

## Spring 2017 Avifaunal Survey Report



InSight Ecology  
for  
Southern New England Landcare Ltd.

July 2018



# Closing The Gap: Functional Habitat for Threatened New England Fauna - Spring 2017 Avifaunal Survey Report



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**Photographs:** Top photograph: Oblique aerial of Kellys Plains showing extent of fragmentation of remnant native vegetation and junction of Platform Road and Old Gostwyck Road in bottom left foreground and main northern railway line in left midground (C. Goodwin, UserCgoodwin, [www.commonswikimedia.org](http://www.commonswikimedia.org), taken 17 July 2008); Upper panel: mixed eucalypt/acacia/callistemon planted strip on an upper slope at “Chesterfield” west of Old Gostwyck Road, Kellys Plains and planted in 2012 (InSight Ecology, taken 21/11/17), mixed eucalypt and acacia planted patch on a stony hilltop at “Big Ridge” Uralla – planted mid-October 2017 (InSight Ecology, taken 23/11/17), isolated remnant woodland and shrubland (“No Man’s Land”) near “Big Ridge” Uralla (InSight Ecology, taken 23/11/17); Lower panel (left to right) - threatened species in NSW: Diamond Firetail *Stagonopleura guttata* (Neville Bartlett), Scarlet Robin *Petroica boodang* (adult male) ([aussiebirding.wildairies.com](http://aussiebirding.wildairies.com), 2012), Varied Sittella *Daphoenositta chrysoptera* (Chris Kookaburra), Speckled Warbler (male) *Chthonicola sagittata* (Ian Colley). Inside front cover: “Big Ridge” Uralla, showing dead trees on hilltop and slopes and planted eucalypt and acacia strip in foreground – planted 2013 (InSight Ecology, taken 28/9/16).

## Acknowledgements

The impetus for this project came from previous bird survey work undertaken by InSight Ecology in the Armidale-Uralla area and discussions with Dave Carr, Ruth Tremont, Des Andersen, Gordon Williams, Andrew Eichorn, Richard Munsie and other local landholders. The project was funded by a grant received by Southern New England Landcare Ltd (SNEL) from NSW Environmental Trust in 2016. Karen Zirkler and Struan Ferguson of SNEL and Ruth Tremont (ex-SNEL) provided administrative and moral support to help make this project possible. SNEL also provided access to reports and data they hold for previous fauna survey and studies undertaken in the area.

Fifteen local landholders participated in this stage of the project. They provided access to their properties, information on revegetation and remnant protection, agriculture, other land management activities, and, in some cases, records of bird species present. The properties were 'Eastlake' (Gordon and Wendy Williams), 'Big Ridge' (Richard, Greg and Rhonda Munsie), 'Chiswick' (CSIRO Agriculture – Andrew Eichorn), Craig and Shona Ritchie's property, 'Chesterfield' (Dan and Ronnie Ryan), 'Stoneleigh' (Robert and Jenny Curtis), 'Lorien' (Sam and Shireen Doak), 'Goobragandra' (Frances and Tony Spiller – and for access to their copy of 'The Man Who Planted Trees'), 'Bahati Park' (Brian and Trish Shaw), 'Banded Bee Farm' (Jane Pickard and Peter South), 'Innesfree Lane' (Elwyn Hegarty), 'Innesfree' (Roger and Jenni Hegarty), 'North Mihi' (Justin Hoad and family), Alison and Philip Attard ('Gostwyck') and Uralla Shire Council (a Council-owned public reserve at Harriet Gully). Deborah Fredericks gave permission to access her older plantings adjoining 'Lorien' which constituted Site 7. Robert Curtis generously provided a detailed history and photographs of revegetation and timber-getting on 'Stoneleigh' as well as access to a 24/2/18 presentation he gave to Armidale Tree Group on the history of revegetation on 'Stoneleigh'. Ronnie and Dan Ryan provided access to a historical photograph of their property. Col Ryan provided information on the local farming history of Harriet Gully and Lambing Gully. Andrew Eichorn supplied revegetation history and livestock management information for 'Chiswick' as well as access to a 2010 tree audit undertaken by Shane Andrews.

Several landholders and other interested volunteers participated in the bird surveys on their properties, namely Gordon Williams, Tony and Frances Spiller, Elwyn Hegarty, Jenni Hegarty and Richard Munsie. Gordon and Wendy Williams generously provided accommodation for the fieldwork phase.

To all I am grateful.

## Summary

The ecological footprint of about 180 years of European settlement on New England Tableland has been substantial. About 60% of the region's indigenous 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 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 undertaken 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 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 remnants.

A new project – Closing The Gap: Functional habitat for threatened New England fauna has been funded to run from 2016 to 2019. This work targets a key 23 km-long gap in habitat connectivity south of Armidale, extending from Mount Butler and Invergowrie in the west to Gara Gorge and Dangars Falls in the east, and a 15 km-long southern extension of this zone to Gostwyck and Hillview Road (termed the 'study area'). This gap is preventing and/or inhibiting the movement and dispersal of 15 threatened fauna species between the eastern and western sides of the tableland. The aim is to plant new functional habitat for these and other species in strips and blocks or 'stepping stones' and restore existing woodland and grassland patches within this gap. Over time, this will increase the amount and quality of habitat available for threatened and declining fauna and help facilitate their movement through this gap.

This report presents the results of a systematic survey of bird communities in planted and remnant native vegetation in spring 2017. This work was undertaken to obtain data on bird occurrence, abundance, species richness and habitat use at 36 sites (29 planted, 7 woodland remnant) on 15 properties in the gap zone. Twenty-seven (27) of these sites had been surveyed during the first round of site monitoring in winter 2017. A further 9 sites were added to the survey program for the spring 2017 round – 5 woodland remnants and 4 planted sites. Eight (8) of the 36 sites had been surveyed for woodland birds by InSight Ecology during previous projects in the area. Surveying was conducted over four days in late-spring (late-November) 2017. Sites were also assessed for their habitat and landscape connectivity, habitat condition and revegetation and regeneration histories.

A total of 994 individual birds from 69 species and 37 families were recorded during the spring 2017 survey. The six woodland remnants surveyed supported 44 bird species, including the threatened (in NSW) Varied Sittella and birds of local conservation significance such as Eastern Yellow Robin, Dusky Woodswallow, Striated Thornbill, Buff-rumped Thornbill, White-throated Treecreeper and the migratory, hollow-nesting Dollarbird. Older (16-25-year-old) planted sites were utilised by 22 bird species from 14 families. These included species that often occur in

woodland remnants such as Brown Thornbill, Striated Thornbill, Rufous Whistler, Grey Shrike-thrush, Yellow-faced Honeyeater, Crimson Rosella and Grey Fantail. Intermediate-aged (6-15-year-old) plantings supported 17 bird species, mostly those able to utilise food, shelter and nest sites available in developing shrubs and trees such as Superb Fairy-wren, Yellow Thornbill, Spotted Pardalote and the warm-season breeding migrant Scarlet Honeyeater. Young (1 month to 5-year-old) revegetation provided habitat for 34 species, typically more common, open country birds - Yellow-rumped Thornbill, Eastern Rosella and Australian Magpie. Tawny Frogmouth was recorded at Site 13 in Harriet Gully.

Aquatic bird species also occurred in or near some sites. These birds rested on dam and creek banks, foraged on open water or foraged on grasses within the plantings – Australian Wood Duck, Pacific Black Duck, Purple Swamphen, Eurasian Coot and Australasian Grebe, among others. Chiswick's Lambing Gully (Site 20) provided important rank grassland and wetland habitat for breeding grassland birds. These included the resident Golden-headed Cisticola and Australasian Pipit and the warm-season breeding migrants – Tawny Grassbird and Brown Songlark.

# Contents

<b>Acknowledgements</b> .....	1
<b>Summary</b> .....	2
<b>1. Introduction</b> .....	5
1.1 The woodland bird conservation crisis .....	5
1.2 Closing The Gap Project .....	5
1.3 Objectives.....	6
<b>2. Location and methods</b> .....	7
2.1 Location.....	7
2.2 Methods .....	7
2.2.1 Literature and data review .....	7
2.2.2 Site selection .....	7
2.2.3 Field surveying.....	12
2.2.4 Habitat assessment .....	13
<b>3. Results</b> .....	14
3.1 Bird species richness and relative abundance .....	14
3.2 Birds in planted and remnant vegetation .....	59
3.3 Differences in bird communities between seasons .....	61
3.4 Birds of conservation significance.....	62
<b>4. Discussion</b> .....	62
4.1 Targeting habitat restoration action .....	62
4.2 Bird communities in revegetation and habitat use.....	63
4.3 Connectivity conservation and revegetation design.....	63
<b>5. Recommendations</b> .....	64
<b>References</b> .....	66

## 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 (see Reid, 1999 and Seddon et al. 2003) and Western Australia (see Saunders 1989; Saunders et al. 1991; Huggett et al. 2004 and 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 and see a discussion on extinction debt in 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 Closing The Gap Project

Since the 1970s, a series of revegetation and remnant protection 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 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; Southern New England Landcare [SNEL] 2015).

A new project proposal 'Closing The Gap: Functional habitat for threatened New England fauna' (termed CTG 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. It was funded by NSW Environmental Trust under its Restoration and Rehabilitation Program for the period, 2016-2019.

The current project targets a key gap in habitat connectivity, located between Armidale and Uralla. It extends across 15-23 km from Invergowrie in the west through Kellys Plains to Gara Gorge and Dangars Gorge in the east. It features an additional 15 km-long extension south to Hillview Road. 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 wildlife corridor mapping (Scotts 2003) and more recent connectivity modelling (Office of Environment & Heritage 2010, 2016; see also Smith 2018) have identified this area as a high priority for ecological restoration action.

Specific interventions planned in this gap include the planting of 30 ha (14,200 native seedlings) of new woodland and shrubland habitat stepping stones and corridors of 30-70 m width, protection and enhancement of 13 ha of remnant native woodland, and erection of 6.3 km of stock exclusion fencing. When completed in 2019, this work will have occurred on a total of 28 sites on 13 properties in the gap zone.

The project also included two systematic surveys of predominantly birds present at a total of 36 sites on 15 properties in the study area – 27 sites on 13 properties in the winter 2017 survey and an additional 9 sites on 2 more properties in the spring 2017 survey. Both older revegetation sites and these remnants were designated as reference sites to allow comparison of bird response to revegetation and remnant enhancement over time.

Other components of the project included three community field workshops to improve knowledge and provide skills and resources to landholders undertaking strategic revegetation, remnant protection works and monitoring of bird populations on their properties in the zone. The first 'Bush for Birds' workshop was held on 25 November 2017 at Harriet Gully. The remaining field workshops are scheduled for September 2018 (bird identification and site monitoring) and November 2018 (planning and planting new habitat for woodland birds).

This document reports on the results of the second 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 first survey have been reported separately (see InSight Ecology 2018a).

### 1.3 Objectives

The CTG Project aims to increase the amount and connectivity of structurally diverse habitat for threatened and declining birds and other fauna in the gap zone. Specifically, the project will:

- Establish 30 ha of new functional habitat for woodland birds and other fauna;
- Protect 13 ha of remnant woodland and grassland;
- Erect 6.3 km of fencing to protect remnants and new revegetation;
- Engage and educate landholders in the gap zone to establish and maintain functional habitat for threatened and declining woodland birds, particularly over the longer term;



- Provide practical training to assist landholders to monitor woodland birds, as indicators of ecosystem health, on their properties in the gap zone.

This report:

- Describes the species richness, 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 sites as faunal habitat and help inform their management over time;
- Contributes to our current knowledge of the ecology and conservation of woodland birds in remnants and revegetation on the southern New England Tableland.

## 2. Location and methods

### 2.1 Location

The gap zone ('study area') is located about 5 km south-east of Armidale on the NSW northern tablelands. It extends in an approximately 15-23 km-wide band from Gara Gorge and Dangars Gorge in the east and across Gostwyck and Kellys Plains west to Invergowrie. The study area includes an additional 15 km-long extension south-east of Uralla to Mihi, Hillview Road and part of Salisbury Plains. Figure 1 delineates the gap zone showing the location of all sites surveyed for avifauna in spring 2017 and the distribution of native vegetation (see page 8). Table 1 provides GPS locations and descriptions of all sites surveyed for avifauna in spring 2017 (see pages 9-12).

### 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 bird records held by individual landowners. Regional and sub-regional connectivity modelling work undertaken by OEH was also reviewed.

#### 2.2.2 Site selection

A total of 36 survey sites were selected across 15 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 CTP 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 the study area helped guide the design of proposed revegetation and remnant regeneration actions, particularly concerning the location and metrics (width and length), structural complexity and functional habitat value of plantings for woodland birds.

Figure 1: Location of the Invergowrie to Dangars Gorge habitat connectivity gap. The red line denotes the gap zone. Sites surveyed for birds in spring 2017 are shown in green circles and boxes. As listed in Table 1, Harriet Gully sites are Sites 1-16 (including 'Goobragandra' Site 3 and Uralla Shire Council reserve), Invergowrie sites ('Bahati Park' and 'Banded Bee Farm') are Sites 17-19, 'Chiswick' sites are Sites 20-21, 'Big Ridge' sites are Sites 22-25, 'No Man's Land' is Site 26, 'Innesfree' including Innesfree Lane sites are Sites 27-29, Rock Abbey Road is Site 30, 'North Mihi' is Site 31 and 'Eastlake' sites are Sites 32-36. Image: Google Earth 2018.

