

Final Report:

# Bird Assessment Surveys in the Coorong, Lower Lakes and Murray Mouth Region 2015

Prepared for  
Department of Environment, Water and Natural Resources

Prepared By  
BirdLife Australia  
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# Introduction

## Background

The Vegetation Program is a five year (2011-2016) landscape scale habitat restoration project, jointly funded by the Commonwealth and South Australian Governments under the Coorong, Lower Lakes and Murray Mouth (CLLMM) Recovery Project. Initiated in response to the Millennium Drought, it aims to increase habitat, species diversity and ecological resilience in the Coorong and Lower Lakes RAMSAR listed wetland and surrounds so that these systems can better withstand the impacts of future droughts. The State of Environment Report (2011) defines resilience as:

**the capacity of a system to absorb disturbance and reorganise while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks.**

Bird surveys aim to document bird species diversity in remnant vegetation and revegetated sites of varying ages. This can then be used as a baseline to gauge the success of the Program in increasing habitat availability and species diversity. Birds are also appropriate to use as an indicator of the improved resilience of the ecosystem in the region (Bibby 1999).

Bird surveys were undertaken in 2013, 2014 and 2015 to gather baseline data on species distribution. This data will also be used to determine area of occupancy for individual species and explore the implications of different vegetation (ecosystem) types and age classes of revegetation on bird distribution and species retention in the CLLMM landscape. Over the course of the 3 years of bird surveys 171 sites have been surveyed - 62 in 2013, 49 in 2014 and 60 in 2015. Sites were selected to represent the dominant environmental settings in a range of landscapes, including remnant patches, restored patches and modified sites.

The current report provides the combined results of all three surveys.

## Scope

This project scope consisted of conducting bird surveys across sites determined by the Department of Environment, Water and Natural Resources (DEWNR) in remnant native, modified and restored vegetation across the CLLMM region.

The scope of the works was as follows:

- Assemble and coordinate a field crew for the bird surveys;
- Undertake field-based bird surveys at the identified sites;
- Enter bird survey data into the DEWNR supplied Microsoft Access database; and,
- Write a high-quality report summarising the bird survey results.



## Study Area

This project was undertaken in the Coorong and Lower Lakes region of South Australia, approximately 65 kilometres south-east of Adelaide (Figure 1). The Coorong is the name given to 130km of saltwater lagoons that are sheltered from the Southern Ocean by the coastal dunes of the Younghusband Peninsula. Along with Lake Alexandrina, Lake Albert and associated wetlands and the Murray Mouth (Coorong, Lower Lakes and Murray Mouth (CLLMM)) this area supports one of Australia's most important wetland areas. This region was listed as a Wetland of International Importance under the Ramsar Convention on Wetlands in 1985.

From the early 2000s, prolonged drought and continued elevated water diversions greatly reduced freshwater inflows to the system, compounding negative impacts of historical management and driving the CLLMM to a point of crisis (Kingsford *et al.* 2011). One of the results of the drought was the exposure of the lake bed soil. This was found to be highly acidic, causing widespread concern that when re-inundation occurred there was potential to cause widespread acidification in the region (CLLMM 2014). To combat this it was decided to increase the carbon content in the soils through a widespread revegetation project (CLLMM 2014). Whilst the potential mitigation effects to soil acidification was the major driver of the revegetation program, it was recognised that other positive biodiversity outcomes were possible.

More than 200 years of widespread land clearance, burning, grazing, and cropping has left much of the region in a degraded ecological state so once the immediate threat of soil acidification was addressed, the focus of the Vegetation Program moved from tackling acidification and stabilising the soil to restoring native vegetation communities, mitigating against the effects of erosion, and providing valuable habitat for the region's native animals, birds and fish (CLLMM 2014).

Bird surveys were undertaken at 171 sites located throughout the CLLMM region 2013-2015. Figures 1-6 present the distribution of these surveys. They are generally split between the east and west sides of Lake Alexandrina.

## Methodology

### Literature and Database Review

The following resources and databases were reviewed over the duration of the project. Each of the databases allows surveyors to prepare for on ground work by reviewing the bird species expected in the study region and familiarising themselves with key identifying features and calls. This preparation builds rigor into the field survey process, ensuring correct bird species identification occurs. Databases reviewed included:

- BirdLife Australia's Atlas Project Database. This is a long term database managed by BirdLife Australia. The atlas has been running in its current form since 1998



and holds over 7 million individual bird records. For further information see <http://www.birdlife.org.au/projects/atlas-and-birddata>;

- BirdLife Australia's Shorebirds 2020 Database. This is another database managed within BirdLife Australia. The database was established in the early 1980s and focuses on migratory and resident shorebirds. For further information see <http://www.birdlife.org.au/projects/shorebirds-2020>;
- The Atlas of Living Australia (ALA). The ALA is an online resource that provides access to millions of records of Australian biota. It has a focus on citizen science, but provides a useful resource for compiling inventory list or area. For further information see <http://www.ala.org.au/> ;
- Department of the Environment (DoE) Protected Matters Search Tool which identifies matters of National Environmental Significance (e.g. listed fauna species, ecological communities and Ramsar wetlands) protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (DoE 2014);

