

Maules Creek Coal Mine Additional Offset Areas Habitat Mapping

Prepared by AMBS Ecology & Heritage Pty Ltd
for Whitehaven Coal Limited

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Executive Summary

The Maules Creek Coal Mine (MCCM) is subject to an approval (EPBC 2010/5566) granted under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act).

EPBC 2010/5566 requires its holder, Aston Coal 2 Pty Limited (Aston), to secure a package of offset areas which contains a specified quantity of EPBC Act listed White Box—Yellow Box—Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered Ecological Community and habitat for the Regent Honeyeater, Swift Parrot and Greater Long-eared Bat.

Condition 11A of EPBC 2010/5566 provides for Aston to include replacement and new offsets in its package of offset areas (additional offset areas).

As per condition 11A(a) of EPBC 2010/5566, the primary purpose of this study is to identify and verify the quantity and quality of "habitat" (as defined in EPBC 2010/5566) for the Regent Honeyeater, Swift Parrot and Greater Long-eared Bat (the latter is now referred to as Corben's Long-eared Bat, after a recent taxonomic study) on additional offset areas within five properties referred to as "Triangle", "Long Gully", "Neranghi North", "Coonoor" and "Thornfield".

AMBS Ecology & Heritage Pty Ltd (AMBS) was engaged to undertake this study, which involved a desktop review of relevant information, including the results of field surveys of the vegetation and fauna habitats within the additional offset areas.

The quantity of potential habitat for the Swift Parrot, Regent Honeyeater and Corben's Long-eared Bat within each of the additional offset areas is summarised in the below table:

Offset Area	Potential Habitat (ha)		
	Corben's Long-Eared Bat	Regent Honeyeater	Swift Parrot
Thornfield	61	61	61
Long Gully	330.7	330.7	352.9
Neranghi North	567	567	567
Triangle	741.9	741.9	741.9
Coonoor	573.9	573.9	573.9
TOTAL	2274.5	2274.5	2296.7

Field surveys of the additional offset areas found that key habitat attributes for each of the three target species were present in all of the additional offset areas and were abundant in many locations. Anthropogenic impacts were common, but rarely observed at a level where they would significantly impact the quality of the habitat for the three target species.

It is AMBS' opinion that the additional offset areas contain good quality "habitat" (as defined in EPBC 2010/5566) for the Regent Honeyeater, Swift Parrot and Corben's Long-eared Bat.

The Thornfield offset area also contains derived native grassland. It is AMBS' opinion that if self-sustaining vegetation communities containing suitable habitat features for these species are effectively restored within these areas in accordance with the relevant Offset Management Plan required to be prepared and implemented under EPBC 2010/5566, then this offset area will ultimately provide additional good quality potential habitat for the Regent Honeyeater, Swift Parrot and Corben's Long-eared Bat (between 75.6 ha to 84.4 ha).

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1 Introduction

1.1 Background

Aston Coal 2 Pty Limited (Aston), a subsidiary of Whitehaven Coal Limited, is the holder of an approval under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) for the Maules Creek Coal Mine (MCCM).

The conditions attached to the EPBC Act approval for the MCCM (EPBC 2010/5566) include Condition 9, Condition 9A, and Condition 11A.

Condition 9(a) of the EPBC Act approval for the MCCM (EPBC 2010/5566) states:

Direct Offsets

9. The person taking the action must register legally binding conservation covenants over offset areas containing, to the satisfaction of the **Minister**, no less than:

- a. 9,334 ha of an equivalent or better quality of habitat for the regent honeyeater, swift parrot and greater long-eared bat; and

Condition 9A states:

9A. The offset areas must be of an overall equivalent or better quality than the areas being cleared. This means:

...

- b. for the threatened species, the quality of the habitat for the species, taking account of its ecological requirements, must be equivalent to or better than the areas being cleared.

For the purpose of meeting the Direct Offsets requirement under condition 9, condition 11A of EPBC 2010/5566 provides for Aston to include replacement and new offsets in its package of offset areas (additional offset areas). Condition 11A states:

Replacement and new offsets

11A. For the purpose of condition 9, the offset areas may include additional offset areas to the offset areas which were the subject of **independent review** under conditions 10 and 11 if:

- a) the person taking the action submits a report to the **Minister** for approval, which has been subject to **additional independent review**, that identifies and verifies the quantity and **condition classes** of White Box—Yellow Box— Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community and the quantity and quality of **habitat** for the regent honeyeater, swift parrot and greater long-eared bat within the additional offset areas;
- b) that report is submitted to the **Minister** for approval by 30 June 2022, unless otherwise agreed by the **Minister** in writing; and
- c) the **Minister** has approved that report.

The person taking the action must publish the report on its website within 30 days of the **Minister's** approval, unless otherwise agreed by the **Minister** in writing.

The expression "habitat" is defined in EPBC 2010/5566 to mean:

areas in which a species or community is known to occur or is thought to have the potential to occur based on the biophysical conditions prevailing in the area and the ecological requirements of the species or community

The Greater Long-eared Bat was listed as Vulnerable under the EPBC Act under the scientific name *Nyctophilus timoriensis* (south-eastern form). Subsequent taxonomic revision resulted in the south-eastern form being renamed as Corben’s Long-eared Bat (*Nyctophilus corbeni*). The scientific name listed under the EPBC Act was updated on 1 August 2011.

AMBS Ecology & Heritage Pty Ltd (AMBS) was engaged to provide an assessment of potential habitat for the Regent Honeyeater (*Anthochaera phrygia*), Swift Parrot (*Lathamus discolor*) and Corben’s Long-eared Bat (*Nyctophilus corbeni*) across five properties referred to as “Triangle”, “Long Gully”, “Neranghi North”, “Coonoor” and “Thornfield”.

As per condition 11A(a) of EPBC 2010/5566, the primary purpose of this study is to identify and verify the quantity and quality of "habitat" (as defined in EPBC 2010/5566) for the Regent Honeyeater, Swift Parrot and Corben’s Long-eared Bat on additional offset areas within five properties referred to as “Triangle”, “Long Gully”, “Neranghi North”, “Coonoor” and “Thornfield”.

This study forms one part of the report required under condition 11A of EPBC 2010/5566. The study titled "Maules Creek Coal Mine Additional Offset Areas Vegetation Mapping" (AMBS 2021) forms the other part of the report required under condition 11A of EPBC 2010/5566.

The report (comprising both studies) will be subject to "additional independent review" (as defined in EPBC 2010/5566), and will ultimately be submitted to the Minister for approval, under condition 11A.

1.2 Scope

The scope of work for this study involves a review of:

- the vegetation communities present within the additional offset areas;
- information regarding the Plant Community Types (PCTs) associated with the Regent Honeyeater, Swift Parrot and Corben’s Long-eared Bat;
- fauna habitat attributes present within the additional offset areas;
- data from fauna monitoring sites near the Thornfield offset area; and,
- records of each of the relevant species in the vicinity of the additional offset areas.

1.3 Location of the Study Areas

The Triangle property is located approximately 15 kilometres (km) west of the township of Barraba, New South Wales (NSW). The Long Gully property is located approximately 5 km south of the township of Tingha, NSW. The Neranghi North and Coonoor properties are located approximately 25 km and 23 km north-east of the township of Barraba, NSW, respectively. The Thornfield property is located between the existing Wollandilly and Onavale offset areas, approximately 24 km north-east of Boggabri, NSW. The locations of the properties are shown on Figure 1.1. The area covered by the proposed offset area within each property is shown in Table 1.1.

Table 1-1 Area of Proposed Offset Area on Each Property

Proposed Offset Area	Area (ha)
Triangle	741.9
Long Gully	352.9
Neranghi North	567.1
Coonoor	574.1
Thornfield	171.3
Total	2,407.3

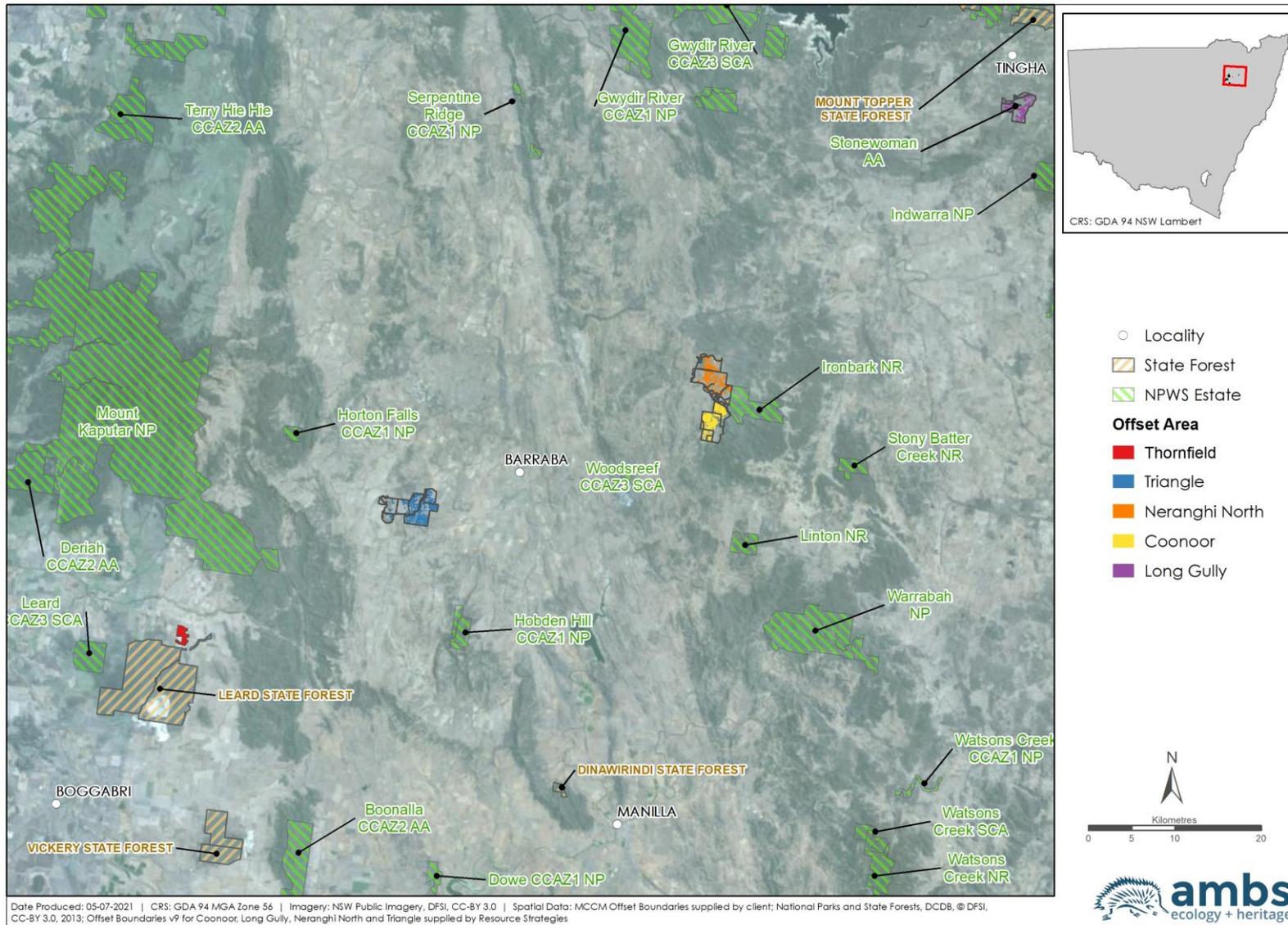


Figure 1.1: Location of the Study Area

1.4 Swift Parrot (*Lathamus discolor*)

The Swift Parrot is a small and mostly bright green parrot with a red face, vent, and underwing linings. It is a fast and agile flier with a long thin tail, and it calls frequently in flight (Cooper *et. al.* 2016, Saunders & Tzaros 2011).

The Swift Parrot breeds only in Tasmania during the summer. It breeds in tree-hollows in old-growth or other forest with suitable hollows, in relatively close proximity to the main food source, flowering Tasmanian Blue Gum (Saunders & Tzaros 2011, Tzaros *et. al.* 2009).

The entire population migrates north across Bass Strait in autumn and disperses across mainland South-Eastern Australia for the winter (Saunders & Tzaros 2011, Tzaros *et. al.* 2009). On the mainland, it can utilise habitats from the south-east corner of South Australia to south-east Queensland. In NSW it occurs the coastal districts and the western slopes but reaches the mountains and western plains in some years (Cooper *et. al.* 2016).

On the mainland, the Swift Parrot can be described as a blossom nomad, because individuals wander widely across the range seeking seasonally variable nectar resources. As such, records of the species are spatially and temporally inconsistent. The primary food source on the mainland are flowers and psyllid lerps in Eucalyptus species. In New South Wales, coastal regions tend to support larger numbers of birds when inland habitats are subjected to drought.

Favoured feed trees include winter flowering species such as Swamp Mahogany (*Eucalyptus robusta*), Spotted Gum (*Corymbia maculata*), Red Bloodwood (*C. gummifera*), Forest Red Gum (*E. tereticornis*), Mugga Ironbark (*E. sideroxylon*), and White Box (*E. albens*) (DPIE 2021a). Commonly used lerp infested trees include Inland Grey Box (*E. macrocarpa*), Grey Box (*E. moluccana*), Blackbutt (*E. pilularis*) and Yellow Box (*E. melliodora*) (DPIE 2021a).

1.5 Regent Honeyeater (*Anthochaera phrygia*)

The Regent Honeyeater tends to occur in woodlands and open forests of the inland slopes of south-east Australia, with birds sometimes found in drier coastal woodlands and forests in some years (DPIE 2021a). The species' range has contracted dramatically and now only occurs between north-eastern Victoria and south-eastern Queensland (DPIE 2021a). There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region (DPIE 2021a). Breeding is occasionally recorded elsewhere, for example a breeding pair were detected in Mulgoa, Sydney in the 2019 breeding season, and the Lower Hunter Spotted Gum forests have recently been demonstrated to support regular breeding events (DPIE 2021a). In NSW, the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands, although in some years flocks converge on flowering coastal woodlands and forests (DPIE 2021a).

Habitat for the species is mainly dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak (DPIE 2021a). Woodlands where the species occurs usually have large numbers of mature trees, high canopy cover and an abundance of mistletoes (DPIE 2021a). The Regent Honeyeater is a generalist forager, although it feeds mainly on the nectar from a relatively small number of eucalypts that produce high volumes of nectar (DPIE 2021a). Key eucalypt species include Mugga Ironbark (*Eucalyptus sideroxylon*), Yellow Box (*E. melliodora*), White Box (*E. albens*) and Swamp Mahogany (*E. robusta*) (DPIE 2021a). Flowering of other species such as Thin-leaved Stringybark (*E. eugenioides*) and other Stringybark species, and Red Ironbark (*E. fibrosa*) can also contribute important nectar flows at times (DPIE 2021a). Nectar and fruit from the mistletoes are also utilised (DPIE 2021a). When nectar is scarce, lerp and honeydew can

comprise a large proportion of the diet, while insects make up about 15 percent of the total diet and are important components of the diet of nestlings (DPIE 2021a).

