

# **Threatened Species of the Bathurst Region**

## ***Beyond the Atlas***

### **Summary of a Database**



**For Bathurst Regional Council**

**June 2011**



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**MJADWESCH**  
**ENVIRONMENTAL**  
**SERVICE SUPPORT**

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This project summary has been prepared by Ray Mjadwesch of Mjadwesch Environmental Service Support for Bathurst Regional Council.

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Cover: *Flame Robin cat-kill* (photo courtesy Dana Sibera 2010)

## Acknowledgments

In 2008 Joel Little (Environmental Officer, Bathurst Regional Council) acknowledged the need for a better understanding of the threatened species of the Bathurst Region, both to improve outcomes when Council determines development applications, and to inform development of the regional LEP (*in prep*) and other planning and strategy instruments. Joel commissioned the first iteration of the Bathurst LGA Threatened Species Database (Mjadwesch 2008), and its update (Mjadwesch 2009), and this summary report. Joel and Deborah Taylor (Environmental Officer, BRC) also searched archived consultants reports (submitted to Council attached to development applications), providing a range of additional records for the database.

Thank you to the institutions who provided data from their often extensive databases, and information about their collections, including OEH-NPWS (GIS), the Australian Museum, Birds Australia, CSIRO and NSW Fisheries. Thank you to David Goldney (consulting ecologist and former academic with Charles Sturt University and the Western Research Institute) for taking time to skim an extensive personal library, and providing many reports treating the flora and fauna of the Bathurst and surrounding region.

Other contributors to the database gave willingly of their time and expertise, and the projects success lies largely with them. These included amateur and professional naturalists and natural resource managers, and wildlife carers and enthusiasts – thank you to Ashley & Dale Bland, Murray Evans, Hugh King, Tiffany Mason, Ian McArtney, Richard Medd, Will Osbourne (Canberra University), Robert Porter, Primrose Raine, Brian Stone, Ross Thompson, Sue Wakefield, Gavin Waters and Kerry Waters. Hedy Bryant assisted by making internal (staff) borrowings from the CSU Library; a special thank you to Dana Sibera for the cover photo.

Otherwise organisations and individuals, including WIRES Central West, SF NSW, environmental consultancies (Greg Madafoglio of Envirowest and Patsy Moppett of Barnson) and Cilla Kinross (CSU – Orange Campus & Orange Field Naturalists), responded that their Bathurst LGA data had been submitted to the DECC or other datasets, or that they had no additional threatened species records to contribute; thank you for taking the time to respond to my enquiries.

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## Section 1 - Introduction

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### 1.1 Background

Environmental impact assessment in NSW requires consultants to consider, amongst other things, potential impacts of an activity on threatened species (*Threatened Species Conservation Act 1995* and the *Environmental Protection and Biodiversity Conservation Act 1999*). Further, consent authorities (generally local Councils) are required to give full consideration to any factors which may affect the environment, in considering the carrying out of any activity (*Environmental Planning & Assessment Act 1979*). Further Council is required to consider (amongst other things) threatened species in development of regional planning instruments, such as Local Environment Plans and Development Control Plans.

A standard tool utilised in assessment of threatened species values is an inquiry to OEH's GIS unit for Wildlife Atlas data (often a minimum search area of 10x10km, or by 1:100 000 mapsheet).

The Wildlife Atlas is easy to access, and DECC-NPWS and Fisheries provide sighting records of species on request. These data often form the only source for consultants preparing impact assessments reports for a client, on which they may presume presence (or more usually absence) of threatened species. On the basis of these predictions, management strategies are often formulated to facilitate development, while attempting to minimise or compensate for impacts on identified threatened species.

Unfortunately the DECC-NPWS Wildlife Atlas does not provide a comprehensive account of threatened species which occur in NSW (the Atlas has a caveat pertaining to the databases reliability). Numerous other databases contain records for species across NSW including museums in Australia and overseas, Birds Australia (based on the most comprehensive bird surveys to have been conducted in Australia), CSIRO and Fisheries NSW. More expensive environmental impact reports (EIS's for mining proposals, for example) may consider records from a range of databases.

However literature reviews and local sources can also provide accounts of species which may never find their way to any data repository – including environmental studies and 'lists' kept by amateur naturalists and interested observers, as well as historic observations, and in the case of Bathurst, student theses.

In 2008 Bathurst Regional Council commissioned compilation of a database of threatened plants and animals in the Bathurst Regional Local Government Area, beyond the Atlas; this was updated in 2010 to include additional threatened species listed under threatened species schedules, and new records of already listed species. This summary report describes the database's compilation and composition, and its limitations.

### 1.2 Aim

The threatened species database was commissioned by BRC, to better inform decisions about the adequacy of impact assessment reports prepared for development projects in the region, and to ensure that Council could meet the requirement for them to give proper consideration to threatened species issues in providing approvals for development, and in devising strategies towards management of a developing landscape.

### **1.3 Scope**

This summary describes the data collection process, summarises results, provides some discussion and a preliminary interpretation of some of the data, and lists the sources used to compile the database.

Preparing this summary report required a final review of data, which necessarily included amendments and additions to the 2010 database. A supplementary file, The Bathurst LGA Threatened Species Database v1.3 (.xls) accompanies this report (Mjadwesch 2011).

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## Section 2 - Methodology

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### 2.1 Methodology

- i. Tables of threatened plants and animals of the Bathurst LGA were compiled, based on results from a Wildlife Atlas enquiry and bioclimatic predictions, as well as species identified as potentially occurring in the region, according to descriptions of species in major texts describing Australia's flora and fauna.
- ii. Minimum data fields for inclusion in the database included: Source / Observer / Observation Type / Family / Genus / Species / Common Name / Date of Observation / Number Observed / Grid Reference / Location Description
- iii. Data enquiries were sent to major natural history and research institutions, including the DECC-PWS (GIS Unit), the Australian Museum, Birds Australia, Fisheries NSW, CSIRO and Universities. The Royal Botanic Gardens PlantNET (internet database) and BioNET (a compilation database) were also searched
- iv. Invitations to submit data were sent to environmental consultancies practicing in the region, as well as local Landcare Groups and WIRES.
- v. Literature was searched for reference to studies on flora and fauna in the Bathurst region, including scientific journals (Australian Mammalogy 1982-1986, and Australian Wildlife Research 1982-1986), student theses and natural history texts.
- vi. BRC conducted an internal search for consultants' reports appended to development applications in the region, and regional planning and development instruments.
- vii. Amateur and practicing naturalists, including academics and researchers, consultants, herpetologists, departmental staff (OEH & the CW CMA) and bushwalking and birdwatching enthusiasts were interviewed about their experiences with the threatened species of the region.
- viii. All records were plotted on a series of topographical maps for the region; these were used to quickly ascertain if newly "found" records had already been submitted to existing databases.

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## Section 3 – Results & Discussion

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### 3.1 Data Sources

The starting point for data collection was the NSW NPWS Wildlife Atlas. Records for the region based on enquiries dated 3<sup>rd</sup> June 2008 and 19<sup>th</sup> October 2009 provided the framework within which to insert records from other data sources.

In the first instance, large collections and databases were identified, these included the Australian Museum, the Royal Botanic Gardens, Fisheries NSW, and the CSIRO (which houses the Australian National Insect Collection and the Australian National Wildlife Collection).

Other major sources targeted for data were environmental reports for various projects throughout the region. These included student studies at Boundary Road Reserve (Fisher *et al* 1997), and impact assessment reports for development proposals (for example Goldney 1993 for the Mt Haven Rural Residential Subdivision, and Goldney & Clements 1994 for the Cow Flat Limestone Quarry). 37 of the authors own reports on surveys across the region were also reviewed (Mjadwesch 2000–2010), providing details on observations beyond what is included in the NPWS Wildlife Atlas data sets for the author. Bathurst Regional Council were able to produce very few additional reports supporting development applications, which had any detail on flora / fauna / threatened species values in the region.

Further to this, the Charles Sturt University ran an environmental sciences course until the early 2000's, and numerous postgraduate papers and theses were produced. None of the data from these appeared on the Wildlife Atlas or other major databases; Fisher (1997) particularly provided some very important observations during 3 years of standardised bird surveys (including the only observation for the Grey Falcon in the region) and Price (1996) provided important koala observations for the dataset.

Historic texts, journal indexes (such as *Australian Mammalogy* and *Australian Wildlife Research*) and general searches for papers containing key words (threatened species names [AND] Bathurst) provided additional source documents. A number of species always "predicted" for the region, but long extinct, were provided by a dig at Abercrombie caves (Johnson 1977), including the Brush-tailed Rock Wallaby and bettongs as sub-fossil remains, even Tasmanian Devils!

Bathurst has a long history as being a destination for early explorers, travellers and naturalists, including Sir Joseph Banks, Sir Charles Darwin and John Gould. Most of the specimens collected by these eminent naturalists have found their way to major museum collections, however they left behind them an interested and enthusiastic coterie of amateur naturalists, who often acted as 'collectors' themselves (periodically sending specimens to their mentors back in England, or elsewhere). The ancestors of some of these families live still in the region.

More recently groups such as Bathurst Field Naturalists, Boundary Road Reserve and other Landcare groups, and a community of amateur naturalists, bird enthusiasts and wildlife carers have maintained an interest in the region's natural environment, and the plants and animals living there. An invitation to the community to contribute to the database was made, targeting these groups particularly, and interviews were conducted with respondents. These provided some of the most interesting and often very rare sightings – incredibly this source provided 9 "new" species for the database (ie: observations of species otherwise unknown in collections / formal data sets, such as *Goodenia macbarronii* and the Brush-tailed Phascogale).



### Flora Data Sources Summary

	Species	No. Records
DECC-NPWS	6	28
Royal Botanic Gardens	11	28
Literature & Consultants	4	4
Community	3	5

### Fauna Data Sources Summary


	Species	No. Records
DECC-NPWS	39	1169
Australian Museum	29	37
Birds Australia	23	801
Major Collections	8	10
Literature & Consultants	37	344
Community	45	198

A complete list of reference material (including nul sources) and other resources used to compile the database is included in this report as Appendix 1.

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**BE 3058 *Pomatostomus temporalis temporalis* Passeriformes : Pom. crowned Babbler**



Registration Number: BE 3058  
Category: Natural Sciences  
Scientific Group: Vertebrate Zoology  
Discipline: Ornithology

*Sources such as the Museum of Victoria were still providing results even as this summary paper was being prepared*  
(<http://collections.museumvictoria.com.au>)

### 3.2 Threatened Species

Threatened Species are the flagships of conservation. As the community increasingly expects sustainable performance from developers and land managers, consideration of threatened species issues should take place as a first principle in considering any development proposal, or land management activity.



