












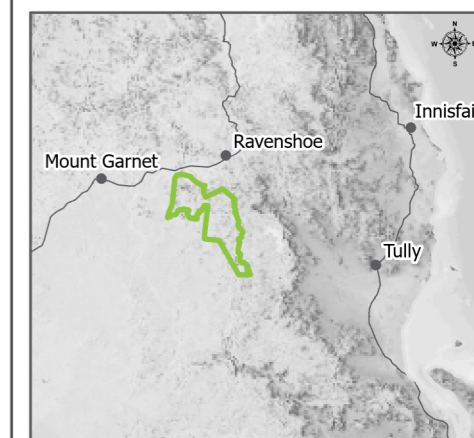
Chalumbin Wind Farm
Potential Habitat for Mountain mistfrog

Figure 4.19

-  Project Area Boundary
-  Study Area
-  Turbine
-  Met-mast
- Clearance Envelope**
-  Stage 1
-  Stage 2
-  Threatened Fauna Record (ALA/WildNet)
-  Potential Habitat
-  Watercourse
-  Lot Boundary
-  Easement

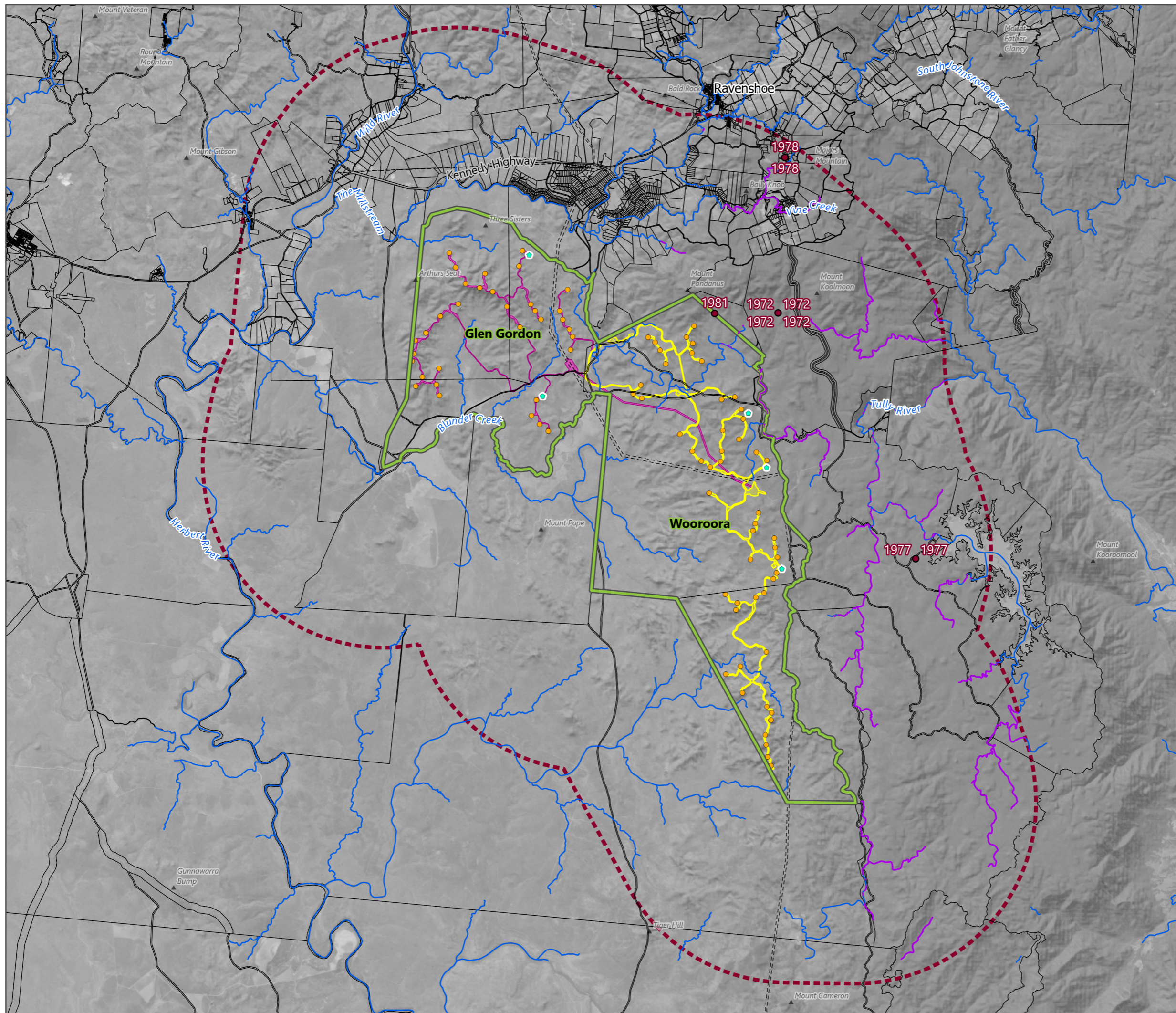
Date: 12/10/2022
Project: EPU-004

Author: TOD
Reviewed: NOD



Scale: 1:200,000@A3

Data Source(s):
Digital Cadastral Database - Department of Resources (2022);
Regional Ecosystem Mapping, WildNet - Department of Environment and Science (2022); Atlas of Living Australia (2020)
Earthstar Geographics, © State of Queensland (Department of Resources) 2022





4.6 Listed Threatened Bird Species

4.6.1 Buff-breasted Button-quail

4.6.1.1 Threat Status, Distribution, Population, Ecology and Habitat Preferences

The buff-breasted button-quail (*Turnix olivii*) is listed as Endangered under the EPBC Act and the NC Act. It is listed globally as Critically Endangered on the IUCN Red List. The Action Plan for Australian Birds 2020 (Garnett and Baker 2021) also lists the species as Critically Endangered.

The buff-breasted button-quail occurs in north-eastern Queensland and is one of the least known birds in Australia. It has only been recorded in the Iron Range and near Coen, Cooktown, Musgrave, Mount Molloy, Mareeba, Chillagoe and Ingham (SPRAT 2022). The only documented locality record in the last decade was from a small area near Mt Mulligan, west of Cairns (Garnett and Baker 2021). There have been no records since 2015 despite dedicated searching of all locations from where the birds have ever been recorded. Sightings are rarely accompanied by sufficient information to rule out the similar painted button-quail, which co-occurs in the southern part of its range (Garnett and Baker 2021).

The species reportedly has an upper elevation limit of 500 m (Birdlife International 2022a), listed as 400 m by Debus and Kirwan 2020.

The extent of occurrence is estimated, with low reliability, to be 2,000 km². This is suspected to be decreasing but there is no firm evidence to support this assumption. The area of occupancy is estimated, with low reliability, to be 50 km² and this is also thought to be decreasing (SPRAT 2022).

There is insufficient information to accurately determine the species' population size but it is suspected to be decreasing (SPRAT 2022).

The few records of the species are from stony and grassy savanna woodlands on plains and slopes, with sparsely wooded, well drained, slight-sloping bases of hills important during the breeding season. Birds have also been reported from grassy clearings within rainforest patches. The species has sometimes been recorded in open glades amongst *Melaleuca*, *Acacia*, *Alphitonia* or *Tristania* (Mathieson and Smith 2009, Garnett and Baker 2021, SPRAT 2022).

4.6.1.2 Known Threats

The species may have been eliminated from much of its range by inappropriate burning regimes and grazing that tends to promote woody weed invasion and results in few areas being storm-burnt in the early wet season (Mathieson and Smith 2009, Garnett and Baker 2021). As a result, there may be few places that retain an open structure that the button-quail appears to prefer for breeding. The species is believed to be susceptible to predation by native (e.g. goannas) and non-native species (e.g. feral cats) as it is ground-dwelling and ground-nesting (Mathieson and Smith 2009, Garnett and Baker 2021).

4.6.1.3 Survey Effort

An initial bird census was undertaken in January 2021. Following this, six bird 148orter148148148148148 surveys have been undertaken at 21 sites across the Project area (June 2021, October 2021, January 2022, April 2022, August 2022 and November 2022), as described in **Section 4.2.2.3**. This has resulted in a total survey effort to date of 205 person hours.