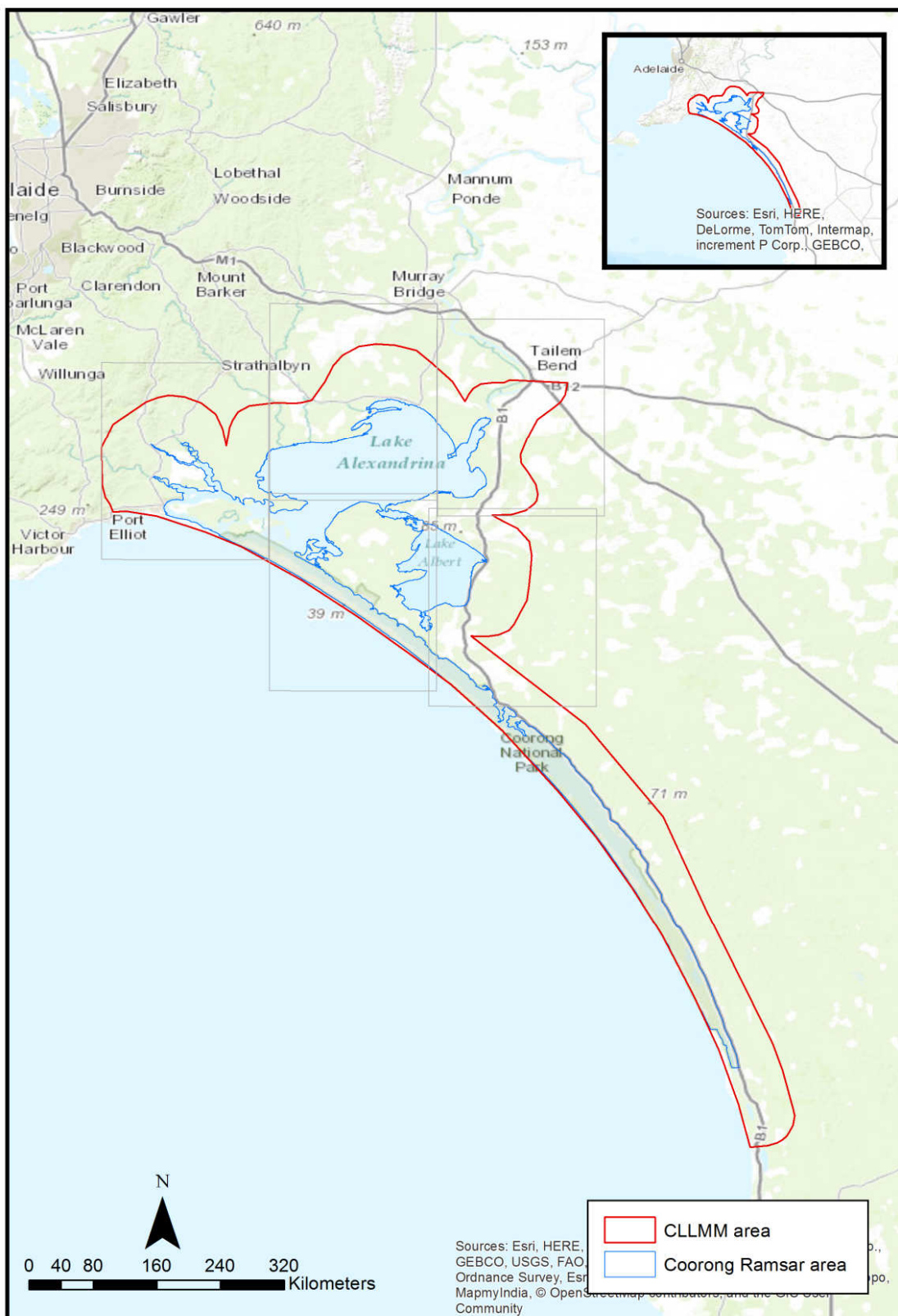
## Field Surveys

Bird surveys were undertaken at 171 sites located throughout the CLLMM region as defined by DEWNR. Bird surveys were all conducted in spring (September – November) in 2013, 2014 and 2015. Due to the distribution of the sites within the CLLMM region, sites were surveyed in groups east or west of Lake Alexandria and Lake Albert. Figures 1-6 show the distribution of the 171 survey sites. Numbers identify each of the survey sites. Information on vegetation community, treatment and age class (see below for details) for each site can be found in Appendix 1.

