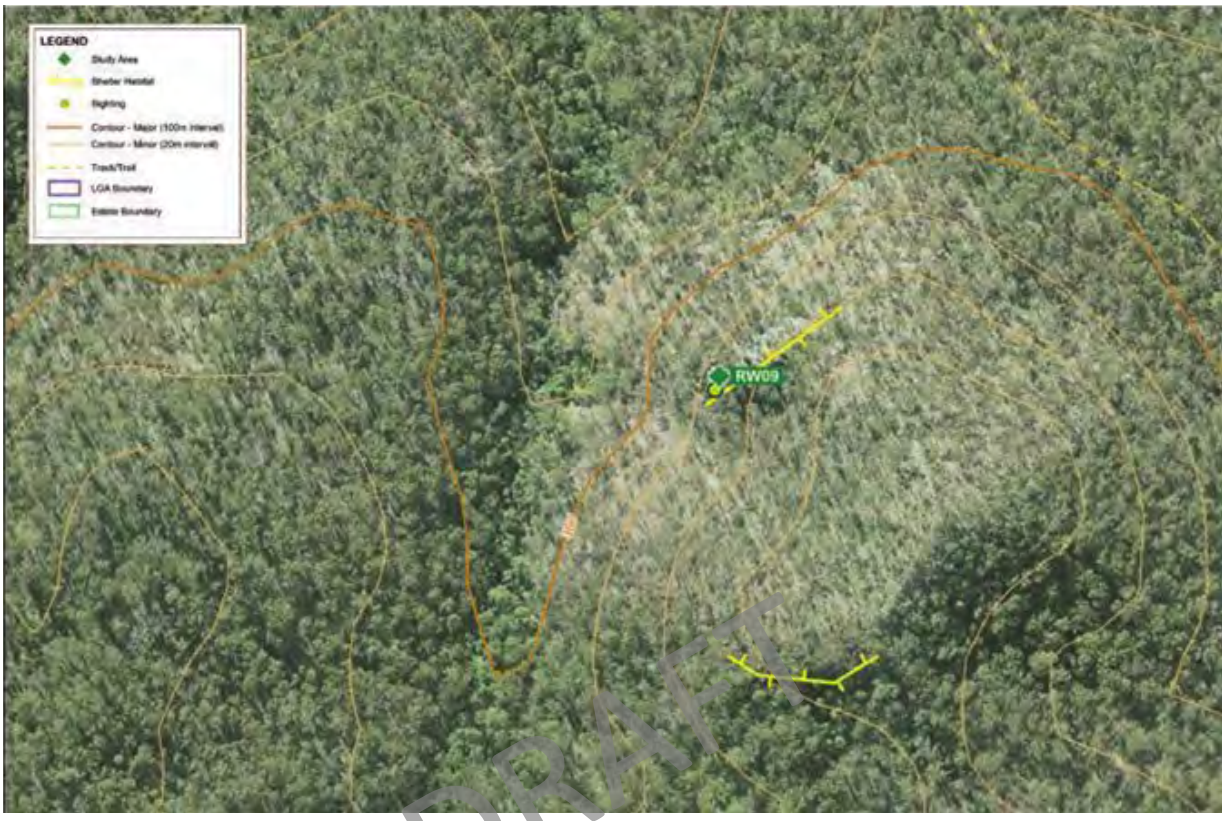


Figure 6: Study area RW09 (The Bommy)

RW09 - The Bommy

Site	Assessment date	Quality of shelter habitat	Quality of foraging habitat	Level of isolation	Connectivity	Predation and competition
RW09	July 2016					

Management objectives

Retain high quality foraging habitat.

Maintain connectivity and suitable matrix between RW09 and adjacent shelter habitat in RW14.

Regional ecosystem

12.8.9 (*Lophostemon confertus* open forest often with vine forest understorey) and 12.8.24 (*Corymbia citriodora* subsp. *variegata*, *Eucalyptus crebra* +/- *E. moluccana* open forest).

Approximate elevation

360m

Terrain

Rocky outcrop on the side of a knoll.

Description

Two separate rocky ridgelines with brush box forest in between them. The northern ridge has evidence of rock wallabies, and the southern ridge is yet to be investigated. The northern ridge is more complex with large boulders, steep rocky pinnacles, ledges and small north facing caves.

Evidence of use

Live sightings as recent as 2013 detected with an on-trail camera. Fresh scat evidence has been identified on several occasions between 2014 and 2017.

Habitat quality

Highly suitable foraging habitat with expansive areas of native grass and rocky areas with montane forbs. The area has highly suitable rocky habitat for temporary shelter, with boulders and small caves, though it is unlikely to be suitable for permanent shelter habitat. It is reasonably close to other offsite shelter habitat and suitable for feeding.

Threats

- Moderate levels of weed infestation limited to lower areas, around the base of the rocks and with prickly pear along the ridges,
- Possible competition from other macropods.

Actions

Monitor vegetation health to determine and record any declines in quality.

Conduct cool prescribed fire, to maintain grass health. Fires prescribed based on visible signs of grass heath decline with consideration to fire regimes, fire history and the 'Ipswich Fire Management Strategic Plan'.

Undertake regular and targeted fox monitoring within the site (targeted in the valley between RW09 and RW14). Any signs of fox predation are to be immediately followed by actions to remove foxes from the area. Any predator scats are to be sent for content analysis.

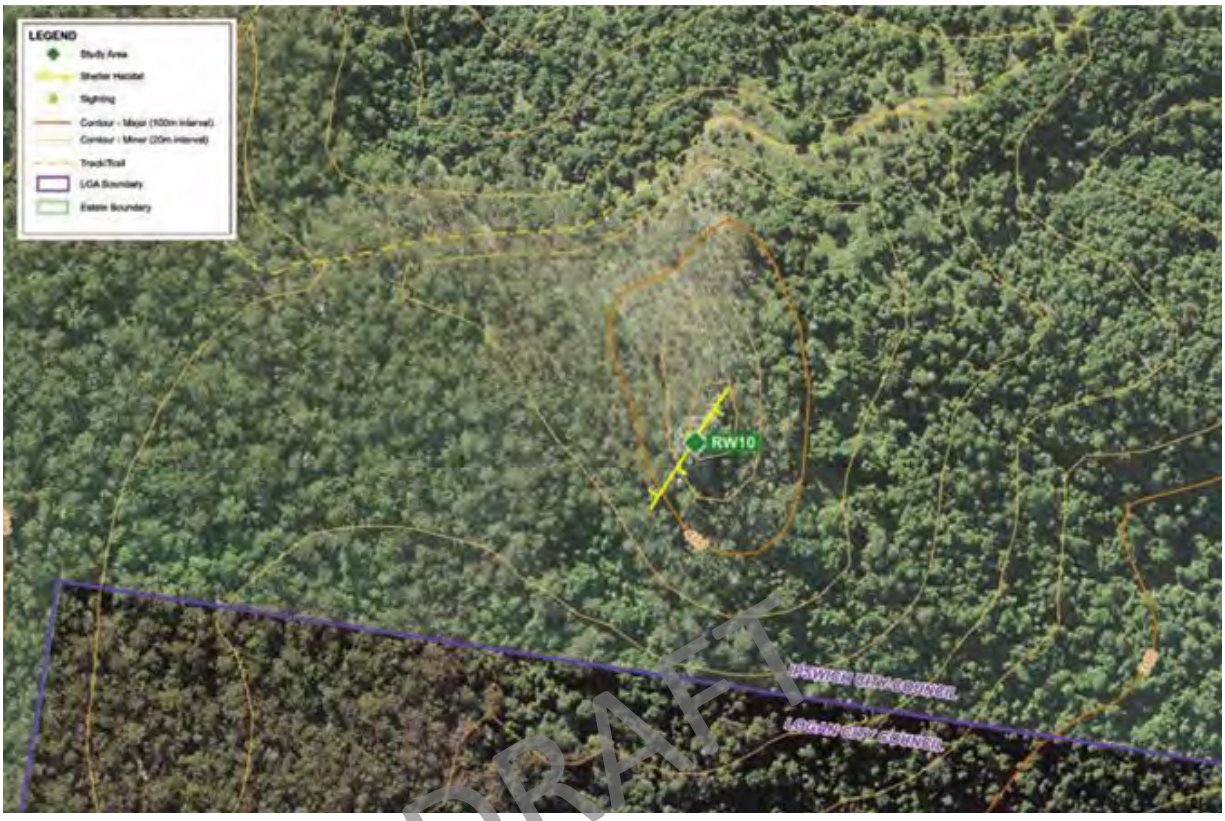


Figure 7: Study area RW10 (Scott's Scrub Pinnacle).

RW10 - Scott's Scrub Pinnacle

Site	Assessment date	Quality of shelter habitat	Quality of foraging habitat	Level of isolation	Connectivity	Predation and competition
RW10	December 2015					

Management objectives

Periodically monitor the site to detect any future use by brush-tailed rock wallaby.

Regional ecosystem

12.9-10.7 (*Eucalyptus crebra* +/- *E. tereticornis*, *Corymbia tessellaris*, *Angophora* spp., *E. melanophloia* woodland on sedimentary rocks) and 12.9-10.2 (*Corymbia citriodora* subsp. *variegata* +/- *Eucalyptus crebra* open forest on sedimentary rocks) and 12.9-10.17 (*Eucalyptus acmenoides*, *E. major*, *E. siderophloia* +/- *Corymbia citriodora* subsp. *variegata* woodland on sedimentary rocks).

Approximate elevation

450m

Terrain

Very steep, complex ledges and an isolated rocky peak.

Description

A small rocky outcrop, potentially not isolated enough or and lacking sufficient shelter for rock wallabies.

Evidence of use

No evidence of rock wallabies in two separate visits (last visit December 2015). There is evidence of swamp wallabies all across the study area, including directly below the rocky outcrop.

Habitat quality

Highly suitable foraging habitat with expansive areas of native grass and rocky areas with montane forbs. Rocky outcrop lacks suitable caves and overhangs to constitute quality shelter habitat.

Threats

- Potential competition with other macropods,
- Limited shelter increases vulnerability to fox predation.

Actions

Revisit site every two years to search for evidence of brush-tailed rock wallaby.

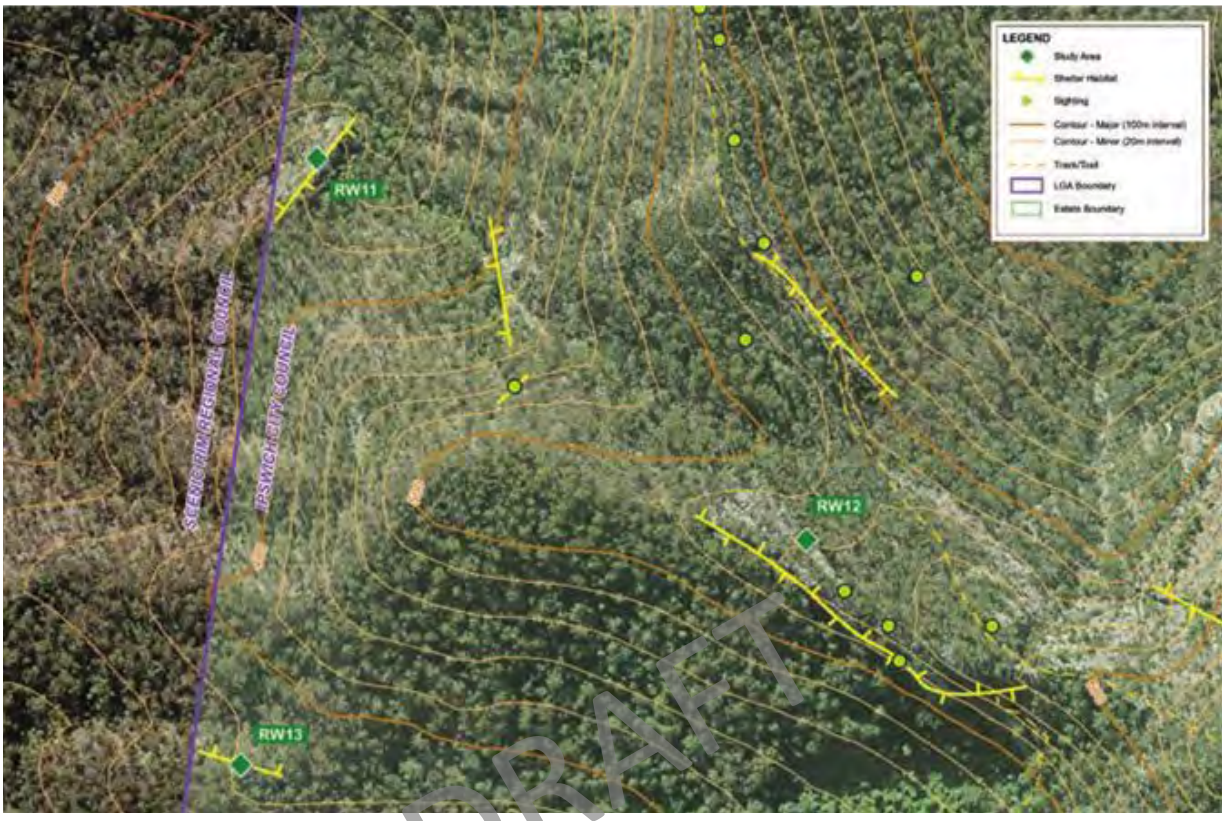


Figure 8: Study areas RW11 (The Descent), RW12 (Mount Flinders Saddle) and RW13 (Roads End).

RW11 - The Descent

Site	Assessment date	Quality of shelter habitat	Quality of foraging habitat	Level of isolation	Connectivity	Predation and competition
RW11	December 2015			cave trail		feral pigs

Management objectives

Improve foraging habitat quality.

Ensure that local populations do not suffer from predation from European red foxes.

Monitor and mitigate potential impacts from recreational use.

Regional ecosystem

12.8.9 (*Lophostemon confertus* open forest with vine forest understory) and 12.8.24 (*Corymbia citriodora* subsp. *variegata*, *Eucalyptus crebra* +/- *E. moluccana* open forest).

Approximate elevation

380m

Terrain

Mix of steep overgrown terrain, with limited rock scrambling and small scree areas.

Description

There are two separate rocky ridgelines and several other outcrops to the east of the Flinders Peak hiking track. Ridgelines run adjacent to each other and are roughly 150m apart.

Evidence of use

At least six live sightings have been recorded, spanning 1996-2016. A moderate level of scat has been recorded in various areas from 2015 surveys. There has been more scat evidence recorded in 2016 surveys.

Habitat quality

High potential foraging habitat but degraded. There is limited refuge habitat within the site but high quality shelter habitat nearby, which would support a permanent colony. There site has high levels of pig damage in areas and there are camera images of pigs recorded on site.

Threats

- Medium to high levels of feral pig activity destroying foraging habitat,
- Fire impacts,
- Moderate levels of weed infestation impacting development of native vegetation recovering from fire,
- Flinders Peak Hiking Track immediately adjacent with low public access to site.

Actions

Measure levels of feral pig activity every six months, to determine the level of pig use on the saddle and on the Havill Track up to the QTFN Koala Crossing Boundary.