4.6.1.4 Project Area Habitat Assessment












The Project area is well outside the species' known range as presented by Birdlife International 2020, and Debus and Kirwan 2020. The entire Project area and the vast majority of the broader Study area is above the species' elevation limit as illustrated in **Figure 4-21**.

There are no prior records of the buff-breasted button-quail within the Project area nor the broader Study area. The nearest known record is approximately 63 km to the northwest (undated record near Innisfail, ALA). The species was not recorded during field surveys.

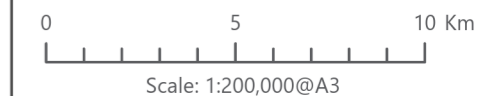
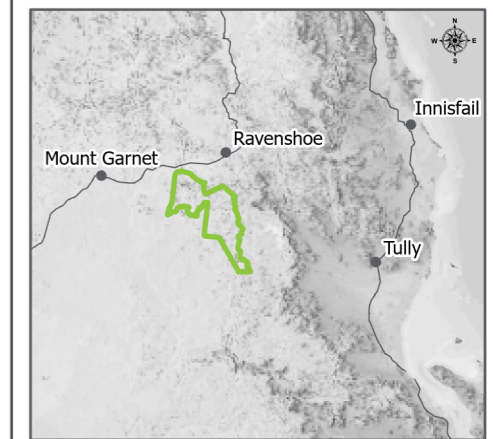
Based on current information, the Project area is not thought to provide habitat for the buff-breasted button-quail.

Chalumbin Wind Farm
Potential Habitat for Buff-breasted
button-quail

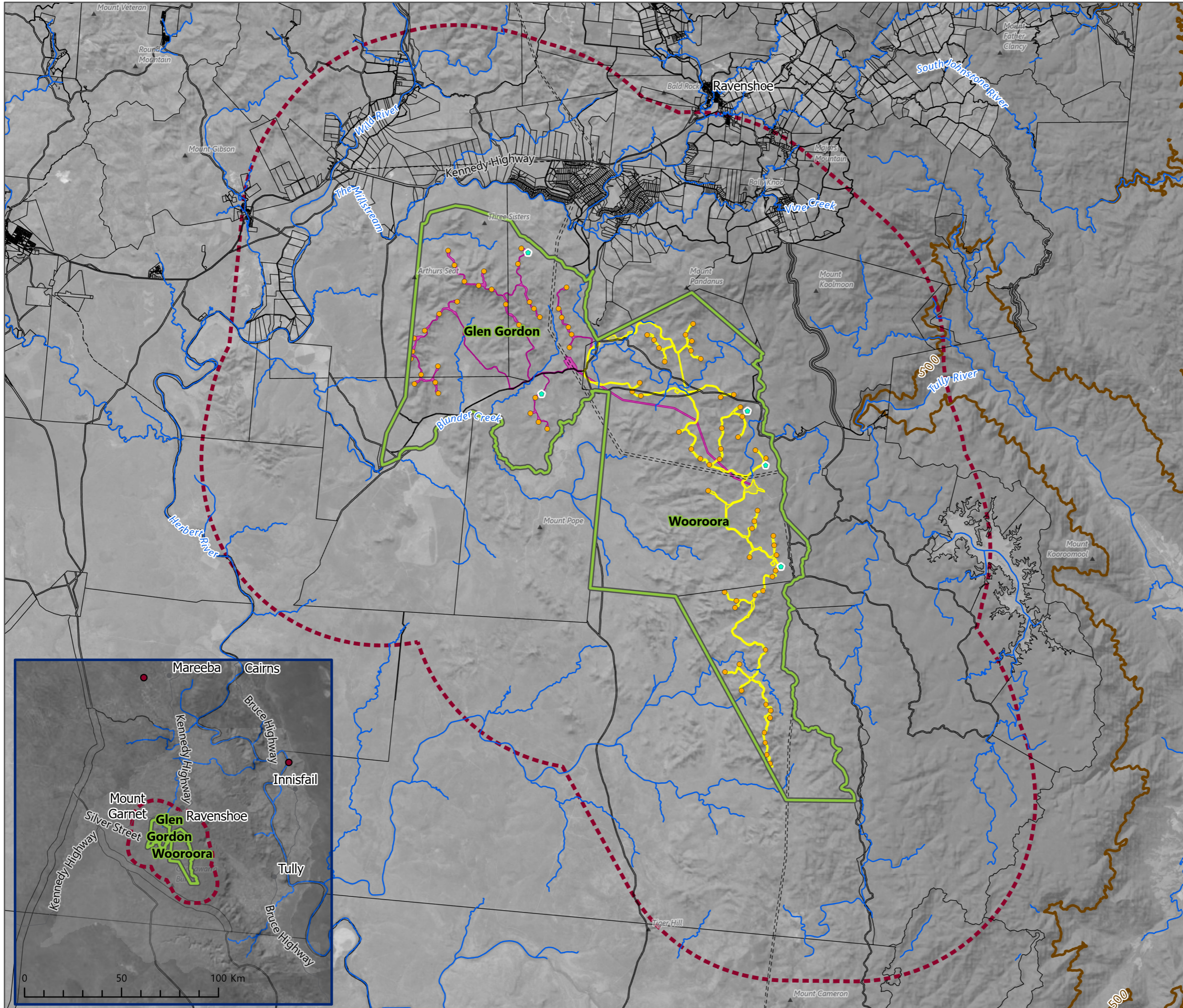
Figure 4.20

-  Project Area Boundary
-  Study Area
-  Turbine
-  Met-mast
- Clearance Envelope**
-  Stage 1
-  Stage 2
-  Threatened Fauna Record (ALA)
-  Contour - 500m
-  Watercourse
-  Lot Boundary
-  Easement

Date: 12/10/2022 Author: TOD
Project: EPU-004 Reviewed: NOD



Data Source(s):
Digital Cadastral Database - Department of Resources (2022);
Regional Ecosystem Mapping, WildNet - Department of
Environment and Science (2022); Atlas of Living Australia (2020)
Earthstar Geographics, © State of Queensland (Department of
Resources) 2022





4.6.2 Masked Owl

4.6.2.1 Threat Status, Distribution, Population, Ecology and Habitat Preferences

The masked owl (northern subspecies) (*Tyto novaehollandiae Kimberli*) is listed as Vulnerable under the EPBC Act and the NC Act. The nominate species is listed globally as Least Concern on the IUCN Red List. The Action Plan for Australian Birds 2020 (Garnett and Baker 2021) considers the Project area to fall within the range of the Cape York subspecies of masked owl, *Tyto novaehollandiae galei*, which it lists as Near Threatened (with a stable population of close to 1,000 mature individuals). However, the Cape York subspecies is currently not formally recognised in legislation. The nominate subspecies is listed as Vulnerable in the Action Plan for Australian Birds 2020 (Garnett and Baker 2021).

The masked owl is native to Australia, Indonesia and Papua New Guinea (BirdLife International 2018a). The distribution of the masked owl (northern) within Australia is poorly known, and three subpopulations have been suggested: Kimberley, Northern Territory and Cape York (SPRAT 2021). In Queensland it occurs along the southern rim of the Gulf of Carpentaria, Cape York Peninsula and south to Atherton Tablelands and the Einasleigh-Burdekin divide (SPRAT 2021).

The extent of occurrence of the masked owl (northern subspecies) is estimated to be 1,800,000 km² while the area of occupancy is estimated to be 18,000 km². Both of these are presumed to be declining (SPRAT 2021).

The species appears to occur as several small subpopulations, with an estimated total of 2,000 mature individuals in the nominate subspecies (Garnett and Baker 2021). The population is suspected to be declining (SPRAT 2021).

The masked owl (northern) has been recorded from riparian forest, open forest, *Melaleuca* swamps and the edges of mangroves, as well as the edges of sugar cane fields (SPRAT 2021). It requires large old-growth trees with large hollows for nesting (TSSC 2015b, SPRAT 2021). It usually nests in patches of closed forest and feeds largely on small to medium sized terrestrial mammals. A study on the southern subspecies identified a core range of approximately 155 ha (SPRAT 2021). The subspecies probably breeds in March–October and nests are 7–8 km apart (SPRAT 2021). It is sedentary and territorial (SPRAT 2021).

The masked owl has a large home range and hence low population density (Woinarksi 2004).