Landowners were contacted up to one week prior to each site visit or as specified, following initial induction and introduction by DEWNR. Sites were accessed by either vehicle or on foot, depending on the proximity of the site to the nearest public road or landholder's private access point. All assessments were undertaken on foot with 10x42 binoculars.

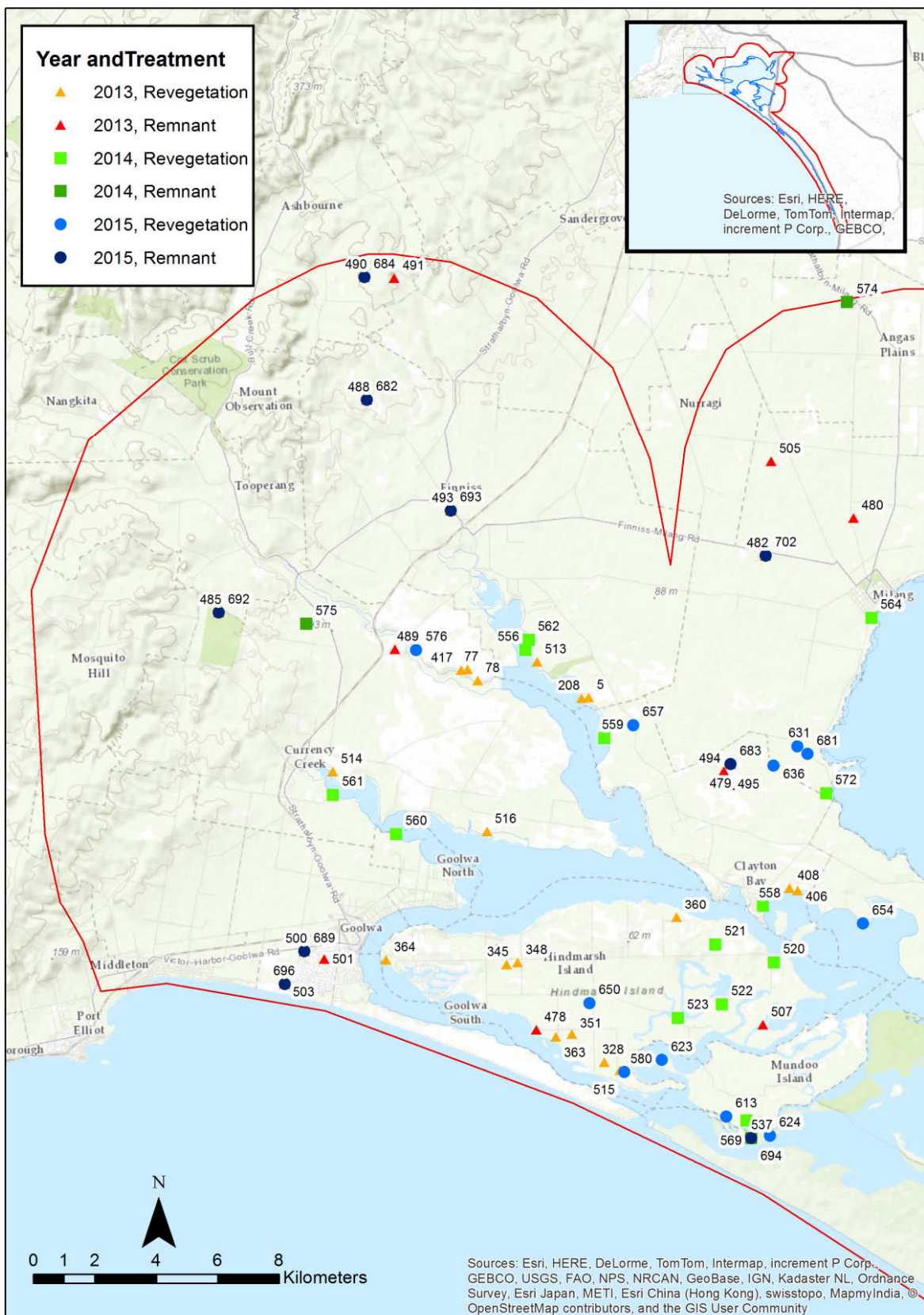
The majority of surveys were undertaken by two teams of two. Due to time constraints some surveys were undertaken by single observers (this data is available in the associated database).