*Threatened species are the flagships of conservation – indeed Bathurst Regional Council adopted the Purple Copper Butterfly as its logo in 2004*

In NSW the *Threatened Species Conservation Act 1995* lists species as threatened under various schedules, defining critically endangered (E4A), endangered (E1), vulnerable (V) and extinct (E4) in NSW, as well as endangered populations and ecological communities, and key threatening processes. The NSW *Fisheries Management Act 1974* lists threatened fish in NSW. The Commonwealth *Environmental Protection & Biodiversity Conservation Act 1999* lists species as threatened nationally.

Species on these threatened species schedules, which are known or predicted in the study area (the Bathurst Regional Council LGA) are listed below, with their status, and with an indication of how many records have come from which major sources (“WA” refers to the NPWS Wildlife Atlas, “RBG” refers to the Royal Botanic Gardens). Red text in the tables below indicates species which are expected (based on bioclimatic conditions and distribution maps for species), but which have not yet been reported / observed in the region.

Table 1. Threatened Plants of the Bathurst Region

<b>FAMILY</b>		<b>NSW (Fed)</b>	<b>WA 2008</b>	<b>WA 2009</b>	<b>Aust Mus</b>	<b>RBG</b>	<b>Major colls</b>	<b>Lit / Cons</b>	<b>Public</b>	<b>Total</b>
<b>Genus species</b>	<b>Common Name</b>									
ASTERACEAE										
<i>Ammobium craspedioides</i>		V (V)								
<i>Calotis glandulosa</i>	Mauve Burr-daisy	V (V)								
BRASSICACEAE										
<i>Lepidium hyssopifolium</i>	Aromatic Peppergrass	E1 (E1)	4			2		1		7
FABACEAE-FABOIDEAE										
<i>Bossiaea fragrans</i>		E4A		5						5
<i>Swainsona sericea</i>	Silky Swainson-pea	V				3				3
<i>Swainsona recta</i>	Small Purple Pea	E1 (E1)								
GOODENIACEAE										
<i>Goodenia macbarronii</i>	Narrow Goodenia	E1 (E1)							1	1
HALORAGACEAE										
<i>Haloragodendron lucasii</i>		E1 (E1)								
LAMIACEAE										
<i>Prostanthera cryptandroides</i>		V (V)								
<i>Prostanthera stricta</i>		V (V)								
MARSILEACEAE										
<i>Pilularia novae-hollandiae</i>	Austral Pillwort	V (V)								
MYRTACEAE										
<i>Eucalyptus aggregata</i>	Black Gum	V				1				1
<i>Eucalyptus cannonii</i>	Capertee Stringybark	V (V)	3							3
<i>Eucalyptus canobolensis</i>	Silver Leaf Candlebark	V (V)								
<i>Eucalyptus pulverulenta</i>	Silver-leafed Gum	V (V)	5			9			1	15
<i>E. robertsonii hemisphaerica</i>	Robertsons Peppermint	V (V)	1							1
<i>Homoranthus darwinioides</i>		V (V)								

FAMILY		NSW	WA	WA	Aust		Major	Lit /		
<i>Genus species</i>	Common Name	(Fed)	2008	2009	Mus	RBG	colls	Cons	Public	Total
ORCHIDACEAE										
<i>Diuris aequalis</i>	Buttercup Double-tail									
<i>Diuris pedunculata</i>										
<i>Diuris tricolor</i>										
POACEAE										
<i>Dichanthium setosum</i>	Queensland Bluegrass	V (V)								
PROTEACEAE										
<i>Grevillea divaricata</i>		E1 (E1)				1				1
<i>Grevillea obtusiflora obtusiflora</i>		E1 (E1)								
<i>Grevillea parviflora</i> *		V				1				1
<i>Persoonia marginata</i> *	Clandulla Geebung	V (V)				3				3
RUTACEAE										
<i>Asterolasia buxifolia</i> *						1				1
<i>Philotheca ericifolia</i>		V (V)								
<i>Zieria obcordata</i> *		E1 (E1)	10			4		1	3	18
SANTALACEAE										
<i>Thesium australe</i>		V (V)								
SCROPHULARIACEAE										
<i>Derwentia blakelyi</i>		V				2				2
<i>Euphrasia arguta</i>		E4						1		1
<i>Euphrasia scabra</i>		E				1		1		2

\* Four records were provided with the data acquired which were extra-limital (ie: records came from outside of the study area). These were:

- *Asterolasia buxifolia*, with a record from the Blue Mountains National Park many miles to the south-east of the region,
- *Zieria obcordata*, with one record being the Wellington population, many miles to the north-west of the LGA
- *Persoonia marginata*, with one of three records falling just outside the LGA to the east (Sunny Corner State Forest) and
- *Grevillea parviflora*, with the specimen being from just outside the LGA to the east (Sunny Corner State Forest).

Table 1. Threatened Fauna of the Bathurst Region

CLASS		NSW (Fed)	WA 2008	WA 2009	Aust Mus	Birds Oz	Major colls	Lit / Cons	Public	Total
Genus species	Common Name									
<b>INSECTA (Insects)</b>										
<i>Paralucia spinifera</i>	Bathurst Copper Butterfly	E1 (V)	41	2	1 (2)		1 (60)	116	3	<b>164</b>
<b>OSTEICHTHYES (Fish)</b>										
<i>Bidyanus bidyanus</i>	Silver Perch	V					2		2	<b>4</b>
<i>Maccullochella macquariensis</i>	Trout Cod	E1 (E1)						1	1	<b>2</b>
<i>Maccullochella peelii</i>	Murray Cod	(E)					2	2	6	<b>10</b>
<i>Macquaria australasica</i>	Macquarie Perch	V (E)						9	2	<b>11</b>
<i>Prototroctes maraena</i>	Australian Grayling	(V)								
<b>AMPHIBIA (Frogs)</b>										
<i>Litoria aurea</i>	Green and Golden Bell Frog	E1 (E1)	10					1	1	<b>12</b>
<i>Litoria booroolongensis</i>	Booroolong Frog	E1	10		12 (103)			3	7	<b>32</b>
<i>Litoria castanea</i>	Yellow-spotted Tree Frog	E1 (E1)								
<i>Litoria raniformis</i>	Southern Bell Frog	E1 (E1)			2 (4)				7	<b>9</b>
<i>Helioporus australiacus</i>	Giant Burrowing Frog	V								
<b>REPTILIA (Lizards &amp; Snakes)</b>										
<i>Emydura macquarii macquarii</i>	Short-necked Turtle	P						1	5	<b>6</b>
<i>Aprasia parapulchella</i>	Pink-tailed Legless Lizard	V (V)	1		1				3	<b>5</b>
<i>Delma impar</i>	Striped Legless Lizard	V (V)								
<i>Tympanocryptis pinguicolla</i>	Grassland Earless Dragon	E1 (E1)			2				6	<b>8</b>
<i>Varanus rosenbergi</i>	Rosenberg's Goanna	V			1				7	<b>8</b>
<i>Hoplocephalus bitorquatus</i>	Pale-headed Snake	V							2	<b>2</b>
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	E1 (E1)			1				2	<b>3</b>
<i>Suta flagellum</i>	Little Whip Snake	V			1				1	<b>2</b>



CLASS Genus species	Common Name	NSW (Fed)	WA 2008	WA 2009	Aust Mus	Birds Oz	Major colls	Lit / Cons	Public	Total
AVES (Birds)										
<i>Oxyura australis</i>	Blue-billed Duck	V				1			5	6
<i>Stictonetta naevosa</i>	Freckled Duck	V				2			3	5
<i>Anseranas semipalmata</i>	Magpie Goose	V	2							2
<i>Leipoa ocellata</i>	Malleefowl	E1 (E1)								
<i>Botaurus poiciloptilus</i>	Australasian Bittern	V				1		2	2	5
<i>Ixobrychus flavicollis</i>	Black Bittern	V								
<i>Phaethon rubricauda</i>	Red-tailed Tropicbird	V	1							1
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	E1								
<i>Grus rubicunda</i>	Brolga	V								
<i>Pandion haliaetus</i>	Osprey	V							1	1
<i>Hamirostra melanosternon</i>	Black-breasted Buzzard	V								
<i>Erythrotriorchis radiatus</i>	Red Goshawk	E1								
<i>Lophoictinia isura</i>	Square-tailed Kite	V		1		1			2	4
<i>Hieraaetus morphnoides</i>	Little Eagle	V		6	1	74		3	4	88
<i>Circus assimilis</i>	Spotted Harrier	V		1		1				
<i>Falco hypoleucos</i>	Grey Falcon	E1						1		1
<i>Ardeotis australis</i>	Australian Bustard	E1							1	1
<i>Burhinus grallarius</i>	Bush Stone-curlew	E1							5	5
<i>Pedionomus torquatus</i>	Plains-wanderer	E1 (E1)			1					1
<i>Rostratula benghalensis</i>	Painted Snipe	V						1		1
<i>Limosa limosa</i>	Black-tailed Godwit	V							1	1
<i>Caladris alba</i>	Sanderling	V							1	1
<i>Charadrius mongolus</i>	Lesser Sand Plover	V							1	1
<i>Geophaps scripta</i>	Squatter Pigeon	E1								
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	V	14	3		85		32	14	148
<i>Cacatua leadbeateri</i>	Major Mitchell's Cockatoo	V								
<i>Calyptorhynchus banksii</i>	Red-tailed Black-Cockatoo	V								
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	V		3		1			6	10
<i>Lathamus discolor</i>	Swift Parrot	E1 (E1)	1		2			1	3	7
<i>Glossopsitta pusilla</i>	Little Lorikeet	V		3		10		1		14