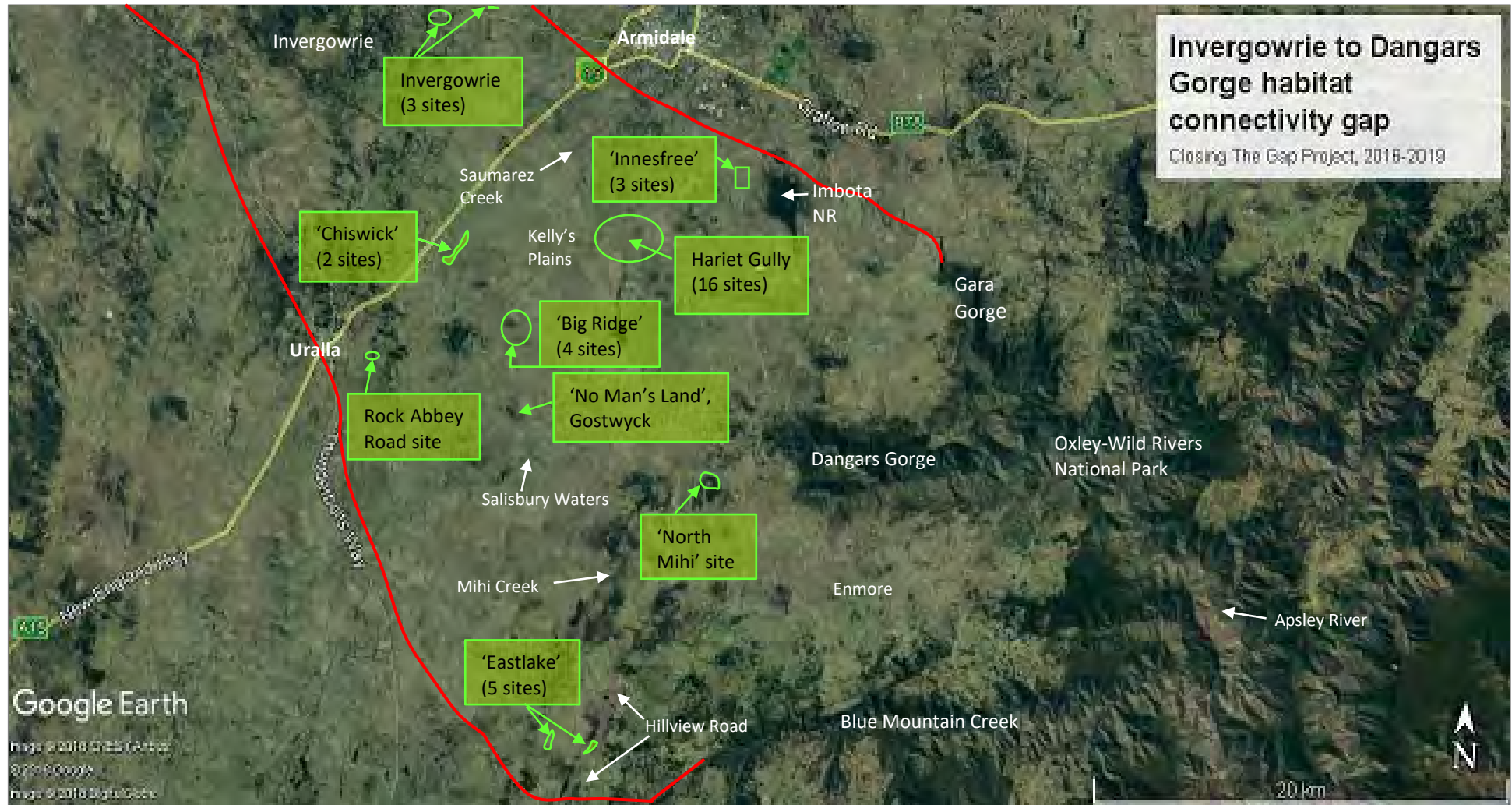


Table 1: Location and description of sites surveyed for avifauna in the Closing The Gap Project, Invergowrie to Dangars Gorge and Hillview Road. Surveys were conducted in spring (21 – 25 November) 2017. Bird communities present in younger revegetation were compared with those recorded in older (20-year-old+) revegetation and woodland remnants. \*coordinates of waypoints given as decimal degrees in latitude (S = south) and longitude (E = east); based on Map Datum WGS 84 and Zone 56J of the Universal Transverse Mercator (UTM) coordinate system.

Site number	Site name	Waypoint	Location*		Site description and field notes
			Latitude (S)	Longitude (E)	
1	'Chesterfield', Kellys Plains Site 1	101	30.58904	151.65245	Proposed revegetation block beside small dam; at fence
		102	30.58830	151.65309	at NE corner of site
		103	30.58796	151.65147	at NW corner
		104	30.58884	151.65117	at SW corner
2	'Chesterfield', Kellys Plains Site 2	201	30.59080	151.65135	Proposed revegetation block in paddock recently drilled for improved pasture, scattered dead & live stringybark & Blakely's red gum
		202	30.59162	151.65236	at SE corner
		203	30.59113	151.65288	at NE corner
		204	30.59008	151.65210	at NW corner
3	'Chesterfield', Kellys Plains Site 3	301	30.59349	151.64951	Proposed revegetation block on S side existing paddock fence, isolated red gums
		302	30.59410	151.65007	open paddock grazed by cattle
4	'Chesterfield', Kelly Plains Site 4	401	30.59219	151.64987	Existing revegetation strip up hill – 10 m W x 400 m L, planted and fenced 2012. Surveyed by InSight Ecology in 2016.
		402	30.59364	151.65173	at midpoint gate in strip
		403	30.59455	151.65280	at SE end of strip (upper slope)
5	'Chesterfield', Kellys Plains Site 5	501	30.59606	151.64438	Proposed revegetation strip – 420 m L x 15 m W, along existing fence to Saumarez Ck.
		502	30.59849	151.64059	at N bank of Saumarez Ck.
6	'Chesterfield', Kellys Plains Site 6	601	30.59598	151.65344	Existing revegetation strip – 600 m L x 10 m W, at W end on ridge; planted 2010
		602	30.59804	151.65863	at SE end downslope, isolated nearby Blakely's red gum (living and dead)
7	'Lorien', Harriet Gully, Kellys Plains, Site 1	701	30.59163	151.63002	Existing planted strip (on neighbour property, along boundary between both properties) - 15 m W x 120 m L, planted 1997; surveyed by InSight Ecology in Nov 2012 and March 2013; revegetation reference site
		702	30.59077	151.62939	at N end of strip nr house
8	'Lorien', Harriet Gully, Site 2	801	30.58807	151.62907	Proposed small revegetation block along E bank of drainage line nr Saumarez Creek
9	'Lorien', Harriet Gully Site 3	901	30.58851	151.62802	Proposed revegetation block on E side of drainage line, above small strip planted along

Site number	Site name	Waypoint	Location*		Site description and field notes
			Latitude (S)	Longitude (E)	
					S bank Saumarez Creek in 2011; to be fenced
		902	30.58859	151.62759	at W end of site
10	'Stoneleigh', Harriet Gully, Kellys Plains Site 1	1001	30.58727	151.64212	Existing revegetation block around homestead & hayshed, planted 1992 – eucalypts, acacias & exotic trees, shrubs; revegetation reference site
		1002	30.58605	151.64201	as above, in poplar section
		1003	30.58677	151.64308	at E side of plantings
11	'Stoneleigh', Kellys Plains Site 2	1101	30.58800	151.64493	Proposed revegetation block in bare paddock nr small dam
		1102	30.59069	151.64600	near Gostwyck Road fence
12	'Stoneleigh', Kellys Plains Site 3	1201	30.60241	151.63464	Existing revegetation strip along stony ridgeline E side Old Gostwyck Rd opp. Corey Rd – 25m W x 300 m L, planted 2012-13
		1202	30.59978	151.63510	at N end of strip
13	'Goobragandra', Kellys Plains Site 1	1301	30.59944	151.62657	Proposed revegetation strip – 24 m W x 200 m L, down slope to SE cnr of property
		1302	30.60112	151.62598	at SE cnr
14	'Goobragandra', Kellys Plains Site 2	1401	30.60124	151.62599	Existing revegetation strip – 16 m W x 600 m L, planted 2015, with isolated remnant Blakely's red gum incl. hollow branches
		1402	30.60098	151.62416	at SW cnr
		1403	30.59858	151.62460	at NW cnr, upslope
15	'Goobragandra', Kellys Plains, Site 3	1501	30.59791	151.62604	Existing revegetation strip – 17 m W x 200 m L, planted 2014
		1502	30.59839	151.62462	at S end of strip
16	Uralla Shire Council reserve, Gostwyck Road, at junction Harriet Gully Road & Old Gostwyck Road, Kellys Plains	1601	30.59351	151.63635	Existing revegetation block, planted 2005 by Dangarsleigh Landcare Group; surveyed by InSight Ecology Nov. 2012 & March 2013, snow gums 12 m tall, flowering, at SW cnr
		1602	30.59289	151.63683	at NW cnr
		1603	30.59382	151.63815	at NE cnr near Gostwyck Road
17	'Banded Bee Farm', Saumarez Ponds	1701	30.49062	151.57448	Proposed 4 ha revegetation strip 10 m W x 300 m L along boundary fence to Saumarez Ck; W end
		1702	30.49104	151.57742	at E end of site, nr Saumarez Ck
18	'Bahati Park', Invergowrie Site 1	1801	30.50709	151.54979	Proposed revegetation strip – 30 m W x 350 m L; at E end of site
		1802	30.50653	151.54625	at W end near TSR remnant & tower
19	'Bahati Park', Invergowrie Site 2	1901	30.51014	151.55202	Proposed revegetation strip – 30 m W x 300 m L, small patch stringybark at midpoint; at W end of site
		1902	30.51079	151.55505	at E end of site nr planted cypress

Site number	Site name	Waypoint	Location*		Site description and field notes
			Latitude (S)	Longitude (E)	
20	'Chiswick' Site 1 – Lambing Gully	2001	30.60213	151.55229	Proposed restoration of existing revegetation in wetland below dam; surveyed by InSight Ecology 2012-13
		2002	30.60193	151.55295	Tawny Grassbird in dense grasses
		2003	30.60111	151.55421	NE along gully – pipit, skylark, kestrel
		2004	30.59908	151.55679	Cisticola in rank grasses, rushes
		2005	30.59824	151.55756	Brown Quail flushed fr rank grasses
		2006	30.59738	151.55867	Tawny Grassbird in rank vegetation
21	'Chiswick' – Site 2	2101	30.60471	151.55151	Proposed small revegetation block beside access road to Site 1, fenced
		2102	30.60588	151.55295	S end of proposed reveg. block
22	'Big Ridge', Uralla - Site 1	2201	30.62928	151.58740	Proposed revegetation block on stony hilltop W of new shed – 20 m W x 160 m L; at S end
		2202	30.62792	151.58765	at N end
23	'Big Ridge', Uralla - Site 2	2301	30.62715	151.58965	Proposed revegetation block on lower slope just E of access road to shed; at W end of fenced strip near access road, 20 m W x 80 m L
		2302	30.62718	151.59044	at E end
24	'Big Ridge', Uralla - Site 3	2401	30.63642	151.59468	Blakely's Red Gum & Rough-barked Apple remnant woodland (2.2 ha) without understorey nr power stanchion; at E end
		2402	30.63644	151.59338	at NW cnr
		2403	30.63726	151.59399	at S end
25	'Big Ridge', Uralla - Site 4	2501	30.63617	151.59471	Proposed revegetation strip (440m L x 20 m W) & triangular small block (1 ha) along existing paddock fence near Site 24; at S end
		2502	30.63301	151.59248	at N end
26	'No Man's Land' remnant	2601	30.66480	151.58882	Isolated <i>Angophora floribunda</i> and Casuarina grassy woodland remnant along border between Big Ridge & Gostwyck properties. Surveyed by InSight Ecology Sept. 2016 & April 2017; at old boundary fence on granite outcrop
		2602	30.66580	151.58859	at main waterhole on granite ridge
		2603	30.66681	151.58861	at active fox den on W slope of granite ridge
		2604	30.66666	151.58939	small bird activity in blackthorn & acacia shrub layer
27	Innesfree Lane – Site 1, near Imbota Nature Reserve	2701	30.56205	151.70204	Existing revegetation strip, east-west along ridge to small house, 15 m W x 220 m L, planted Oct 2016
		2702	30.56171	151.69969	at W end
28	Innesfree Lane – Site 2, nr Imbota Nature Reserve	2801	30.56449	151.69347	Proposed small revegetation block around dam, re-ripping needed, planting proposed autumn 2018
		2802	30.56524	151.70160	at N end



Site number	Site name	Waypoint	Location*		Site description and field notes
			Latitude (S)	Longitude (E)	
29	'Innesfree', near Imbota Nature Reserve	2901	30.56996	151.69347	Existing revegetation strip along S property boundary, 15 m W x 220 m L; at W end; planted 2016. Also, proposed planting strip 15 m W x 430 m L east to nr Long Swamp Rd
		2902	30.57097	151.70009	at E end
30	Rock Abbey Road, Uralla	3001	30.64233	151.51727	proposed revegetation strip in paddock, c. 25 m W x 100 m L; at E end, upslope from Rock Abbey Road
		3002	30.64266	151.51631	at W end
31	'North Mihi', Mihi	3101	30.68901	151.68173	remnant stringybark patch on hills and slopes, native and exotic grasses, some blackthorn & acacia on E side; at W side of site; remnant reference site
		3102	30.68854	151.69011	old stringybark
		3103	30.69112	151.69228	Brown-headed Honeyeater foraged in flowering mistletoe on stringybark
		3104	30.69136	151.69191	Varied Sittella foraged on branches of stringybarks on E side midslope
32	'Eastlake', Uralla - Site 1 (South Jacks Creek)	3201	30.79852	151.61798	Proposed revegetation strip upslope to stringybark, Blakely's red gum, yellow box and apple box remnant on ridge along property boundary; at N end. Not previously surveyed.
		3202	30.80210	151.61612	at S end near property boundary
33	'Eastlake', Uralla - Site 2 (Gorge revegetation)	3301	30.79751	151.63695	Existing revegetation strip, planted Sept. 2017 – c. 40 m W x 80 m L. Surveyed by InSight Ecology April 2017 (before planting)
34	'Eastlake', Uralla - Site 3 (Gorge remnant 1)	3401	30.79718	151.63780	Small patch of remnant snow gum, stringybark, NE peppermint, fenced & enhanced by acacia direct seeding & revegetation (Aug. 17) on slope below down to Mihi Creek. Not previously surveyed.
35	'Eastlake', Uralla - Site 4 (Gorge remnant 2)	3501	30.79739	151.63895	Stringybark remnant (fenced), enhanced by acacia direct seeding & revegetation (planned for spring 2019). Located N side Mihi Creek. Not previously surveyed.
36	'Eastlake', Uralla - Site 5 (Gorge-Hillview Road remnant)	3601	30.79601	151.64914	5 ha fenced remnant forest patch (stringybark, narrow-leaved peppermint, Blakely's red gum, yellow box – some old-growth trees) enhanced by acacia direct seeding & 130 seedlings planted Aug 2017; at N end. Not previously surveyed.
		3602	30.80004	151.63930	at S end

### 2.2.3 Field surveying

Terrestrial and diurnal bird species were surveyed at each site in the study area over the period 21-25 November 2017. Three (3) of these sites had been surveyed by InSight Ecology in 2012-

2013 – ‘Lorien’ Site 1, Uralla Shire Council reserve in Hariet Gully and ‘Chiswick’ Site 1 (Lambing Gully) and one site was surveyed in 2016-2017 - ‘No Man’s Land’ remnant at Gostwyck. Three (3) other properties surveyed in spring 2017 contained other revegetation and remnant woodland/forest sites that were surveyed by InSight Ecology in 2012-2013 - ‘Bahati Park’, ‘North Mihi’ and ‘Eastlake’. One other property - ‘Big Ridge’ - had been previously surveyed by InSight Ecology in 2016-2017.

