

# Re-connecting Thunderbolt Country for Threatened New England Woodland and Wetland Biodiversity

## Avifaunal Survey Report 1: 2020-2021



InSight Ecology  
for  
Southern New England Landcare Ltd.

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**Photographic credits:** Front page - main photograph: view over Salisbury Water from Top Spring Paddock, 'Taylor's Run', Kentucky South (InSight Ecology, 5/8/20). Front page, smaller images - clockwise from left to right (upper row): Site prepared for planting at 'Big Ridge', Uralla (InSight Ecology, 31/8/22); recently planted Far Dip Paddock at 'Taylor's Run' (InSight Ecology, 4/1/22); Billabong wetland at 'Salisbury Court', Salisbury Plains (InSight Ecology, 13/1/22). Front page (bird images): Scarlet Robin ([aussiebirding.wildiaries.com](http://aussiebirding.wildiaries.com) 2012), Speckled Warbler (Helen Fallow DEC and Ian Colley), Latham's Snipe (Jason Girvan and [en.wikipedia.org](http://en.wikipedia.org)), Blue-billed Duck (Spikerccs, [commons.wikimedia.org](http://commons.wikimedia.org)). Inside front page – view south from Stringybark Hill remnant, 'Big Ridge' (InSight Ecology, 13/8/20); Pink-eared Duck (Melbourne Water), recorded at Dangar's Lagoon.

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This project took place during the Covid19 pandemic. This required additional project planning and some initial meetings were undertaken online or re-scheduled. The fieldwork program, however, was unaffected. Strict Covid19 protocols including full vaccination for InSight Ecology staff were observed.

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## Executive summary

The ecological footprint of about 180 years of European settlement on New England Tableland has been substantial. About 70% of the region's native vegetation has been removed for agriculture, housing and urban infrastructure. This has caused the widespread loss, fragmentation and degradation of habitat and, consequently, the removal or disruption of wildlife corridors. Remaining native animal populations have become highly isolated, leading to the decline and local extinction of many native species. Remnant habitat in the region is now confined to a small number of nature reserves and national parks, narrow and often degraded road reserves and, importantly, bushland on privately-owned properties.

Efforts to reduce these impacts have been underway since the 1970s through a series of revegetation and remnant regeneration projects in the region. These have focused on planting trees and shrubs on farms and along roadsides and waterways to control soil erosion, establish windbreaks, provide wildlife habitat and improve aesthetics. More recent Landcare-related work has recognised the importance of re-connecting wildlife corridors through targeted plantings in key locations, widening and extending existing revegetation, and improving the condition of woodland/forest remnants.

Two recent Southern New England Landcare (SNEL) projects have focused on strategic revegetation and protection of remnant native vegetation in a key gap (about 35 km long by 23-25 km wide) in habitat connectivity between Armidale in the north and Uralla and Salisbury Plains/Kentucky in the south. This gap is preventing and/or inhibiting the movement and dispersal of 19 threatened fauna species and 7 threatened plant species between the eastern and western sides of the tableland.

The first project - *Closing the Gap: Functional Habitat for Threatened New England Fauna (2016-2019)* - surveyed woodland birds in revegetation and remnant woodland/forest at 36 sites on 15 properties in the northern section (Dangarsleigh and Kellys Plains to Uralla and Mihi) of the gap zone. The second project - *Re-connecting Thunderbolt Country for Threatened New England Woodland and Wetland Biodiversity (2019-2023)* - surveyed woodland/forest and wetland birds in revegetated woodland/forest, grassland, and aquatic habitats at 21 sites on 14 properties in the southern section of the gap zone, between Uralla, Enmore, Salisbury Plains and Kentucky South.

This report presents the results of the first two bird surveys completed under this second project, in winter 2020 and summer 2021. Four variables were targeted at each surveyed site in woodland/forest and wetland habitats – bird species presence, species richness, individual abundance, and habitat use. Five of these properties have been surveyed for birds by InSight Ecology during previous SNEL, Local Land Services, and CSIRO projects in the area. Sites were also assessed for their habitat and landscape connectivity, habitat condition, and land management and revegetation histories. A second report presents the results of the remaining two bird surveys for the Thunderbolt Project, conducted in summer and winter 2022.

A total of 2,766 individual birds from 82 species and 45 families were recorded during the winter 2020 and summer 2021 surveys in the study area. Over half (1,543 or 56.9%) of these birds and species (43) were recorded foraging, sheltering and/or breeding (in summer) in woodland/forest remnants. These remnants supported 5 threatened (in NSW) species including Scarlet Robin, Varied Sittella, Dusky Woodswallow, Diamond Firetail, and Little Eagle.

Fifteen (15) species of local conservation significance were recorded in some of these remnants including Satin Flycatcher, Jacky Winter, White-browed Scrubwren, Eastern Yellow Robin, Double-barred Finch (declining nationally), Peregrine Falcon, and White-winged Chough. These species occurred in the larger, higher quality stringybark, yellow box, New England peppermint and Blakely's red gum remnants. These were, in order of highest quality of remnant, number of threatened bird species detected at a site, and the properties they occurred on - 'Mihi Station', 'Spring Camp', CSIRO 'Chiswick – Stringybark Paddock', 'Eastlake', and Mt Mutton Reserve.

Freshwater wetlands surveyed in the study were utilised by 1,191 birds from 39 species across both survey periods. Expectedly, both the number of individual birds and species recorded were markedly higher in the summer survey (702 birds from 16 species) than in winter (489 birds from 30 species). In summer, the two larger wetlands surveyed - Dangar's Lagoon was 80% full (40% during the winter survey) and 'The Billabong' at 'Salisbury Court' was at 90% capacity in summer and 25% full in winter. This contributed to the summer survey result, with nomadic species (some flew from inland regions) foraging and breeding at particularly Dangar's Lagoon.

Conservation-significant wetland species recorded were Blue-billed Duck (threatened in NSW), Pink-eared Duck, Plumed Whistling-Duck, Great Crested Grebe, Hoary-headed Grebe, Black Swan, Black-winged Stilt, Australian Reed-Warbler, and Black-fronted Dotterel. Rank vegetation along Chiswick's Lambing Gully supported breeding territories for the migratory Tawny Grassland and resident Golden-headed Cisticola and Brown Quail. The wetland paddock site at 'Benambra' was utilised by Latham's Snipe, an intercontinental migratory wader subject to protection agreements between Australia, China, Japan and South Korea. Horsfield's Bushlark, a rare summer grassland visitor to the study area, was also recorded at 'Benambra' and near Chiswick's Lambing Gully.

Recommendations are provided to help protect, conserve and re-establish key habitat for woodland/forest and wetland bird communities in the study area. These actions target the restoration and rehabilitation of foraging, refuge, and breeding habitat for threatened and declining bird species within the connectivity gap zone. The actions focus on completing the current project's funded program of revegetation, remnant protection and enhancement, recording progress on achieving goals at project-participating properties, running community information and demonstration site workshops on participating farms in the study area, securing significant ongoing funding to support the continuation of revegetation and restoration work commenced under the Thunderbolt Project, potentially in similarly cleared districts such as Walcha and Guyra, and monitoring bird communities at each site in 3-5 years' time.

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## 1. Introduction

### 1.1 The woodland bird conservation crisis

The ecological footprint of about 180 years of European settlement on the native forests, woodlands and wetlands of New England Tableland has been substantial. About 60% of the region's native vegetation has been removed for farming and urban development. This has caused the widespread loss, fragmentation, and degradation of habitat and, as a result, the removal or disruption of wildlife corridors. Remaining animal populations have become highly isolated and this has led to the decline and local extinction of many native species. Remnant habitat in the region is now confined to some nature reserves and national parks, narrow and often degraded road reserves and, importantly, bushland on privately-owned properties.

Woodland birds and mammals have been particularly hard hit by these changes to the amount, condition and connectivity of habitat in the region. Hugh Ford and his colleagues have shown that small woodland bird species have been declining in abundance and disappearing at an alarming rate across southern Australia (Ford et al. 2001). This has also been occurring in other highly fragmented landscapes such as the sheep-wheatbelts of NSW (Reid, 1999 and Seddon et al. 2003) and Western Australia (see Saunders 1989; Saunders et al. 1991; Huggett et al. 2004; InSight Ecology et al. 2015).

It is also likely that woodland birds of New England Tableland are continuing to pay an extinction debt imposed by this large-scale land clearing and fragmentation (Ford et al. 2009; Kuussaari et al. 2009). This has involved the gradual disappearance of a suite of woodland birds from the region as patches have become increasingly isolated, smaller in size, degraded, and often heavily predated. Species-specific mechanisms have also been implicated in this process. These include, for example, the inability or unwillingness of the female Brown Treecreeper to disperse between isolated patches leaving remaining males to eventually die out (Cooper et al. 2002; Ford et al. 2009). High nest predation in isolated patches experienced by another ground-foraging woodland insectivore that has declined markedly across the region – Hooded Robin – has resulted in inadequate recruitment rates to replace losses caused by adult mortality (Fitri and Ford 2003; Debus 2006; Ford et al. 2009). The outcome has been the eventual extinction of this species from many small remnants across the tableland (Ford et al. 2009).

### 1.2 Re-connecting Thunderbolt Country Project

Since the 1970s, a series of revegetation projects have re-introduced vegetation into parts of the New England landscape. Livestock grazing pressure on woodland remnants has been reduced in some areas through fencing and improved stock management and pest control practices. While these efforts have helped to reduce soil erosion, provide shelter for livestock, establish habitat for some wildlife and improve local aesthetics, gaps in native vegetation cover between the eastern and western sides of the tableland still remain. Also, these plantings have often been too narrow, short or isolated within paddocks to act as functional corridors or stepping stones for area-sensitive and dispersal-limited native fauna species (see InSight Ecology 2012a, b, 2018a, b; Southern New England Landcare [SNEL] 2015).

A new project proposal, *Re-connecting Thunderbolt Country for Threatened New England Woodland and Wetland Biodiversity* (termed Thunderbolt Project), was developed by SNEL to address this key conservation issue in the region. This drew on the results of previous fauna

surveys and Landcare-based revegetation projects undertaken in the southern New England, particularly work completed under the Closing the Gap Project (2016-2019) (InSight Ecology 2018a, b). The Thunderbolt Project is funded by the NSW Environmental Trust under its Restoration and Rehabilitation Program for the period, 2019-2023.