CLASS Genus species	Common Name	NSW (Fed)	WA 2008	WA 2009	Aust Mus	Birds Oz	Major colls	Lit / Cons	Public	Total
AVES (Birds) cont										
<i>Polytelis swainsonii</i>	Superb Parrot	V		1					1	2
<i>Neophema pulchella</i>	Turquoise Parrot	V				2			2	4
<i>Ninox connivens</i>	Barking Owl	V	2		2	2			4	10
<i>Ninox strenua</i>	Powerful Owl	V	9	1				1	7	18
<i>Tyto novaehollandiae</i>	Masked Owl	V	2						1	3
<i>Climacteris picumnus</i>	Brown Treecreeper	V	11	1	1	112	1	21	6	153
<i>Pyrrholaemus sagittatus</i>	Speckled Warbler	V	6			70		17	7	100
<i>Calamanthus fuliginosus</i>	Striated Fieldwren	V							1	1
<i>Grantiella picta</i>	Painted Honeyeater	V		1	1	1	2		1	6
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater	V	3			7			1	11
<i>Certhionyx variegatus</i>	Pied Honeyeater	V								
<i>Xanthomyza phrygia</i>	Regent Honeyeater	E1	12		4	3		1	5	25
<i>Petroica boodang</i>	Scarlet Robin	V		13	16 (28)	148	1	26	2	206
<i>Petroica phoenicea</i>	Flame Robin	V		7	24 (66)	69	1	11	1	113
<i>Melanodryas cucullata</i>	Hooded Robin	V	5		5	50		4	4	68
<i>Petroica rodinogaster</i>	Pink Robin	V								
<i>Daphoenositta chrysoptera</i>	Varied Sitella	V		8	4 (5)	26		6	1	45
<i>Pachycephala inornata</i>	Gilbert's Whistler	V				1				
<i>Stagonopleura guttata</i>	Diamond Firetail	V	5	4	4 (14)	126		10	21	170
<i>Pomatostomus t. temporalis</i>	Grey-crowned Babbler	V			5		1			6
<i>Artamus superciliosus</i>	White-browed Woodswallow	P		2	4	8		1		15
MAMMALIA (Mammals)										
<i>Dasyurus geoffroyi</i>	Western Quoll	E4 (E1)								
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	18	1	2			1	3	25
<i>Dasyurus viverrinus</i>	Eastern Quoll	E4						1	1	2
<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	V							2	2
<i>Antechinomys laniger</i>	Kultarr	E1								
<i>Isodon obesulus</i>	Southern Brown Bandicoot	E1						1	3	4

CLASS		NSW	WA	WA	Aust	Birds	Major	Lit /		
Genus species	Common Name	(Fed)	2008	2009	Mus	Oz	colls	Cons	Public	Total
MAMMALIA (Mammals) cont										
<i>Parameles bougainville</i>	Western Barred Bandicoot	E4 (E1)								
<i>Macrotis lagotis</i>	Bilby	E4 (E1)			2				1	3
<i>Phascolarctos cinereus</i>	Koala	V	932	7	3			64	24	1030
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	V	1						4	5
<i>Petaurus australis</i>	Yellow-bellied Glider	V	1		1				2	4
<i>Petaurus norfolcensis</i>	Squirrel Glider	V	1					1		2
<i>Aepyprymnus rufescens</i>	Rufous Bettong	V						1	2	3
<i>Bettongia gaimardi</i>	Southern Bettong	E4 (E1)								
<i>Bettongia penicillata</i>	Brush-tailed Bettong	E4 (E1)								
<i>Bettongia lesueur</i>	Burrowing Bettong	E4 (E1)								
<i>Lagorchestes leporides</i>	Eastern Hare Wallaby	E4 (E4)								
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	E1						3	2	5
<i>Onychogalea fraenata</i>	Bridled Nail-tail Wallaby	E4 (E1)								
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	1					1	11	13
<i>Macroderma gigas</i>	Ghost Bat	X							2	2
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V	1							1
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	V								
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	3							3
<i>Chalinolobus picatus</i>	Little Pied Bat	V								
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V	2	1				2		5
<i>Miniopterus shreibersii</i>	Eastern Bentwing Bat	V	9		1			1	2	13
<i>Myotis macropus</i>	Large-footed Mouse-eared Bat	V			1					1
<i>Nyctophilus timoriensis</i>	Greater Long-eared Bat	V (V)			1			1		2
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	V						1		1
<i>Vespadelus troughtii</i>	Eastern Cave Bat	V						1		1
<i>Conolurus albipes</i>	White-footed Rabbit Rat	E4 (E4)								
<i>Pseudomys gouldi</i>	Goulds Mouse	E4 (E4)								
<i>Pseudomys oralis</i>	Hastings River Mouse	E1								



### 3.3 Limitations

There are general limitations to the database, such as the reliability of data, the scope of the search being limited by the budget, and data errors and inconsistencies. These are discussed as they pertain to certain aspects of the database, as observations of each species are summarised below.

#### 3.3.1 Threatened Plants

The Royal Botanic Gardens PlantNET data set was the primary resource for additional plant records, beyond the existing Wildlife Atlas data set. Many of the RBG records in the Bathurst Regional Threatened Species Database have since been incorporated into the Wildlife Atlas. The lack of community observations of threatened plants will be principally because botany is a rare skill; even amongst a community of tens-of-thousands of people, few people are capable of making reliable identifications.



*While Zieria obcordata may be readily recognised by its glandular leaves “in threes”, other species (such as the Lepidium or Goodenia), require minute examination of characteristics of the peduncle, the silique, or the leaf, and Eucalyptus cannonii differs from the common and widespread Red Stringybark only in the characteristics of the fruit*

Many of the observations are notable historic records, including ***Grevillea divaricata***, the only formerly endemic species (known only from the TYPE specimen, collected in 1823 by the renowned botanist Allan Cunningham, in the “hills north of Bathurst”), ***Euphrasia arguta***, and ***Swainsona sericea***, all three of which are now likely to be extinct in the region, if not altogether.

*Lepidium hyssopifolium* persists in the grasslands and woodlands along Hen & Chicken Lane and probably at other locations around Perthville; *Bossiaea fragrans* is known only from a small population at Abercrombie Caves; *Goodenia macbaronnii* has been reported from the big granite outcrops and slabs in the Crackerjack area.

Of the eucalyptus, **Black Gum** is known historically from the Tarana area, the **Capertee Stringybark** from the Winburndale Ranges, and **Robertson's Peppermint** from a single observation near Sunny Corner. Compared to these species the **Silver-leafed Gum** *Eucalyptus pulverulenta* is well known (12 records), from several locations around Mount Rockley.

*Persoonia marginata*, *Derwentia blakelyi* and *Euphrasia scabra* are known only from old collections, the *Persoonia* and *Derwentia* from the Winburndale Ranges, the *Euphrasia* being labelled "Bathurst" (location data has been attributed to the regional centre, rather than the actual collection location).

*Zieria obcordata* is well known locally – it is a distinctive plant, and can be seen at any time of year. Conservation Volunteers Australia have done some work with rehabilitation of sites where this species persists (principally weed work, *pers comm* John Fry).

Several extra-limital observations were included in the data set. *Asterolasia buxifolia* is known from the Blue Mountains National Park; its possible occurrence in the LGA is considered to be very low. *Zieria obcordata* also occurs near Wellington. The records for *Grevillea parviflora* and *Persoonia marginata* from Sunny Corner State Forest (outside the LGA) have a wide margin of error (10km and 5km respectively), which overlaps the edge of the LGA. For the *grevillea* the proximity of the record, and widespread and intact habitat, indicates a high potential for this species to occur in the LGA.

Interestingly **the reliability of threatened plant identifications for the region is of very high fidelity**. All species listed as occurring within the LGA, with the exception of *Euphrasia arguta*, *Goodenia macbaronnii* and *Robertson's Peppermint* (*Eucalyptus robertsonii hemisphaerica*), are backed up by voucher specimens, mostly held by the Royal Botanic Gardens in the National Herbarium.

Location data, however, is less certain. Bathurst was a popular destination for early naturalists and visitors to the colony, and many of the older records – some dating back to the 1820's, others from the early 1900's, were collected at "Bathurst", or their collection details were given only by a general description. In situations where collectors were logging their position with a sextant, locations were often recorded only to the closest minute.

Further, in assimilating specimens into modern data sets and GIS systems, location datum will have often been interpreted by a technical officer, collection assistant or similar, and ascribed to the closest Latitude / Longitude to "Bathurst". As such species in the database plotting within the city precinct (*Eucalyptus pulverulenta*, *Euphrasia scabra*, *Lepidium hyssopifolium*, *Persoonia marginata* and *Swainsona sericea*) are likely to have actually been found in the surrounding countryside, rather than in the city itself.

Accuracies for these location datum have therefore been given as 3,000m, 5,000m, 10,000m, and even 25,000m, to reflect the fact that observations / specimens may have come from some distance away from the given point. The actual location of observations / collections of many of the threatened plant remains poorly understood, and **the database does not provide accurate location details for the identified threatened plant species**.

Consideration of habitat requirements for species should inform Council about potential occurrence of the threatened plants in the region, rather than location data – **identified**

threatened plant species are in no sense considered to be limited in their distribution through the LGA, according to observation locations indicated by the data set. Further, the obscure nature of many of the “potential” threatened plants, and the small populations which can persist with some species (for example *Swainsona recta* occurs at Mandurama in a colony of only 20 or so plants – *pers obs* 2011), means it is highly likely that other as-yet undetected threatened plant species also occurred historically, and may persist in the region.

### 3.3.2 Invertebrates

“The Other 99%” is a collection of papers referring to the fact that most of the biodiverse / living environment consists of invertebrate lifeforms – 99% or thereabouts (Ponder & Lunney 1999). However very little is known about invertebrates, the Bathurst invertebrate fauna could be described as “largely unknown”, and only a single invertebrate species occurring in the region is identified as threatened, the Purple Copper Butterfly.



*Populations of the Purple Copper Butterfly have been subject to studies in the 1980's, and between 1997 and 2011.*

The HOLOTYPE for the Purple Copper was collected from “Yetholme” in 1964 by Ian Common and Murray Upton; it sat in the collection marked as “a new species of *Paralucia*” (annotation by D Sands) until 1977, at which time the CSIRO’s Ted Edwards went to Yetholme to try to find it. He did so at the “Boulder Site”, near the western terminus of Broken Bridge Road, collecting the TYPE series (60 or so butterflies) from which the species was described (in 1978).



Since then surveys targeting the butterfly have increased the number of known sites and the range of the species considerably, and it is probably one of the better known species in the region, with detailed habitat descriptions, a lot of count data (including nil data records), and an active recovery program.

### 3.3.3 Fish

Four of the five threatened fish that are predicted to occur in the regions rivers do occur; the TYPE specimen for the Trout Cod was collected at “Bathurst”.

NSW Fisheries provide recent records for the **Silver Perch**, **Murray Cod**, and **Macquarie Perch**, and anglers also know them. The Silver Perch may now be restricted to the Abercrombie River and its tributaries; the other two species persist in the deep rocky pools of the Macquarie and Turon Rivers, and their tributaries, and other major streams in the region.

The **Trout Cod** has not been reported since the 1970’s, and may be regionally extinct.

### 3.3.4 Amphibians

Three threatened frog species have been identified in the database, only two of these – the Booroolong Frog (*Litoria booroolongensis*) and the Southern Bell Frog (*Litoria raniformis*) are identifications supported by Australian Museum specimens.

Given that the time of observation and the location (White Rock / Macquarie River precinct) of many of the Green & Golden Bell Frog (*Litoria aurea*) records provided by one observer, correspond to dates and locations provided by a second observer (but identifying the Southern Bell Frog *L. raniformis*), it is likely that the Bell Frog observed along the Macquarie River floodplain was one of these species, rather than both of them. The Museum specimen from this section of the Hylidae for the region is *L. raniformis* (from Trunkey); it is most likely that the **Southern Bell Frog** occupied the river valley up until 20 or 30 years ago.