Target pig control on Havill Track when pig activity is noted, and use the dam on the eastern side of the peak as an alternative trapping site, and coordinate the pig control with QTFN.

Undertake regular and targeted fox monitoring within the site. Any signs of fox predation are to be immediately followed by actions to remove foxes from the area. Any predator scats are to be sent for content analysis.

Manually modify vegetation to restore habitat structure more suited to brush-tailed rock wallaby foraging. Target monocultures of *Acacia fimbriata*, inkweed and *Lantana montedivensis* and use chemical control or fire applied, where practical and appropriate. Initial work completed by December 2019 with follow up work to trial a mixture of direct seeding and planting of suitable forage species.

RW12 - Mount Flinders Saddle

Site	Assessment date	Quality of shelter habitat	Quality of foraging habitat	Level of isolation	Connectivity	Predation and competition
RW12	July 2016		*Lantana camara*			Feral goats

Management objectives

Improve foraging habitat quality on Mount Flinders Saddle and downslope areas.

Ensure that local populations do not suffer from predation from European red foxes.

Monitor and mitigate potential impacts from recreational use.

Regional ecosystem

12.8.9 (*Lophostemon confertus* open forest with vine forest understory) and 12.8.24 (*Corymbia citriodora* subsp. *variegata*, *Eucalyptus crebra* +/- *E. moluccana* open forest).

Approximate elevation

595m

Terrain

Cliffs, rock stacks, caves, ledges and overhangs.

Description

A ridge running west from Flinders saddle. There are extensive cliffs below the western ridge, with some isolated rock stacks. Rock stacks are on top of the ridge and there are several caves below cliff line.

Evidence of use

Widespread brush-tailed rock wallaby activity on top of the ridge. Some activity and live sightings have been recorded below the ridge. Whilst a den site is not known, there have been observations of brush-tailed rock wallaby with pouch young at this site. Fresh and recent, high scat density in places, especially on exposed rocky outcrops used for winter basking.

Habitat quality

Refuge habitat is surrounded by native vegetation on all sides. Fire impacts including loss of canopy and species diversity in important areas of the site, such as potential brush-tailed rock wallaby foraging habitat areas. There is considerable pig damage, particularly on the south facing slope below the site and around rocky habitat in the south-western corner of the site. The site has high suitability as a permanent rock wallaby colony, but is currently affected by several disturbance factors.

Threats

- Moderate levels of weed infestation,
- High level of feral pig damage,
- Changes to vegetation structure due to fire,
- The Flinders Peak Hiking Track is immediately adjacent; thought there is low public access to site.

Actions

Measure levels of feral pig activity every six months to determine level of pig use on the saddle and on Havill Track up to the QTFN Koala Crossing Boundary.

Target pig control on Havill Track when pig activity is noted, using the dam on the eastern side of the peak as an alternative trapping site, and coordinate pig control with QTFN.

Undertake regular and targeted fox monitoring within the site. Any signs of fox predation are immediately followed by actions to remove foxes from the area. Any predator scats are sent for content analysis.

Manually modify vegetation to restore habitat structure more suited to brush-tailed rock wallaby foraging. Target monocultures of *Acacia fimbriata*, inkweed and *Lantana montedivensis* and use chemical control or fire applied, where practical and appropriate with initial work to be completed by December 2019.

Mount Flinders by A Morrison
Ipswich Enviroplan Photo Competition

RW13 - Roads End

Site	Assessment date	Quality of shelter habitat	Quality of foraging habitat	Level of isolation	Connectivity	Predation and competition
RW13	September 2016					feral goats

Management objectives

Retain high quality foraging habitat.

Regional ecosystem

12.8.9 (*Lophostemon confertus* open forest with vine forest understory) and 12.8.24 (*Corymbia citriodora* subsp. *variegata*, *Eucalyptus crebra* +/- *E. moluccana* open forest).

Approximate elevation

380m

Terrain

Steep slope access from the southern side of Flinders Peak. The site has a smooth, moderately sloped rocky outcrop at the top.

Description

The site is a prominent rocky knoll on top of a ridgeline, running south-west from Flinders Peak. Overhang on the northern side of the outcrop.

Evidence of use

No evidence recorded in two separate site visits in 2016.

Habitat quality

Mixed quality of foraging habitat with several open grassed areas, and areas with thick Acacia regrowth supressing grass. The site also has moderate to high levels of pig activity, destroying understory vegetation. The rocky outcrop lacks complexity, and overhang does not present sufficient shelter for a permanent den.

Threats

- Potential for competition with other wallabies, most notably swamp wallabies,
- Destruction of foraging habitat by feral pigs,
- Minimal public access,
- Fire impacts on vegetation structure,
- Moderate levels of weed infestation,
- No evidence of fox predation recorded.

Actions

Monitor vegetation health every two years to determine and record any decline in quality.

Conduct cool prescribed fire to maintain grass health and prescribe fires based on visible signs of grass heath decline with consideration to fire regimes, fire history and the 'Ipswich Fire Management Strategic Plan'.

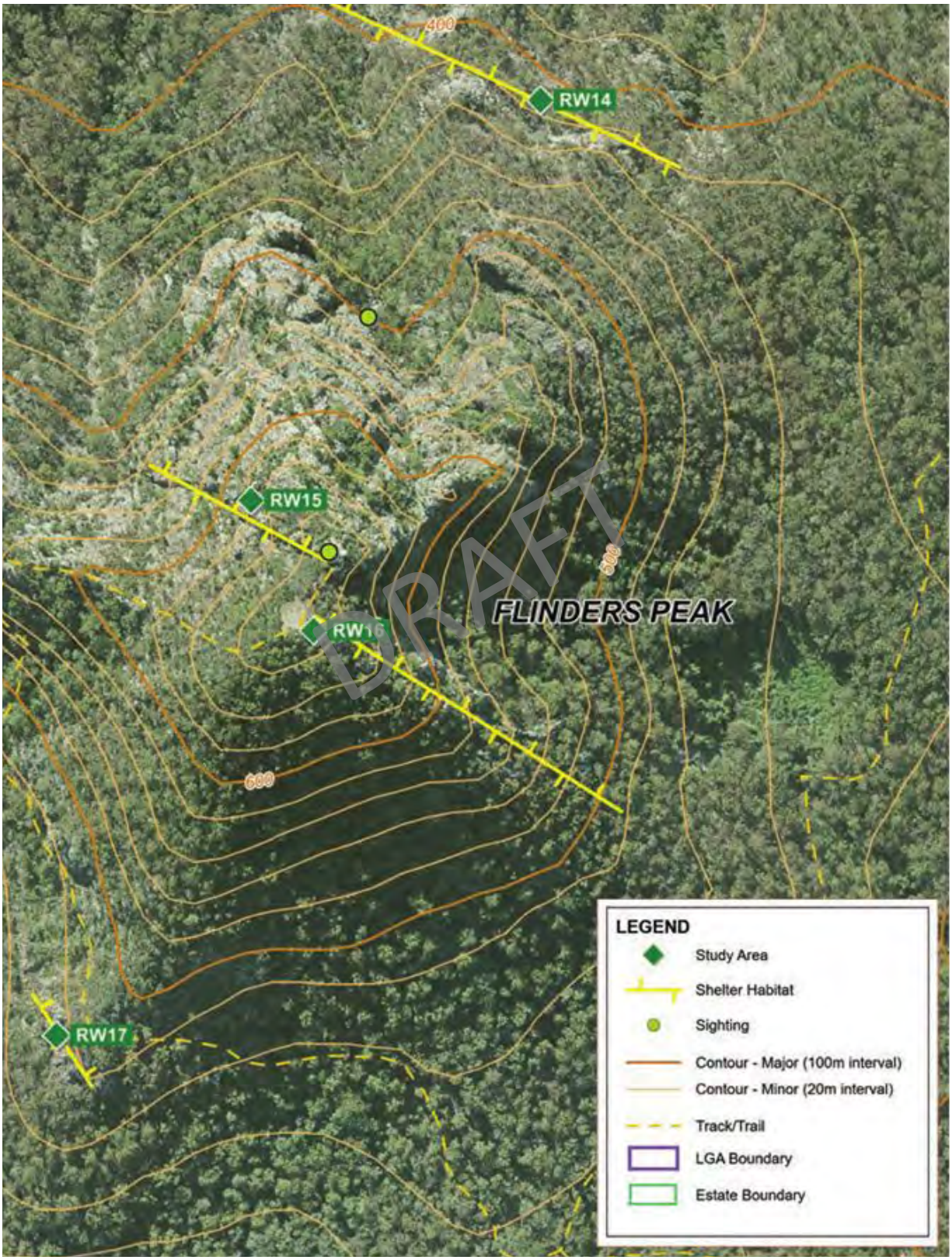


Figure 9: Study area RW14 (Flinders Peak North East), RW15 (Flinders Peak Summit), RW16 (Flinders Peak East Ridge) and RW17 (Flinders Foot).

RW14 - Flinders Peak North East

Management objectives

Obtain baseline data.

Regional ecosystem

12.8.9 (*Lophostemon confertus* open forest with vine forest understory) and 12.8.24 (*Corymbia citriodora* subsp. *variegata*, *Eucalyptus crebra* +/- *E. moluccana* open forest).

Approximate elevation

420m

Terrain

Unknown, needs investigating.

Description

Prominent complex rocky outcrops with a north-eastern aspect down slope from Flinders Peak.

Evidence of use

No evidence currently but highly suitable habitat. No surveys have been conducted.

Habitat quality

Detailed habitat assessment not available.

Threats

Detailed threat assessment not available.

Actions

Investigate area for safe access to cliffs with likely habitat.

Conduct initial survey to determine presence and activity of brush-tailed rock wallaby.

RW15 - Flinders Peak Summit

Site	Assessment date	Quality of shelter habitat	Quality of foraging habitat	Level of isolation	Connectivity	Predation and competition
RW15	June 2014					

Management objectives

Periodically monitor the site to detect any future use by brush-tailed rock wallaby.

Regional ecosystem

12.8.19 (Heath and rock pavement with scattered shrubs or open woodland on Cainozoic igneous hills and mountains).

Approximate elevation

670m

Terrain

Complex, steep rocky outcrops (some isolated), with loose rock and scree.

Description

Rock stacks, cliffs, caves and potential den sites in upper slopes. There are grassy areas in lower slopes, rock stacks, overhangs, caves (1 containing probable scat) and upper slopes.

Evidence of use

Recent and fresh scat, density increasing in upper rocky areas with moderate scat density. A live sighting was recorded in 2008.

Habitat quality

Several grassy slopes in the area present highly suitable foraging areas. Rock stacks, scree, overhangs and caves are present throughout the site, whichpresent highly suitable shelter habitat.

Threats

- High level of public access to several areas,
- Some potential disturbance from recreational rock climbers using the area,
- No feral pig activity recorded,
- No evidence of red fox recorded on site.

Actions

Monitor vegetation health to determine and record any declines in quality.

Conduct cool prescribed fire to maintain grass health and prescribe fire based on visible signs of grass heath decline, with consideration to fire regimes, fire history and the 'Ipswich Fire Management Strategic Plan'.

RW16 - Flinders Peak East Ridge

Site	Assessment date	Quality of shelter habitat	Quality of foraging habitat	Level of isolation	Connectivity	Predation and competition
RW16	June 2014					

Mount Flinders by B Saunders
Ipswich Enviroplan Photo Competition

Management objectives

Periodically monitor the site to detect any future use by brush-tailed rock wallaby.

Regional ecosystem

12.8.19 (Heath and rock pavement with scattered shrubs or open woodland on Cainozoic igneous hills and mountains).

Approximate elevation

670m

Terrain

Complex, steep rocky outcrops (some isolated), with loose rock and scree.

Description

Rock stacks, cliffs, caves and potential den sites in upper slopes. There are grassy areas in lower slopes, rock stacks, overhangs, caves (1 containing probable scat) and upper slopes.

Evidence of use

Recent and fresh scat, density increasing in upper rocky areas with moderate scat density. A live sighting was recorded in 2008.

Habitat quality

Several grassy slopes in the area present highly suitable foraging areas. Rock stacks, scree, overhangs and caves are present throughout the site, which present highly suitable shelter habitat.

Threats

- High level of public access to several areas,
- Some potential disturbance from recreational rock climbers using the area,
- No feral pig activity recorded,
- No evidence of red fox recorded on site.

Actions

Monitor vegetation health to determine and record any declines in quality.

Conduct cool prescribed fire to maintain grass health and prescribe fire based on visible signs of grass heath decline, with consideration to fire regimes, fire history and the 'Ipswich Fire Management Strategic Plan'.

RW17 - Flinders Foot

Site	Assessment date	Quality of shelter habitat	Quality of foraging habitat	Level of isolation	Connectivity	Predation and competition
RW17	July 2016			cave trail		feral pigs

Mount Flinders by B Donaldson
Ipswich Enviroplan Photo Competition

Management objectives

Retain high quality foraging habitat.

Regional ecosystem

12.8.9 (*Lophostemon confertus* open forest with vine forest understory) and 12.8.24 (*Corymbia citriodora* subsp. *variegata*, *Eucalyptus crebra* +/- *E. moluccana* open forest).

Approximate elevation

N/A

Terrain

Rocky outcrops and small cliffs with limited complexity.

Description

Small rocky outcrop off the Havill Track in the south of Flinders-Goolman Conservation Estate.

Evidence of use

None observed, but the cliffs and caves are largely inaccessible.

Habitat quality

The site contains rocky outcrops with some potential shelter areas between boulders in the southern corner of site. Towards the centre of the site, there are mainly sheer slopes with limited shelter opportunities. Fire has impacted parts of the site and has killed off the canopy though regeneration of native species, including brush box and Acacia species is preventing weed colonisation and growth.

Threats

- Low weed density and limited to south-eastern corner of the site,
- Evidence of pig activity to the south of the site,
- No evidence of other pest animals recorded,
- Fire impacts,
- Limited public access.

Actions

Monitor vegetation health every two years to determine and record any declines in quality.

Conduct cool prescribed fire to maintain grass health and prescribe fire based on visible signs of grass heath decline, with consideration to fire regimes, fire history and the 'Ipswich Fire Management Strategic Plan'.