1.6 Corben's Long-eared Bat (*Nyctophilus corbeni*)

The Corben's Long-eared Bat occurs throughout south-eastern Australia, with its distribution aligning approximately with the Murray Darling Basin, while the Pilliga Scrub region is considered a distinct stronghold for this species (DPIE 2021a). The species inhabits a variety of vegetation types, including mallee, Buloke (*Allocasuarina luehmannii*) and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland (DPIE 2021a). They roost in tree hollows, crevices, and under loose bark (DPIE 2021a). Mating takes place in autumn with one or two young born in late spring to early summer (DPIE 2021a).

2 Methods

2.1 Database Search

The *BioNet Atlas* (DPIE 2021c) was interrogated for all records of the three species within 10 km of each of the additional offset areas and within a broader area containing all of the additional offset areas.

2.2 Vegetation Mapping Report (AMBS 2021)

AMBS (2021) undertook field surveys across the additional offset areas between July 2020 and April 2021. Field surveys involved a combination of “full-floristic” plots (a 20 metre [m] x 20 m quadrat nested within a 20 m x 50 m transect) and rapid data points. A multivariate cluster analysis of full floristic plot data was undertaken and the resulting groups assigned to PCTs. Vegetation maps were produced on the basis of these data and interpretation of aerial imagery (AMBS 2021).

2.3 Habitat Mapping

The *Threatened Biodiversity Data Collection* (TBDC) (DPIE 2021b) was interrogated to identify PCTs that are associated with each of the three species. Potential habitat maps were then prepared for each species, by matching the PCTs associated with each species with the vegetation mapped in the additional offset areas by AMBS (2021).

The relevant PCTs on the Triangle, Long Gully, Neranghi North and Coonoor offset areas are entirely comprised of woodland; thus, the mapped habitat on these offset areas comprises woodland. Both woodland and derived native grassland forms of the relevant PCTs occur within the Thornfield offset area. The habitat mapping identifies the derived native grassland within the Thornfield offset area because this land will ultimately provide potential habitat if self-sustaining vegetation communities are effectively restored in accordance with the relevant Offset Management Plan required to be prepared and implemented under EPBC 2010/5566 (this land is referred to as "Future Potential Habitat").

Some additional areas in the Thornfield offset area were included in the potential habitat map for the Swift Parrot. These were areas of PCT 101 (woodland form) along drainage lines that have been assessed by AMBS fauna ecologists and contain known feed trees for the Swift Parrot (Yellow Box [*Eucalyptus melliodora*], Poplar Box [*E. populnea*] and White Box [*E. albens*]).

2.4 Habitat Verification

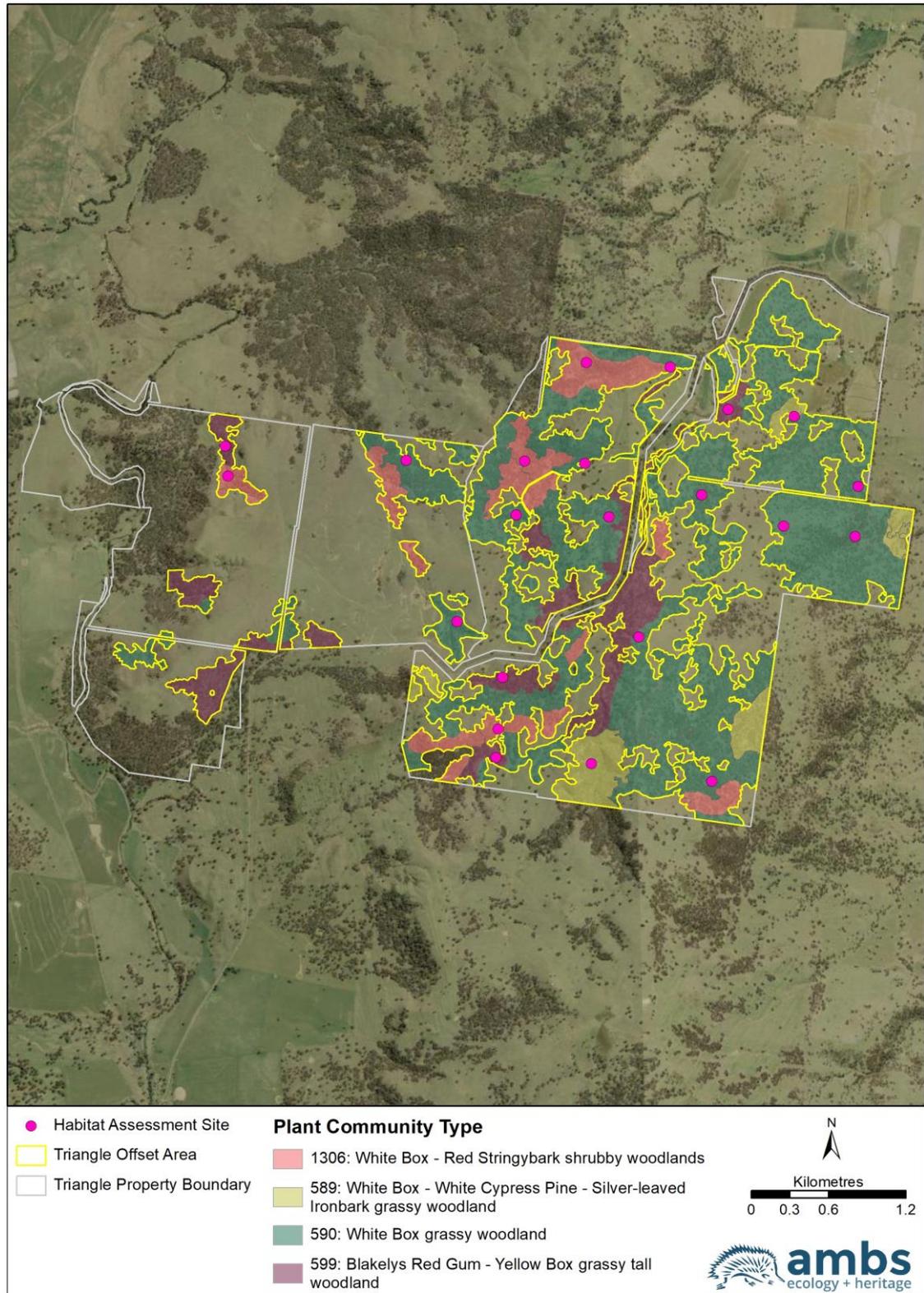
Potential habitat for the Regent Honeyeater, Swift Parrot and Corben’s Long-eared Bat was evaluated by assessing the presence and abundance of key habitat attributes that are associated with each species. This involved fauna habitat surveys undertaken on the Triangle, Long Gully, Neranghi North and Coonoor offset areas between 15 and 21 July 2021 and previous observations of habitat on the Thornfield property. The fauna habitat surveys were undertaken by an ecologist with experience trapping Corben’s Long-eared Bat in the region (Chris Jackson) and an ornithologist with experience surveying for Regent Honeyeater and Swift Parrot in the region (David James).

The fauna habitat surveys on Triangle, Long Gully, Neranghi North and Coonoor included:

- Assessments of habitat structure and attributes at 61 pre-selected sites (22 on Triangle, 11 on Long Gully, 13 on Neranghi North and 15 on Coonoor; Figures 2.1 to 2.4). Sites were selected to gain a representative sample of PCTs across the offset areas; and,
- Transects across multiple PCTs to determine if habitat data collected at habitat assessment sites matched the overall pattern found within the mapped PCT polygons.

The focus of the habitat surveys for the Regent Honeyeater and Swift Parrot was the presence and abundance of key feed trees and mistletoe and for Corben's Long-eared Bat, the presence and abundance of tree hollows. Data were also collected on signs of disturbance or other impacts that could affect the quality of the habitat, including presence of pest animals, habitat clearing or modification, grazing, fire and erosion. The abundance of the recorded attributes was scored using the following scale:

- Abundant: habitat feature or impact is conspicuous, unavoidable;
- Common: habitat feature or impact is obvious to observe when looked for;
- Scattered: habitat feature or impact is irregular and targeted search is required;
- Rare: habitat feature or impact is difficult to locate and only located once or twice during dedicated search; and,
- None: no feature or impact observable from habitat assessment point.



Date Produced: 25-08-2021 | CRS: GDA 94 MGA Zone 56 | Imagery: NSW Public Imagery, DFSI, CC-BY 3.0 | Spatial Data: TriangleVegetation Mapping, AMBS, 2021; Triangle Property Boundary, Stewart Surveys, 2020; Triangle Offset Area v11, AMBS, 2021; Survey Locations, AMBS, 2021