The Thunderbolt Project targets the southern section of a key gap in habitat connectivity on the southern New England Tableland (termed the “study area”). This gap is about 35 km long by 23-25 km wide and occurs between Uralla in the north, Dangar’s Gorge and Enmore in the east, and Kentucky South and Salisbury Plains in the south. This area represents a significant gap in connectivity that is preventing and/or inhibiting threatened and declining fauna moving between habitats on the western and eastern sides of this part of New England Tableland. Previous SNEL projects (e.g. InSight Ecology 2018a), wildlife corridor mapping (Scotts 2003), habitat connectivity modelling projects (Mackey et al. 2010; Office of Environment and Heritage 2010, 2016; Smith 2018; Harwood et al. 2022), a local strategic plan (Local Land Services 2021), and a State of the Environment report (Uralla Shire Council 2017-2021) have identified the study area as a high priority for ecological restoration.

Key conservation management actions that are in progress or planned for the study area include the protection of 18 ha of remnant woodland and wetland using 6 km of fencing, planting 36 ha of new future habitat with 12,000 local native trees, shrubs and ground cover species, and managing key threats. This work is targeting a total of 18 sites on 12 private properties in the study area. In addition, a total of 10,000 community members in the Uralla, Walcha and Armidale LGAs have been reached via an online training workshop and articles in the local media and on SNEL’s website. Field training events are also planned for the second phase (2022-23) of the project.

This report presents the results of the first two avifaunal surveys conducted under the Thunderbolt Project. This work was undertaken in winter 2020 and summer 2021 at 21 sites on 14 properties across the study area. Six (6) of these sites comprised remnant and/or constructed wetland habitats, 9 sites supported remnant eucalypt woodland/forest, and 6 sites were proposed to be revegetated with native flora. Remnant woodland/forest sites were designated as reference sites to allow comparison of bird response to revegetation and remnant protection over time.

This document reports on the results of the first of these field surveys of bird communities undertaken in planted and remnant native vegetation in the gap zone or study area. The results of the second survey, conducted in summer and winter 2022, are reported separately (InSight Ecology 2023b).

### 1.3 Objectives

The Thunderbolt Project aims to increase habitat connectivity and improve habitat condition for threatened fauna and flora in the study area.

Specifically, the project will:

- Establish 36 ha of new functional habitat for woodland birds and other fauna;
- Protect 18 ha of remnant woodland/forest and grassland;
- Erect 6 km of fencing to protect remnants and new revegetation;



- Increase community awareness, skills and knowledge of functional habitat connectivity and its importance for threatened New England flora and fauna among 10,000 community members in the Uralla, Armidale, Walcha and Guyra LGAs.

This report:

- Describes the species composition, relative abundance, habitat use and conservation significance of bird communities surveyed in remnant and planted native vegetation in the study area;
- Provides new data to allow monitoring of the performance of revegetated and remnant woodland and wetland sites as functional faunal habitat and help inform their conservation management over time;
- Contributes to our current knowledge of the ecology and conservation of woodland and wetland birds in remnants and revegetation on the southern New England Tableland;
- Provides recommendations to protect, increase and re-connect habitat for threatened birds and other fauna in the study area.

## **2. Location and methods**

### **2.1 Location**

The study area is located between 18 km south-west (CSIRO 'Chiswick', north of Uralla) and 51 km south (Hillview Road at 'Eastlake') of Armidale on the NSW northern tablelands. Figure 1 (next page) shows the location of surveyed properties and sites in the study area and the distribution of vegetation across the landscape. Table 1 lists the properties and sites surveyed for avifauna in the Thunderbolt Project.

### **2.2 Methods**

#### **2.2.1 Literature and data review**

A review of existing literature and data on avifauna and revegetation of the study area and southern Australia generally was undertaken before and during the project. This included published research papers in ornithological science and ecological restoration journals, reports of previous bird surveys and revegetation projects, field data from past bird surveys and habitat assessments in the study area, NSW Wildlife Atlas (BioNet, under licenced access to InSight Ecology) and Landcare funding applications, and verified bird records held by individual landowners. Regional and sub-regional connectivity modelling work undertaken by NSW Department of Planning and Environment and University of New England was also reviewed.

#### **2.2.2 Site selection**

A total of 21 survey sites were selected across 14 properties in the study area. The selection of these sites was based on proposals submitted to SNEL for on-ground habitat protection and revegetation works by individual landholders under the Thunderbolt Project. Works plans for each property were prepared by landholders in consultation with the SNEL project officer and commitment to plans secured through landholder management agreements. Recommendations from previous surveying in and near the study area helped guide the design of proposed revegetation and remnant protection actions, particularly concerning the connectedness, width and length of plantings, and their functional habitat value for woodland and wetland birds.

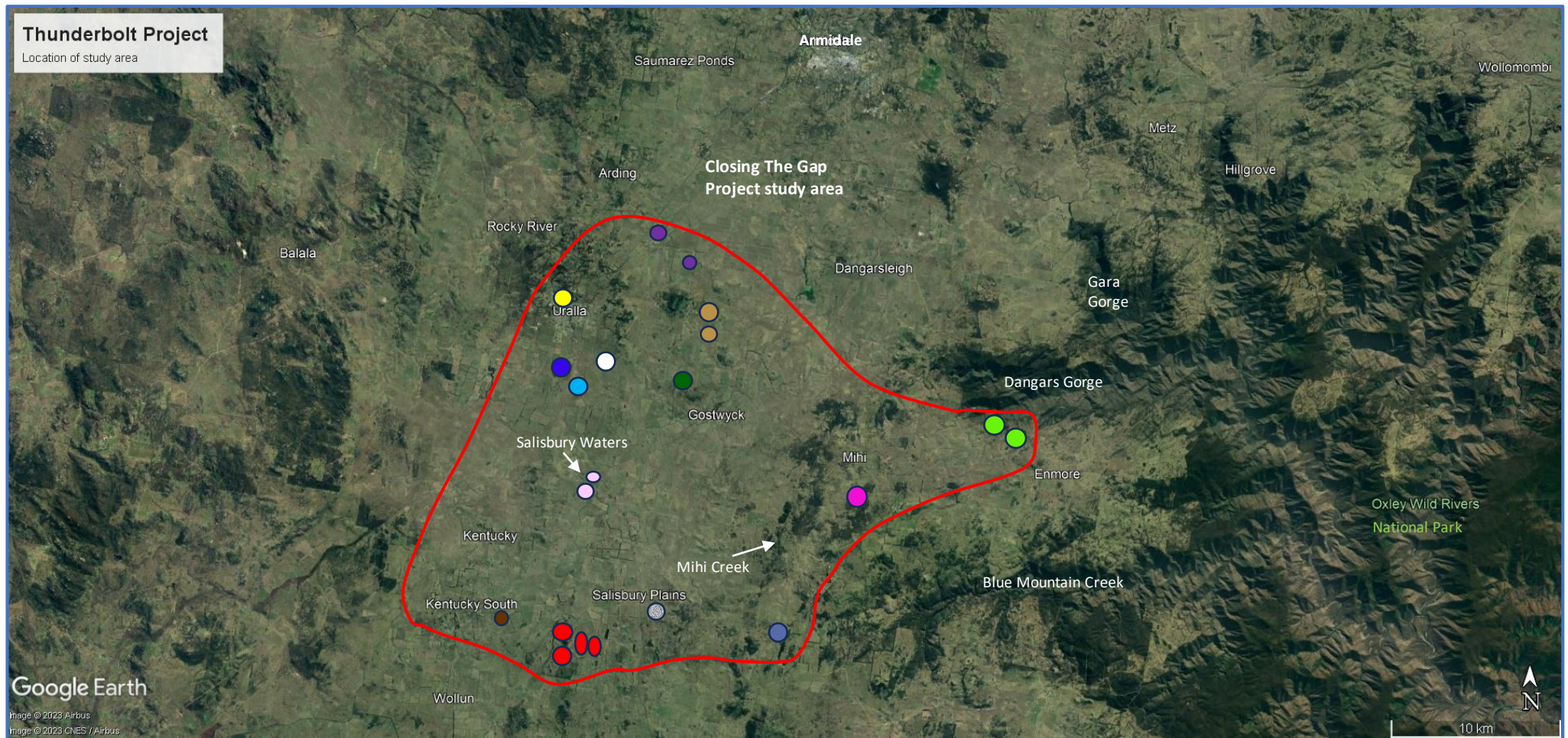


Figure 1: Location of the Uralla to Kentucky South and Salisbury Plains connectivity gap (the study area). Red line denotes the Thunderbolt Project study area boundary. Key to properties and surveyed sites: purple = 'Chiswick', yellow = Mt Mutton Reserve, brown = 'Big Ridge', dark green = 'Gostwyck', white = 'Benambra', dark blue = Racecourse Lagoon Reserve, light blue = Dangar's Lagoon NR, light green = 'Spring Camp', magenta = 'Mihi Station', dark grey = 'Eastlake', light grey = 'East Oaks', red = 'Taylor's Run', dark brown = 'Woodstock', light pink = 'Salisbury Court'.

**Table 1:** List of properties and sites surveyed in the Thunderbolt Project. Sites previously surveyed by InSight Ecology (between 2011 and 2018) are indicated. The location of sites is shown in Figure 1.