**Figure 1. Overall study landscape showing CLLMM area and Ramsar area. Grey squares correspond to the following higher resolution site maps**





**Figure 2. Survey site locations around Goolwa, Hindmarsh and Mundoo Islands, Finniss and Milang**

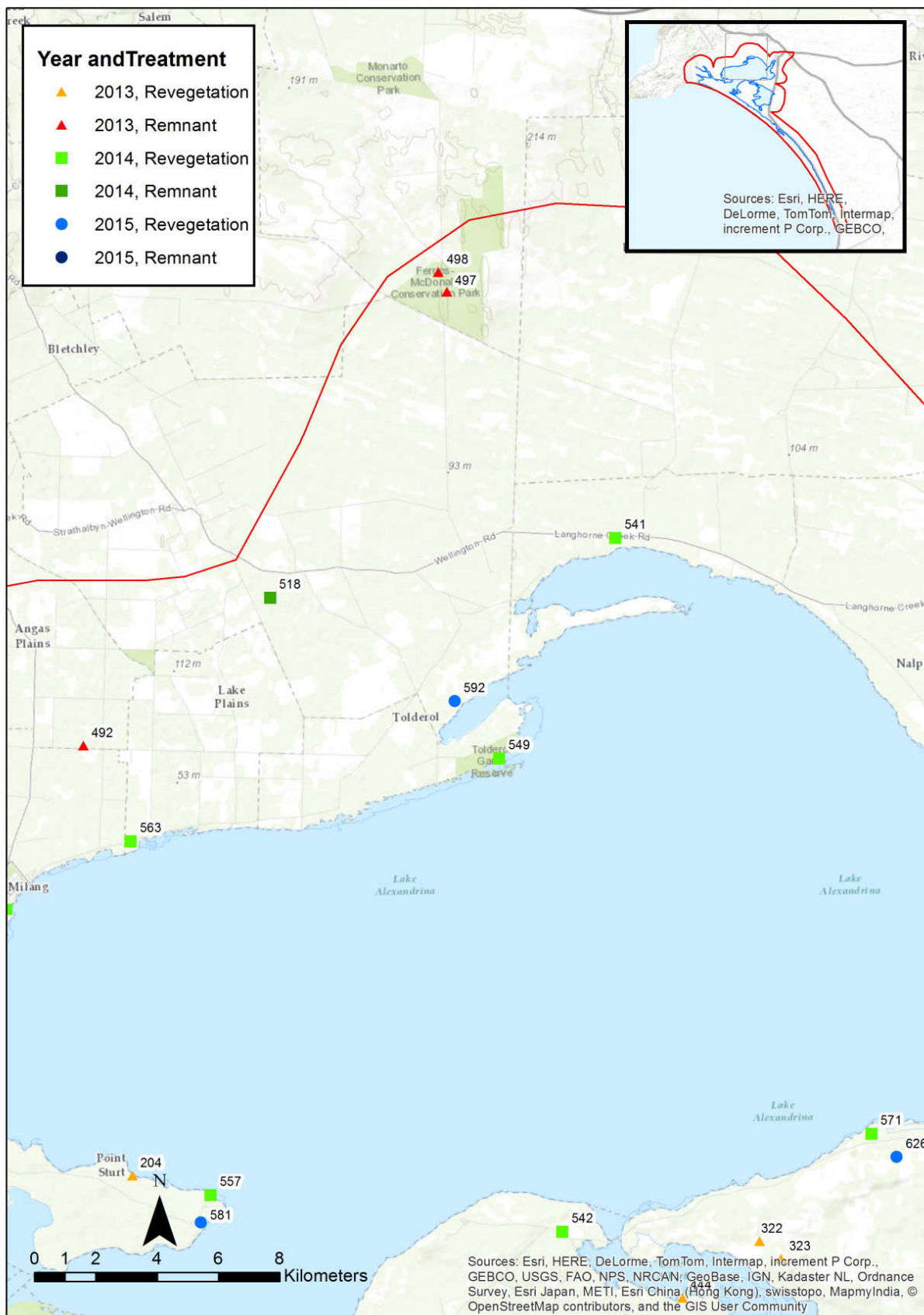


Figure 3. Survey site locations around