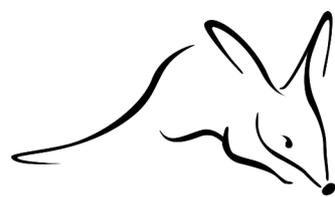


# Wongalara Wildlife Sanctuary Ecohealth Report 2021



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## Summary

Australian Wildlife Conservancy (AWC) has implemented an Ecological Health Monitoring Program (Ecohealth) across Wongalara Wildlife Sanctuary to measure the changes in the status and trend of conservation assets, and threats to those assets. Metrics from the program are reported in annual Ecohealth Reports and Scorecards. This is the Ecohealth Report for 2021. Values of metrics derived in this report were based on data collected during surveys carried out between 2020 and 2021. The complete set of metrics and their values are summarised in the accompanying Ecohealth Scorecard.

In implementing the Ecohealth program in 2021, AWC undertook a comprehensive camera trap survey of 80 sites in lowland savanna and riparian habitats across Wongalara and collected incidental observations throughout the year. Over 2,300 camera trap nights were undertaken which detected 41 species of native vertebrates (including 13 mammals; 5 reptiles; 21 birds and 2 frogs) and 7 introduced vertebrates. Camera traps also detected macropods, Dingoes (*Canis dingo*), cattle (*Bos taurus*), feral cats (*Felis catus*) and introduced black rats (*Rattus rattus*) and cane toads (*Rhinella marina*).

When combined with incidental observations made on the sanctuary in 2020 and 2021, a total of 17 mammals, 85 birds, 22 reptiles, and 15 frogs were detected, comprising 47% of all species thought to exist on Wongalara. One of these, the Gouldian Finch (*Chloebia gouldiae*), is a nationally listed threatened species (Endangered) and two (Merten's Water Monitor, *Varanus mertensi*; and Mitchell's Water Monitor, *Varanus mitchelli*) are listed as Vulnerable in the Northern Territory. This is the first time Mitchell's Water Monitor has been detected on Wongalara, as populations of both monitor species declined considerably after the arrival of cane toads between 1995–2000. Incidental observations from sanctuary ecologist and managers provide ongoing information on a range of significant species across the property (such as those listed as Near Threatened in the Northern Territory). These include large birds such as Australian Bustard (*Ardeotis australis*), Bush Stone-curlew (*Burhinus grallarius*) and Emu (*Dromaius novaehollandiae*).

Recent climatic variability is likely to strongly affect detectability and habitat occupancy of many species. The 2020–21 wet season rainfall was above average, and the first wet year following failed wet seasons in 2018–19 and 2019–20. The Northern Brown Bandicoot (*Isodon macrourus*) was detected for the first time in 3 years despite targeted surveys in 2019 and 2020. Northern Brushtail Possum (*Trichosurus vulpecula arnhemensis*) activity was also higher in the reporting year than in the previous dry years. Contrary to this pattern, Gouldian Finches and Hooded Parrots (*Psephotellus dissimilis*) were found in larger numbers in the prior dry years likely because of regional seasonal availability of water and food resources rather than a true decline in population. Both of these bird species can range widely and in dry conditions are concentrated on smaller areas of remaining surface water.

In 2021, a Small-medium Mammal Camera Survey was conducted: Small-medium mammals were present at 19% of sites and macropods of four species were present at 40% of sites, with Agile Wallabies (*Macropus agilis*; activity metric of  $5.3 \pm 1.5/100$  trap nights) and Northern Nailtail Wallabies (*Onychogalea unguifera*;  $1.27 \pm 0.5/100$  trap nights) the most common. Dingoes were present at 11.3% of all sites. At Wongalara, small-medium mammal numbers are low, likely as a result of decades of decline across northern Australia, with small increases in populations (and detectability) after wetter than average wet seasons which generate more ground cover and food resources.

This survey data was also used to report on feral animal status. Feral cats were widespread across the savanna at 18.8% of sites, which is a decrease in occupancy from 2020, although at a higher activity (0.21 in 2020 compared to 3.4 in 2021). At time of reporting 17 individual cats had been identified from camera trap images. Black rats were detected at 10% of all sites. Cane toads are ubiquitous across the landscape, detected at 47.5% of all sites surveyed.

Active fire management began in 2009. Since then, the extent of late dry season fires has been substantially reduced, with 28% of the sanctuary being impacted by late dry season fires before 2008 vs 8 % in 2021. Fire management has also reduced distances to unburnt vegetation from within fire scars, which are important features that offer refuge and resources to wildlife. These results highlight the success of AWC's fire management strategy.

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Document citation: Mulder E, Watson A, Diете R, Wauchope M, Pierson J, Joseph L, Kanowski J (2022) Wongalara Ecohealth Report for 2021. Australian Wildlife Conservancy, Perth, WA.

## Introduction

Australian Wildlife Conservancy (AWC) currently owns, manages, or works in partnerships across 31 properties in Australia, covering almost 6.5 million hectares, to implement our mission: *the effective conservation of Australian wildlife and their habitats*. AWC relies on information provided by an integrated program of monitoring and research to measure progress in meeting its mission and to improve conservation outcomes.

AWC's Ecohealth Monitoring Program has been designed to measure and report on the status and trends of species, ecological processes and threats on each of these properties (Kanowski et al. 2018). Data from the monitoring program are used to address the following broad questions relevant to our mission:

- 'are species persisting on a property?'
- 'are habitats being maintained?'
- 'are threats below ecologically-significant thresholds?'

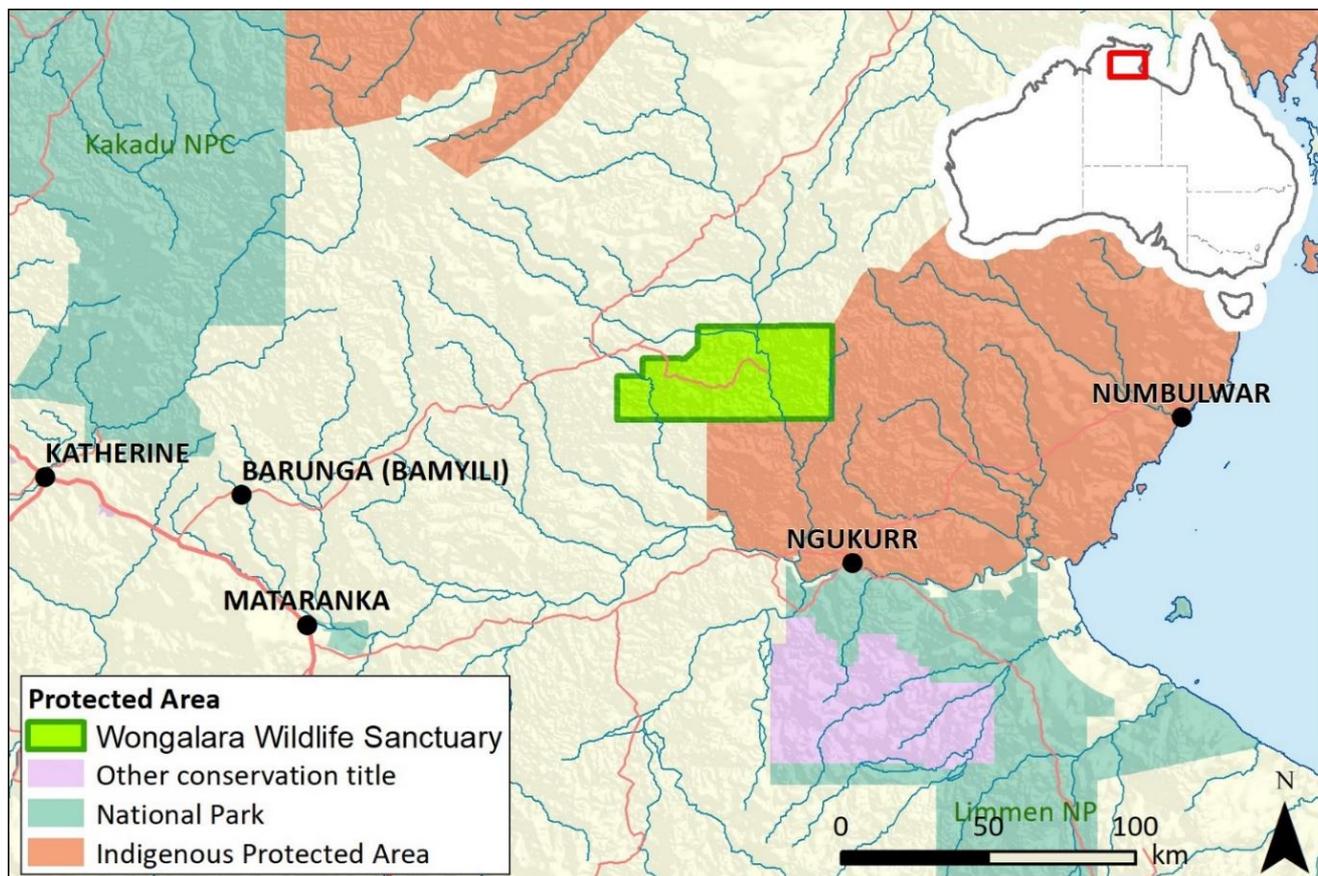
For threatened and iconic species, including reintroduced species, AWC's monitoring program aims to obtain more detailed information related to their conservation management; for example, data on survival, recruitment, condition, distribution and/or population size.

The structure of the Ecohealth Program is as follows. AWC's Monitoring and Evaluation framework provides guidance on the development of the Ecohealth Monitoring Plans for each property managed by AWC: these plans describe the conservation values and assets of each property, the threats to these assets, and the monitoring program that will be used to track their status and trend, and to evaluate outcomes. Annual survey plans and schedules are developed to implement these plans. The outcomes of these surveys are presented in annual Ecohealth Reports and summary Ecohealth Scorecards.

This document is one of a series of annual Ecohealth Reports for Wongalara Wildlife Sanctuary (referred to here as Wongalara). The companion Ecohealth Scorecard presents the indicators and their metrics in a summary format.

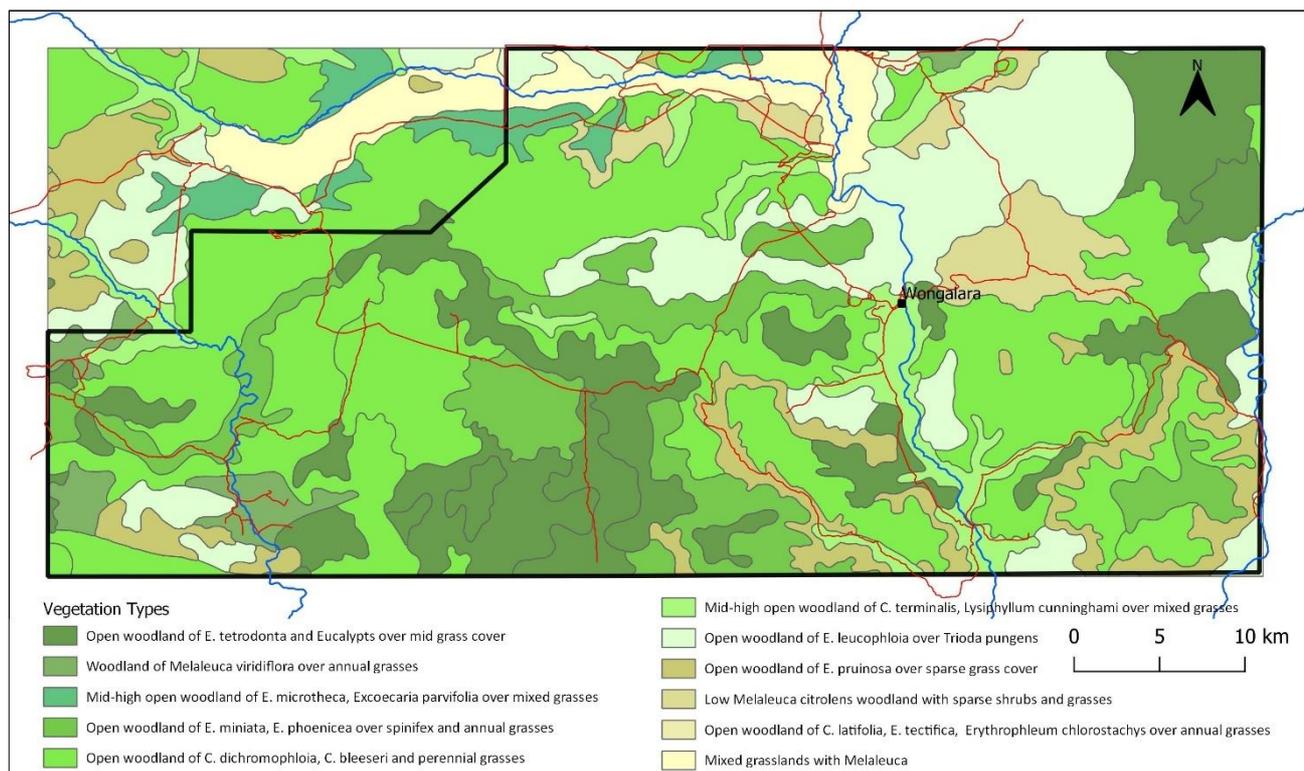
## Wongalara Wildlife Sanctuary

Covering over 190,000 hectares on the southern edge of Arnhem Land, Wongalara is situated in the 'Gulf Fall and Uplands' Bioregion. Wongalara is within the traditional lands of the Ngalagkan and Rembarrgna people. The property is divided by three major drainage systems; from north to south by the Wilton River, along the north-western floodplain by the Mainoru River, and in the central/south-western region by the Jalboi River (Figure 1).



**Figure 1. Location and regional context of Wongalara.**

The centre of the sanctuary is dominated by a deeply dissected sandstone plateau that supports the most southerly occurrence of Arnhem Land sandstone ecosystems. Soils on Wongalara include alluvial and coarse-textured loams, red earths/red clayey loams and sands. The ecosystems on Wongalara form an intricate and complex pattern, with fine-scale variation and numerous refugial habitats for wildlife. Wetlands, sandstone communities and patches of monsoon rainforest and heathland, alongside blacksoil plains and alluvial flats, provide a contrast to the drier, spinifex-clad ranges and sandstone plateaus that dominate much of the sanctuary. A range of soil types support diverse eucalypt and acacia-dominated woodlands (Figure 2). Shallow soils carry stringybark, woollybutt and acacia scrub with spinifex, annual sorghums and spear grass; whereas the valley floors carry silver box (*Eucalyptus pruinosa*), bloodwood, ti-tree, quinine (*Petalostigma* spp.), bauhinia (*Lysiphyllum cunninghamii*), coolibah and paperbarks. Snappy gum (*E. leucophloia*) and lancewood (*Acacia shirleyi*) are found on escarpment edges. The sanctuary has over 560 plant species recorded, including many rare species and plants endemic to the Top End of the Northern Territory.