Figure 2.1: Habitat assessment sites on the Triangle Offset Area

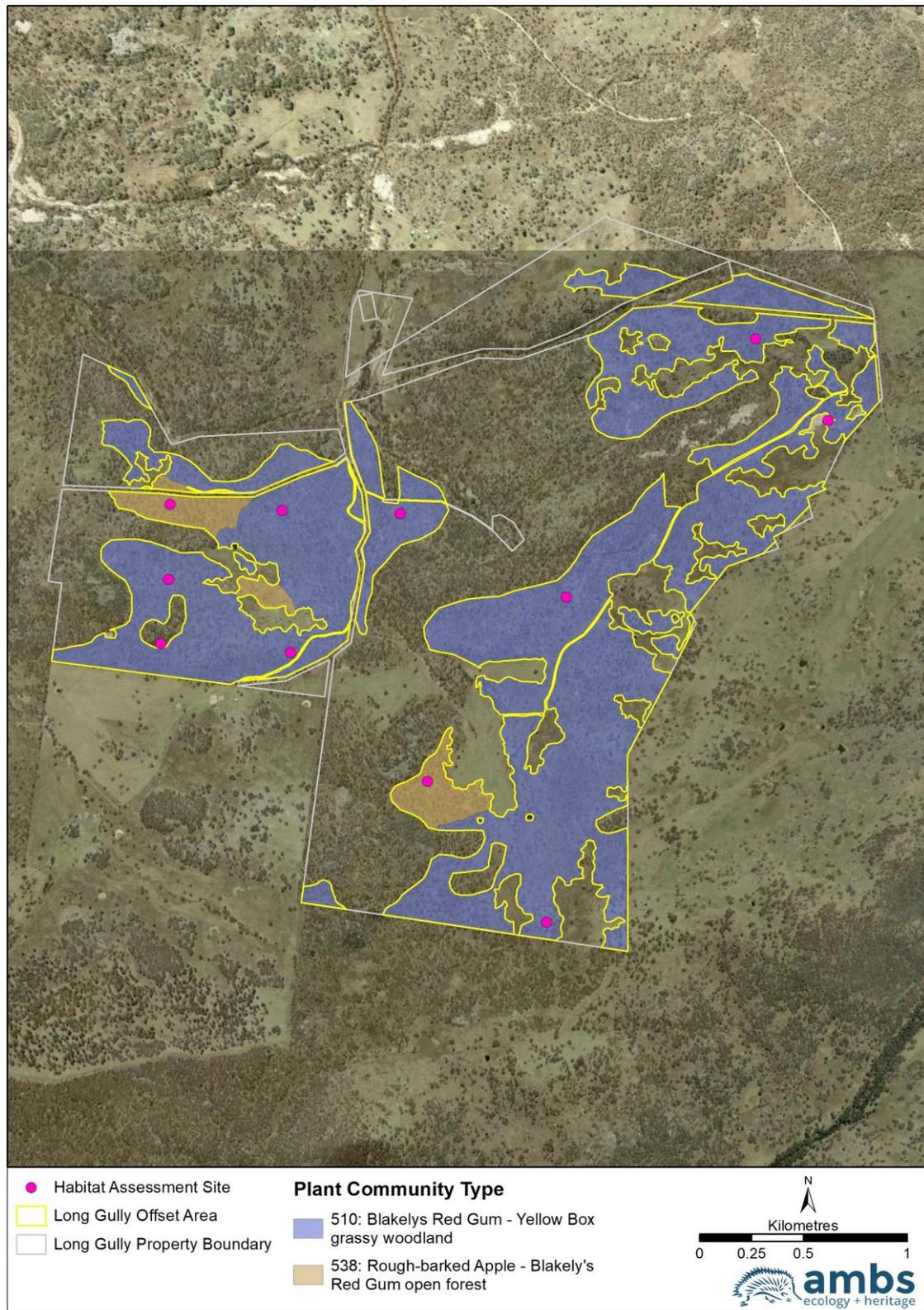


Figure 2.2: Habitat assessment sites on the Long Gully Offset Area

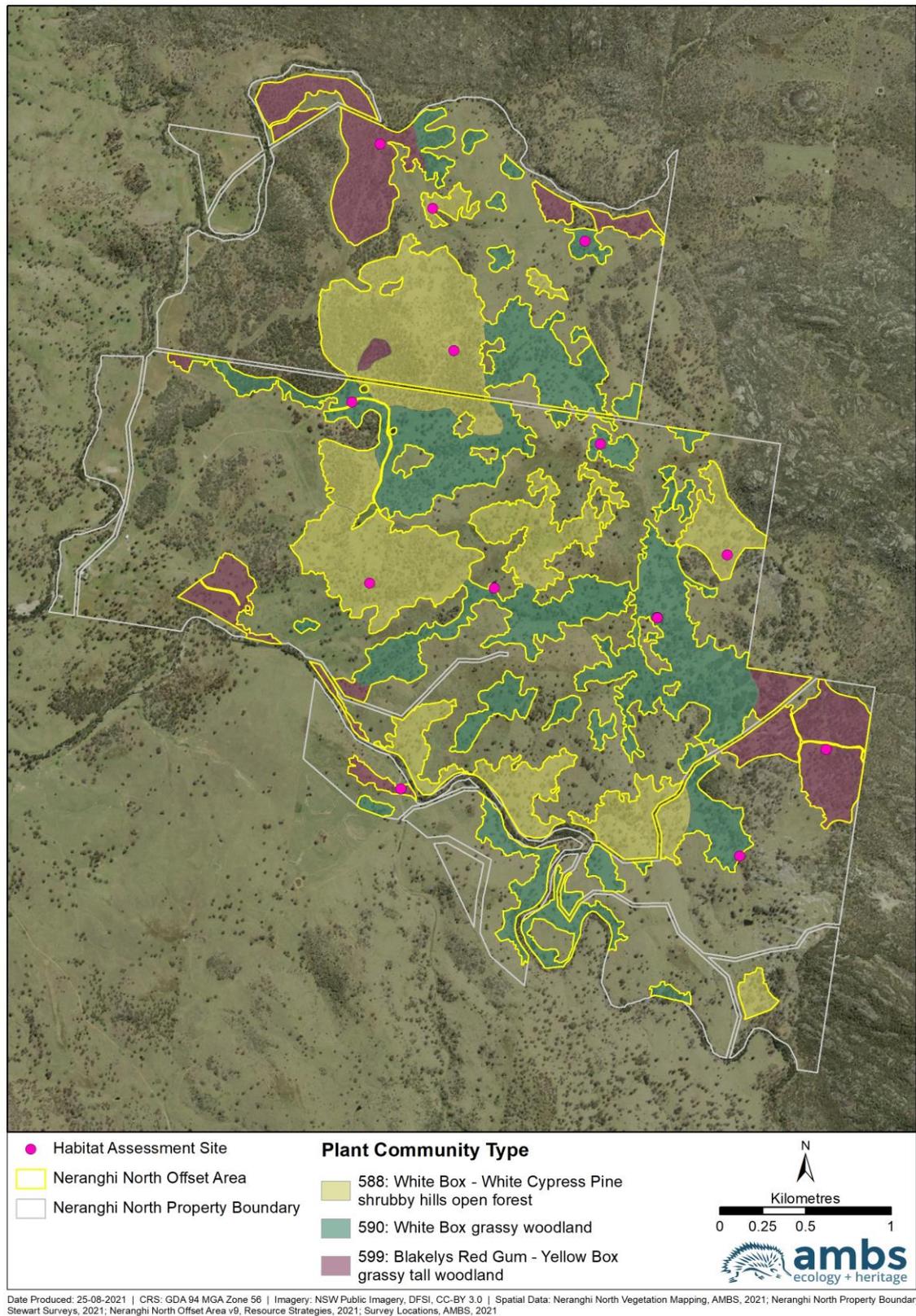


Figure 2.3: Habitat assessment sites on the Neranghi North Offset Area

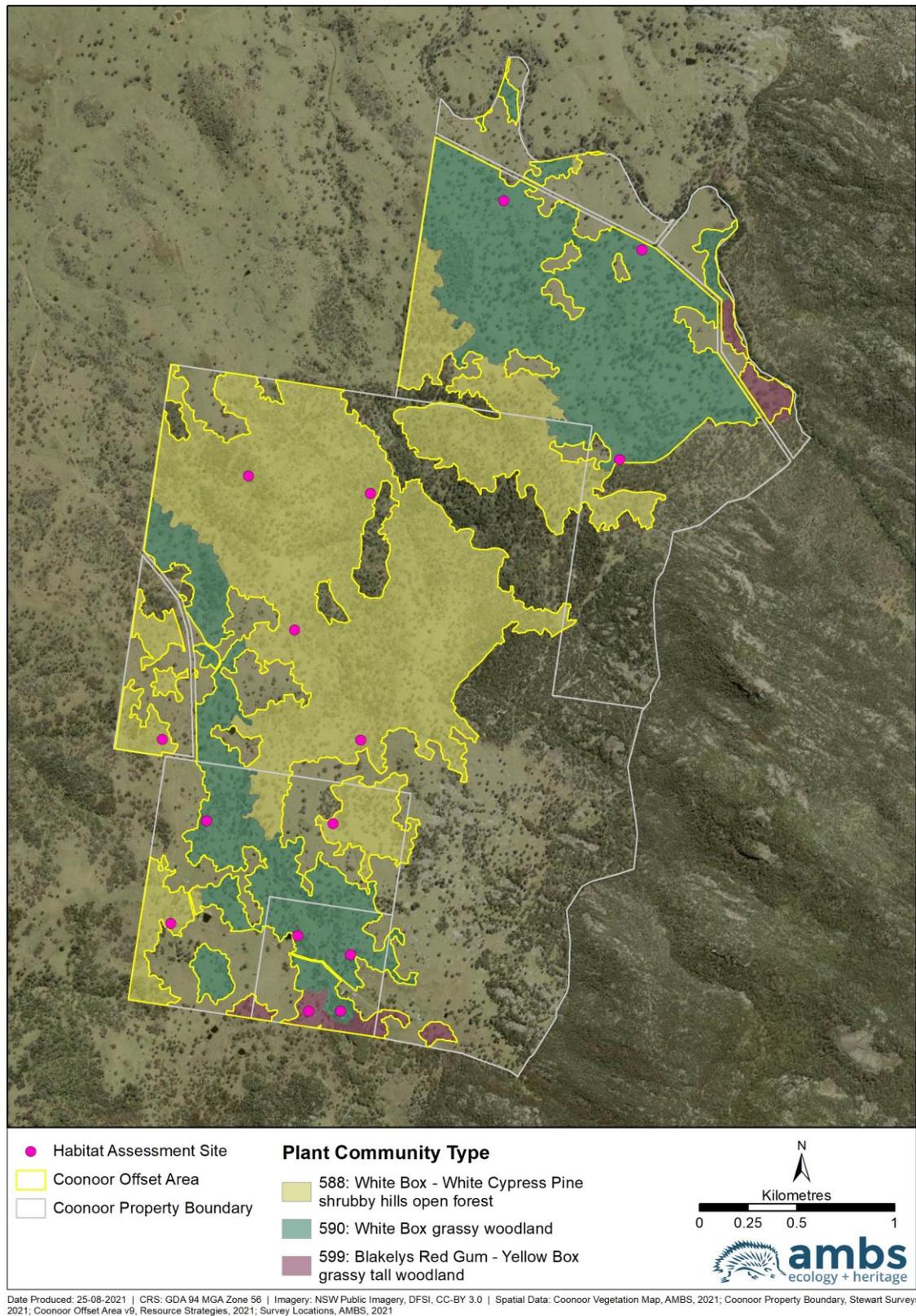


Figure 2.4: Habitat assessment sites on the Coonor Offset Area

3 Results

3.1 Database Search

Database records of the three species in relation to the broader area around the additional offset areas are shown on Figure 3.1.

There are historic records of the Regent Honeyeater across the general locality, with most records around or to the east of Barraba and extending north to Inverell. Swift Parrot and Corben's Long-eared Bat records are also scattered across much of the area. There is a concentration of Corben's Long-eared Bat records in and around the Leard State Forest and extending to the north-east; this is likely to be a reflection of survey effort.

Regional records of all three species covered in this report are temporally irregular. This reflects the nomadic nature of the two bird species and the difficulty in determining presence of Corben's Long-eared Bat, which can only be reliably identified by capture. Records of the species that are within 10 km of the additional offset areas include one record of the Swift Parrot (in 2016), 89 records of the Regent Honeyeater (six since 2016) and 21 records of Corben's Long-eared Bat (seven since 2016).

3.2 Vegetation Mapping

The results of the vegetation surveys and mapping are presented in AMBS (2021).

Ten PCTs were identified and mapped collectively on the Triangle, Long Gully, Neranghi North, Coonoor and Thornfield offset areas:

- 101: Poplar Box - Yellow Box - Western Grey Box grassy woodland;
- 413: Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland;
- 435: White Box - White Cypress Pine shrub grass hills woodland;
- 510: Blakely's Red Gum - Yellow Box grassy woodland;
- 538: Rough-barked Apple - Blakely's Red Gum open forest;
- 588: White Box - White Cypress Pine shrubby hills open forest;
- 589: White Box - White Cypress Pine - Silver-leaved Ironbark grassy woodland;
- 590: White Box grassy woodland;
- 599: Blakely's Red Gum - Yellow Box grassy tall woodland; and
- 1306: White Box - Red Stringybark shrubby woodlands.

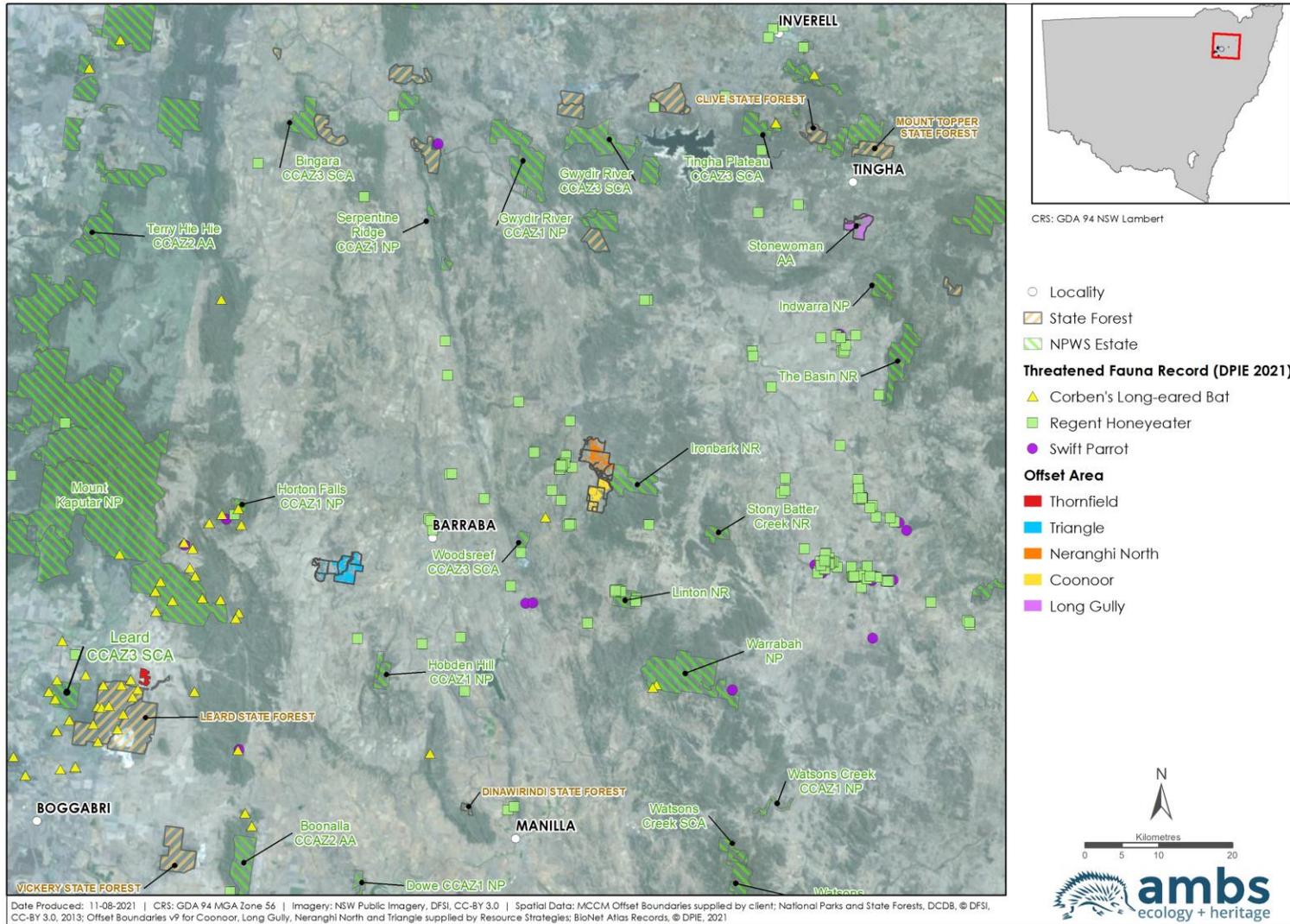


Figure 3.1: Records of Swift Parrot, Regent Honeyeater and Corben's Long-eared Bat

3.3 Potential Habitat Mapping - Summary

A summary of the quantity of potential habitat for each species in each additional offset area is provided in Table 3.1.

Table 3-1: Potential Habitat

Offset Area	Potential Habitat (ha)		
	Corben's Long-Eared Bat	Regent Honeyeater	Swift Parrot
Thornfield	61	61	61
Long Gully	330.7	330.7	352.9
Neranghi North	567	567	567
Triangle	741.9	741.9	741.9
Coonoor	573.9	573.9	573.9
TOTAL	2274.5	2274.5	2296.7

The Thornfield offset area also contains derived native grassland which will ultimately provide potential habitat for the three species if self-sustaining vegetation communities are restored pursuant to the relevant Offset Management Plan required under EPBC 2010/5566 (Future Potential Habitat). A summary of the quantity of Future Potential Habitat within the Thornfield offset area for each species is provided in Table 3.2.

Table 3-2: Future Potential Habitat

Offset Area	Potential Habitat (ha)		
	Corben's Long-Eared Bat	Regent Honeyeater	Swift Parrot
Thornfield	84.4	84.4	75.6
Long Gully	0	0	0
Neranghi North	0	0	0
Triangle	0	0	0
Coonoor	0	0	0
TOTAL	84.4	84.4	75.6

Revegetation (planting) is the primary tool that will be used to provide additional potential habitat for these species, along with management of pest animals and weeds. In this regard, AMBS understands that the relevant Offset Management Plan under EPBC 2010/5566 will provide for active revegetation measures (such as direct seeding or seedling planting), secondary revegetation measures (passive or assisted natural regeneration), revegetation maintenance, ongoing annual monitoring and assessment, and adaptive management.

Regent Honeyeaters have been observed foraging in older (>14 years) regenerated woodland in the Capertee Valley in New South Wales and the Lurg Valley in Vitoria (Ingwersen et al. 2019). Swift Parrots have been observed foraging and roosting in areas of planted Blue Gum (*Eucalyptus globulus*) in Tasmania and are regularly recorded using street and park plantings for foraging on the mainland of Australia (Saunders et al. 2010, Saunders and Tzaros 2011). While data on the use of regenerated habitats for Corben’s Long-eared Bat is lacking, recent studies suggest that forestry practices that create mosaics of dense canopied and open canopied woodland, an expected outcome of revegetation on the offsets, can provide suitable roosting and foraging opportunities for the species (Law et al. 2016, Law et al. 2018).

The areas of revegetation are expected to become good quality potential habitat for all three species because:

- the revegetation areas are surrounded by existing good quality potential habitat;
- an aim of the revegetation is to result in maturing woodland tree species that are likely to produce seasonal flower and lerp resources for foraging;

- an aim of the revegetation is to increase the patch size and connectivity of the potential habitat; and
- ongoing management of the offset areas (including the revegetation areas) will be provided for through the Offset Management Plan under EPBC 2010/5566 and legally binding conservation covenants.

Potential habitat maps for each species are presented in Sections 3.4 (Swift Parrot), 3.5 (Regent Honeyeater) and 3.6 (Corben's Long-eared Bat).

The areas of the PCTs considered to be habitat for each species on each offset area are provided in Appendix A, as well as the areas of the PCTs considered to be Future Potential Habitat for each species on the Thornfield offset area.

3.4 Swift Parrot

The following PCTs are considered to represent potential habitat for the Swift Parrot within the additional offset areas as per the TBDC (DPIE 2021b):

- 413: Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland;
- 435: White Box - White Cypress Pine shrub grass hills woodland;
- 510: Blakely's Red Gum - Yellow Box grassy woodland;
- 538: Rough-barked Apple - Blakely's Red Gum open forest;
- 588: White Box - White Cypress Pine shrubby hills open forest;
- 589: White Box - White Cypress Pine - Silver-leaved Ironbark grassy woodland;
- 590: White Box grassy woodland;
- 599: Blakely's Red Gum - Yellow Box grassy tall woodland; and
- 1306: White Box - Red Stringybark shrubby woodlands.

AMBS added areas of PCT 101 that contain known feed trees for the Swift Parrot (Yellow Box [*Eucalyptus melliodora*], Poplar Box [*E. populnea*] and White Box [*E. albens*]) along drainage lines on Thornfield as potential habitat for the species.

A summary of abundance scores for habitat attributes and disturbance that have been associated with defining the quality of woodland habitat for the Swift Parrot is presented in Table 3.2. Nectar or lerp tree species considered suitable for the Swift Parrot were present on all assessed properties at varying levels of abundance:

- Triangle – of 22 habitat assessment sites, nectar and lerp trees were present at 95% of the sites and were common or abundant at approximately 63% of sites;
- Coonoor – of 15 habitat assessment sites, nectar and lerp trees were present at 93% of the sites and were common or abundant at approximately 53% of sites;
- Neranghi North – of 13 habitat assessment sites, nectar and lerp trees were present at 92% of the sites and were common or abundant at approximately 46% of sites; and,
- Long Gully – of 11 habitat assessment sites, nectar and lerp trees were present at 100% of the sites and were common or abundant at approximately 45% of sites.