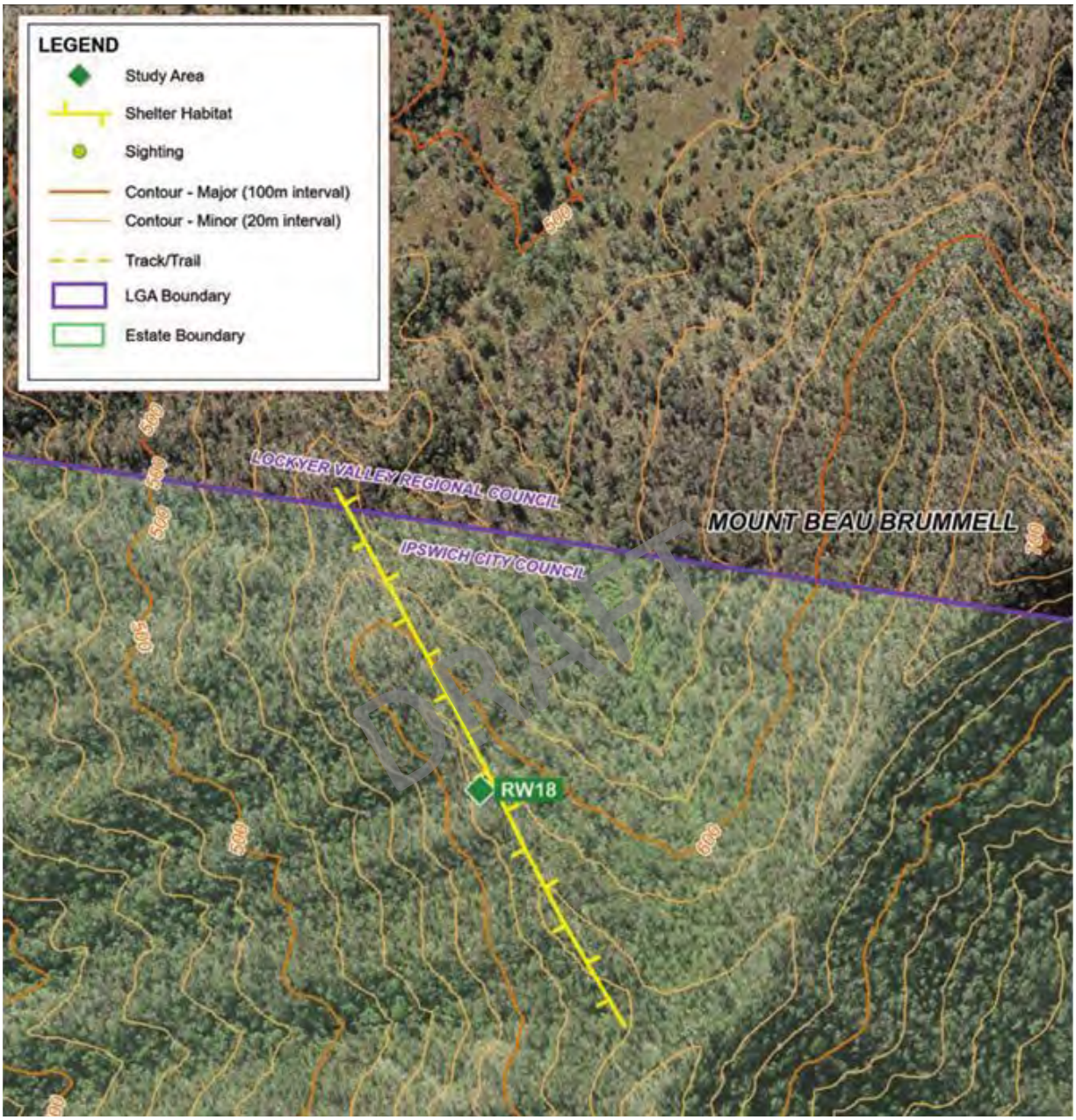


Figure 10: Study area RW18 (Mount Beau Brummel).

RW18 - Mt Beau Brummel

Site	Assessment date	Quality of shelter habitat	Quality of foraging habitat	Level of isolation	Connectivity	Predation and competition
RW18	September 2016					red foxes

Management objectives

Determine the status of the cliff line, to the west of Mt Beau Brummel.

Coordinate the management by and support conservation efforts undertaken by the Queensland Trust for Nature.

Regional ecosystem

12.8.16 (*Eucalyptus crebra* +/- *E. melliodora*, *E. tereticornis* woodland on Cainozoic igneous rocks) and 12.8.17 (*Eucalyptus melanophloia* +/- *E. crebra*, *E. tereticornis*, *Corymbia tessellaris* woodland on Cainozoic igneous rocks).

Approximate elevation

630m

Terrain

Steep climb to the top of the ridge.

Description

Prominent ridgeline following Mt Beau Brummel on Little Liverpool Range.

Evidence of use

Three historic sightings from 1997 found on Wildnet. No scats or other evidence recorded during surveys in 2016. The neighbouring Queensland Trust for Nature has recorded regular evidence of rock wallabies, including breeding activity. This confirms that rock wallabies are still present along the Little Liverpool Range.

Habitat quality

The southern face of Mt Beau Brummel contains pristine quality foraging habitat, with thick native grass and a variety of shrubs and forbs around the higher rocky areas. Limited shelter habitat has been identified on Mt Beau Brummel itself. Although yet to be surveyed, the cliff lines to the west are likely to exhibit suitably complex shelter habitat.

Threats

- Minimal to no public access,
- Fire impacts on vegetation structure,
- Minimal weed infestation,
- Evidence of fox predation at the peak of Mt Beau Brummel.

Actions

No actions

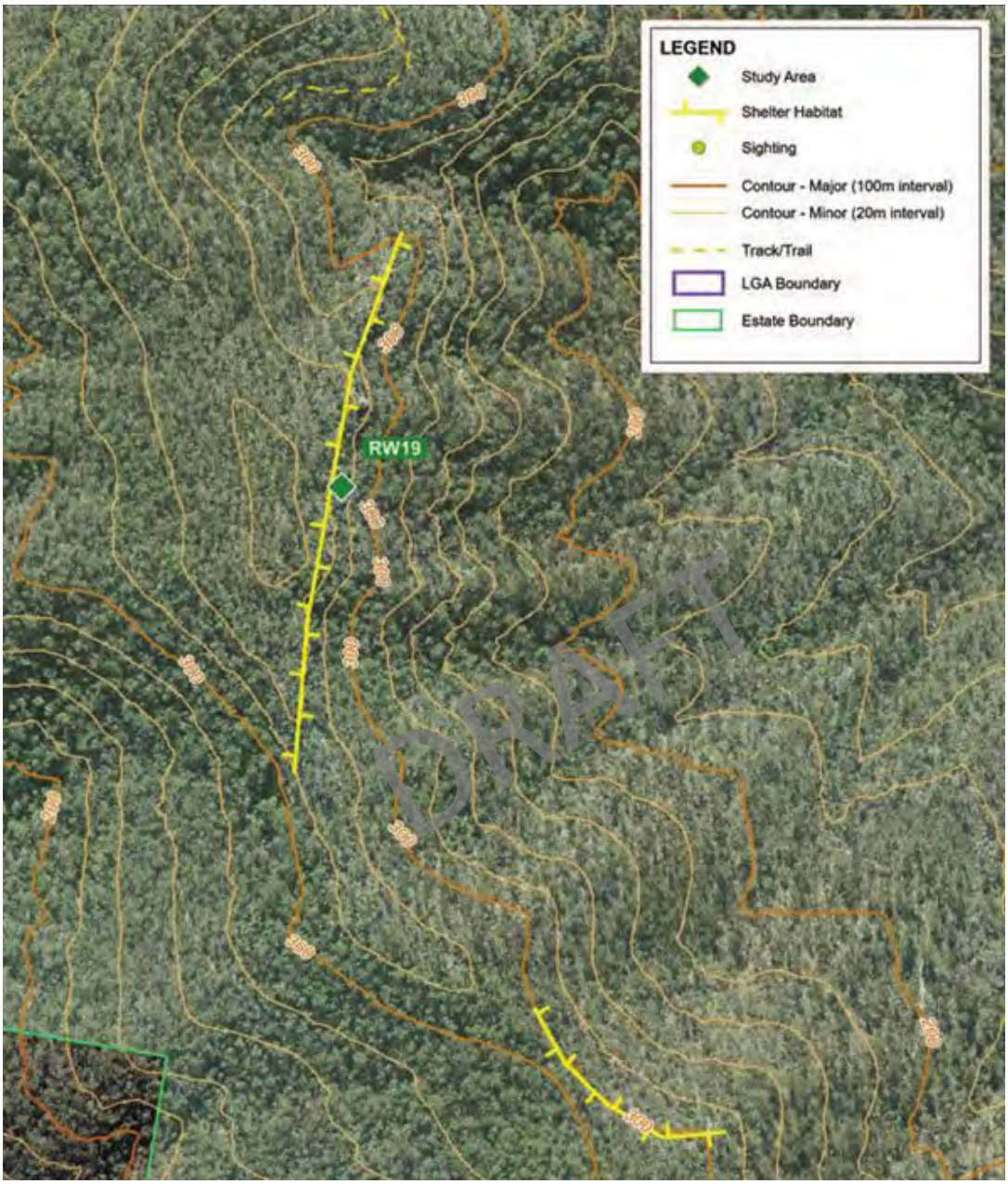


Figure 11: Study area RW19 (White Rock – Spring Mountain Conservation Estate).

RW19 - White Rock-Spring Mountain Conservation Estate

Site	Assessment date	Quality of shelter habitat	Quality of foraging habitat	Level of isolation	Connectivity	Predation and competition
RW18	September 2016					

Management objectives

Periodically monitor the site to detect any future use by the brush-tailed rock wallaby.

Regional ecosystem

12.9-10.19a (*Eucalyptus fibrosa* subsp. *fibrosa* woodland on sedimentary rocks).

Approximate elevation

350m

Terrain

Cliffs, rock stacks, caves, ledges and overhangs.

Description

A long, complex rocky ridgeline running north to south at the very south of the White Rock - Spring Mountain Conservation Estate. There are vast areas of highly suitable foraging habitat in the areas to the east and west of the ridgeline. Periodic caves and overhangs are present along the length of the ridgeline facing east and north-east.

Evidence of use

Evidence of long historic use within east facing caves, based on the polish on rock faces. However, obtaining evidence of wear within caves was more difficult than normal due to weathered sandstone parent rock. No current evidence found on rock stacks or in caves. There is evidence of pretty face and swamp wallaby along the length of the ridgeline.

Habitat quality

Extremely high quality foraging habitat. There are large areas of grassy understory, xanthorreas and a diverse range of shrubs. There are also a variety of eastern facing sandstone caves spanning approximately 1km along a ridgeline running north to south.

Threats

- No evidence of red foxes in the area (needs further investigation),
- Evidence of feral pigs with minimal damage,
- No impacts from fire,
- Minimal to no public access.

Actions

Revisit site every two years to search for evidence of brush-tailed rock wallaby.

Conduct more detailed investigations to determine the cause of current absence.

Investigate the potential for this location to be a release site for captive breeding programs.

Implementation

Actions are prioritised based on several factors, primarily:

- Level of threat at a study area,
- Type of threat,
- Previous evidence of use at a study area,
- Recovery potential,
- Objectives of the study area.

For example, an action within a high threat area that has a long history of use and high recovery potential is considered a high priority action. Where an action is proposed in an area with high threat and limited historic usage, it is considered to have lower recovery value and will be a lower priority.

Table 2 lists all actions that have been prescribed, including the year of proposed implementation. Several actions are to be implemented across various study areas, or may simultaneously affect more than one at a time.

The last column in Table 2 lists measures that will be used to determine the action success upon implementation. For the majority of actions that involve habitat improvement or active threat mitigation, changes to the habitat assessment will be used to measure success.

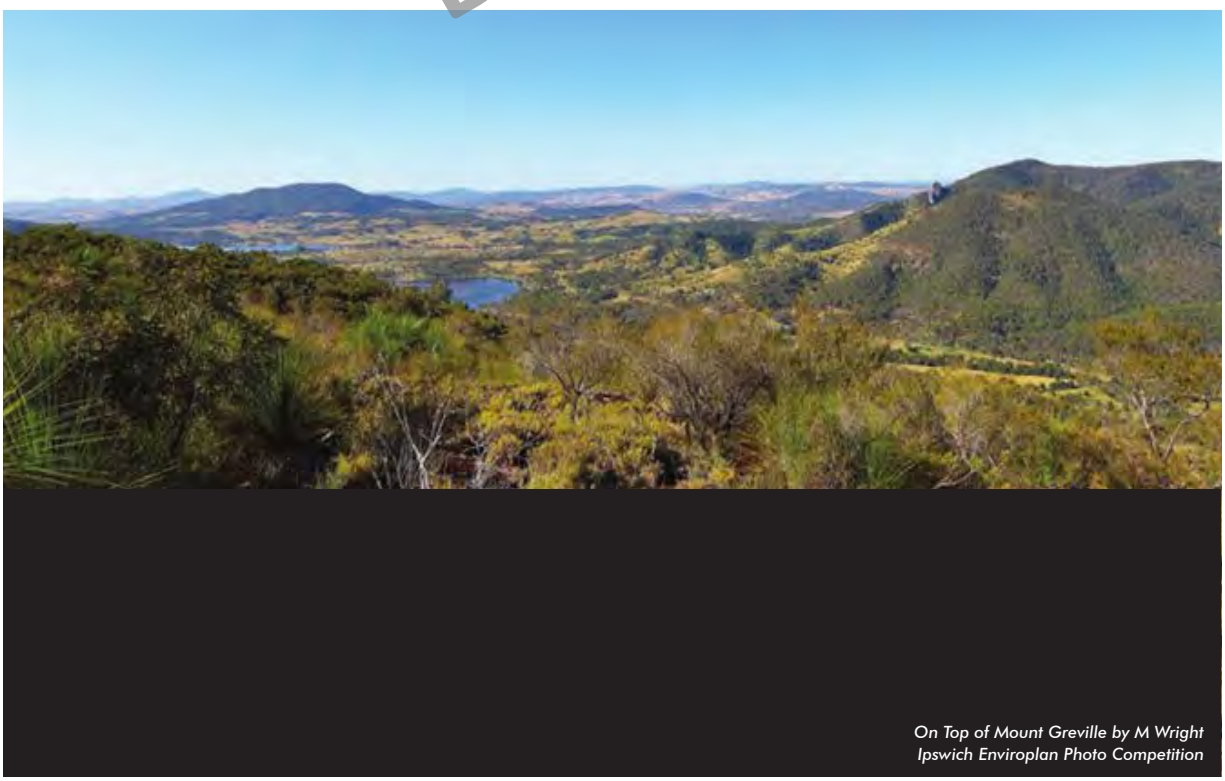
Table 2: Complete List of Actions and Locations for Implementation

Action	Study area(s)	Measure
Nominate the site for lantana control under Council's Conservation Works Program. Works to be undertaken before 2020.	RW01, RW04	Each site is given a high for habitat quality.
Revisit site every two years to search for evidence of brush-tailed rock wallaby.	RW01, RW02, RW04, RW06, RW07	Surveys are undertaken.
Identify potential movement corridors between neighbouring study areas (RW01-RW03, RW07). Survey to be completed by June 2018.	RW01, RW02, RW03, RW04, RW06, RW07 RW10	Level of connectivity is increased to moderate at all sites.
Undertake site inspections prior to any recreational embellishment to determine potential impacts and propose mitigation measures.	RW02	Level of isolation is kept to moderate.
Investigate area for safe access to cliffs with likely habitat by December 2017.	RW03, RW14	Low impact from feral predators and/or medium to low competition from feral herbivores
Undertake works to reduce weed infestation on site to below 10% by the end of 2018. Monitor the recovery of native fodder and prescribe further restoration actions accordingly.	RW08	Quality of foraging habitat is improved to high.