**Figure 2. Extent and distribution of broad vegetation types of Wongalara.**

The diversity of habitats on Wongalara and its location on the edge of Arnhem Land and the Gulf bioregions make it a hotspot for Top End wildlife including endemic species such as the Hooded Parrot (*Psephotellus dissimilis*). At reporting, 296 native vertebrates have been confirmed; 31 mammals, 167 birds, 76 reptiles and 18 amphibians, with another 70 very likely or likely to occur. Wongalara is home to 5 threatened and multiple declining species including the Gouldian Finch (*Chloebia gouldiae*), Orange Leaf-nosed Bat (*Rhinonicteris aurantia*), Spectacled Hare-wallaby (*Lagorchestes conspicillatus leichardti*), Northern Brown Bandicoot (*Isodon macrourus*), Emu (*Dromaius novaehollandiae*), Australian Bustard (*Ardeotis australis*), Merten's and Mitchell's Water Monitors (*Varanus mertensi* and *V. mitchelli*) and the Northern Brushtail Possum (*Trichosurus vulpecula arnhemensis*).

The mammal fauna includes a suite of macropods including Wilkins' Rock-wallaby (*Petrogale wilkinsi*), Agile Wallaby (*Macropus agilis*), Northern Nailtail Wallaby (*Onychogalea unguifera*), Common Wallaroo (*Macropus robustus*) and Antilopine Wallaroo (*Macropus antilopinus*). This is in addition to smaller marsupials and native rodents including Long-tailed Planigale (*Planigale ingrami*) and Grassland Melomys (*Melomys burtoni*). Rock Ringtail Possums (*Petropseudes dahli*) inhabit the isolated rocky outcrops and sheltered spring areas support Water Rats (*Hydromys chrysogaster*) and Rufous Owls (*Ninox rufa*).

With over 55 kilometres of two major rivers – the Wilton and the Mainoru – the property is home to both Saltwater (*Crocodylus porosus*) and Freshwater Crocodiles (*Crocodylus johnstoni*), at least one unidentified shark species (most likely Bull Sharks, *Carcharhinus leucas*), turtles, water monitors and a large number of freshwater fish species.

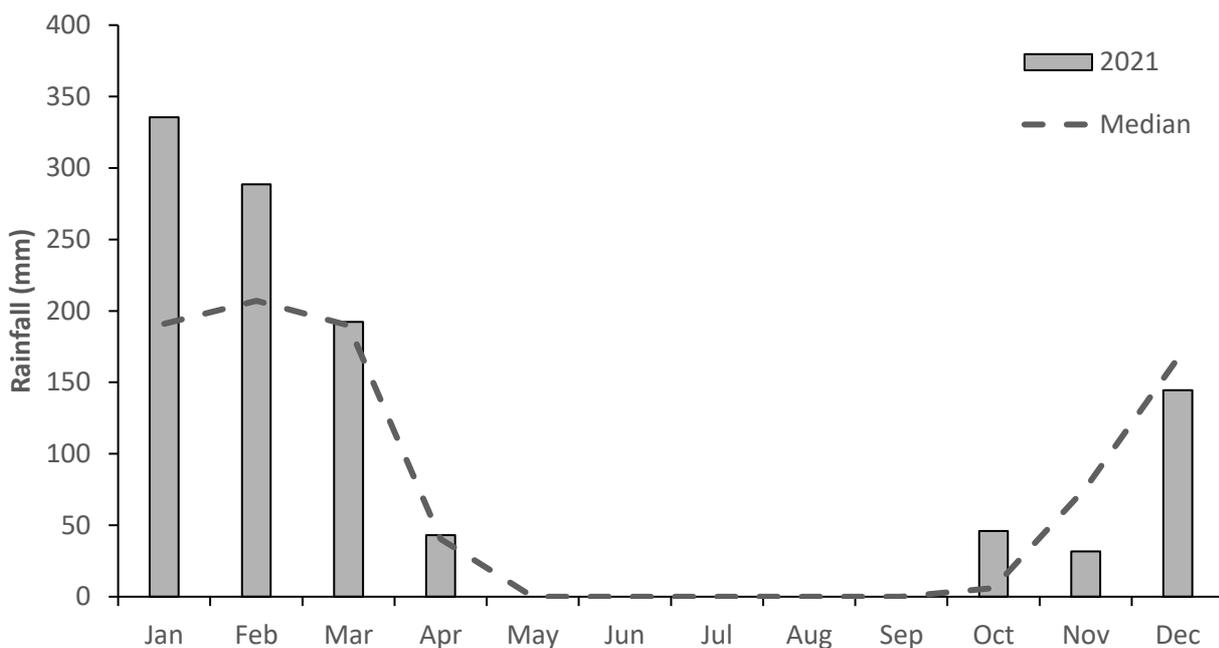
In 2012, AWC established a large feral herbivore-exclusion fenced area on Wongalara, the largest on mainland Australia at the time. The fenced area has a perimeter of 160 km of fencing enclosing 100,000 ha of the sanctuary. Over one thousand feral herbivores were removed from inside the fence. A similar exclusion at Mornington-Marion Downs Wildlife Sanctuary, together with appropriate fire management, has resulted in a significant increase in the population of small-medium sized mammals (Legge et al. 2019). An increase in ground cover and the recovery of riparian habitats within the exclusion area should provide additional food and cover for small mammals. Outside the fenced area, feral herbivore densities are generally low, although management is needed to control ongoing re-invasion from surrounding properties.

## Climate and weather summary

Wongalara is within the 650–1,200 mm annual rainfall zone of the monsoonal wet-dry tropics of central northern Northern Territory (Bureau of Meteorology 2022a). Rembarrnga people describe seven distinct seasons (Mimal Land Management 2021, pers. comm.). These seven seasons are:

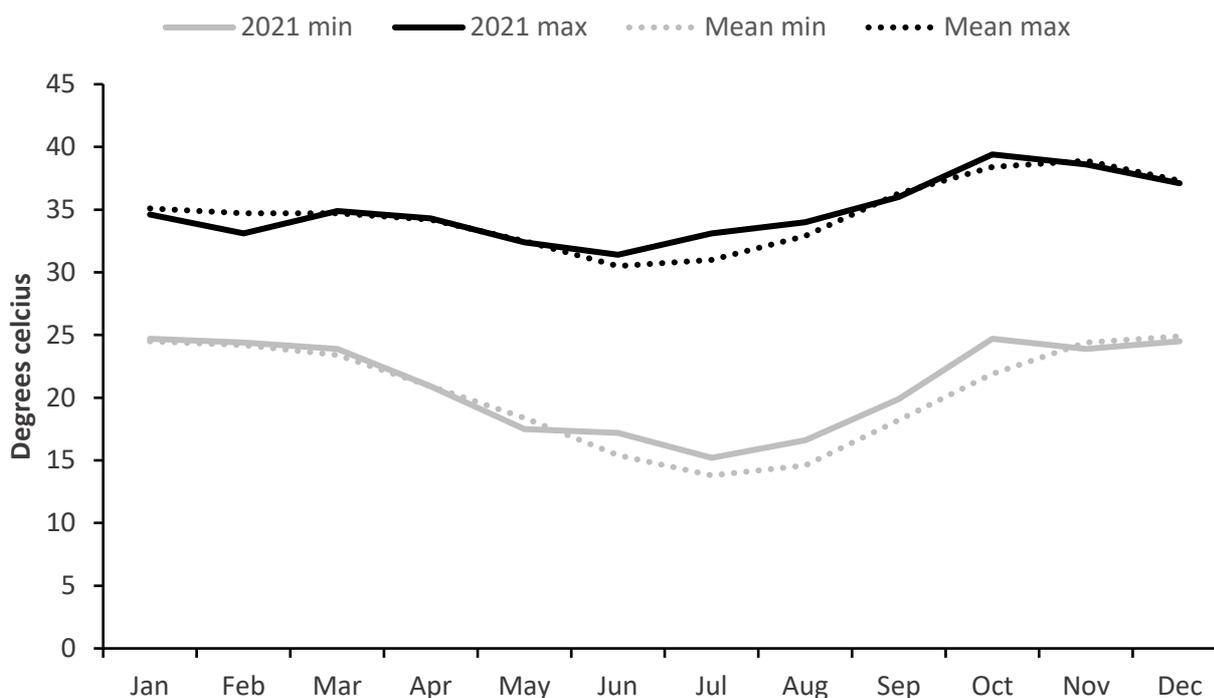
- **Juwalkka** January into March: Wet season
- **Wularri** March and April: Knock ‘em down
- **Marlawurru** end April to July: Cool season
- **Warlirr** August to mid-September: Hot season
- **Warlirr bultjjarn** late September and October: Middle of the hot season
- **Ga ngol-gaba** October and November: Build-up clouds
- **Gepjalk** December: New growth.

Rainfall records for Wongalara have been collected since 1999, but there are gaps in the series. Only 8 years have complete records, and the totals in these ranged from 411 to 1,257 mm (annual median 876 mm). In 2021, rainfall was above the median (Figure 3): 1082 mm compared to the annual median of 876 mm. While 2019 and 2020 rainfall were well below the median, 2021 was the wettest year since 2000, with most rain falling in January and February (335 mm and 289 mm respectively; Figure 3).



**Figure 3. Monthly rainfall from 2021 compared with the median monthly rainfall, 1999–2021.** Data sourced from Bureau of Meteorology 2022b, Wongalara Station Number 14602, with additions from Chris Whatley (Wongalara Sanctuary Manager).

Temperature data are taken from the Bulman weather station, approximately 55 km north of Wongalara. This station has collected temperature data since 2002, although some years have incomplete data. The 2021 mean maximum temperature was 0.1°C higher than average (Figure 4). Minimum temperatures were 0.5°C above average.



**Figure 4. Mean monthly minimum and maximum temperatures in 2021 compared with averages 2002–2021 (Bulman, weather station number 14627; Bureau of Meteorology 2022c, 2022d).**

## Methods

### Monitoring and evaluation framework

Wongalara’s Ecohealth Monitoring Program has been designed to measure and report on the status and trends of selected biodiversity and threat indicators on the property, using metrics derived from data collected through a series of purpose-designed surveys. Where possible, outcomes will be evaluated against performance criteria relevant to each species, guild or assemblage.

### Key threatened and iconic vertebrates

The Ecohealth program is focused on species of high conservation value, including threatened and ‘iconic’ species (e.g., regional endemics, species with high public profile and other species of conservation importance because of the role they play in an ecosystem, etc). Where relevant, reintroduced species are also in this category. AWC will aim to develop *Conservation Plans* for the extant threatened and iconic species to ensure early detection of any serious issues that arise and to trigger timely responses. These plans will specify metrics to monitor outcomes for target species against nominated performance criteria.

### Vertebrate assemblages and surveillance species

AWC’s mission involves the conservation of all wildlife, not only threatened or reintroduced species. For this reason, AWC’s monitoring program extends to surveillance monitoring of faunal assemblages (mammals, birds, reptiles, frogs). The monitoring program aims to address questions relevant to the conservation of assemblages.

At the most basic level, the program seeks to establish whether all species that are known to occur on the property are persisting on the property (i.e., ‘are all species present?’).

With increasing information, the monitoring program can address more detailed questions relating to conservation of assemblages, such as ‘have species maintained their distributions or abundance?’ However, the boom/ bust conditions of most Australian environments can lead to large variations in the numbers of individuals in a population and the habitats or sites occupied by a species – these variations may not necessarily be informative in relation to the conservation of a species at a property over the long term.

AWC is currently working on developing an evaluation framework for surveillance monitoring of faunal assemblages. At present, we will continue to present data on a range of metrics relating to indicator species and guilds.

## Indicators and metrics

On Wongalara 36 biodiversity (species and guilds) indicators have been selected for monitoring (Table 1) of which 24 are reported on in 2021.

Threat metrics are selected to monitor the status and trends of weeds, introduced predators and herbivores, and fire regimes. Nine threat indicators have been selected for monitoring (Table 2) and five are reported on in 2021.

**Table 1. Biodiversity indicators and metrics for Wongalara.**

### Key threatened and iconic vertebrates

Indicator	Survey name	Survey method	Metric/s
<b>Mammals</b>			
Northern Brown Bandicoot, dunggah ( <i>Isoodon macrourus</i> )	Small-medium Mammal Camera Survey	Camera trapping	Activity, occupancy
Northern Brushtail Possum, rduh ( <i>Trichosurus vulpecula arnhemensis</i> )	Small-medium Mammal Camera Survey	Camera trapping	Activity, occupancy
<b>Birds</b>			
Gouldian Finch, gurluwitjwitj ( <i>Chloebia gouldiae</i> )	Targeted Bird Survey in 2020	Waterhole count	Abundance, occupancy
Hooded Parrot, mardabulbara ( <i>Psephotellus dissimilis</i> )	Targeted Bird Survey in 2020	Waterhole count	Abundance, occupancy
<b>Reptiles</b>			
Merten's Water Monitor ( <i>Varanus mertensi</i> )	Small-medium Mammal Camera Survey	Camera trapping	Occupancy
Mitchell's Water Monitor ( <i>Varanus mitchelli</i> )	Small-medium Mammal Camera Survey	Camera trapping	Occupancy

### Vertebrate assemblages and surveillance species

Indicator	Survey name	Survey method	Metric/s
<b>Mammals</b>			
Assemblage richness	All mammal surveys	Compilation of all records	Number of species
<b>Small-medium mammals – savanna and riparian</b>			
Assemblage richness	Small-medium Mammal Camera Survey, Spring and Riparian Camera Survey	Camera trapping	Number of species
Small-medium mammal – savanna and riparian guild	Small-medium Mammal Camera Survey	Camera trapping	Richness, Activity
Delicate Mouse ( <i>Pseudomys delicatulus</i> )	Small-medium Mammal Camera Survey	Camera trapping	Activity, occupancy
Water Rat ( <i>Hydromys chrysogaster</i> )	Spring and Riparian Camera Survey	Camera trapping	Activity, occupancy
<b>Small-medium mammals – rocky habitat</b>			
Assemblage richness	Rocky Area Camera Survey	Camera trapping	Number of species
Small-medium mammal – rocky habitat guild	Rocky Area Camera Survey	Camera trapping	Richness, Activity
Rock Ringtail Possum, jorrkkun ( <i>Petropseudes dahli</i> )	Rocky Area Camera Survey	Camera trapping	Activity, occupancy
Wilkins' Rock-wallaby, garndawulh ( <i>Petrogale wilkinsi</i> )	Rocky Area Camera Survey	Camera trapping	Activity, occupancy