Bird species that utilised aquatic habitats in or near surveyed sites were also recorded. These included open or standing water, reedy margins, fringing trees, shrubs and grasses, fallen logs and rocky embankments or small escarpments along creeks, farm dams, wet paddocks or drains.

The area search technique (Loyn 1987; InSight Ecology 2012a, b, 2018c) 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.

All birds observed or heard at a site or along a line transect 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.

Surveys were generally conducted in the main morning (c. 0730-1030 hours) and afternoon (c. 1500-1900 hours) bird foraging periods (survey sessions) on each survey day. At some sites on the ‘Big Ridge’, ‘Innesfree’ and ‘Stoneleigh’ properties, the late morning to midday activity period was also sampled. No surveying occurred in windy or wet weather.

A total of 36 field survey sessions (17.83 hours – 12.92 hours in revegetation and 4.92 hours in remnants) were completed during the spring 2017 field program. The total number of hours spent surveying birds was similar between the spring and winter (17.25 hours) 2017 programs. In spring an additional 2.92 hours were spent surveying remnants while revegetation was surveyed for 2.32 hours less than in winter. This reflected the addition of 5 remnant (reference) sites to the spring survey program.

## 2.2.4 Habitat assessment

The biophysical attributes of each surveyed site were assessed. These included location, size and shape of revegetation and remnants, geology, broad habitat type - forest, woodland, grassland or pasture, 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, 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 attitudes and intentions.

Still photographs were taken of the surveyed sites and especially the 9 additional 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.

### **3. Results**

#### **3.1 Bird species richness and relative abundance**

A total of 994 individual birds from 69 species and 37 families were recorded during the spring 2017 survey in the study area. Woodland remnants provided habitat for 44 bird species (337 individual birds, 23 families), including the threatened (in NSW) Varied Sittella and birds of local conservation significance in the highly fragmented southern New England landscape such as Eastern Yellow Robin, Dusky Woodswallow, Striated Thornbill, Buff-rumped Thornbill, Brown Thornbill, White-throated Treecreeper and the migratory Dollarbird. Some of the latter species are members of a suite of declining woodland birds on New England Tableland (see Reid et al. 2006; InSight Ecology 2012a, 2018c; Southern New England Landcare 2015).

Older (16-25-year-old) planted sites were utilised by 22 species (81 individuals, 14 families). Birds that occurred in woodland/forest remnants such as Brown Thornbill, Striated Thornbill, Rufous Whistler, Grey Shrike-thrush, Yellow-faced Honeyeater, and Crimson Rosella (see Section 3.2) were also recorded in these older plantings. Intermediate-aged (6-15-year-old) plantings supported 17 species (55 individuals, 12 families). These were typically birds able to forage and roost in developing shrub and tree layers such as Grey Fantail, Superb Fairy-wren, Yellow Thornbill, Rufous Whistler (in 12-year-old plantings at Site 16) and Spotted Pardalote. Young (1 month to 5-year-old) revegetation provided habitat for 34 species (206 individuals, 20 woodland bird families and 2 aquatic bird families). These were typically more common, open country birds such as Yellow-rumped Thornbill, Eastern Rosella, Australian Magpie and the introduced Common Starling. The other introduced species recorded in the spring survey was European Goldfinch.

In the grassy wetland at Chiswick's Lambing Gully (Site 20) were breeding resident species - Brown Quail, Australasian Pipit and Golden-headed Cisticola and the warm-season breeding migrants, Tawny Grassbird and Brown Songlark. Aquatic species recorded included Australasian Grebe, Grey Teal, Pacifica Black Duck, Australian Wood Duck, Eurasian Coot, Pied Cormorant, Australasian Darter in Saumarez Creek (near Site 5) and small farm dams adjoining revegetation sites, e.g. at Site 14. Australian Wood Duck foraged in grassy cover at Site 13 while Straw-necked Ibis foraged in some paddocks within or adjacent to sites.

All bird species recorded during the survey are presented in tabular form below, together with the number of individual birds detected for each species and the total number of species and individuals recorded for each site. Species of local, regional or State conservation significance are highlighted in bold. Introduced species are indicated by an asterisk. The location and description of each site is provided in Table 1, with additional notes provided below, where relevant. Photographs of bird species recorded during the survey as well as revegetation, remnants and key habitat features are also provided for most sites.

Table 2: Avifauna recorded at Site 1: 'Chesterfield' (Site 1) – 21 November 2017 (1850-1900 hours). Site not yet planted or fenced, grazed by 32 yearling cattle, no trees/shrubs present, mostly sown pasture cover, some old stumps, small dry dam nearby. One living mountain gum present in adjacent fenced laneway. obs. = observed. Calm, cooled to 13°C at 1900.

Bird species	Number of individuals	Field notes
Galah	1	flew over, called
Common Starling*	32	foraging nr cattle, obs. eating seeds in dung, flew to roosts & likely nests in isolated paddock trees
Total bird species: 2 Total individual birds: 33		

Table 3: Avifauna recorded at Site 2: 'Chesterfield' (Site 2) – 21 November 2017 (1835-1845). Site features a stand of dead and living New England stringybark, Blakely's red gum and mountain gum of mixed ages – older trees with some hollows, absence of shrub layer, some rocky areas, sown brassica for cattle foraging. A small dam with water flanks southern edge of the site. Not fenced or planted.

Bird species	Number of individuals	Field notes
Australian Magpie	8	foraged
Noisy Miner	3	called, with fledgling in scattered red gums
Eastern Rosella	3	foraged, flew
Common Starling*	13	foraged on ground
Total bird species: 4 Total individual birds: 27		

Table 4: Avifauna recorded at Site 3: 'Chesterfield' (Site 3) – 21 November 2017 (1820-1830). Small proposed revegetation site, recently ripped but not planted or fenced yet, isolated individual Blakely's red gum. Grazed by young steers.

Bird species	Number of individuals	Field notes
Eastern Rosella	6	
Spotted Pardalote	1	called in isolated Blakely's red gum
Australian Magpie	2	perched in Blakely's red gum
Common Starling*	5	perched, likely nesting in stag
Total bird species: 4 Total individual birds: 14		

Plate 1: Proposed revegetation site on 'Chesterfield' with improved pasture, sown in late autumn, and isolated paddock trees. Looking northwest beyond Gostwyck Road. Photo: InSight Ecology, 21/11/17.



Table 5: Avifauna recorded at Site 4: 'Chesterfield' (Site 4) – 21 November, 2017 (1640-1705). Existing 5-year-old revegetation strip 10 m W x 400 m L, planted and fenced in 2012, runs upslope from near Site 3 to a small hill. Contains mix of native trees and shrubs – acacia, melaleuca, callistemon, Blakely's red gum, stringybark, mountain gum, and rocks and grasses. Surrounded by currently grazed paddocks with individual isolated Blakely's red gum, mountain gum and stringybark. Light SE, sun/cloud, 18°C at 1630.

Bird species	Number of individuals	Field notes
Eastern Rosella	7	foraged, flushed from strip
Australian Magpie	1	foraged
Common Starling*	29	flewover, foraged in adjacent paddock
Yellow-rumped Thornbill	8	foraged in W end of strip & along fence/paddock
Red Wattlebird	1	foraged in strip
Fairy Martin	13	group foraged over upper slope section of strip
Welcome Swallow	4	foraged
Red-rumped Parrot	2	foraged adjacent to strip in N paddock edge
Spotted Pardalote	1	male called adjacent stag on S side
Total bird species: 9 Total individual birds: 66		



Plates 2-4: A common but endearing small insect-eating bird of edges between vegetation and open paddocks, the Yellow-rumped Thornbill (Plate 2), foraged in the 5-year-old revegetation strip at this site (looking east upslope - Plates 3-4). Owners are committed to revegetation for multiple benefits including wildlife habitat. Photos by InSight Ecology, 21/11/17.



Table 6: Avifauna recorded at Site 5: 'Chesterfield' (Site 5) – 21 November 2017 (1725-1805). Proposed revegetation strip along property boundary fence (unfenced on 'Chesterfield' side), 15 m W x 420 m L, still not planted or ripped, extends southwest to southern rocky escarpment of Saumarez Creek. Cattle grazed in cleared paddocks either side of proposed strip and in the shallows of the creek itself. Blackberries, hawthorn and thistles along northern bank of creek provided cover for Superb Fairy-wren. Pooled sections of creek with rushes provided habitat for aquatic bird species. Light SE, mostly sunny, 17°C at 1715.

Bird species	Number of individuals	Field notes
Common Starling*	2	perched on fence
European Goldfinch*	13	nr flowering scotch thistle under fruiting hawthorn patch & bathed in Saumarez Creek

Fairy Martin	6	foraged above site & adjacent paddocks
Australian Wood Duck	27	rested on creek bank downstream of site; likely part of flock recorded at Site 2 in winter survey
Masked Lapwing	3	rested near wood ducks
Eurasian Coot	5	on water of creek's pooled section
Purple Swamphen	2	rested on N bank of creek
Pacific Black Duck	4	rested on N creek bank
Grey Teal	4	rested on N bank
Australasian Grebe	1	foraged in pooled section of creek
Australasian Darter	1	perched, drying on post along creek
Pied Cormorant	1	perched, drying on fencepost nr creek
Brown Falcon	1	perched
Magpie-lark	2	foraged
Crested Pigeon	1	foraged
Superb Fairy-wren	2	foraged nr blackberry patch N side of creek
Yellow-rumped Thornbill	7	flock flew over site to 'Stoneleigh' 2004 plantings ('Vicksburg Bend') on S side of Saumarez Creek
Galah	2	flew over
Total bird species: 17 Total individual birds: 84		

Plates 5-7: The proposed revegetation site looking south to Saumarez Creek and beyond (Plate 5). The patch of revegetation in the centre midground occurs on the southern side of the creek on Curtis's 'Stoneleigh' and is part of the 2004 'Vicksburg Bend' planting. Plate 6 shows Saumarez Creek's pooled section looking downstream to the southeast, with regrowth of rushes following cattle grazing and trampling in winter and. A basking adult Eastern Water Dragon (Plate 7) was detected on a rocky section of the site's northern end near the creek – note red patch on underbelly just visible, indicative of breeding condition. Photos: InSight Ecology, 1/8/17.









Table 7: Avifauna recorded at Site 6: 'Chesterfield' (Site 6) – 21 November, 2017 (1520-1600). Existing 7-year-old revegetation strip 10 m W x 600 m L, planted and fenced in 2010, extends from hillcrest downslope under 330 kV powerline to southeast. Contains mix of native trees and shrubs – acacia, melaleuca, callistemon, Blakely's red gum, snow gum, stringybark, mountain gum, grasses and some rocks and fallen branches. Surrounded by currently grazed paddocks with individual isolated Blakely's red gum, mountain gum and stringybark. Light-moderate SE, sun/cloud, 19°C at 1500.

Bird species	Number of individuals	Field notes
Spotted Pardalote	1	called from adjacent stag on S side of strip
Common Starling*	4	likely nesting in Blakely's red gum stags & standing live tree hollows adjacent to strip; flewover
Noisy Miner	2	foraged in strip, called
Fairy Martin	2	foraged above strip
Red-rumped Parrot	3	foraged
Red Wattlebird	1	foraged in strip
Eastern Rosella	6	foraged, perched in planted eucalypts, flushed
Australian Magpie	4	foraged, flew into adjacent paddock
Nankeen Kestrel	2	perched, called in adjacent N side paddock stag; obs. inspecting potential nest hollows in stags
Straw-necked Ibis	2	flewover to forage in adjacent paddock
Crimson Rosella	2	flushed from eucalypt perches in E end of strip
Grey Fantail	1	foraged near S end of site
Total bird species: 12 Total individual birds: 30		

Plates 8-9: The 7-year-old revegetation strip from about midpoint near the 3330 kV transmission line (Plate 8 – InSight Ecology). Fairy Martin is an aerial insectivore that builds mud nests typically in colonies often under bridges and culverts but also in standing dead trees and caves and migrates from northern Australia in September-October to breed (Plate 9 – Christopher Watson, commons.wikimedia.org).





Table 8: Avifauna recorded at Site 7: 'Lorien' (Site 1) – 22 August 2017 (1000-1015). Existing 20-year-old revegetation strip, 15 m W x 120 m L, extending from the verge of Harriet Gully Road in the adjoining property then north to near Saumarez Creek. Planted and fenced in 1997, never grazed. Fenced strip consists of snow gum, acacia, ribbon gum, callistemon, melaleuca, native grasses, rocks, leaf litter and fallen branches. Adjoining areas have small plantings around house and creek slopes. Owners committed to habitat restoration for wildlife conservation on their 6 ha property. Light ESE, sun/cloud 16°C at 1000.

Bird species	Number of individuals	Field notes
Eastern Spinebill	2	called, foraged in flowering snow gum
Welcome Swallow	2	mate pursuits
Yellow Thornbill	4	foraged in snow gum
Yellow-faced Honeyeater	2	called, foraged in flowering snow gum
Spotted Pardalote	1	male called
Crimson Rosella	2	called, flew into snow gum
Grey Fantail	3	foraged, around honeyeaters
Willie Wagtail	2	called, foraged
Total bird species: 8 Total individual birds: 18		

Table 9: Avifauna recorded at Site 8: 'Lorien' (Site 2) – 21 November 2017 (1020-1025). Recently ripped and re-fenced small revegetation block toward Saumarez Creek. Planting scheduled for December 2017.