Action	Study area(s)	Measure
Undertake regular monitoring of den sites and of downslope foraging areas to tracks changes in rock wallaby usage.	RW08	Increase in foraging habitat leads to an increase in rock wallaby presence.
Undertake regular and targeted fox monitoring within the site. Any signs of fox predation are immediately followed by actions to remove foxes from the area. Any predator scats locations are sent for content analysis.	RW08, RW09, RW11, RW12, RW14	Level of predation and competition is increased or kept to high (No evidence of competition or predation from feral species).
Regularly monitor access points to den sites for presence of recreational users of the park, and implement actions to reduce visitor impact where necessary.	RW08	Level of isolation is improved to moderate.
Undertake works to reduce *Lantana montedivensis* cover on site to less than 10% by June 2019.	RW05	Foraging habitat is improved to moderate.
Continue to monitor and respond to new infestations of weed species to facilitate recovery of grassy understory.	RW05	Foraging habitat is improved to moderate.
Conduct study of brush-tailed rock wallaby movement patterns around Mt Goolman to determine level of connectivity.	RW05	Level of connectivity is increased to moderate.
Measure levels of feral pig activity every six months to determine level of pig use on the saddle and on Havill Track up to the QTFN Koala Crossing Boundary.	RW11, RW12	Level of predation is kept to moderate or improved to high.
Target pig control on Havill Track when pig activity is noted (use dam on eastern side of the peak as an alternative trapping site) and coordinate pig control with QTFN.	RW11, RW12	Level of predation is kept to moderate or improved to high.
Manually modify vegetation to restore habitat structure more suited to brush-tailed rock wallaby foraging. Target monocultures of *Acacia fimbriata*, inkweed and *Lantana montedivensis*. Chemical control or fire applied where practical and appropriate. Initial work completed by December 2019. Follow up work to trial a mixture of direct seeding and planting of suitable forage species.	RW11, RW12	Foraging habitat quality is improved to high.

Action	Study area(s)	Measure
Monitor vegetation health every two years to determine and record any declines in quality.	RW09, RW13, RW15, RW16, RW17	Foraging habitat quality is kept to high for all sites.
Conduct cool prescribed fire to maintain grass health with fire prescribed based on visible signs of grass heath decline, with consideration to fire regimes, fire history and the 'Ipswich Fire Management Strategic Plan'.	RW09, RW13, RW15, RW16, RW17	Foraging habitat quality is kept to high for all sites.
Conduct initial survey to determine presence and activity of the brush-tailed rock wallaby.	RW14	Habitat assessment complete and actions prescribed by December 2017.
Conduct more detailed investigations to determine cause of current absence.	RW19	Completion.
Investigate the potential for this location to be a release site for captive breeding programs.	RW19	Completion.

The completion and monitoring of actions will be recorded via a register created from Table 2.



On Top of Mount Greville by M Wright
Ipswich Enviroplan Photo Competition

Priority actions

This section lists actions by year, to illustrate the order of implementation and delivery. This forms the register of actions for implementation of the plan.

Year 1 (17/18)

- Conduct initial survey to determine presence and activity of the brush-tailed rock wallaby by December 2017 (RW03).
- Identify potential movement corridors between neighbouring study areas (RW01-RW04).
- Conduct initial survey to determine presence and activity of the brush-tailed rock wallaby (RW14).
- Undertake works to reduce weed infestation on site to below 10% by the end of 2018. Monitor the recovery of native fodder and prescribe further restoration actions accordingly (RW08).

Year 2 (18/19)

- Undertake works to reduce *Lantana montedivensis* cover on site to less than 10% by June 2019 (RW05).
- Conduct a study of brush-tailed rock wallaby movement patterns around Mt Goolman to determine the level of connectivity (RW05).
- Revisit site every two years to search for evidence of brush-tailed rock wallaby (RW01, RW02, RW03, RW04, RW06, RW07, and RW19).
- Conduct more detailed investigations to determine cause of current absence (RW19).

Year 3 (19/20)

- Manually modify vegetation to restore habitat structure more suited to brush-tailed rock wallaby foraging. Target monocultures of *Acacia fimbriata*, inkweed and *Lantana montedivensis*. Chemical control or fire applied where practical and appropriate. Initial work completed by December 2019 (RW11, RW12). Follow up work to trial a mixture of direct seeding and planting of suitable forage species.

Year 4 (20/21)

- Nominate the site for lantana control under Council's Conservation Works Program. Works to be commenced before 2020).
- Revisit site every two years to search for evidence of brush-tailed rock wallaby (RW01, RW02, RW03, RW04, RW19).

Ongoing actions

- Undertake regular monitoring of den sites and of downslope foraging areas to tracks changes in rock wallaby usage (RW08).
- Undertake regular and targeted fox monitoring within the site. Any signs of fox predation are immediately followed by actions to remove foxes from the area. Any predator scats locations are sent for content analysis (RW08, RW09, RW11, RW12, and RW14).
- Measure levels of feral pig activity every six months to determine level of pig use on the saddle and on Havill Track up to the QTFN Koala Crossing Boundary (RW11, RW12).
- Continue to monitor for the presence of feral goats within all sites.

As required

- Undertake site inspections prior to any recreational embellishment to determine potential impacts and propose mitigation measures (RW02).
- Conduct cool prescribed fire to maintain grass health with fire prescribed based on visible signs of grass heath decline, with consideration to fire regimes, fire history and the 'Ipswich Fire Management Strategic Plan'. Investigate the potential for this location to be a release site for captive breeding programs (RW19).

Implementation

Relocation, captive breeding and translocation

Captive breeding has been used as a conservation tool for brush-tailed rock wallabies across much of their range. Populations have been released within the southern and central ESU's with some successes. There are currently no captive breeding populations within the northern ESU. The University of Queensland are in the process of establishing a wildlife breeding facility at Spicers Hidden Vale. The brush-tailed rock wallaby is one of the species proposed to be included in the program to have breeding populations established.

Council's role in such programs is providing land, understanding local rock wallaby populations and managing threatening processes. Council also has a role in supporting private landholders with rock wallaby habitat through its Conservation Partnership Program.

Wherever appropriate, captive breeding and release is considered a viable conservation approach. To determine whether release of captive bred animals is suitable in a given location there are a number of guiding principles that are to be followed:

- Subsidising wild populations should only be considered where a conservation need is recognised.
- It must be demonstrated that all local, state and commonwealth legislation has been met.
- Animals are not to be released to a historically used location without investigating and addressing the reason for their current absence.
- Expert input should be sought where releasing into a site with suitable habitat with no historic evidence of use.
- Captive populations are required to be of the same ESU, where subsidising an existing wild population.
- Prior to releasing captive bred animals, sufficient lead time is allowed to make informed decisions and address any relevant risks. This should be 12 months as a minimum.

Community awareness

The community and members of the public have an important role to play in rock wallaby conservation. Active and engaged communities can lead to increased reporting of sightings, population monitoring and predator and competitor control. The following will be used to promote engagement with the community:

- Expand brush-tailed rock wallaby support groups,
- Facilitate community involvement in the recovery program,
- Provide species and habitat management advice to landholders,
- Publicise results of recovery to the community.

Working with adjacent landholders

Many areas of brush-tailed rock wallaby habitat within the Ipswich local government area are bordered by private landholders with varying land management practices. While the actions prescribed in this plan are primarily tied to a discrete location, there must be consideration of cross boundary influences where threat abatement is required. Council already works with several adjacent landholders including Ivory's Rock Conference Centre and the Queensland Trust for Nature. Key actions to coordinate include:

- Prescribed burning and wildfire mitigation,
- Pest animal management,
- Stock access and management, and
- Species and habitat monitoring.

Monitoring Schedule

Study area monitoring

In addition to searching for signs and active searches for rock wallaby evidence, regular surveys should include:

- A reassessment of the habitat matrix,
- Searches for evidence of pest animals and assess the need for further actions or intervention,
- Search for evidence of other disturbance such as human activity, and
- Determining the status of foraging vegetation and assess the need for further actions or intervention.

The following survey intensity is prescribed for the various study areas:

Twice yearly: RW05, RW09, RW11, RW12 – Plus one run of camera monitoring and surveying for signs.

Yearly: RW08, RW14, RW16, RW19 – Searching for signs.

Every 2 years: RW01, RW02, RW03, RW04, RW06, RW07, RW10, RW13, RW15, RW18 – Searching for signs or inferential evidence.

Table 3 is a minimum recommended effort for each of the survey techniques to be used. This has been adapted from the targeted species survey guideline for Sharman's Rock Wallaby, as one does not currently exist for *P. penicillata* (Venz and Rowland 2013).

Table 3: Minimum effort per 5 ha of suitable habitat

Survey technique	Minimum effort
Searching for signs	Two hours per survey day
Infra-red camera trapping	Five cameras, at least 14 nights
Observation surveys	Four hours per survey day
Other inferential evidence	One hour per survey day

Links with the NAE pest management program

Mitigating the risks of feral animals and their threats to rock wallaby populations is a major focus of many of the actions within the recovery plan. All actions aimed at reducing this risk will be delivered through the NAE Pest Management Program. When monitoring for pest animals, more frequent and intense effort is required than through study area surveys, especially in the case of predation for European red foxes.

For European red foxes, monitoring is to involve 14 camera nights every three months in areas, as prescribed in the priority actions. Cameras will target areas that foxes are likely to traverse or features they will habitually use. This will ensure that foxes impacting on rock wallaby populations are identified quickly and control actions can be implemented.

The impacts of feral pigs can be identified during study area surveys or through routine driving of tracks adjacent to study areas, given their large home range and mobile nature. Feral pig control should be targeting during winter when pig activity is at its highest and control programs are easiest to implement.

Potential impacts from other pest animals such as goats, dogs and cats are to be identified through study area surveys and other available evidence, such as being noted by visitors to Flinders Peak.

Monitoring and reporting on actions

At the beginning of each financial year for the life of the recovery plan, a register of actions will be created. This register can then be included in Conservation Works Program Register, Pest Animal Program Yearly Action Plan and Operational Plans.

As actions are completed throughout the year they will be ticked off. At the completion of the financial year a report will be compiled and submitted to Council.

Evaluation

The brush-tailed rock wallaby Recovery Plan is a five year document. At the conclusion of the fifth year, all actions should have been implemented. After the fifth year a review of the recovery plan will be undertaken to determine the current status of brush-tailed rock wallabies within Ipswich. From this review an updated recovery plan can be developed, incorporating findings from monitoring and successes and failures of the original plan.

New actions can be added to the action plan on a yearly basis where monitoring reveals a conservation need. Where these actions do not occur within an existing study area, a new study area can be created.

White Rock at Dusk by N Power
Ipswich Enviroplan Photo Competition

City of Ipswich

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Conservation and Environment Committee	
Mtg Date: 19.03.18	OAR: YES
Authorisation: Bryce Hines	

TS: TS
H:\departmental\committee reports\1802TS Wildlife of Ipswich Book Series CR.doc

26 February 2018

M EM OR A N D U M

TO: SPORTS RECREATION AND NATURAL RESOURCES MANAGER

FROM: PLANNING OFFICER (BIODIVERSITY)

RE: WILDLIFE OF IPSWICH BOOK SERIES

INTRODUCTION:

This is a report by the Planning Officer (Biodiversity) dated 26 February 2018 concerning the creation of a Wildlife of Ipswich book series.

BACKGROUND:

In mid-2017, Council commission local wildlife photographers and authors, DDW Fauna, to create a series of books that are representative of common and iconic wildlife in Ipswich. The aim of the books is to increase community awareness of Ipswich's high biological diversity, and to provide Ipswich residents with a localised tool for identifying native wildlife in the wild and their backyards.

Five books have been developed, including:
- Wildlife of Ipswich (overview of a variety wildlife)
- Mammals of Ipswich
- Frogs and Reptiles of Ipswich
- Birds of Ipswich
- Fish of Ipswich

A draft of the full Wildlife of Ipswich book is provided in Attachment A and covers of remaining four books (due to the file size) are provided in Attachments B-E.

OVERVIEW:

Ipswich contains a diverse range of natural vegetation types, including rainforest, dry vine forest, open forest, woodlands, wetlands and grasslands. Many of these are found within Council's conservation estates, bushland reserves and on Conservation Partnership properties. To date, there are over 2,000 recorded species of native plants and animals in Ipswich, including numerous rare and threatened species.

The Wildlife of Ipswich has been designed to provide an overview of some of Ipswich's common and a few less known species of interest. The four supporting books provided greater detail and a few extra species under each of the themes. These will be of benefit for people who have a greater level of interest in either mammals, frogs, fish or birds. The books are not intended to be a complete field guide, but rather illustrate the rich and varied diversity of wildlife in Ipswich.

Printed copies of the books will be made available to Conservation Partners and through Council's customer contact points such as divisional offices, libraries and Queens Park Environmental Education Centre.

The Wildlife of Ipswich book has also been registered and can be sold commercially through books stores or the Visitor Information Centre, if desired.

CONSULTATION:

Consultation was undertaken with key stakeholders including local bird specialists and fish experts.

Some of the images were also sought from specialists for certain groups of animals, such as microbats and small mammals.

CONCLUSION:

The Wildlife of Ipswich book series has been developed as a visually attractive overview of Ipswich's rich and varied wildlife.

ATTACHMENTS:

Name of Attachment	Attachment
Wildlife of Ipswich Book Attachment A (Part 1) Attachment A (Part 2) Attachment A (Part 3) Attachment A (Part 4)	Attachment A_Part1.pdf Attachment A_Part2.pdf Attachment A_Part3.pdf Attachment A_Part4.pdf
Mammals of Ipswich Cover Art	Attachment B
Fishes and other Aquatic Life of Ipswich Cover Art	Attachment C
Frogs and Reptiles of Ipswich Cover Art	Attachment D
Birds of Ipswich Cover Art	Attachment E

RECOMMENDATION:

A. That Council adopt the draft Wildlife of Ipswich book series for printing and distribution to Conservation Partners and through Council's customer contact centres, as detailed in the report by the Planning Officer (Biodiversity) dated 26 February 2018.

B. That Council promote the Wildlife of Ipswich book series as an illustrative representation of the rich and varied diversity of wildlife in Ipswich.