Point Sturt and northern Lake Alexandrina

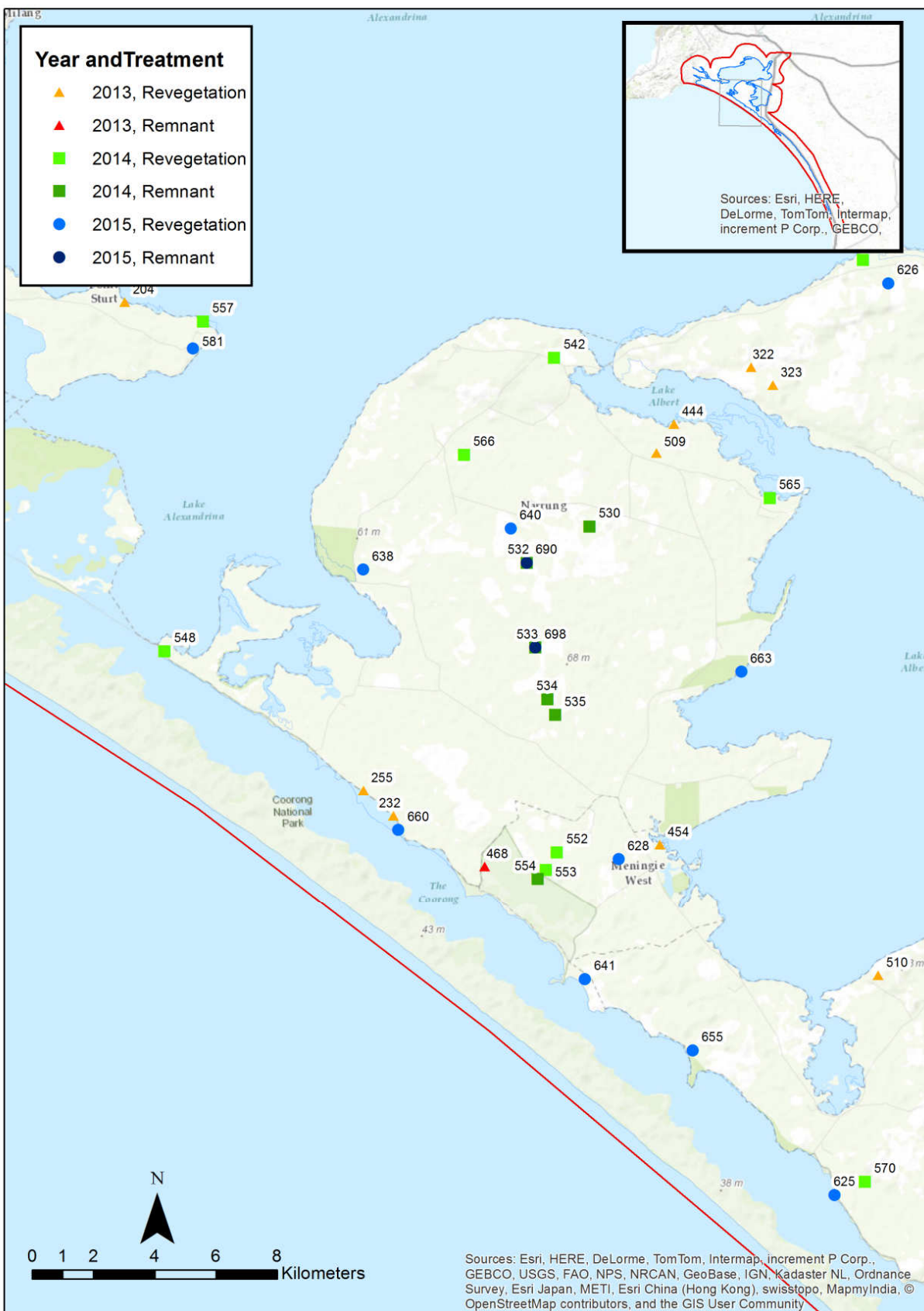
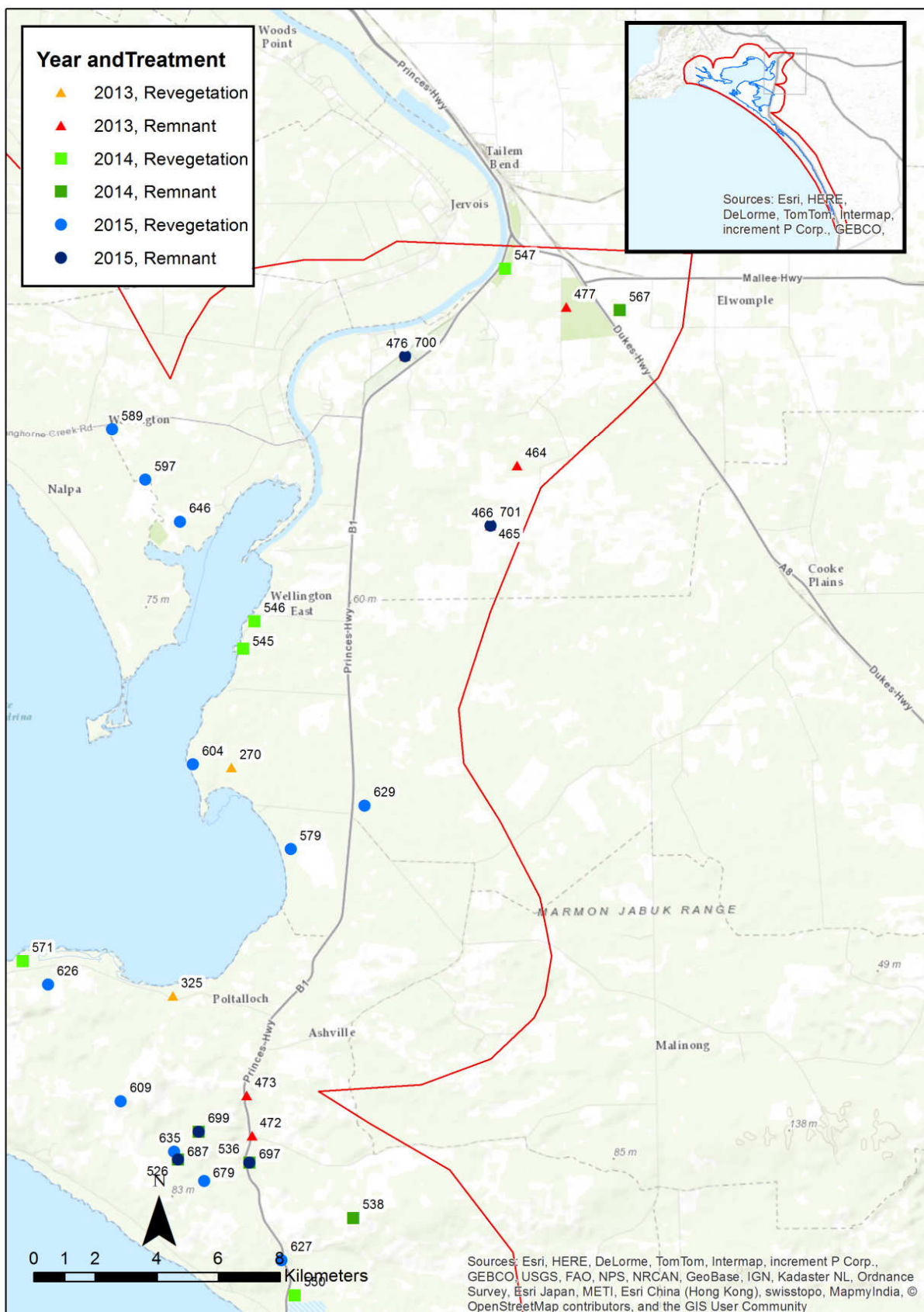
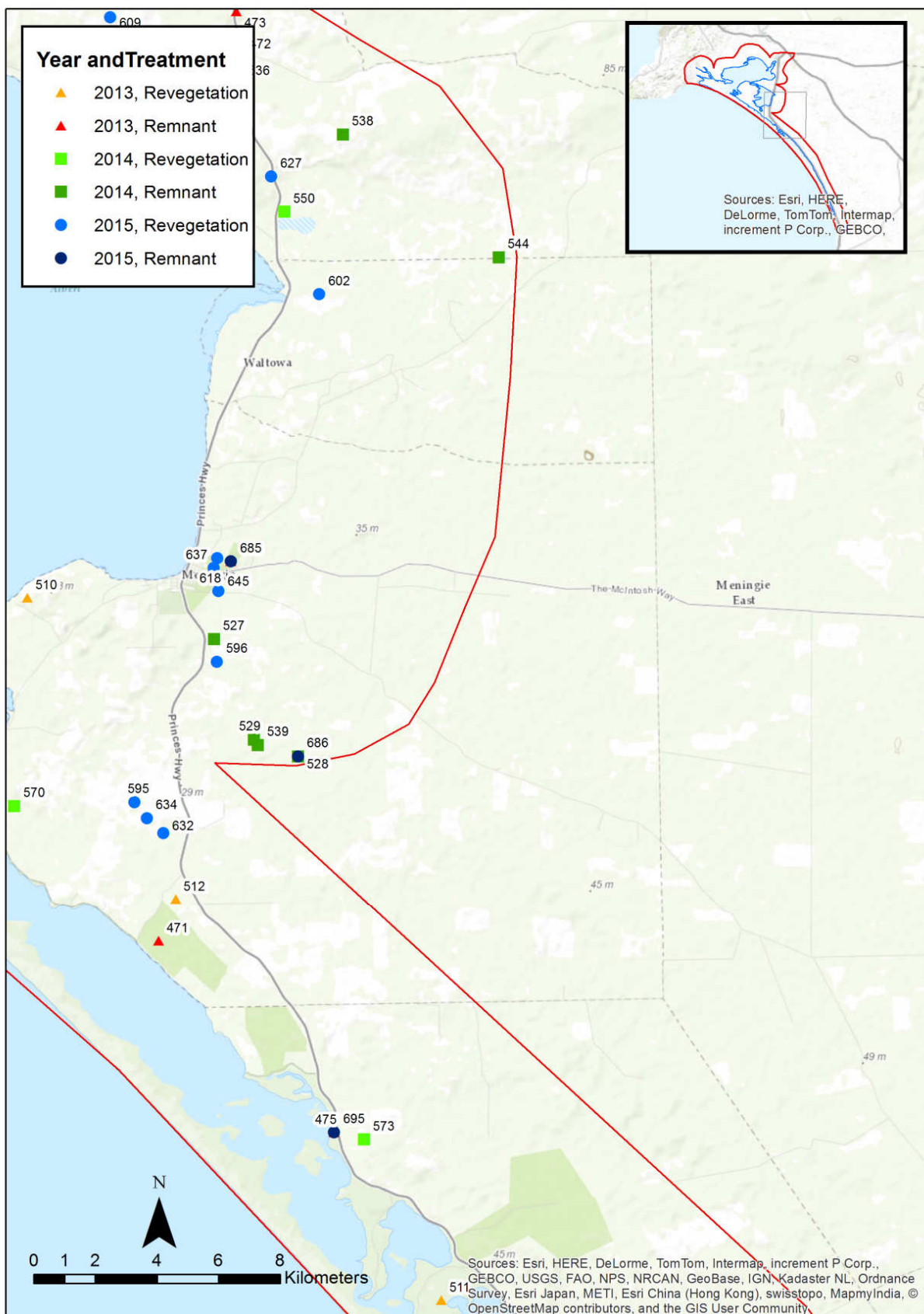