Anthropogenic impacts were common, but rarely observed at a level where they would significantly impact the quality of the habitat for the Swift Parrot. Clearing was the most frequent impact observed and was recorded on all additional offset properties. However, the clearing within the additional offsets was characterised by the retention of remnant paddock trees or patches of vegetation, was rarely widespread and natural regeneration was often observed. For example, while clearing was abundant at 18 habitat assessment sites (two on Triangle, three on Long Gully, five on Neranghi North and eight on Coonoor), 16 of those sites also had suitable nectar trees for the Swift Parrot.

The habitat attribute values and anthropogenic impact values described are indicative of a good quality woodland habitat for the Swift Parrot.

Habitat for the Swift Parrot across the additional offset areas is shown on Figures 3.2 to 3.6. Figure 3.2 also depicts the area of Future Potential Habitat for the Swift Parrot within the Thornfield offset area.

Records of the species in the region are sparse. There is a recent (2016) record of the species within 5 km of Neranghi North (DPIE 2021b).

Table 3-3: Habitat attribute and anthropogenic impact data for the Swift Parrot by property

	Variable	Number of assessment sites				
		Abundant	Common	Scattered	Rare	None
Triangle						
Habitat attribute	Mistletoe	1	6	5	5	5
	Nectar and lerp trees	5	9	7	0	1
Disturbance	Pest Animal	1	3	8	8	2
	Fire	0	0	0	1	21
	Clearing	2	11	8	1	0
	Logged Stumps	0	3	7	8	4
	Grazing	1	3	5	7	6
	Erosion	0	1	3	6	12
	Coonoor					
Habitat attribute	Mistletoe	0	2	5	5	3
	Nectar and lerp trees	2	5	7	0	1
Disturbance	Pest Animal	0	0	1	3	11
	Fire	0	0	2	1	12
	Clearing	8	2	1	2	2
	Logged Stumps	2	1	5	4	3
	Grazing	6	0	1	2	6
	Erosion	0	0	0	3	12
	Neranghi North					
Habitat attribute	Mistletoe	1	6	3	1	2
	Nectar and lerp trees	2	4	6	0	1
Disturbance	Pest Animal	1	4	4	2	2
	Fire	0	4	0	0	8
	Clearing	5	5	3	0	0
	Logged Stumps	0	0	1	4	8
	Grazing	1	3	6	0	3
	Erosion	0	0	3	2	8
	Long Gully					
Habitat attribute	Mistletoe	0	3	2	3	3
	Nectar and lerp trees	0	5	6	0	0
Disturbance	Pest Animal	0	1	6	3	1
	Fire	3	4	4	0	0
	Clearing	3	2	5	1	0
	Logged Stumps	1	1	6	1	2
	Grazing	0	0	2	5	4
	Erosion	0	0	2	1	8

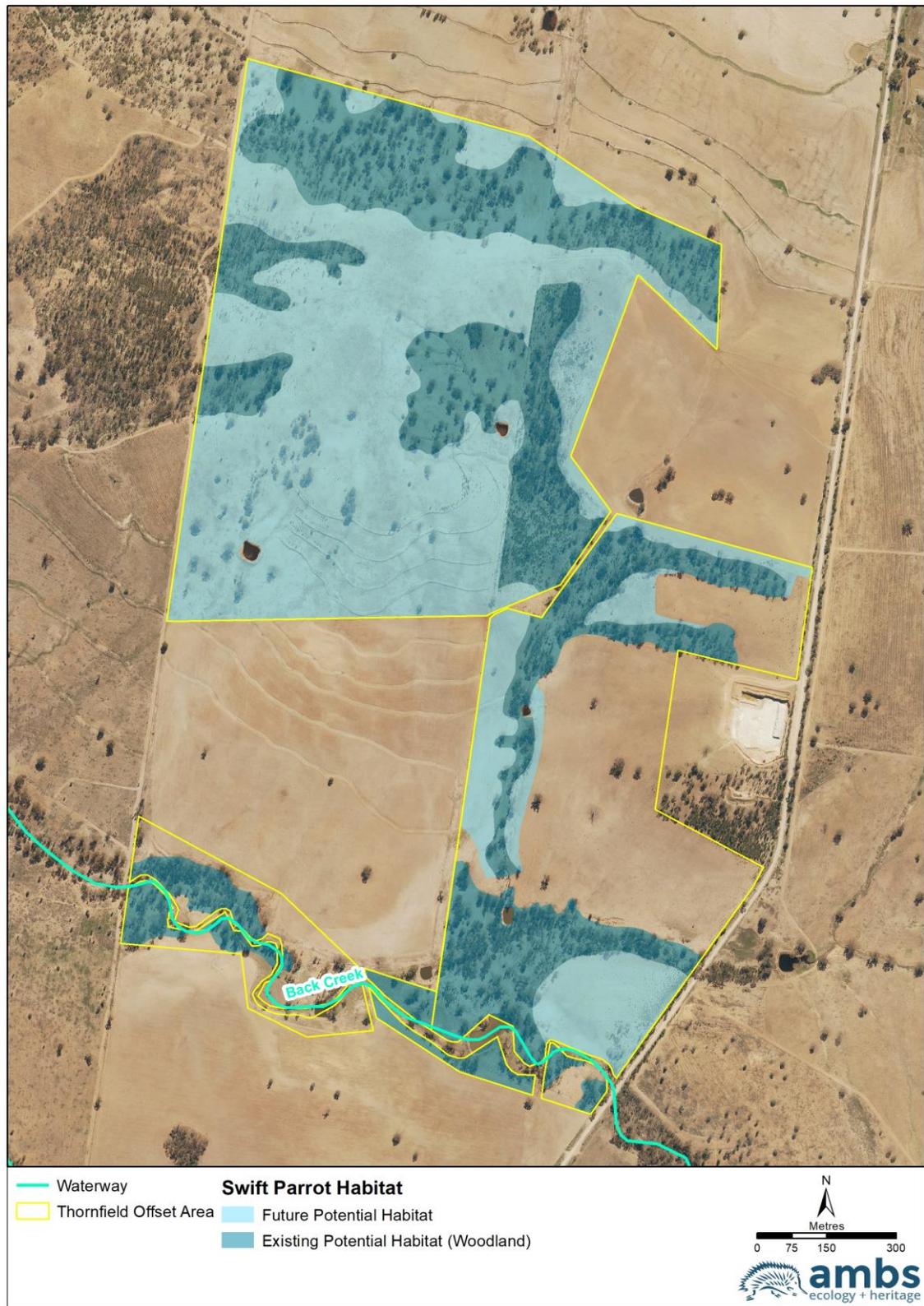
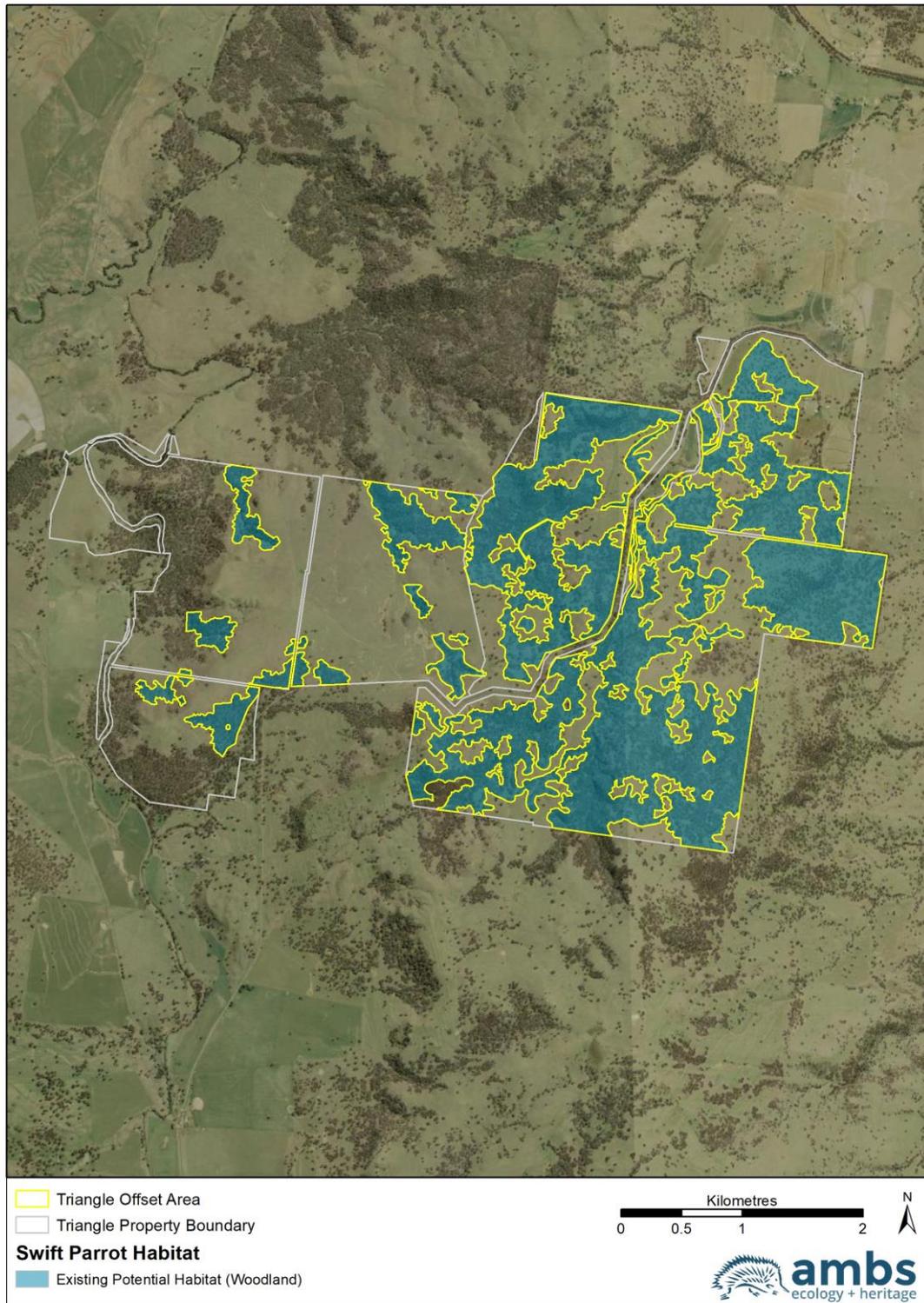
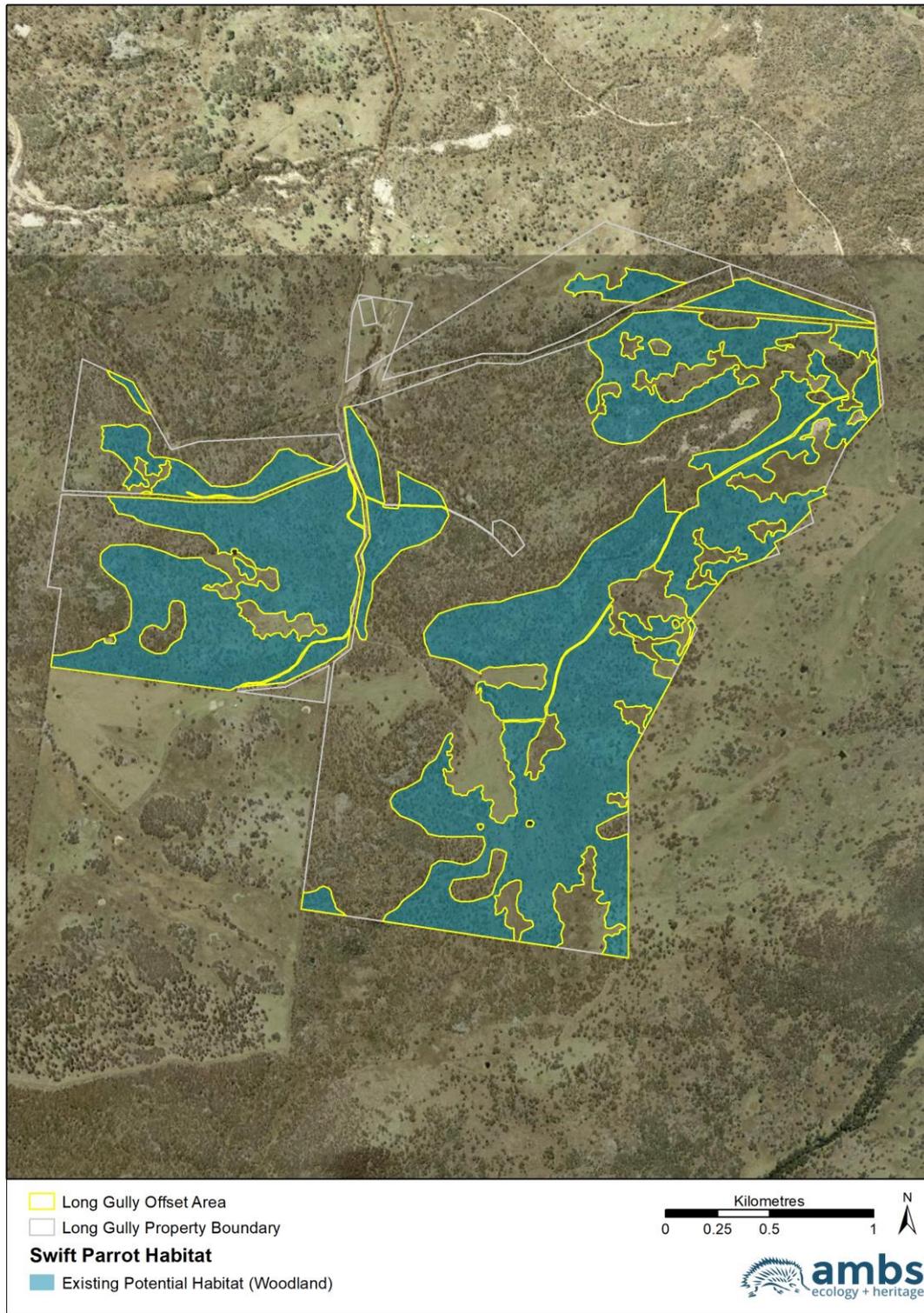


Figure 3.2: Swift Parrot Habitat and Future Potential Habitat in the Thornfield Offset Area