4.6.2.2 Known Threats

The northern subspecies has undoubtedly been affected by broad-scale changes to the environment caused by altered fire regimes, grazing by livestock and feral animals, and the invasion of native woodlands by exotic plants, particularly introduced pasture grasses. The most likely cause of the species' decline is a shortage of food, as small and medium-sized native mammals are becoming increasingly uncommon across much of northern Australia (TSSC 2015b, Garnett and Baker 2021).

The current regime of more intense, frequent and extensive fires may also reduce the availability of the large trees and hollows required for nesting (TSSC 2015b). One study has found that possums (specifically, common brushtail possums) monopolise hollows in woodland fragments at the expense of other species (TSSC 2015b). Other potential threats include competition with other large owls.

The main factors identified as making the northern subspecies eligible for listing in the Vulnerable category are a limited number of mature individuals (approximately 3,000), a suspected continuing decline in population size and a geographic distribution that may be precarious for the survival of the species (TSSC 2015b).



SPRAT 2021 lists the following threat abatement plan as relevant to this species:

- Threat abatement plan to reduce the impacts on northern Australia's biodiversity by the five listed grasses (DSEWPC 2012a).

4.6.2.3 Survey Effort

An assessment of hollow-bearing trees for occupation by nocturnal fauna (including masked owls) was undertaken across the Project area and these areas were then targeted for survey using call playback and spotlighting in the wet season and dry season, in line with relevant guidelines (DEWHA 2010b, Eyre et al 2018) and as described in **Section 4.2.2.3**. The total survey effort comprised 103 person hours with call playback being undertaken on 12 days.

4.6.2.4 Project Area Habitat Assessment

There are a number of historical records of masked owl within the Study area, to the north of the Project area in the vicinity of Ravenshoe (the most recent dating from 2021) and to the south (an undated record from within Yourka Nature Reserve) (ALA).

During the January 2021 surveys masked owl was recorded vocalising at two locations on the Glen Gordon property; on multiple occasions alongside Blunder Creek (within riparian vegetation dominated by *Eucalyptus tereticornis* and *Casuarina cunninghamiana*) and once within mixed Eucalypt woodland dominated by *Corymbia intermedia*, *E. resinifera* and *E. portuensis*.

The masked owl requires large hollows for nesting, and usually nests in patches of closed forest (SPRAT 2021). The demonstrated correlation between tree diameter at breast height (DBH) and presence of hollows is well established and is increasingly used as an indicator of tree habitat value (DES 2022). Size thresholds for what constitutes a "large tree" within a particular ecosystem type is guided by the probability of hollow presence in different tree species in different regions, meaning some species may contain hollows at smaller diameters than other species.

Light Imaging Detection And Ranging (LiDAR) data was acquired for the Project area in March 2021 to assist with the assessment of environmental constraints. This data was processed to create a Digital Elevation Model (DEM) and Digital Surface Model (DSM) for the Project area. The former is derived from 'ground-returns' representing the true height of the ground surface. The latter is derived from 'non-ground returns' reflected off trees and built structures and represents the height of the highest feature of the landscape. The difference of these two layers (DSM – DEM) was used to derive the height of vegetation present in the Project area.

The mapping of 'large trees' across the study area was undertaken through the derivation of allometric relationships between DBH and tree height measurements of habitat trees captured during a greater glider habitat assessment in December 2021 (see **Section 4.7.7.4**) and extrapolated across the entire site using tree height data extracted from LiDAR data. Using the recommended threshold for DBH for "large trees" of 41.2 cm in the Wet Tropics bioregion (as identified in DES 2022), the habitat assessment data was plotted to indicate an allometric relationship on site between DBH and tree height. A conservative intercept of 13 m tree height was selected as a threshold for the height of tall trees when using the mean of all species. Species such as *Eucalyptus tereticornis* and *Corymbia intermedia* were observed to have a taller tree structure, achieving heights closer to 17-20 m at the same DBH. A density of 25 large trees per hectare was considered indicative of the species' preference for nesting in "closed forest".

Masked owl habitat within the Project area was mapped as follows (see **Figure 4-21**):

- Nesting habitat comprises rainforest, riparian forest or open eucalypt forest containing "large trees" at a density of > 25 trees per ha; and
- Additional foraging habitat was mapped as rainforest, riparian forest and open forest within a buffer area around nesting habitat based on a core range of 155 ha (SPRAT 2021).

















Potential habitat within the broader Study area (where LIDAR data was not available to derive tree heights) was conservatively mapped as rainforest, riparian forest and open forest.

The Project will result in the clearance of 534.2 ha of nesting and foraging habitat and an additional 507 ha of foraging-only habitat.

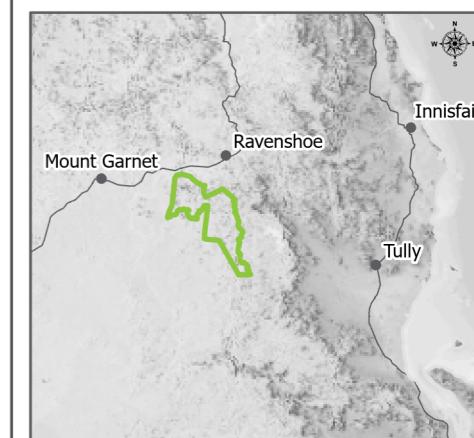
Chalumbin Wind Farm
Observations and Potential Habitat for Masked owl

Figure 4.21

-  Project Area Boundary
-  Study Area
-  Turbine
-  Met-mast
- Clearance Envelope**
-  Stage 1
-  Stage 2
-  Watercourse
-  Survey Observation
-  Threatened Fauna Record (ALA/WildNet)
-  Nesting Habitat
-  Foraging Habitat
-  Potential Habitat
-  Lot Boundary
-  Easement