Property name	Site number	Site name	Description	Site previously surveyed by InSight Ecology
CSIRO 'Chiswick'	1	Lambing Gully	Remnant wetland	yes
CSIRO 'Chiswick'	2	Stringybark Paddock	Remnant woodland	yes
Mt Mutton Reserve	3	Mt Mutton Reserve	Remnant woodland/forest	no
'Big Ridge'	4	Corridor planting Site 3	Proposed woodland planting	No (yes, other sites on 'Big Ridge')
'Big Ridge'	5	Corridor planting Site 4	Proposed woodland planting	no
'Gostwyck'	6	'No Man's Land'	Remnant woodland and shrubland on rocky ridge	yes
'Benambra'	7	Wetland Paddock Site 3	Remnant wetland in drainage line connected to Dangar's Lagoon	no
Dangar's Lagoon Nature Reserve	8	Dangar's Lagoon	Remnant wetland	no
Racecourse Lagoon Reserve and Wildlife Refuge	9	Racecourse Lagoon	Remnant wetland	no
'Salisbury Court'	10	'Rock quarry'	Scattered remnant woodland on rocky knoll east of Salisbury Waters	no
'Salisbury Court'	11	'The Billabong' wetland	Remnant wetland	no
'Spring Camp'	12	'Fairy Glen' and 'Hill of Birds'	Remnant forest and shrubby woodland on rocky knolls and gullies	yes
'Spring Camp'	13	'Dam wetland'	Fully vegetated old dam	no
'Mihi Station'	14	'Lower Ram Paddock' and part of 'Trig Reserve' (contiguous site)	Remnant grassy woodland	no
'Eastlake'	15	'Green Camp Peppermint Block'	Remnant grassy woodland to Jack's Creek	no (yes - other sites on 'Eastlake')
'East Oaks'	16	'Lower Hill Planting' and 'Lower Hill Enhancement'	Proposed woodland corridor planting and remnant woodland enhancement	no
'Taylor's Run'	17	'Top Spring'	Remnant woodland/forest and planted pines	no
'Taylor's Run'	18	'Wallaby Paddock'	Remnant woodland/forest and planted pines	no
'Taylor's Run'	19	'Corner Paddock'	Remnant grassy woodland	no
'Taylor's Run'	20	'Far Dip Paddock'	Proposed woodland corridor planting	no
'Woodstock'	21	Woodstock dam	Proposed wetland fencing and woodland strip planting	no

### 2.2.3 Field surveying

Terrestrial and aquatic bird species were surveyed by InSight Ecology during the day at each site in the study area in winter 2020 (3-14 August) and summer 2021 (5-15 January). InSight Ecology has previously surveyed bird communities on 5 of the properties that participated in the

Thunderbolt Project – ‘Eastlake’, ‘Big Ridge’, CSIRO ‘Chiswick’, ‘Gostwyck’ (at ‘No Man’s Land’), and ‘Spring Camp’.

Bird species that utilised wetland habitats present at 7 surveyed sites were also recorded. These included open or standing water, floating vegetation on lake and dam surfaces, reedy margins, fringing trees, shrubs and grasses, fallen logs and rocky embankments along creeks and farm dams, and wet paddocks/grassy creeks.

The area search technique (InSight Ecology 2012a, b, 2018a, b) was used to sample bird communities present in woodland remnants. This involved surveying by steadily walking a loop route in which different forward and return legs, separated where possible by a distance of at least 100 metres, were taken through the main habitats present at each site. In revegetation, point-count line transects were used to sample bird species present in typically narrow planted strips. Both techniques avoided recording the same bird twice, particularly flocking, group-foraging, and fast or very frequently moving species such as Noisy Miner, Yellow-faced Honeyeater, Welcome Swallow, and Eastern Rosella. This also helped to avoid committing the same error with more sedentary species such as Australian Magpie and Grey Butcherbird. These species tend to remain in specific areas for periods of time, scanning for ground-based prey in grass or leaf litter.

Wetland sites were surveyed for birds by walking slowly around a lake, billabong or dam’s dryland perimeter or walking a transect through reeds, grasses and other wetland vegetation at ‘Benambra’, CSIRO ‘Chiswick’, ‘Salisbury Court’ (‘The Billabong’ wetland), Dangar’s Lagoon, Racecourse Lagoon, ‘Spring Camp’, and ‘Woodstock’.

All birds observed or heard at a site were recorded, including individuals flying over the site. Data recorded included the species present, number of individuals observed, date, time, behaviour (ie. foraging/feeding, courting, calling, mobbing, resting, flying), use of habitat, and other relevant information such as age, species composition and condition of revegetation and remnants, weather, and interactions with other birds. Nomenclature used was consistent with Christidis and Boles (2008). All observations were made by the same experienced ornithologist (A.H.) using a pair of Zeiss 10x40BT® binoculars fixed to a Pro-Harness® chest strap. Several landholders accompanied A.H. during surveys on their properties.

Surveys were generally conducted in the main morning (c. 0700-1030 hours) and afternoon (c. 1400-1700 hours in winter and 1500-1900 hours in summer) bird foraging periods (survey sessions) on each survey day. No surveying occurred in windy or wet weather. A total of 19 field survey sessions were conducted in winter 2020 (total of 19 hours) and 21 survey sessions in summer 2021 (total of 21.5 hours). Therefore, a total of 40.5 hours was spent surveying birds in the study area.

#### 2.2.4 Habitat assessment

The biophysical attributes of each surveyed site were assessed. These included location and area of woodland remnants, woodland revegetation and wetland remnants, geology, broad habitat type - forest, woodland, grassland, pasture or wetland, type of native vegetation present - mature trees, young trees, grasses, herbs/forbs, moss/fungi/lichens, leaf litter and bare soil, habitat and habitat condition features – standing dead trees, trees with hollows, trees with mistletoe, fallen timber and rocks, open water, wetland vegetation, unhealthy habitat features –

dead/dying/mistletoe-infested trees, introduced shrubs and grasses, soil erosion, feral animals and excessive grazing, main tree, shrub and grass/forb species present, observations of other fauna, and land management information including land use types, native vegetation connectivity and owner's perspectives.

Still photographs were taken of the surveyed sites using a Nikon D3200 (Nikkor 55-300 mm lens) digital SLR camera. These provided reference points for future monitoring of revegetation and remnant enhancement sites as well as habitat condition in remnant and planted sites. They also captured some birds present and their use of habitat and provided a landscape-scale perspective of vegetation distribution within the gap zone. All images were stored on a standard 500GB ATA HDD and backed up to a 500GB external HDD.

### 2.3 Community engagement and education

Several activities were designed and implemented by SNEL and InSight Ecology to engage landholders and local communities in the Thunderbolt Project. These aimed to increase community awareness, skills and knowledge of functional habitat connectivity and its importance for threatened New England fauna. This work targeted reached out to 10,000 community members in the Uralla, Walcha, Armidale and Guyra LGAs.

Activities conducted during 2020-21 included promotion of the project through the local print media, Landchat newsletter, and SNEL eNewsletter and website, and an online facilitator's program workshop (held 3 June 2020, during the Covid19 pandemic). Work commenced on the production of educational publications including a poster and a pocket guide for landholders. Landholders were invited to accompany the ornithologist on surveys of sites on their properties. Planning also started for field training events to be conducted in the second phase of the project (2022-23).

## 3. Results

### 3.1 Overview

A total of 2,766 birds from 82 species and 45 families were recorded at woodland and wetland sites during the winter 2020 and summer 2021 surveys in the study area. Fewer birds were recorded in winter (1,223) than in summer (1,543). During the winter survey, Dangar's Lagoon was 40% full while in the summer survey the lagoon was 80% full. Racecourse Lagoon was mostly dry during both survey periods. 'The Billabong' wetland at 'Salisbury Court' was 25% full in winter 2020 and at 90% capacity during the summer 2021 survey.

#### 3.1.1 Woodland birds

A total of 1,575 woodland birds from 43 species and 35 families was recorded during the winter 2020 and summer 2021 surveys in the study area.

Most woodland birds were recorded in eucalypt remnants and mixed eucalypt remnant/old pine plantings. These provided important foraging, refuge and/or breeding habitat for 30 bird species in winter 2020 (734 birds) and 37 bird species (841 birds) in the summer 2021 survey. Some species occurred in both surveys.

Conservation-significant species recorded were the threatened (in NSW) Varied Sittella, Scarlet Robin, Dusky Woodswallow, Diamond Firetail, and Little Eagle. Woodland birds of local conservation significance in the highly fragmented southern New England landscape detected were White-browed Scrubwren, Eastern Yellow Robin, Buff-rumped Thornbill, Restless Flycatcher, Satin Flycatcher, Jacky Winter, Little Friarbird, Double-barred Finch, Horsfield's Bushlark, White-winged Chough, Forest Raven, and Peregrine Falcon (see Section 3.3).

Surveying of existing woodland revegetation in this project was limited to two sites, both on 'Taylor's Run' – 'Top Spring' and 'Wallaby Paddock'. The former site was a mix of remnant New England Stringybark and Blakely's Red Gum and old planted Radiata Pine while these pines dominated much of 'Wallaby Paddock'. Bird species recorded in these sites included nesting Brown Goshawk ('Top Spring'), White-throated Treecreeper, Crimson Rosella, Brown Thornbill, Buff-rumped Thornbill, Superb Fairy-wren, White-browed Scrubwren, Eastern Yellow Robin, Yellow-faced Honeyeater, and Red Wattlebird. Summer breeding migrants recorded at these sites were Pallid Cuckoo, Satin Flycatcher and Dollarbird.

Five sites proposed for woodland revegetation in the project were also surveyed for birds. These included two sites at 'Big Ridge' and one each at 'East Oaks', 'Taylor's Run', and 'Salisbury Court'. Birds recorded at these sites were open country species, typically Australian Magpie, Eastern Rosella and Crested Pigeon as well as birds flying between remnants and paddocks such as Red-rumped Parrot and Torresian Crow.

### 3.1.2 Wetland birds

The winter 2020 survey produced a total of 489 wetland birds and those foraging along wetland margins from 22 species and 13 families. In contrast, the summer 2021 survey yielded 702 birds from 30 species and 16 families.

Lagoons and dams with open water supported common residents such as Australian Wood Duck, Pacific Black Duck, Grey Teal, Australasian Grebe, Eurasian Coot and Welcome Swallow. Dangar's Lagoon, Racecourse Lagoon (when full in the summer 2021 survey) and 'The Billabong' at 'Salisbury Court' provided expanses of open water and some aquatic floating vegetation for Pink-eared Duck, Hoary-headed Grebe, Great Crested Grebe, Australasian Shoveler, Hardhead, Black Swan and Plumed Whistling-Duck. The threatened Blue-billed Duck was recorded at Dangar's Lagoon when water levels had reached 80% capacity in the summer 2021 survey.

Reedy and muddy margins of wetlands were utilised by White-faced Heron, Purple Swamphen, Eurasian Coot, Black-winged Stilt and Masked Lapwing. Three Black-fronted Dotterel were recorded foraging along the exposed muddy shores of Woodstock Dam in the summer 2021 survey.

An extensive seasonally wet grassland along Lambing Gully at 'Chiswick' provided rank foraging, refuge and nesting habitat for summer breeding migrants Tawny Grassland and Brown Songlark and residents, Golden-headed Cisticola and Brown Quail. The uncommon/rare Horsfield's Bushlark was recorded at 'Benambra' wetland paddock site where the conservation-significant and intercontinental migratory wader, Latham's Snipe, was also detected in summer 2021.