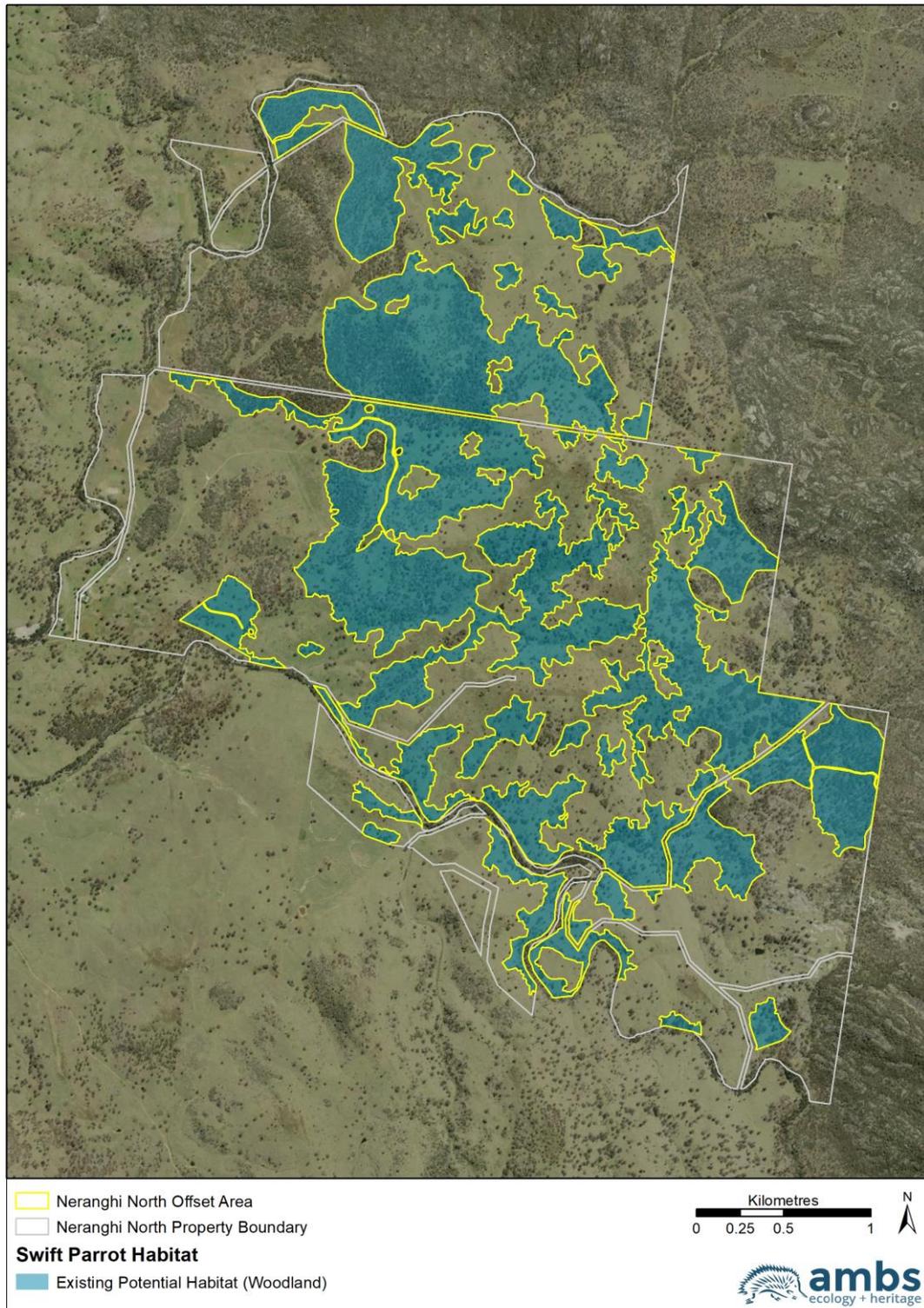
Date Produced: 07-05-2021 | CRS: GDA 94 MGA Zone 56 | Imagery: NSW Public Imagery, DFSI, CC-BY 3.0 | Spatial Data: Triangle MNES Habitat, AMBS, 2021; Triangle Property Boundary, Stewart Surveys, 2020; Triangle Offset Area v9, Resource Strategies, 2021

Figure 3.3: Swift Parrot Habitat in the Triangle Offset Area



Date Produced: 07-05-2021 | CRS: GDA94 MGA Zone 56 | Imagery: NSW Public Imagery, DFSI, CC-BY 3.0 | Spatial Data: Long Gully MNES Habitat, AMBS, 2021; Long Gully Property Boundary, Stewart Surveys, 2020; Long Gully Offset Area v8, Resource Strategies, 2021

Figure 3.4: Swift Parrot Habitat in the Long Gully Offset Area



Date Produced: 07-05-2021 | CRS: GDA 94 MGA Zone 56 | Imagery: NSW Public Imagery, DFSI, CC-BY 3.0 | Spatial Data: Neranghi North MNES Habitat, AMBS, 2021; Neranghi North Property Boundary, Stewart Surveys, 2021; Neranghi North Offset Area v8, Resource Strategies, 2021

Figure 3.5: Swift Parrot Habitat in the Neranghi North Offset Area

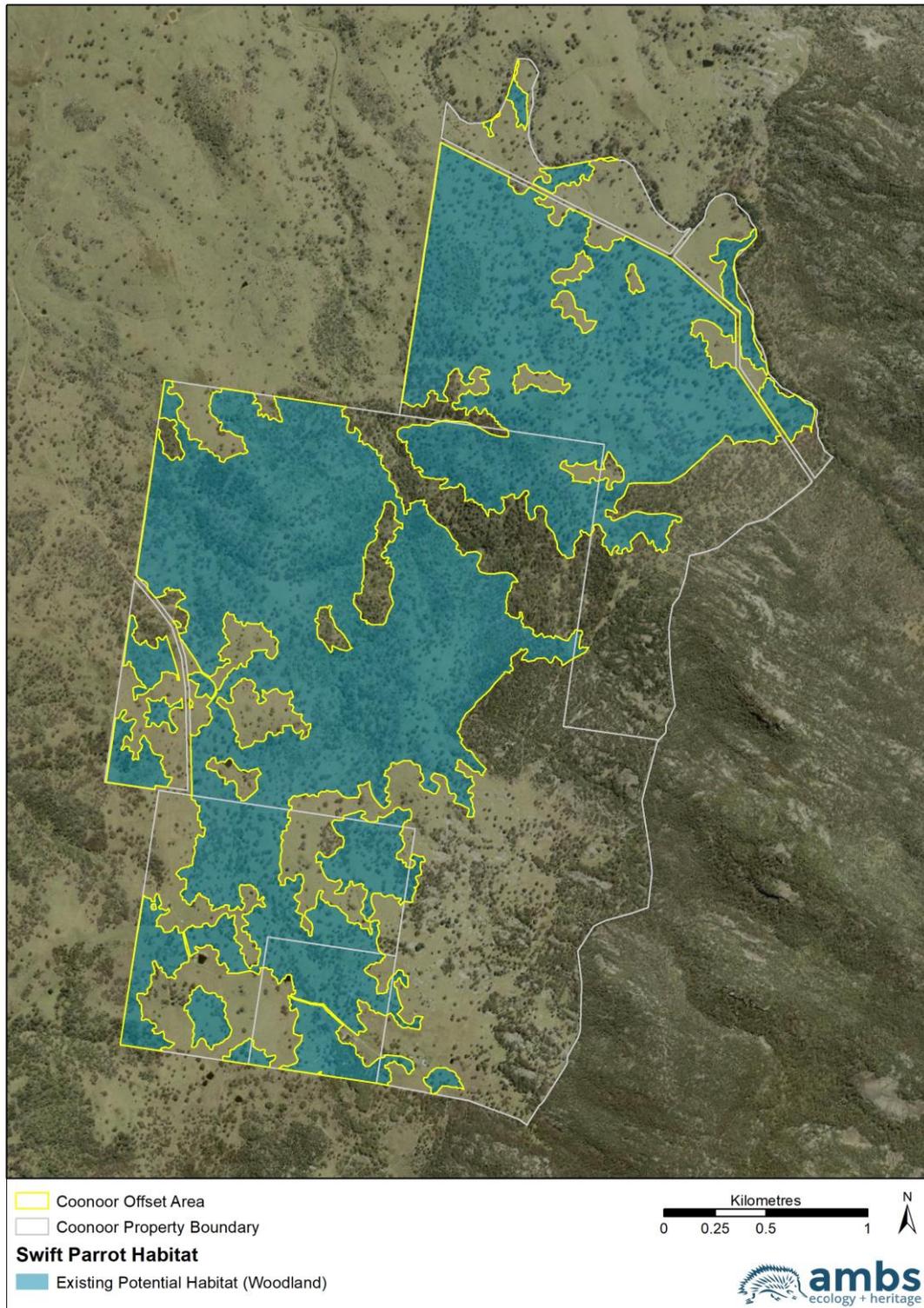


Figure 3.6: Swift Parrot Habitat in the Coonoor Offset Area

3.5 Regent Honeyeater

The following PCTs are considered to represent potential habitat for the Regent Honeyeater within the additional offset areas as per the TBDC (DPIE 2021b):

- 101: Poplar Box - Yellow Box - Western Grey Box grassy woodland;
- 413: Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland;
- 435: White Box - White Cypress Pine shrub grass hills woodland;
- 510: Blakely's Red Gum - Yellow Box grassy woodland;
- 588: White Box - White Cypress Pine shrubby hills open forest;
- 589: White Box - White Cypress Pine - Silver-leaved Ironbark grassy woodland;
- 590: White Box grassy woodland;
- 599: Blakely's Red Gum - Yellow Box grassy tall woodland; and
- 1306: White Box - Red Stringybark shrubby woodlands.

Habitat for the Regent Honeyeater across the additional offset areas is shown on Figures 3.7 to 3.11. Figure 3.7 also depicts the area of Future Potential Habitat for the Regent Honeyeater within the Thornfield offset area.

Large aggregations of the species were reported in Traveling Stock Reserves and remnant woodland close to Coonoor and Neranghi North up until the early 2000s. Since then, records have been sporadic, with just five records since 2016 in these areas.

A summary of abundance scores for habitat attributes and disturbance that have been associated with defining the quality of woodland habitat for the Regent Honeyeater is presented in Table 3.3. Nectar or lerp tree species and mistletoes considered suitable for the Regent Honeyeater were present on all assessed properties at varying levels of abundance:

- Triangle – of 22 habitat assessment sites, nectar and lerp trees were present at 95% of the sites and were common or abundant at approximately 63% of sites while mistletoe was present at 54% of the sites and common or abundant at approximately 31% of sites;
- Coonoor – of 15 habitat assessment sites, nectar and lerp trees were present at 93% of the sites and were common or abundant at approximately 53% of sites while mistletoe was present at 46% of the sites and common or abundant at approximately 15% of sites;
- Neranghi North – of 13 habitat assessment sites, nectar and lerp trees were present at 92% of the sites and were common or abundant at approximately 46% of sites while mistletoe was present at 76% of the sites and common or abundant at approximately 53% of sites; and,
- Long Gully – of 11 habitat assessment sites, nectar and lerp trees were present at 100% of the sites and were common or abundant at approximately 45% of sites while mistletoe was present at 45% of the sites and common or abundant at approximately 27% of sites.

Anthropogenic impacts were common, but rarely observed at a level where they would significantly impact the quality of the habitat for the Regent Honeyeater. Clearing was the most frequent impact observed and was recorded on all additional offset properties. However, the clearing within the additional offsets was characterised by the retention of remnant paddock trees or patches of vegetation, was rarely widespread and natural regeneration was often observed. For example, while clearing was abundant at 18 habitat assessment sites (two on Triangle, three on Long Gully, five on Neranghi North and eight on Coonoor), 16 of those sites also had suitable nectar trees for the Regent Honeyeater.

The habitat attribute values and anthropogenic impact values described are indicative of good quality woodland habitat for the Regent Honeyeater.

Table 3-4: Habitat attribute and anthropogenic impact data for the Regent Honeyeater by property

	Variable	Number of assessment sites				
		Abundant	Common	Scattered	Rare	None
Triangle						
Habitat attribute	Mistletoe	1	6	5	5	5
	Nectar and lerp trees	5	9	7	0	1
Disturbance	Pest Animal	1	3	8	8	2
	Fire	0	0	0	1	21
	Clearing	2	11	8	1	0
	Logged Stumps	0	3	7	8	4
	Grazing	1	3	5	7	6
	Erosion	0	1	3	6	11
	Coonoor					
Habitat attribute	Mistletoe	1	6	3	1	2
	Nectar and lerp trees	2	4	6	0	1
Disturbance	Pest Animal	0	0	1	3	11
	Fire	0	0	2	1	12
	Clearing	8	2	1	2	2
	Logged Stumps	2	1	5	4	3
	Grazing	6	0	1	2	6
	Erosion	0	0	0	3	12
	Neranghi North					
Habitat attribute	Mistletoe	6	3	1	2	0
	Nectar and lerp trees	4	6	0	1	0
Disturbance	Pest Animal	1	4	4	2	2
	Fire	0	4	0	0	8
	Clearing	5	5	3	0	0
	Logged Stumps	0	0	1	4	8
	Grazing	1	3	6	0	3
	Erosion	0	0	3	2	8
	Long Gully					
Habitat attribute	Mistletoe	0	3	2	3	3
	Nectar and lerp trees	0	5	6	0	0
Disturbance	Pest Animal	0	1	6	3	1
	Fire	3	4	4	0	0
	Clearing	3	2	5	1	0
	Logged Stumps	1	1	6	1	2
	Grazing	0	0	2	5	4
	Erosion	0	0	2	1	8