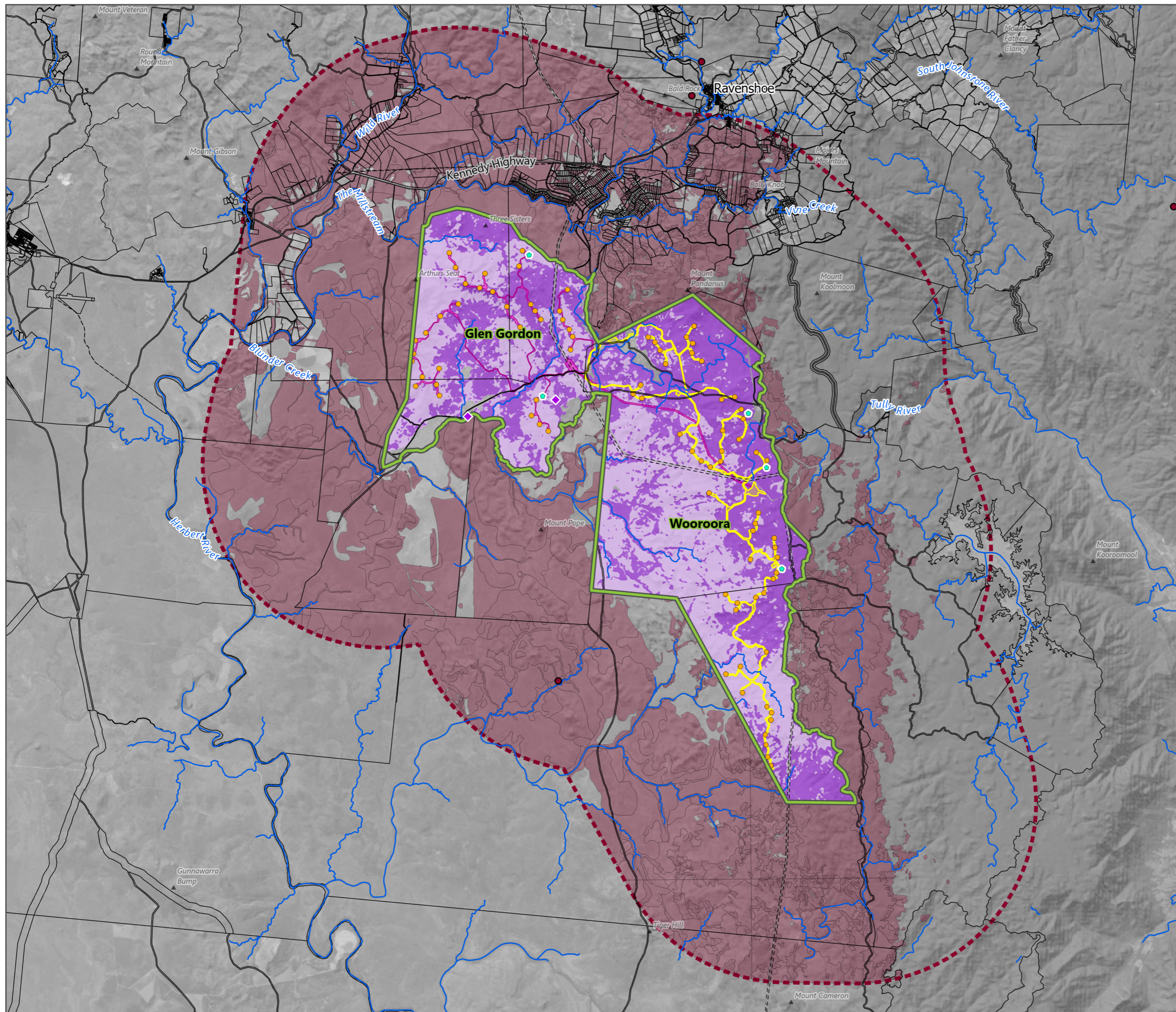
Date: 12/10/2022
Project: EPU-004

Author: TOD
Reviewed: NOD



Scale: 1:200,000@A3

Data Source(s):
Digital Cadastral Database - Department of Resources (2022);
Regional Ecosystem Mapping, WildNet - Department of Environment and Science (2022); Atlas of Living Australia (2020)
Earthstar Geographics, © State of Queensland (Department of Resources) 2022





4.6.3 Red Goshawk

4.6.3.1 Threat Status, Distribution, Population, Ecology and Habitat Preferences

The red goshawk (*Erythrotriorchis radiatus*) is listed as Vulnerable under the EPBC Act and Endangered under the NC Act. The red goshawk is listed globally as Near Threatened in the IUCN Red List and as Endangered in the Action Plan for Australian Birds 2020 (Garnett and Baker 2021).

The red goshawk is endemic to Australia. It occurs in a patchy, widespread distribution across coastal and sub-coastal regions of northern and eastern Australia. The distribution of the red goshawk is not severely fragmented. It is suspected that there is some fragmentation but there is no evidence this is severe (SPRAT 2021).

Historically the red goshawk occurred from the northeast tip of New South Wales, across Queensland and the Northern Territory, to the north of Western Australia. However, there is evidence to suggest that the mainland population may now be smaller than previously estimated and that the species' range may have contracted to the north (TSSC 2015c).

The estimated extent of occurrence is assessed in SPRAT 2021 as likely to be stable at 1,000,000 km². There is no clear data to indicate past declines in the species' extent of occurrence, and there is no information available on predicted future changes in the extent of occurrence. The red goshawk is suspected to have always had a very large distributional range and extent of occurrence within which it was very sparsely distributed. The estimated area of occupancy is suspected to be 200,000 km², although the reliability of this estimate is low. The area of occupancy has declined since European settlement, although this decline cannot be quantified and there are no quantified predictions of future changes to the species' area of occupancy (SPRAT 2021). The Action Plan for Australian Birds 2020 estimates the extent of occurrence to be 3,800,000 km² and area of occupancy to be 134,000 km², with both said to be contracting (Garnett and Baker 2021).

The Action Plan for Australian Birds 2020 estimates there is a population of 1,340 mature individuals in a single population, which is declining (Garnett and Baker 2021).

The species inhabits biodiverse, extensive, multi-species mosaics of mostly Eucalypt-dominated open forests and woodlands, in permanently watered, varied terrain. Its present association with rugged terrain may be an artefact of past patterns of habitat clearance, an interpretation supported by the pattern of early records (Czechura et al. 2010).

Nests are restricted to trees that are taller than 20 m (mean height = 31 m, DERM 2012) and within 1 km of a watercourse or wetland (TSSC 2015c). Pairs are believed to remain within the nesting territory all year but may expand their home range when not breeding (SPRAT 2021; TSSC 2015c). Breeding generally occurs in spring, with laying from May to October in the north (DERM 2012). The estimated home range is 120 km² for a breeding female and 200 km² for a male (TSSC 2015c; SPRAT 2021).

The same breeding territories may be occupied year after year (although not necessarily the same nest). Adults are year-round residents in northern Australia and, as is common among large bird-eating raptors, they have large home ranges. Population turnover is probably low. Juveniles may disperse widely and are probably responsible for the bulk of sightings outside the core breeding areas (TSSC 2015c, DERM 2021). Northeast QLD (north of 20°S) and eastern Cape York Peninsula are considered to be the strongholds for the species in eastern Australia and this has been corroborated by extensive field surveys (DERM 2012).

A recognised species expert, Dr Richard Seaton of the Australian Wildlife Conservancy, stated in a radio interview in May 2020 with the ABC Kimberley¹⁶ that there are currently no known nesting pairs south of Cape York. Garnett and Baker 2021 indicate that red goshawks breed from the Kimberley east to the Cape York Peninsula and may breed at

¹⁶ <https://www.abc.net.au/radio/kimberley/programs/breakfast/red-goshawk/12223322>



very low densities in the Wet Tropics and Einasleigh Uplands, although data is scarce. Generally, records south of the Cape York Peninsula over the last decade are increasingly scant, with the exception of tracked individuals.

In northern QLD red goshawks are mainly associated with extensive, uncleared mosaics of native vegetation, especially riparian vegetation, open forest and woodland that contain a mix of eucalypt, ironbark and bloodwood species (DERM 2012). Red goshawk habitat has to be open enough for fast attack and manoeuvring in flight, but provide cover for ambushing of prey. Therefore, forests of intermediate density are favoured, or ecotones between habitats of differing densities, e.g. between rainforest and eucalypt forest, between gallery forest and woodland, or on edge of woodland and forest where they meet grassland, etc. (SPRAT 2021).

The red goshawk is a visitor to the Atherton areas, in June to October – however this observation may represent an extension of home-range when not breeding (SPRAT 2021).

The red goshawk's diet is 95 % birds (SPRAT 2021), especially those in the 100-250 g range (DERM 2012). The usual method of capture is hunting from concealed, or occasionally exposed, perches. They occasionally use rapid contour hunting and often seize prey in flight. They actively perch hunt early and late in the day, while flying for much of the time between 1200 and 1600 hours. They fly for prolonged periods (up to 60 minutes) through and just above the canopy, occasionally soaring up to approximately 1,000 m for up to 30 minutes (SPRAT 2021).

4.6.3.2 Known Threats

Vegetation clearance is thought to have caused the historical decline in NSW and southern QLD. Ongoing declines may also be attributed to habitat fragmentation and degradation. Reduced fire frequencies, leading to vegetation thickening and a reduction in habitat suitability may also be a threat. Declines in abundance of the key prey species caused by the loss or degradation of freshwater wetlands, loss of hollow-bearing trees in which prey breed, overgrazing by livestock and feral herbivores, and altered fire regimes (including both increased and decreased fire frequencies) may also be impacting the species' long-term viability (NSW National Parks & Wildlife Service 2002, DERM 2012, TSSC 2015c).

No Threat Abatement Plans have been identified as relevant for this species (SPRAT 2021).

4.6.3.3 Survey Effort

In northern Australia the species starts nest-building in May, lays eggs from July to September and fledges young from October to December. The fledged young remain around the nest area for another month or so (DEWHA 2010c). Surveys for nests in the period October to December are therefore appropriately timed to identify birds on a nest, if present.

The survey method for red goshawk recommended in The Survey Guidelines for Australia's Threatened Birds (DEWHA 2010c) is to search for their characteristic nests within patches of the tallest forest along riverbanks. In eastern Australia's ranges, searching for nests is more difficult but soaring birds can sometimes be located from vantage points such as mountain tops. Some success has also been had surveying this species using call playback during the breeding season (DEWHA 2010c). All three of these methods were used during Project surveys, as described in **Section 4.2.2**.

Project ecologists spent a total of 345 person hours surveying the Project area for red goshawk. Of this, 140 person hours were spent undertaking dedicated searches for red goshawk nests across the 7,500 ha area mapped as potential nesting habitat in October 2021 and December 2022 (as described in **Section 4.6.3.4**). Transects were a mixture of driven and walked (see **Figure 4-22**). Call playback was only utilised near the single potential nest identified during these surveys.