Bird species	Number of individuals	Field notes
Red-rumped Parrot	2	flew over
Welcome Swallow	2	foraged
Superb Fairy-wren	3	foraged in adjoining snow gum regrowth
Total bird species: 3 Total individual birds: 7		



Plates 10-11: Recently ripped and fenced small proposed revegetation block (Plate 10) along eastern bank of a tributary of Saumarez Creek (creek occurs near willow at left centre of image). Superb Fairy-wren forage across 'Lorien' and have been recorded nesting in dense planted shrubs around the house (S. Doak pers. comm.). Male fairy-wren in eclipse plumage shown in snow gum patch in right midground (Plate 11). Photos by InSight Ecology, 22/11/17.



Table 10: Avifauna recorded at Site 9: 'Lorien' (Site 3) – 21 November 2017 (1035-1050). Proposed revegetation block on western hill above Saumarez Creek and near an older (2011) planted strip along creek bank. Ripped but not planted or fenced yet. Overcast, light SE, 17°C at 1030.

Bird species	Number of individuals	Field notes
European Goldfinch*	3	on fence near creek
Yellow-rumped Thornbill	1	on fence
Common Starling*	2	flew over to nearby old stag nest site
Willie Wagtail	1	foraged, called
Welcome Swallow	2	foraged
Grey Fantail	3	foraged nr 5 m tall black sallee & snow gum plantings
Yellow Thornbill	2	flew, called
Superb Fairy-wren	5	called at site & along shrubby banks of creek
Total bird species: 8 Total individual birds: 19		

Table 11: Avifauna recorded at Site 10: 'Stoneleigh' (Site 1) – 22 November 2017 (0735-0915). Old (25-year-old) revegetation block planted around cottage and grounds in 1992, featuring snow gum, black sallee, ribbon gum, mountain gum, Blakely's red gum, poplar, elm, maple, cedar, cypress, box elder, willow, prunus, cotoneaster, roses, hawthorn, acacia, banksia, callistemon, lomandra and native and introduced grasses. Fully fenced, small dam in southeast section, functioning as a habitat island or 'stepping stone' surrounded by old grazed paddocks. 'Stoneleigh' is periodically grazed by sheep and some cattle. Eastern Grey Kangaroo have started to return to 'Stoneleigh' after a long absence (R. Curtis pers. comm.) Light ESE, sun/cloud, cool, 7°C at 0730.

Bird species	Number of individuals	Field notes
Grey Fantail	8	foraged, followed other small birds; 2 juvenile birds with adult near front road section so likely bred at site
Crimson Rosella	2	called, perched in acacia
Rufous Whistler	2	adult male with female, foraged & called in snow gum and acacia
Spotted Pardalote	1	male called
Red Wattlebird	2	foraged, male called
Australian Magpie	1	old nest in 15 m tall ribbon gum
Crested Pigeon	1	foraged
Willie Wagtail	3	likely nesting
Sulphur-crested Cockatoo	1	flew over
Grey Butcherbird	1	called
Yellow-faced Honeyeater	4	foraged, flew
Yellow Thornbill	4	foraged in acacias
Superb Fairy-wren	12	3 groups – 2 nesting currently: 1 <sup>st</sup> grp foraged along driveway, incl full colour males; 2 <sup>nd</sup> grp simple pair nesting in N side acacia & eucalypts; 3 <sup>rd</sup> grp nesting in thick tea-tree at front opp. sheepyards along Stoneleigh Road
Eastern Spinebill	6	foraged in flowering callistemon
<b>Brown Thornbill</b>	1	male called territory in thick garden shrubs, female possibly nesting nearby
<b>Grey Shrike-thrush</b>	2	male and female called, foraged near house, possible nest nearby?
Laughing Kookaburra	2	called, possible nesting E side area
Silvereye	3	foraged in dense exotic shrubs around house
<b>Striated Thornbill</b>	2	called, foraged near house, breeding unknown
Red-rumped Parrot	2	flew over from NW to SE



Bird species	Number of individuals	Field notes
Common Starling*	3	flew over
Total bird species: 21 Total individual birds: 63		

Plate 12: Driveway into 'Stoneleigh' photographed in 2001, 9 years after the site was planted out to native vegetation. Older windbreak plantings of cypress, cedar and poplar species are visible in the background. Photo courtesy Robert Curtis.



Plate 13: The same driveway shown in Plate 12 taken 16 years later on 22 November 2017. The degree of canopy development from acacia and eucalypt plantings has now provided foraging, shelter and nesting opportunities for a suite of small birds found in woodland/forest remnants, the nearest being Imbota Nature Reserve, 6.6 km to the east-north-east. Photo: InSight Ecology.





Plates 14-15: Flowering planted snow gum provided nectar for honeyeaters, insects for pardalotes, thornbills and fairy-wrens and nest sites for whistlers, fantails and honeyeaters (Plate 14). Grey Fantail foraged and probably nested in dense shrubs and trees in the cottage garden (Plate 15). Photos by InSight Ecology, 22/11/17.



Plate 16: Male Eastern Spinebill warming after a cold night, perched on the branch of a deciduous tree in the gardens of 'Stoneleigh' cottage. Photo: InSight Ecology, taken during winter survey, 2/8/17.



Plate 17: Grey Shrike-thrush is normally associated with woodland/forest remnants but will cross 1-2 km gaps in habitat cover using isolated individual trees along road verges and within paddocks to forage for insects, particularly during winter when food is scarce (InSight Ecology 2018c). An adult bird (male shown – note black bill and whitish lores) and a suspected female were recorded foraging near the cottage. Photo: InSight Ecology, taken during winter survey at this site, 2/8/17.





Table 12: Avifauna recorded at Site 11: 'Stoneleigh' (Site 2) – 22 November 2017 (0940-0950). Proposed revegetation block in bare paddock, extending from Stoneleigh Road to a small dam then onto near Gostwyck Road. Not ripped, fenced or planted yet.

Bird species	Number of individuals	Field notes
Australasian Pipit	1	adult held insects for delivery to nest on rocky hillock with 4 flowering snow gums
Australian Magpie	3	foraged
Galah	2	flewover
Australian Wood Duck	10	rested on dam bank and foraged in paddock
European Goldfinch*	1	flewover from Saumarez Creek to Site 10
Total bird species: 5 Total individual birds: 17		

Table 13: Avifauna recorded at Site 12: 'Stoneleigh' (Site 3) – 22 November 2017 (1110-1150). Existing fenced revegetation strip 25 m W x 300 m L, north-south orientated, located on a rocky ridgeline ('Soldier's Hill') denuded of its former stands of Blakely's red gum (R. Curtis pers. comm.). Planted in two stages of 6 rows wide each, in 2012 and 2013 (based on a detailed site revegetation history supplied by Robert Curtis). The northern end of this dog-leg-shaped strip is adjacent to an earlier (2004) planting along the southern bank ('Vicksburg Bend') of Saumarez Creek. The southern end abuts the property's boundary. A third fenced revegetation strip of 600 m L x 20 m W runs east-west downslope from this southern end of Site 12 to terminate near Saumarez Creek. This was planted in 2017 to restore a failed earlier planting on this slope – it was not surveyed in the CTG Project. Site 12 is surrounded by cleared, cattle-grazed paddocks; livestock were excluded from Vicksburg Bend in 2005 to prevent continued bank erosion. Cloudy, moderate ESE, 18°C at 1130.

Bird species	Number of individuals	Field notes
Yellow-faced Honeyeater	2	foraged in flowering <i>Callistemon pungens</i> , mate pursuits - possible nesting soon
Superb Fairy-wren	5	foraged, called, incl 3 full colour males so likely nesting in strip
Nankeen Kestrel	1	foraged over middle section of site
Grey Fantail	2	foraged near fairy-wren group
Silveryeye	2	foraged in acacia and callistemon
Yellow Thornbill	5	foraged in family group incl 2 fledglings in 5 m tall acacia ridgeline
Rufous Whistler	1	adult male called in N dogleg section nr creek
White-throated Gerygone	1	called, foraged in N dogleg section nr creek
Total bird species: 8 Total individual birds: 19		

Plates 18-19: Rufous Whistler (Plate 18 – left, adult male) and the spring-summer breeding migrant White-throated Gerygone (Plate 19 - right) probably entered the site from older plantings along Vicksburg Bend. Photos: Greg Clancy (Plate 18), David Cook (Plate 19).



Plates 20-23: Provision of structurally complex and floristically diverse native vegetation placed within reach, in small bird gap-crossing terms, of older plantings along Saumarez Creek and other sites in Harriet Gully has resulted in the return of other small woodland birds to 'Soldier's Hill'. These include (left to right, then top to bottom) Superb Fairy-wren (Plate 20 – adult male, InSight Ecology at site 22/11/17), Yellow Thornbill (Plate 21 – Lindsay Hansch), Silvereye (Plate 22, InSight Ecology at site 22/11/17) and Grey Fantail (Plate 23, InSight Ecology at site 22/11/17).







Plate 24: The site on 'Soldier's Hill' with newly planted rows of Blakely's red gum, snow gum, black sallee, apple box, melaleuca, callistemon and acacia taken in 2012 (the first 6 of 12 rows inserted), looking south to property boundary. Photo courtesy Robert Curtis.





Plate 25: This site is now providing valuable foraging and roosting habitat for a group of small woodland and shrubland birds (some shown in Plates 20-23) in a landscape devoid of its original native vegetation through past extensive land clearing and timber-getting (see Plate 26). Photo: InSight Ecology, 2/8/17 - taken during winter survey at almost the same location in the strip as used in Plate 24.



Plate 26: Past broadscale removal of woodland/forest for grazing and logging in this part of the district has made it impossible for many small woodland birds to survive in this area. Photo taken from the southern end of Site 12 looking south/southwest to a lone living mountain gum and 330 kV transmission line in the distance. Photo by InSight Ecology, 2/8/17.



Table 14: Avifauna recorded at Site 13 - 'Goobragandra' (Site 1), Kellys Plains, 24 November 2017 (1930-1950). Recently revegetated (700 trees, shrubs, lomandra, planted October 2017) and fenced strip 24 m W x 200 m L, runs downslope to southeast corner of property from house block, native grasses (e.g. Snow Grass *Poa sieberiana*) present and forbs (e.g. Peach Heath *Lissanthe strigosa*). Several years since property was last grazed and no stock present now. Adjacent properties cleared and grazed, with scattered paddock eucalypts.

Bird species	Number of individuals	Field notes
Galah	2	flew over to paddock tree roost
Tawny Frogmouth	1	called in house block trees at 1955 hours
Total bird species: 2 Total individual birds: 3		

Plates 27-28: Before- and after-planting and fencing of Site 13 at 'Goobragandra' (Site 1), looking south to scattered Blakely's red gum and mountain gum on adjoining property (Plate 27, 2/8/17) and north upslope to house block with 6 rows wide planting (Plate 28, 24/11/17). Photos: InSight Ecology.





Table 15: Avifauna recorded at Site 14 on 'Goobragandra' (Site 2), Kellys Plains, 24 November 2017 (1900-1925). Existing 2-year-old fenced revegetation strip 16 m W x 600 m L, planted October 2015, heavy competition for tree and shrub seedlings from introduced and native grasses, isolated 6-7 individual Blakely's red gum and rough-barked apple *Angophora floribunda* some with hollow dead branches in strip and adjacent paddock. Small dam with reeds on the property supported some aquatic bird species.

Bird species	Number of individuals	Field notes
Red Wattlebird	2	perched in Blakely's red gum isolate in strip
Common Starling*	1	flewover
Australian Magpie	3	flewover, also foraged in mown strip lane
Spotted Pardalote	1	male called in Blakely's red gum
Eastern Rosella	1	foraged in strip
Red-rumped Parrot	22	flock flewover from S to N
Australasian Grebe	2	on dam, adult with juvenile – bred here
Grey Teal	5	rested on bank of dam
Pacific Black Duck	2	rested on dam bank
Total bird species: 9 Total individual birds: 39		

Plate 29: Existing revegetation strip at Site 14 - 'Goobragandra' (Site 2), showing solid eucalypt and acacia growth in 2 years with grassy interlanes, looking south along property boundary. Photo: InSight Ecology, 24/11/17.





Table 16: Avifauna recorded at Site 15: 'Goobragandra' (Site 3), Kellys Plains, 24 November 2017 (1745-1845). Existing native revegetation strip, 17 m W x 200 m L, planted March-October 2014. Extends west from house block on ridge to property boundary then south along boundary to laneway gate.

Bird species	Number of individual birds	Field notes
Australian Magpie	1	foraged in strip
Little Corella	2	flew over
Crimson Rosella	4	flew over
Eastern Rosella	2	foraged in strip
Australian Wood Duck	2	flushed from foraging in strip
Galah	1	flushed from strip
Nankeen Kestrel	1	at likely nest in stag hollow at S end
Red Wattlebird	4	flew from N section of strip
Total bird species: 8 Total individual birds: 17		

Plates 30-31: Three-year-old revegetation strip on 'Goobragandra' (Site 3) showing strong development of shrub and tree layers with pasture grass cover (Plate 30 – above) and Nankeen Kestrel at suspected nest hollow in stag at southern end of site (Plate 31 – below). Photos: InSight Ecology, 24/11/17.



Table 17: Avifauna recorded at Site 16: Uralla Shire Council reserve, Gostwyck Road near intersection with Harriet Gully Road and Old Gostwyck Road, Kellys Plains, 24 November 2017 (1650-1725). Existing revegetation block (c. 2 ha) established by Dangarsleigh Landcare Group in 2005, 12 m tall flowering snow gum, candlebark gum, ribbon gum, callistemon, grevillea, acacia and leptospermum in rows, thick pasture grasses and some blackberry patches. Fox, cat and rabbit scats (moderate levels) noted. Surveyed by InSight Ecology in November 2012 and March 2013. Sun/cloud, 19°C, calm at 1700.

Bird species	Number of individuals	Field notes
Yellow-faced Honeyeater	5	called, foraged in flowering snow gum rows, possibly nesting
Superb Fairy-wren	6	breeding group in blackberry cover
Grey Fantail	3	foraged, called, flew
Rufous Whistler	2	adult male called territory, female nearby; possible nesting
Yellow Thornbill	6	nesting (fierce responses, decoy flights)
Scarlet Honeyeater	3	called, foraged in flowering snow gums centre & E side of site
Total bird species: 6 Total individual birds: 25		

Plates 32-33: Council reserve revegetation block from Gostwyck Road side taken 23 November 2012 showing rows of callistemon, snow gum and black sallee (Plate 32 - above) and 7-year-old snow gum rows in centre section of site (Plate 33 - below). Photos by InSight Ecology.