### 3.2 Birds recorded at each surveyed site

All bird species recorded during both surveys are listed in Tables 2-22, together with the number of individual birds detected for each species in each survey period, their behaviour/habitat use, and the total number of species and individuals recorded at each site. Species of local, regional or State conservation significance are highlighted in bold. Species classified as threatened under NSW Biodiversity Conservation Act 2016 are also indicated in bold. Introduced species are shown by an asterisk.

**Table 2:** Birds recorded at Lambing Gully remnant wetland, CSIRO ‘Chiswick’ (Site 1)

Species and survey date - winter 2020 (13/8/20)	Species and survey date - summer 2021 (14/1/21)
Torresian Crow 5	Brown Quail 1
Willie Wagtail 1	<b>Brown Songlark</b> 1 (called breeding territory)
Straw-necked Ibis 12 (foraged in flowing creek)	<b>Tawny Grassbird</b> 7 (nesting/aerial displays)
Australasian Shoveler 2 (foraged pooled section’s banks)	Straw-necked Ibis 8 (flew over)
Nankeen Kestrel 1	Torresian Crow 1 (flew over)
Australasian Pipit 1	Willie Wagtail 1
	Superb Fairy-wren 3
<i>Total birds 22. Total species 6</i>	<i>Total birds 22. Total species 7</i>

**Table 3:** Birds recorded at Stringybark Paddock woodland/forest remnant, CSIRO ‘Chiswick’ (Site 2)

Species and survey date - winter 2020 (13/8/20)	Species and survey date - summer 2021 (13/1/21)
Spotted Pardalote 2	Grey Fantail 6
Australian Wood Duck 2	Rufous Whistler 4
Rufous Whistler 3	<b>Dusky Woodswallow</b> 5 – <b>threatened</b> (nesting – 2 adults, 2 juveniles, 1 other adult)
White-throated Gerygone 1	Spotted Pardalote 1
Common Starling* 6	Torresian Crow 1
Eastern Rosella 3	White-throated Gerygone 3 (called territory)
Australian Magpie 6	Crimson Rosella 6 (incl. juveniles)
Red Wattlebird 1	Eastern Rosella 8
Golden Whistler 1	<b>Horsfield’s Bushlark</b> 1 (near site gate)
Yellow-rumped Thornbill 6	Red-rumped Parrot 2
White-throated Treecreeper 3	White-throated Treecreeper 1
Galah 6	Silvereye 10
Grey Fantail 3	Willie Wagtail 1
Superb Fairy-wren 11 (foraged in Cassinia patch)	Superb Fairy-wren 15 (foraged in Cassinia patch)
Yellow-faced Honeyeater 2	Laughing Kookaburra 3 (nesting)
Brown Thornbill 3 (foraged in Cassinia patch)	Noisy Friarbird 2 (nesting)
Musk Lorikeet 4 (in stringybark canopy, western knoll)	<b>White-browed Scrubwren</b> 1 (took prey to nest)
Silvereye 2	Brown Thornbill 3 (Cassinia patch & eastern knoll)
Striated Thornbill 6	Striated Thornbill 7 (foraged in stringybark canopy)
Crimson Rosella 13 (some nesting/mate pursuits)	Galah 4 (nesting)
Willie Wagtail 1	<b>Varied Sittella</b> 6 - <b>threatened</b>
Brown Falcon 1	Striated Pardalote 2
Laughing Kookaburra 3	Common Starling * 20
	Red-rumped Parrot 4
	Grey Butcherbird 1
	Australian Magpie 3
	Yellow-rumped Thornbill 7 (incl. juveniles fed by adult)
<i>Total birds 89. Total species 23</i>	<i>Total birds 127. Total species 27</i>

**Table 4:** Birds recorded at Mt Mutton Reserve - grassy woodland and shrubland remnant (Site 3)

Species and survey date - winter 2020 (11/8/20)	Species and survey date - summer 2021 (13/1/21)
Striated Thornbill 9	White-throated Treecreeper 2
Spotted Pardalote 5 (inspected earth bank nest site)	Striated Thornbill 9
Eastern Spinebill 2	Red-browed Finch 6 (foraged grassy west slope)
Yellow-faced Honeyeater 6 (lerp-foraged)	Superb Fairy-wren 3
Pied Currawong 2	Eastern Spinebill 1
Brown Thornbill 4 (in <i>Bursaria</i> & <i>Cassinia</i> thickets on east & west sides of Mt Mutton Reserve)	<b>White-browed Scrubwren</b> 7 (likely with young nearby, group 2 of 2 adults & 2 juveniles south slope <i>Cassinia</i> )
<b>Buff-rumped Thornbill</b> 4	Grey Butcherbird 2
Eastern Rosella 2	Red Wattlebird 1
White-throated Treecreeper 3	Silvereye 4
Yellow-rumped Thornbill 2	Yellow-faced Honeyeater 2
Australian Magpie 3	Grey Fantail 2
Superb Fairy-wren 10	<b>Satin Flycatcher</b> 1 (calling male, hilltop)
Red-browed Finch 2	Australian Magpie 2
Silvereye 12	Dollarbird 1
Grey Fantail 3	Crimson Rosella 1
<b>Varied Sittella</b> 3 – <b>threatened</b> (north grassy slope, regrowth stringybark & Angophora)	Spotted Pardalote 1
Noisy Friarbird 1	Noisy Friarbird 1
<b>White-browed Scrubwren</b> 2 (territory calls)	
<i>Total birds 75. Total species 18</i>	<i>Total birds 46. Total species 17</i>

**Table 5:** Birds recorded at 'Big Ridge' – proposed corridor planting site 3 (Site 4)

Species and survey date - winter 2020 (13/8/20)	Species and survey date - summer 2021 (7/1/21)
Red-rumped Parrot 3	Torresian Crow 1
Crested Pigeon 1	<b>Wedge-tailed Eagle</b> 2
Australian Magpie 2	
<i>Total birds 6. Total species 3</i>	<i>Total birds 3. Total species 2</i>

**Table 6:** Birds recorded at 'Big Ridge' – proposed corridor planting site 4 (Site 5)

Species and survey date - winter 2020 (13/8/20)	Species and survey date - summer 2021 (7/1/21)
Australian Magpie 2	Australian Magpie 2
Crested Pigeon 1	Torresian Crow 2
Red-rumped Parrot 2 (flew over)	
<i>Total birds 5. Total species 3</i>	<i>Total birds 4. Total species 2</i>

**Table 7:** Birds recorded at 'No Man's Land' remnant woodland/shrubland, 'Gostwyck' (Site 6)

Species and survey date - winter 2020	Species and survey date - summer 2021 (7/1/21)
Not surveyed – surveyed in autumn, winter & late spring 2016-17 (see InSight Ecology 2018a, b, 2019). Additional conservation-significant species recorded in 2016-17: Common Bronzewing, Rufous Fantail, Scarlet Honeyeater, Eastern Yellow Robin & Satin Flycatcher.	Rufous Whistler 3
	Yellow-faced Honeyeater 5
	Grey Fantail 6 (incl immature birds)
	<b>White-browed Scrubwren</b> 7 (incl. family group of 5, foraged in old-growth tea-tree thicket)
	White-throated Treecreeper 1
	White-throated Gerygone 2
	Silvereye 6
	<b>Buff-rumped Thornbill</b> 6 (incl. juveniles)
	Brown Thornbill 1
	Striated Thornbill 6 (decoy flights, with juveniles)
Grey Butcherbird 1	



Species and survey date - winter 2020	Species and survey date - summer 2021 (7/1/21)
	Laughing Kookaburra 1
	Little Friarbird 1
	<b>Peregrine Falcon 1</b>
	Total birds 47. Total species 14

**Table 8:** 'Benambra', Wetland Paddock Site 3 (Site 7)

Species and survey date - winter 2020 (6/8/20)	Species and survey date - summer 2021 (7/1/21)
Little Crow 3	<b>Golden-headed Cisticola 2</b> (rushes at small dam)
Galah 2	Galah 3 (flew over)
Superb Fairy-wren 4	Torresian Crow 2 (flew along creek)
Little Corella 1 (flew over)	<b>Horsfield's Bushlark 1</b> (called on western fence)
Yellow-rumped Thornbill 3	<b>Latham's Snipe 1</b> (foraged in wet paddock)
Common Starling* 4	Superb Fairy-wren 4
Australian Magpie 2	Australian Magpie 2
Crested Pigeon 2	
Total birds 21. Total species 8	Total birds 15. Total species 7

**Table 9:** Dangar's Lagoon Nature Reserve wetland (Site 8)

Species and survey date - winter 2020 (6/8/20)	Species and survey date - summer 2021 (7&14/1/21)
Pacific Black Duck 140 (lagoon 40% full)	Musk Duck 1 (male on open water)
<b>Black-winged Stilt 17</b>	Australasian Shoveler 31
Grey Teal 19	<b>Black Swan 40</b> (cygnets, nests, lagoon 80% full)
Welcome Swallow 2	Eurasian Coot 228 (incl. young)
<b>Black Swan 48</b> (incl immature birds)	Pacific Black Duck 54 (incl. ducklings)
Eurasian Coot 130	Grey Teal 32
Masked Lapwing 9	Australasian Grebe 47 (incl. young)
Purple Swamphen 24	Purple Swamphen 30 (2 active nests)
White-faced Heron 4	Pied Cormorant 2
Australasian Shoveler 5	<b>Peregrine Falcon 1</b>
Australasian Grebe 1 (breeding plumage)	<b>Blue-billed Duck 14</b> (8 males, 6 females) - <b>threatened</b>
Chestnut Teal 8	Hardhead 17
<b>Peregrine Falcon 1</b>	<b>Great Crested Grebe 1</b>
Swamp Harrier 1 (flew over east side reeds)	Chestnut Teal 10
	<b>Hoary-headed Grebe 28</b> (some in breeding plumage)
	Whistling Kite 1
	<b>Pink-eared Duck 14</b>
Total birds 409. Total species 14	Total birds 551. Total species 17