An additional 205 person hours were spent undertaking timed counts of all birds observed (which would include any soaring red goshawks, if present) at 21 vantage points across the Project area, including within potential nesting and foraging habitat for red goshawk. This was spread across six survey events between January 2021 and November 2022.

4.6.3.4 Project Area Habitat Assessment

The species was known to nest historically on the Yourka Nature Reserve immediately to the south of the Project area, with the last recorded sighting in ALA dating from 2007. The red goshawk has not been observed in Yourka Nature Reserve in the last decade (Bush Heritage Australia, pers. comm.).

No red goshawks have been observed during any of the Project surveys. In January 2021 a nest considered as possibly belonging to red goshawk was observed in the Glen Gordon property, in riparian vegetation to the north of the main property access road. The nest was unoccupied (as would be expected in late January) but appeared to have been recently built (no older than the 2019-20 breeding season). Photographs of the nest were sent to a number of recognised bird specialists (including a QPWS ranger, a member of BirdLife Australia, a staff member of the AWC and another experienced ornithologist); one agreed the nest resembled that of a red goshawk, two others considered it was 'possibly' belonging to a red goshawk and one was certain that the nest was not that of a red goshawk but instead belonged to a grey goshawk (a non-threatened species that was observed during surveys). This demonstrates how challenging it is to identify the species based solely on a photograph of the nest.

As with the masked owl (see **Section 4.6.2.4**), a tree height layer was derived from LiDAR data and interrogated to estimate the abundance and distribution of large trees (>20 m) within 1 km of permanent water (a watercourse or a wetland) which could be potential red goshawk nesting trees. This resulted in an area of approximately 7,500 ha being identified as potential red goshawk nesting habitat within the Project area. These areas were the focus of targeted red goshawk nest surveys in October 2021. Bird utilisation surveys were undertaken as part of the same survey, which would have identified any soaring red goshawks if present. No red goshawks were observed during the survey. No new potential red goshawk nests were identified during the survey. The previously identified potential red goshawk nest was revisited and appeared to be disused. There was no evidence of bones, food or faeces under the nest. Call playback was undertaken in proximity to the nest for 30 minutes and the only species to respond was a pied currawong.

The survey for nesting red goshawks was repeated in December 2022 and no red goshawks were observed. The previously-identified potential red goshawk nest was revisited and was again disused. There was no evidence of bones, food or faeces under the nest and no evidence that fresh nesting material had been placed in the nest during the current breeding season. No other potential red goshawk nests were identified within suitable habitat.














There is no evidence of any breeding pairs nesting within the Project area in the previous two nesting seasons and no evidence of any red goshawks currently using any part of the Project area for foraging. The potential for juvenile red goshawks to use the Project area for foraging whilst undertaking the vast migrations for which they are known cannot be discounted.

As the species has not been recorded from within the Project area (nor within the broader Study area for approximately 15 years), no habitat critical to the survival of the species has been mapped within the Project area. Potential nesting habitat within the Project area has been mapped as remnant vegetation up to 1 km from a watercourse (stream order 3 or greater) and with a canopy height greater than 20 m. Potential foraging habitat within the Project area and the broader Study area (for which canopy height data is not available) has been mapped as any other remnant or regrowth vegetation that is not rainforest.

Potential nesting and foraging habitat are mapped in **Figure 4-22** along with previous species records and observations from Project surveys.

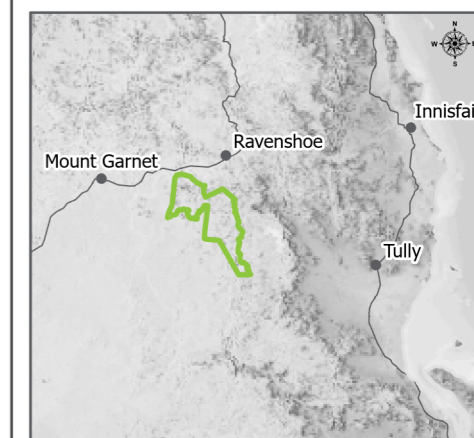
Chalumbin Wind Farm
Observations and Potential Habitat for Red goshawk

Figure 4.22

-  Project Area Boundary
-  Study Area
-  Turbine
-  Met-mast
- Clearance Envelope**
-  Stage 1
-  Stage 2
-  Watercourse
-  Survey Observation
-  Threatened Fauna Record (ALA/WildNet)
-  Nesting Habitat
-  Foraging Habitat
-  Lot Boundary
-  Easement

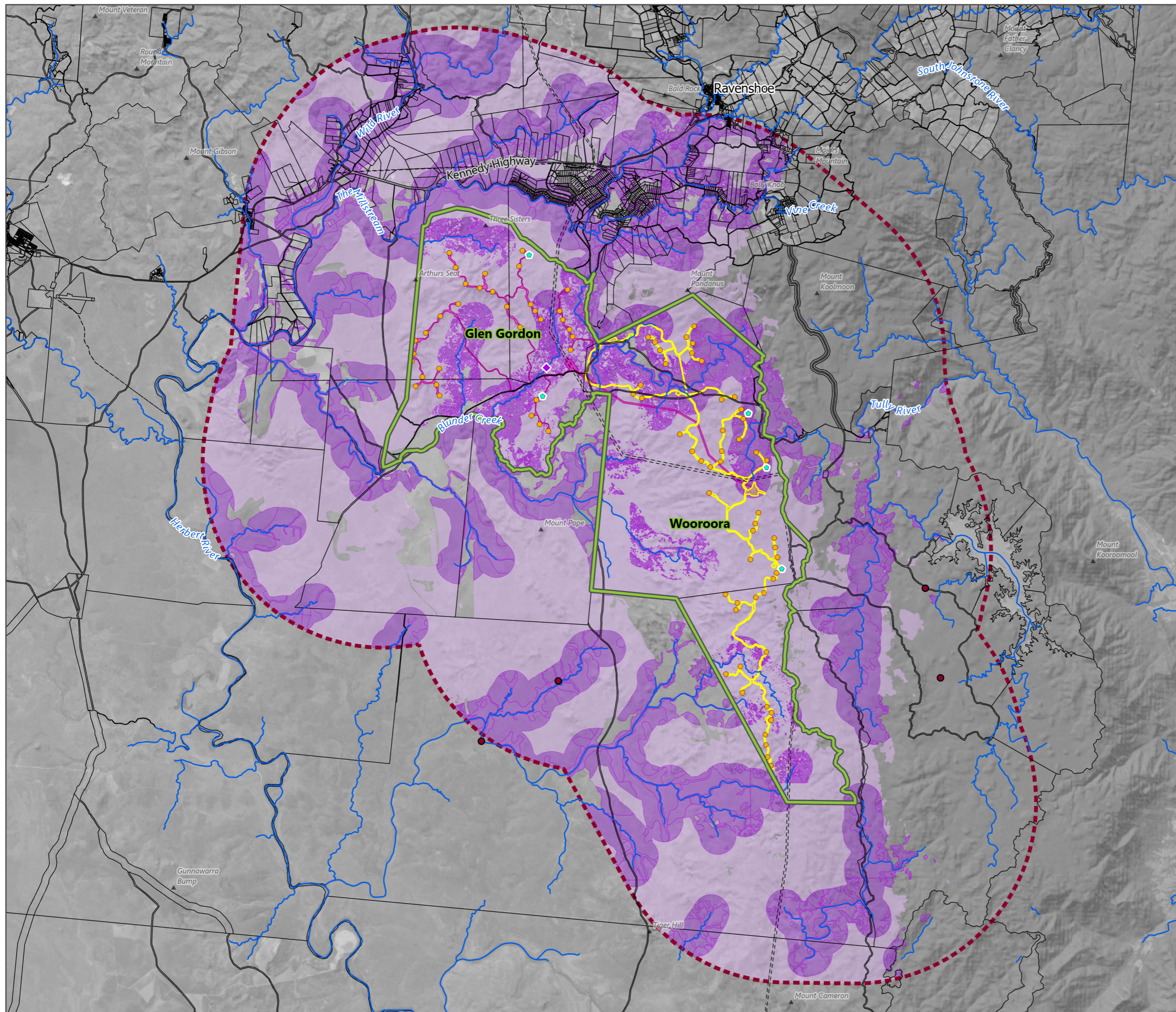
Date: 12/10/2022
Project: EPU-004

Author: TOD
Reviewed: NOD



Scale: 1:200,000@A3

Data Source(s):
Digital Cadastral Database - Department of Resources (2022);
Regional Ecosystem Mapping, WildNet - Department of Environment and Science (2022); Atlas of Living Australia (2020)
Earthstar Geographics, © State of Queensland (Department of Resources) 2022





4.6.4 Southern Cassowary – Southern Population

4.6.4.1 Threat Status, Distribution, Population, Ecology and Habitat Preferences

The southern cassowary – southern population (*Casuarius casuarius johnsonii*) is listed as Endangered under the EPBC Act and the NC Act. It is listed globally as Least Concern on the IUCN Red List, and as Least Concern in the Action Plan for Australian Birds 2020 (Garnett and Baker 2021).