Plates 34-36: Council reserve revegetation block at 12-year-old growth stage (2017) showing dense foliage cover and snow gum canopy development (Plate 34, this page), foraged and nested in by shrub and canopy insectivores such as Rufous Whistler (Plate 35 - immature bird, top next page) and nectarivores like the summer breeding migrant, Scarlet Honeyeater (Plate 36 – adult male, below next page). Plates 34-35: InSight Ecology, 24/11/17. Plate 36: Greg Miles, commons.wikimedia.org







Table 18: Avifauna recorded at Site 17: 'Banded Bee Farm', Saumarez Ponds, 24 November 2017 (1430-1500). Proposed revegetation strip 10 m W x 300 m L on eastern side of farm towards Saumarez Creek. Introduced firethorn and hawthorn along boundary with neighbour's property on southeast side and along Saumarez Creek provided habitat for Superb Fairy-wren. Owner plans to eventually replace these with native shrubs. When purchased in 2014, this 16 ha property was totally devoid of native vegetation, have planted along Saumarez Road with Armidale Tree Group involvement. Thick introduced grass layer extends across site. Fencing not erected nor ground ripped for planting yet – planting (480 seedlings, 0.33 ha) scheduled for 2018. No current livestock grazing. Holistic farming focus growing vegetables and producing eggs. Calm, warm 21°C and cloudy at 1400.

Bird species	Number of individuals	Field notes
Australian Magpie	1	foraged along fence
Black-shouldered Kite	1	foraged above grass swards, abundance of house mouse in paddocks currently (P. South pers. comm.)
Superb Fairy-wren	4	foraged, called nr E end in hawthorn along ck
Common Starling*	3	flew over to creek
Total bird species: 3 Total individual birds: 9		

Plate 37: Proposed revegetation strip along existing fence east to Saumarez Creek – a line of yellow-capped metal stakes at left of photo delineates northern boundary of planting area. Photo: InSight Ecology, 24/11/17.



Table 19: Avifauna recorded at Site 18 – 'Bahati Park' (Site 1), Invergowrie, 24 November 2017 (1450-1610). Recently (October 2017) planted 5 row-wide strip to almost connect (20 m gap left for paddock access) with TSR remnant woodland at western end below transmitter tower on hill. Fenced on northern side only to date. Calm, warm 25°C at 1500, sun/cloud.

Bird species	Number of individuals	Field notes
Australian Magpie	1	foraged in newly planted rows
Torresian Crow	1	flew over to TSR
Superb Fairy-wren	4	foraged, called nr W end shrubs in TSR
Black-faced Cuckoo-shrike	1	flew over to TSR
Total bird species: 4 Total individual birds: 7		

Plate 38: View west along Site 18's newly planted strip to remnant woodland in TSR in background. Photo: InSight Ecology, 24/11/17.



Table 20: Avifauna recorded at Site 19: 'Bahati Park' (Site 2), Invergowrie, 24 November 2017 (1525-1540). Proposed revegetation strip 30 m W x 300 m L (0.5 ha) along paddock fence to near planted cypress row. Small patch of New England stringybark at midpoint in strip and one rough-barked apple along fence. Currently grazed by sheep, some fallen branches, no ripping, fencing or planting undertaken yet. Overcast, calm, humid 24°C at 1300, light SW breeze.

Bird species	Number of individuals	Field notes
Noisy Miner	2	foraged, called in isolated stringybark in strip
Eastern Rosella	2	perched on fence, flew
Australian Magpie	2	flew over
Total bird species: 3 Total individual birds: 6		

Table 21: Avifauna recorded at Site 20: 'Chiswick' Site 1 – Lambing Gully, 23 November 2017 (1530-1645). Proposed restoration of existing fenced revegetation in wetland below dam, previous planted in 2011 but had low survival of seedlings due to 3 successive years of inundation (A. Eichorn, pers. comm.). Previously surveyed by InSight Ecology in 2012-13. Site (22 ha, 50-100 m W x 1.6 km L) dominated by 2 m tall thick introduced grasses, reeds and rushes around a few pooled sections (much drier than in winter), and some blackberry patches. Some surviving callistemon, melaleuca and eucalypts in small patches, site surrounded by open grazed paddocks and older planted pines and cypress to the east. Sun/cloud, cooled to 17°C at 1530, light SE wind, storm arrived from SW at 1650 (brief shower).

Bird species	Number of individuals	Field notes
Fairy Martin	2	foraged
Australian Magpie	5	adult & immature birds foraged, called, flew
Magpie-lark	1	foraged, flew



Bird species	Number of individuals	Field notes
<b>Golden-headed Cisticola</b>	8	6 males, 2 indeterminates (potentially females), all males constantly called breeding territory, most gave song-flights, foraged in rank grasses along Lambing Gully; most likely nesting
<b>Tawny Grassbird</b>	2	possible pair obs. foraging by walking along ground through thick grasses near blackberry patch near E side kink in fence, ie. at site of winter record. Likely breeding as male called territory at this location
<b>Brown Songlark</b>	2	both males obs., called, display flights from fenceposts along edge of grassland
Australasian Pipit	1	likely nesting in thick grasses below dam
Brown Quail	2	flushed from rank grasses around pooled section of creek
Pacific Black Duck	3	flewover to N from S
Australian Raven	1	flewover
Superb Fairy-wren	4	group incl adult male foraged, likely nesting near large blackberry patch into which Tawny Grassbird retreated on my approach
Total bird species: 11 Total individual birds: 31		

Plate 39: View north along upper Lambing Gully, showing existing planted shrubs and trees, fencing and dense grasses within the wetland strip. Potential exists to increase the width of this site. Current proposal is to plant 30 small groupings or copses of native trees and shrubs along the 22 ha site to provide habitat for wetland birds and other fauna such as frogs. Photo by InSight Ecology, 23/11/17.



Plate 40: Golden-headed Cisticola called incessantly throughout the wetland with males displaying rufous crowns indicative of breeding condition and performing song-flights. These tiny (9-11.5 cm) birds depend on rank grassland for food, refuge and nest sites, often flying to fences before darting back into grass swards. They are year-round residents in Lambing Gully wetland. Photo: InSight Ecology, 23/11/17.



Plate 41: Tawny Grassbird is a small (17-19 cm) cryptic bird of dense wetland vegetation. Often detected skulking through thick grasses or giving alarm calls then dropping from lookouts on tall grass or rush stems back to the ground. Patience and stealth are needed when following individual birds through dense vegetation. Breeding males make fluttering, tail-down song-flights over thick cover. It is a spring-summer breeding migrant to the tablelands, arriving in August and departing in January-February. Photo: Greg Clancy.



Plate 42: Brown Songlark is a summer breeding migrant to the tablelands, arriving in June and leaving by March. There is also a coastal movement during inland droughts. The sooty-brown plumage of breeding males is distinctive while females are pale brown. Males observed sitting on fenceposts and powerlines often with tails cocked and performing fluttering song-flights before gliding and dropping back to the ground. Photo (male in breeding plumage): David Orchard



Table 22: Avifauna recorded at Site 21: 'Chiswick' (Site 2), 23 November 2017 (1655-1710). Proposed small revegetation block beside road to dam near Site 20. Fenced, ripped and scheduled for planting with native shrubs, trees and grasses by mid-December 2017. SNEL-funded site.

Bird species	Number of individuals	Field notes
Australian Wood Duck	7	grazing grasses within block
Galah	10	flew over
Black-faced Cuckoo-shrike	1	perched on fence
Total bird species: 3 Total individual birds: 18		

Table 23: Avifauna recorded at Site 22: 'Big Ridge', Uralla (Site 1), 23 November 2017 (1110-1120). Recently planted block (0.31 ha, 20 m W x 160 m L) on stony hilltop west of large shed, fenced. Total of 84 eucalypt and 167 shrub seedlings planted mid-October 2017. Close to New England stringybark and narrow-leaved peppermint remnant on same hill to south, surrounding slopes grazed by sheep. Panoramic views north over Kellys Plains and north to Armidale and Duval Range. Calm, warm 22°C at 1100, sunny.

Bird species	Number of individuals	Field notes
Tree Martin	1	foraged
Red-rumped Parrot	2	flew over
Yellow-rumped Thornbill	3	foraged in strip
Common Starling*	2	nesting in adjacent stag
Total bird species: 4 Total individual birds: 8		



Plate 43: Recently ripped and planted hilltop site on 'Big Ridge' (Site 22) showing basaltic nature of site and stringybark/peppermint remnant that the site connects with to the immediate south. Photo: InSight Ecology, 23/11/17.



Table 24: Avifauna recorded at Site 23: 'Big Ridge', Uralla (Site 2), 23 November 2017 (1135-1145). Proposed revegetation block, 0.12 ha, 20 m W x 80 m L, ripped, fenced and planted with 126 seedlings (84 shrubs, 42 trees) in mid-October 2017. Adjacent sheep grazing and yards, two nearby living paddock trees (yellow box and rough-barked apple), mass historical death of eucalypts on Big Ridge itself east of site and extending south.

Bird species	Number of individuals	Field notes
Willie Wagtail	1	flewover
Yellow-rumped Thornbill	2	called, flew into site's eastern end to forage
Total bird species: 2 Total individual birds: 3		

Plate 44: Recently planted and fenced Block near entrance road to large shed. Note isolated *Angophora floribunda* near eastern edge of block. Photo: InSight Ecology, 23/11/17.





Table 25: Avifauna recorded at Site 24: 'Big Ridge', Uralla (Site 3), 23 November 2017 (1035-1100). Remnant rough-barked apple *Angophora floribunda* woodland (2.2 ha), shrub layer absent due to livestock grazing, sheep camp and timber-getting, ground cover mostly pasture grasses with some *Microlaena stipoides* and fallen decaying branches and trunks, dieback evident in parts, standing dead and senescing trees with hollows. Proposed enhancement of remnant by direct seeding acacia and other species over 500 m to re-establish shrub and small tree layers. Fencing to exclude livestock. Site adjoins Site 25 (triangular-shaped revegetation block).

Bird species	Number of individuals	Field notes
Australian Magpie	6	adults foraged with juveniles
Grey Butcherbird	1	mobbed by Noisy Miner in angophoras
Noisy Miner	11	adults with 2 juveniles
Eastern Rosella	6	perched, called, foraged
Laughing Kookaburra	2	likely nesting in stag
Galah	8	likely nesting in stags
Total bird species: 6 Total individual birds: 34		

Plates 45-46: The remnant comprised a mix of younger (Plate 45 - left) and older (Plate 46 - right) angophoras indicating the woodland was regrowing from past logging and stock damage. There was a notable absence of eucalypt and angophora seedlings, grazed by stock, as well lacking a shrub layer. Surrounded by cleared paddocks grazed by sheep and cattle, a nearby small dam and a 330kV powerline stanchion. Photos: InSight Ecology, 4/8/17

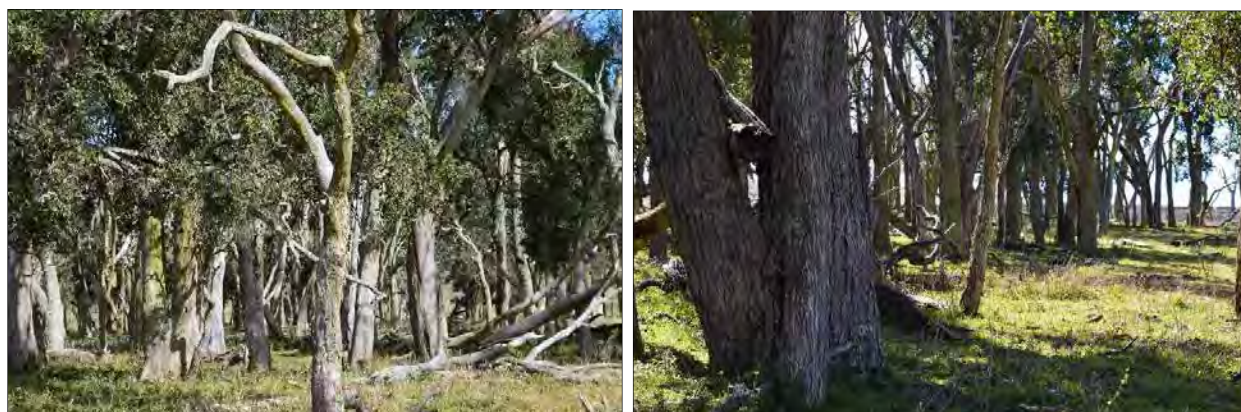


Table 26: Avifauna recorded at Site 25: 'Big Ridge', Uralla (Site 4), 23 November 2017 (1010-1020). This site comprised a recently (October 2017) planted and fenced triangular-shaped block planting of 300 seedlings (100 trees, 200 shrubs). This triangular section abuts a 330kV powerline stanchion and connects with Site 24's remnant woodland. Calm, warm, 21°C at 1000, full sun.

Bird species	Number of individuals	Field notes
Australian Magpie	2	foraged
Eastern Rosella	1	flew over to Site 24
Australasian Pipit	1	foraged in 20 cm tall grass near stanchion
Common Starling*	2	perched on fence, nesting in nearby stag
Total bird species: 4 Total individual birds: 6		

Plate 47: Recently planted Site 25 showing fenced block adjoining remnant woodland of Site 24 to the immediate south. Photo: InSight Ecology, 23/11/17.



Table 27: Avifauna recorded at Site 26: ‘No Man’s Land’ remnant woodland and shrubland, Gostwyck, 23 November 2017 (0830-0950). Isolated 7 ha *Angophora floribunda*, snow gum and she-oak *Allocasuarina torulosa* grassy woodland on large granite outcrop with waterholes, old-growth trees, *Leptospermum*, *Olearia* and *Bursaria spinosa* shrubland, surrounded by cleared paddocks with scattered patches of Blakely’s red gum, angophora and mountain gum in ‘Big Ridge’ section. Located just north of Julia Gully which flows southeast into Salisbury Waters. Grazed only once by 20 head cattle 10 years ago, not logged in the Munsie family’s memory (G. and R. Munsie, pers. comm.). Home to c. 70 Eastern Grey Kangaroo, a few Swamp Wallaby, fox den below granite boulders on eastern slope, Eastern Brown Snake, Red-bellied Black Snake, echidna and possibly bandicoot. First surveyed by InSight Ecology 28/9/16 and 11/4/17. Light ESE wind, full sun, 10°C at 0830 on 23/11/17.