Indicator	Survey name	Survey method	Metric/s
Common Rock-rat ( <i>Zyomys argurus</i> )	Rocky Area Camera Survey	Camera trapping	Activity, occupancy
Short-beaked Echidna, battahyi ( <i>Tachyglossus aculeatus</i> )	Rocky Area Camera Survey	Camera trapping	Activity, occupancy
<b>Bats</b>			
Assemblage richness	Opportunistic Surveys Incidental Records	Compilation of all records	Number of species
<b>Macropods</b>			
Assemblage richness	Small-medium Mammal Camera Survey, Spotlighting, Incidental Records	Camera trapping, observation	Number of species, occupancy
Macropod guild	Small-medium Mammal Camera Survey, Spectacled Hare-wallaby Camera Survey	Camera trapping	Richness, Activity
Spectacled Hare-wallaby ( <i>Lagorchestes conspicillatus</i> )	Small-medium Mammal Camera Survey, Spectacled Hare-wallaby Camera Survey	Camera trapping	Activity, occupancy
Agile Wallaby ( <i>Macropus agilis</i> )	Small-medium Mammal Camera Survey	Camera trapping	Activity, occupancy
Northern Nailtail Wallaby, wurlarla ( <i>Onychogalea unguifera</i> )	Small-medium Mammal Camera Survey	Camera trapping	Activity, occupancy
<b>Predators</b>			
Dingo ( <i>Canis dingo</i> )	Small-medium Mammal Camera survey, Rocky Area Camera Survey	Camera trapping	Activity, occupancy
<b>Birds</b>			
Assemblage richness	All surveys and incidental records	Compilation of all records	Number of species
Red-backed Fairy-wren ( <i>Malurus melanocephalus</i> )	Savanna Bird Survey	Call playback	Occupancy
Rufous Whistler ( <i>Pachycephala rufiventris</i> )	Savanna Bird Survey	Call playback	Occupancy
Grey-crowned Babbler ( <i>Pomatostomus temporalis</i> )	Savanna Bird Survey	Call playback	Occupancy
Striated Pardalote ( <i>Pardalotus striatus</i> )	Savanna Bird Survey	Call playback	Occupancy
Australian Bustard ( <i>Ardeotis australis</i> )	Bustard Survey, Incidental Records	TBD	TBD
Buff-sided Robin ( <i>Poecilodryas cerviniventris</i> )	BSR Call Playback Survey	Call playback	Occupancy
<b>Reptiles</b>			
Assemblage richness	Reptile Trapping Survey, Incidental Records, Spotlighting	Compilation of all records	Number of species
<b>Small-medium reptiles – savanna</b>			
Assemblage richness	Reptile Trapping Survey, Incidental Records, Spotlighting	Compilation of all records	Number of species
Small-medium savanna reptile guild	Reptile Trapping Survey	Pitfall and funnel trapping	Abundance, occupancy, richness
<b>Large reptiles – savanna</b>			
Assemblage richness	Small-medium Mammal Camera Survey, Incidental Records, Spotlighting	Camera trapping, observation	Number of species
<b>Frogs</b>			
Assemblage richness	Wet Season Opportunistic Surveys	Compilation of all records	Number of species

**Table 2. Threat indicators and metrics for Wongalara.**

Indicator	Survey name/methods	Metric	Performance criteria
<b>Pest animals – predators</b>			
Feral cat ( <i>Felis catus</i> )	Small-medium Mammal Camera Survey, Rocky Area Camera Survey	Activity Occupancy	TBD
<b>Pest animals – large feral herbivores</b>			
Large feral herbivores	Aerial Feral Herbivore Survey	Density (head / km), population/density estimate (head / ha)	TBD
Feral cattle ( <i>Bos taurus</i> )	Aerial Feral Herbivore Survey	Density (head / km), population/density estimate (head / ha)	TBD
Swamp buffalo ( <i>Bubalus bubalis</i> )	Aerial Feral Herbivore Survey	Density (head / km), population/density estimate (head / ha)	TBD
Feral donkeys ( <i>Equus asinus</i> )	Aerial Feral Herbivore Survey	Density (head / km), population/density estimate (head / ha)	TBD
<b>Pest animals – other</b>			
Feral pigs ( <i>Sus scrofa</i> )	Small-medium Mammal Camera Survey, Aerial Feral Herbivore Survey	Activity Occupancy	TBD
Black rat ( <i>Rattus rattus</i> )	Small-medium Mammal Camera Survey, Rocky Area Camera Survey	Activity Occupancy	TBD
Cane toads ( <i>Rhinella marina</i> )	Small-medium Mammal Camera Survey, Spring and Riparian Camera Survey	Activity Occupancy	TBD
<b>Fire</b>			
Fire	Fire Scar Analysis	Early dry season fire extent, late dry season fire extent (1 year and 3 years), distance to unburnt vegetation.	Area burned by late season fires

## Survey types and history

To report on the Biodiversity and Threat Indicators, our survey teams conduct a variety of surveys repeated on a schedule of 1–5 years, as required to obtain timely information on each indicator. These include:

For threatened and iconic species, a range of targeted surveys including:

- Small-medium Mammal Camera Survey
- Rocky Area Camera Survey
- Waterhole Bird Survey
- Spring and Riparian Camera Survey

For surveillance monitoring of assemblages, these include:

- Small-medium Mammal Camera Survey
- Reptile Trapping Survey
- Rocky Area Camera Survey
- Spectacled Hare-wallaby Survey

- Targeted Bird Survey (Red-backed Fairy-wren, Rufous Whistler)
- Spotlighting
- Opportunistic Frog Surveys
- Incidental Records

To monitor threats, a range of surveys are used, including:

- Spring and Riparian Camera Survey
- Rocky Area Camera Survey
- Small-medium Mammal Camera Survey
- Aerial Feral Herbivore Survey
- Fire Scar Analysis

One of the ecological surveys was conducted at Wongalara in 2021: Small-medium Mammal Camera Survey (Table 3). The results for one of the surveys undertaken in 2020 (Waterhole Bird Survey) are also presented in this report. The Fire Scar Analysis was completed using satellite data from 1999 (eight years prior to acquisition) to 2021. The methodology is described and results of these surveys and computations are reported on here.

**Table 3. Survey effort for Ecohealth surveys on Wongalara presented in this report.**

Survey name	Effort (2021)	Description/comment	Previous surveys
Small-medium Mammal Camera Survey	2,080 camera trap nights	80 sites, 2 cameras per site, minimum 13 nights.	2020 – 34 sites, 2 cameras per site, 21-54 nights, 1,477 camera trap nights
Waterhole Bird Survey	-	2-hour point counts with observers at independent waterholes for concurrent 2 hr surveys.	2020 – 30 point counts

## Survey design and methods

### Small-medium Mammal Camera Survey

The major component of ecological health monitoring in 2021 was a sanctuary-wide camera trap survey targeting small and medium-sized mammal species. These mammals have historically been surveyed through live trapping (e.g. pitfall and small aluminium box traps). Captures have historically been extremely low, often with less than 10 individual mammals captured per survey of approximately 3,000 trap nights (AWC, unpublished data). Using camera traps allows us to spread survey effort more broadly across the sanctuary for a longer detection period.

The Small-medium Mammal Camera Survey was conducted in September and early October 2021 in two rounds with cameras collected and redeployed at a second set of sites (Figure 5). Two cameras were placed at each site, in the north-east and south-west corners of a 1 ha plot to detect small and medium-sized mammals, macropods and dingoes (*Canis dingo*). The cameras were left in place for a minimum of 13 nights.

Reconyx Hyperfire HP2W white flash camera traps were baited with a mixture of peanut butter, oats, vanilla and sardines, in a canister and attached to stable trees or star pickets with bungee cords. Both cameras were set 70 cm from the ground and angled to capture the bait container placed 150 cm away (Figure 6). The camera traps were pre-set to the following customised settings: Motion pictures were turned on, three pictures per trigger, 'Rapidfire' picture interval, a 'NO DELAY' quiet period and 'high' sensitivity.

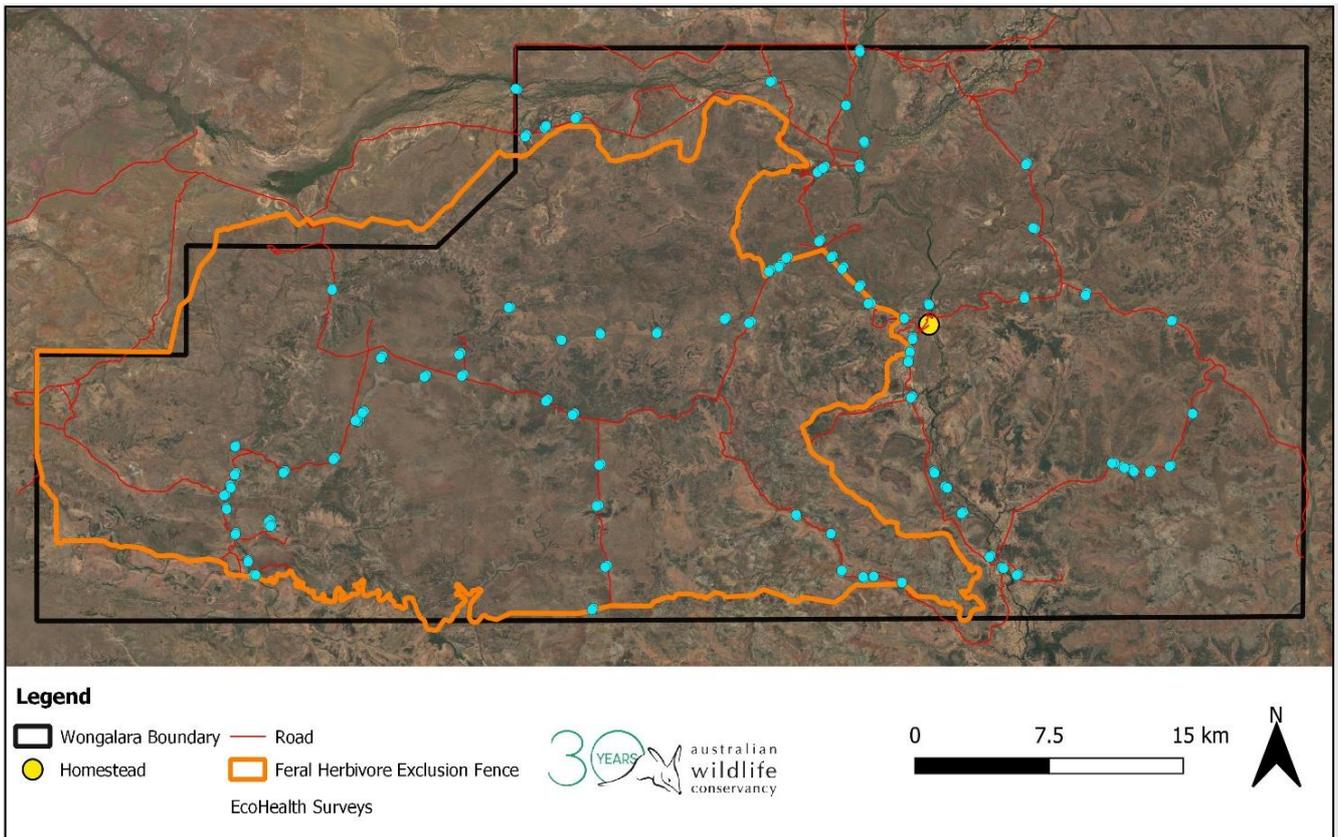


Figure 5. Locations of camera traps for the Small-medium Mammal Camera Survey.

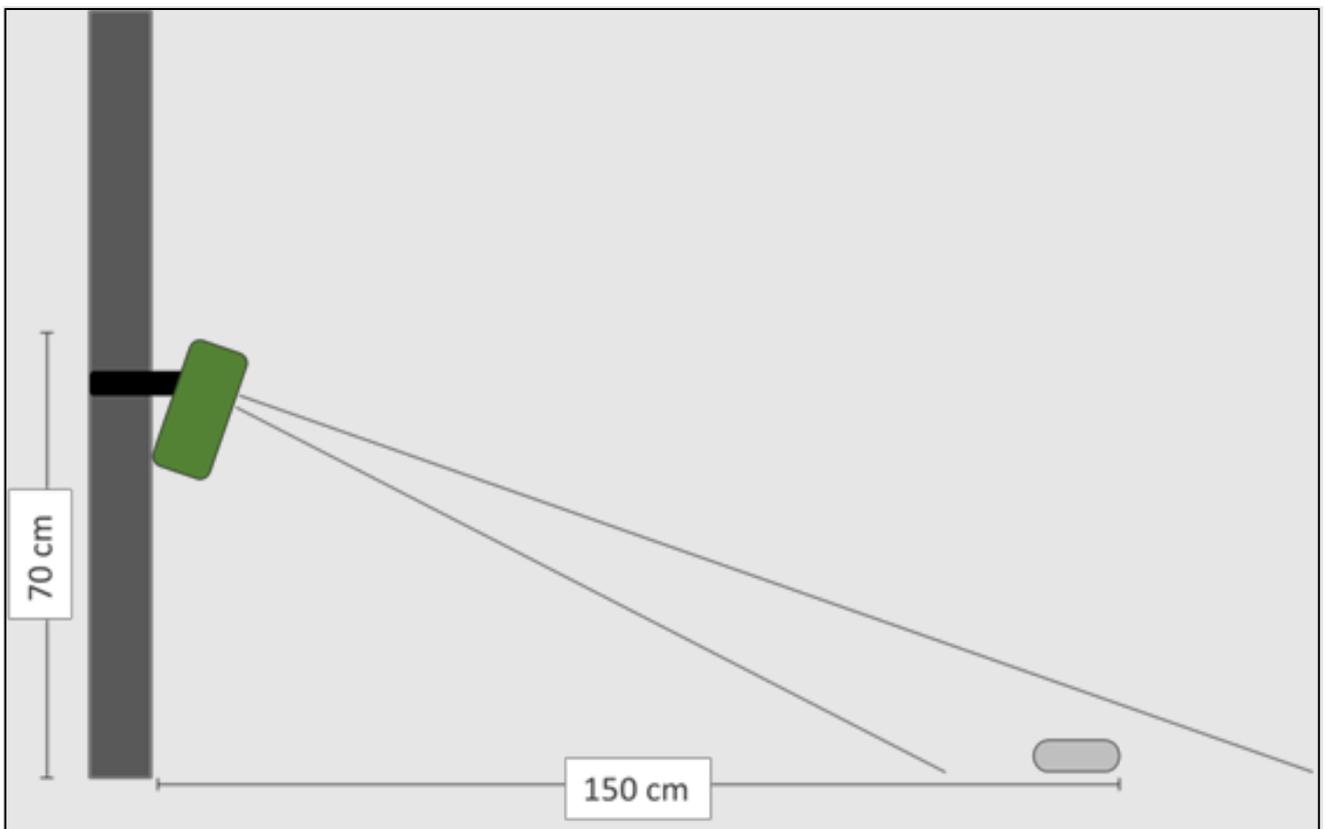


Figure 6. Configuration of camera traps for the Small-medium Mammal Camera Survey.

## Waterhole Bird Survey

In 2020, two indicator species, the Hooded Parrot and the Gouldian Finch, were surveyed at waterholes. A total of 30 waterholes were surveyed for these species using a two-hour observational survey between 5.45–7.45 am. This survey has been conducted annually for 2 years in 2019 and 2020 in October/November (late dry season). Exact waterhole locations and sampling effort changes from year to year due to water availability, suitable drinking holes, and logistical constraints (e.g. access).

## Analysis methods

Most Ecohealth metrics are common across the indicator species for Wongalara. Unless noted otherwise, the metrics are calculated as set out in Table 4.