Cassowaries in the Wet Tropics were historically distributed between Cooktown and Townsville, west to the extent of rainforest including the entire rainforested portion of the Atherton Tableland. The present distribution remains similar but greatly reduced and fragmented by forest clearance.

Although the total species population is small, there are two substantial subpopulations and no evidence of a decline in the last three generations. This is thought to be because rainforest clearing has largely ceased following the World Heritage listing of the WTQ in 1988. In relation to the species as a whole, the extent of occurrence is estimated at 75,000km² and the area of occupancy is estimated at 12,900km²; both of these are considered stable. The population is approximately 2,900 mature individuals and also considered stable. The largest subpopulation is in Wet Tropics rainforest between Cooktown and Townsville (Garnett and Baker 2021). Its core habitat is the coastal lowlands between Ingham and Mossman, as well as upland areas incorporating the southern Atherton and Evelyn Tablelands (Latch 2007).

The cassowary is a keystone species in tropical rainforest, playing a key ecological role in the dispersal of many rainforest plant seeds. It is the only long-distance disperser of some fleshy-fruited plants with large seeds. Adult cassowaries are territorial and do not migrate once they have established a home territory. However, home range size may vary with seasonal fruit production and cassowaries may travel over 4 km a day to access resources. Home ranges may be up to 12 km² in upland regions, smaller in coastal lowland habitat. While cassowaries live in and depend on tropical rainforest, they will also utilise a mosaic of associated habitats when these are available, including mangroves, melaleuca, eucalypt woodlands, swamps and swamp forests. They rely on a year-round supply of fleshy fruit and these habitats can provide crucial food resources at certain times of the year. A range of non-rainforest habitats may also be used as corridors (DEWHA 2010d).

Key landscape values for the cassowary include:

- Feeding habitat: cassowaries feed primarily on the fleshy fruits of rainforest trees and shrubs, taking most fruit from the ground. They will also feed on exotic fruit plantations and some weed species such as pond apple. Feeding areas change with fruiting seasons and if traditional food supplies fail (e.g. due to a cyclone), alternative food sources may be sought in areas not usually used.
- Breeding habitat: cassowaries nest in a variety of habitats such as primary and regrowth rainforest and woodland. All recorded nests have been in rainforest or woodland mosaics with rainforest elements often with a closed understorey of vines, regrowth or dense grass thickets.
- Water: cassowaries depend on access to fresh water for drinking and bathing many times a day.
- Resting habitat: the cassowary requires quiet and dark habitat during the night. Noise and light pollution has the potential to disrupt and stress cassowaries.
- Corridors for movement: a cassowary habitat corridor provides a continuous, or near continuous, link of suitable habitat across a modified landscape that may otherwise impede movement of the species. A habitat corridor may comprise remnant habitat, regenerated habitat or artificially created habitat. Corridors for movement may include open areas as well as vegetated areas. Cassowaries, including dispersing young, often use riparian corridors to move between habitat patches, moving up to 2-3 km along them (DEWHA 2010d).



All habitat utilised by cassowaries is considered important. Three categories of habitat utilised by cassowaries have been identified and mapped, based on RE mapping (DEHWA 2010d):

- Essential habitat is defined as being necessary for the persistence of cassowary populations in perpetuity: those REs where there is an accurate and verified record of a cassowary and that are known to be preferentially used by cassowaries for breeding, feeding and general activity;
- General habitat is defined as that occasionally used by cassowaries but not considered essential for the persistence of cassowary populations in perpetuity: those REs where there is an accurate and verified record of a cassowary but that are not known to be preferentially used as habitat; and
- Rehabilitating habitat: non-remnant REs that consist of rehabilitating and regrowing vegetation that provide shelter and supplementary feeding and breeding resources. If allowed to return to a remnant state, these REs would be likely to be categorised as either essential or general cassowary habitat (DEHWA 2010d).

It is the category of 'essential habitat' that is deemed to be the best estimate of habitat critical to the survival of the species. In the Wet Tropics there is approximately 800,000 ha of essential cassowary habitat, of which 84 % is within the World Heritage area. Appendix 2 of the Recovery Plan for Southern Cassowary lists 91 REs that are considered Essential Habitat for the species, the majority of which are rainforest communities (Latch 2007).

4.6.4.2 Known Threats

The Action Plan for Australian Birds 2020 identifies that the major historical reason for decline was habitat clearing but that this almost ceased with the declaration of the WTQ World Heritage Area in 1986 and the subsequent protection of rainforests. While some losses do occur due to predation by feral pigs, wild or free-roaming domestic dogs, loss of habitat to urban development and vehicle strikes, they do not appear to be significantly affecting abundance throughout the species range (Garnett and Baker 2021).

The Recovery Plan for the Southern Cassowary (Latch 2007) identifies the following main threats to the species:

- Habitat loss from clearing: more than 80 % of coastal lowland habitat has gone;
- Habitat fragmentation: much of the remaining habitat is fragmented, isolating groups and disrupting movement;
- Habitat degradation: through invasion of weeds such as pond apple, and changed fire regimes;
- Roads and traffic: cassowaries are killed by vehicles on roads;
- Dog attacks: urban development brings more domestic dogs;
- Hand feeding: brings cassowaries closer to vehicle traffic and dogs;
- Diseases: aspergillosis, avian tuberculosis and parasites; and
- Natural catastrophic events: cyclones.

SPRAT 2021 lists the following threat abatement plan as relevant for this species:

- Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*) (DoEE 2017).



4.6.4.3 Survey Effort

The recommended survey effort guide for southern cassowary is 20 hours over 10 days for an area < 50 ha using a combination of area searches, detection by sightings, calls, observation of dung and footprints (DEWHA 2010c).

The Significant Impact Guidelines for the Endangered Southern Cassowary Wet Tropics population recommend investigations by targeting dung, footprints, sightings and community knowledge. Sampling across seasons recommended (DEWHA 2010d).

Project ecologists have collectively undertaken in excess of 600 person hours of survey across the Project area in addition to approximately 9,270 camera trap nights.

4.6.4.4 Project Area Habitat Assessment

There are recent records of southern cassowary within the Study area but not the Project area, with the most recent dating from 2020 (ALA). No evidence of southern cassowary was observed during the field surveys.













There are three small, isolated patches of two vegetation communities listed as Essential Habitat for the southern cassowary within the Project area (DEHWA 2010d):

- RE 7.3.8 Broad-leaf tea-tree (*Melaleuca viridiflora*) woodland swamp complex on dry to very wet poorly drained lowlands and tablelands; and
- RE 7.8.7 *Eucalyptus tereticornis* (forest red gum) open forest, and associated grasslands. Uplands and highlands on basaltic krasnozems and prairie soils, of the moist rainfall zone.

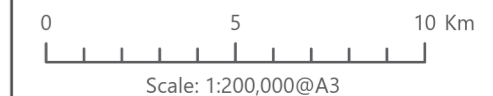
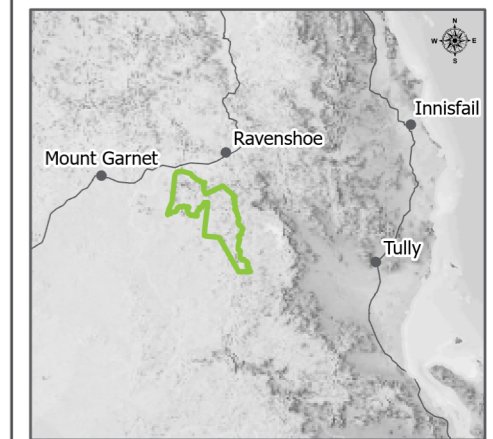
These have been mapped as habitat critical to the survival of the species where they occur within 1.5 km of a water source, see **Figure 4-23**.