Tim Shields
PLANNING OFFICER (BIODIVERSITY)

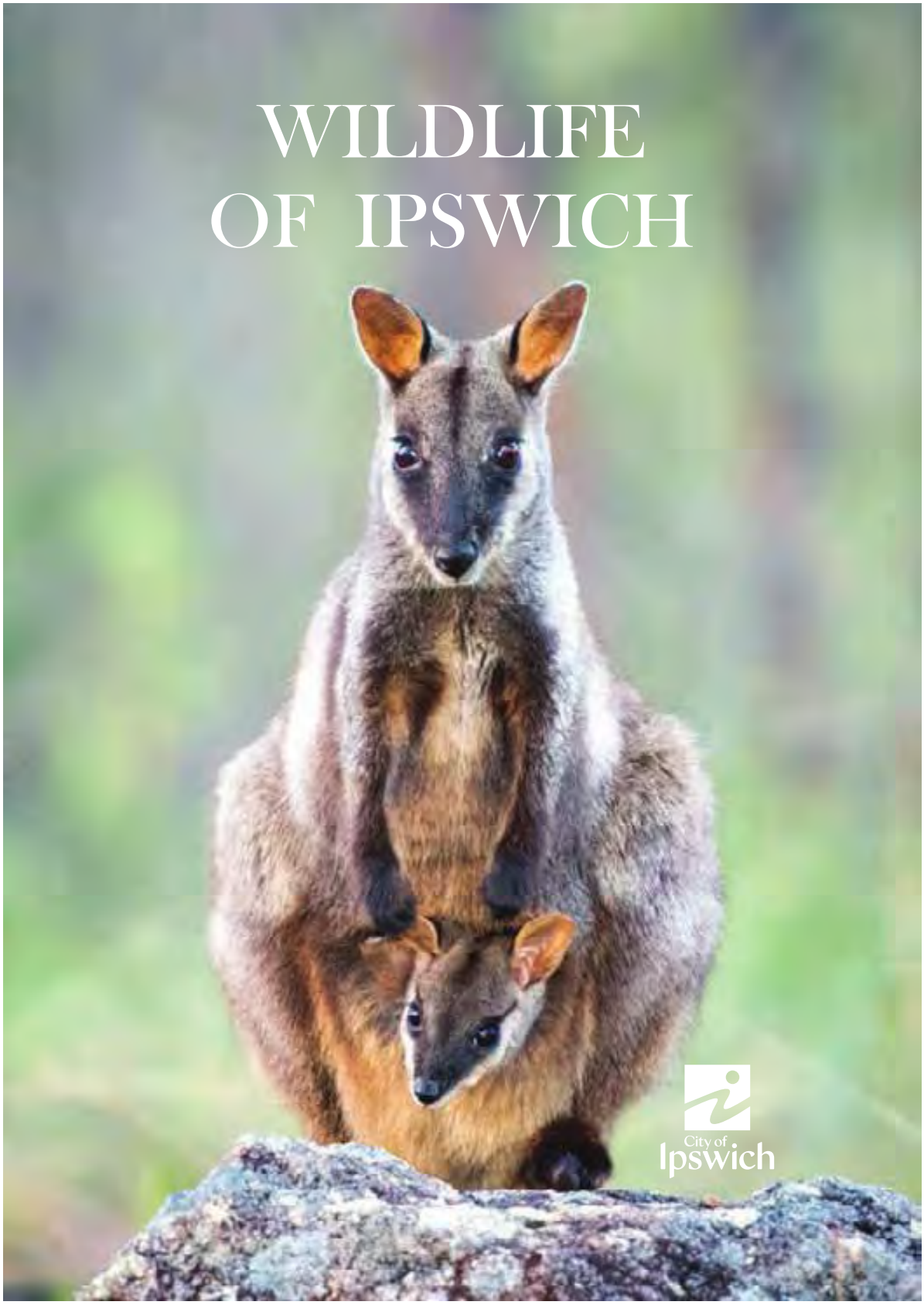
I concur with the recommendation/s contained in this report.

Kaye Cavanagh
ACTING SPORT, RECREATION AND NATURAL RESOURCES MANAGER

I concur with the recommendation/s contained in this report.

Bryce Hines
ACTING CHIEF OPERATING OFFICER (WORKS, PARKS AND RECREATION)

WILDLIFE OF IPSWICH



WILDLIFE OF IPSWICH

City of Ipswich

First published 2017.

National Library of Australia Cataloguing-in-Publication entry

Creator: xxx.

Title: Ipswich Wildlife. replace

ISBN: xxxxxxxxxxxxxxxx (paperback)

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Animals--Queensland--Pictorial works.
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Other Creators/Contributors:
xxxx

Dewey Number: xxx.xxxxx

Layout and typsetting by Narelle Power.
Cover Photos by Narelle Power & Damian White.
Written by N.P.Power & D.White t/as ddwfauna.
All photos by Narelle Power and Damian White unless otherwise stated.

Introduction to Ipswich and how to use this guide

The Ipswich local government area is located in south-east Queensland, about 40 kilometers south-west of the Brisbane CBD. Ipswich is bounded by the Somerset Regional Council area and Brisbane City in the north, Logan City in the east, the Scenic Rim Regional Council area in the south, and the Lockyer Valley Regional Council area in the west. The area is home to a population in excess of 200,000 people and covers an area of 1,090 square kilometers.

Ipswich is a fast growing city, and one of the fastest growing regions in Queensland. With this growth comes the challenges of balancing development with the future of the environment. Ipswich City Council has two key tools for creating this balance; the Nature Conservation Strategy 2015 and Ipswich Envrioplan.

Through the Ipswich Enviroplan, Council manages more than 6,500ha of conservation land. Conservation estates and reserves contain intact tracts of native bushland and have a diverse range of highly significant ecological and cultural values. This includes White Rock-Spring Mountain Conservation Estate and Flinders-Goolman Conservation Estate, both of which are over 2,000ha in size.

Council also partners with private landowners through voluntary conservation agreements to assist in the protection of a further 12,000ha of land. Council offers a variety of agreements tailored to individual landholders needs, including Land for Wildlife, Habitat Gardens, Bushland Conservation Agreement, Koala Conservation Agreement, Waterways Conservation Agreement and Nature Conservation Agreement. Each agreement comes with a variety of incentives including free trees, access to grants and annual land management payments.

Ipswich contains one of the most diverse ranges of natural vegetation types in south-east Queensland, including rainforest, dry vine forest, open forests, woodlands, wetlands and grasslands. Approximately 62% of the city has vegetated cover. This includes 38 different regional ecosystems, many of which are contained within the 28% of the city dedicated as protected green space.

These communities in turn support an equally diverse range of wildlife. There are over 2,000 recorded species of native plants and animals in Ipswich, including numerous rare and threatened species. Thirty-one species are currently listed as threatened under the Nature Conservation Act 1992. Under Councils 2015 Nature Conservation Strategy, three local fauna species and two flora species are of iconic status and are priority for conservation planning and activities. These include the koala, brush-tailed rock-wallaby, platypus, cooneana olive and plunkett mallee.

"This book is not intended as a complete field guide to the fauna of Ipswich, but rather it is hoped it will help illustrate the rich and varied diversity of wildlife present and where possible, should be used in conjunction with other dedicated field guides. This publication includes photos of almost 300 species which is only a fraction of the species present."

NOTE: The records listed in this publication are indicative only. They represent some suburbs within which the species are known to occur, and are not necessarily a complete list of known locations.

TABLE OF CONTENTS

Front Cover: Brush-tailed Rock Wallaby with joey (*Petrogale penicillata*)
Inner Front Cover: Double-drummer Cicada, emerging (*Thopha saccata*)
Inner Back Cover: Forest Darner Dragonfly, mating (*Austroaeschna pulchra*)
Back Cover: Wood Geckoes (*Diplodactylus vittatus*)
Title Page: Blue-billed Duck (*Oxyura australis*)

Spiders (Araenae)

There are several hundred species of spiders within the City of Ipswich, we have included photos and information on just 12 of these. Included are some of the more better known or more common species, or groups of species, and some lesser known spiders which are less likely to be encountered. Spiders occur in most habitats in the city, including dense bushland, farmland, urban parks and gardens and can often make themselves uninvited guests in people's houses. They make up a vital part of the food-chain as they are important predators and prey for innumerable other species. Although all spider bites should be treated with caution, the vast majority of species will do little harm and will only cause mild pain for a short period of time. Others, however, are potentially life threatening.

Triangle Spider (*Arkys lancearius*)

Redback Spider
Latrodectus hasseltii
Description: 30 mm LS, generally smaller. Female is larger than the male, adults are black in colour with a yellowish to red stripe. Males are black with a white stripe.
Habitat: Occupies disturbed habitat in Queensland, including urban areas, houses, outside furniture, rubbish piles etc.
Remarks: Very common in Ipswich, around houses and recognised by their untidy 'tangled' web. A dangerous species and medical attention should be sort if bitten.
Records: Ipswich throughout.

Huntsmen Spiders
Sparassidae
***Heteropoda* spp. *Holconia* spp. *Typostola* spp.**
Description: 100 – 200 mm LS. Large fast-moving spiders, which vary in colour from greenish to grey through to brown. Long legs and active hunters.
Habitat: Occur in most habitats, including rainforest, wet and dry forest and woodlands Some species occur in urban areas.
Remarks: Very common in Ipswich, several species, often seen on the walls and ceilings.
Records: Ipswich throughout.

Green Jumping Spider
Mopsus mormon
Description: 12 mm LS. Largely green-yellow and black in colour. Males have long white 'side whiskers', which rise to a peak with a topknot of black hairs. Females have a red and white 'mask'.
Habitat: Occurs in numerous habitats including wet and dry forest and woodlands. Do not build a web and are active hunters.
Remarks: Common in Ipswich, but as with many invertebrates there are few records.
Records: Ipswich and Spring Mountain.

Lynx Spiders
Oxyopes spp.
Description: 20 mm LS. Small spiders which are daytime hunters and don't construct a web. A striped body and legs with numerous spines.
Habitat: Occurs in numerous habitat types including, dry forest, woodlands, mangroves and urban areas.
Remarks: Common in Ipswich, there are several species which occur in numerous habitats.
Records: Ipswich throughout.

Net-casting Spiders
Deinopidae
Description: 70 - 170 mm LS. Medium to large spiders with long legs and large eyes. Can vary in color from fawn to pinkish brown or chocolate brown.
Habitat: Occurs in both drier forest and urban areas. A nocturnal hunter, which hunts at night, using a silken net to capture its prey.
Remarks: Uncommon in Ipswich, few records, but may be more common than the records suggest.
Records: New Chum, Spring Mountain and White Rock.

Garden Orb-weaver
Eriophora transmarina
Description: 40 mm LS. A variable species with a brown to grey body and either dots or a central stripe on the centre of the abdomen and slender legs.
Habitat: Occurs in most habitat types from wet forest, woodlands to urban areas.
Remarks: Very common in Ipswich, often seen in bushland and urban areas and backyards.
Records: One Mile, Ipswich, Purga, Rosewood and White Rock.

Golden Orb-weavers
***Nephila* spp.**
Description: 200 mm LS. The females are large spiders with black heads and a silver to grey body. The males are tiny with a 10 mm LS.
Habitat: Occurs in most habitat types from rainforest, dry forest, woodlands and urban areas. Build a strong often golden web.
Remarks: Very common in Ipswich, one of the more commonly encountered web building species.
Records: Chuwar, Ipswich, Purga, Redbank and White Rock.

Leaf Curling Spiders
Araneus dimidiatus
Description: 20 mm LS. Body hoary white in colour with brown patch on rear of abdomen.
Habitat: Occurs in dry forest and woodlands but also in well vegetated backyards and urban areas. A leaf is incorporated into the web as a retreat for the spider.
Remarks: Common in Ipswich, occurs in backyards but generally more commonly seen in bushland areas.
Records: Grandchester, New Chum, Spring Mountain and White Rock.

St Andrew's Cross Spider
Argiope keyserlingi
Description: 40 mm LS. An attractive spider with bright yellow stripes and spots and bands on the legs.
Habitat: Occurs in both dry and wet forest, grassland and urban areas.
Remarks: Very common in Ipswich, an easily recognised species, often seen in urban backyards.
Records: Blacksoil, Bundamba, Ipswich, Redbank Plains and Spring Mountain.

Tent-web Spider
Cyrtophora hirta
Description: 30 mm LS, males smaller. A largely light brown hairy species.
Habitat: Occurs in dry forest, woodland and backyard gardens. The web resembles a small Russian peaked tent up to 150 mm diameter.
Remarks: Uncommon in Ipswich, but likely more common than the records suggest.
Records: Camira, Kholo, New Chum, Spring Mountain and White Rock.

Northern White-tailed Spider
Lampona murina
Description: 30 mm LS. A slender species with a grey body with small white spots and a white tipped abdomen.
Habitat: Prefers moister habitat including wet forest and moist areas of dry forest and gardens.
Remarks: Common in Ipswich, likely more widespread than the records suggest. Contrary to belief it is a harmless species which has weak venom and does not cause necrotic lesions.
Records: Camira, Dinmore, Ipswich and Leichhardt.

Wolf Spiders
Lycosidae
Description: 30 - 70 mm LS. All species have large eyes and are dark brown to black above, with various markings.
Habitat: Prefers open habitat, including woodland and grasslands. A non-web building, ground dwelling species. The females carry the young on her back for approximately one week after hatching.
Remarks: Common in Ipswich, often seen on the ground at night including backyard lawns.
Records: Amberley, Brassall, Ipswich, Redbank Plains and White Rock.

Freshwater shrimps, prawns and crayfish (Decapoda)

There are only a small number of freshwater crustacean decapods present in the City of Ipswich. This includes three families - freshwater shrimps and prawns, long-armed prawns and freshwater crayfish. Photos and information on four of these species have been included. The freshwater shrimps are all relatively small and inconspicuous but can be present in very large numbers in small creeks, streams and larger rivers. They are considered an important part of the food chain for many aquatic species, including fish. The long-armed prawns are larger than freshwater shrimps and have a pair of distinctive enlarged claws. The crayfish (often termed yabbies) are much larger and generally better known than the other freshwater decapod groups.

Orange-fingered Crayfish (*Cherax depressus*)

Indistinct Caridina
Caridina indistincta
Description: 3 cm TL (generally smaller). A largely transparent species with darker markings. Serrations along the entire upper edge of the rostrum.
Habitat: Slow-moving and rapid rivers, streams and creeks.
Remarks: Common in Ipswich, in creeks, streams and rivers, including estuarine areas.
Records: Amberly, Grandchester, Karalee and Redbank Plains.

Australian Paratya
Paratya australiensis
Description: 3.5 cm TL (generally smaller). One of the larger local freshwater shrimp species which is largely transparent with darker markings. Unlike other local shrimps, it has a small spine above the eye cavity.
Habitat: Slow moving and rapid rivers, streams and creeks.
Remarks: Common in Ipswich, in creeks, streams and rivers.
Records: Chuwar, Kholo and Redbank.

Common Australian River Prawn
Macrobrachium australiense
Description: 8 cm TL (generally smaller). Colour varies with age, from brown or grey-brown with blotches or bands in juveniles. Second pair of legs are elongated slender claws which are particularly long in males.
Habitat: Rivers, streams and creeks.
Remarks: Common in better quality creek and streams. Tends to avoid highly polluted or disturbed streams and creeks.
Records: Chuwar, Karalee, Kholo and Raceview.

Orange-fingered Crayfish
Cherax depressus
Description: 9 cm TL. Variable species from brown to bluish-green. Claws are broad with tips that are often orange.
Habitat: A burrowing species along creeks and streams including temporary water, dams, gullies and roadside ditches. Feeds on organic matter.
Remarks: Common in Ipswich, found in many waterbodies, including those of relatively poor quality.
Records: Amberley, Bellbird Park Deebing Heights, and Goodna and White Rock.

Dragonflies and damselflies (Odonata)

There are approximately 60 species of dragon and damselflies present within the City of Ipswich. Photos and information on 32 species have been included. They are a conspicuous, often colourful, part of the invertebrate fauna, particularly in and around water bodies and wetland areas during spring and summer, although many species are often recorded long distances from water. Distinguishing dragonflies from damselflies can be difficult at times, but generally, although there are exceptions, damselflies are smaller, perch with their wings folded above the thorax, have eyes which are widely separated and have hindwings and forewings which are the same shape.