A single observation (based on a call) of the **Green and Golden Bell Frog** has been reported for Winburndale Dam — this species may have occurred in the region, however this identification remains unsupported by a voucher specimen or other corroborating evidence.

**Booroolong Frogs** are well known from collections made across the region (the Australian Museum had collected over a hundred animals up until 1986), from rocky streams including (but not limited to) the Turon River, the Fish River and its tributaries, Winburndale Rivulet and Grove Creek near the Abercrombie Caves, and the Abercrombie River (where they persist *pers comm* NPWS Ranger Jules Bros).

### 3.3.5 Reptiles

Identifications of the threatened reptiles in the database are very reliable, due to the fact that only people who have studied reptiles generally make any attempt at an identification. The low numbers of records of threatened reptiles in the database is likely to reflect not only the low numbers of animals which may comprise local populations, but also the lack of systematic / comprehensive survey that has occurred, and their naturally elusive habits.

The Murray Turtle (*Emydura macquarii macquarii*) was listed as a threatened species in 2008 when the Threatened Species database program commenced, the listing was refined to specify the Bellinger River as threatened (*E. m. signata*), but even this was de-listed in 2009, after DNA analysis revealed it lay within the clade occupying the wider Clarence and Hastings River catchments. The Murray Turtle has been left in the database as a species of concern in the region (few records — no verified records, such as museum specimens).

The **Pink-tailed Worm Lizard** (*Aprasia parapulchella*) occurs in the rocky hills between Sofala and Hill End (and probably beyond). Its secretive nature makes for rare records, however there is a museum voucher specimen, and photos of the species from various locations (pictured at Limekilns: Mjadwesch 2002).



*The Pink-tailed Worm Lizard is unmistakable*

There has been a taxonomic revision of the Tympanocryptis, with some databases still logging old *T. lineata* records, instead of updating the identification to *T. pinguicolla*. With much of the species habitat (the former Bathurst Plains – a wide open grassland) now developed or greatly modified and given to agriculture, and few records (and none recently), the **Grassland Earless Dragon** may be a local extinction.

**Rosenbergs Goanna** (*Varanus rosenbergi*) is a ground dwelling goanna that nests in termite mounds. It is not dissimilar to the more common and widespread Lace Monitor (*Varanus varius*) and it is likely that misidentifications have occurred (Rosenbergs Goanna may have been largely overlooked). Records indicate that it is associated with the dry forests of the ranges (Winburndale Nature Reserve and Hill End). A roadkill specimen has been retained in the Mjadwesch collection.

The **Pale-headed Snake** (*Hoplocephalus bitorquatus*) has been reported on two occasions, one was an animal that was brought to Barry (from Bogan Gate), the other was observed in a tree at the northern end of the study area, near Hill End. The Bathurst region represents the southern limit of this species distribution.

The Australian Museum has a voucher specimen of the **Broad-headed Snake** (*Hoplocephalus bungaroides*), collected from near Peel. Two other animals have died by misadventure in the vicinity of Wattle Flat (one as roadkill, the other deliberately killed by a person). Any population of the Broad-headed Snake which persisted locally would be **very significant**, being isolated from the stronghold for the species (the sandstones of the Sydney Basin).

The Australian Museum has a voucher specimen of the **Little Whip Snake** (*Suta flagellum*), labelled as collected at “Bathurst”; this may be a denatured location description, as the species is known to prefer rocky habitats (and it is not “rocky” in Bathurst). It has been found on a single occasion near Freemantle, however its small size and secretive habits will make observations rare, and its similarity to the regionally widespread Dwyers Snake (*Parasuta dwyeri*) will make some identifications uncertain.

### 3.3.6 Birds

There are 39 species of threatened bird known in the region; again identifications are generally very reliable, with 29 of these being supported by voucher specimens.

The Red-tailed Tropic Bird is an aberrant record for the region – this species is a coastal / seabird. One landed in the middle of town in 1991 – this was captured by the local NPWS Ranger Allan Goodwin, and was forwarded to wildlife carers on the coast.

**Blue-billed and Freckled Ducks**, and the **Australasian Bittern**, have been observed widely across the region, but rarely, generally in association with larger dams and rivers. The **Magpie Goose** has appeared during unseasonally wet periods; an early account (Governor Macquarie’s visit to the Bathurst fort in 1815) also refers to “geese”, which may have been an observation of this species.

Of the birds of prey, the **Osprey** and the **Grey Falcon** have only been observed once each, at Chifley Dam and Duramana respectively. Osprey may become more frequent visitors if Council continue to enlarge the dam; Grey Falcons are shy and elusive birds, rarely seen. A few observations of the **Square-tailed Kite**, and two records of the **Spotted Harrier**, provide that these species are also uncommon regionally.

The only raptor which seems to be relatively secure in the region is the **Little Eagle**, with numerous observations across all landforms, including recent observations, and observations of nests. Nonetheless **factors affecting the Little Eagle are operating in the LGA**, including the clearing of habitat, roadkill (a specimen has been retained in the Mjadwesch collection), and ongoing programs targeting rabbits (the eagle’s principle food source, following the loss of the native medium to small-sized ground-dwelling mammal fauna).

The open plains of the Bathurst basin were a temperate grassland prior to the advent of Europeans in the region; birds closely associated with these environments, the **Australian Bustard** and the **Plains Wanderer**, like the Grassland Earless Dragon, are almost certainly regionally extinct. The **Bush Stone Curlew** is a closely related species, but favours woodland; few records indicate that this species may be at very high risk locally.

Of the waders, the **Painted Snipe** is only referred to in a single source (Goldney and Bowie 1987), which cites their use of Chifley Dam as a “known” staging post; the Lagoon has been provided as an observation location for the **Black-tailed Godwit**; a “stunned” **Sanderling** was moved to the side of the road near Billywillinga by a passing motorist. Observations of these species are likely to be related to migratory movements. **Lesser Sand Plovers** are given as “resident” at the aerodrome, though this is a tentative identification.

The **Glossy Black Cockatoo** is strongly associated with habitat that is of very limited distribution regionally (*Allocasuarina verticillata*), as such observations of this species are rare. The **Swift Parrot** is migratory, breeding in Tasmania in spring, it is otherwise dispersive across south-east Australia; the **Little Lorikeet** is nomadic, probably occurring locally in response to food being available. The **Superb Parrot** and the **Turquoise Parrot** are likely residents for most of the year, however the Superb Parrot does contract to the northern end of its range in winter, and Turquoise Parrots are described as partially nomadic.





*Glossy Black Cockatoos are superficially similar to the much more common and widespread Yellow-tailed Black Cockatoos (which are frequently seen in Bathurst); the dark orange tail panels in the male has even seen them referred to as “Red-tailed Black Cockatoos”*

The **Gang-gang Cockatoo** is well known regionally, with the major stronghold for the species along the Great Dividing Range (Yetholme to Winburndale Nature Reserve).

**Barking Owls** occupy woodlands and forest, often even hunting in the daytime, however records for the region remain rare. In contrast the **Powerful Owl** is well known from the Winburndale range, particularly in the deep valleys associated with Winburndale Rivulet and Clear Creek – it will respond readily to call playback. In 2009 a roadkill specimen was collected near Vittoria, indicating that their range may be wider than previously thought. Observations from student studies of the species were never submitted to the Wildlife Atlas, and there remains a body of work which was not made available for the database.

“Strange screams” were heard out at Chifley Dam in the early days (the 1960’s) – the caretaker went out to find out what it was, with his shotgun. He brought back a **Masked Owl**. Other than this, the only other records for this species come from near Hill End in 2000.

**Brown Treecreepers** are frequently observed throughout the region, however they are conspicuously absent from some remnants, such as the Mount Panorama and Boundary Road Reserve units. Despite their numbers, their susceptibility to human impacts – particularly the loss of woody debris, will be contributing to their regional decline. The **Speckled Warbler** is likely to be similarly situated. The **Striated Fieldwren** may be another regionally extinct species, with only a single anecdotal reference to the species, and no details.

The **Painted Honeyeater** is the rarest of the region's honeyeaters, with very infrequent sightings around the perimeter of the former Bathurst Plains. The **Black-chinned Honeyeater** and **Regent Honeyeater** are more frequently observed, though apparently occurring seasonally. Records have come primarily from extensively wooded / remnant regions.



*Scarlet Robins are frequently observed on the high wooded ranges*

In 1973 the Australian Museum sent out various collectors, who every month or so shot a few **Scarlet Robins** and **Flame Robins** around the Yetholme / Sunny Corner region; Scarlet Robins can still be seen readily, particularly on the slopes of the high ranges. The Flame Robin has been observed less frequently, however a cat-attacked animal was received by WIRES in 2010 (it subsequently died of its injuries – see cover) on the western edge of town (the robin is given to persist in Boundary Road Reserve, though a rare sighting). Records for the **Hooded Robin** come from widely across the region.

The **Varied Sitella** occupies the forested ranges and woodlands of the plains; the **Diamond Firetail** occurs widely in grassy woodlands, with frequent sightings around locations such as Clear Creek / Limekilns, Duramana and Caloola, and even in and around Bathurst. **Gilberts Whistler** is known from a single New Atlas of Australian Birds observation (Birds Australia 2007); Specimens of the **Grey-crowned Babbler** collected in the early 1900's are the only records of this species in the region.

The White-browed Woodswallow was provisionally listed as vulnerable under the *TSCA 1995* in 2009; the NSW Scientific Committee rejected the nomination. This species has been retained in the database as a species which may be at risk.

### 3.3.7 Mammals

The **Eastern Quoll** is listed as endangered in NSW, however general consensus is that it is in fact extinct on the mainland; the **Tiger Quoll** persists in the region along the incised ravines of the Macquarie and Turon River corridors, however most records for the region are based on a remote survey (Lunney & Mathews 2001). **Brush-tailed Phascogales** prefer tall wet forests – a single observer has reported them from the Yetholme area, however they may be more widely distributed in forests along the ranges in the east of the study area.

The **Southern Brown Bandicoot** is described as formerly “abundant”; it has not been seen for 30 years, and is presumed to be locally extinct. The Rabbit-eared Bandicoot, the **Bilby**, was collected by the Australian Museum (data sets are incomplete, lacking dates and collection location details); anecdotal evidence suggests they may have persisted in the Mount Rankin area until the 1950's. This species has suffered a dramatic decline since then nationally, being only known now from small populations in central western Queensland & WA.



The **Koala** is an iconic species, with SEPP44 *Koala Habitat Protection* being legislated to provide a measure of protection for the koala and its habitat in 1995. Over 1000 records are included in the database for this single species, however 827 of these are based on radio-tracked observations of only 30 koalas in the Newbridge – Caloola region (S Cox *pers comm*), creating a false impression in the data of a population centred on this area.