**Table 10:** Racecourse Lagoon Reserve and Wildlife Refuge wetland (Site 9)

Species and survey date - winter 2020 (3/8/20)	Species and survey date - summer 2021 (15/1/21)
Superb Fairy-wren 11	Pacific Black Duck 4 (flew over – lagoon dry)
Striated Thornbill 2 (edge plantings – lagoon almost dry)	Crimson Rosella 5 (edge near northern side)
Grey Fantail 1	Rufous Whistler 3 (edge remnant eucalypts)
Yellow-rumped Thornbill 9	Yellow-faced Honeyeater 5 (ate spiders in grassland)
Australian Magpie 2	Dollarbird 1 (in lone Blakely's red gum)
Forest Raven 1 (flew over)	Torresian Crow 1
Stubble Quail 1 (flushed from sedgeland)	European Goldfinch* 1
	Red-rumped Parrot 3
	Yellow Thornbill 4 (edge eucalypts)
	Superb Fairy-wren 10 (incl. immatures)
	Grey Fantail 5 (incl. immatures)
	Yellow-rumped Thornbill 6

Species and survey date - winter 2020 (3/8/20)	Species and survey date - summer 2021 (15/1/21)
	Silvereye 1
Total birds 27. Total species 7	Total birds 49. Total species 13

**Table 11:** ‘Salisbury Court’ rock quarry remnant woodland with exotic/native grass swards and located on the eastern side of Salisbury Water to the old cottage (Site 10)

Species and survey date - winter 2020 (12/8/20)	Species and survey date - summer 2021 (6/1/21)
Grey Butcherbird 1	Silvereye 7
Nankeen Kestrel 1 (perched on stag)	Galah 4 (flew over)
Common Starling* 5	Superb Fairy-wren 3
Yellow-rumped Thornbill 4	European Goldfinch* 2 (foraged in saffron thistle)
Grey Fantail 1	Crimson Rosella 3
Willie Wagtail 1	Rufous Whistler 2
White-faced Heron 1	Grey Shrike-thrush 1 (called)
Australian Magpie 3	<b>White-winged Triller</b> 2 (pair foraged)
	<b>Rufous Songlark</b> 3 (calling males)
	Grey Fantail 6
	Red Wattlebird 5
	White-throated Gerygone 1 (calling male)
	<b>Australian Reed-Warbler</b> 5 (3 males called in reedbeds)
Total birds 17. Total species 8	Total birds 44. Total species 13

**Table 12:** ‘Salisbury Court’ – ‘The Billabong’ remnant wetland (Site 11)

Species and survey date - winter 2020 (12/8/20)	Species and survey date - summer 2021 (6/1/21)
Straw-necked Ibis 16 (foraged)	Eurasian Coot 10
Crested Pigeon 1	Australasian Grebe 6 (produced 4 young in Nov.20)
Superb Fairy-wren 4	Pacific Black Duck 29
Grey Teal 7	Willie Wagtail 2
Willie Wagtail 2	Grey Teal 14
Pacific Black Duck 5	Australian Shoveler 4 (billabong 90% full)
Australasian Grebe 3 (billabong 25% full)	Chestnut Teal 12
Eurasian Coot 3	Hardhead 6
White-faced Heron 1	Australian Wood Duck 2
	<b>Sacred Kingfisher</b> 1 (flew from ephemeral wetland)
	<b>Dollarbird</b> 3 (perched in planted 20 yr-old snow gum)
	Tawny Frogmouth 1 (called in old hawthorn near house)
	<b>Plumed Whistling-Duck</b> 2 (flew, called, landed wetland)
Total birds 42. Total species 9	Total birds 92. Total species 13

**Table 13:** ‘Spring Camp’ – ‘Fairy Glen’ and ‘Hill of Birds’ remnant grassy woodland/forest (Site 12)

Species and survey date - winter 2020 (14/8/20)	Species and survey date - summer 2021 (8/1/21)
White-throated Gerygone 2	Noisy Friarbird 6
Crimson Rosella 5	Rufous Whistler 5
Musk Lorikeet 3	Grey Shrike-thrush 4
Red Wattlebird 4	Striated Thornbill 4
Rufous Whistler 2	Red Wattlebird 1
Yellow-faced Honeyeater 2	<b>Satin Flycatcher</b> 2
Grey Butcherbird 1	Silvereye 6
Eastern Spinebill 6	Yellow-faced Honeyeater 6
Noisy Friarbird 2	White-naped Honeyeater 12 (stringybark canopies)
White-naped Honeyeater 4 (with juvenile)	Grey Fantail 5
<b>White-browed Scrubwren</b> 2 (suspected nesting in Blackberry patch upper ‘Fairy Glen’)	<b>White-browed Scrubwren</b> 20 (incl. juveniles from nest site in blackberry patch and Olearia on slopes)

Species and survey date - winter 2020 (14/8/20)	Species and survey date - summer 2021 (8/1/21)
Australian Magpie 1	Black-faced Cuckoo-shrike 3
Brown Thornbill 2	Eastern Spinebill 8 (foraged in flowering <i>Denhamia Cunninghamiana</i> )
Striated Thornbill 2 (nest detected)	White-throated Treecreeper 2
Yellow-rumped Thornbill 4	<b>Varied Sittella</b> 10 – <b>threatened</b> (foraged 'Fairy Glen')
<b>Buff-rumped Thornbill</b> 2	Australian Magpie 1
Superb Fairy-wren 4	White-throated Gerygone 1
Striated Pardalote 2	Spotted Pardalote 2
Shining Bronze-Cuckoo 2	Striated Pardalote 2
Silvereye 2	Pied Currawong 1
Grey Fantail 1	Eastern Rosella 1
Grey Shrike-thrush 2	Channel-billed Cuckoo 1
White-throated Treecreeper 4	Grey Butcherbird 2
Horsfield's Bronze-Cuckoo 1	Torresian Crow 2
<b>Double-barred Finch</b> 5	Crimson Rosella 2
<b>Forest Raven</b> 3	Brown Quail 1
Red Wattlebird 2	Willie Wagtail 3
<b>Varied Sittella</b> 5 (foraged, on ridge NE from house) – <b>threatened</b>	<b>Rufous Songlark</b> 1 (foraged in blackberries near house)
<b>White-winged Triller</b> 3	
<b>Restless Flycatcher</b> 1 (upper slope, near house)	
<i>Total birds 81. Total species 30</i>	<i>Total birds 114. Total species 28</i>

**Table 14:** 'Spring Camp' – Dam wetland (Site 13)

Species and survey date - winter 2020 (3/8/20)	Species and survey date - summer 2021 (8/1/21)
Superb Fairy-wren 3 (foraged in sedgeland)	Nankeen Kestrel 3 (foraged over wetland)
Australasian Pipit 1	Superb Fairy-wren 5 (flew between old teatree)
Willie Wagtail 1	White-faced Heron 1
Stubble Quail 1 (flushed from rat-tail fescue edge)	
<i>Total birds 6. Total species 4</i>	<i>Total birds 9. Total species 3</i>

**Table 15:** 'Mihi Station' – 'Lower Ram Paddock' and part of 'Trig Reserve' remnant grassy woodland (Site 14)

Species and survey date - winter 2020 (11-12/8/20)	Species and survey date - summer 2021 (15/1/21)
<b>Scarlet Robin</b> 4 (male condition-fed female & 2 <sup>nd</sup> pair in Trig Reserve) - <b>threatened</b>	Rufous Whistler 4 (incl 1 juvenile fed in Blakely's Red Gum)
<b>Dusky Woodswallow</b> 4 - <b>threatened</b>	White-throated Gerygone 6
<b>Jacky Winter</b> 3 (calling males)	Torresian Crow 3
<b>Diamond Firetail</b> 3 - <b>threatened</b>	Red Wattlebird 3 (nesting)
<b>Varied Sittella</b> 9 - <b>threatened</b>	Grey Fantail 4
<b>Eastern Yellow Robin</b> 3 (male territory-called)	Crimson Rosella 6
<b>Restless Flycatcher</b> 3 (territory-called)	Shining Bronze-Cuckoo 1
Red Wattlebird 3	Australian Magpie 2
Grey Shrike-thrush 4	<b>Satin Flycatcher</b> 5 (male & female in Blakely's Red Gum; 2 <sup>nd</sup> pair upslope Blakely's Red Gum + 1 juvenile)
Black-faced Cuckoo-shrike 4	Willie Wagtail 2
Yellow-faced Honeyeater 4	Noisy Friarbird 4 (nesting)
White-naped Honeyeater 12	Mistletoebird 1
White-throated Treecreeper 3	Spotted Pardalote 2
Spotted Pardalote 1	<b>Dusky Woodswallow</b> 2 (adult + juvenile)
Striated Pardalote 2	White-throated Treecreeper 2
White-throated Gerygone 2	<b>Fuscous Honeyeater</b> 3 (foraged in mistletoe)
<b>Buff-rumped Thornbill</b> 10	Black-faced Cuckoo-shrike 1
Grey Fantail 1	<b>Buff-rumped Thornbill</b> 5

Species and survey date - winter 2020 (11-12/8/20)	Species and survey date - summer 2021 (15/1/21)
Torresian Crow 7	Eastern Rosella 1 (nesting)
Striated Thornbill 2 (breeding – nest decoys)	Grey Shrike-thrush 2
Eastern Spinebill 1	
Golden Whistler 2	
Rufous Whistler 3	
Willie Wagtail 2 (mate pursuits)	
Yellow-rumped Thornbill 1 (nesting, with prey)	
Eastern Rosella 2	
Crimson Rosella 2	
Noisy Friarbird 1	
<b>White-winged Chough 3</b>	
<i>Total birds 101. Total species 29</i>	<i>Total birds 59. Total species 20</i>