Figure 4. Survey site locations around Nurrung





**Figure 5. Survey sites around the north-east of Lake Alexandrina**



**Figure 6 Survey sites around Meningie and south along the Coorong.**



Methodology implemented was as per the original project brief, and is outlined below:

### **Structured surveys:**

- The survey areas consisted of pre-determined two hectare sites. GPS waypoints were provided for each site to locate the centre point of the survey area. For non-circular sites maps were provided of the survey area.
- Weather conditions and any other observations relevant to the visit (e.g. flowering species) were recorded at the start of each survey.
- At each site a 20 minute search for bird species over a 2 hectare area surrounding the waypoint (= 80 metre radius) was undertaken.
- The species observed, including whether they was in or out of the assessment area, method of observation and any notes relating the species (e.g. feeding, flying etc) were recorded onto the datasheets provided by DEWNR.
- Bird record are defined as either onsite (that is the bird was recorded within the 2ha survey area within the 20min survey period) or off site (bird was recorded outside the defined 2ha area but within the 20min survey period, bird was recorded within the 2ha area but outside the 20min period or bird was recorded in the proximity of the survey area but was neither within the 2ha area or recorded during the 20min survey period).
- Records included both observed and heard species within the 2ha plot. Reference calls were available through portable devices and used to confirm ambiguous or novel bird calls.
- Each site was visited on three separate occasions. The original brief in 2013 was to conduct the three visits on three different mornings. However after initial surveys in 2013 it was negotiated to undertake two morning and one afternoon survey for each site, which is how 2014 and 2015 surveys were also run. Most sites were visited on three different days, however there were 12 sites (11 in 2013 and 1 in 2014) that had morning and afternoon surveys completed on the same day. This was undertaken to ensure completion of surveys within set timeframes, as well as necessary due to access issues.
- Morning surveys were generally commenced within 4 hours of sunrise, unless weather conditions were suitable for further surveys to be undertaken after this time (i.e. mild conditions, birds still actively calling, detectability unchanged from early morning).
- Evening surveys were generally conducted within 4 hours of sunset.
- Bird species observed on site were recorded on the datasheet once per visit.
- Any observations of other vertebrate species that could be identified were also recorded (e.g. rabbits, goats, deer, or kangaroos from tracks, scats, skeletons etc.).



- 5 minutes at the end of the 20 minute bird survey were used to look for signs of other vertebrate species. These were recorded on the same datasheet using the same codes.

### **Opportune records:**

Opportune records are those where bird species are seen outside of defined survey sites and survey periods. These are recorded as species that occur in the landscape may otherwise be missed during systematic surveys, particularly high conservation value or cryptic species. By making opportune records a fuller inventory of the species diversity in the CLLMM region is obtained. For the purposes of this survey opportune species were noted to assist in the identification of sub-landscape distributions of species that are characteristic of the area. When taking opportune records, surveyors spent 30 seconds recording any other species that were detectable in the immediate area around each defined survey site.

Opportune records were recorded straight onto the same datasheet using Waypoint IDs that were pre-assigned to individual observers.

Whilst species recorded opportunistically have been included in the overall species list, if they were not recorded during the fixed 20min 2 ha surveys, they have not been included in the analysis below (unless otherwise stated).

### **Data Analysis**

For the purposes of this report only species recorded onsite during the 20min 2ha survey have been included in the summary statistics. Species recorded as “fly overs”, that is species that are recorded in the sky above sites during survey periods but aren’t actually using the survey area, for example large groups or ibis seen flying in formation between water bodies, have also been excluded from the site statistics. These species are not in essence utilising the site and skew survey results. Species recorded flying below the canopy (when one is present) or at ground level across an open site but not necessarily landing within the site, or bird species observed hunting over the survey area are included as being present on site.

As this is the final year of baseline surveys funded under the CLLMM Vegetation Program, summary statistics are presented generally as pooled for the duration of the study. Whilst some annual summaries have been included in this report, differences in the vegetation communities, age classes of revegetation and number of sites surveyed among years limits the ways in which this data can be used.

Summary statistics presented are species accumulation curves and mean numbers of species across treatments and vegetation communities. Reporting rates have also been calculated for each species.