78 Atlas observations from a remote survey (questionnaires posted to residents in the region – Lunney 2001), and other records of the species, show its actual distribution along the ranges from Trunkey in the south, to Rockley and Caloola, via the Rocks and Freemantle, to Hill End and beyond. Rare observations around Peel, Mount Wiagdon and Chifley Dam may link the population to the Blue Mountains / Wollemi meta-population (via Hampton, and / or the Turon corridor to the Capertee Valley).

Processes directly affecting the koala are in play in the region – rural residential development rarely considers impacts on this species, despite provisions of the SEPP. Indeed a report for a proposal at Hill End (Fanning 2008) specifically said koalas *did not* exist there, in order to try to facilitate the development, despite their presence. This may also have been the case with the Hill End gold mine, with which the same consultant was involved. In addition, Koalas are killed and injured on the regions roads, and their habitat is being destroyed (a quarry at Cow Flat apparently has approval to clear 55ha of occupied territory).



*There are roadside advisory signs at Caloola, however koalas are still injured and killed on the regions roads here and elsewhere*

Further an LEP is being prepared for the LGA; without careful consideration of this species distribution across the LGA, proposed “regional village precincts” will almost certainly have a negative impact on the koala’s long term prospects for conservation.

The **Eastern Pygmy Possum** is known only from 5 observations in the region, and not since the 1990's, however it is a small and secretive species, which may be rarely detected on account of these attributes, rather than a decline or a local extinction. The **Yellow-bellied Glider** was collected at "Bathurst" (there is an Australian Museum specimen), and may persist in the deep valleys of the Winburndale Range; the **Squirrel Glider** is known from only two observations.



*The Eastern Pygmy Possum is known from the region, it favours habitats with a thick shrub / heath component*

Of the macropods there were data deficiencies with some observations. For example Darwin describes pulling a "kangaroo rat" out of a log on his trip to Bathurst in the 1830's, but it is difficult to tell if this was a Hare Wallaby, a Bettong, a Potoroo or some other creature. Further the Abercrombie dig (Johnson 1977) provides only "Bettongia sp" for some bone fragments.

Those for which there are records include the **Rufous Bettong** (3 records only, and not seen since the 1970's), and the **Brush-tailed Rock Wallaby**, which was known from the Abercrombie excavation (Johnson 1977), and the Winburndale Range, and which may persist in the Wallaby Rocks complex on the Turon River.

**Grey-headed Flying Foxes** may be a new arrival in the region, with a major summer camp developing on the Macquarie River between Bathurst and Eglinton (a count in 2010 put their number at around 20-30K, with 50K or so Little Red Flying Foxes). If the NPWS aren't handing out permits to shoot them (the only threatened species you can legally shoot in NSW), these threatened fruit bats are being shot illegally, electrocuted, or killed and injured in barbed wire and netting. They are suffering from malnutrition generally (much of their preferred habitat has been destroyed), heat extremes are causing mass-deaths, and their long-term outlook is grim.



The **Ghost Bat** is an extra-limital observation. This species is not listed on any schedules of threatened species in NSW because they are “unknown” in the state. However there are sub-fossil records for the species across Australia, and it was included in the target species list on the basis of remains being reported in deposits in caves near Cowra (Molnar *et al* 1984) and Wellington (Dickman *et al* 1992). Descriptions of “large grey bats taking smaller bats in the lights at the showground” in the 1980’s were un-attributed by the observer, however such observations could be few other species. A subsequent observation of “large bats” at Mount Dedman (a large granite outcrop) provides a lead for further investigations into this species’ (possibly former) occurrence in the region. Granite outcrops have been identified as important for mammal conservation, including the Ghost Bat, in Western Australia (Morris 2000).

The **Yellow-bellied Sheath-tail Bat** is reported from a single unsubstantiated observation at Hill End in 2000. Since the 1990’s the advent of sonar-recording technology for bat survey has provided records for the **Large-eared Pied Bat** and the **Eastern False Pipistrelle** (which was also caught in 1996). Only a single record for the **Greater Broad-nosed Bat** and the **Eastern Cave Bat** were found; the **Large-footed Mouse-eared Myotis** (recently split from the Indonesian *Myotis adversus*) is known from a single specimen held by the Australian Museum.

The long-eared bat *Nyctophilus timoriensis* has been revised (Parnaby 2007); the form recognised in NSW / southern Queensland has been named the **South-eastern Long-eared Bat** (*Nyctophilus* Species 2).

The **Eastern Bent-wing Bat** *Miniopterus schreibersii* has been reported most frequently of the threatened bats in the region. This included observations, including trapping and sonar-recording, of a comparatively large colony in the Mammoth Mine (350 calls logged at one of the entrances), at the end of Molybdenite Road, between Yetholme and Tarana.



*As its name suggests, the Eastern Bent-wing Bat has a bent wing*

Threatened rodents which may have occurred in the region are data deficient. The Abercrombie excavation did not include identifications to species level in the Muridae; extensive lists (including the White-footed Rabbit Rat, *Pseudomys gouldii* and *P. oralis*) from the Jenolan Caves Reserve Trust (Thurgate 2000), brought together observations from Abercrombie, Borenore, Jenolan and Wombeyan Caves, however allocated these species to the Jenolan site only, which lies outside the study area.

### 3.3.8 Questionable Identifications

Several of the fauna identifications remain questionable:

The Green and Golden Bell Frog may have been confused with the Southern Bell Frog.

The Lesser Sand Plover was given by the observer as a tentative identification.

The Masked Owl and the Yellow-bellied Sheath-tail Bat observations at Hill End are both attributed to one consultant. However it would be expected that someone amongst the numerous and observant naturalists of the region would have reported a species like the Masked Owl if it persisted locally; the Yellow-bellied Sheath-tail Bat has a call similar to the White-striped Mastiff Bat (*Nyctinomus australis*) – without sonar-graphs, the Sheath-tail Bat record remains unsubstantiated.

The latest observation of the Yellow-bellied Glider (1996) was given as “uncertain”; the Squirrel Glider is superficially similar to the Sugar Glider; additional observations of this species would be required to validate this identification.

### 3.3.9 Limitations on Use

As with plant data, the fauna **records in the database do not define or limit the distribution of threatened fauna in the region** – observations provide an indication of the species one can still expect to occur in the region, if there is suitable habitat. Limiting searches or advice to species “known” from around a location will necessarily provide an inadequate assessment of threatened species issues in considering a development application, or in formulation of regional planning strategies.

Further, other threatened species may have yet to be detected, due perhaps to low numbers, a cryptic or elusive habit, or a lack of systematic / comprehensive survey in the region. **The database is not the definitive list for threatened species in the region.**

### 3.3.10 Threatened Species in the Bathurst LGA: Status Summary

Species have been grouped in the table below into “Extinct” (under schedules of TSCA 1995), “Locally Extinct” (absent > 20yrs), “Extreme Risk” (<10 records, limited distribution), “High Risk” (<10 records, wider distribution), “Moderate Risk” (10-50 records including recent records), “Low Risk” (51-100 records including recent records), and “Secure” (>100 records with recent records).

**These predictions are based solely on numbers of records, their distribution across the LGA, and whether species have been observed recently.**

Threatened Plants	Threatened Animals
<hr/>	
Extinct in NSW	
<hr/>	
<i>Euphrasia arguta</i>	Bilby

Threatened Plants	Threatened Animals
<hr/>	
Regionally Extinct	
<hr/>	
<i>Swainsona sericea</i> Black Gum ( <i>Eucalyptus aggregata</i> ) <i>Grevillea divaricata</i> <i>Grevillea parviflora</i> <i>Persoonia marginata</i> <i>Derwentia blakelyi</i> <i>Euphrasia scabra</i>	Trout Cod Green & Golden Bell Frog Southern Bell Frog Grassland Earless Dragon Pale-headed Snake Broad-headed Snake Little Whip Snake Australian Bustard Plains Wanderer Striated Field-wren Grey-crowned Babbler Eastern Quoll Southern Brown Bandicoot Rufous Bettong Ghost Bat Greater Broad-nosed Bat <i>Nyctophilus timoriensis</i> (Species 2)
<hr/>	
Extreme Risk	
<hr/>	
<i>Lepidium hyssopifolium</i> <i>Bossiaea fragrans</i> <i>Goodenia macbarronii</i> Capertee Stringybark ( <i>Eucalyptus cannonii</i> ) Robertsons Peppermint ( <i>E robertsonii hemispharica</i> )	Osprey Bush Stone-curlew Black-tailed Godwit Lesser Sand Plover Masked Owl Painted Honeyeater Gilberts Whistler Brush-tailed Phascogale Eastern Pygmy Possum Yellow-bellied Glider Squirrel Glider Brush-tailed Rock Wallaby Yellow-bellied Sheath-tail Bat Eastern Cave Bat Large-footed Mouse-eared Myotis
<hr/>	
High Risk	
<hr/>	
	Silver Perch Pink-tailed Worm Lizard Rosenbergs Goanna Blue-billed Duck Freckled Duck Australasian Bittern Square-tailed Kite Spotted Harrier Grey Falcon Glossy Black Cockatoo Swift Parrot Superb Parrot Turquoise Parrot Barking Owl Large-eared Pied Bat Eastern False Pipestrelle

Threatened Plants	Threatened Animals
Moderate Risk	
Silver-leafed Gum ( <i>Eucalyptus pulverulenta</i> ) <i>Zieria obcordata</i>	Murray Cod Macquarie Perch Booroolong Frog Little Lorikeet Powerful Owl Black-chinned Honeyeater Regent Honeyeater Varied Sitella Spotted-tailed Quoll Grey-headed Flying Fox Eastern Bent-wing Bat
Low Risk	
	Little Eagle Speckled Warbler Hooded Robin
Secure	
	Gang-gang Cockatoo Brown Thornbill Scarlet Robin Flame Robin Diamond Firetail Koala Purple Copper Butterfly

Survey targeting some species and locations could readily improve the above categorisations – for example Black Gum (*Eucalyptus aggregata*) could readily persist in the cold sub-catchments of the Meadow Flat, Sunny Corner, Dark Corner and Tarana valleys, but survey for the species has probably never occurred. Conversely species such as the Masked Owl, which rely on uncertain recent identifications, could be doing worse than indicated (the Masked Owl is probably more likely to be regionally extinct).

Further, species given as “secure” are not necessarily equally so – the Flame Robin is more at risk than the Scarlet Robin, given half the number of observations over the years. Running this analysis again in 10 years would see a lot more species categorised as regionally extinct, if no new records are forthcoming (eg: Eastern Pygmy Possum, Yellow-bellied Glider, Squirrel Glider, Brush-tailed Rock Wallaby, Eastern Cave Bat and the Myotis).

Other species have not been included in this table, as seasonal visitors, rather than resident species (Magpie Goose, Red-tailed Tropic Bird, Sanderling, Painted Snipe).