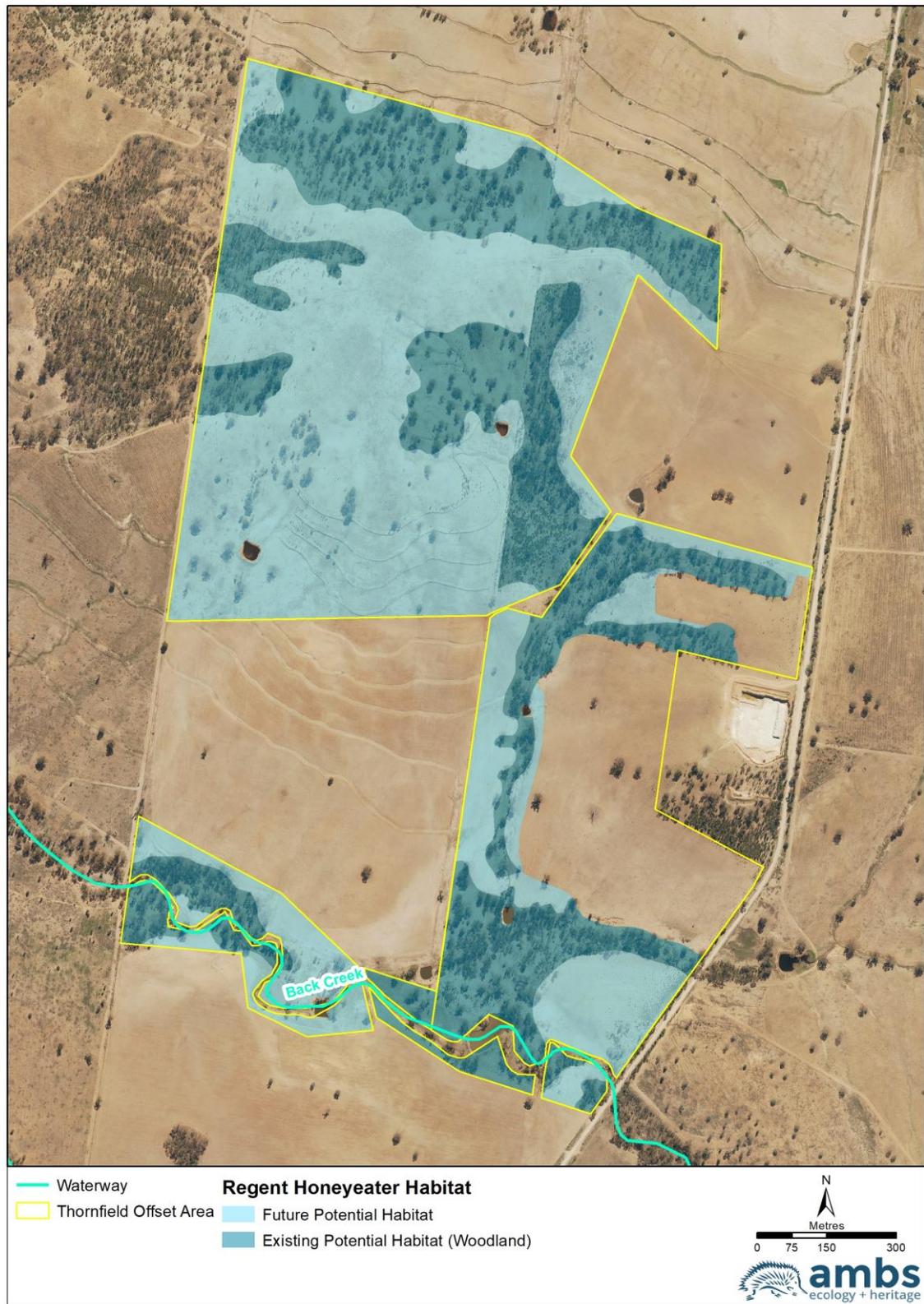
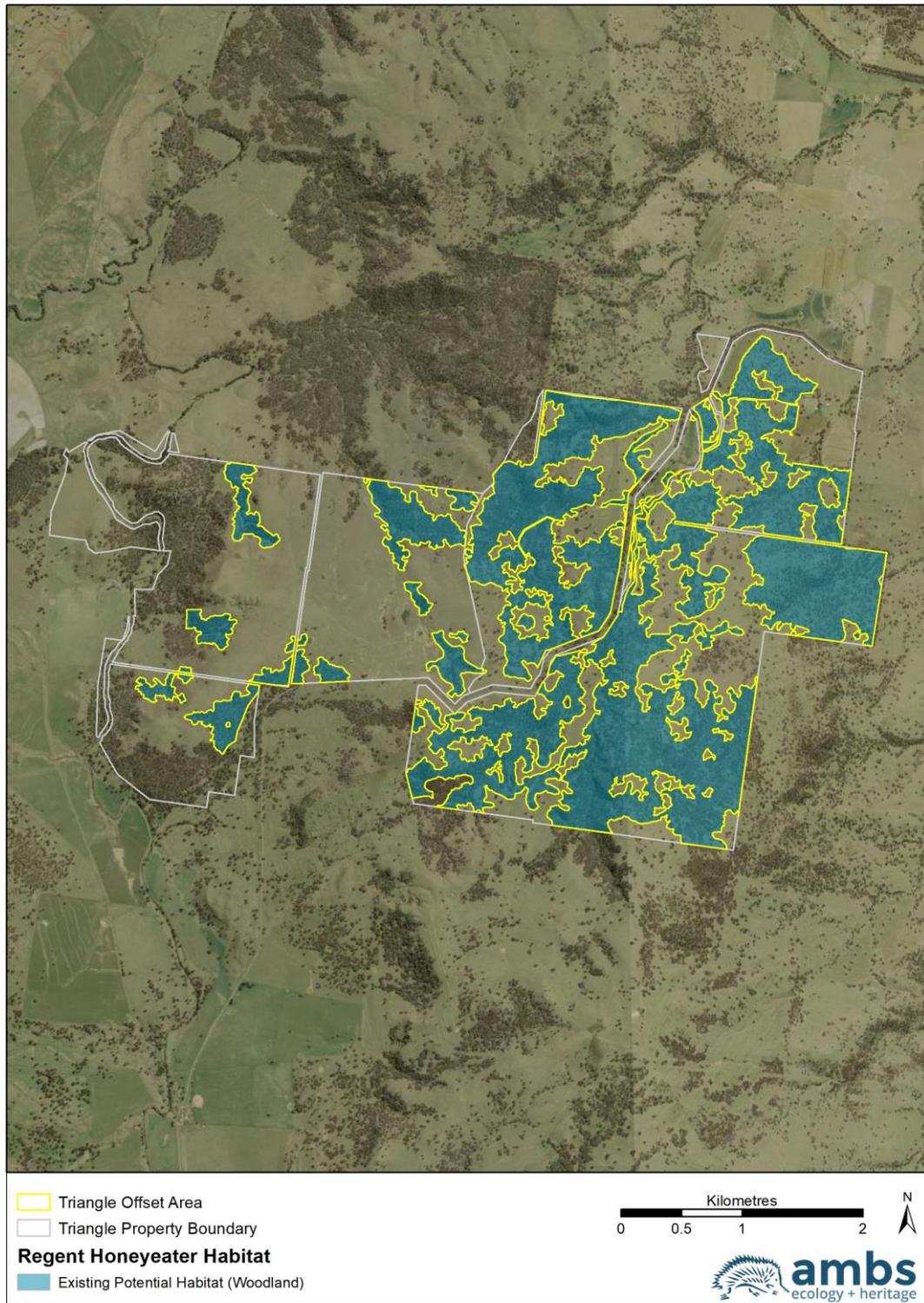
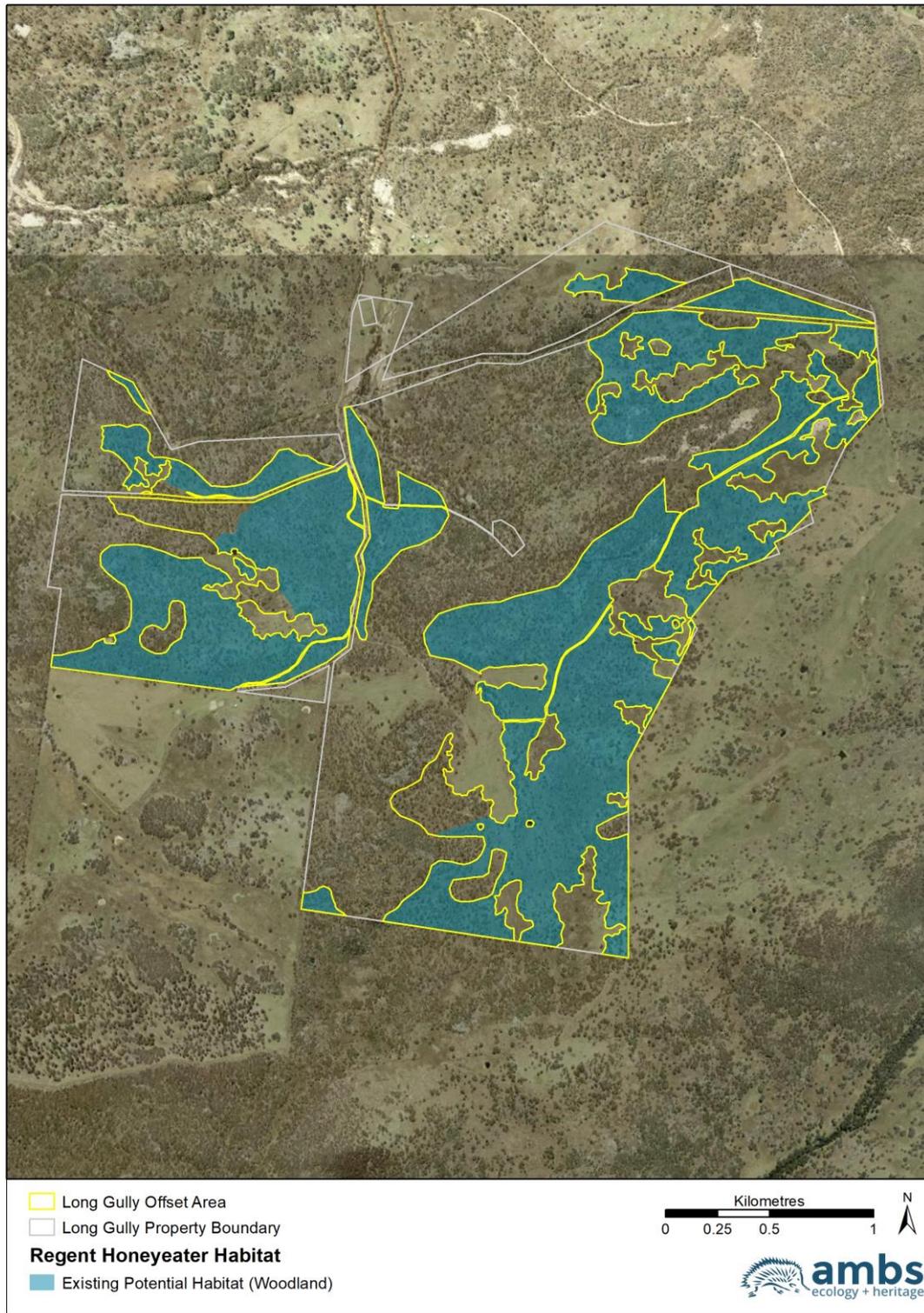


Figure 3.7: Regent Honeyeater Habitat and Future Potential Habitat in the Thornfield Offset Area



Date Produced: 07-05-2021 | CRS: GDA 94 MGA Zone 56 | Imagery: NSW Public Imagery, DFSI, CC-BY 3.0 | Spatial Data: Triangle MNES Habitat, AMBS, 2021; Triangle Property Boundary, Stewart Surveys, 2020; Triangle Offset Area v9, Resource Strategies, 2021

Figure 3.8: Regent Honeyeater Habitat in the Triangle Offset Area



Date Produced: 07-05-2021 | CRS: GDA 94 MGA Zone 56 | Imagery: NSW Public Imagery, DFSI, CC-BY 3.0 | Spatial Data: Long Gully MNES Habitat, AMBS, 2021; Long Gully Property Boundary, Stewart Surveys, 2020; Long Gully Offset Area v8, Resource Strategies, 2021

Figure 3.9: Regent Honeyeater Habitat in the Long Gully Offset Area

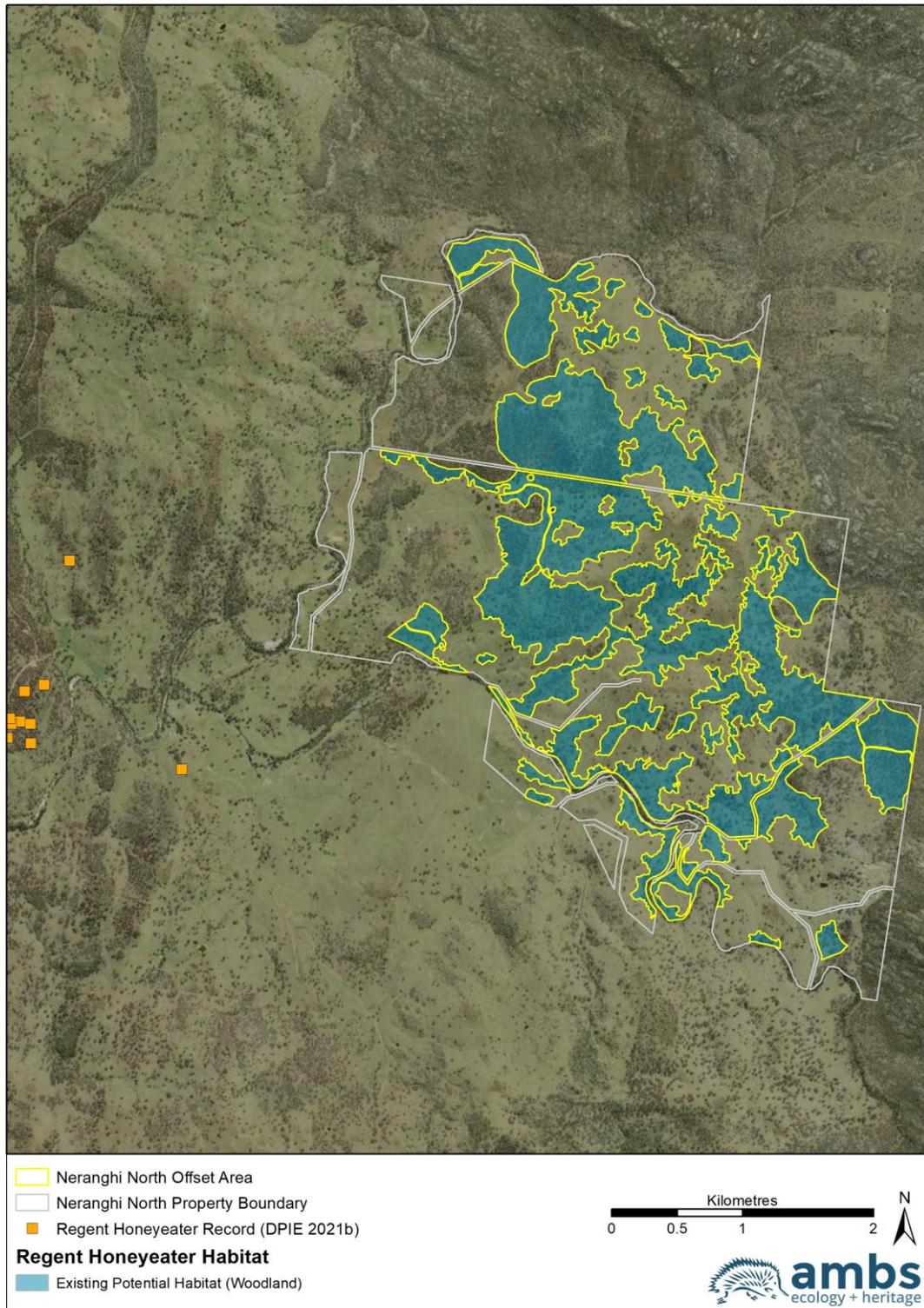


Figure 3.10: Regent Honeyeater Habitat in the Neranghi North Offset Area

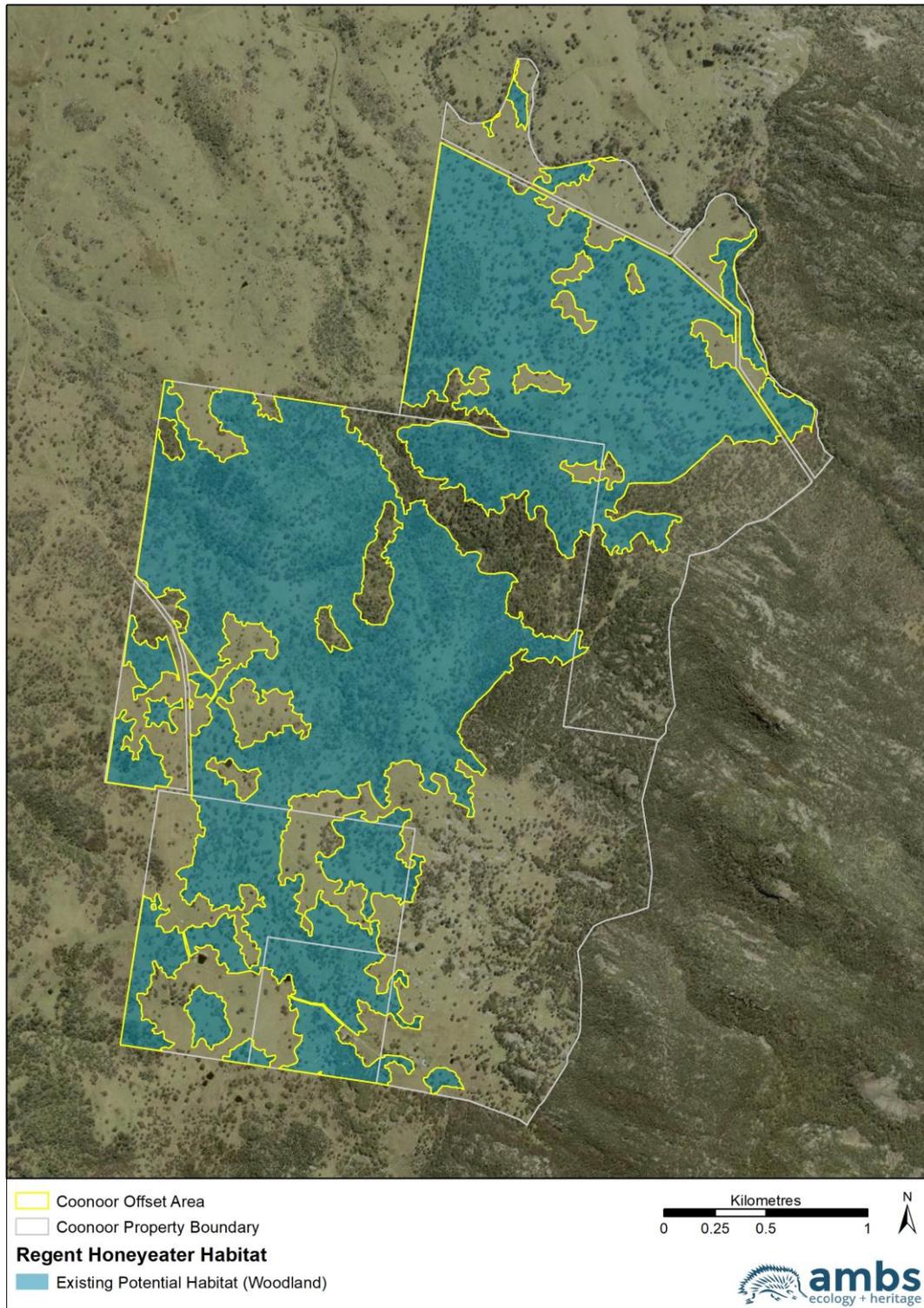


Figure 3.11: Regent Honeyeater Habitat in the Coonoor Offset Area

3.6 Corben's Long-eared Bat

The following PCTs are considered to represent potential habitat for the Corben's Long-eared Bat in the additional offset areas as per the TBDC (DPIE 2021b):

- 435: White Box - White Cypress Pine shrub grass hills woodland;
- 510: Blakely's Red Gum - Yellow Box grassy woodland;
- 588: White Box - White Cypress Pine shrubby hills open forest;
- 589: White Box - White Cypress Pine - Silver-leaved Ironbark grassy woodland;
- 590: White Box grassy woodland;
- 599: Blakely's Red Gum - Yellow Box grassy tall woodland; and
- 1306: White Box - Red Stringybark shrubby woodlands.