**Table 16:** ‘Eastlake Green Camp Peppermint Block’ remnant grassy woodland (Site 15)

Species and survey date - winter 2020 (6/8/20)	Species and survey date - summer 2021 (6/1/21)
Red-rumped Parrot 2	Noisy Friarbird 2
Grey Fantail 2	Red Wattlebird 9 (incl. 1 juvenile)
Superb Fairy-wren 4	Crimson Rosella 13 (some with young)
Grey Shrike-thrush 2	Yellow-faced Honeyeater 5
Striated Pardalote 3	Striated Pardalote 2
<b>Eastern Yellow Robin 1</b> (called territory)	Eastern Spinebill 6 (in flowering mistletoe)
Torresian Crow 2	White-throated Treecreeper 4
<b>White-winged Chough 5</b>	Grey Butcherbird 1
White-naped Honeyeater 6	Rufous Whistler 1
Yellow-faced Honeyeater 2	Sulphur-crested Cockatoo 2 (flew over)
Noisy Miner 14 (mostly in western slope peppermints)	Eastern Rosella 3
Crimson Rosella 4	<b>Satin Flycatcher 3</b> (pair nesting – mobbed GBB)
Black-faced Cuckoo-shrike 1	Australian Magpie 1
Striated Thornbill 1	White-throated Gerygone 5 (juvenile fed)
Grey Butcherbird 1	White-naped Honeyeater 8
White-throated Treecreeper 2	Grey Butcherbird 3
Golden Whistler 2	Willie Wagtail 1 (nesting)
<b>Fuscous Honeyeater 4</b>	Spotted Pardalote 6
<b>Satin Bowerbird 1</b>	Grey Fantail 3 (nesting)
Red Wattlebird 3	Superb Fairy-wren 3
<b>Little Eagle 2 – threatened</b> (soared high above)	<b>Sacred Kingfisher 1</b> (likely nesting – W slope)
Eastern Spinebill 2	Noisy Miner 28 (inc. juvs, mostly W slope to Jacks Ck)
Grey Teal 2 (Jacks Creek pooled section)	Grey Shrike-thrush 1
Eastern Rosella 6	Torresian Crow 2
	Pacific Black Duck 2
	Striated Thornbill 2
<i>Total birds 74. Total species 24</i>	<i>Total birds 117. Total species 26</i>

**Table 17:** ‘East Oaks’ – Proposed ‘Lower Hill Planting’ and ‘Lower Hill Enhancement’ (Site 16)

Species and survey date - winter 2020 (7/8/20)	Species and survey date - summer 2021 (6/1/21)
Australian Magpie 4	Red-rumped Parrot 2
Noisy Miner 14 (nest-building in young <i>E. blakelysi</i> )	Crested Pigeon 7
Galah 2	Welcome Swallow 14
Striated Pardalote 1	Australian Magpie 2
Eastern Rosella 5	Grey Butcherbird 1
Grey Butcherbird 2	Striated Pardalote 5 (foraged in mountain gum)
Straw-necked Ibis 1 (flew over to south)	Noisy Miner 6
White-faced Heron 1 (flew over)	<b>Dollarbird 2</b> (called, perched, dead branches)

Species and survey date - winter 2020 (7/8/20)	Species and survey date - summer 2021 (6/1/21)
	Australian Wood Duck 2
	Galah 2
	Eastern Rosella 6
	Noisy Friarbird 1
<i>Total birds 30. Total species 8</i>	<i>Total birds 50. Total species 12</i>

**Table 18:** ‘Taylor’s Run’ – ‘Top Spring’ remnant woodland/forest and planted pines (Site 17)

Species and survey date - winter 2020 (5/8/20)	Species and survey date - summer 2021 (5/1/21)
Golden Whistler 2	Laughing Kookaburra 2
<b>Buff-rumped Thornbill</b> 10	Pied Currawong 4 (incl. juvenile)
Brown Thornbill 3	Grey Butcherbird 2
Superb Fairy-wren 8	White-throated Treecreeper 3
Grey Fantail 4	Rufous Whistler 2
<b>White-browed Scrubwren</b> 2	Superb Fairy-wren 6 (foraged fallen pine debris)
Yellow-faced Honeyeater 7 (in flowering stringybark)	Crimson Rosella 4
Crimson Rosella 4	<b>Satin Flycatcher</b> 1 (male called in old pines)
<b>White-winged Chough</b> 6 (in N grassy gully then pines)	<b>Eastern Yellow Robin</b> 1 (territory-called NE end)
Grey Shrike-thrush 2	Grey Shrike-thrush 1
Striated Thornbill 7	Australian Magpie 1
Yellow-rumped Thornbill 3	<b>Brown Goshawk</b> 1 (male in tall peppermint & pines)
Willie Wagtail 1	Brown Thornbill 2
Torresian Crow 2	Torresian Crow 2 (called)
White-throated Treecreeper 2	Noisy Miner 1 (alert called re goshawk)
	Yellow-rumped Thornbill 2
	Grey Fantail 1
	<b>Buff-rumped Thornbill</b> 6 (incl. 2 juveniles, in pines)
	Yellow-faced Honeyeater 2
	<b>White-browed Scrubwren</b> 2
	Red Wattlebird 3 (mistletoe-foraged)
<i>Total birds 63. Total species 15</i>	<i>Total birds 49. Total species 21</i>

**Table 19:** ‘Taylor’s Run’ – ‘Wallaby Paddock’ remnant woodland/forest and planted pines (Site 18)

Species and survey date - winter 2020 (4/8/20)	Species and survey date - summer 2021 (5/1/21)
Brown Thornbill 2 (called territory, likely nesting)	Brown Thornbill 3
<b>White-browed Scrubwren</b> 6 (nesting in stinging nettle and inkweed upslope)	<b>White-browed Scrubwren</b> 3 (inkweed patch incl. immature bird)
Yellow-faced Honeyeater 3	Pallid Cuckoo 1 (called)
Grey Shrike-thrush 2	Superb Fairy-wren 4
Grey Fantail 2	Rufous Whistler 1
Torresian Crow 9 (flew over)	White-throated Treecreeper 1
Silvereye 4	Yellow-faced Honeyeater 3
White-throated Treecreeper 2 (tall pines & ribbon gum)	Silvereye 3 (foraged in pines)
<b>Eastern Yellow Robin</b> 3 (mate pursuits lower slope)	Grey Shrike-thrush 1
Yellow-rumped Thornbill 2	Crimson Rosella 2
Superb Fairy-wren 4 (lower slope cotoneasters)	Australian King-Parrot 2
Laughing Kookaburra 1	Laughing Kookaburra 1
Striated Pardalote 2	Australian Magpie 2
	Noisy Friarbird 1
	Grey Fantail 1
<i>Total birds 42. Total species 13</i>	<i>Total birds 29. Total species 15</i>

**Table 20:** ‘Taylor’s Run’ – ‘Corner Paddock’ remnant grassy woodland (Site 19)

Species and survey date - winter 2020 (5/8/20)	Species and survey date - summer 2021 (5/1/21)
Black-faced Cuckoo-shrike 1	Australian Magpie 6
Noisy Miner 11	Eastern Rosella 8
Eastern Rosella 9	Galah 2
Crimson Rosella 4	Noisy Miner 6 (incl. young)
Pied Currawong 2	Superb Fairy-wren 4
Australian Wood Duck 2	Striated Pardalote 1
Superb Fairy-wren 4	Torresian Crow 3
	Crimson Rosella 2
	Pied Currawong 1
	Red-rumped Parrot 8
	<b>Dollarbird</b> 1
	Black-faced Cuckoo-shrike 1
<i>Total birds 33. Total species 7</i>	<i>Total birds 43. Total species 12</i>

**Table 21:** ‘Taylor’s Run’ – ‘Far Dip Paddock’ proposed woodland corridor planting (Site 20)

Species and survey date - winter 2020 (3/8/20)	Species and survey date - summer 2021 (5/1/21)
Australian Magpie 2	Striated Pardalote 2
Eastern Rosella 2	Red-rumped Parrot 4
Laughing Kookaburra 1 (flew over)	Eastern Rosella 7
Yellow-rumped Thornbill 4	Australian Magpie 3
	Yellow-rumped Thornbill 5
<i>Total birds 9. Total species 4</i>	<i>Total birds 21. Total species 5</i>

**Table 22:** ‘Woodstock’ – proposed wetland fencing and woodland strip planting at a dam (Site 21)

Species and survey date - winter 2020 (4/8/20)	Species and survey date - summer 2021 (15/1/21)
Pacific Black Duck 8	Australian Wood Duck 20
Australian Wood Duck 6	Hardhead 2
Magpie-lark 2	Magpie-lark 2
Welcome Swallow 4	Grey Fantail 1
Straw-necked Ibis 9	Masked Lapwing 2
Pied Butcherbird 1	Red-rumped Parrot 2 (flew over)
Superb Fairy-wren 10 (5 roosted in debris pile)	Superb Fairy-wren 5
Australian Magpie 5	Australian Magpie 4
White-faced Heron 1	Grey Shrike-thrush 1 (in isolated mt gum paddock tree)
Australian King-Parrot 2 (flew over)	Rufous Whistler 1 (in isolated mt gum paddock tree)
Australian Raven 2	Grey Teal 2
Galah 2	Little Corella 2 (flew over)
Sulphur-crested Cockatoo 1	<b>Black-fronted Dotterel</b> 3 (foraged along muddy north-east shoreline of dam)
Eastern Rosella 4	
Common Starling* 2 (flew over)	
Willie Wagtail 1	
Red-browed Finch 2 (roosting in debris pile)	
Yellow-rumped Thornbill 3 (roosted in debris pile)	
<i>Total birds 65. Total species 18</i>	<i>Total birds 47. Total species 13</i>

### 3.3 Birds of conservation significance and their habitats

A total of 37 bird species of conservation significance was recorded during the surveys. These included 6 species listed as Vulnerable under the NSW Biodiversity Conservation Act 2016, one intercontinental migratory species (Latham’s Snipe) listed under the Australian Environment

Protection and Biodiversity Conservation Act 1999 and migratory bird protection agreements that Australia hold with Japan (JAMBA), China (CAMBA), and Republic of Korea (ROKAMBA), and 30 species of local conservation importance. Double-barred Finch, White-browed Scrubwren, Eastern Yellow Robin and Satin Flycatcher are members of a suite of declining woodland birds on New England Tableland (see Reid et al. 2006; InSight Ecology 2012a, 2018a, b; Southern New England Landcare 2015). Plates 1-25 depict some of these species including the habitats they utilised.