Consideration of factors such as the processes operating in the region, for example increasing densities of rural residential development, will affect any conclusion on the actual conservation status of the individual species. The Koala is an example of a species for which there are many records across a large range, however its trajectory and long term prognosis in a developing landscape may be poor.

### 3.3.11 Data Gaps

Many data sources provided numerous and important records; the original Wildlife Atlas data formed a very solid basis on which to build the regions threatened species knowledge, and the Australian Museum and the Royal Botanic Gardens provided dozens of verifiable records (which increases the likelihood that non-voucher identifications will be correct). Birds Australia provided the most comprehensive data set for a class of fauna.

Supplementing these databases with community observations and observations reported in consultant's reports and student theses expanded the number and type of observations, so that the Bathurst Threatened Species Database is likely to provide a useful account of threatened species in the region.

Nonetheless, there are certainly gaps. Some resources, such as the CSIRO's Australian National Wildlife Collection remains uncatalogued, and could not be searched by a database enquiry. Others such as the London Museum of Natural History would apply additional search fees, however as the holder of a large part of Darwin's collection, this may be a very fruitful area into which to extend the search.

A species by species inquiry of the Kew Gardens herbarium catalogue provided results for *Swainsona sericea*, *Pilularia novaehollandiae*, *Eucalypus pulverulenta* and *E. robertsonii*, and *Diuris pedunculata*, however these were either annotated only location: "Australia", or they were specimens collected from outside the study area. More information from this source, and tracking down the rest of some major botanical collections (such as by Banks and Cunningham) would almost certainly provide additional "Bathurst" specimens.

Brian Stone, a former post-graduate student with the Charles Sturt University, has never submitted his Powerful Owl observations to the Wildlife Atlas, and has withheld this data from this project also. Stone considers that he may be in a position at some stage in the future to publish this information himself (*pers comm*); thus his observations cannot at this stage be accessed to contribute to conservation of this species. Otherwise the Bathurst LGA Threatened Species Database has captured all of the pertinent data from other post-grad studies conducted by students at the University.

Many consultant's reports have provided new records for the database; results of surveys have obviously not been communicated to the NPWS Wildlife Atlas (in contravention of licensing conditions for flora / fauna practitioners). It is expected that other un-found reports by consultants who have conducted work in the region would provide more evidence of threatened species occurrence in the Bathurst LGA.

WIRES too have been operating outside of the conditions of their licence to work with / rescue wildlife. Of the thousands of rescues per year, few have been submitted to the Wildlife Atlas, and many observations of threatened species may become available in the future, if WIRES ever collate and submit their data.

Sectors of the community and other community members will be able to provide more observations. Threatened fish were rarely reported by naturalists interviewed for the database, however the "fishing" sector of the community was not targeted for survey. Anecdotal records were provided by a few individuals who fish for sport; there would be many observations of species and comments on their distribution and abundance, from these enthusiasts.

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## Section 4 – Performance, Conclusion & Recommendations

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### 4.1 Performance

A simple summary table allows a comparison of information on threatened species for the Bathurst Regional LGA “before” the Threatened Species Database (based on data in the NPWS Wildlife Atlas), compared to what is known about the region's threatened plants and animals in 2011 (based on the output from this research project).

	NPWS WA 2008/09	TS Database 2011
No. Threatened Plant Species	6	16
No. Records Plant Species	28	65
No. Threatened Invertebrate Species	1	1
No. Records Invertebrate Species	43	164
No. Threatened Fish Species	0	4
No. Records Fish Species	0	27
No. Threatened Frog Species	2	3
No. Records Frog Species	20	53
No. Threatened Reptile Species	1	6
No. Records Reptile Species	1	34
No. Threatened Bird Species	24	39
No. Records Bird Species	138	1254
No. Threatened Mammal Species	10	21
No. Records Mammal Species	978	1124
<b>Total Species</b>	<b>44</b>	<b>90</b>
<b>Total Records</b>	<b>1208</b>	<b>2721</b>

The number of threatened plant species identified as having occurred in the region, and possibly still occurring, was nearly tripled; the number of records of threatened plant species has been more than doubled.

In the fauna, a fourfold increase in the number of observations of the Purple Copper Butterfly provides a lot more information in this species' distribution; 4 species of threatened fish provide something totally new for consideration in planning and development. A six-fold increase in the number of reptile species known in the region; a doubling of data on threatened frogs, and bringing to bear consideration of possibly anomalous observations. Nearly doubling the number of threatened bird species known, with a tenfold increase in the number of data points; in the mammals a doubling of species, with (if Cox's 827 koala observations are counted as 30 animals) a seven-fold increase in the number of observations.

It bears note that since the 2008 database was compiled, the NSW Wildlife Atlas has incorporated many of the records from the original Threatened Species Database (Mjadwesch 2009) into their system. Centralisation of wildlife data into a single resource (in prep) will no doubt incorporate many of the other records from the Bathurst TS Database, as data sources are added to the database.



## **4.2 Conclusion**

The Bathurst LGA Threatened Species Database provides Council with a lot of information on a section of the flora and fauna which have occurred in the region; the diversity of species, an indication of their abundance, and whether they may be now extinct in the region, or relatively secure.

However as time passes more species will be listed on threatened species schedules, more observations of identified threatened species will be made, and processes impacting species in the region will continue to operate.

The database provides information; it will be up to Bathurst Regional Council to interpret and use this information in a way that informs long term strategic policy and land-use planning instruments to ensure that development *and* conservation objectives are balanced and sustainable.

## **4.3 Recommendations**

As the project unfolded, it became clear that it would also be a useful tool for assessing the status of individual threatened species in the region, and targeting conservation and recovery actions (and funding) to priority areas and species.

An analysis of the situation for each species will be required to identify persisting, at risk and locally extinct species. Further work will need to be based on the database and further research about each species, as well as fieldwork, and should identify priority species and programs to which funding should be directed.

## References

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- Fanning D 2008 *"Sunnyside" Proposed Property Subdivision* Whelans InSites, Sydney
- Fisher AM, Cox SJ, Windsor DM 1997 *A Flora & Fauna Survey of the Boundary Road Reserve, Bathurst* CSU, Bathurst
- Fisher AM 1997 *The distribution and abundance of avifauna in the Bathurst landscape; implications for conservation and land management* CSU, Bathurst
- Goldney DC & Bowie IJS 1987 *Scenic & Scientific Survey of the Central West Region* Mitchell College, Bathurst
- Goldney DC 1993 *Fauna Impact Statement for parts of the proposed subdivision of Brookfield, Meadow Flat* CSU, Bathurst
- Goldney DC 1994 *Fauna & Flora Studies for the Proposed Extension of a Limestone/Marble Quarry at Cow Flat & Ponsonby, Incorporating a Fauna Impact Statement on the Koala* CSU, Bathurst
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- Mjadwesch R 2000-2010 36 reports on the regions wildlife and environments (listed below)
- Molnar RE, Hall LS, Mahoney JH 1984 *New fossil localities for Macroderma in NSW, and its past and present distribution in Australia*, *Australian Mammalogy* v 7 1-116 CSIRO Publishing
- Morris KD 2000 *The value of granite outcrops for mammal conservation in Western Australia* Australian Mammalogy Royal Society for Western Australia
- NSW Parliament 1974 *Fisheries Management Act*
- NSW Parliament 1979 *Environmental Planning & Assessment Act*
- NSW Parliament 1995 *Threatened Species Conservation Act*
- NSW Parliament 1995 *State Environmental Planning Policy No. 44 – Koala Habitat Protection*
- Parnaby HE 2007 *A taxonomic review of the Australian Greater Long-eared Bat Nyctophilus timoriensis (Chiroptera: Vespertilionidae) and associated taxa* Zootaxa
- Ponder W, Lunney D 1999 *The Other 99%: The Conservation and Biodiversity of Invertebrates* Transactions of the Royal Zoological Society of New South Wales, Mosman
- Price H 1996 *Aspects of the ecology of the koala in a fragmented landscape near Bathurst* Charles Sturt University, Bathurst
- Thurgate M 2000 *List of Plant & Animal Species from Abercrombie, Borenore, Jenolan & Wombeyan caves* Jenolan Caves Karst Trust

## Appendix 1 - Threatened Species Resource Inventory

### Databases

2009	Australian Museum	Voucher specimen collection (database)
2009	Birds Australia	Bird Atlas (database)
2008	CSIRO	Vertebrate collection
2008	CSIRO	Invertebrate collection
2008	Fisheries NSW	NSW Fish (database)
2010	Kew Gardens	On-line specimen catalogue
2011	Museum Victoria	On-line specimen catalogue
2008	NSW Govt	BioNet
2009	OEH-NPWS	NSW Wildlife Atlas
2009	Royal Botanic Gardens	PlantNET

### Reference Texts

1995	Barker J, Grigg GC, Tyler MJ	<i>A Field Guide to Australian Frogs</i>	Surrey Beatty & Sons, Chipping Norton
1996	Bishop T	<i>Field Guide to the Orchids of NSW &amp; Victoria</i>	UNSW Press
2006	Bonin F, DeVaux B, Dupre A	<i>Turtles of the World</i>	A&C Black, London
2000	Braby MF	<i>Butterflies of Australia</i>	CSIRO Publishing
1999	Brooker MIH, Kleinig DA	<i>Field Guide to Eucalypts Volume 1 (SE Aust)</i>	Blooming Books
2008	Churchill S	<i>Australian Bats (2nd Edition)</i>	Allen & Unwin
2000	Cogger HG	<i>Reptiles &amp; Amphibians of Australia (6th Ed)</i>	Reed New Holland, Sydney
1999	DECC	<i>Draft Recovery Plan for the Pink-tailed Worm Lizard Aprasia parapulchella</i>	DECC-PWS, Sydney
2008	DECC	<i>TSCA 1995 schedules of threatened species, endangered ecological communities &amp;c.</i>	DECC-PWS, Sydney
2006	Dept TMS Canberra	<i>National Recovery Plan for the Grassland Earless Dragon Tympanocryptis pinguicolla.</i>	PWS-ACT
1992-2002	Harden G (Ed)	<i>Flora of New South Wales (Volumes 1-4)</i>	University NSW Press, Sydney
2006	Jones DL	<i>A Complete Guide to Orchids of Australia</i>	Reed New Holland

2001	Menkhorst P, Knight F	<i>A Field Guide to the Mammals of Australia</i>	Oxford University Press, Melbourne
2007	Pizzey G, Knight F	<i>Field Guide to the Birds of Australia</i> (8 <sup>th</sup> Ed)	Harper Collins Publishers Pty Ltd, Sydney
1995	Strahan R (Ed)	<i>The Mammals of Australia</i>	Reed New Holland, Sydney
1990	Swan G	<i>A Field Guide to the Snakes and Lizards of New South Wales</i>	Three Sisters Productions Pty Ltd, Winmalee
1996	Triggs B	<i>Tracks, Scats and Other Traces A Field Guide to Australian Mammals</i>	Oxford University Press, Melbourne
2008	Wilson S, Swan G	<i>A Complete Guide to Reptiles of Australia</i> (2 <sup>nd</sup> Ed)	New Holland