Powdered Wiretail (*Rhadinosticta simplex*)

Southern Whitetip
Episynlestes albicauda
Description: Large damselfly, 60 - 70mm TL, WS 60mm. Largely bronze-green with white markings on thorax and abdomen and a white tip to the abdomen.
Habitat: Better quality creek and streams generally away from the coast.
Remarks: Uncommon in Ipswich, occurs along well vegetated creeks and streams.
Records: Bellbird Park and Kholo.

Wandering Ringtail
Austrolestes leda
Description: Medium-sized damselfly, 40 mm TL, WS 40 – 45mm. Blue and black damselfly with blue tail-light, female duller with no blue tail-light.
Habitat: Larger standing or slow flowing water, often found some distance from water.
Remarks: Common in Ipswich, occupies most habitat types.
Records: Amberley, Bundamba, Ipswich, Marburg and Swanbank.

Common Flatwing
Austroargiolestes icteremeles
Description: Large damselfly, 45mm TL, WS 60 - 70mm. Dark abdomen with coppery and yellow markings on thorax and face. It sits with wings flat.
Habitat: Fast and slow-moving water bodies, creeks and rivers.
Remarks: Very common in Ipswich, found along many creeks and streams.
Records: Bundamba, Chuwar, Goodna, Walloon and Peak Crossing.

Orange Threadtail
Nosoticta solida
Description: Medium-sized damselfly, 45 mm TL WS 40 – 50mm. Attractive damselfly with black with bright orange markings on the thorax, female duller. Base of wings generally yellowish (though newly emerged individuals lack wing colouration).
Habitat: Most water body types including dams, ponds, creeks and streams.
Remarks: Common in Ipswich.
Records: Bellbird Park, Raceview, Rosewood and Spring Mountain.

Gold-fronted Riverdamsel
Pseudagrion aureofrons
Description: Medium-sized damselfly, 35 mm TL, WS 45mm. It is a blue and black damselfly. Face and front of the thorax is gold in males. Females are dull greenish-grey in appearance.
Habitat: Better quality creeks and streams.
Remarks: Rare in Ipswich, restricted to a few locations. Similar in appearance to many other blue-black damselflies in SEQ, but with a gold face.
Records: Flinders – Goolman and Rosewood.

Flame Headed Riverdamsel
Pseudagrion ignifer
Description: Large damselfly, 50mm, TL, WS 50mm. Male 'flame' (orange) coloured face, blue (pruinose sections when mature) and black thorax. Females dull blueish-grey.
Habitat: Better quality flowing streams and rivers.
Remarks: Uncommon in Ipswich.
Records: Kholo.

Blue Riverdamsel
Pseudagrion microcephalum
Description: Medium-sized damselfly, 37 mm TL, WS 45mm. Male blue and black damselfly, female dull greenish-grey in appearance.
Habitat: Still and flowing water bodies.
Remarks: Common species in Ipswich, recorded at many local water bodies. Similar in appearance to many other blue-black damselflies in SEQ.
Records: Goodna, Karalee, Kholo, Raceview and Redbank Plains.

Splendid Longlegs
Austrocnemis splendida
Descriptions: Very small damselfly, barely 20mm TL, WS 30mm. Males and females are very similar, the front of the thorax is bronze and they have a blue 'tail light'.
Habitat: Present in still or slow-moving water bodies, particularly those with water lilies, often overlooked due to its small size.
Remarks: Uncommon in Ipswich, but present in high abundance in the right habitat i.e. dams and ponds.
Records: Raceview and the Ripley Valley.

Redtail
Ceragrion aeruginosum
Description: Medium-sized damselfly, 45 mm TL, WS 50mm. Mature male with greenish thorax, reddish abdomen and green eyes. Female dull greenish-grey with dark eyes.
Habitat: Slow moving water bodies, dams and ponds, often found in fringing vegetation.
Remarks: Common species in Ipswich.
Records: Brookwater, Goodna, Ironbark, Raceview and Yamanto.

Common Bluetail
Ischnura heterosticta
Description: Medium-sized damselfly, 35 mm TL, WS 45 – 50mm. Male predominantly blue with black markings, female duller bluish-grey. Blue tail light and blue patches behind eyes.
Habitat: Still and slow-moving water bodies, absent from rainforest.
Remarks: Very common in Ipswich, present at most water bodies, throughout much of the year.
Records: Deebing Heights, Haigslea, Ipswich, Pine Mountain, Wacol and Walloon.

Red and Blue Damsel
Xanthagrion erythroneurum
Description: Medium-sized damselfly, 35 mm TL, WS 45 – 50mm. Male head, thorax and base of abdomen are bright red. Remainder of abdomen black with two blue bands at tip. Female duller and lacking blue bands.
Habitat: Large still and slow-moving water bodies.
Remarks: Uncommon in Ipswich, restricted to still and slow-moving water bodies.
Records: Raceview and Sapling Pocket.

Blue-spotted Hawker
Adversaeschna brevistyla
Description: Large strong flying dragonfly, 65mm TL, WS 90mm. Dark brown with two pale stripes on thorax. Abdomen with paired yellowish spots.
Habitat: Rivers, streams, ponds and dams, not including rainforest.
Remarks: Very common species in Ipswich, often seen some distance from water.
Records: Goodna, Ipswich, Kholo, Redbank Plains and Tallegalla.

Australian Tiger
Ictinogomphus australis
Description: Large dragonfly, 65mm TL, WS 80mm. Black and yellow thorax and abdomen. Distinctive broad flaps on underside of the last segment of the abdomen.
Habitat: Most water bodies, although tends to be absent from smaller creeks and streams.
Remarks: Common in Ipswich, but generally not seen in large numbers, often seen perching on vegetation near water bodies.
Records: Ipswich, Karalee and Raceview.

Jade Hunter
Austrogomphus ochraceus
Description: Medium-sized dragonfly, 45mm TL, WS 53 mm. A yellow and black species, with eyes separated at the top of the head. The wing pterostigma has a 'yellowish' window with a black margin.
Habitat: Generally prefers flowing creeks and streams.
Remarks: Uncommon in Ipswich, only recorded from a few locations.
Records: Raceview.

Yellow-tipped Tigertail
Choristhemis flavoterminata
Description: Medium-sized dragonfly, 45mm TL, WS 70mm. Black and yellow thorax and abdomen with distinctive yellow tail-light.
Habitat: Numerous habitat types particularly slow-moving streams and creeks.
Remarks: Common in Ipswich, associated with a range of creeks, streams and nearby open areas.
Records: Goodna, Karalee and Raceview.

Fat-bellied Emerald
Hemicordulia continentalis
Description: Medium-sized dragonfly, 45 mm, TL, WS 60mm. A relatively dark species, which is lighter on the side of the thorax. It has a distinctive bright green metallic top of the frons. The male has a broad expanded abdomen.
Habitat: Numerous habitat types including slow-flowing creeks, streams and dams.
Remarks: Common in Ipswich, often seen flying well above the ground in relatively large numbers.
Records: Ipswich, Kholo and Raceview.

Palemouth
Brachydiplax denticauda
Description: Small-sized dragonfly, 30mm TL, WS 50 mm. Male bright blue when mature, females darker with reddish bands on abdomen. Labrum (mouth) pale and frons (top of head) brilliant metallic.
Habitat: Still and slow-moving water bodies.
Remarks: Relatively common in Ipswich, but less widespread than other common species.
Records: Raceview, Redbank Plains and Silkstone.

Black-headed Skimmer
Crocothemis nigrofrons
Description: Medium-sized dragonfly, 75 mm, TL, WS 75mm. Male head and thorax black with abdomen deep blue. Female thorax and abdomen lighter. Both sexes have spear shaped abdomens. Teneral (newly emerged) males and females are yellow to bronze in colour.
Habitat: Flowing and still water in most open habitats, avoids closed forest.
Remarks: Very common in Ipswich.
Records: Bellbird Park, New Chum, One Mile, Rosewood and South Ripley.

Wandering Percher
Diplacodes bipunctata
Description: Small dragonfly, 35mm TL, WS 50mm. Male red with darker markings on the abdomen. Female is sandy yellow.
Habitat: Most habitats and water bodies with exception of wetter forest and rainforest.
Remarks: Very common in Ipswich, often seen away from water, present year-round.
Records: Amberley, Bellbird Park, Ironbark, Ipswich, Wacol and White Rock.

Scarlet Percher
Diplacodes haematodes
Description: Small dragonfly 30mm TL, WS 57mm. Mature male bright red in colour with no dark markings on abdomen, brownish markings at base of hindwings. Female yellowish in colour with brownish wingtips.
Habitat: Potentially present at most water body types including streams, rivers, dams and ponds. Often seen resting on the ground or rocks.
Remarks: Common in Ipswich.
Records: Karalee, Kholo and Raceview.

Black-faced Percher
Diplacodes melanopsis
Description: Small dragonfly, 35mm TL, WS 57mm. Both sexes have black head and eyes. Males have a red and black spindle shaped abdomen. Female greenish-yellow and black abdomen and thorax.
Habitat: Slow moving and still water bodies.
Remarks: Common in Ipswich, but least common of the *Diplacodes* genus.
Records: Goodna, Raceview and Redbank Plains.

Water Prince
Hydrobasileus brevistylus
Description: Large dragonfly, 50mm TL, WS 100mm. Black-brown with green markings on thorax and abdomen with large smoky bronze wings. The female is very similar but has a short broader abdomen.
Habitat: Numerous habitats including slow moving water, dams and large swamps.
Remarks: Uncommon in the Ipswich region, generally seen flying above large dams and ponds.
Records: Purga.

Common Archtail
Nannophlebia risi
Description: Small attractive dragonfly, 30mm TL, WS 52 mm. Yellow and black in colour, with a distinctly arched abdomen when at rest, with a swollen tip.
Habitat: Restricted to better quality streams and creeks.
Remarks: Uncommon in Ipswich, with few records.
Records: Sapling Pocket.

Australian Pygmyfly
Nannophya australis
Description: Very small dragonfly 20mm TL, WS 30 mm. Dark spoon shaped abdomen with a clubbed end which is red in males. Female yellow with darker banding on abdomen.
Habitat: Most common in coastal swamps (wallum), including offshore islands, possibly declining in SEQ.
Remarks: Rare in Ipswich, only recorded at one location, probably declining in mainland SEQ.
Records: Ipswich.

Blue Skimmer
Orthetrum caledonicum
Description: Medium-sized dragonfly, 45mm TL, WS 75mm. Male with dark thorax and a blue abdomen which is darker towards the tip. Teneral males and females are largely yellow. Adult females are similar to adult males, just duller.
Habitat: Flowing and still water in most open habitats, avoids closed forest.
Remarks: Very common in Ipswich, often encountered away from water.
Records: Deebing Heights, Ipswich, New Chum, Rosewood and Walloon.

Slender Skimmer
Orthetrum sabina
Description: Medium-sized dragonfly, 50mm TL, WS 75mm. Male and females are similar, greenish, black and cream markings and a small dark spot on the base of the hindwing.
Habitat: Flowing and still waters including creeks, streams, ponds and dams.
Remarks: Very common in Ipswich, although due to its colouration is less conspicuous than other common species.
Records: Flinders – Goolman, Ipswich, Kholo and Raceview.

Fiery Skimmer
Orthetrum villosovittatum
Description: Medium-sized dragonfly, 75 mm TL, WS 65 – 75mm. Male abdomen bright red and spindle shaped, female yellow when first emerged becoming reddish brown as it ages. Thorax is darker in both sexes.
Habitat: Flowing and still water in most open habitats, avoids closed forest.
Remarks: Very common and widespread in Ipswich.
Records: Dinmore, Granchester, Ipswich, New Chum, White Rock and Yamanto.

Wandering Glider
Pantala flavescens
Description: Medium-sized dragonfly, 50mm TL, WS 90mm. Generally yellow-orange or tan in colour with darker markings, males and females very similar in appearance. A strong flying species.
Habitat: Flowing and still waters including rivers, dams and wetlands.
Remarks: Common in Ipswich, but not seen in large numbers. Often recorded far from water.
Records: Ipswich, Kholo, Rosewood and Sapling Pocket.

Red Arrow
Rhodothemis lieftincki
Description: Medium-sized dragonfly, 40mm TL, WS 70mm. Male bright red when mature, females are orange. Both sexes have a spear shaped abdomen.
Habitat: Flowing and still waters including rivers, dams and wetlands.
Remarks: Very common in Ipswich, although often mistaken for other similar looking red coloured dragonflies.
Records: Ipswich, Raceview and Kholo.

Graphic Flutterer
Rhyothemis graphiptera
Description: Medium-sized dragonfly, 35mm TL, WS 65mm. Thorax and abdomen black and relatively short. Wings attractive golden colour with brown patterning.
Habitat: Still and slow-moving waters often seen far from water.
Remarks: Very common in Ipswich, often seen in large numbers around ponds and dams.
Records: Purga, Ipswich, Raceview and South Ripley.

Yellow Stripped Flutterwing
Rhyothemis phyllis
Description: Medium-sized dragonfly, 40mm TL, WS 80 mm. Eyes, thorax and abdomen essentially black. Abdomen relatively short. Wings with dark tips and blotches, with a yellow stripe on the base of the hindwing.
Habitat: Still and slow-moving waters often seen far from water.
Remarks: Very common in Ipswich, often seen in large numbers around ponds and dams.
Records: Ipswich, Raceview and Woodend.

Common Glider
Tramea loewii
Description: Large dragonfly, 50mm TL, WS 90 mm. Reddish-brown dragonfly with distinctive 'saddlebag' markings in hindwings. Female colouration similar to male, just duller.
Habitat: Large still or slow-moving waters, often recorded some distance from water.
Remarks: Very common in Ipswich.
Records: Ipswich, Goodna, Silkstone and White Rock.

Cicadas (Cicadidae)

There is likely to be between 25 and 35 species of cicadas in the City of Ipswich. Photos and information on 12 of these species are included. Like dragonflies and butterflies, cicadas are a prominent part of the invertebrate fauna, but unlike these other groups it is not due to their dazzling colours with many cicadas drab in comparison to other insects. Rather they are known for their characteristic song which reverberates throughout bushland habitat during spring and summer each year. Only male cicadas sing, which they do to attract females. Some cicadas, mainly larger species, form large aggregations often on the side of large Eucalyptus trees while other, generally smaller species, may form small congregations or call singly. Some species are very particular about the tree species they choose to call from while others are less so.

Red Squeeker (*Pauropsalta rubea*)

Double Drummer
Thopha saccata
Song: Loud continuous chainsaw-like whine.
Description: Large, 45 mm TL. A large species which is pale brown to reddish brown in colour, with black markings on the thorax. Male with large brown swollen tymbals (sound producing) covers.
Habitat: Prefers open eucalypt forest.
Remarks: Very common in Ipswich, largely restricted to eucalypt forest.
Records: Deebing Heights, Goolman, Tallegalla and White Rock.