Bird species	Number of individuals	Field notes
Scarlet Honeyeater	13	males called breeding territories, foraged in angophoras and old-growth snow gum
Yellow-rumped Thornbill	6	ground-foraged N edge with paddock
Sulphur-crested Cockatoo	6	flew over remnant
Rufous Whistler	6	breeding, 4 adult males called territories, 2 females
Yellow-faced Honeyeater	6	foraged in flowering snow gum & angophora woodland, called, flew, likely nesting
Grey Fantail	7	foraged, followed other small birds, bred
Fan-tailed Cuckoo	1	calling male
Horsfield’s Bronze-Cuckoo	1	male called
Noisy Friarbird	6	foraged, called, territory defence N sector & paddock edge, breeding
<b>Buff-rumped Thornbill</b>	2	foraged, called in forest oaks



Bird species	Number of individuals	Field notes
Red Wattlebird	2	foraged in flowering snow gum NW sector
<b>White-throated Treecreeper</b>	1	called breeding territory
Laughing Kookaburra	2	breeding in angophora woodland
Superb Fairy-wren	4	2 adults obs. delivering insects to young in nest or recently fledged, with 2 juveniles – later breeding season due to cooler Sept & Nov.
<b>Grey Shrike-thrush</b>	1	called in angophora woodland
Crimson Rosella	2	perched, foraged angophora woodland
<b>Striated Thornbill</b>	7	foraged in mixed flock with Buff-rumped Thornbill & Silvereye in angophora woodland central section, likely breeding
<b>Buff-rumped Thornbill</b>	8	foraged in mixed species flock, with 3 immature birds so bred this site
Silvereye	6	foraged in mixed species flock with thornbills
Willie Wagtail	1	foraged paddock edge
Spotted Pardalote	2	males called breeding territories
<b>Dollarbird</b>	1	called, likely breeding NE paddock edge trees
European Goldfinch*	2	perched N paddock edge
<b>Eastern Yellow Robin</b>	2	male territory called, likely pair breeding near main rocky waterhole section
Shining Bronze-Cuckoo	1	male called (strident ascending calls) N edge
Total bird species: 25 Total individual birds: 96		

Plate 48: ‘No Man’s Land’ is an important remnant of native vegetation that has been hardly disturbed since the arrival of the first farming families in the district (Greg Munsie, pers. comm.). It functions as a key habitat stepping stone for some birds as well as home for other birds, reptiles, macropods, echidna and possibly bandicoot. View from the central granite ridge northwest to a mid-paddock planting in ‘Big Ridge’s southeast corner then onto ‘The Mountain’ stringybark forest remnant on ‘Kelvin Grove’ in the distance. Photo: InSight Ecology, 23/11/17.



Plate 49: The central granite ridge in the remnant features old leptospermum patches and rock pools providing the only surface water in the area for Eastern Grey Kangaroo, Swamp Wallaby, birds and other fauna. Photo: InSight Ecology, 23/11/17.



Plate 50: Angophora woodland with Olearia shrub layer and lomandra provided suitable foraging and nesting space for several small woodland bird species and cover for a suspected small bandicoot population. Grazing of native grasses in foreground by kangaroos. Photo: InSight Ecology, 23/11/17.





Plates 51-52: Superb Fairy-wren (female with freshly-caught insect for delivery to nestlings – Plate 51) and Rufous Whistler (adult male – Plate 52) were breeding in the remnant's *Angophora floribunda* woodland during the spring survey. Photos: InSight Ecology, 23/11/17.



Table 28: Avifauna recorded at Site 27: Innesfree Lane (Site 1), Long Swamp Road, near Imbota Nature Reserve, 24 November 2017 (1030-1040). Revegetation strip 15 m W x 220 m L (0.26 ha), planted (200 seedlings) and fenced October 2016, runs across upper slope west to small house. Located about 700 m from privately-owned woodland/forest that is connected to Imbota Nature Reserve in a scattered tree landscape with areas of open paddocks, predominantly small hobby farms, small dam on lower slope.

Bird species	Number of individual birds	Field notes
Noisy Miner	1	flewover
Eastern Rosella	1	flewover
Total bird species: 2 Total individual birds: 2		

Table 29: Avifauna recorded at Site 28: Innesfree Lane (Site 2), Long Swamp Road, near Imbota NR, 24 November 2017 (1000-1015). Proposed revegetation block around small dam. Needs re-ripping, not planted or fully fenced yet.

Bird species	Number of individuals	Field notes
Little Corella	2	flewover
Eastern Rosella	1	called
Torresian Crow	4	flewover
Crimson Rosella	2	perched
Noisy Friarbird	1	called in isolated eucalypt
Spotted Pardalote	1	called
Laughing Kookaburra	1	perched
Red-rumped Parrot	3	flewover
Noisy Miner	2	called, flew
Total bird species: 9 Total individual birds: 17		

Table 30: Avifauna recorded at Site 29: 'Innesfree', Long Swamp Road, near Imbota NR, 24 November 2017 (1050-1135). Western section is an existing revegetation strip 8 m W x 230 m L (0.26 ha), planted and fenced in October 2016 (very dry period), runs along a broad ridge. Eastern section is a proposed planting (240 seedlings) in a 10m W x 430 m L (0.6 ha) fenced strip to near Long Swamp Road, bordered by 6-year-old acacia and callistemon plantings on neighbouring property – still not planted at time of spring survey, but fenced. Located about 200-600 m from privately-owned woodland/forest that is connected to Imbota NR in a scattered tree landscape with areas of open paddocks, predominantly small hobby farms.

Bird species	Number of individuals	Field notes
Crimson Rosella	2	flewover
Dollarbird	1	nesting in adjacent paddock tree
Galah	2	called, flewover
Red-rumped Parrot	1	flewover
Black-faced Cuckoo-shrike	2	flewover
Common Starling*	1	flewover, nesting in nearby stag
Eastern Rosella	2	flewover
Fairy Martin	5	foraged above site and adjacent paddocks
Straw-necked Ibis	7	flewover
Little Corella	1	flewover
Tree Martin	5	foraged
Welcome Swallow	4	foraged
Whistling Kite	1	soared over E end
Total bird species: 13 Total individual birds: 34		

Table 31: Avifauna recorded at Site 30: Rock Abbey Road, Uralla, 25 November 2017 (1105-1125). Proposed revegetation strip 15 m W x 100 m L, fenced but not planted yet, runs 6 ripped rows wide east-west across upper slope. Woodland/forest remnants with Australian Blackthorn understorey occur nearby to property's north at 'Summer Hill' and adjoining lands. Strip occurs in paddocks devoid of remnant native vegetation. A bird species list is held for a nearby property in Rock Abbey Road. It contains 33 species including two threatened species – Varied Sittella and Diamond Firetail (courtesy SNEL/CWC Threatened Woodland Birds Project, 2014). Other bird records are held by InSight Ecology for 'Summer Hill' and a neighbouring property. These include the threatened Speckled Warbler, Varied Sittella, Diamond Firetail and Koala (InSight Ecology 2012a, 2018c). Light ESE wind, full sun, 22°C.

Bird species	Number of individuals	Field notes
Superb Fairy-wren	5	foraged, called in firethorn roadside
Silvereye	3	in fruiting firethorn clump
Willie Wagtail	1	on strip's internal fence
Pied Butcherbird	1	on fence
Eastern Spinebill	1	flew into firethorn clump
Torresian Crow	2	flew over site
Australian Magpie	3	foraged in strip, called
Total bird species: 7 Total individual birds: 16		

Plate 53: Proposed revegetation site (Site 30) across an upper slope in background with internal fencing erected, taken from Rock Abbey Road. Photo: InSight Ecology, 25/11/17.

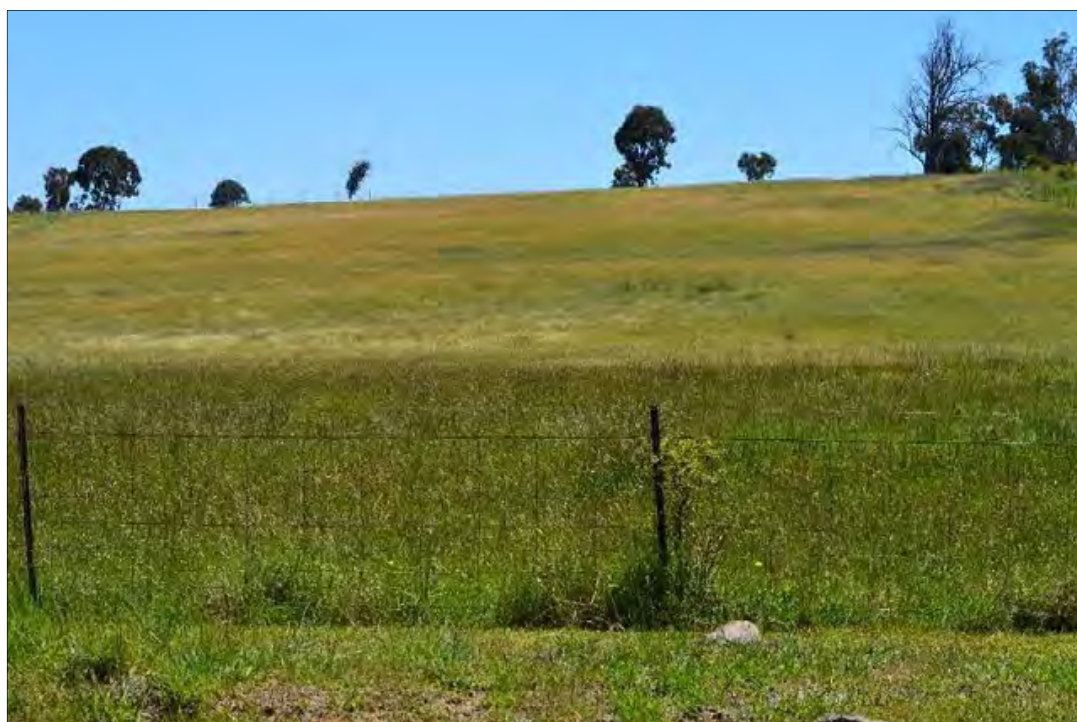




Table 32: Avifauna recorded at Site 31: 'North Mihi', Mihi, 24 November 2017 (0730-0900). Remnant stringybark forest on two interconnected ridges with scattered individual yellow box, white box and Blakely's red gum. Some old-growth and hollow-bearing stringybarks present with stags, fallen timber and leaf litter, particularly on the higher eastern ridge where recent storm damage has occurred. Lack of understorey on western ridge with native and introduced grasses dominating the ground layer, fallen branches and some rocks. The rocky eastern ridge features better natural regeneration of stringybarks and a blackthorn, acacias, dogwood and cough-bush *Cassinia quinquefaria* shrub layer with peach heath *Lissanthe strigosa* and kangaroo grass. This is the northern section of a larger stringybark forest remnant, arranged in a 'horseshoe'-shape with a cleared central valley and lower slopes and two dams. Proposal includes fencing of northern section into four paddocks to allow improved management of cattle grazing. Currently site has been lightly grazed and is fenced on northern side only. Southern section of the overall remnant surveyed by InSight Ecology in September 2016 and April 2017. First survey of northern section. Perfect morning – foggy and 6°C at 0630, calm, fog lifted and full sun from 0700, 11°C at 0900.

Bird species	Number of individuals	Field notes
Crimson Rosella	10	called, perched NW edge area, mate pursuits, likely starting to nest E side stringybarks
Noisy Miner	12	breeding, with 4 fledglings – NW edge
Noisy Friarbird	14	nesting, mate pursuits & territory defence, foraged in flowering stringybark forest
Willie Wagtail	1	foraged
Spotted Pardalote	5	males called, likely nesting
<b>White-throated Gerygone</b>	4	males called, foraged, likely nesting lower E side stringybarks
Eastern Rosella	2	foraged
Australian Magpie	5	foraged
Scarlet Honeyeater	13	males called, likely nesting, foraged in flowering stringybarks
Grey Butcherbird	2	called – W & E sides of forest
Torresian Crow	4	called, perched in stringybarks
Grey Fantail	1	foraged, called, likely nesting
Straw-necked Ibis	1	flew to perch E side
<b>Sacred Kingfisher</b>	2	likely pair nesting E side stringybark spout
Mistletoebird	3	foraged in flowering mistletoe, likely nesting
Eastern Spinebill	3	foraged in flowering mistletoe E side
<b>Brown Thornbill</b>	2	foraged in E side stringybarks
Rufous Whistler	2	calling males in stringybark forest
<b>Striated Thornbill</b>	7	foraged in mixed species group W side stringybarks, likely nesting
<b>Buff-rumped Thornbill</b>	4	foraged in mixed species group W side stringybarks, likely nested
Red Wattlebird	4	called, foraged, likely nesting, competed with friarbird, miner for stringybark, snow gum & yellow box nectar, E & W sides of site
Black-faced Cuckoo-shrike	2	foraged, inspecting nest sites in stringybarks
<b>Grey Shrike-thrush</b>	1	male called W side stringybark
<b>White-throated Treecreeper</b>	1	called fr stringybark nr W edge of site
Total bird species: 24 Total individual birds: 105		

Plates 54-55: Stringybark forest with individual older trees provided food, shelter and nest sites for a diverse range of woodland and forest birds on 'North Mihi' (Plate 54 – central eastern area). The western part of the horseshoe-shaped remnant (Plate 55 below) contained flowering mistletoe and eucalypts that attracted larger and small honeyeaters and other species that took insects attracted to blossoms and lerps on leaf surfaces such as pardalotes and gerygones. Photos: InSight Ecology, 24/11/17.



Plate 56: Buff-rumped Thornbill is a woodland/forest-dependent bird that searched for leaf insects including lerps in a small group in the canopy of stringybark on the eastern ridge of 'North Mihi'. Photo: InSight Ecology, 2/6/15 near Walcha.