For the purpose of the reporting, species and sites are assigned to one (or more) of the following guilds: savanna and riparian woodland (savanna) and rocky gorges (rocky). This requires that all sites surveyed, and all species reported on, are correctly assigned to a particular guild (or guilds) prior to undertaking these calculations. The full lists of the species guilds to which they have been assigned for the purposes of metrics calculations are included with the sanctuary species list (Appendix 1).

**Table 4. Metrics and associated calculations for Wongalara.**

Indicator	Metric	Survey data sources	Description	Analysis summary/calculation
Assemblage richness	Number of species	All surveys and incidental records	A measure of intactness for the whole sanctuary	The number of species detected on the sanctuary within the last 2 years is compared to the number of species listed as 'confirmed', 'very likely' or 'likely' on the sanctuary species list.
Various	Abundance/activity	Small-medium Mammal Camera Survey Waterhole Bird Survey	<p>A measure of activity, either number of detections per 100 trap nights, or per site Where, 'number of detections' is individuals captured for live trapping data; and independent 'visits' for camera traps.</p> <p>In a sequence of images of a single species, a single camera 'visit' is defined as occurring when there is at least a 12 hour period between the species' first capture and subsequent image, unless otherwise stated.</p> <p>For targeted bird surveys, abundance is the average number of individuals recorded per site.</p>	<p><b>Per 100 trap nights:</b> <u>For individual species:</u> Calculate the average over all survey sites of: ((No. individuals of that species recorded at survey site/ total number of trap night at survey site) x 100)</p> <p><u>For guilds:</u> Calculate the average of: ((Total no. individuals of the guild recorded at each survey site/ total number of trap night at each survey site) x 100)</p> <p>Here, trap nights are only included where a trap type targets the indicator appropriately. For example, funnel trap nights are excluded for small to medium-sized mammals, and cage and Elliott traps are excluded for small reptiles.</p>

Indicator	Metric	Survey data sources	Description	Analysis summary/calculation
Mammals, reptiles, birds	Occupancy	Small-medium Mammal Camera Survey	A measure of distribution; the proportion of sites where the species was recorded using a particular technique	For individual species: (Number of sites at which the species was recorded/ number of sites surveyed) [x 100 if reporting as a %]  For guilds: (Number of sites at which any species within the relevant guild was recorded/ number of sites surveyed) [x 100 if reporting as a %]  <i>Note that animals identifiable to guilds, but not to species are included in guild occupancy and abundance and are not included in species richness or number of species counts.</i>
Mammals, reptiles, birds	Richness	Small-medium Mammal Camera survey	A measure of diversity; average number of species per site	Average number of species recorded at each site

### Small-medium Mammal Camera Survey

Camera data were downloaded and categorised as “animal present” or “animal absent” using the Artificial Intelligence (AI) software (Microsoft Azure and Postman). Once categorised, images with animals present were uploaded into the program ‘Timelapse’ (Greenberg et al. 2019) and animals were identified to species level where possible. A file containing all species captures was exported from Timelapse into Microsoft Excel and activity, occupancy and richness metrics were calculated as per Table 4.

Same-species detections within a 12-hour period were removed (i.e. one record of a species per 12-hour period per camera was retained). Records that occurred after the set period of deployment for that set of sites were excluded (e.g. any records on day 14 or later were excluded when the set deployment time was 13 nights). For sites with multiple cameras, data from multiple cameras were pooled.

The activity and occupancy metrics were then calculated as described in Table 4.

### Fire Scar Analysis

Fire scar data were derived from Landsat satellite imagery, and in later years supplemented by Sentinel-2 satellite imagery. ‘Hotspot’ data from the North Australian Fire Information (NAFI) website were used to help identify the month of the fire when the Landsat satellite imagery interval extended across two months. Each scar was attributed by year, month and season. Fire scars detected from January to July (inclusive) were attributed as ‘Early’, whereas those detected August to December were attributed as ‘Late’. For each year, unburnt areas were created by erasing the recorded fires from the entire boundary area. The maps and statistics for the analyses were created using ArcGIS (Environmental System Research Institute Inc., Redlands, CA, USA) with Spatial Analyst, and were semi-automated using Python scripting. Graphs were produced using Microsoft Excel. Detailed methods are provided in Webb et al. (2021).

## Results

### Key threatened and iconic vertebrates

#### Northern Brown Bandicoot

In 2021, Northern Brown Bandicoots were detected at five of 80 (6.3%) sites and had an activity metric of  $1.65 \pm 0.9$  individuals/100 trap nights. This is the first time bandicoots have been detected at Wongalara since 2018 when one individual was caught in 280 traps nights (occupancy 2.1%, abundance  $0.02 \pm 0.02$  individuals/100 trap nights), despite targeted cage trapping (2019) and camera trap surveys (2020), likely due to a number of very dry years between 2019 and 2021, and the increased number of sites in riparian areas surveyed in 2021.

#### Northern Brushtail Possum

Northern Brushtail Possums were detected at four locations in 2021 across 80 sites (occupancy of 5%), the same as occupancy from 37 sites surveyed in 2020. The average activity of Northern Brushtail Possums in 2021 ( $2.75 \pm 2.18$  individuals/100 trap nights) was higher than 2020 ( $0.19 \pm 0.1$  individuals/100 trap nights). Brushtail Possums likely persist in low numbers at Wongalara, at riparian sites with mature hollow-bearing trees and diverse mid-storey vegetation.

#### Gouldian Finch

The 2020 Waterhole Bird Surveys results showed Gouldian Finches detected at 2 of 30 sites surveyed, giving an occupancy of 6.7%. In total 15 individuals were observed resulting in an abundance of  $0.27 \pm 0.17$  birds per site. In comparison, Gouldian Finches were far more abundant in 2019 when 119 individuals were observed and they were recorded at four of 18 sites (occupancy 22%). This difference is due to the highly nomadic nature of Gouldian Finches and the regional seasonal availability of water and food resources.

#### Hooded Parrot

Hooded Parrots were detected at 5 sites (occupancy 16.7%) spread across Kangaroo Valley and the northern Wilton River and associated drainage during 2020 surveys. A total of 121 individuals were observed resulting in an average abundance of 4 birds per site. During 2019 waterhole surveys, Hooded Parrots were detected at five of 18 sites (occupancy 16.7%), with 37 individuals seen (abundance  $4.0 \pm 3.0$  individuals/site). Hooded parrots are also regularly sighted incidentally across the sanctuary, usually at water points or in association with their preferred nesting habitat.

#### Merten's Water Monitor

Merten's Water Monitor is listed as Vulnerable in the Northern Territory and was detected on camera trap at Wongalara in 2021 with an occupancy of 1.3%. Merten's Water Monitor was sighted by staff at Wongalara at one location in 2020, and one location in 2019.

#### Mitchell's Water Monitor

Mitchell's Water Monitor is listed as Vulnerable in the Northern Territory and Critically Endangered under the IUCN criteria of the Lizard and Snake Action Plan (Chapple et al. 2019). It was detected for the first time at one site on Wongalara in 2021, as an incidental record from the Small-medium Mammal Camera Survey (occupancy of 1.3%).

### Vertebrate assemblages and surveillance species

#### Mammals

In 2020–21, 23 species of mammal were recorded from 33 species known or likely to occur on Wongalara. We recorded 2 arboreal mammals, 7 of 13 bats, 6 of 11 small-medium sized mammals (savanna and riparian guild), 3 of 3 small-medium sized mammals (rocky habitat guild), and 5 of the 6 macropods. The 7 bats and 5 small-medium sized mammals (savanna and riparian guild) that have not been detected in the past two years are all microbats and small rodents and dasyurids which would require more targeted surveys to detect. The 1

missing macropod was the Spectacled Hare-wallabies that occurs in very low density across northern Australia (see section below).

### ***Small-medium mammals – savanna and riparian***

Six of 11 species of savanna and riparian small mammals were detected, with this guild having an overall occupancy of 19% and an activity of  $3.4 \pm 1.1/100$  trap nights. The average number of small-medium mammals per site (richness) was  $0.2 \pm 0.05$ . This was the first year of an extensive camera trap survey for this guild.

#### ***Delicate mouse***

One of the most commonly detected small mammals at Wongalara, Delicate Mice (*Pseudomys delicatulus*) were detected at 3.8% of sites with an activity of  $0.82 \pm 0.48$ . The species was not detected in 2020 and further data is required to detect trends.

#### ***Water Rat***

Water Rats were detected at 5% of sites with an activity of  $0.72 \pm 0.38$ . This species is restricted to riparian habitats and is usually detected on camera traps in the course of other surveys. The species was not detected in 2020 and further data is required to detect trends.

### ***Small-medium mammals – rocky habitat***

In 2020, all three species were detected of those known or likely to occur on Wongalara within this assemblage.

No surveys were conducted for this guild in 2021.

### **Bats**

During 2020-21 six of 13 confirmed and likely bat species were detected through targeted surveys and incidental records. Bats were only detected through some incidental harp trapping in limited habitats using one methods, thus precluding detection of high-flying and obligate cave-dwelling species.

### **Macropods**

Four macropod species were detected in the 2021 Small-medium Mammal Camera Survey, with site richness of  $0.5 \pm 0.09$  species per site, and activity of  $9.0 \pm 1.7$ . It is important to note the 2021 survey covered different areas of the sanctuary to 2020 and didn't include rocky areas, where Common Wallaroos were most common that year. Below, we report on three indicator species from 2021 surveys.

#### ***Spectacled Hare-wallaby***

Spectacled Hare-wallabies were not detected on cameras in 2021 and further targeted survey work is needed to understand the ecology and appropriate monitoring methods for this species. They were incidentally recorded at one site during 2020 camera trap surveys.

#### ***Agile Wallaby***

In 2021, Agile Wallabies were the most common species recorded (occupancy 18.8%, activity  $5.0 \pm 1.5$ ). They are widespread across Wongalara and commonly detected on camera trap. In 2020 they were detected at 16% of sites and activity of  $0.4 \pm 0.2$ . Populations appear stable across the sanctuary.

#### ***Northern Nailtail Wallaby***

Camera trap surveys revealed Northern Nailtail Wallabies had an 8.9% occupancy of all sites, with an activity of  $1.27 \pm 0.5$ . This makes them the second most common macropod species recorded in 2021. Occupancy at 34 sites surveyed in 2020 was 16% with an activity of  $0.75 \pm 0.4$ . This higher occupancy is likely to have been recorded as most sites surveyed in 2020 were in open savanna preferred by this species.

### **Dingo**

In 2021, Dingo were detected at 11.3% of sites with an activity of  $2.77 \pm 1.3$ . This species was not detected in savanna on Wongalara in 2020 due to drought conditions.

## Birds

Of the 165 species known from Wongalara (from sightings and surveys 2007–2021) 85 species were recorded in the last 2 years; 50% of the total inventory. The species recorded were skewed towards larger, easy to observe diurnal species. Missing species included those which visit during the wet season when fewer incidental records are collected and those which require dedicated survey effort in various habitats. The last comprehensive dry season savanna bird surveys were conducted in 2014.

## Reptiles

Reptile assemblage data was compiled from all incidental records from 2020 and 2021 in combination with a small number of records of large reptiles, such as Eastern Blue-tongued Skink (*Tiliqua scincoides*), from camera traps. Of the 77 species known to occur on Wongalara, 22 were recorded in 2020 and 2021.

The last comprehensive live trapping survey targeting reptiles was conducted in 2018 so the majority of species missing from the current assemblage are small, cryptic, fossorial and nocturnal. This group will be surveyed in 2022. Despite no comprehensive surveys, camera trap and incidental records provided data on large reptiles in savanna habitats, which are not surveyed in any other way. It was found that 14 of 22 (64%) of the species in this assemblage were detected using these methods.

## Frogs

Frog records are compiled from opportunistic wet season acoustic and spotlight surveys combined with incidental observation. This is a successful surveillance monitoring method, with 15 of 18 known frogs recorded in 2020–2021. The three missing species are two burrowing frogs and a toadlet, all of which have short periods of activity around first wet season storms and are found in habitats difficult to access during the wet season.

## Threat indicators

### Feral cats

Feral cats (*Felis catus*) in savanna habitats were detected at an occupancy of 18.8% and activity of  $3.4 \pm 0.97$  (Table 5). This was a higher activity level with a comparable occupancy to the 2020 result for savanna habitats, noting that fewer (34) sites were surveyed in 2020 compared to 80 sites in 2021. The rocky habitat was last surveyed in 2020 and during this survey cat occupancy was 33% and activity was  $0.21 \pm 0.09$  for this habitat.

**Table 5: Feral Cat metrics for Wongalara for 2020 and 2021.**

Indicator	Metric	2020	2021	Performance/comments
<b>Feral predators</b>				
Feral cat - savanna	Activity Occupancy	$0.6 \pm 0.2$ 22%	$3.4 \pm 0.97$ 18.8%	↑ Higher activity and comparable occupancy to 2020, broader area of sanctuary surveyed in 2021.
Feral cats - rocky	Activity Occupancy	$0.21 \pm 0.09$ 33%	N/A	Next surveyed again in 2022-23 wet season

### Pest animals – other

Black rats (*Rattus rattus*) were detected at 10% of sites with an activity of  $4.35 \pm 2.1$  (Table 6). Cane toads were widespread at 47.5% of all 80 sites with activity of  $33.2 \pm 8.7$  (Table 6). Cane toads (*Rhinella marina*) arrived at Wongalara from 1995–2000 (Shine 2010) and are usually detected at all but the driest savanna sites. Feral pigs (*Sus scrofa*) were detected at 11.3% of sites, concentrated around riparian sites as would be expected. Activity was  $17.6 \pm 13.6$ , the large SE due to varying group sizes with some groups having up to 10 piglets.

**Table 6: Metrics for pigs, black rat and cane toad on Wongalara in 2021.**

Indicator	Metric	Current value	Year	Performance/comments
<b>Pest animals – other</b>				
Pigs	Activity Occupancy	17.6 11.3%	2021	
Black rat	Activity Occupancy	4.35 10%	2021	
Cane toads	Activity Occupancy	33.2 47.5%	2021	

## Fire

During 2021, ground-based and aerial prescribed burning was conducted by the Wongalara Sanctuary Manager. All 2021 metrics indicate improvements considered to be beneficial for ecological health since the commencement of AWC fire management (Table 7). The area burnt in 2021 early dry season prescribed burns was 5% less than 2020 and the mean distance to unburnt and long-unburnt vegetation has decreased substantially compared to baseline values. The first late dry season fire in seven years was ignited by lightning in 2021, burning 8% of the sanctuary.

**Table 7. Fire metrics for Wongalara for 2021.**

Metric	Baseline average	AWC average	2021 result	Trend (AWC vs baseline)	Trend (2021 vs baseline)
Area burnt by early dry season (EDS) fire (%)	9	20	15	↑	↑
Area burnt by late dry season (LDS) fire (%)	28	3	8	↓	↓
Cumulative extent burnt by LDS fire in past 3 years (%)	65	9	8	↓	↓
Mean distance to unburnt vegetation (km)	1.5	0.6	0.6	↓	↓
Mean distance to vegetation unburnt by LDS fire for 3 or more years (km)	1.8	0.6	0.6	↓	↓

### Notes:

**Baseline** values for metrics are the average for the years immediately prior to acquisition of Wongalara by AWC: i.e., 2000–2007, for annual metrics, and 2002–2007, for 3 year metrics.