Greengrocer
Cyclochila australasiae
Song: A loud continuous harsh call with minimal fluctuations.
Description: Large cicada, 35 mm TL. Green or yellow body and wing veination. Eyes are reddish brown.
Habitat: Dry and wet sclerophyll forest where it can occur in large numbers.
Remarks: Uncommon in Ipswich, generally recorded further south.
Records: White Rock.

Razor Grinder
Henicopsaltria eydouxii
Song: Loud, sometimes painful to hear, repititious grinding sound that rises and falls.
Description: Large cicada, 40 mm TL. Dark brown with paler markings on the thorax and a pale stripe behind the head. Dark zigzag patterned veins of forewings.
Remarks: Very common in Ipswich, often in large numbers.
Records: Amberley, Rosewood, Spring Mountain and White Rock.

Clanger Cicada
Psaltoda claripennis
Song: Loud rattling song, with pulsing phase.
Description: Medium-sized cicada, 26 mm TL. A brown and green species with red eyes and a silver patch on each side of the abdomen and the leading edge of forewing green in colour.
Habitat: Open forest and urban areas, including backyards.
Remarks: Very common in Ipswich, one of the more common species heard in urban regions.
Records: Chuwar, Ipswich, Ironbark, Pine Mountain, Purga and Wulkuraka.

Floury Baker Cicada
Aleeta curvicosta
Song: A series of zeep-zeep phases followed by a long buzz.
Description: Medium-sized cicada, 30 mm TL. Brown with a pale mid dorsal line on the head. Wings clear with two spots on the forewing. Newly emerged adults are covered with flour like dusting.
Habitat: Open forest, calls on numerous tree and shrub species.
Remarks: Very common in Ipswich, in both backyards and most vegetation types.
Records: Ebenezer, Ipswich, Spring Mountain and Yamanto.

Brown Bunyip
Tamasa tristigma
Song: Low pitched buzzing.
Description: Small cicada, 20 mm TL. Brown-green with black markings. Three spots near the tip of forewing.
Habitat: Open forest including backyards.
Remarks: Common in Ipswich, doesn't generally form large congregations.
Records: Grandchester, Ipswich, North Ipswich, Kholo and Spring Mountain.

Black Treeticker
Birrima varians
Song: Sings while flying a series of fast 'zits'
Description: Small cicada, 24 mm TL. Thorax brown with black markings. Abdomen dark brown. The male has large black tympals.
Habitat: Open forest both dry and moist.
Remarks: Common in Ipswich, generally restricted to bushland, less common in the suburbs.
Records: White Rock, Kholo, Marburg, Mount Mort and Rosewood.

Bark Squeaker
Pauropsalta corticinus
Song: Repetitive zip-zip-zip followed by longer zeeep.
Description: Small cicada, 18 mm TL. Black-brown with yellow to yellow-brown bands on the abdomen. Eyes dark brown.
Habitat: Open eucalypt forest, including suburbia.
Remarks: Very common in Ipswich, tends to call from the trunks of rough barked eucalypt trees.
Records: Goodna, Ipswich, Ironbark, Karalee, New Chum and White Rock.

Wattle Cicada
Cicadetta oldfieldi
Song: Soft buzzing song with two patterns.
Description: Small cicada, 25 mm TL. Green with reddish-brown central mid dorsal stripe. Wings are clear.
Habitat: Dry open forest, including disturbed areas, large congregations can occur.
Remarks: Very common in Ipswich, generally calls and breeds on wattles *(Acacia* spp.).
Records: Bundamba, Ipswich, South Ripley, Springfield and Willowbank.

Hibiscus Cicada
Cicadetta forresti
Song: Quiet continuous buzzing.
Description: Small cicada, 15 mm TL. Small species which is olive-green dorsally and lime-green ventrally with wings clear.
Habitat: Wet sclerophyll forest, also in suburbs if suitable plant species are present. Often calls from *Hibscus* spp. following heavy rain.
Remarks: Rare in Ipswich, although it is probably more widespread than records suggest.
Records: Ipswich and Raceview.

Paperbark Cicada
Cicadetta hackeri
Song: Soft, repeating zip, often increasing in speed.
Description: Small cicada, 20 mm TL. Pale grey to silver with green markings and clear wings.
Habitat: Occurs in swampy paperbark dominated habitat, but will also call from paperbarks in urban streets.
Remarks: Very common in Ipswich, often heard calling from paperbarks planted in local parks and streets.
Records: Chuwar, Goodna, Ipswich, New Chum, Purga and White Rock.

Bladder Cicada
Cystosoma saundersii
Song: Long deep continuous call.
Description: Large cicada, 45 mm TL. Body is green, the male abdomen is inflated, wings are green and resemble leaves.
Habitat: Prefers closed forest, but will occupy densely planted gardens and backyards.
Remarks: Uncommon in Ipswich, only sings at dusk and early evening.
Records: White Rock.

Lacewings, antlions and owl flies (Neuroptera)

It is uncertain how many species of lacewings are likely to occur in the City of Ipswich however, it is likely to be under 50. Eight of these species are included, with photos and information on each. Species range in size from just a few millimetres to over 75 mm and vary in colour from dull grey-brown to bright green or orange. Adults have two pairs of largely transparent wings and long antennae. Most immature stages of lacewings are voracious predators who prey on other invertebrates while others are parasites of spiders.

Diamond-banded Lacewing (*Norfolius howensis*)

Owl Fly (Ascalaphidae)
Suhpalasca flavipes
Description: 60 mm WS. A relatively robust yellow and black patterned species. It has long wings and large eyes. The antennae are also long with a clubbed end.
Habitat: Tends to prefer open habitat including woodlands and grasslands.
Remarks: Common in Ipswich, although can be difficult to separate from other local *Suhpalasca* spp.
Records: New Chum, Purga, Raceview and White Rock.

Green Lacewing (Chrysopidae)
***Mallada* spp., *Oligochrysa* spp., *Italochrysa* spp.**
Description: Relatively small lacewings with a WS of 15 – 40 mm. Generally green to yellow in colour with little other obvious colouration, and net like wings.
Habitat: Occur in most habitats including wet and dry forest, woodlands and grasslands.
Remarks: Common in Ipswich, often encountered at night when attracted to outdoor lights.
Records: Ipswich, Karalee, New chum, Raceview and Spring Mountain.

Mantid Lacewing (Mantispidae)
***Euclimacia* sp.**
Description: These are medium-sized robust lacewings, 50 – 60 mm WS. Wasp-like in appearance and brightly marked with black, yellow, and orange. The wings are narrow with dark leading edges. The front legs are used for grasping insect prey.
Habitat: Occurs in both dry and wet forest and woodlands.
Remarks: Uncommon in Ipswich, although like many invertebrates may be more common than the records suggest.
Records: White Rock.

Mantid Lacewing (Mantispidae)
Theristria discolor
Description: This is a medium-size lacewing, 45 mm WS. A tan-pinkish species, with large eyes. The front legs are used for grasping insect prey.
Habitat: Occurs in both dry and wet forest and woodlands.
Remarks: Common in Ipswich, generally seen at night in bushland areas.
Records: Bellbird Park, Chuwar, Spring Mountain and White Rock.

Orange Antlion (Myrmeleontidae)
Callistoleon erythrocephalus
Description: 70 mm WS. A relatively large distinctive antlion, with short black antennae and an orange and black body. The wings are marked with a series of black spots.
Habitat: Occurs in drier forest, woodlands and grasslands.
Remarks: Common in Ipswich, generally only encountered in bushland habitat.
Records: Bellbird Park, Chuwar, Goolman, New Chum and White Rock.

Brown Antlions (Myrmeleontidae)
***Myrmeleon* spp.**
Description: 50 – 60 mm WS. Relatively large, dark bodied antlions, with shortish antennae and long wings.
Habitat: Occurs in a variety drier habitats, including woodlands and grassland. Larvae form pits to trap unwary prey.
Remarks: Very common in Ipswich, in both bushland and the urban environment.
Records: Grandchester, Ipswich, Purga, Kholo and White Rock.

Antlion (Myrmeleontidae)
***Stilbopteryx* spp.**
Description: 70 mm WS. Large antlions with large eyes and short antennae. The body is generally dark with a series of lighter spots. Wings often have a dark margin and dark tips.
Habitat: Prefers drier habitat and are generally seen at rest on upright sticks and grass, in bushland habitat.
Remarks: Uncommon in Ipswich, restricted to bushland habitat.
Records: White Rock.

Blue Eyes Lacewing (Nymphidae)
Nymphes myrmeleonides
Description: 80 mm WS. A large species, with an orange body. The wings are long with distinctive light and dark markings at the tips.
Habitat: Occurs in numerous habitat types and often seen in suburban areas and backyards.
Remarks: Very common in Ipswich, often seen at night when attracted to lights.
Records: Goolman, Ipswich, Raceview, Rosewood and White Rock.

Butterflies (Lepidoptera)

The exact number of butterfly species in the City of Ipswich is likely to be between 80 and 100. Photos and information on 32 of these species are included. Butterflies are probably the most conspicuous of all invertebrates due to their bright colours and inoffensive nature, however the caterpillars of some species can be pests to farmers and home gardeners alike. There is a great diversity of species within Ipswich from very large species, such as the swallowtails with wingspans over 100 mm to very small 'blues' and 'skippers' which are often mistaken for moths with some species having a wingspan of less than 20 mm.

Orchard Swallowtail Butterfly Chrysalis (*Papilio aegeus*)

Blue Triangle
Graphium sarpedon
Description: 60 mm WS. Large attractive turquoise-blue with black margins and a small amount of red on the ventral wing surface.
Habitat: Rainforest and lowland wet forest.
Remarks: Common in Ipswich, often seen near Camphor laural trees on which it breeds.
Records: Collingwood Park, Deebing Heights, Goolman, Ipswich and Woodend.

Orchard Swallowtail
Papilio a aegeus
Description: 105 mm WS, a very large butterfly. Male is mostly black with some white dorsally with red-orange and blue spots on the hindwing. Female is largely white and black.
Habitat: Numerous habitat types - rainforest, wet and dry forest to disturbed habitats.
Remarks: Very common in Ipswich, often seen around citrus trees in urban backyards.
Records: Bundamba, Ipswich, Rosewood, South Ripley and White Rock.

Dainty Swallowtail
Papilio anactus
Description: 70 mm WS. A largely black and white patterned butterfly with red and bluish markings at the rear of the hindwing of both sexes.
Habitat: Open Eucalypt forest, woodland and suburban gardens.
Remarks: Common in Ipswich, although generally not seen in large numbers.
Records: Ipswich, Raceview, Spring Mountain and White Rock.

Chequered Swallowtail
Papilio demoleus
Description: 75 mm WS. Both sexes are black with pale yellow, blue and orange markings.
Habitat: Generally prefers the moister regions in both dry forest and semi-arid areas.
Remarks: Uncommon in Ipswich, a fast flying butterfly which is often overlooked.
Records: Dinmore, Karalee and Kholo.

Narrow-brand Grass-dart
Ocybadistes f flavovittata
Description: 20 mm WS. Relatively small largely orange and brown skipper.
Habitat: Open eucalypt forest often with open grassy habitat.
Remarks: Very common in Ipswich, but often overlooked due to its relatively small size.
Records: Goodna, Ipswich, Marburg, Spring Mountain and White Rock.

Wide-brand Grass-dart
Suniana sunias rectivitta
Description: 22 mm WS. Small orange and black skipper.
Habitat: Eucalypt forest and grasslands also common in urban backyards.
Remarks: Very common in Ipswich, one of more common skippers recorded in the local area.
Records: Amberley, Flinders View, Ipswich and Raceview.

Black-ringed Ochre
Trapezites petalia
Description: 28 mm WS. A medium-sized largely tan brown skipper with a single white spot enclosed in black on the underside of the hindwing.
Habitat: Prefers dry forest and open woodlands often with a heath understory.
Remarks: Uncommon in Ipswich, generally restricted to bushland areas.
Records: White Rock.

Splendid Ochre
Trapezites s symmomus
Description: 46 mm WS. Relatively large colourful skipper with brown and black wings with clear, orange and white markings.
Habitat: Numerous habitat types including wet and dry forest, riparian zones and backyards.
Remarks: Very common in Ipswich, often associated with Lomandra spp. in urban backyards.
Records: Bellbird Park, Ipswich, Ironbark, Spring Mountain and White Rock.

Yellow Albatross
Appias paulina
Description: 53 mm WS. A species which is black and white above, with yellow and dark brown coulouration and markings below.
Habitat: Occurs in both wet and dry forest and vine forest.
Remarks: Common in Ipswich,
Records: Chuwar, Bundamba, Ipswich, Rosewood and White Rock.

Caper White
Belenois java teutonia
Description: 55 mm WS. Largely white and black above, with also some yellow below. The female has more yellow than males.
Habitat: Numerous habitat types.
Remarks: Very common in Ipswich, often seen in large numbers during migrations from inland areas where the host plant *Capparis* spp. grows
Records: Kholo, Raceview, Springfield lakes, Thagoona and White Rock.

Caper Gull
Cepora perimale
Description: 43 mm WS. A species which is largely black and white above, with yellow and dark brown coulouration and markings below.
Habitat: A variety of habitat types, wet and dry forest, vine forest and woodlands.
Remarks: Uncommon in Ipswich, tends to be found in bushland habitat rather than urban areas.
Records: New Chum, Swanbank, Spring Mountain and White Rock.

Scarlet Jezebel
Delias a argenthona
Description: 60 mm WS. The upper wings are black and white, while the underside is coloured yellow, black, red and white.
Habitat: Larvae feed on a number of mistletoe species in dry, wet and paperbark forest and urban areas.
Remarks: Very common in Ipswich, often seen during the cooler months of the year.
Records: Bundamba, Goodna, Ipswich, Marburg, Purga and White Rock.

Black Jezebel
Delias nigrina
Description: 55 mm WS. White and black above and largely black below with attractive yellow and red markings.
Habitat: Larvae feed on a number of mistletoe species in dry, wet and paperbark forest and urban areas.
Remarks: Very common in Ipswich, often seen during the cooler months of the year
Records: Deebing Heights, Ipswich, Haigslea and Ripley.

Large Grass-yellow
Eurema hecabe
Description: 40 mm WS. Yellow butterfly with dark margins dorsally on fore and hindwings.
Habitat: Several habitat types including open forest where host plants are often common.
Remarks: Very common in Ipswich, often seen in backyards laying on one of the host plants *Breynia* spp.
Records: Ebenezer, Ipswich, Spring Mountain, Yamanto and White Rock.

Glasswing
Acrea andromacha
Description: 55 mm WS. The forewing is almost transparent, while the hindwing is creamy-white, both wings have contrasting dark spots.
Habitat: Occurs in a variety of habitat including, dry forest, woodland and grassland.
Remarks: Common in Ipswich, sometimes seen in large numbers following the seasonal emergence of adults.
Records: Gailes, Ipswich, Ironbark, South Ripley and White Rock.