**Plate 1:** Varied Sittella *Daphoenositta chrysoptera* – threatened in NSW. Drawing: Nicholas Day



**Plate 2:** Scarlet Robin *Petroica boodang* - threatened (NSW). Photo: Iestyn Taylor



**Plate 3:** Diamond Firetail *Stagonopleura guttata* - threatened (NSW). Photo: Iestyn Taylor



**Plate 4:** Dusky Woodswallow *Artamus cyanopterus* - threatened (NSW). Photo: Greg Clancy



**Plate 5:** Little Eagle *Hieraetus morphnoides* - threatened (NSW). Photo: mountainsbeyond.org



**Plate 6:** Latham's Snipe *Gallinago hardwickii*. Photo: Jason Girvan, en.wikipedia.org. See [Latham's Snipe Project \(swift.net.au\)](http://Latham's Snipe Project (swift.net.au))



**Plate 7:** Blue-billed Duck *Oxyura australis* - Threatened (NSW). Photo: Spikerccs, commons.wikimedia.org



**Plate 8:** Stringybark and peppermint grassy woodland foraged in by Scarlet Robin *Petroica boodang* at Eastlake's Green Camp Peppermint Block site. Photo: InSight Ecology, 29/8/22



**Plate 9:** A flock of locally significant Pink-eared Duck *Malacorhynchus membranaceus* foraged on open water at Dangar's Lagoon Nature Reserve following good rainfall in January 2021. Photo: Melbourne Water





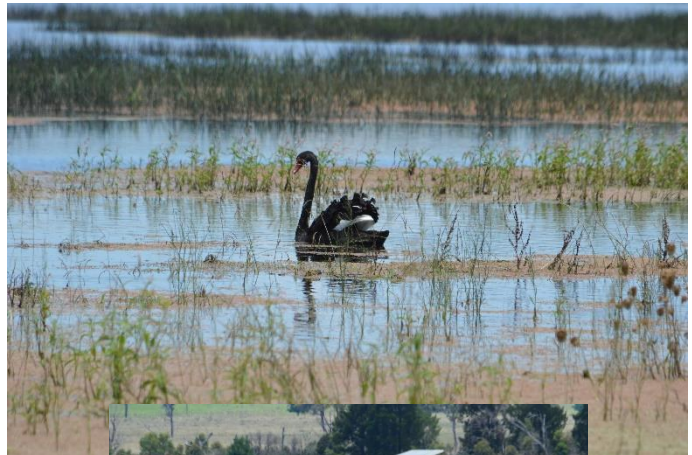
**Plate 10:** Plumed Whistling-Duck *Dendrocygna eytoni*. Foraged in shallow water and muddy banks at Billabong Wetland, Salisbury Court and Dangar’s Lagoon NR in January 2022. Photo: JJ Harrison, en.wikipedia.org



**Plate 11:** Great Crested Grebe *Podiceps cristatus*. Foraged in small numbers after good rainfall in reeds and open water on Dangar’s Lagoon NR. Photo: JJ Harrison, en.wikipedia.org



**Plates 12-14:** Hoary-headed Grebe *Poliiocephalus poliocephalus* (above), photo JJ Harrison, en.wikipedia.org – foraged in small flocks on Dangar’s Lagoon NR (Jan. 2021). Black Swan foraged with Eurasian Coot and other aquatic birds and nested on Dangar’s Lagoon NR after good rainfall (Jan. 2021). Swan photos at Dangar’s Lagoon NR: InSight Ecology.



**Plate 15:** Australian Reed-Warbler *Acrocephalus australis* foraged and nested in rank Phragmites and other rushes along Salisbury Water. Photo: birdlife.org.au



**Plate 16:** Tawny Grassbird *Megalurus timoriensis* bred at Chiswick’s Lambing Gully Photo: aviceda.org



**Plate 17:** Golden-headed Cisticola *Cisticola exilis* defended breeding territories at Chiswick’s Lambing Gully. Photo: aviceda.org



**Plate 18:** Horsfield's Bushlark *Mirafra javanica* - recorded in dense grassy paddock on 'Benambra'. Photo: Nevil Lazarus, birdsinbackyards.net



**Plate 19:** Black-fronted Dotterel *Elseyornis melanops* foraged along muddy banks of 'Woodstock' dam in Jan. 2021. Photo: Steve Scalise



**Plate 20:** Black-winged Stilt *Himantopus himantopus* foraged for small invertebrates in the shallows of Dangar's Lagoon NR in January 2021. Photo: InSight Ecology



**Plate 21:** An adult male Brown Goshawk *Accipiter fasciatus* was recorded calling near a nest in ‘Top Spring’ remnant and old pines, ‘Taylor’s Run’, January 2021. Photo: InSight Ecology



**Plate 22:** Adult male White-browed Scrubwren *Sericornis frontalis* foraged and nested in tall thistle, ‘Wallaby Paddock’ and ‘Top Spring’ at ‘Taylor’s Run’, Mt Mutton Reserve, ‘No Man’s Land’, ‘Chiswick’ and ‘Spring Camp’. Photo: Iestyn Taylor at Summer Hill.



**Plate 23:** Eastern Yellow Robin *Eopsaltria australis* - recorded at ‘Mihi Station’, ‘Taylor’s Run’ and ‘Eastlake’ and ‘No man’s Land’. Photo: Iestyn Taylor (Summer Hill)



**Plate 24:** Double-barred Finch *Taeniopygia bichenovii*. This declining species was recorded at ‘Spring Camp’ in winter 2020. Photo: Glen Fergus, commons.wikimedia.org



**Plate 25:** White-winged Chough *Corcorax melanorhamphos* foraged in leaf litter at ‘Eastlake’, ‘Taylor’s Run’ and ‘Mihi Station’, all in winter 2020. Photo: birdlife.org.au

## 4. Discussion

### 4.1 Patterns and processes in bird communities of the study area

#### 4.1.1 Woodland avifauna

About 180 years of native vegetation removal on the New England Tableland has substantially reduced the diversity of woodland bird communities and confined remaining populations to small isolated patches of bush surrounded by cleared land. Often these patches have declined in condition under weed incursion and livestock and hare grazing pressure.

Despite five decades of Landcare on the tablelands, we are still losing iconic woodland bird species. Recent examples of this loss between Armidale and Kentucky are the Hooded Robin and Brown Treecreeper (Ford et al. 2009; InSight Ecology 2019). This suggests that the tablelands are indeed continuing to pay the extinction debt proposed by Ford et al. (2009) and Ford (2011). It also highlights a potential time lag effect in the development of planted habitat to reach the stage where they can be utilised by birds for food, breeding and refuge, particularly hollow-dependent species. As a guide, repeated surveys of 23 planted and remnant sites on 'Chiswick' by InSight Ecology since 2018 have demonstrated that planted exotic and native trees and shrubs have taken about 25 years to provide suitable foraging and nesting habitat for woodland species such as the threatened Flame Robin (non-breeding) and Scarlet Robin, Striated Thornbill, Rufous Whistler, Grey Shrike-thrush, Grey Fantail and Yellow Thornbill.

Bird communities surveyed in the current study reflected these historical and ongoing patterns of habitat loss and condition decline. The larger remnants surveyed in the study – Mihi Station's Lower Ram Paddock and Trig Reserve (4 threatened species – a high quality remnant), Eastlake's Green Camp Peppermint Block, Mt Mutton Reserve, Top Spring Paddock (Taylor's Run), Spring Camp (1 threatened species, 8 of local conservation significance), and Chiswick's Stringybark Paddock (2 threatened species) – supported some of the core group of woodland birds described in previous studies (see Reid 2006; Ford et al. 2009; Ford 2011; InSight Ecology 2018a, b, 2019). These are species requiring canopy cover, foliage, bark, shrub and leaf litter food resources (invertebrates), nest sites, and vegetated linkages with other remnants within a 200 m – 1 km radius. They included Eastern Yellow Robin, Scarlet Robin, Varied Sittella, Dusky Woodswallow, White-browed Scrubwren, Jacky Winter, Double-barred Finch, Forest Raven, and White-winged Chough.

Not detected in the winter 2020 and summer 2021 surveys was the threatened Speckled Warbler *Chthonicola sagittata* which requires a thick, well developed shrub layer, usually Australian Blackthorn *Bursaria spinosa* or exotic hawthorn, for nest sites and refuge. This species has been previously recorded at Chiswick's Stringybark Paddock remnant and nearby 'Summer Hill' remnant (InSight Ecology 2012a, 2018b, 2019).

In contrast, smaller remnants and planted strips supported a depauperate range of woodland bird species, relative to the larger and better-connected remnants. Small remnants surveyed at Taylor's Run (Corner Paddock), 'East Oaks' and 'Salisbury Court' (rock quarry site) typically supported 7-13 species such as Eastern Rosella, Noisy Miner, Galah, Australian Magpie, Torresian Crow, and Superb Fairy-wren. These are common species able to forage and in some cases nest in more disturbed sites where canopies have been generally reduced to under 25% projective

foliage cover, weedy grasses and forbs dominate the ground layer, and alternative habitat such as blackberry and hawthorn thickets occur.

#### 4.1.2 Wetland avifauna

Wetland bird communities surveyed in the study area exhibited a characteristic ‘boom-bust’ pattern of response to changes in the seasonal availability of surface water and associated aquatic vegetation growth. Markedly lower water levels in winter (drought-associated) in the three main wetland sites surveyed – Dangar’s Lagoon (40% capacity), Racecourse Lagoon, and ‘The Billabong’ wetland at ‘Salisbury Court’ (25% capacity) yielded lower numbers of aquatic birds and species than in summer when levels rose to 80% (Dangar’s Lagoon) and 90% (‘The Billabong’). Racecourse Lagoon is connected to Dangar’s Lagoon via a natural subterranean drainage line (G. Williams, pers comm) and so requires substantial rainfall to fill – it was mostly dry during both surveys.

A resident core of wetland bird species bred on Dangar’s Lagoon (DL) and probably ‘The Billabong’ (TB) between both surveys. These included Eurasian Coot (130 in winter and 228 in summer on DL), Pacific Black Duck (140 birds in winter, 54 in summer on DL), Australasian Grebe (bred at both sites), Black Swan (12 pairs nested and raised cygnets at DL), Grey Teal, Chestnut Teal, and Purple Swamphen.

Dangar’s Lagoon and ‘The Billabong’ attracted other species known to fly significant distances, often from inland and coastal regions, in search of suitable freshwater bodies. These included Pink-eared Duck (60 on open water at DL in the summer survey), the threatened Blue-billed Duck (both sites), Plumed Whistling-Duck (TB only, summer), Australasian Shoveler, Hardhead, Black-winged Stilt, Great Crested Grebe and Hoary-headed Grebe. Reedbeds, *Phragmites australis* swards, and other fringing wetland vegetation supported populations of these species and provided nest sites and cover for protection from aerial predators - Peregrine Falcon, Swamp Harrier and/or Whistling Kite. Black-fronted Dotterel foraged along the muddy shores of Woodstock’s dam in summer.