**AWC management** values for metrics are the average for the years following acquisition of Wongalara by AWC: i.e., 2008 onwards, for annual metrics, and 2010 onwards, for 3 year metrics.

**Trend:** change in metric compared with baseline, considering (i) average across AWC management; (ii) current year. Change in magnitude shown by arrows: increase ↑, no change ↔, reduction ↓.

Inferred consequences for ecological health depicted by colour: improving in green (e.g., ↑ or ↓, depending on the metric); deteriorating in red (e.g., ↑ or ↓); no change, or if the change cannot be interpreted in terms of ecological health, in black. (↔, ↑ or ↓).

## Discussion

The largest camera trap survey to date in savanna and riparian habitats on Wongalara was conducted in 2021. This provided monitoring data for all the small-medium savanna mammals and macropods, including those nominated for specific monitoring including Northern Brushtail Possum and Northern Brown Bandicoot. Threat metrics for pigs, cane toads and black rats were also generated from these data.

Northern Brown Bandicoots are detected intermittently in very low numbers at Wongalara and are often not detected for a number of years. These gaps in the data correspond with periods of dry conditions across the property such as those experienced in 2018–2020, suggesting that bandicoot numbers are too low to detect during those times. As we develop more targeted surveys, our understanding of the dynamics of this species at Wongalara will improve.

The Northern Brushtail Possum has declined across much of its range in northern Australia, especially the more semi-arid parts, and was recently listed as Vulnerable by the Australian Government (2020). They are

reliant on mature tree hollows and a well-developed shrub density for protection from feral cat predation (Stobo-Wilson et al. 2019). Northern Brushtail Possums persist at a small number of sites at Wongalara, currently all associated with riparian vegetation with mature River Redgums (*Eucalyptus camaldulensis*) and shrubby understorey.

Both the Endangered Gouldian Finch and the Northern Territory endemic Hooded Parrot were systematically surveyed through waterhole counts in the late dry season in 2020. More birds of both species were observed in late 2019 during heatwave conditions across much of the top end Northern Territory (Bureau of Meteorology 2022c) which could indicate that birds were more reliant on whatever remaining water was available. These birds may have then been dispersed across a broader area of the sanctuary (and regionally) with more water available away from survey areas. Both species were also observed incidentally through 2019, 2020 and 2021, indicating that Wongalara continues to provide important habitat for these species.

Continued detection of Merten's Water Monitor and the first record of Mitchell's Water Monitor are encouraging signs given the ubiquitous presence of cane toads in riparian areas across the property. Cane toads were the cause of a sharp decline in both these species across northern Australia and has resulted in them both being listed as Critically Endangered in the Lizard and Snake Action Plan (Chapple et al. 2019). Continued removal of large feral herbivores and pigs assists with maintaining integrity of riparian vegetation and water quality and persistence through the late dry season, both of which are critical factors in water monitors having shelter and food sources alternative to toads.

The 2020–21 wet season rainfall was above average, and the first wet year following failed wet seasons in 2018–19 and 2019–20. This meant that there was still water available in many riparian areas at the time of surveys, and may have allowed us to capture a 'boom' in small-medium mammal populations. The numbers of small mammals detected increased between 2020 and 2021, however given different survey types and sites it is not yet clear whether this reflects survey design or local conditions. These numbers are still very low compared to historical small native mammal populations and are reflective of landscape scale decline of small and medium mammals across northern Australia (Ziembiecki et al. 2015). Timing of future surveys within a 3–5 year cycle will take climate conditions into account to allow for highest detectability of target species and guilds.

Feral cats continue to be the major threatening process for all native fauna at Wongalara (Frank et al. 2014; Tuft et al. 2021). In the absence of adequate landscape-scale control measures for cats, continued fire and large feral herbivore management are critical to the persistence of native fauna at Wongalara. These land management actions also help us to reduce the ongoing impacts of other widespread introduced species including pigs, black rats and cane toads. As omnivores, pigs and black rats in particular compete directly with native species for food and water resources, can prey upon native animals directly and consume eggs/young and may carry parasites and diseases.

Fire management by AWC has been ongoing at Wongalara for 14 years (2007-2021) since acquisition and changed the fire regime from one primarily dominated by hot, late dry season wildfire to a pattern of widespread mosaic of fire scars of various ages, through delivery of prescribed burning in the early dry season. This fire program is designed to directly benefit the native fauna reported on in this report, through the creation and retention of increased grown cover (for small-medium mammals and reptiles), promotion of grasses diversity and seeding (for finches and parrots) and protection of riparian areas (for bandicoots, possums, water rats and water monitors).

## Acknowledgments

AWC acknowledges the Ngalagkan and Rembarrgna people, the Traditional Custodians, of Ngalagkan and Rembarrgna Country on which Wongalara (Bunditjka) is situated. We also acknowledge their continuing connection to land, waters, culture and community. We pay our respects to Ngalagkan and Rembarrgna Elders past and present.

AWC's Ecohealth Program is only possible because of the generosity of AWC's supporters.

Surveys in 2021 were conducted with the support of Wongalara Sanctuary Managers Chris & Heather Whatley, and we particularly thank volunteer Nigel Westerhuis, Spatial Ecologist Clare Millen and Ecology Intern Christine Mauger for their work deploying and collecting camera traps.

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## Appendix 1. Wongalara species list with groups/guilds

### Mammals

Family	Scientific name	Common name	Likelihood	Group/guild	EPBC	State	Action plan
Macropodidae	<i>Lagorchestes conspicillatus leichardti</i>	Spectacled Hare-wallaby (mainland)	Confirmed	Indicator		N Thr	N Thr
Peramelidae	<i>Isodon macrourus</i>	Northern Brown Bandicoot	Confirmed	Indicator		N Thr	
Phalangeridae	<i>Trichosurus vulpecula arnhemensis</i>	Common Brushtail Possum (north-western)	Confirmed	Indicator	Vul	N Thr	
Pseudocheiridae	<i>Petropseudes dahlii</i>	Wogoit, Rock Ringtail Possum	Confirmed	Indicator			
Tachyglossidae	<i>Tachyglossus aculeatus</i>	Short-beaked Echidna	Confirmed	Indicator			
Petauridae	<i>Petaurus ariel</i>	Savanna Glider	Confirmed	Mammals - arboreal			
Emballonuridae	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tailed Bat	Confirmed	Mammals - Bat			
Emballonuridae	<i>Taphozous georgianus</i>	Common Sheath-tailed Bat	Likely	Mammals - Bat			
Hipposideridae	<i>Hipposideros ater</i>	Dusky Leaf-nosed Bat	Confirmed	Mammals - Bat			
Hipposideridae	<i>Rhinonictis aurantia</i>	Orange Leaf-nosed Bat	Confirmed	Mammals - Bat		N Thr	
Megadermatidae	<i>Macroderma gigas</i>	Ghost Bat	Possible	Mammals - Bat	Vul	N Thr	Vul
Miniopteridae	<i>Miniopterus orianae</i>		Possible	Mammals - Bat			
Molossidae	<i>Chaerephon jobensis</i>	Northern Mastiff Bat	Likely	Mammals - Bat			
Molossidae	<i>Ozimops lumsdenae</i>	Northern Free-tailed Bat	Likely	Mammals - Bat			
Pteropodidae	<i>Macroglossus minimus</i>	Northern Blossom Bat	Confirmed	Mammals - Bat			
Pteropodidae	<i>Pteropus alecto</i>	Black Flying-fox	Confirmed	Mammals - Bat			
Pteropodidae	<i>Pteropus scapulatus</i>	Little Red Flying-fox	Very Likely	Mammals - Bat			
Vespertilionidae	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	Possible	Mammals - Bat			
Vespertilionidae	<i>Chalinolobus nigrogriseus</i>	Hoary Wattled Bat	Possible	Mammals - Bat			
Vespertilionidae	<i>Myotis macropus</i>	Large-footed Myotis	Possible	Mammals - Bat			
Vespertilionidae	<i>Nyctophilus arnhemensis</i>	Northern Long-eared Bat	Possible	Mammals - Bat			
Vespertilionidae	<i>Nyctophilus bifax</i>	Eastern Long-eared Bat	Possible	Mammals - Bat			
Vespertilionidae	<i>Nyctophilus daedalus</i>	Pallid Long-eared Bat	Confirmed	Mammals - Bat			
Vespertilionidae	<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat	Confirmed	Mammals - Bat			
Vespertilionidae	<i>Nyctophilus walkeri</i>	Pygmy Long-eared Bat	Possible	Mammals - Bat			

Family	Scientific name	Common name	Likelihood	Group/guild	EPBC	State	Action plan
Vespertilionidae	<i>Scotorepens greyii</i>	Little Broad-nosed Bat	Confirmed	Mammals - Bat			
Vespertilionidae	<i>Vespadelus caurinus</i>	Northern Cave Bat	Possible	Mammals - Bat			
Macropodidae	<i>Macropus agilis</i>	Agile Wallaby	Confirmed	Mammals - macropods			
Macropodidae	<i>Macropus antilopinus</i>	Antilopine Wallaroo	Confirmed	Mammals - macropods			
Macropodidae	<i>Macropus robustus</i>	Euro, Common Wallaroo	Confirmed	Mammals - macropods			
Macropodidae	<i>Onychogalea unguifera</i>	Northern Nailtail Wallaby	Confirmed	Mammals - macropods		N Thr	
Macropodidae	<i>Petrogale wilkinsi</i>	Wilkin's Rock-wallaby	Confirmed	Mammals - macropods			N Thr
Dasyuridae	<i>Dasyurus hallucatus</i>	Northern Quoll, Digul	Possible	Mammals - Predator	End	Cr End	End
Dasyuridae	<i>Phascogale tapoatafa kimberleyensis</i>	Kimberley Brush-tailed Phascogale	Possible	Mammals - Predator			N Thr
Muridae	<i>Hydromys chrysogaster</i>	Water-rat, Rakali	Confirmed	Mammals - Small-medium riparian			
Dasyuridae	<i>Pseudantechinus bilarni</i>	Sandstone Antechinus	Possible	Mammals - Small-medium rocky			
Muridae	<i>Zyromys argurus</i>	Common Rock-rat, Djoorri	Confirmed	Mammals - Small-medium rocky			
Muridae	<i>Zyromys maini</i>	Arnhem Rock-rat, Kodjper	Possible	Mammals - Small-medium rocky	Vu	Vul	Vul
Dasyuridae	<i>Planigale ingrami</i>	Long-tailed Planigale	Confirmed	Mammals - Small-medium savanna			
Dasyuridae	<i>Planigale maculata</i>	Common Planigale	Confirmed	Mammals - Small-medium savanna			
Dasyuridae	<i>Sminthopsis bindi</i>	Kakadu Dunnart	Confirmed	Mammals - Small-medium savanna			N Thr
Dasyuridae	<i>Sminthopsis virginiae</i>	Red-cheeked Dunnart	Possible	Mammals - Small-medium savanna			
Muridae	<i>Leggadina lakedownensis</i>	Northern Short-tailed Mouse, Kerakenga	Confirmed	Mammals - Small-medium savanna			
Muridae	<i>Melomys burtoni</i>	Grassland Melomys, Loolong	Confirmed	Mammals - Small-medium savanna			
Muridae	<i>Pseudomys delicatulus</i>	Delicate Mouse, Molinipi	Confirmed	Mammals - Small-medium savanna			
Muridae	<i>Pseudomys johnsoni</i>	Central Pebble-mouse, Ilyema	Confirmed	Mammals - Small-medium savanna		N Thr	

Family	Scientific name	Common name	Likelihood	Group/guild	EPBC	State	Action plan
Muridae	<i>Pseudomys nanus</i>	Western Chestnut Mouse, Moolpoo	Confirmed	Mammals - Small-medium savanna		N Thr	
Muridae	<i>Rattus tunneyi tunneyi</i>	Pale Field-rat (north-western)	Confirmed	Mammals - Small-medium savanna		Vul	
Muridae	<i>Rattus villosissimus</i>	Long-haired Rat, Mayaroo	Possible	Mammals - Small-medium savanna		N Thr	
Canidae	<i>Canis dingo</i>	Dingo	Confirmed	Predator			N Thr

**Notes:**

For Mammals and Birds the threatened species listings are given for federal (EPBC), State and relevant Action Plan (Woinarski et al. 2012; Garnett and Baker 2021).

Listings are abbreviated as follows:

Near Threatened = N Thr

Vulnerable = Vul

Endangered = End

Critically Endangered = Cr End

**Birds**

Family	Scientific name	Common name	Likelihood	Group/guild	EPBC	State	Action plan
Aegothelidae	<i>Aegotheles cristatus</i>	Australian Owlet-nightjar	Confirmed	Birds - nocturnal			
Caprimulgidae	<i>Caprimulgus macrurus</i>	Large-tailed Nightjar	Possible	Birds - nocturnal			
Caprimulgidae	<i>Eurostopodus argus</i>	Spotted Nightjar	Confirmed	Birds - nocturnal			
Podargidae	<i>Podargus strigoides</i>	Tawny Frogmouth	Confirmed	Birds - nocturnal			
Burhinidae	<i>Burhinus grallarius</i>	Bush Stone-curlew	Confirmed	Birds - nocturnal		N Thr	
Strigidae	<i>Ninox connivens</i>	Barking Owl	Confirmed	Birds - nocturnal			
Strigidae	<i>Ninox rufa</i>	Rufous Owl	Confirmed	Birds - nocturnal			
Tytonidae	<i>Tyto javanica</i>	Eastern Barn Owl	Very Likely	Birds - nocturnal			
Tytonidae	<i>Tyto longimembris</i>	Eastern Grass Owl	Possible	Birds - nocturnal		N Thr	
Tytonidae	<i>Tyto novaehollandiae kimberli</i>	Northern Masked Owl	Possible	Birds - nocturnal			
Accipitridae	<i>Haliaeetus leucogaster</i>	White-bellied Sea Eagle	Confirmed	Birds - riparian			
Accipitridae	<i>Haliastur indus</i>	Brahminy Kite	Possible	Birds - riparian			
Pandionidae	<i>Pandion cristatus</i>	Eastern Osprey	Confirmed	Birds - riparian			