Habitat for the Corben's Long-eared Bat across the additional offset areas is shown on Figures 3.12 to 3.16. Figure 3.12 also depicts the area of Future Potential Habitat for the Corben's Long-eared Bat within the Thornfield offset area.

There are a number of records of the species near the Thornfield offset area. There are few records of the species within 10 km of the Triangle, Long Gully, Neranghi North and Coonoor offset areas (DPIE 2021c), which is possibly a reflection of limited targeted survey work using harp traps.

A summary of abundance scores for habitat attributes and disturbance that have been associated with defining the quality of habitat for the Corben's Long-eared Bat is presented in Table 3.2. Potential tree hollows of varying entrance size were present on all properties at varying levels of abundance:

- Triangle – of 22 habitat assessment sites, hollows were present at 77% of the sites and were common or abundant at approximately 68% of sites;
- Coonoor – of 15 habitat assessment sites, hollows were present at 73% of the sites and were common or abundant at approximately 53% of sites;
- Neranghi North – of 13 habitat assessment sites, hollows were present at 38% of the sites and were common or abundant at approximately 23% of sites; and,
- Long Gully – of 11 habitat assessment sites, hollows were present at 72% of the sites and were common or abundant at approximately 54% of sites.

Anthropogenic impacts were common, but rarely observed at a level where they would significantly impact the quality of the habitat for the Corben's Long-eared Bat. Clearing was the most frequent impact recorded. However, the clearing within the additional offsets was characterised by the retention of remnant paddock trees or patches of vegetation, was rarely widespread and natural regeneration was often observed. For example, while clearing was abundant at 18 habitat assessment sites (two on Triangle, three on Long Gully, five on Neranghi North and eight on Coonoor), 15 of those sites had tree hollows that were potentially suitable for Corben's Long-eared Bat.

The habitat attribute values and anthropogenic impact values described are indicative of good quality woodland habitat for the Corben's Long-eared Bat.

Table 3-5: Habitat attribute and anthropogenic impact data for Corben’s Long-eared Bat by property

	Variable	Number of assessment sites				
		Abundant	Common	Scattered	Rare	None
Triangle						
Habitat attribute	Tree Hollows	12	3	2	3	2
Disturbance	Pest Animal	1	3	8	8	2
	Fire	0	0	0	1	21
	Clearing	2	11	8	1	0
	Logged Stumps	0	3	7	8	4
	Grazing	1	3	5	7	6
	Erosion	0	1	3	6	11
Coonoor						
Habitat attribute	Tree Hollows	6	2	3	2	2
Disturbance	Pest Animal	0	0	1	3	11
	Fire	0	0	2	1	12
	Clearing	8	2	1	2	2
	Logged Stumps	2	1	5	4	3
	Grazing	6	0	1	2	6
	Erosion	0	0	0	3	12
Neranghi North						
Habitat attribute	Tree Hollows	2	1	2	7	1
Disturbance	Pest Animal	1	4	4	2	2
	Fire	0	4	0	0	8
	Clearing	5	5	3	0	0
	Logged Stumps	0	0	1	4	8
	Grazing	1	3	6	0	3
	Erosion	0	0	3	2	8
Long Gully						
Habitat attribute	Tree Hollows	5	1	2	1	1
Disturbance	Pest Animal	0	1	6	3	1
	Fire	3	4	4	0	0
	Clearing	3	2	5	1	0
	Logged Stumps	1	1	6	1	2
	Grazing	0	0	2	5	4
	Erosion	0	0	2	1	8

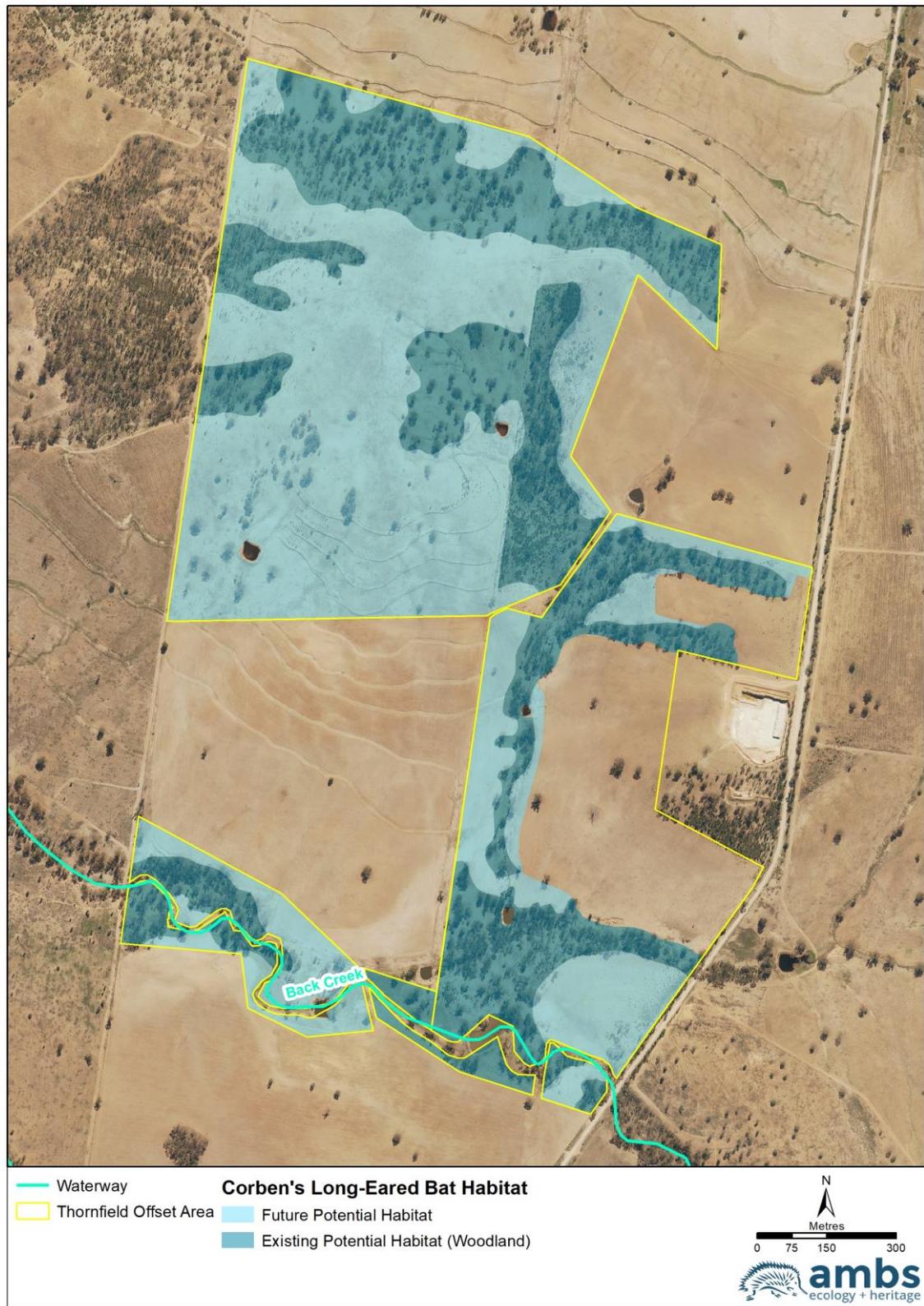


Figure 3.12: Corben's Long-eared Bat Habitat and Future Potential Habitat in the Thornfield Offset Area

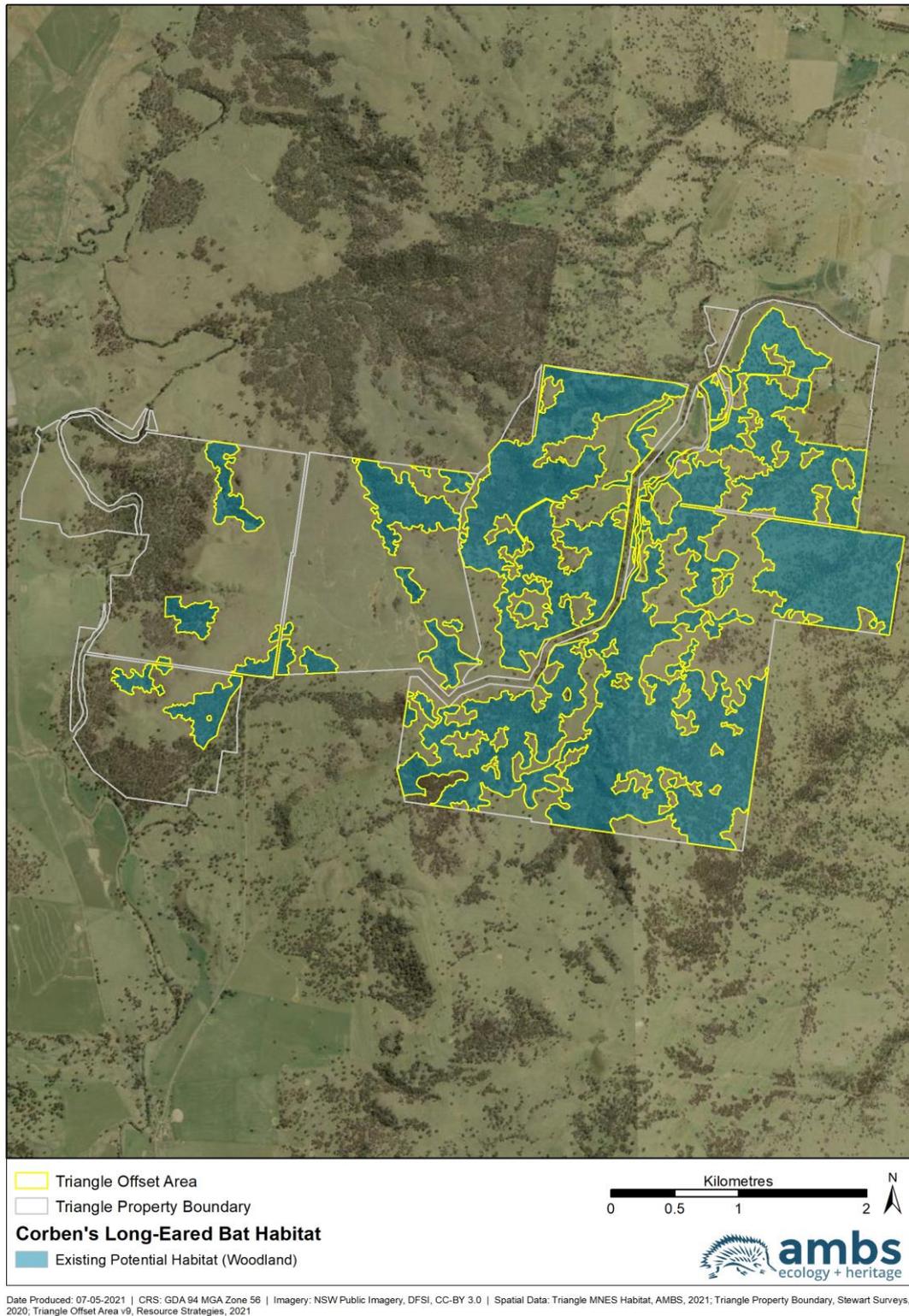
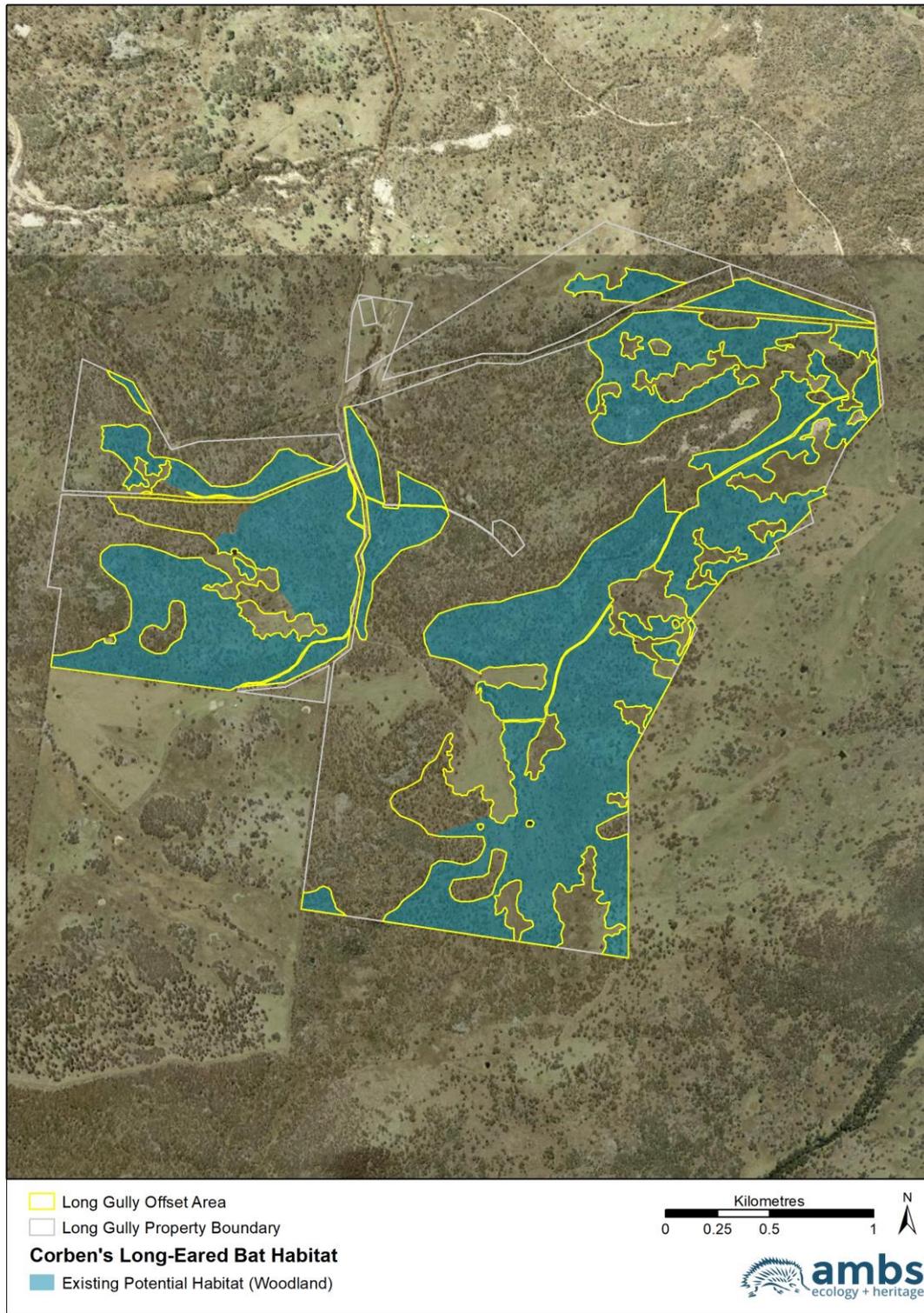
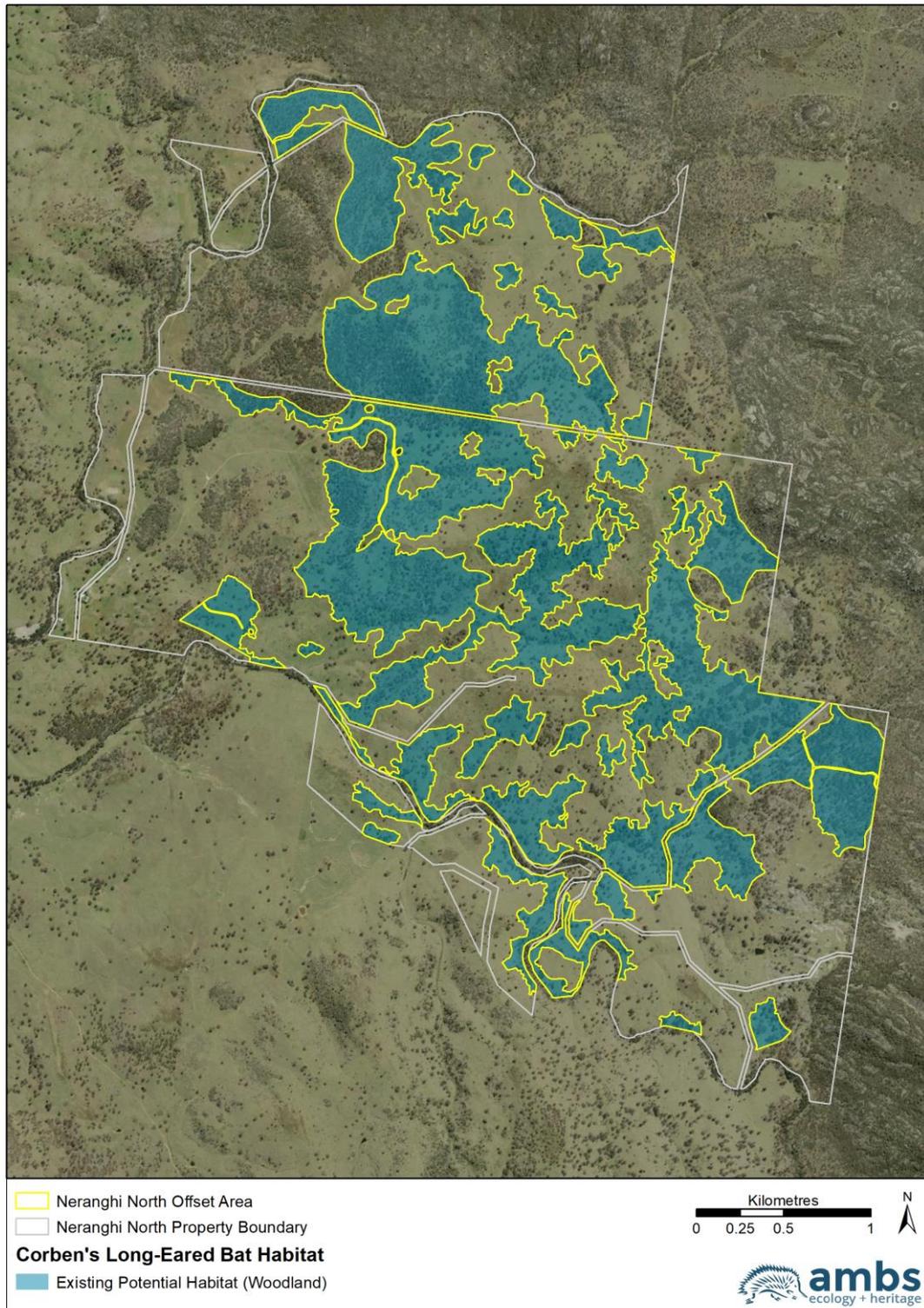