Plates 57-58: The resident White-throated Treecreeper foraged for insects on and in the bark and on the branches of stringybarks and other trees at 'North Mihi' (Plate 57, left – Ron Litjens). The summer breeding migrant Sacred Kingfisher was recorded searching for suitable nest hollows in stringybarks on the eastern side of the site (Plate 58, right – fir0002, flagstaffotos.com.au)

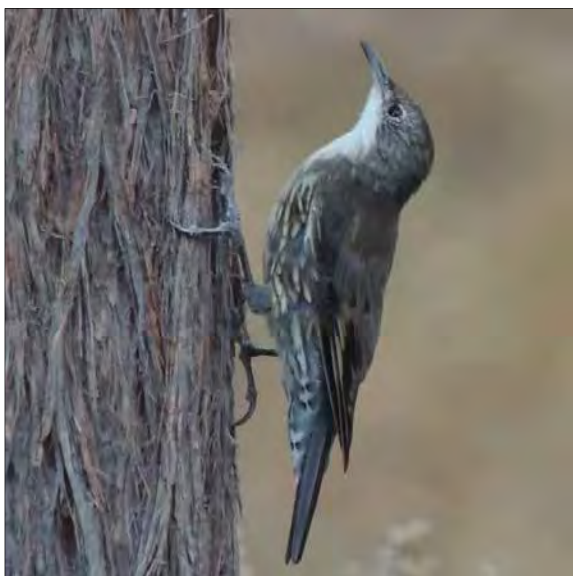




Table 33: Avifauna recorded at Site 32: 'Eastlake' (Site 1) – South Jacks Creek, 25 November 2017 (0955-1010). Proposed revegetation strip, 40 m W x 420 m L (1.8 ha) to extend upslope to connect with remnant Blakely's red gum-yellow box-apple box-stringybark-mountain gum-*Angophora floribunda* woodland on ridge adjoining neighbouring property. Site currently grazed, sheep camp on ridge, site scheduled for planting (1,800 seedlings) and fencing in August-September 2018. Surrounding landscape is a mosaic of revegetation strips and blocks, some connected across ridges and slopes and enhancing remnants, woodland/forest remnants, scattered paddock trees, cleared paddocks for cattle and sheep grazing and streams.

Bird species	Number of individuals	Field notes
Tree Martin	5	foraged
Laughing Kookaburra	1	called
Spotted Pardalote	1	called
Willie Wagtail	1	foraged, called
Eastern Rosella	3	flew over to ridge remnant
Total bird species: 5 Total individual birds: 11		

Table 34: Avifauna recorded at Site 33: 'Eastlake' (Site 2) – Gorge Revegetation, 25 November 2017 (0730-0740). Existing planted strip that connects Site 34 (small remnant woodland) with other revegetation and remnants to the south on 'Eastlake'. Surveyed by InSight Ecology in April 2017 before planting in September 2017. Calm, early fog then full sun, 11°C at 0730.

Bird species	Number of individuals	Field notes
Galah	5	flew over
Fairy Martin	2	foraged above
Tree Martin	2	foraged above, near Fairy Martin
Total bird species: 3 Total individual birds: 9		

Plates 59-60: Recently planted rows of acacia, eucalypts and other species at Site 33 help to connect small woodland remnants with older revegetation and remnants visible in the centre background on 'Eastlake' (Plate 59). This is part of an overall plan on this property to establish wildlife corridors for birds and other fauna over time. Plate 60 shows Site 33 plantings connecting with a snow gum remnant visible in the background. Photos: InSight Ecology, 25/11/17.





Table 35: Avifauna recorded at Site 34: 'Eastlake' (Site 3) – Gorge Remnant 1, 25 November 2017 (0745-0835). Small snow gum, New England peppermint and stringybark remnant on a rocky knoll adjoining northern end of Site 33 and south of Mihi Creek. Enhanced by direct seeding of acacia and plantings in late August 2017. Recently fenced to near southern creek bank. Not previously surveyed by InSight Ecology.

Bird species	Number of individuals	Field notes
Willie Wagtail	2	nesting pair obs. with nest material
Common Starling*	4	likely nesting in stag
Grey Fantail	1	foraged in snow gums
<b>Dusky Woodswallow</b>	4	pair obs. building nest 3 m up in snow gum
Tree Martin	3	foraged, called, mate pursuits, likely breeding
Fairy Martin	4	foraged, called, likely breeding
Crimson Rosella	2	perched in stringybark
Eastern Rosella	8	called, flew
Red Wattlebird	4	flew between remnants to S and N
Eastern Spinebill	2	immature birds flew into flowering snow gum
Yellow-rumped Thornbill	3	foraged along paddock-remnant edge, crossed gap to N
Spotted Pardalote	2	called, foraged in snow gum foliage
Torresian Crow	2	flew over
Yellow-faced Honeyeater	1	foraged, flew
<b>Varied Sittella</b>	4	flock foraged in stringybark & snow gum
Red-rumped Parrot	5	foraged within patch, flew
Welcome Swallow	2	foraged
Total bird species: 17 Total individual birds: 53		



Plates 61-63: Two conservation-significant bird species that were recorded at Site 34 were the threatened (in NSW) Varied Sittella (Plate 61, left) and declining and migratory Dusky Woodswallow (Plate 63, below). The latter species was observed carrying material to a nest 3 m off the ground in a remnant snow gum (Plate 62, right). Photos: Chris Kookaburra (Plate 61), InSight Ecology (Plates 62-63).





Table 36: Avifauna recorded at Site 35: 'Eastlake' (Site 4) – Gorge Remnant 2, 25 November 2017 (0745-0835). Stringybark with some yellow box remnant on northern side of Mihi Creek, extends to boundary with neighbouring property on hill, proposed for fencing and enhanced by direct seeding of acacia (some to 2-3 m tall) and 100 seedlings to be planted in spring 2019. Designed to function as a habitat stepping stone between Sites 32, 34 and 36. Not previously surveyed by InSight Ecology. Common Wallaroo detected grazing within remnant. Calm, sunny, 15°C at 0900.

Bird species	Number of individuals	Field notes
Noisy Miner	5	foraged, called, incl 2 juveniles
Crimson Rosella	2	perched, foraged in stringybarks
Australian Magpie	2	foraged
Eastern Rosella	2	foraged, called
Grey Butcherbird	1	called, perched
Rufous Whistler	2	adult pair foraged, called, possibly breeding
<b>White-throated Gerygone</b>	2	called territory, foraged
Scarlet Honeyeater	2	males called territory
<b>White-throated Treecreeper</b>	1	male called, foraged in stringybarks
Grey Fantail	1	called, foraged
Spotted Pardalote	2	called, likely nesting
Total bird species: 11 Total individual birds: 22		

Plate 64: Stringybark and yellow box remnant enhanced by direct acacia seeding and scheduled for revegetation and fencing – Site 35 on 'Eastlake'. Note some natural regeneration of stringybark in foreground following stock exclusion. Photo: InSight Ecology, 25/11/17.



Table 37: Avifauna recorded at Site 36: 'Eastlake' (Site 5) – Gorge-Hillview Road remnant, 25 November 2017 (0910-0940). Fenced 5 ha remnant woodland/forest – stringybark, narrow-leaved peppermint, flowering yellow box, ribbon gum, apple box, Blakely's red gum, with some old-growth trees including narrow-leaved peppermint (estimated 150-200-year-old), hollows, stags and fallen woody debris. Enhanced by direct seeding of acacia (4.5 km, August 2017) and planting of 130 seedlings in gaps between mainly stringybarks. Site 36 is 50-100 m W x 80 m W x 600 m L. Not previously surveyed by InSight Ecology.

Bird species	Number of individuals	Field notes
Noisy Miner	13	foraged, called, incl 4 fledglings, dominated flowering yellow box nectar flows
Australian Magpie	4	foraged, called, flew
Eastern Rosella	4	foraged
Crimson Rosella	2	foraged
Scarlet Honeyeater	2	foraged, called, likely nesting
Spotted Pardalote	2	called, likely nesting
Total bird species: 6 Total individual birds: 27		

Plate 65: Remnant stringybark, narrow-leaved peppermint, yellow box and Blakely's red gum (Site 36) showing living and dead trees, some affected by dieback, with direct seeded rows of acacia (August 2017). Photo: InSight Ecology, 25/11/17.

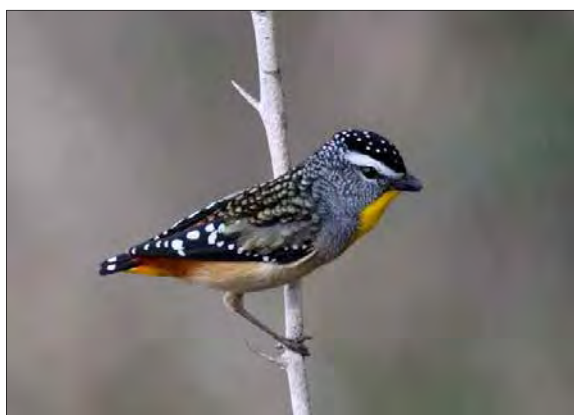




Plate 66: South-southwest corner of Site 36 showing a large stringybark within the fenced remnant, a lone yellow box in the paddock beyond, and a degree of habitat connectivity provided by remnant and planted sites, including Site 34, in the midground and background. This illustrates the approach undertaken on 'Eastlake' to progressively returning connectivity to this landscape. Photo: InSight Ecology, 25/11/17.



Plates 67-68: Spotted Pardalote is a tiny woodland/forest bird that gleans insects including lerps from leaf surfaces, often high in the canopy, coming down to build nest burrows in uncompacted earthen banks and in hollow branches. Plate 67 (L) - adult male (Lindsay Hansch), Plate 68 (R) - juvenile (Greg Clancy).





### 3.2 Birds in planted and remnant vegetation

Three separate age classes of revegetation were surveyed at sites in the spring 2017 program. These were young plantings of between 1 month and 5 years of age (total of 12 sites), intermediate-age plantings (6-15-year-old – 2 sites), and old established plantings aged between 16 and 25 years (2 sites). One habitat restoration site (Site 20) was also surveyed. Six (6) woodland/forest remnants were surveyed as reference sites against which the bird species composition and habitat structural complexity of revegetation sites could be compared over time. Table 38 shows the distribution of these classes, the restoration site and remnants among the surveyed sites and their member bird species. Many of these species were recorded breeding at surveyed sites – giving courtship displays, calling and/or defending breeding territory, building nests, sitting on nests or feeding dependent young out of the nest.

Table 38: Three different age classes of revegetation, an important grassland/wetland habitat restoration site and remnant woodland/forest reference sites surveyed during the spring 2017 program in the study area and their associated avifauna. \* introduced species. Species of conservation significance in the highly fragmented New England tableland landscape are indicated in bold. The threatened species (in NSW) is shown in italics and bold. Breeding records are shown by + after the bird's common name. Ages of revegetation at specific sites are provided in Tables 2-37.

Age class of revegetation surveyed at sites and bird species recorded			Habitat restoration site	Remnant woodland/forest reference sites
Young (1 month-5-year-old)	Intermediate (6-15-year-old)	Old established (16-25-yr-old) reference sites		
Site 4 – 'Chesterfield' Site 12 – 'Stoneleigh' Site 13 – 'Goobragandra' Site 14 – 'Goobragandra' Site 15 – 'Goobragandra' Site 18 – 'Bahati Park' Site 22 – 'Big Ridge' Site 23 – 'Big Ridge' Site 25 – 'Big Ridge' Site 27 – Innesfree Lane Site 29 – 'Innesfree' (west) Site 33 – 'Eastlake'	Site 6 – 'Chesterfield' Site 16 – Uralla Shire Council reserve	Site 7 - 'Lorien' Site 10 - 'Stoneleigh'	Site 20 – 'Chiswick' Lambing Gully (part-failed 2011 plantings, important grassy wetland, planned future restoration, revegetation)	Site 24 - 'Big Ridge' Site 26 - 'No Man's Land' Site 31 – 'North Mihi' Site 34 – 'Eastlake' Site 35 – 'Eastlake' Site 36 – 'Eastlake'
Eastern Rosella Australian Magpie+ Common Starling*+ Yellow-rumped Thornbill Red Wattlebird Fairy Martin Welcome Swallow Red-rumped Parrot Spotted Pardalote Yellow-faced Honeyeater Superb Fairy-wren+ Nankeen Kestrel+ Grey Fantail Silveryeye Yellow Thornbill+ Rufous Whistler White-throated Gerygone Galah Tawny Frogmouth	Spotted Pardalote Common Starling*+ Noisy Miner Fairy Martin Red-rumped Parrot Red Wattlebird Eastern Rosella Australian Magpie Nankeen Kestrel+ Crimson Rosella Straw-necked Ibis Grey Fantail+ Yellow-faced Honeyeater+ Superb Fairy-wren+ Rufous Whistler+ Yellow Thornbill+ Scarlet Honeyeater	Eastern Spinebill Welcome Swallow+ Yellow Thornbill Yellow-faced Honeyeater Spotted Pardalote Crimson Rosella Grey Fantail+ Willie Wagtail Rufous Whistler+ Red Wattlebird Australian Magpie Crested Pigeon Sulphur-crested Cockatoo Grey Butcherbird Superb Fairy-wren+ <b>Brown Thornbill+</b> <b>Grey Shrike-thrush+</b>	Fairy Martin Australian Magpie Magpie-lark Australasian Pipit+ Brown Quail+ Superb Fairy-wren+ Pacific Black Duck Australian Raven <b>Golden-headed Cisticola+</b> <b>Tawny Grassbird+</b> <b>Brown Songlark+</b>  Total: 11 species, 31 birds, 10 families	Australian Magpie+ Grey Butcherbird Noisy Miner+ Eastern Rosella Laughing Kookaburra+ Galah+ Scarlet Honeyeater+ Sulphur-crested Cockatoo Yellow-rumped Thornbill Rufous Whistler+ Yellow-faced Honeyeater Grey Fantail+ Fan-tailed Cuckoo Horsfield's Bronze-Cuckoo Shining Bronze-Cuckoo

Age class of revegetation surveyed at sites and bird species recorded			Habitat restoration site	Remnant woodland/ forest reference sites
Young (1 month-5-year-old)	Intermediate (6-15-year-old)	Old established (16-25-yr-old) reference sites		
Australasian Grebe+ Pacific Black Duck Grey Teal Little Corella Crimson Rosella Australian Wood Duck Torresian Crow Black-faced Cuckoo-shrike Tree Martin Willie Wagtail Australasian Pipit Noisy Miner Straw-necked Ibis <b>Dollarbird</b> Whistling Kite  <u>Total:</u> 34 species, 206 birds, 20 woodland bird families, 2 aquatic bird families.	<u>Total:</u> 17 species, 55 birds, 12 families	Laughing Kookaburra Silvereye <b>Striated Thornbill</b> Red-rumped Parrot Common Starling*  <u>Total:</u> 22 species, 81 birds, 14 families		Noisy Friarbird+ <b>Buff-rumped Thornbill+</b> Red Wattlebird+ White-throated Treecreeper Superb Fairy-wren+ Grey Shrike-thrush Crimson Rosella+ <b>Striated Thornbill+</b> <b>Brown Thornbill</b> Silvereye Willie Wagtail+ Spotted Pardalote+ <b>Dollarbird+</b> European Goldfinch* <b>Eastern Yellow Robin+</b> <b>White-throated Gerygone+</b> Torresian Crow Straw-necked Ibis <b>Sacred Kingfisher+</b> Mistletoebird+ Eastern Spinebill Black-faced Cuckoo-shrike+ <b>Dusky Woodswallow+</b> Tree Martin+ Common Starling* Fairy Martin+ Red-rumped Parrot <b>Varied Sittella+</b> Welcome Swallow  Total: 44 species, 337 birds, 23 families

Young revegetation supported the most number (206) of individual birds recorded in revegetation and remnants during the spring survey and a significant number of bird species (34). These were a mix of hardy birds typically found on farms such as Eastern Rosella, Australian Magpie, Noisy Miner and the introduced Common Starling and species able to forage in 4-5-year-old plantings from nearby paddock trees and exotic shrubs such as hawthorn and firethorn. The latter group included Superb Fairy-wren, Grey Fantail and Yellow-faced Honeyeater. These species tend to be habitat generalists or are less sensitive than other woodland birds such as robins and flycatchers to the effects of habitat fragmentation especially the presence of large gaps between vegetation cover, reduced woodland/forest patch size, increased predation and grazing pressure.