Family	Scientific name	Common name	Likelihood	Group/guild	EPBC	State	Action plan
Anatidae	<i>Anas gracilis</i>	Grey Teal	Confirmed	Birds - riparian			
Anatidae	<i>Anas superciliosa</i>	Pacific Black Duck	Confirmed	Birds - riparian			
Anatidae	<i>Aythya australis</i>	Hardhead	Confirmed	Birds - riparian			
Anatidae	<i>Cygnus atratus</i>	Black Swan	Confirmed	Birds - riparian			
Anatidae	<i>Dendrocygna arcuata</i>	Wandering Whistling Duck	Confirmed	Birds - riparian			
Anatidae	<i>Dendrocygna eytoni</i>	Plumed Whistling Duck	Confirmed	Birds - riparian			
Anatidae	<i>Malacorhynchus membranaceus</i>	Pink-eared Duck	Confirmed	Birds - riparian			
Anatidae	<i>Nettapus pulchellus</i>	Green Pygmy Goose	Confirmed	Birds - riparian			
Anatidae	<i>Radjah radjah</i>	Raja Shelduck	Confirmed	Birds - riparian			
Anseranatidae	<i>Anseranas semipalmata</i>	Magpie Goose	Confirmed	Birds - riparian			
Charadriidae	<i>Charadrius ruficapillus</i>	Red-capped Plover	Likely	Birds - riparian			
Charadriidae	<i>Charadrius veredus</i>	Oriental Plover	Likely	Birds - riparian			
Charadriidae	<i>Eseyornis melanops</i>	Black-fronted Dotterel	Confirmed	Birds - riparian			
Charadriidae	<i>Erythronyx cinctus</i>	Red-kneed Dotterel	Likely	Birds - riparian			
Charadriidae	<i>Pluvialis fulva</i>	Pacific Golden Plover	Possible	Birds - riparian			
Charadriidae	<i>Vanellus miles</i>	Masked Lapwing	Confirmed	Birds - riparian			
Glareolidae	<i>Glareola maldivarum</i>	Oriental Pratincole	Likely	Birds - riparian			
Glareolidae	<i>Stiltia isabella</i>	Australian Pratincole	Likely	Birds - riparian			
Jacanidae	<i>Irediparra gallinacea</i>	Comb-crested Jacana	Confirmed	Birds - riparian			
Laridae	<i>Chlidonias hybrida</i>	Whiskered Tern	Possible	Birds - riparian			
Laridae	<i>Chlidonias leucopterus</i>	White-winged Tern	Possible	Birds - riparian			
Laridae	<i>Gelochelidon macrotarsa</i>	Australian Tern	Possible	Birds - riparian			
Laridae	<i>Hydroprogne caspia</i>	Caspian Tern	Possible	Birds - riparian			
Laridae	<i>Larus pacificus</i>	Pacific Gull	Possible	Birds - riparian			
Recurvirostridae	<i>Himantopus leucocephalus</i>	Pied Stilt	Likely	Birds - riparian			
Rostratulidae	<i>Rostratula australis</i>	Australian Painted-snipe	Possible	Birds - riparian	End	Vul	End
Scolopacidae	<i>Actitis hypoleucos</i>	Common Sandpiper	Confirmed	Birds - riparian			
Scolopacidae	<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	Possible	Birds - riparian			
Scolopacidae	<i>Calidris ferruginea</i>	Curlew Sandpiper	Possible	Birds - riparian	Cr End	Vul	Cr End
Scolopacidae	<i>Calidris ruficollis</i>	Red-necked Stint	Possible	Birds - riparian			N Thr

Family	Scientific name	Common name	Likelihood	Group/guild	EPBC	State	Action plan
Scolopacidae	<i>Calidris subminuta</i>	Long-toed Stint	Possible	Birds - riparian			
Scolopacidae	<i>Gallinago hardwickii</i>	Latham's Snipe	Likely	Birds - riparian			
Scolopacidae	<i>Gallinago megala</i>	Swinhoe's Snipe	Possible	Birds - riparian			
Scolopacidae	<i>Limosa lapponica</i>	Bar-tailed Godwit	Possible	Birds - riparian		Vul	
Scolopacidae	<i>Limosa limosa</i>	Black-tailed Godwit	Possible	Birds - riparian		N Thr	N Thr
Scolopacidae	<i>Numenius minutus</i>	Little Curlew	Possible	Birds - riparian			
Scolopacidae	<i>Tringa glareola</i>	Wood Sandpiper	Possible	Birds - riparian			
Scolopacidae	<i>Tringa nebularia</i>	Common Greenshank	Likely	Birds - riparian			
Scolopacidae	<i>Tringa stagnatilis</i>	Marsh Sandpiper	Possible	Birds - riparian			
Ciconiidae	<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	Confirmed	Birds - riparian			
Columbidae	<i>Ducula spilorrhoa</i>	Torresian Imperial Pigeon	Possible	Birds - riparian			
Columbidae	<i>Ptilinopus regina</i>	Rose-crowned Fruit Dove	Possible	Birds - riparian			
Alcedinidae	<i>Ceyx azureus</i>	Azure Kingfisher	Confirmed	Birds - riparian			
Alcedinidae	<i>Ceyx pusillus</i>	Little Kingfisher	Possible	Birds - riparian			
Rallidae	<i>Fulica atra</i>	Eurasian Coot	Likely	Birds - riparian			
Rallidae	<i>Hypotaenidia philippensis</i>	Buff-banded Rail	Likely	Birds - riparian			
Rallidae	<i>Poliolimnas cinerea</i>	White-browed Crake	Likely	Birds - riparian			
Rallidae	<i>Porphyrio melanotus</i>	Australasian Swamphen	Confirmed	Birds - riparian			
Rallidae	<i>Zapornia pusilla</i>	Baillon's Crake	Likely	Birds - riparian			
Acanthizidae	<i>Gerygone olivacea</i>	White-throated Gerygone	Confirmed	Birds - riparian			
Ardeidae	<i>Ardea alba</i>	Great Egret	Confirmed	Birds - riparian			
Ardeidae	<i>Ardea intermedia</i>	Intermediate Egret	Confirmed	Birds - riparian			
Ardeidae	<i>Ardea pacifica</i>	White-necked Heron	Confirmed	Birds - riparian			
Ardeidae	<i>Ardea sumatrana</i>	Great-billed Heron	Confirmed	Birds - riparian			
Ardeidae	<i>Bubulcus coromandus</i>	Eastern Cattle Egret	Likely	Birds - riparian			
Ardeidae	<i>Egretta garzetta</i>	Little Egret	Confirmed	Birds - riparian			
Ardeidae	<i>Egretta novaehollandiae</i>	White-faced Heron	Confirmed	Birds - riparian			
Ardeidae	<i>Egretta picata</i>	Pied Heron	Confirmed	Birds - riparian			
Ardeidae	<i>Ixobrychus dubius</i>	Black-backed Bittern	Possible	Birds - riparian			
Ardeidae	<i>Ixobrychus flavicollis</i>	Black Bittern	Confirmed	Birds - riparian			
Ardeidae	<i>Nycticorax caledonicus</i>	Nankeen Night-Heron	Confirmed	Birds - riparian			

Family	Scientific name	Common name	Likelihood	Group/guild	EPBC	State	Action plan
Pelecanidae	<i>Pelecanus conspicillatus</i>	Australian Pelican	Confirmed	Birds - riparian			
Threskiornithidae	<i>Platalea flavipes</i>	Yellow-billed Spoonbill	Confirmed	Birds - riparian			
Threskiornithidae	<i>Platalea regia</i>	Royal Spoonbill	Confirmed	Birds - riparian			
Threskiornithidae	<i>Plegadis falcinellus</i>	Glossy Ibis	Likely	Birds - riparian			
Threskiornithidae	<i>Threskiornis molucca</i>	Australian White Ibis	Confirmed	Birds - riparian			
Threskiornithidae	<i>Threskiornis spinicollis</i>	Straw-necked Ibis	Confirmed	Birds - riparian			
Podicipedidae	<i>Poloiocephalus poloiocephalus</i>	Hoary-headed Grebe	Likely	Birds - riparian			
Podicipedidae	<i>Tachybaptus novaehollandiae</i>	Australasian Grebe	Confirmed	Birds - riparian			
Anhingidae	<i>Anhinga novaehollandiae</i>	Australasian Darter	Confirmed	Birds - riparian			
Phalacrocoracidae	<i>Microcarbo melanoleucos</i>	Little Pied Cormorant	Confirmed	Birds - riparian			
Phalacrocoracidae	<i>Phalacrocorax carbo</i>	Great Cormorant	Confirmed	Birds - riparian			
Phalacrocoracidae	<i>Phalacrocorax sulcirostris</i>	Little Black Cormorant	Confirmed	Birds - riparian			
Phalacrocoracidae	<i>Phalacrocorax varius</i>	Pied Cormorant	Confirmed	Birds - riparian			
Columbidae	<i>Petrophassa rufipennis</i>	Chestnut-quilled Rock Pigeon	Confirmed	Birds - rocky		N Thr	
Accipitridae	<i>Accipiter cirrocephalus</i>	Collared Sparrowhawk	Confirmed	Birds - savanna			
Accipitridae	<i>Accipiter fasciatus</i>	Brown Goshawk	Confirmed	Birds - savanna			
Accipitridae	<i>Accipiter novaehollandiae</i>	Grey Goshawk	Possible	Birds - savanna			
Accipitridae	<i>Aquila audax</i>	Wedge-tailed Eagle	Confirmed	Birds - savanna			
Accipitridae	<i>Aviceda subcristata</i>	Pacific Baza	Confirmed	Birds - savanna			
Accipitridae	<i>Circus approximans</i>	Swamp Harrier	Likely	Birds - savanna			
Accipitridae	<i>Circus assimilis</i>	Spotted Harrier	Confirmed	Birds - savanna			
Accipitridae	<i>Elanus axillaris</i>	Black-shouldered Kite	Likely	Birds - savanna			
Accipitridae	<i>Elanus scriptus</i>	Letter-winged Kite	Possible	Birds - savanna		N Thr	N Thr
Accipitridae	<i>Erythrotriorchis radiatus</i>	Red Goshawk	Likely	Birds - savanna	Vul	Vul	N Thr
Accipitridae	<i>Haliastur sphenurus</i>	Whistling Kite	Confirmed	Birds - savanna			
Accipitridae	<i>Hamirostra melanosternon</i>	Black-breasted Buzzard	Confirmed	Birds - savanna			
Accipitridae	<i>Hieraaetus morphnoides</i>	Little Eagle	Confirmed	Birds - savanna			
Accipitridae	<i>Lophoictinia isura</i>	Square-tailed Kite	Confirmed	Birds - savanna		N Thr	
Accipitridae	<i>Milvus migrans</i>	Black Kite	Confirmed	Birds - savanna			
Apodidae	<i>Apus pacificus</i>	Pacific Swift	Likely	Birds - savanna			
Casuariidae	<i>Dromaius novaehollandiae</i>	Emu	Confirmed	Birds - savanna		N Thr	

Family	Scientific name	Common name	Likelihood	Group/guild	EPBC	State	Action plan
Turnicidae	<i>Turnix castanotus</i>	Chestnut-backed Buttonquail	Confirmed	Birds - savanna			
Turnicidae	<i>Turnix maculosus</i>	Red-backed Buttonquail	Likely	Birds - savanna			
Turnicidae	<i>Turnix pyrrhothorax</i>	Red-chested Buttonquail	Likely	Birds - savanna			
Columbidae	<i>Geopelia cuneata</i>	Diamond Dove	Confirmed	Birds - savanna			
Columbidae	<i>Geopelia humeralis</i>	Bar-shouldered Dove	Confirmed	Birds - savanna			
Columbidae	<i>Geopelia placida</i>	Peaceful Dove	Confirmed	Birds - savanna			
Columbidae	<i>Geophaps plumifera</i>	Spinifex Pigeon	Likely	Birds - savanna			
Columbidae	<i>Geophaps smithii smithii</i>	Eastern Partridge Pigeon	Possible	Birds - savanna		Vul	Vul
Columbidae	<i>Ocyphaps lophotes</i>	Crested Pigeon	Confirmed	Birds - savanna			
Columbidae	<i>Phaps chalcoptera</i>	Common Bronzewing	Confirmed	Birds - savanna			
Alcedinidae	<i>Dacelo leachii</i>	Blue-winged Kookaburra	Confirmed	Birds - savanna			
Alcedinidae	<i>Todiramphus macleayii</i>	Forest Kingfisher	Confirmed	Birds - savanna			
Alcedinidae	<i>Todiramphus pyrrhopygius</i>	Red-backed Kingfisher	Confirmed	Birds - savanna			
Alcedinidae	<i>Todiramphus sanctus</i>	Sacred Kingfisher	Confirmed	Birds - savanna			
Coraciidae	<i>Eurystomus orientalis</i>	Oriental Dollarbird	Confirmed	Birds - savanna			
Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater	Confirmed	Birds - savanna			
Cuculidae	<i>Cacomantis pallidus</i>	Pallid Cuckoo	Confirmed	Birds - savanna			
Cuculidae	<i>Cacomantis variolosus</i>	Brush Cuckoo	Confirmed	Birds - savanna			
Cuculidae	<i>Centropus phasianinus</i>	Pheasant Coucal	Confirmed	Birds - savanna			
Cuculidae	<i>Chrysococcyx basalis</i>	Horsfield's Bronze Cuckoo	Confirmed	Birds - savanna			
Cuculidae	<i>Chrysococcyx minutillus</i>	Little Bronze Cuckoo	Confirmed	Birds - savanna			
Cuculidae	<i>Chrysococcyx osculans</i>	Black-eared Cuckoo	Confirmed	Birds - savanna			
Cuculidae	<i>Cuculus optatus</i>	Oriental Cuckoo	Confirmed	Birds - savanna			
Cuculidae	<i>Eudynamys orientalis</i>	Pacific Koel	Likely	Birds - savanna			
Cuculidae	<i>Scythrops novaehollandiae</i>	Channel-billed Cuckoo	Confirmed	Birds - savanna			
Falconidae	<i>Falco berigora</i>	Brown Falcon	Confirmed	Birds - savanna			
Falconidae	<i>Falco cenchroides</i>	Nankeen Kestrel	Confirmed	Birds - savanna			
Falconidae	<i>Falco longipennis</i>	Australian Hobby	Confirmed	Birds - savanna			
Falconidae	<i>Falco peregrinus</i>	Peregrine Falcon	Confirmed	Birds - savanna			
Falconidae	<i>Falco subniger</i>	Black Falcon	Likely	Birds - savanna			
Phasianidae	<i>Coturnix ypsilophora</i>	Brown Quail	Confirmed	Birds - savanna			