Chalumbin Wind Farm
Potential Habitat for Southern cassowary

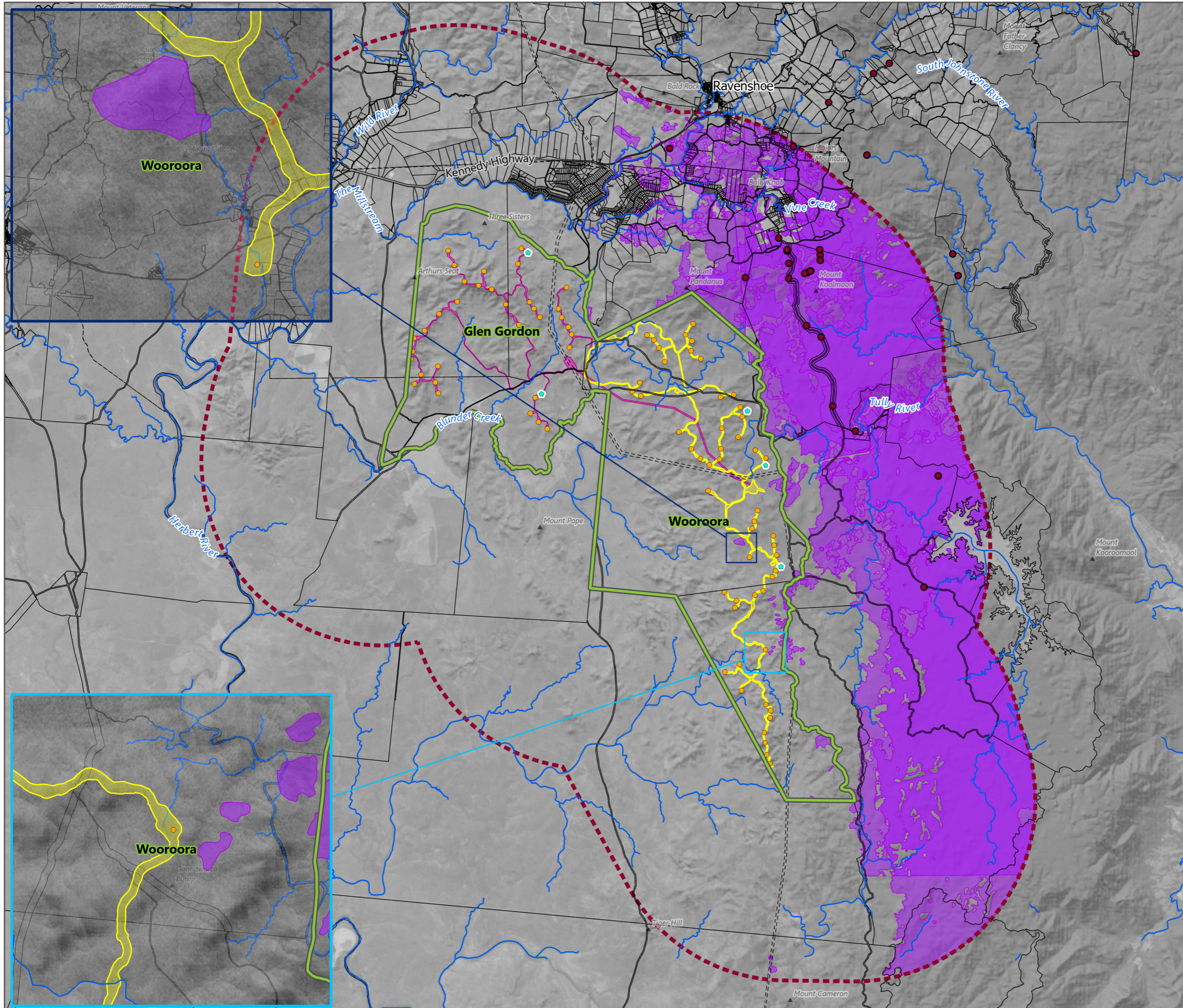
Figure 4.23

-  Project Area Boundary
-  Study Area
-  Turbine
-  Met-mast
- Clearance Envelope**
-  Stage 1
-  Stage 2
-  Threatened Fauna Record (ALA/WildNet)
-  Potential Habitat
-  Watercourse
-  Project Area Boundary
-  Lot Boundary
-  Easement

Date: 12/10/2022 Author: TOD
Project: EPU-004 Reviewed: NOD



Data Source(s):
Digital Cadastral Database - Department of Resources (2022);
Regional Ecosystem Mapping, WildNet - Department of Environment and Science (2022); Atlas of Living Australia (2020)
Earthstar Geographics, © State of Queensland (Department of Resources) 2022, Maxar





4.6.5 White-throated Needletail

4.6.5.1 Threat Status, Distribution, Population, Ecology and Habitat Preferences

The white-throated needletail (*Hirundapus caudacutus*) is listed as Vulnerable and Migratory under the EPBC Act, and Vulnerable under the NC Act. It is listed globally as Least Concern on the IUCN Red List. It is covered by CAMBA, JAMBA and ROKAMBA. The Action Plan for Australian Birds 2020 lists *H. c. caudacutus* (eastern white-throated needletail) as Vulnerable, based on evidence of ongoing decline since the 1950s; this decline is thought to be continuing because of a decline in habitat quality on the breeding grounds (which are all outside Australia) (Garnett and Baker 2021).

The species' extent of occurrence and area of occurrence are estimated at 10,000,000km² and both are considered to be stable. The species' population is estimated at 41,000 mature individuals, and declining (Garnett and Baker 2021).

The white-throated needletail is widespread in eastern and south-eastern Australia. It is believed that the entire migratory population moves from the northern hemisphere into Australasia during the non-breeding season. It is local and uncommon throughout much of its range (SPRAT 2021).

It is recorded in all coastal regions of Queensland, extending inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains (SPRAT 2021). There are scattered records from Torres Strait Islands and Cape York peninsula. It is mostly on and east of the Great Dividing Range from north of Cooktown to the New South Wales border, although it sometimes occurs further inland (DoE 2015a). The species breeds in northern Asia and spends the non-breeding season (typically October – March inclusive) in Australia where it is almost exclusively aerial, occurring from heights of less than 1 m up to more than 1,000 m above the ground.

The white-throated needletail occurs over most types of habitat, including cleared areas, but is most often recorded above wooded areas (SPRAT 2021).

4.6.5.2 Known Threats

The major threat to the species in Australia appears to be wind turbines. The high mobility of the species means that their daily foraging flights may intersect many wind farms in the course of an Australian summer, while the lateness with which they cease feeding in the evening means that they are unlikely to see those turbines they encounter (Garnett and Baker 2021).

No Threat Abatement Plans have been identified as relevant for this species (SPRAT 2021).

4.6.5.3 Survey Effort

An initial bird census was undertaken in January 2021. Following this, six bird utilisation surveys have been undertaken at 21 sites across the Project area (June 2021, October 2021, January 2022, April 2022, August 2022 and November 2022), as described in **Section 4.2.2.3**. This has resulted in a total survey effort to date of 205 person hours.

DoE 2015a indicates that surveys for white-throated needletail are undertaken as late as possible in the evening; afternoon BUS were undertaken between 3pm and 6pm, which is as late as observer visual acuity will generally allow for without artificial lighting.














4.6.5.4 Project Area Habitat Assessment

There are a number of historical records of white-throated needletail within the Study area, to the north, south and east of the Project area (ALA). One white-throated needletail was observed during the March 2021 field surveys. The specimen was found deceased within the existing transmission line corridor. In addition, white-throated needletails were observed during the April 2022 BUS (5 individuals observed across 2 sites) and the November 2022 BUS (45 individuals recorded across 4 sites). These records are mapped in **Figure 4-24**.