#### Literature Review – Positive Data Sources

2008	Carter Alex	Environmental Assessment: Lots 164 & 166, 581 Rivulet Rd (data based on McArtney species lists)	TREE
2005	Chaseling Tim	Sunny Corner State Forest 'Frappells Block' Flora & Fauna Survey 1997	NPA
1997	CMPS&F Environmental	EIS for the Proposed Upgrading & Augmentation of Ben Chifley Dam	CMPS&F, Chatswood
1996	Cox S, Windsor D, Goldney D	Suttors Pit Flora & Fauna Survey	CSU
1996	Cox S, Windsor D, Goldney D	A Flora & Fauna Survey for the Proposed Fish River Extractive Industry Extension	CSU
2008	DECC	2007 PCB survey results	unpublished
1997	Fisher AM, Cox SJ, Windsor DM	A Flora & Fauna Survey of the Boundary Road Reserve, Bathurst *	Environmental Studies Unit, CSU, Bathurst
1997	Fisher AM	The distribution and abundance of avifauna in the Bathurst landscape; implications for conservation and land management, CSU Bathurst	CSU
1977	Floyd RG & Waters G	Hill End species list kept at DECC HEHS site office	unpublished
1978	Goldney DC	Water for the Growth Centre - an EIS of shortlisted options	MCAE
1979	Goldney D & Pratten C	New City Flora & Fauna Study	MCAE
1987	Goldney DC Bowie IJS	Scenic & Scientific Survey of the Central West Region, Mitchell College, Bathurst	MCAE
1988	Goldney DC	handwritten notes on Freemantle NR	unpublished

1993	Goldney DC	Fauna Impact Statement for parts of the proposed subdivision of Brookfield, Meadow Flat	unpublished
1994	Goldney D & Clements A	Fauna & Flora Studies for the Proposed Extension of a Limestone / Marble Quarry at Cow Flat & Ponsonby, Incorporating a Fauna Impact Statement on the Koala	CSU
1995	Goldney DC	An FIS for five State Forests in Bathurst District & Dubbo District Forestry Areas	Environmental Studies Unit, CSU, Bathurst
2000	Goldney D & Cardale S	<i>Macquarie &amp; Campbells River; Environmental Survey &amp; Management Plan</i> (this incorporated Fisher AM: list of birds identified in surveys carried out at 6 sites along the Macquarie River (Apex Jubilee Park - Wonalabee, Gormans Hill Rd) 1998-2000)	CSU, Bathurst
1999	Herman KJ	Avian use of woodland fragments in the Bathurst landscape, CSU Bathurst	CSU
1977	Johnson I	Abercrombie Arch Shelter; and excavation near Bathurst NSW. Australian Archaeology no. 6, 28-40	Flinders University
2001	Lunney D & Mathews A	<i>The contribution of the community to defining the distribution of a vulnerable species, the spotted-tailed quoll, Dasyurus maculatus in Australian Wildlife Research</i> Volume 28, Number 5. pp. 537	CSIRO Publishing
1993	McArtney I	A preample on the history of the Winburndale Rivulet and Lagoon Creek that form the upper catchment for the Winburndale Dam	unpublished
2004	McArtney I	St Anthony's Creek - Napoleon Reef (herps, fish, some invertebrates) Species List	unpublished
2004	McArtney I	Reptiles & Amphibians of the Winburndale Dam & Environs - Species Lists and Discussion	unpublished
2000	Mjadwesch R	Purple Copper ( <i>Paralucia spinifera</i> ) Monitoring Report *	MESS
2001	Mjadwesch R	Purple Copper ( <i>Paralucia spinifera</i> ) Larvae & Ant Survey Report *	MESS
2003	Mjadwesch R	Flora / Fauna Impact Assessment (Limekilns) *	MESS
2003	Mjadwesch R	Purple Copper ( <i>Paralucia spinifera</i> ) Monitoring Report *	MESS
2005	Mjadwesch R	Fauna Survey of Mt Everndon VCA (Cow Flat) *	MESS
2005	Mjadwesch R	Integrated Property Management Plan (Cow Flat) *	MESS
2006-2007	Mjadwesch R	Biodiversity Conservation in the Wheat / Sheep Belt of NSW (contributions to database)	DEC (NSW)
2007	Mjadwesch R	Flora / Fauna Impact Assessment (Bridle Trail) *	MESS

2007	Mjadwesch R	Flora / Fauna Impact Assessment (Hill End) *	MESS
2008	Mjadwesch R	REF: Roadworks MR54 (Abercrombie) *	BRC & MESS
2008	Mjadwesch R	Flora & Fauna Survey - Boundary Road Reserve *	MESS
2009	Mjadwesch R	Vegetation Survey & Monitoring of Purple Copper Butterfly Sites	OEH & MESS
2009	Mjadwesch R	White Rock Road Conservation Assessment & Management Plan	BRC & MESS
2010	Mjadwesch R	Flora / Fauna Impact Assessment (Wattle Flat)	MESS
1998	Mullins BJ, Carden YR	Ben Chifley Dam; Flora, Fauna & Threatened Species Assessment	CSU, Wagga
1996	Price H	Aspects of the ecology of the koala in a fragmented landscape near Bathurst, CSU University	CSU
2005	Scott A	Historical Evidence of Native Fish in the Murray-Darling Basin at the Time of European Settlement - from the Diaries of the First Explorers	CRC for Freshwater Ecology
2000	Thurgate M	<i>List of Plant &amp; Animal Species from Abercrombie, Borenore, Jenolan &amp; Wombeyan caves</i>	Jenolan Caves Karst Trust
1972-1983	Waters G	unpublished notes on reptiles of the Central Tablelands	unpublished
1992-2008	Waters G	unpublished species lists for "Gundabooka" (Turon River)	unpublished

\* data submitted to Wildlife Atlas

#### Literature Review – Nil Data Sources

1982-1988	AMS (Eds)	Australian Mammalogy (journal)	Australian mammal Society
2002	Adams J	Willow Distribution	CSU
1988	Bowie IJS	The Bathurst Region: A Portfolio of Maps	MCAE
1989	Bowie IJS	The Bathurst Region: A Profile	CSU-Mitchell
1993	Bryant AG	An evaluation of the habitat characteristics of pools by platypus in the upper Macquarie River system	CSU
1994	Buchan A	Aspects of the ecology of the common wombat in a fragmented landscape, CSU Bathurst	CSU
1997	Buchan A	Living on the edge; The survival of the Brush-tailed Rock Wallaby in central eastern NSW, CSU Bathurst	CSU
1997	Buchan A, Goldney D	The Common Wombat <i>Vombatus ursinus</i> in a fragmented landscape in Wombats (Ed RT Wells & PA Pridmore) pp 301-311, Surrey	Beatty & Sons, Chipping Norton

2005	Butzer KW, Helgren DM	Livestock, Land Cover & Environmental History: The Tablelands of NSW, Australia in Annals of the Association of American Geographers,	Blackwell Publishing
No date	Cox S, Windsor D	<i>Peel Common Management Plan</i>	CSU
1995	Cox S	Co-operative breeding, habitat change and inter- specific competition; The White-winged Chough in a Magpie Dominated Landscape, CSU Bathurst	CSU
1974- 1989	CSIRO (Eds)	Australian Wildlife Research (journal)	CSIRO Publishing
1995	Cunningham G	Remnant Vegetation Management in the Ben Chifley Dam Catchment - A Prescription for the Future	Cunningham Natural Resource Consultants
1993	Cuppaidge V	Assignment 3; Flora & Fauna Management Planning	unpublished
1836	Darwin C	The Voyage of the Beagle (mentions trip to Bathurst) & letters	online
2006	DEC	Reconstructed and extant distribution of native vegetation in the central west catchment	DECC
1996	Edwards AF	A study of the germinable soil seed bank species composition and vegetation structure of eucalyptus dominated alliances within the central tablelands of NSW	CSU
1996	ERM Mitchel McCotter	Chapter 3; Winburndale Nature Reserve - 95260RP2	ERM MM
1999	Evans Shire Council	State of the Environment Report	ESC
1998	Fisher AM, Goldney DC	Native forest fragments as critical bird habitat in a softwood forest landscape in Australian Forestry Vol 61 No. 4, pp 287-295	Environmental Studies Unit, CSU
1981	Forestry Commission of NSW	Bathurst Management Plan	SF NSW
1980	Goldney DC	The flora and fauna of the Cudal-Orange-Bathurst- Meadow Flat region of the Central Western Tablelands and Slopes in the Growth Centre and Beyond, Latona & Masterman, Sydney	MCAE
1984	Goldney DC	Proposed Brewongle Pulp Mill; Resource Pack for MCAE Students, Volume 1	MCAE
1988	Goldney DC, Bowie IJS	Some management implications for the conservation of vegetation remnants and associated fauna in the central western region of NSW	MCAE

1994	Goldney D	Remnant Woodland Ecology Program in the central Western Region of NSW	Johnstone Centre of Parks, Recreation & Heritage
2001	Goldney D, Giles J, Gibbs A, Bauer J	Future Scenarios for the Sir Joseph Banks Nature Park, Mount Panorama, Bathurst	Environmental Studies Unit, CSU, Bathurst
2007	Goldney D, Fleming M, Kerle A	Vertebrate Fauna of the Central West & Lachlan CMA; their status and distribution by mapsheet	CWCMA
1977	Hannam ID, Mills JJ, Murphy BW	Urban Capability Study: MCAE - Bathurst	Soil Con
1978	Hannam ID, Emery KA, Murphy BW	Land Resources Study of the City of Bathurst	Soil Con
1995	Kamarudin S	Habitat use in a fragmented landscape: <i>Rattus fuscipes</i> & <i>Antechinus stuartii</i>	CSU, Bathurst
1984	Lawrie RA, Nott MJ	Agricultural Land Bulletin 3: Bathurst City Agricultural Land Suitability Study	Dept Ag NSW
1948	MacKanness George	Memoirs of George Suttor, FLS, Banksian Collector (1774-1859) (Australian Historical Monographs)	DS Ford, Printers
2003	Mjadwesch R	REF: Roadworks MR54 (Wattle Flat) *	BRC & MESS
2003	Mjadwesch R	Flora / Fauna Impact Assessment (Cow Flat) *	MESS
2003	Mjadwesch R	SOEE of 3 Lot Subdivision (Yetholme) *	MESS
2004	Mjadwesch R	Conservation Assessment of Tarana Quarry *	MESS
2006	Mjadwesch R	Flora / Fauna Impact Assessment (Bannockburn) *	MESS
2006	Mjadwesch R	Brooke-Moore Reserve Flora Survey *	BRC & MESS
2007	Mjadwesch R	REF: Roadworks MR54 (Wiagdon) *	BRC & MESS
2007	Mjadwesch R	Flora / Fauna Impact Assessment (Bridle Trail) *	MESS
1993	Osbourne WS, Kukolic K, Williams KD	Conservation of reptiles in lowland native grasslands in the ST of NSW & ACT; in <i>Herpetology in Australia - a diverse discipline</i> , Lunney D & Ayres D pp 151-158	Royal Zoo Soc NSW
2003	Schabel J & Moppett P	Rapid assessments of the cemetery's of Evans Shire	
No date	Semple WS	Native Shrubs & Low Trees of the Bathurst Granites	unpublished
1974	Soil Conservation Service NSW	Bathurst District Technical Manual	Soil Con