Family	Scientific name	Common name	Likelihood	Group/guild	EPBC	State	Action plan
Gruidae	<i>Antigone antigone</i>	Sarus Crane	Confirmed	Birds - savanna			
Gruidae	<i>Antigone rubicunda</i>	Brolga	Confirmed	Birds - savanna			
Otididae	<i>Ardeotis australis</i>	Australian Bustard	Confirmed	Birds - savanna		N Thr	
Acanthizidae	<i>Smicromis brevirostris</i>	Weebill	Confirmed	Birds - savanna			
Alaudidae	<i>Mirafra javanica</i>	Horsfield's Bush Lark	Likely	Birds - savanna			
Artamidae	<i>Artamus cinereus</i>	Black-faced Woodswallow	Confirmed	Birds - savanna			
Artamidae	<i>Artamus leucorhynchus</i>	White-breasted Woodswallow	Confirmed	Birds - savanna			
Artamidae	<i>Artamus minor</i>	Little Woodswallow	Confirmed	Birds - savanna			
Artamidae	<i>Artamus personatus</i>	Masked Woodswallow	Confirmed	Birds - savanna			
Artamidae	<i>Artamus superciliosus</i>	White-browed Woodswallow	Confirmed	Birds - savanna			
Artamidae	<i>Cracticus argenteus</i>	Silver-backed Butcherbird	Confirmed	Birds - savanna			
Artamidae	<i>Cracticus nigrogularis</i>	Pied Butcherbird	Confirmed	Birds - savanna			
Artamidae	<i>Gymnorhina tibicen</i>	Australian Magpie	Confirmed	Birds - savanna			
Artamidae	<i>Melloria quoyi</i>	Black Butcherbird	Possible	Birds - savanna			
Campephagidae	<i>Coracina maxima</i>	Ground Cuckooshrike	Likely	Birds - savanna			
Campephagidae	<i>Coracina novaehollandiae</i>	Black-faced Cuckooshrike	Confirmed	Birds - savanna			
Campephagidae	<i>Coracina papuensis</i>	White-bellied Cuckooshrike	Confirmed	Birds - savanna			
Campephagidae	<i>Edolisoma tenuirostre</i>	Common Cicadabird	Possible	Birds - savanna			
Campephagidae	<i>Lalage leucomela</i>	Varied Triller	Confirmed	Birds - savanna			
Campephagidae	<i>Lalage tricolor</i>	White-winged Triller	Confirmed	Birds - savanna			
Cisticolidae	<i>Cisticola exilis</i>	Golden-headed Cisticola	Confirmed	Birds - savanna			
Climacteridae	<i>Climacteris melanurus</i>	Black-tailed Treecreeper	Confirmed	Birds - savanna			
Corcoracidae	<i>Struthidea cinerea</i>	Apostlebird	Confirmed	Birds - savanna			
Corvidae	<i>Corvus bennetti</i>	Little Crow	Likely	Birds - savanna			
Corvidae	<i>Corvus orru</i>	Torresian Crow	Confirmed	Birds - savanna			
Dicaeidae	<i>Dicaeum hirundinaceum</i>	Mistletoebird	Confirmed	Birds - savanna			
Dicruridae	<i>Dicrurus bracteatus</i>	Spangled Drongo	Possible	Birds - savanna			
Estrildidae	<i>Bathilda ruficauda</i>	Star Finch	Likely	Birds - savanna		N Thr	
Estrildidae	<i>Chloebia gouldiae</i>	Gouldian Finch	Confirmed	Birds - savanna	End	Vul	N Thr
Estrildidae	<i>Heteromunia pectoralis</i>	Pictorella Mannikin	Confirmed	Birds - savanna		N Thr	
Estrildidae	<i>Lonchura castaneothorax</i>	Chestnut-breasted Mannikin	Confirmed	Birds - savanna			

Family	Scientific name	Common name	Likelihood	Group/guild	EPBC	State	Action plan
Estrildidae	<i>Neochmia phaeton</i>	Crimson Finch	Confirmed	Birds - savanna			
Estrildidae	<i>Poephila acuticauda</i>	Long-tailed Finch	Confirmed	Birds - savanna			
Estrildidae	<i>Poephila personata</i>	Masked Finch	Confirmed	Birds - savanna			
Estrildidae	<i>Stizoptera bichenovii</i>	Double-barred Finch	Confirmed	Birds - savanna			
Estrildidae	<i>Taeniopygia guttata</i>	Zebra Finch	Confirmed	Birds - savanna			
Falcunculidae	<i>Falcunculus frontatus whitei</i>	Northern Crested Shriketit	Possible	Birds - savanna		N Thr	
Hirundinidae	<i>Petrochelidon ariel</i>	Fairy Martin	Confirmed	Birds - savanna			
Hirundinidae	<i>Petrochelidon nigricans</i>	Tree Martin	Likely	Birds - savanna			
Locustellidae	<i>Cincloramphus mathewsi</i>	Rufous Songlark	Confirmed	Birds - savanna			
Locustellidae	<i>Cincloramphus timoriensis</i>	Tawny Grassbird	Likely	Birds - savanna			
Maluridae	<i>Malurus assimilis</i>	Purple-backed Fairywren	Confirmed	Birds - savanna			
Maluridae	<i>Malurus melanocephalus</i>	Red-backed Fairywren	Confirmed	Birds - savanna			
Meliphagidae	<i>Cissomela pectoralis</i>	Banded Honeyeater	Confirmed	Birds - savanna			
Meliphagidae	<i>Conopophila albogularis</i>	Rufous-banded Honeyeater	Likely	Birds - savanna			
Meliphagidae	<i>Conopophila rufogularis</i>	Rufous-throated Honeyeater	Confirmed	Birds - savanna			
Meliphagidae	<i>Entomyzon cyanotis</i>	Blue-faced Honeyeater	Confirmed	Birds - savanna			
Meliphagidae	<i>Gavicalis virescens</i>	Singing Honeyeater	Confirmed	Birds - savanna			
Meliphagidae	<i>Lichmera indistincta</i>	Brown Honeyeater	Confirmed	Birds - savanna			
Meliphagidae	<i>Manorina flavigula</i>	Yellow-throated Miner	Confirmed	Birds - savanna			
Meliphagidae	<i>Melithreptus albogularis</i>	White-throated Honeyeater	Confirmed	Birds - savanna			
Meliphagidae	<i>Melithreptus gularis</i>	Black-chinned Honeyeater	Confirmed	Birds - savanna			
Meliphagidae	<i>Myzomela obscura</i>	Dusky Myzomela	Confirmed	Birds - savanna			
Meliphagidae	<i>Philemon argenticeps</i>	Silver-crowned Friarbird	Confirmed	Birds - savanna			
Meliphagidae	<i>Philemon buceroides</i>	Helmeted Friarbird	Confirmed	Birds - savanna			
Meliphagidae	<i>Philemon citreogularis</i>	Little Friarbird	Confirmed	Birds - savanna			
Meliphagidae	<i>Ptilotula flavescens</i>	Yellow-tinted Honeyeater	Confirmed	Birds - savanna			
Meliphagidae	<i>Ptilotula plumula</i>	Grey-fronted Honeyeater	Confirmed	Birds - savanna			
Meliphagidae	<i>Ramsayornis fasciatus</i>	Bar-breasted Honeyeater	Confirmed	Birds - savanna			
Meliphagidae	<i>Stomiopera unicolor</i>	White-gaped Honeyeater	Confirmed	Birds - savanna			
Monarchidae	<i>Grallina cyanoleuca</i>	Magpie-lark	Confirmed	Birds - savanna			
Monarchidae	<i>Myiagra alecto</i>	Shining Flycatcher	Confirmed	Birds - savanna			

Family	Scientific name	Common name	Likelihood	Group/guild	EPBC	State	Action plan
Monarchidae	<i>Myiagra nana</i>	Paperbark Flycatcher	Confirmed	Birds - savanna			
Monarchidae	<i>Myiagra rubecula</i>	Leaden Flycatcher	Confirmed	Birds - savanna			
Motacillidae	<i>Anthus australis</i>	Australian Pipit	Likely	Birds - savanna			
Neosittidae	<i>Daphoenositta chrysoptera</i>	Varied Sittella	Confirmed	Birds - savanna			
Oriolidae	<i>Oriolus sagittatus</i>	Olive-backed Oriole	Confirmed	Birds - savanna			
Oriolidae	<i>Sphecotheres vieilloti</i>	Australasian Figbird	Possible	Birds - savanna			
Pachycephalidae	<i>Colluricincla harmonica</i>	Grey Shrikethrush	Confirmed	Birds - savanna			
Pachycephalidae	<i>Colluricincla megarhyncha</i>	Arafura Shrikethrush	Confirmed	Birds - savanna			
Pachycephalidae	<i>Colluricincla woodwardi</i>	Sandstone Shrikethrush	Confirmed	Birds - savanna			
Pachycephalidae	<i>Pachycephala rufiventris</i>	Rufous Whistler	Confirmed	Birds - savanna			
Pachycephalidae	<i>Pachycephala simplex</i>	Grey Whistler	Possible	Birds - savanna			
Pardalotidae	<i>Pardalotus rubricatus</i>	Red-browed Pardalote	Confirmed	Birds - savanna			
Pardalotidae	<i>Pardalotus striatus</i>	Striated Pardalote	Confirmed	Birds - savanna			
Petroicidae	<i>Melanodryas cucullata</i>	Hooded Robin	Confirmed	Birds - savanna			
Petroicidae	<i>Microeca fascinans</i>	Jacky Winter	Confirmed	Birds - savanna			
Petroicidae	<i>Microeca flavigaster</i>	Lemon-bellied Flyrobin	Confirmed	Birds - savanna			
Petroicidae	<i>Poecilodryas cerviniventris</i>	Buff-sided Robin	Confirmed	Birds - savanna		N Thr	
Pomatostomidae	<i>Pomatostomus temporalis</i>	Grey-crowned Babbler	Confirmed	Birds - savanna			
Ptilonorhynchidae	<i>Chlamydera nuchalis</i>	Great Bowerbird	Confirmed	Birds - savanna			
Rhipiduridae	<i>Rhipidura albiscapa</i>	Grey Fantail	Likely	Birds - savanna			
Rhipiduridae	<i>Rhipidura dryas</i>	Arafura Fantail	Confirmed	Birds - savanna			
Rhipiduridae	<i>Rhipidura leucophrys</i>	Willie Wagtail	Confirmed	Birds - savanna			
Rhipiduridae	<i>Rhipidura rufiventris</i>	Northern Fantail	Confirmed	Birds - savanna			
Cacatuidae	<i>Cacatua galerita</i>	Sulphur-crested Cockatoo	Confirmed	Birds - savanna			
Cacatuidae	<i>Cacatua sanguinea</i>	Little Corella	Confirmed	Birds - savanna			
Cacatuidae	<i>Calyptorhynchus banksii</i>	Red-tailed Black Cockatoo	Confirmed	Birds - savanna			
Cacatuidae	<i>Eolophus roseicapilla</i>	Galah	Confirmed	Birds - savanna			
Cacatuidae	<i>Nymphicus hollandicus</i>	Cockatiel	Confirmed	Birds - savanna			
Psittaculidae	<i>Aprosmictus erythropterus</i>	Red-winged Parrot	Confirmed	Birds - savanna			
Psittaculidae	<i>Melopsittacus undulatus</i>	Budgerigar	Confirmed	Birds - savanna			
Psittaculidae	<i>Platycercus venustus</i>	Northern Rosella	Confirmed	Birds - savanna			

Family	Scientific name	Common name	Likelihood	Group/guild	EPBC	State	Action plan
Psittaculidae	<i>Psephotellus dissimilis</i>	Hooded Parrot	Confirmed	Birds - savanna		N Thr	
Psittaculidae	<i>Psitteuteles versicolor</i>	Varied Lorikeet	Confirmed	Birds - savanna			
Psittaculidae	<i>Trichoglossus rubritorquis</i>	Red-collared Lorikeet	Confirmed	Birds - savanna			
Strigidae	<i>Ninox boobook</i>	Australian Boobook	Confirmed	Birds - savanna			

Notes:

For Mammals and Birds the threatened species listings are given for federal (EPBC), State and relevant Action Plan (Woinarski et al. 2012; Garnett and Baker 2021).

Listings are abbreviated as follows:

Near Threatened = N Thr

Vulnerable = Vul

Endangered = End

Critically Endangered = Cr End

**Reptiles**

Family	Scientific name	Common name	Likelihood	Group/guild	State	Action plan
Crocodylidae	<i>Crocodylus johnstoni</i>	Freshwater Crocodile	Confirmed	Crocodyles		
Crocodylidae	<i>Crocodylus porosus</i>	Saltwater Crocodile	Confirmed	Crocodyles		
Acrochordidae	<i>Acrochordus arafurae</i>	Arafura File Snake	Confirmed	Reptiles - Aquatic Snakes		
Homalopsidae	<i>Pseudoferania polylepis</i>	Macleay's Water Snake	Very Likely	Reptiles - Aquatic Snakes		
Agamidae	<i>Chelosania brunnea</i>	Chameleon Dragon	Very Likely	Reptiles - large	N Thr	
Agamidae	<i>Chlamydosaurus kingii</i>	Frilled Lizard	Confirmed	Reptiles - large		
Boidae	<i>Aspidites melanocephalus</i>	Black-headed Python	Confirmed	Reptiles - large		
Boidae	<i>Liasis fuscus</i>	Water Python	Confirmed	Reptiles - large		
Boidae	<i>Liasis olivaceus</i>	Olive Python	Confirmed	Reptiles - large		
Boidae	<i>Morelia spilota</i>	Carpet Python	Likely	Reptiles - large		
Colubridae	<i>Boiga irregularis</i>	Brown Tree Snake	Confirmed	Reptiles - large		
Colubridae	<i>Dendrelaphis punctulatus</i>	Green Tree Snake	Confirmed	Reptiles - large		
Colubridae	<i>Stegonotus australis</i>	Slaty-grey Snake	Confirmed	Reptiles - large		
Elapidae	<i>Demansia olivacea</i>	Olive Whipsnake	Confirmed	Reptiles - large		
Elapidae	<i>Demansia papuensis</i>	Greater Black Whipsnake	Confirmed	Reptiles - large		
Elapidae	<i>Demansia vestigiata</i>	Lesser Black Whipsnake	Confirmed	Reptiles - large		

Family	Scientific name	Common name	Likelihood	Group/guild	State	Action plan
Elapidae	<i>Pseudechis australis</i>	Mulga Snake	Confirmed	Reptiles - large	N Thr	
Elapidae	<i>Pseudonaja nuchalis</i>	Northern Brown Snake	Confirmed	Reptiles - large		
Scincidae	<i>Tiliqua scincoides</i>	Eastern Blue-tongued Lizard	Confirmed	Reptiles - large		
Varanidae	<i>Varanus acanthurus</i>	Ridge-tailed Monitor	Confirmed	Reptiles - large		
Varanidae	<i>Varanus baritji</i>	Black-spotted Spiny-tailed Monitor	Very Likely	Reptiles - large		
Varanidae	<i>Varanus glebopalma</i>	Black-palmed Monitor	Confirmed	Reptiles - large		
Varanidae	<i>Varanus gouldii</i>	Gould's Goanna	Possible	Reptiles - large		
Varanidae	<i>Varanus panoptes</i>	Yellow-spotted Monitor	Confirmed	Reptiles - large	Vul	
Varanidae	<i>Varanus primordius</i>	Northern Ridge-tailed Monitor	Possible	Reptiles - large	N Thr	
Varanidae	<i>Varanus scalaris</i>	Spotted Tree Monitor	Confirmed	Reptiles - large		
Varanidae	<i>Varanus tristis</i>	Black-headed Monitor	Confirmed	Reptiles - large		
Colubridae	<i>Tropidonophis mairii</i>	Keelback	Confirmed	Reptiles - Small-medium riparian		
Agamidae	<i>Ctenophorus caudicinctus</i>	Ring-tailed Dragon	Possible	Reptiles - Small-medium rocky		
Carphodactylidae	<i>Nephrurus sheai</i>	Northern Knob-tail	Confirmed	Reptiles - Small-medium rocky		
Agamidae	<i>Diporiphora bilineata</i>	Two-lined Dragon	Possible	Reptiles - Small-medium savanna		
Agamidae	<i>Diporiphora magna</i>	Yellow-sided Two-lined Dragon	Confirmed	Reptiles - Small-medium savanna		
Agamidae	<i>Diporiphora sobria</i>	Northern Savannah Two-pored Dragon	Confirmed	Reptiles - Small-medium savanna		
Agamidae	<i>Lophognathus gilberti</i>	Gilbert's Dragon	Confirmed	Reptiles - Small-medium savanna		
Agamidae	<i>Lophognathus horneri</i>	Horner's Dragon	Likely	Reptiles - Small-medium savanna		
Agamidae	<i>Tropicagama temporalis</i>	Swamplands Lashtail	Very Likely	Reptiles - Small-medium savanna		
Boidae	<i>Antaresia childreni</i>	Children's Python	Confirmed	Reptiles - Small-medium savanna		
Diplodactylidae	<i>Amalosia rhombifer</i>	Zigzag Velvet Gecko	Confirmed	Reptiles - Small-medium savanna		