No habitat mapping has been undertaken for white-throated needletail as this species could occur in any airspace over the Project area. It is a migratory species that occurs in Australia only during the summer months but is highly aerial and only rarely alights while in Australia. Potential roosting habitat for the white-throated needletail includes trees with dense canopies and hollow-bearing trees on ridgelines (SPRAT 2021). The Queensland Regional Ecosystem Description Database (REDD) includes a field for structure category which defines vegetation density as dense, mid-dense, sparse, very sparse or grassland. The majority of the Project area is mapped as open eucalypt forest of various REs; the REDD was reviewed for each of the REs ground-truthed within the Project area and all are categorised as sparse or mid-dense. There are no dense vegetation communities within the Project area and therefore no potential roosting habitat for white-throated needletail.

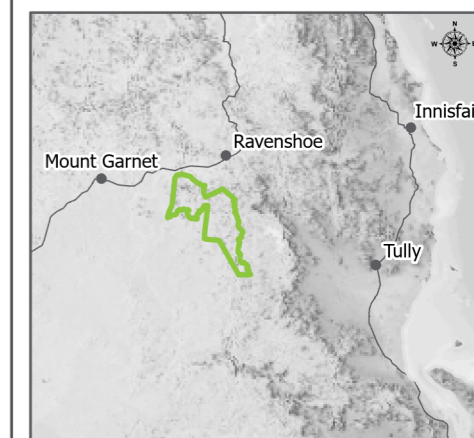
Chalumbin Wind Farm
Observations for White-throated
needletail

Figure 4.24

-  Project Area Boundary
-  Study Area
-  Turbine
-  Met-mast
- Clearance Envelope**
-  Stage 1
-  Stage 2
-  Survey Observation
-  Threatened Fauna Record (ALA/WildNet)
-  Watercourse
-  Lot Boundary
-  Easement

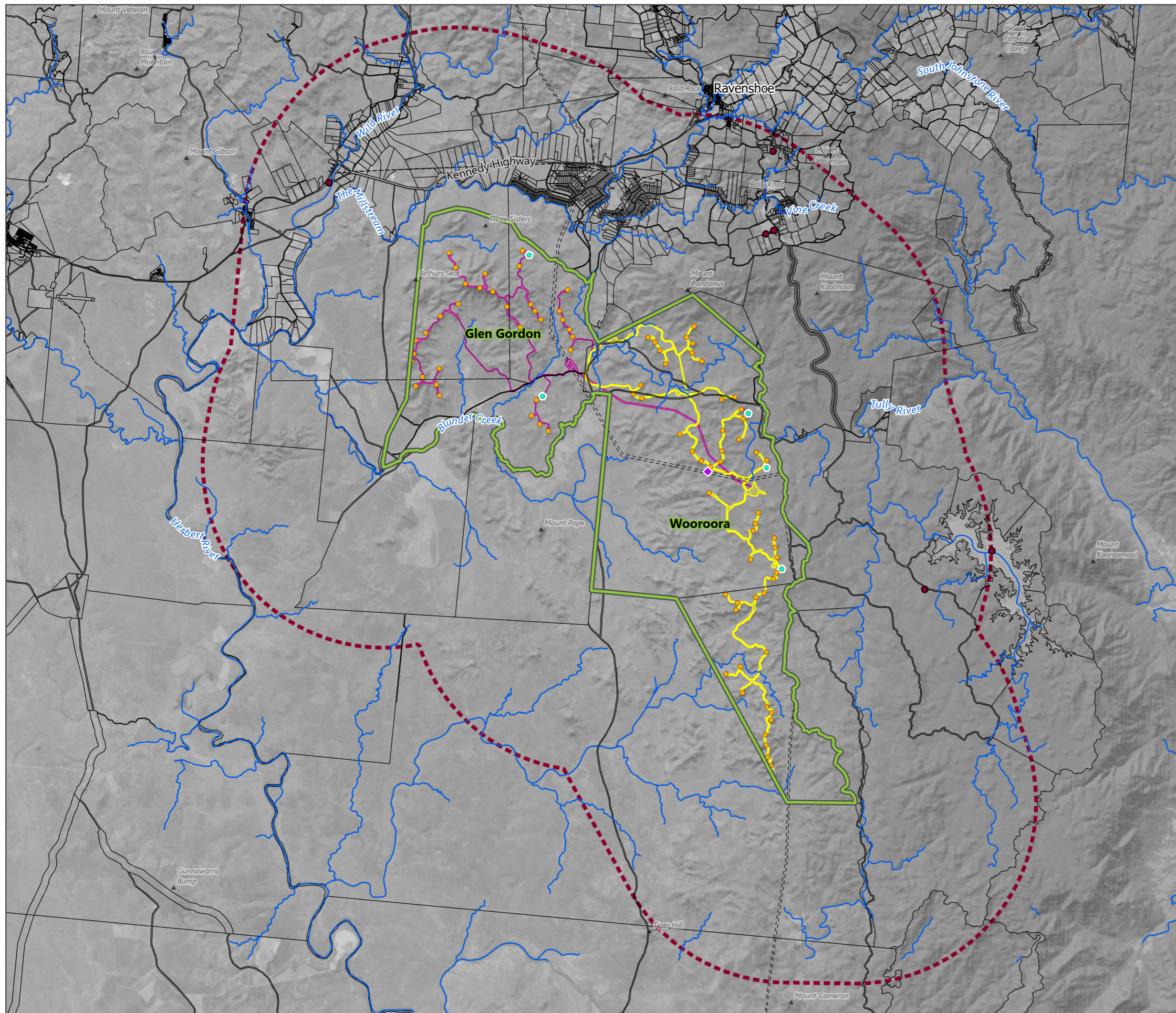
Date: 12/10/2022
Project: EPU-004

Author: TOD
Reviewed: NOD



Scale: 1:200,000@A3

Data Source(s):
Digital Cadastral Database - Department of Resources (2022);
Regional Ecosystem Mapping, WildNet - Department of
Environment and Science (2022); Atlas of Living Australia (2020)
Earthstar Geographics, © State of Queensland (Department of
Resources) 2022





4.7 Listed Threatened Mammal Species

4.7.1 Black-footed Tree Rat

4.7.1.1 Threat Status, Distribution, Population, Ecology and Habitat Preferences

The black-footed tree-rat (north Queensland) (*Mesembriomys gouldii rattoides*) is listed as Vulnerable under the EPBC Act and Least Concern under the NC Act. It is listed globally as Vulnerable on the IUCN Red List.

The species' distribution is poorly known. It has been recorded mostly from eucalypt forests and woodlands (but not rainforests) around Mareeba, with some sparse records across the Cape York Peninsula (TSSC 2015a). There are no published estimates of the species' population size but it is thought to be declining; an attempt to study the species in the Mareeba area had to be abandoned when no individuals were recorded during intensive sampling, including at sites where it had previously been recorded (TSSC 2015a).

The black-footed tree-rat occurs mostly in lowland open forests and woodlands dominated by *Eucalyptus 166orter166* and/or *Eucalyptus tetradonta*, particularly where these forests have a relatively dense shrubby understorey (Woinarski and Burbridge 2016c). It dens mostly in tree hollows but occasionally in dense foliage (notably of *Pandanus*) and occasionally in buildings (TSSC 2015a). It forages on the ground and in trees, and its diet mostly comprises fruits of *Pandanus spiralis*, seeds, some invertebrates and grass (Woinarski and Burbridge 2016c).

The black-footed tree-rat has an upper elevation limit of 700 m (Woinarski and Burbridge 2016c).

4.7.1.2 Known Threats

Major threats are predation by cats, habitat loss and habitat degradation due to inappropriate fire regimes, grazing and invasive pasture grass (TSSC 2015a, Woinarski and Burbridge 2016c).

SPRAT 2022 does not identify any threat abatement plans as being relevant to this species.

4.7.1.3 Survey Effort

As described in **Section 4.2.2.3** an extensive camera trapping program was undertaken across the full extent of the Project area, comprising nearly 6,000 camera trap nights between January and December 2021.

4.7.1.4 Project Area Habitat Assessment

The species has not previously been recorded within the Study area. There is an undated record from Mount Garnet (to the west of the Study area) and an undated record to the north of Bluff State Forest, north of the Study area (ALA). The species was not recorded in the Project area during field surveys.

In the absence of a confirmed population of black-footed tree-rat, *potential* habitat has been mapped as riparian forest (as this is more likely to support *Pandanus*, a key food species) below 700 m, buffered by 500 m as this is reportedly the species' foraging range (TSSC 2015a) (see **Figure 4-25**).