Figure 3.13: Corben's Long-Eared Bat Habitat in the Triangle Offset Area



Date Produced: 07-05-2021 | CRS: GDA94 MGA Zone 56 | Imagery: NSW Public Imagery, DFSI, CC-BY 3.0 | Spatial Data: Long Gully MNES Habitat, AMBS, 2021; Long Gully Property Boundary, Stewart Surveys, 2020; Long Gully Offset Area v8, Resource Strategies, 2021

Figure 3.14: Corben's Long-Eared Bat Habitat in the Long Gully Offset Area



Date Produced: 07-05-2021 | CRS: GDA 94 MGA Zone 56 | Imagery: NSW Public Imagery, DFSI, CC-BY 3.0 | Spatial Data: Neranghi North MNES Habitat, AMBS, 2021; Neranghi North Property Boundary, Stewart Surveys, 2021; Neranghi North Offset Area v8, Resource Strategies, 2021

Figure 3.15: Corben's Long-Eared Bat Habitat in the Neranghi North Offset Area

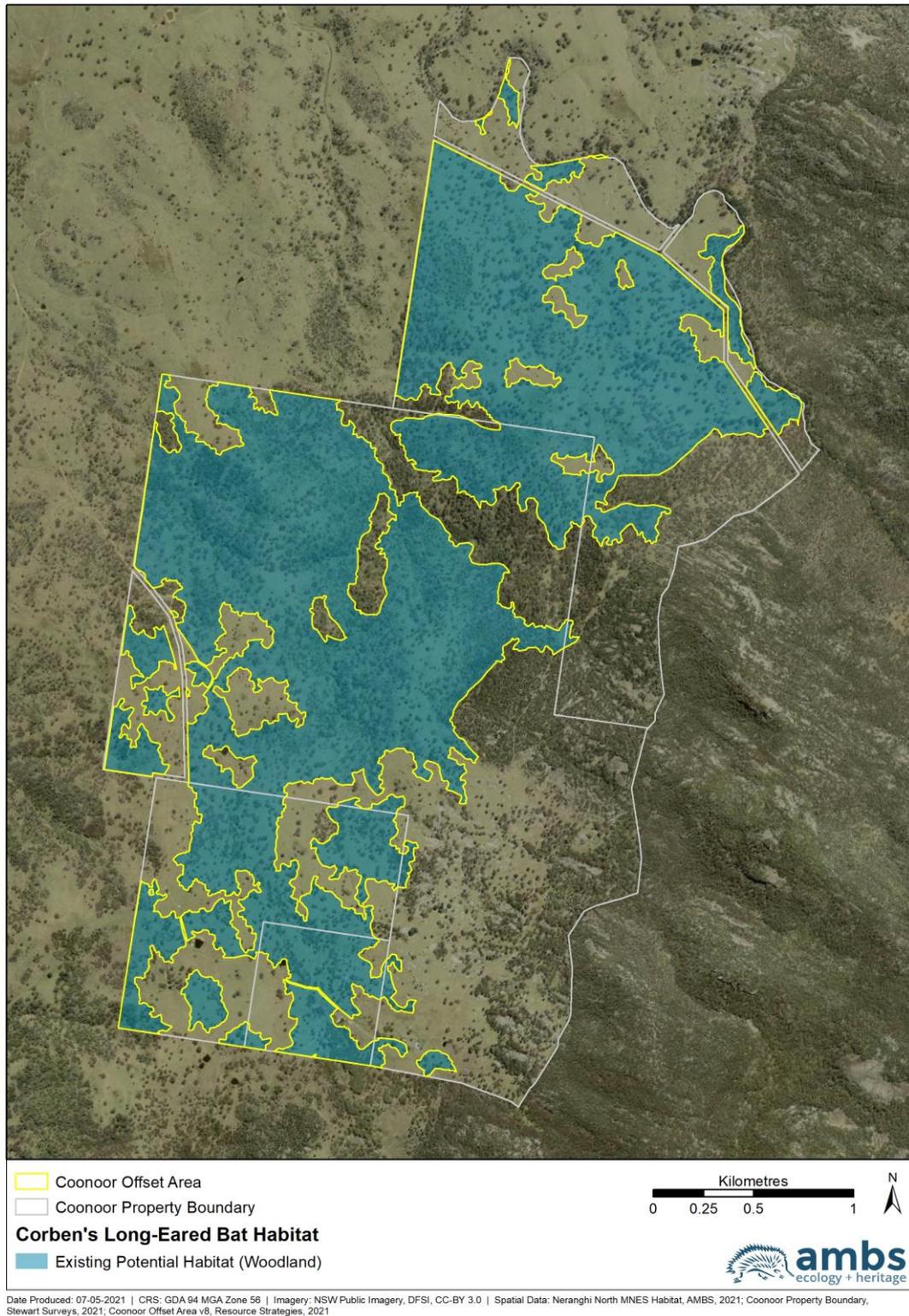


Figure 3.16: Corben's Long-Eared Bat Habitat in the Coonoor Offset Area

4 Conclusion

The TBDC (DPIE 2021b) identifies PCTs that are associated with the Regent Honeyeater, Swift Parrot and Corben's Long-eared Bat. A range of these PCTs were identified and mapped within the additional offset areas by AMBS (2021). There are records of these three species scattered across the wider locality in which the additional offset areas are located.

Field surveys of the additional offset areas found that fauna habitats were generally in good condition. Key habitat attributes for each of the three target species were present in all of the additional offset areas and were abundant or common in many locations. Anthropogenic impacts were common, but rarely observed at a level where they would significantly impact the quality of the habitat for the three target species.

In conclusion, it is AMBS' opinion that the additional offset areas contain good quality "habitat" (as defined in EPBC 2010/5566) for the Regent Honeyeater, Swift Parrot and Corben's Long-eared Bat, and that the Thornfield offset area will ultimately provide additional good quality potential habitat if self-sustaining vegetation communities containing suitable habitat features for these species are effectively restored within the areas of derived native grassland.

The quantities of potential habitat for the Swift Parrot, Regent Honeyeater and Corben's Long-eared Bat summed across all the additional offset areas are:

- Swift Parrot – 2,296.7 ha of woodland habitat;
- Regent Honeyeater – 2,274.5 ha of woodland habitat; and
- Corben's Long-eared Bat – 2,274.5 ha of woodland habitat.

The quantities of Future Potential Habitat for the Swift Parrot, Regent Honeyeater and Corben's Long-eared Bat in the Thornfield offset area are:

- Swift Parrot – 75.6 ha of derived native grassland;
- Regent Honeyeater – 84.4 ha of derived native grassland; and
- Corben's Long-eared Bat - 84.4 ha of derived native grassland.

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Appendix A: Habitat Areas by PCT and Offset Area

Existing Potential Habitat

Offset Area	Plant Community Type	Potential Habitat (ha)		
		Corben's Long-Eared Bat	Regent Honeyeater	Swift Parrot
Coonoor	588: White Box - White Cypress Pine shrubby hills open forest	324.8	324.8	324.8
	590: White Box grassy woodland	233.7	233.7	233.7
	599: Blakely's Red Gum - Yellow Box grassy tall woodland	15.4	15.4	15.4
Long Gully	510: Blakely's Red Gum - Yellow Box grassy woodland	330.7	330.7	330.7
	538: Rough-barked Apple - Blakely's Red Gum open forest	0	0	22.2
Neranghi North	588: White Box - White Cypress Pine shrubby hills open forest	224.9	224.9	224.9
	590: White Box grassy woodland	238.3	238.3	238.3
	599: Blakely's Red Gum - Yellow Box grassy tall woodland	103.8	103.8	103.8
Thornfield	101: Poplar Box - Yellow Box - Western Grey Box grassy woodland	16.6	16.6	16.6
	413: Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland	37.1	37.1	37.1
	435: White Box - White Cypress Pine shrub grass hills woodland	5.6	5.6	5.6
	599: Blakely's Red Gum - Yellow Box grassy tall woodland	1.7	1.7	1.7
Triangle	589: White Box - White Cypress Pine - Silver-leaved Ironbark grassy woodland	47.8	47.8	47.8
	590: White Box grassy woodland	491.6	491.6	491.6
	599: Blakely's Red Gum - Yellow Box grassy tall woodland	109.2	109.2	109.2
	1306: White Box - Red Stringybark shrubby woodlands	93.3	93.3	93.3
TOTAL		2274.5	2274.5	2296.7

Future Potential Habitat

Offset Area	Plant Community Type	Future Potential Habitat (ha)		
		Corben's Long-Eared Bat	Regent Honeyeater	Swift Parrot
Coonoor	588: White Box - White Cypress Pine shrubby hills open forest	0	0	0
	590: White Box grassy woodland	0	0	0
	599: Blakely's Red Gum - Yellow Box grassy tall woodland	0	0	0
Long Gully	510: Blakely's Red Gum - Yellow Box grassy woodland	0	0	0
	538: Rough-barked Apple - Blakely's Red Gum open forest	0	0	0
Neranghi North	588: White Box - White Cypress Pine shrubby hills open forest	0	0	0
	590: White Box grassy woodland	0	0	0
	599: Blakely's Red Gum - Yellow Box grassy tall woodland	0	0	0
Thornfield	101: Poplar Box - Yellow Box - Western Grey Box grassy woodland	8.8	8.8	0
	413: Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland	70.2	70.2	70.2
	435: White Box - White Cypress Pine shrub grass hills woodland	1.7	1.7	1.7
	599: Blakely's Red Gum - Yellow Box grassy tall woodland	3.7	3.7	3.7
Triangle	589: White Box - White Cypress Pine - Silver-leaved Ironbark grassy woodland	0	0	0
	590: White Box grassy woodland	0	0	0
	599: Blakely's Red Gum - Yellow Box grassy tall woodland	0	0	0
	1306: White Box - Red Stringybark shrubby woodlands	0	0	0
TOTAL		84.4	84.4	75.6