However, none of these birds were detected breeding in the older and thus structurally more developed plantings in this age class – Sites 4, 12 and 15. Also included in the young revegetation age class total were some aquatic species that foraged within the young plantings or rested on small dams near or adjacent to these sites.

In contrast, intermediate and old established revegetation each supported fewer numbers of birds and bird species than did the young plantings – 55 birds and 17 species at intermediate sites and 81 birds and 22 species in old established revegetation. A possible reason for this was that birds had dispersed more widely throughout the study area (and beyond) to search for mates and nest sites at this stage of the breeding season than they had during winter. Thus, these birds were less detectable and under-sampling (offset by increasing the number of sites surveyed) could have occurred at the sites monitored in spring. Also, seasonal fluctuations in food availability, predation and competition from other species (and for nest sites) are other plausible reasons for these observed differences in bird abundance and species richness.

The oldest revegetation surveyed - Site 10 at 'Stoneleigh' (25-year-old) - provided foraging, roost and nest sites that were not available in the younger plantings of smaller patch size and narrower width. This influenced the composition of bird species at this site which supported some birds found in remnant woodland/forest such as Grey Shrike-thrush, Brown Thornbill, Striated Thornbill, Grey Fantail, Rufous Whistler, Yellow-faced Honeyeater and Crimson Rosella.

Two remnants of high conservation value in the study area again produced high quality results in terms of bird species richness, abundance and breeding and supported birds not detected in young and intermediate-aged revegetation. These were an isolated, rocky woodland and shrubland remnant – 'No Man's Land' (Site 26) and a stringybark forest remnant at 'North Mihi' (Site 31). A core group of woodland and forest birds of moderate to high sensitivity to the effects of habitat loss and fragmentation were recorded breeding at these sites. These included Eastern Yellow Robin, White-throated Treecreeper, Buff-rumped Thornbill, Striated Thornbill and Grey Shrike-thrush. These are birds that require larger areas of habitat, higher structural complexity of habitat or have specific life cycle requirements such as the availability of suitable nest sites and food supplies more likely to be provided by larger remnants. Also, reduced competition from aggressive species such as Noisy Miner, introduced species that compete for nest hollows – Common Starling, and, possibly, lower predation pressure from butcherbirds and corvids in this larger remnant relative to small revegetation strips and blocks may have contributed to the presence of these generally smaller insectivores at remnants such as 'North Mihi'.

The threatened (in NSW) Varied Sittella and declining Dusky Woodswallow were recorded in a snow gum remnant at Site 34 on 'Eastlake'. The latter species was detected nesting at this site.

### 3.3 Differences in bird communities between seasons

Bird communities surveyed in the study area differed in terms of occurrence, abundance, species richness and habitat use between winter and spring. There were 22% more birds present in spring (994) than winter (775) and slightly more bird species in spring (69) than winter (65). This is expected during the breeding season when birds are moving into and out of areas in search of prospective mates, nest sites and food supplies.

The increased number of birds and bird species detected in young revegetation also reflected an increase in physical sample size. Sites that were effectively bare paddocks during the winter survey contained new plantings by the time of the spring survey. Therefore, an additional 8 sites containing 1-2-month-old plantings and one additional 3-year-old site (Site 15) were included in the spring survey round. This increased the size of the survey sample obtained in spring relative to winter.



Other differences detected between both seasons related to variation in bird utilisation of the different ages of revegetation and remnants, particularly for breeding. Older revegetation and the two larger remnants (Sites 26 and 31) provided greater woodland/forest area and a wider range of nest sites for woodland and forest-dependent bird species than did younger and intermediate-aged plantings (see Section 3.2).

### 3.4 Birds of conservation significance

A total of 13 species of State, regional or local conservation significance were recorded in the winter 2017 survey. One species of State conservation significance – the threatened (in NSW) Varied Sittella – was recorded foraging in a small flock in remnant snow gum woodland at Site 34 on 'Eastlake'.

Other species were of local conservation significance because of the extensive nature of loss, fragmentation and modification of their woodland and forest habitat across the study area and New England Tableland generally. These were Eastern Yellow Robin (only recorded at Site 26), Grey Shrike-thrush, Buff-rumped Thornbill, Striated Thornbill, Brown Thornbill, Dusky Woodswallow, White-throated Treecreeper, Dollarbird and White-throated Gerygone (see Table 38). A further 3 species were also considered locally conservation-significant because of their uncommon status in the area and habitat specificity – the grassland/wetland-affiliated Golden-headed Cisticola and migratory Tawny Grassbird and Brown Songlark, all recorded in Lambing Gully at 'Chiswick' (Site 20).

## 4. Discussion

### 4.1 Targeting habitat restoration action

Re-connecting indigenous 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 restorative 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 bird species still persist, where they occur and their habitat restoration requirements in the connectivity gap zone. The spring 2017 survey determined the composition and abundance of bird communities present at 36 sites in this zone and their use of revegetation and woodland/forest remnants. This established an important baseline for further site-based monitoring of bird responses to revegetation and habitat protection.

## 4.2 Bird communities in revegetation and habitat use

Avifaunal responses to revegetation surveyed in the study area were similar to those identified during previous studies undertaken locally and in other parts of the southern New England (see InSight Ecology 2012a, b, 2018c; Southern New England Landcare 2015). These identified three groups of terrestrial birds with different levels of sensitivity to variation in the amount, degree of cover (and thus age), structure and connectivity of planted vegetation. These were species able to exploit food, shelter and, where applicable, nest sites available in revegetation of young (1 month-5-year-old), intermediate (6-15-year-old) and old established (16-25-year-old) age classes.

Birds able to utilise young revegetation such as Eastern Rosella, Noisy Miner and Australian Magpie were typically less sensitive to narrow strips of plantings inserted in open paddocks than birds recorded in intermediate – for example, Yellow Thornbill, Superb Fairy-wren, Spotted Pardalote, and old established – e.g., Grey Shrike-thrush, Rufous Whistler, Brown Thornbill, revegetation. Birds recorded in young plantings were essentially resilient, open country species that visited these strips for short periods before moving on to forage in nearby isolated paddock trees and, in the case of Eastern Rosella, Noisy Miner and Common Starling, flew across open paddocks over distances of c. 100-600 m to reach roadside vegetation, isolated trees or other small in-paddock plantings.

Bird species able to forage in and move through intermediate-age plantings at ‘Chesterfield’ (Site 6) and ‘Chiswick’ Lambing Gully (Site 20) often did so because of the availability of sufficient foliage cover and food supplies. The proximity of these sites (c. 50-200 m) to small woodland remnants and/or other plantings also helped facilitate movement by Spotted Pardalote, Superb Fairy-wren and Yellow Thornbill within this landscape. This highlighted the importance of retaining a range of different habitat plantings or small stepping stones and standing dead and living individual paddock trees for woodland birds in areas like Harriet Gully and on ‘Big Ridge’.

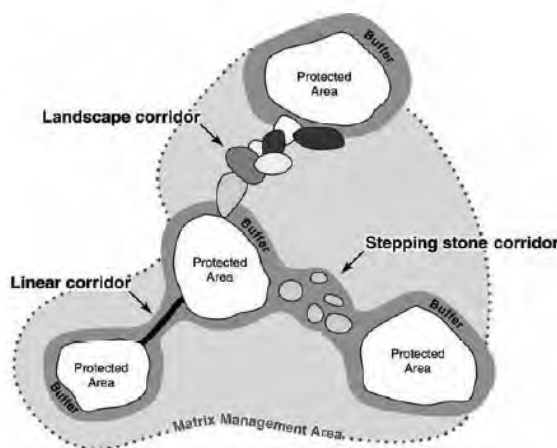
Old established plantings offered a wider range of foraging, refuge and, often, breeding resources for woodland birds than did both younger revegetation classes. Taller and thicker shrub and canopy layers provided more leaf, branch and bark substrates and most likely more invertebrates for insect-gleaning species such as Rufous Whistler, Striated Thornbill, Brown Thornbill and Yellow-faced Honeyeater than were available in the less advanced plantings. ‘Stoneleigh’ (Site 10) contained a floristically and structurally diverse range of 25-year-old plantings including introduced shrubs and trees. Twenty-year-old snow gum (with fruit), nectar-producing callistemon, grevillea and melaleuca and seeding native grass revegetation at ‘Lorien’ (Site 7) was foraged through intensively by Eastern Spinebill, Yellow-faced Honeyeater, Spotted Pardalote, Rufous Whistler and Crimson Rosella. Thus, the habitat structural complexity and food availability provided by these sites were able to attract some birds of woodland remnants – encouraging progress for habitat restoration in areas such as the extensively cleared Kellys Plains!

## 4.3 Connectivity conservation and revegetation design

Inserting new habitat for woodland birds into landscapes long-cleared of their remnant native vegetation takes time, money, long-term commitment, and, crucially, science-informed planning and design. The latter needs to be based on an understanding of the concept of ecological thresholds and principles of connectivity conservation for dispersal-limited species in highly

fragmented landscapes (see, e.g., Huggett 2005; Radford et al. 2005; Radford and Bennett 2007; InSight Ecology 2016). Figure 2 illustrates some key elements of connectivity conservation planning that should underpin the design of revegetation projects for woodland birds and other fauna – core remnants or protected areas, the landscape matrix management area (effectively the study area of local landscape scale restoration projects) and native vegetation acting as habitat stepping stones and linear and landscape corridors.

Figure 2: Some conceptual components of connectivity conservation spatial planning showing four types of revegetation design – linear corridor, landscape (larger) corridor, habitat stepping stones and buffer zones enhancing and protecting remnants (after Bennett 2004).



The metrics - size, length and width - and spatial arrangement of revegetation corridors and stepping stones has been discussed at length in the applied restoration ecology literature. Some have suggested that the length of corridors and the size of gaps within the corridors are more important than corridor width, based on dispersal studies of 5 New England Tableland woodland bird species across gaps (see Doerr et al. 2011). Others have maintained that Australian woodland bird movement is species-specific and that factoring in adequate corridor size, length, width and strategic landscape position in the design and implementation of revegetation projects to re-connect bird populations is recommended (see Huggett et al. 2004; Radford and Bennett 2007; Southern New England Landcare 2015).

The current project represents a balance between factoring in these important revegetation design considerations and what can be realistically achieved on the ground. Practical challenges to many landscape scale restoration projects are to enlist the participation of landholders located in key parts of habitat connectivity gaps and obtain enough ongoing funding to support this work. While the latter is nearly always a constraint, the Closing The Gap Project needs to be viewed as the continuation of an ongoing effort to re-connect key habitats for threatened and declining woodland birds and other fauna in the area.

## 5. Recommendations

There is a need to obtain more data to accurately determine the viability of existing faunal habitat linkages in the study area. Narrow planted strips along internal paddock boundaries can improve wind erosion and aesthetic values but, as we have seen in this study, may not allow dispersal-



and/or area-sensitive woodland birds to use them as local movement and habitat corridors. Careful planning using baseline data such as that provided in this and previous studies is therefore essential to re-connect previously isolated remnants for threatened and declining birds and other fauna.

Equally, the need to continue improving local community knowledge of the requirements of threatened and declining woodland birds, on-farm actions needed, and increasing their engagement in protecting these species and their habitat remains a high priority for landholders, landcare advisors and universities alike.

With this in mind, the following recommendations are put forward to assist in the informed protection and conservation management of threatened and declining woodland birds and their habitat in the study area. These are:

- Educate local landholders and communities on-the-ground about the requirements of threatened and declining birds, the need to protect and re-connect their woodland/forest habitats, and undertake monitoring and maintenance of plantings over time. All three workshops in Closing The Gap (CTG) Project provide this information and on-ground revegetation knowledge, based on actual revegetation and regeneration undertaken on key farms in the study area and the practical experiences of the landholders involved in this work;
- Establish best habitat restoration, revegetation practice and corridor re-connection demonstration sites in strategic parts of the landscape, i.e. where the need is greatest and has the best chance of being successfully implemented and maintained. The CTG Project has helped achieve this through the on-farm workshops which have demonstration sites as works-in-progress;
- Secure adequate funding to ensure both of the above actions happen and are sustained over time. Pursue new funding opportunities to build on progress with local community engagement in biodiversity conservation that has been achieved through this project;
- Ensure linkage with current and proposed habitat connectivity and on-ground habitat revegetation and restoration projects so that baseline data obtained in the CTG Project can be effectively used and community engagement and participation can be further developed;
- Implement photopoints, database management and education measures to ensure accurate and timely recording and measuring of project progress can be undertaken without onerous impost on financial and human resources. This work has been a central feature of the CTG Project;
- Promote knowledge transfer and communication of the results of projects focusing on the above actions throughout the NRM community and neighbouring landscapes/CMAAs through appropriate publicity and media mechanisms.

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