Family	Scientific name	Common name	Likelihood	Group/guild	State	Action plan
Diplodactylidae	<i>Diplodactylus barraganae</i>	Gulf Fat-tailed Gecko	Very Likely	Reptiles - Small-medium savanna		
Diplodactylidae	<i>Diplodactylus conspicillatus</i>	Variable Fat-tailed Gecko	Likely	Reptiles - Small-medium savanna		
Diplodactylidae	<i>Diplodactylus hillii</i>	Northern Fat-tailed Gecko	Possible	Reptiles - Small-medium savanna		
Diplodactylidae	<i>Lucasium immaculatum</i>	Pale-striped Ground Gecko	Confirmed	Reptiles - Small-medium savanna		
Diplodactylidae	<i>Lucasium stenodactylum</i>	Crowned Gecko	Confirmed	Reptiles - Small-medium savanna		
Diplodactylidae	<i>Oedura marmorata</i>	Marbled Velvet Gecko	Confirmed	Reptiles - Small-medium savanna		
Diplodactylidae	<i>Rhynchoedura ornata</i>	Western Beaked Gecko	Confirmed	Reptiles - Small-medium savanna		
Diplodactylidae	<i>Strophurus ciliaris</i>	Spiny-tailed Gecko	Confirmed	Reptiles - Small-medium savanna		
Diplodactylidae	<i>Strophurus taeniatus</i>	Phasmid Striped Gecko	Confirmed	Reptiles - Small-medium savanna		
Elapidae	<i>Acanthophis praelongus</i>	Northern Death Adder	Very Likely	Reptiles - Small-medium savanna		
Elapidae	<i>Acanthophis rugosus</i>	Papuan Death Adder	Very Likely	Reptiles - Small-medium savanna		
Elapidae	<i>Brachyurophis roperi</i>	Roper Shovel-nosed Snake	Confirmed	Reptiles - Small-medium savanna		
Elapidae	<i>Cryptophis pallidiceps</i>	Northern Small-eyed Snake	Confirmed	Reptiles - Small-medium savanna		
Elapidae	<i>Demansia quaesitor</i>	Sombre Whipsnake	Confirmed	Reptiles - Small-medium savanna		
Elapidae	<i>Furina ornata</i>	Orange-naped Snake	Confirmed	Reptiles - Small-medium savanna		
Elapidae	<i>Pseudechis weigeli</i>	Pygmy Mulga Snake	Confirmed	Reptiles - Small-medium savanna		
Elapidae	<i>Suta punctata</i>	Little Spotted Snake	Confirmed	Reptiles - Small-medium savanna		
Elapidae	<i>Vermicella intermedia</i>	Wide-banded Northern Bandy-bandy	Confirmed	Reptiles - Small-medium savanna		

Family	Scientific name	Common name	Likelihood	Group/guild	State	Action plan
Gekkonidae	<i>Gehyra arnhemica</i>	East Arnhem Land Gehyra	Confirmed	Reptiles - Small-medium savanna		
Gekkonidae	<i>Gehyra australis</i>	Western Top End Gehyra	Possible	Reptiles - Small-medium savanna		
Gekkonidae	<i>Gehyra gemina</i>	Plain Tree Gehyra	Likely	Reptiles - Small-medium savanna		
Gekkonidae	<i>Gehyra nana</i>	Northern Spotted Rock Gecko	Confirmed	Reptiles - Small-medium savanna		
Gekkonidae	<i>Heteronotia binoei</i>	Bynoe's Prickly Gecko	Confirmed	Reptiles - Small-medium savanna		
Gekkonidae	<i>Heteronotia planiceps</i>	Banded Prickly Gecko	Confirmed	Reptiles - Small-medium savanna		
Pygopodidae	<i>Delma borea</i>	Rusty-topped Delma	Confirmed	Reptiles - Small-medium savanna		
Pygopodidae	<i>Delma tinctoria</i>	Excitable Delma	Confirmed	Reptiles - Small-medium savanna		
Pygopodidae	<i>Lialis burtonis</i>	Burton's Snake-lizard	Confirmed	Reptiles - Small-medium savanna		
Pygopodidae	<i>Pygopus steelescotti</i>	Northern Hooded Scaly-foot	Confirmed	Reptiles - Small-medium savanna		
Scincidae	<i>Carlia amax</i>	Bauxite Rainbow-skink	Confirmed	Reptiles - Small-medium savanna		
Scincidae	<i>Carlia gracilis</i>	Slender Rainbow-skink	Confirmed	Reptiles - Small-medium savanna		
Scincidae	<i>Carlia munda</i>	Shaded-litter Rainbow-skink	Confirmed	Reptiles - Small-medium savanna		
Scincidae	<i>Carlia triacantha</i>	Desert Rainbow-skink	Confirmed	Reptiles - Small-medium savanna		
Scincidae	<i>Cryptoblepharus mertensi</i>	Merten's Snake-eyed Skink	Confirmed	Reptiles - Small-medium savanna		
Scincidae	<i>Cryptoblepharus metallicus</i>	Metallic Snake-eyed Skink	Confirmed	Reptiles - Small-medium savanna		
Scincidae	<i>Ctenotus decaneurus</i>	Ten-lined Ctenotus	Confirmed	Reptiles - Small-medium savanna		
Scincidae	<i>Ctenotus inornatus</i>	Bar-shouldered Ctenotus	Confirmed	Reptiles - Small-medium savanna		

Family	Scientific name	Common name	Likelihood	Group/guild	State	Action plan
Scincidae	<i>Ctenotus pantherinus</i>	Leopard Ctenotus	Confirmed	Reptiles - Small-medium savanna		
Scincidae	<i>Ctenotus quirinus</i>	Arnhem Plain-backed Ctenotus	Confirmed	Reptiles - Small-medium savanna		
Scincidae	<i>Ctenotus robustus</i>	Robust Ctenotus	Confirmed	Reptiles - Small-medium savanna		
Scincidae	<i>Ctenotus spaldingi</i>	Straight-browed Ctenotus	Confirmed	Reptiles - Small-medium savanna		
Scincidae	<i>Ctenotus storri</i>	Buff-striped Ctenotus	Possible	Reptiles - Small-medium savanna		
Scincidae	<i>Ctenotus superciliaris</i>	Sharp-browed Ctenotus	Confirmed	Reptiles - Small-medium savanna		
Scincidae	<i>Ctenotus vertebralis</i>	Scant-striped Ctenotus	Confirmed	Reptiles - Small-medium savanna		
Scincidae	<i>Eremiascincus douglasi</i>	Orange-sided Bar-lipped Skink	Confirmed	Reptiles - Small-medium savanna		
Scincidae	<i>Eremiascincus intermedius</i>	Northern Narrow-banded Skink	Likely	Reptiles - Small-medium savanna		
Scincidae	<i>Eremiascincus isolepis</i>	Northern Bar-lipped Skink	Confirmed	Reptiles - Small-medium savanna		
Scincidae	<i>Glaphyromorphus darwiniensis</i>	Northern Mulch-skink	Possible	Reptiles - Small-medium savanna		
Scincidae	<i>Lerista karlschmidti</i>	Lesser Robust Fine-lined Slider	Possible	Reptiles - Small-medium savanna		
Scincidae	<i>Lerista orientalis</i>	North-eastern Orange-tailed Slider	Confirmed	Reptiles - Small-medium savanna		
Scincidae	<i>Menetia greyii</i>	Common Dwarf Skink	Confirmed	Reptiles - Small-medium savanna		
Scincidae	<i>Menetia maini</i>	Northern Dwarf Skink	Confirmed	Reptiles - Small-medium savanna		
Scincidae	<i>Morethia ruficauda</i>	Lined Firetail Skink	Confirmed	Reptiles - Small-medium savanna		
Scincidae	<i>Morethia storri</i>	Top End Firetail Skink	Confirmed	Reptiles - Small-medium savanna		
Scincidae	<i>Notoscincus ornatus</i>	Ornate Soil-crevice Skink	Confirmed	Reptiles - Small-medium savanna		

Family	Scientific name	Common name	Likelihood	Group/guild	State	Action plan
Scincidae	<i>Proablepharus tenuis</i>	Northern Soil-crevice Skink	Confirmed	Reptiles - Small-medium savanna		
Typhlopidae	<i>Anilius diversus</i>	Northern Blind Snake	Confirmed	Reptiles - Small-medium savanna		
Typhlopidae	<i>Anilius guentheri</i>	Top End Blind Snake	Possible	Reptiles - Small-medium savanna		
Typhlopidae	<i>Anilius ligatus</i>	Robust Blind Snake	Confirmed	Reptiles - Small-medium savanna		
Typhlopidae	<i>Anilius unguirostris</i>	Claw-snouted Blind Snake	Likely	Reptiles - Small-medium savanna		
Chelidae	<i>Chelodina canni</i>	Cann's Snake-necked Turtle	Likely	Turtles		
Chelidae	<i>Chelodina oblonga</i>	Northern Snake-necked Turtle	Confirmed	Turtles		
Chelidae	<i>Elseya flaviventralis</i>	Yellow-bellied Snapping Turtle	Confirmed	Turtles		
Chelidae	<i>Emydura subglobosa</i>	Red-flushed River Turtle	Confirmed	Turtles		
Chelidae	<i>Emydura tanybaraga</i>	Northern Yellow-faced Turtle	Possible	Turtles		
Varanidae	<i>Varanus mertensi</i>	Merten's Water Monitor	Confirmed	Water Monitors	Vul	End
Varanidae	<i>Varanus mitchelli</i>	Mitchell's Water Monitor	Confirmed	Water Monitors	Vul	Cr End

**Notes:**

For Reptiles the threatened species listings are given for State and relevant Action Plan (Chapple et al. 2017).

Listings are abbreviated as follows:

Near Threatened = N Thr

Vulnerable = Vul

Endangered = End

Critically Endangered = Cr End

**Frogs**

Class	Order	Family	Scientific name	Common name	Likelihood	Group/guild
Amphibia	Anura	Hylidae	<i>Cyclorana australis</i>	Giant Frog	Confirmed	Frogs
Amphibia	Anura	Hylidae	<i>Cyclorana longipes</i>	Long-footed Frog	Possible	Frogs
Amphibia	Anura	Hylidae	<i>Litoria bicolor</i>	Northern Dwarf Tree Frog	Confirmed	Frogs
Amphibia	Anura	Hylidae	<i>Litoria caerulea</i>	Green Tree Frog	Confirmed	Frogs

Class	Order	Family	Scientific name	Common name	Likelihood	Group/guild
Amphibia	Anura	Hylidae	<i>Litoria coplandi</i>	Copland's Rock Frog	Confirmed	Frogs
Amphibia	Anura	Hylidae	<i>Litoria dahlii</i>	Dahl's Aquatic Frog	Very Likely	Frogs
Amphibia	Anura	Hylidae	<i>Litoria inermis</i>	Peters's Frog	Confirmed	Frogs
Amphibia	Anura	Hylidae	<i>Litoria meiriana</i>	Rockhole Frog	Confirmed	Frogs
Amphibia	Anura	Hylidae	<i>Litoria microbelos</i>	Javelin Frog	Possible	Frogs
Amphibia	Anura	Hylidae	<i>Litoria nasuta</i>	Rocket Frog	Confirmed	Frogs
Amphibia	Anura	Hylidae	<i>Litoria pallida</i>	Pale Frog	Confirmed	Frogs
Amphibia	Anura	Hylidae	<i>Litoria rothii</i>	Roth's Tree Frog	Confirmed	Frogs
Amphibia	Anura	Hylidae	<i>Litoria rubella</i>	Desert Tree Frog	Confirmed	Frogs
Amphibia	Anura	Hylidae	<i>Litoria spaldingi</i>	Northern Creek Frog	Confirmed	Frogs
Amphibia	Anura	Hylidae	<i>Litoria tornieri</i>	Tornier's Frog	Confirmed	Frogs
Amphibia	Anura	Limnodynastidae	<i>Limnodynastes convexiusculus</i>	Marbled Frog	Confirmed	Frogs
Amphibia	Anura	Limnodynastidae	<i>Notaden melanoscaphus</i>	Northern Spadefoot Toad	Confirmed	Frogs
Amphibia	Anura	Limnodynastidae	<i>Platyplectrum ornatum</i>	Ornate Burrowing Frog	Confirmed	Frogs
Amphibia	Anura	Myobatrachidae	<i>Crinia remota</i>	Remote Froglet	Confirmed	Frogs
Amphibia	Anura	Myobatrachidae	<i>Uperoleia inundata</i>	Floodplain Toadlet	Confirmed	Frogs
Amphibia	Anura	Myobatrachidae	<i>Uperoleia lithomoda</i>	Stonemason Toadlet	Confirmed	Frogs

### Introduced Species

Class	Family	Scientific name	Common name	Group/guild
Amphibia	Bufo	<i>Rhinella marina</i>	Cane Toad	Feral
Mammalia	Bovidae	<i>Bos taurus</i>	European Cattle	Feral - large herbivore
Mammalia	Bovidae	<i>Bubalus bubalis</i>	Swamp Buffalo	Feral - large herbivore
Mammalia	Equidae	<i>Equus asinus</i>	Donkey	Feral - large herbivore
Mammalia	Equidae	<i>Equus caballus</i>	Horse	Feral - large herbivore
Mammalia	Suidae	<i>Sus scrofa</i>	Pig	Feral - large herbivore

<b>Class</b>	<b>Family</b>	<b>Scientific name</b>	<b>Common name</b>	<b>Group/guild</b>
Mammalia	Felidae	<i>Felis catus</i>	Cat	Feral - predator
Mammalia	Muridae	<i>Rattus rattus</i>	Black Rat	Feral - rodent

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