Four bird species associated with rank vegetation and tall grassland adjoining wetland sites were mostly migratory or nomadic species that track the warm-season availability of insects and thick-sward nest sites on the tablelands. These included Tawny Grassbird, Golden-headed Cisticola, Australian Reed-Warbler and Horsfield’s Bushlark. The latter species is an uncommon visitor to the study area and has not been recorded in previous InSight Ecology surveys. The tall thick grasses along Chiswick’s Lambing Gully provided ideal breeding habitat for Tawny Grassbird. An intercontinental migratory wader, Latham’s Snipe, was recorded foraging at Benambra’s wetland paddock with other records of this species made during the summer survey period at Salisbury Court’s The Billabong (Trish Rasmussen, pers comm).

#### 4.2 Targeting functional habitat

Re-connecting native fauna and flora isolated by habitat loss, fragmentation, and degradation is a key goal of biodiversity conservation programs worldwide (see IUCN 2007; Mackey et al. 2010; Saura et al. 2014; Correa Ayram et al. 2016). In highly fragmented landscapes such as New England Tableland and in the face of the current woodland bird crisis (Bennett and Watson 2011; Ford 2011), effective restoration action is urgently needed. This work must target specific parts of landscapes where key taxa still occur and beneficial outcomes for their conservation are

achievable – areas where new habitat for threatened and declining species can be successfully established and remnant habitat better protected and enhanced.

The emphasis in these areas needs to be on providing **functional** habitat for species still present and those that could be reasonably expected to return over time in response to these interventions. Functional habitat is habitat of sufficient size, structure and condition to allow target taxa – woodland birds in this project – to survive, successfully reproduce and disperse.

The site-specific knowledge needed to inform this work is the focus of the surveying component of this project - determining what woodland and wetland bird species still persist, where they occur and their habitat restoration requirements in the connectivity gap zone. The winter 2020 and summer 2021 surveys determined the composition and abundance of bird communities present at 21 sites in this zone and their use of remnant woodland/forest and wetland habitats. This has built on the survey results of the adjoining Closing The Gap Project and contributed to important baseline data for this part of the southern New England region. Baseline data are essential for monitoring of bird responses to restoration actions including remnant protection and enhancement and strategic revegetation over time.

## 5. Recommendations

The key objective of the Thunderbolt Project is to plant new habitat to re-connect fragmented woodland and forest in the gap zone. A related goal is to improve habitat condition for a suite of threatened fauna and flora. Actions to achieve these goals are recommended below, together with priorities for their implementation. While the focus is primarily on birds, other native taxa should also benefit from this work.

### 5.1 Complete the current program of project works on each property (Priority 1)

This work should align with the Landholder Management Agreement that SNEL holds with each property owner in the project. Key components and relevant project sites include:

- **Strategic revegetation** to increase habitat area and improve local connectivity, targeting:
  - ‘Big Ridge’ (Sites 3 and 4)
  - ‘Benambra’ wetland paddock using suitable native wetland plant species. Suggest consulting Armidale Tree Group or Kentucky Tree Nursery
  - ‘Salisbury Court’ rock quarry woodland restoration
  - ‘East Oaks’ Lower Hill planting and Lower Hill enhancement
  - ‘Taylor’s Run’ Far Dip Paddock planting
  - ‘Woodstock’ dam planting to connect with an existing planted strip and enhance wetland function. Suggest contacting Armidale Tree Group for suitable species.
- **Protection and enhancement of remnant woodland/forest:**
  - Install new rabbit-proof fencing and gates around the western and eastern knoll sections of Chiswick’s Stringybark Paddock remnant;
  - Replace old fencing around the high quality No Man’s Land remnant with new rabbit-proof fencing and gates. This could be outside the current project’s scope but should be pursued with the owners of ‘Gostwyck’ and ‘Big Ridge’ as a high priority.
  - Fence (rabbit-proof if possible) off the upper section of Lower Ram Paddock adjoining Trig Reserve at ‘Mihi Station’ to protect naturally regenerating Blakely’s red gum, white box and yellow box Endangered Ecological Community from livestock grazing. This site

supported more threatened woodland bird species than any other site in the study and habitat condition was generally high.

- Protect and enhance remnant Blakely's red gum regrowth at 'East Oaks' from damage by livestock – fence out livestock from the area of naturally regenerating Blakely's red gum; in other parts of the site, continue managing grazing with a focus on long spelling to allow native grass recovery and light, short-period stocking.
- Continue protecting peppermint regrowth, trees, forbs and shrubs including planted acacias from livestock grazing at Eastlake's Green Camp Peppermint Block.
- Limit sheep grazing in Top Spring remnant at 'Taylor's Run' to encourage regeneration of the currently sparse shrub and ground cover layers. Retain storm-blown tree branches and trunks within the site to provide microhabitat for ground foraging birds such as White-browed Scrubwren and Superb Fairy-wren and reptiles.
- Consider planting native shrubs such as Australian Blackthorn *Bursaria spinosa* and Dead Finish *Cassinia laevis* and ground covers to provide cover and foraging and breeding habitat for White-browed Scrubwren, Brown Thornbill and Superb Fairy-wren in Wallaby Paddock remnant at 'Taylor's Run'.
- Undertake best-practice weed and feral animal management programs on most of the properties surveyed. Immediate action is needed at Chiswick's Stringybark Paddock remnant, Top Spring, Wallaby Paddock (staged removal of stinging nettles and inkweed and replacement with *Bursaria spinosa* and *Cassinia laevis*), and Corner Paddock remnants at Taylor's Run, Mt Mutton reserve (staged removal of cotoneaster and other woody weeds, followed by replacement with *B. spinosa* and *C. laevis* for small bird cover and nest sites), and the rock quarry site at 'Salisbury Court' (removal of rank exotic grasses and removal of hawthorn, replacement with *B. spinosa* and *C. laevis*).
- **Protection of freshwater wetlands:**
  - Replace old fencing with new rabbit-proof fencing and gates at Chiswick's Lambing Gully to prevent livestock entering the wetland.
  - Encourage either fencing or limiting/reducing stock access to Salisbury Court's 'The Billabong' wetland.
  - Work with Uralla Shire Council to revegetate the dryland northern fringe of Racecourse Lagoon Reserve as a buffer to the wetland itself and to link with older plantings along its north-western and western borders.
  - Continue liaison with NPWS and LLS to protect and, where needs be, revegetate Dangar's Lagoon and its margins. Access to the lagoon itself should continue to be prevented, except for scientific studies and surveys. A new or renovated bird hide is needed at the lagoon's southern end.
  - Limit livestock access to 'Woodstock' dam to protect muddy banks as foraging substrate for Black-fronted Dotterel and other birds. Install logs as perches for cormorants and ducks and plant native reeds and rushes for cover along the dam's northern, eastern and western margins. This would enhance the value of the site for other aquatic species such as Purple Swamphen, Black-winged Stilt, Latham's Snipe, Eurasian Coot and egrets. Advice from Armidale Tree Group and/or Kentucky Tree Nursery would assist in planning and selection of wetland plant species.
  - Exclude current livestock access to the wetland paddock site at 'Benambra'. This is needed as a high priority to help reedbeds and *Phragmites australis* patches recover from livestock trampling. Some sections will need to be revegetated (see above). Maintain existing fencing as required – there may be a need to install rabbit-proof fencing at the wetland revegetation locations.

## 5.2 Record progress toward achieving project goals (Priority 1)

Implement photo points and establish a simple project database to ensure accurate and timely recording and measuring of project progress over time. With some training, this work could be undertaken by landholders participating in the project and should include observations of bird and other fauna species utilising project sites.

This information would be helpful in reporting the project's achievements against specific goals to the funding body – NSW Environmental Trust. It would also add to the knowledge gained and lessons learnt from other similar projects completed by SNEL and their project partners such as *Closing The Gap Project: Functional Habitat for Threatened New England Fauna* (2016-19) and *Moths, Magpies and Marsupials: Promoting On-farm Biodiversity* (2014-15).

## 5.3 Run on-farm education and information events (Priority 2)

These events could be run as education and knowledge-sharing workshops/field days by SNEL on selected properties participating in the project. They should aim to help educate local landholders and communities about the presence and conservation requirements of threatened and declining woodland and wetland birds, their habitat types, strategic revegetation and restoration actions, and on-farm monitoring and data recording over time (see also Section 5.2).

A further benefit of these events would be the communication and sharing of knowledge between other habitat connectivity and biodiversity-focused restoration projects completed or in-progress in other parts of the Northern Tablelands, North West Slopes and North Coast regions. The value-adding potential of these events to conservation and sustainable farm management projects and on-ground restoration actions across these regions would be considerable.

## 5.4 Identify and secure significant ongoing project funding (Priority 2)

Work with project partners and local communities to identify and secure significant and appropriate ongoing project funding. This would allow progress made and knowledge gained by habitat connectivity and biodiversity monitoring-focused projects such as the Thunderbolt Project and Closing The Gap Project to be used in other parts of the southern New England landscape. One area that could benefit would be the Walcha and Guyra districts where significant habitat connectivity gaps occur.

Additional funding would also allow for the maintenance of revegetation and remnant enhancement programs commenced under the Thunderbolt Project and Closing The Gap Project. This would demonstrate to funding bodies such as NSW Environmental Trust the ongoing commitment of SNEL and project partners in working to address key ecological challenges such as increasing habitat connectivity and the woodland bird crisis on the tablelands.

Applications for funding from the NSW Environmental Trust should preferably target periods of 3-4 years with project-specific budgets of at least \$170,000. This would allow for more realistic resourcing of projects that could potentially achieve better on-ground results in key target areas.



## 5.5 Monitor bird communities at project sites over time (Priority 2)

Repeat bird surveys at the same sites using the same methods during the same seasons as those undertaken for this project at 3–5-year intervals. This is essential to be able to assess the performance over time of revegetation and remnants in providing functional (especially breeding) habitat for threatened and declining bird species. Data collected should be stored in a project database that can be readily accessed for project review, management, and on-ground application purposes by SNEL. These data should be made available to each participating landholder holding a Landholder Management Agreement with SNEL.

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