Tailed Emperor
Charaxes sempronius
Description: 85 mm WS. Very large butterfly which is cream dorsally with black wing margins and multi coloured ventrally with two pointed tails.
Habitat: Numerous habitats including wet and dry forest and suburban areas.
Remarks: Common in Ipswich, and also commonly seen in flying rapidly in urban areas.
Records: Ipswich, Raceview, Redbank Plains and Spring Mountain.

Lesser Wanderer
Danaus petilia
Description: 60 mm WS. Large butterfly with orange, black and white markings both dorsally and ventrally.
Habitat: Numerous habitat types often associated with open grassy or disturbed areas.
Remarks: Very common in Ipswich, sometimes mistaken for the Monarch (*Danaus plexippus*).
Records: New Chum, Pine Mountain, Redbank Plains and Swanbank.

Monarch
Danaus plexippus
Description: 90 mm WS. Large orange and black butterfly with little variation between males and females.
Habitat: Various habitats particularly open and disturbed regions.
Remarks: Very common in Ipswich, one of the better known and commonly observed species.
Records: Chuwar, Blacksoil, Ipswich, Riverview and Yamanto.

Common Crow
Euploea corinna
Description: 70 mm WS. Large black butterfly with white markings and little variation between the sexes.
Habitat: Numerous habitat types including open dry forest and lowland coastal habitat.
Remarks: Very common in Ipswich, recorded throughout the year in most habitat types.
Records: Camira, Flinders, Ipswich, Springfield, Walloon and White Rock.

Blue Moon
Hypolimnas bolina
Description: 85 mm WS. Large variable butterfly. The male is black dorsally with lighter white and blue spots and brown-black with white markings ventrally, the female also has orange on the forewings.
Habitat: Numerous habitat types including both dry and wet forest.
Remarks: Very common in Ipswich, often seen visiting flowers in backyards.
Records: Bellbird Park, Ipswich, South Ripley and White Rock.

Brown Ringlet
Hypocysta metirius
Description: 31 mm WS. Largely brown butterfly with orange markings and black eyespot dorsally and two spots on the hindwing ventrally.
Habitat: Open forest and margins of wetter forest.
Remarks: Common in Ipswich, although restricted to bushland areas and generally not present in suburban backyards.
Records: Goolman, Spring Mountain and White Rock.

Meadow Argus
Junonia villida
Description: 43 mm WS. Both sexes are largely light brown and patterned above and below with darker and lighter markings including prominent black eye spots.
Habitat: Numerous open habitats including eucalyptus woodland and grassland.
Remarks: Very common in Ipswich, occurs all year round and is common is disturbed suburban habitat.
Records: Goodna, Grandchester, Ipswich, Marburg and Rosewood.

Evening Brown
Melanitis leda
Description: 63 mm WS. Large brown butterfly which has a black and white patch on the dorsal forewing and several eye spots below.
Habitat: Numerous habitats including dry and wet forest and urban areas.
Remarks: Very common in Ipswich, most often seen flying in the early evening. Has a dry and wet season form.
Records: Blackstone, Goolman, Muirlea, Swanbank and White Rock.

Jezebel Nymph
Mynes geoffroyi
Description: 55 mm WS. White above with a broad black border on the outer edge of the forewing and narrow black border on outer edge of the hindwing. Black with yellow, red and white markings below.
Habitat: Generally restricted to upland and lowland rainforest, often along watercourses.
Remarks: Rare in Ipswich, sometimes seen in urban areas which have the larval hostplant *Pipturus argenteus*.
Records: Ipswich.

White-banded Plane
Phaedyma shepherdi
Description: 55 mm WS. A butterfly which is black and white dorsally and black-brown and white ventrally with little variation between the sexes. Has a distinctive gliding flying motion.
Habitat: Inhabits rainforest edges, gallery forest and riparian habitat.
Remarks: Common in Ipswich, including in better vegetated backyards.
Records: Bellbird Park, Ipswich, Pine Mountain and Spring Mountain.

Blue Tiger
Tirumala hamata
Description: 72 mm WS. This large butterfly is black with numerous pale blue streaks and elongated spots, with little difference between males and females.
Habitat: Prefers vine forest and lowland rainforest but occurs in numerous habitat types.
Remarks: Very common in Ipswich, some years seen in very large flight migrations.
Records: Amberley, Blacksoil, Booval, Ipswich, Swanbank and White Rock.

Small Dusky-blue
Candalides erinus
Description: 22 mm WS. Small butterfly with grey-brown dorsal and lighter below with two small black spots ventrally, located at the rear of the forewing.
Habitat: Paperbark, heath and dry eucalypt forest.
Remarks: Common in Ipswich, particularly in grassy areas within dry forest.
Records: Swanbank, White Rock and Spring Mountain.

Imperial Hairstreak
Jalmenus evagoras
Description: 35 mm WS. Attractive butterfly bright blue dorsally with black wing margins, ventrally wings are tan-orange with darker markings, with a single tail.
Habitat: Dry eucalypt and Acacia woodland.
Remarks: Uncommon in Ipswich, generally recorded in wattle dominated habitat.
Records: Redbank Plains and White Rock.

Plumbago Blue
Leptotes plinius
Description: 23 mm WS. Largely blue and black above and attractively marbled brown and white below.
Habitat: Open forest, woodland and vine forest and also urban areas and backyards.
Remarks: Common in Ipswich, particularly where the host plant *Plumbago* spp. is found.
Records: Brassall, North Ipswich and Raceview.

Large Purple Line-blue
Nacaduba berenice
Description: 22 mm WS. Males light blue above, females similar with more-black. Brown below with white markings and an orange and black spot and a single tail.
Habitat: Wet forest and rainforest and most backyards with suitable host plants including the common street tree *Cupaniopsis.*
Remarks: Common in Ipswich, in both bushland and well vegetated gardens.
Records: Flinders View, Ipswich, Pine Mountain and Spring Mountain.

Small Green-banded Blue
Psychonotis caelius
Description: 32 mm WS. Male blue above, with white with black wing margins, female with less blue and more-black. White below with black and green iridescent markings with a single tail.
Habitat: Wetter forest but also common in lowland suburbia where host plant is common (*Alphitonia excelsa*).
Remarks: Common in Ipswich, including backyards.
Records: Ipswich, New Chum, North Ipswich, Spring Mountain and White Rock.

Common Grass-blue
Zizina otis labradus
Description: 23 mm WS. Rather plain butterfly with blue and grey wings with little patterning and no tails.
Habitat: Very widespread species in most disturbed habitats.
Remarks: Very common in Ipswich, in open and altered habitats, including suburban areas and backyards.
Records: Ipswich, Marburg, Pine Mountain, Raceview and Springfield.

Freshwater fishes

There are over 300 described species of freshwater fishes in Australia, with approximately 150 species known to occur in Queensland. At least 37 species, or approximately 25% of the Queensland fauna have been recorded within the City of Ipswich. In addition to the 37 primarily freshwater species, a further nine species, more commonly found in estuarine or marine environments, but also known to occur in the brackish upper reaches of the larger rivers in Ipswich, have also been included in the species list for the local area. Photos and information on 16 of these species have been included.

Ipswich freshwater fish fauna consists of at least 46 species from 27 families, some of the better-known families include –

- 1 species of Australian lungfish (Family - Ceratodontidae)
- 2 species of freshwater eel (Family - Anguillidae)
- 2 species of rainbowfish (Family - Melanotaeniidae)
- 2 Species of glassfish (Family - Ambassidae)
- 3 species of freshwater bass and cod (Family - Percichthyidae)
- 2 species of mullet (Family - Mugilidae)
- 7 species of gudgeon (Family - Eleotridae)

Of these species, two are scheduled as *threatened* under either State and/or Commonwealth legislation, the Australian lungfish (*Neoceratodus forsteri*) and Mary river cod (*Maccullochella mariensis*).

Australian Smelt (*Retropinna semoni*)

Queensland Lungfish
Neoceratodus forsteri
Description: Large fish up to 150 cm TL. Elongate body with large bony scales, flattened head and small eyes. Brown to olive dorsally and laterally with a whitish-yellow to pink underside.
Habitat: Prefers deep, slow moving rivers.
Remarks: Native to the Burnett and Mary river catchments. Introduced to a number of southern drainages including the Brisbane, Coomera, Albert and Stanley Rivers.
Records: Brisbane/Bremer Rivers. Known from both Kholo and Colleges Crossings.

Longfin Eel
Anguilla reinhardtii
Description: 250 cm TL, but common to about 100 cm. Elongate snake-like body, with a small head. Olive-brown dorsally with numerous irregular darker spots. Light coloured below with dorsal fin originating well in front of anal fin origin.
Habitat: A mostly nocturnal species which occurs in most water body types.
Remarks: Very common in Ipswich, in most water courses, both fresh and brackish.
Records: Goodna, Karalee, Kholo, Rosewood and Thagoona.

Freshwater Catfish
Tandanus tandanus
Description: 90 cm TL but common to 40 cm. Grey to charcoal-brown with mottling in colour and whitish underneath. Anterior dorsal fin has a sharp spine while the second dorsal fin is long and eel like. Eight sensory barbels around the mouth.
Habitat: A bottom feeding species which prefers still or slow-flowing streams and rivers.
Remarks: Very common in Ipswich, particularly in larger creeks and rivers etc.
Records: Karalee, Kholo, Peak Crossing and Rosewood.

Fly-specked Hardyhead
Craterocephalus stercusmuscarum
Description: 8 cm TL, common to about 5 cm. A relatively slender species with a black stripe from the base of the pectoral fin through the eye to the snout. Black spots are often present along the sides
Habitat: Perfers the shallow regions of slow moving creeks and streams, pods and dams.
Remarks: Common in Ipswich, particularly in better quality streams and creeks.
Records: Amberley, Kholo, Silkstone, Swanbank, Walloon and Willowbank.

Crimson-spotted Rainbowfish
Melanotaenia duboulayi
Description: 12 cm TL, but common to 7 cm. Colour variable, body green-grey. Laterally there are a number of narrow horizontal red stripes, a blackish stripe mid laterally and a crimson spot on the gill cover.
Habitat: Occurs in several water body types including streams, creeks and impoundments.
Remarks: Very common in Ipswich, in better quality creeks and streams.
Records: Amberley, Goodna, Karalee, Kholo, Peak Crossing and Silkstone.

Pacific Blue Eye
Pseudomugil signifier
Description: 6 cm TL, but common to 3 cm. A variably coloured species from dull olive to yellowish-tan, to blue-grey with dark scale outlies dorsally. Sometimes with white spots along the mid-lateral stripe.
Habitat: Variable including coastal freshwater, brackish and mangrove lined creeks and streams.
Remarks: Common in Ipswich, often associated with streams with a tidal influence.
Records: Karalee, Kholo and Purga.

Bullrout
Remarksthes robusta
Description: A robust fish up to 30 cm in size with large pectoral fins. Variable in colour with mottled brown, yellow, red and whitish markings. Venomous spines on the dorsal, anal and pelvic fins can inflict painful wounds
Habitat: Occurs in estuarine and brackish water, although it is most commonly found in freshwater systems.
Remarks: Common in the Brisbane and Bremer rivers of the Ipswich region.
Records: Brisbane/Bremer Rivers i.e. Barellan Point, Chuwar, Kholo and Karalee.

Agassiz's Glassfish
Ambassis agassizii
Description: 7.5 cm TL, but common to approximately 4 cm. A semi-transparent/silver species with dark edged scales. Dorsal, anal and pelvic fins often have dusky coloured edges.
Habitat: Freshwater streams and creeks often in areas with dense aquatic vegetation.
Remarks: Common in Ipswich, known from a number of stream and creek systems.
Records: Purga, Rosewood, Swanbank and Thagoona.

Australian Bass
Macquaria novemaculeata
Description: 60 cm TL, generally smaller. Olive-green to silver-grey in colour, paler below. Relatively large eye and short snout and protruding jaw. Juveniles have dark blotches on some fins
Habitat: Lakes, dams, rivers and streams. Spawning occurs in estuaries.
Remarks: Uncommon in Ipswich. Popular angling fish which is good eating.
Records: Karalee, Willowbank and Yamanto.

Sea Mullet
Mugil cephalus
Description: 90 cm TL, but common to half this length. A silver-grey species, with a blunt rounded snout. Sometimes with 6-7 diffuse brown stripes on the upper sides of the body.
Habitat: Essentially a coastal marine and estuarine species but also occurs in freshwater rivers, creeks and dams.
Remarks: Common in many streams in Ipswich, particularly those with a coastal\estuarine influence.
Records: Karalee and Kholo.

Speckled Goby
Redigobius bikolanus
Description: 4 cm TL. A relatively small largely cylindrical species with a small mouth. Tan-brown in colour with four short bars on the lower body between the anal and caudal fins and transverse bars across the head.
Habitat: Occurs in brackish waters, estuaries and lower sections of freshwater streams and rivers.
Remarks: Uncommon in Ipswich, restricted to brackish waters in rivers.
Records: Karalee.

Striped Gudgeon
Gobiomorphus australis
Description: 18 cm TL, but common to about 10 cm. Dark brown to light brown dorsally, cream to light grey on the lower sides and ventrally. A number of brown-black stripes run along the sides of the body.
Habitat: Freshwater slow-moving streams and creeks often with snags.
Remarks: Common in Ipswich, in freshwater or brackish streams and creeks.
Records: Deebing Heights, Karalee, Kholo, One Mile and Purga.

Empire Gudgeon
Hypseleotris compressa
Description: 11 cm TL, generally smaller. Olive-brown in colour to silvery below, dark markings on side of body which tend to form 'X' shapes. Breeding males are vibrant orange-red on head, belly and some fins.
Habitat: A hardy species present in coastal small creeks and streams.
Remarks: Very common in Ipswich, particularly in creeks and streams.
Records: Collingwood Park, Raceview, Karalee, Kholo, Purga and Swanbank.

Firetail Gudgeon
Hypseleotris galii
Description: 6 cm TL, but generally smaller. Grey-brown and a silvery belly with reddish dorsal, anal and caudal fins in the males. Male colouration is more intense during the breeding season.
Habitat: Numerous water bodies including dams, ponds, streams and creeks.
Remarks: Very common in Ipswich, in creeks, streams, rivers and impoundments including those of relatively poor quality.
Records: Chuwar, Goodna, Karalee, Kholo, Raceview and Rosewood.

Mosquito Fish - Introduced
Gambusia holbrooki
Description: 6 cm TL, males much smaller (3.5cm). Pale unremarkable species, olive-greenish above, often with a bluish sheen on the sides. An angular head and fins often finely speckled and gives birth to live young.
Habitat: Prefers still or slow flowing streams and rivers but will inhabit and often dominate most water bodies.
Remarks: Very common in Ipswich including brackish systems.
Records: Bundamba, Goodna, Kholo, Raceview and Purga.

Platy - Introduced
Xiphophorus maculatus
Description 6 cm TL, males smaller to 4 cm. A deep bodied species with an arched back. A small triangular head with a small upturned mouth. Aquarium fish are colourful orange and black, wild fish are olive-brownish.
Habitat: Occurs in swamps and slow-moving creek and rivers, unfortunately the distribution appears to be expanding in SEQ.
Remarks: Common in Ipswich, and likely spreading.
Records: Deebing Creek, Goodna and Karalee.