No date	Stone B, Goldney D	<i>The integration of remote sensing, geographical information systems and field methods to model remnant woodland and forest sustainability across land systems</i>	Environmental Studies Unit, CSU, Bathurst
No date	Wakefield S	Riparian Understorey Mapping	database
1994	Weal D	Plant Materials III; Major Assignment - A study of vegetation types of a portion of Winburndale Nature Reserve	CSU
1995	Windsor D	Peel Common Vegetation Survey	CSU
1998	Windsor DM	A landscape approach to optimise recruitment of woodland species in an intensive agricultural environment in the central tablelands of NSW	CSU
2004	Windsor DM, Bloomfield C, Goldney (Eds)	Ecological Status & Restoration of Degraded Riparian Zones in the Upper Macquarie River Catchment, Faculty of Rural Management, U Syd	CSU
2004	Windsor G & Windsor J	Preliminary Native Plant List; Freemantle Rd (east of Mt Rankin Rd intersection)	unpublished
2004	Windsor G & Windsor J	Preliminary Plant List; Mt Rankin Rd	unpublished
2004	Windsor G & Windsor J	Preliminary Native Plant List; Peel Rd (Bathurst - Winburndale Rivulet)	unpublished
2004	Windsor G & Windsor J	Preliminary Plant List; Sawpit Creek	unpublished
2004	Windsor G & Windsor J	Preliminary Plant List; Mount Panorama (inside track)	unpublished
2004	Windsor G & Windsor J	Blue Wren Bush Nursery; stock available based on Bathurst granites according to Clunies-Ross	unpublished
2004	Windsor G & Windsor J	Shrubs of the Bathurst batholith (Steve Burrows)	unpublished
2004	Windsor G & Windsor J	Native & Naturalised Shrubs of the Bathurst Granites (Bill Semple)	unpublished plant species list
1990	Witchard	Freemantle NR species list (plants)	unpublished

\* data submitted to Wildlife Atlas

#### Papers Relevant to Study Area – Not Found

1963	Bland J	List of mammals species within proposed Gulf Stream - Winburndale - Mt Horrible Wildlife Refuge	unpublished
1902	Cabbage RH	Notes on the botany of the interior of NSW. VII from Forbes to Bathurst	Proc Linn Soc NSW 27: 561-593

1898	Clunies-Ross WJ	Notes on the flora of Bathurst and its connection with the geology of the district	Aust Assoc Adv Sci 1898 pp 467
1976	Disney WJ, Stokes A	Birds in pine and native forest	Emu 76:133-138
1963a	Ingram CK	Flora of Mount Horrible in Wildlife Preservation Society Austral newsletter: pp 6-10	unpublished
1963b	Ingram CK	Introductory notes on the flora of the Bathurst region	unpublished
1963c	Ingram CK	Preliminary list of the flora of the Bathurst/Oberon/Jenolan/Portland area	unpublished
1963d	Ingram CK	Preliminary list of the flora of the Gulf Stream area, Ovens Rd, Bathurst	unpublished
1970	Ingram CK, Whitehead B	Orchid flora of the central west, NSW	The Orchardian 3 (11) 1-19
1999	Jones SR	Conservation Biology of the Pink-tailed Legless Lizard <i>Aprasia parapulchella</i> , unpublished thesis	University of Canberra
1968	McArtney I	Reptiles and Amphibians of the Bathurst district in Australian Zoology XIV (3): 265-267	CSIRO Publishing
No date	Suttor G	Fauna of the Bathurst Region	Royal Society in London

### Positive Community Responses

26 responses from interested community members provided various types and numbers of observations.

Observer		Observer	
Archer, Jason	Reptiles	Medd, Richard	Plants
Benson, Peter	Koala (Bathampton)	Moses, Derek	Barking Owl (Cow Flat)
Bergen, Helen	WIRES data	Porter, Gavin	Some Fauna
Bland, Ashley	Some Fauna	Porter, Robert	All Fauna
Bland, Dale	All Fauna	Raine, Primrose	Birds (Peel)
Braithwaite, John	Tiger Quoll (Northjack)	Roebuck, Tim	Powerful Owl (Forest Grove)
Goldney, David	All Fauna	Sibera, Dana	Flame Robin (WIRES)
Gray, Andrew	Koala (Chifley Dam)	Thompson, Ross	Birds (Duramana)
King, Hugh	Silver-leafed Gum	Van Emmerik, Gregor	Some Fauna
Lewis, Clare	Koala (Mt Fitz)	Waters, Gavin	All Fauna
Marshall, Chris	Birds (BRR list)	Waters, Kerry	Koala (Crudine)

Mason, Tiffany	Birds	Whyte, Richard	Birds (BRR list)
McArtney, Ian	All Fauna	Windsor, Geoff	Plants

Further contacts in the fishing community (Murphy P, Van Emmerik G), herpetology (Carter P) and other naturalists (eg: Fry J, Little J, Bauer J), as well as land-holders (eg: Suttor family and McSpeddon G) provided anecdotes, but still require formal interview for incorporation of observations into the database. Other unidentified community members will almost certainly be able to provide additional observations.

#### Literature: Surrounding Regions

Literature pertaining to environmental / wildlife studies and research regionally (and outside of the study area) provided a range of species and observations which were considered in compiling target / predicted species lists for the Bathurst threatened species data set.

1995	Bauer J, Goldney D	<i>Restoration and Sustainable Use of Degraded Farmland</i>	Johnstone Centre of Parks, Recreation & heritage
2000	Beard J, Goldney D	<i>Assessment of the Potential for Rowing and Other Recreational Activities on Spring Creek Reservoir, Orange City</i>	Cenwest Environmental Services
1993	Bulinski J	The distribution, behaviour and ecology of the Brush-tailed Rock Wallaby, CSU Bathurst	CSU
2003	Central West Environmental Services	Flora & Fauna Assessment - White Granite Quarry, Oberon	CWES
1996	Cox S, Windsor D, Goldney D	A Flora & Fauna Survey for the Proposed Orange-Mudgee Roadway at Dixons Long Point	CSU
1996	Cox S, Goldney DC	A Report on the Conservation Values of Rodds Creek	CSU
1995	Date EM, Paull DC	Final Report for the Fauna Survey of the Northwest Cypress/Ironbark Belt of NSW	SF NSW
1995	Date EM, Paull DC	DRAFT Fauna Impact Statement - Proposed Forestry Operations in the Northwest Cypress & Ironbark Area of NSW	SF NSW
1992	Dickman CR, Pressey RL, Lim L, Parnaby HE	Mammals of Particular Conservation Concern in the Western Division of NSW	School of Biological Science, University of Sydney
1995	Fisher AM, Goldney DC	Fauna Survey; Cadia Hill	CSU
1995	Goldney D, Stone B, Windsor D, Bryant A	Stage 1 - Discussion Paper for Developing a Long Term Revegetation Strategy for the Walli Limestone Landcare Catchment Area	CSU
1995	Goldney D Stone B	Flora & Fauna Study; "Genaren" via Peak Hill	CSU

1995	Goldney DC	Fauna Survey of the Cypress Forests of South-west NSW	Forestry NSW
2000	Grant TR	Ridgeway Mine Water Supply Project: Assessment of the Occurrence of Platypuses in the belubula River & Flyers Creek	Grant
1974	Hamilton-Smith E	The present knowledge of Australian Chiroptera	Australian Mammal Society
1997	Medd RW, Bower CC, Kenna JI	Flora & Fauna Survey of Ophir Reserve	Orange Field Naturalist & Conservation Society Inc. Orange
2001	Mjadwesch R	Mount Werong Biodiversity Survey	OEH & MESS
2002	Mjadwesch R	Fauna Survey & Habitat Assessment (Cowra)	USyd & MESS
2003	Mjadwesch R	Baseline Fauna Survey (Belgravia)	USyd & MESS
2004	Mjadwesch R	Conservation Assessments of 13 TSR's	MESS
2008	Mjadwesch R	Borenore Caves – Vegetation Assessment I	OEH & MESS
2008	Mjadwesch R	Roadside Conservation Assessments (Burrendong Way & Cobbora Road)	WSC & MESS
2009	Mjadwesch R	Jenolan Fauna Survey	MESS
2009	Mjadwesch R	Borenore Caves – Vegetation Assessment II	OEH & MESS
2009	Mjadwesch R	Flora / Fauna Impact Assessment (Kanimbla Valley)	MESS
2009	Mjadwesch R	Summit Redevelopment: Mount Canobolas SRA	OEH & MESS
2010	Mjadwesch R	Buttercup Double-tail – Lesser Known Sites: Survey & Management (Taralga – Goulburn)	MESS & Lachlan CMA
2010	Mjadwesch R	Flora / Fauna Impacts Assessment - Jenolan Caves Powerline Upgrade	MESS
2010	Mjadwesch R	Buttercup Double-tail Survey (Gurnang)	MESS
2011	Mjadwesch R	Flora Survey – Jenolan Additions to Kanangra-Boyd National Park	OEH & MESS
2011	Mjadwesch R	Flora / Fauna / Habitat Assessment – Maiyingu marragu (Lidsdale – Newnes Plateau)	MESS
1984	Molnar RE, Hall LS, Mahoney JH	New fossil localities for Macroderma in NSW, and its past and present distribution in Australia, Australian Mammalogy v 7 1-116	CSIRO Publishing
2005	Paton L	Neville Forest Project Report	Lisa Paton
2004	Windsor G & Windsor J	Plants in the Ophir Reserve; Box Woodland & Cemetery	unpublished plant species list

Journals of early visitors to the region, including Evans (1813), Blaxland (1813), Macquarie (1815), Oxley (1817-1818) and Mitchell (1836 and 1839) were also reviewed; these contained many references to species, including some now listed as threatened species, however nothing which could be included as “data” for the database.