Accumulation curves are a way to assess if survey effort has been sufficient to detect the maximum number of species expected in a survey region. Previously unrecorded species are added to an overall total (accumulation). Over time, as survey numbers increase, the total count of species recorded increases. Once the accumulation curve flattens out (asymptotes) it indicates that the majority of species likely to be recorded have been. Continuing survey effort is unlikely to result in significant increases in the number of species recorded. Conversely, if the curve does not flatten out, then the maximum likely species have not been recorded. Ideally survey effort should continue until the curve asymptotes.

Reporting rates are a standardized measure of the frequency at which a species of bird is recorded. The reporting rate for a bird species is calculated by dividing the total number of times a species has been recorded across all surveys by the total number of survey undertaken.

Summary statistics have been derived for treatments, vegetation community and age class of revegetation. Treatment refers to Remnant or Revegetation sites; vegetation community corresponds to Ecosystems defined by Jellinek and Te (2015).

## **Vegetation Community and Age Class**

Data has been summarised by both vegetation community and age class of revegetation. Vegetation communities (Ecosystems) were identified using Jellinek and Te (2015). In consultation with DEWNR, bird data relating to specific vegetation communities were pooled based on their similarity to other vegetation communities. Generally these pooled communities had low replication rates within and/or between years. For the purposes of this report Vegetation communities have been pooled as follows:

- Community 2 pooled into community1  
These communities were similarly dominated by *Eucalyptus fasciculosa* (Pink Gum) and *E. baxteri* (Cup Gum)
- Community 6.1, 6.2, 6.3 and 6.4 combined into 6  
These communities were largely Mallee communities dominated by a variety of eucalypt species
- Community 7 pooled with 10.1.  
These were wetter communities dominated by fringing wetland vegetation

Table 1 taken from Jellinek and Te (2015) provides the definitions of each of the vegetation communities.

Table 2 provides a summary of the number of sites surveyed for the CLLMM baseline bird surveys within each of the vegetation communities across the three year survey period.



**Table 1 Overview of each of the Vegetation Communities surveyed**

Vegetation Community	
1. <i>Eucalyptus fasciculosa</i> (Pink Gum) Low Open Grassy Woodland of the Mount Lofty Ranges*	
2. <i>Eucalyptus cosmophylla</i> (Cup Gum) / <i>E. baxteri</i> (Brown Stringybark) Woodland over heath of the Mount Lofty Ranges	
3. Coastal Shrubland of the Coorong	
4. <i>Eucalyptus diversifolia</i> (Coastal White Mallee) Mallee	
5. <i>Allocasuarina verticillata</i> (Drooping Sheoak) low woodland with shrubby understorey	
6. Mixed <i>Eucalypt</i> Woodland / Mallee	
	6.1 <i>Eucalyptus porosa</i> (Mallee Box) Grassy Woodland*
	6.2 <i>Eucalyptus odorata</i> (Peppermint Box) Grassy Woodland*
	6.3 <i>Eucalyptus incrassata</i> (Ridge Fruited Mallee) / <i>E. leptophylla</i> (Narrow Leafed Red Mallee) +/- <i>E. socialis</i> (Beaked Red Mallee) Mallee
	6.4 <i>Eucalyptus leucoxydon</i> ssp. (SA Blue Gum) Grassy Woodland*
7. Freshwater fringing wetland community	
8. <i>Duma florulenta</i> (Lignum) Shrubland	
9. Samphire +/- <i>Melaleuca halmaturorum</i> (Swamp Paper-bark) Shrubland*	
10. Other	
	10.1 <i>Gahnia filum</i> sedgeland
	10.2 <i>Eucalyptus camaldulensis</i> var. <i>camaldulensis</i> (Red Gum) grassy woodland
	10.3 Grassland community
	10.4 <i>Allocasuarina verticillata</i> (Sheoak) & <i>Callitris gracilis</i> (Native Pine) non eucalypt grassy woodland*

\* Denotes vegetation communities identified by Bonifacio *et al.*, (2014) as priority for habitat restoration, including revegetation.

**Table 2 Survey effort across ecosystem types with years**



Vegetation Community	2013	2014	2015	Total
1 <i>Eucalyptus fasciculosa</i> (Pink Gum) Low Open Grassy Woodland	12	2	7	21
3 Coastal Shrubland of the Coorong	3	3		6
<i>Eucalyptus diversifolia</i> (Coastal White Mallee) Mallee	6	7	14	27
5 <i>Allocasuarina verticillata</i> (Drooping Sheoak) low woodland	15	9	5	29
6 Mixed <i>Eucalypt</i> Woodland / Mallee	8	10	11	29
9 Samphire +/- <i>Melaleuca halmaturorum</i> (Swamp Paper-bark) Shrubland	9	9	14	32
10.1 <i>Gahnia filum</i> sedgeland	1	2		3
10.2 <i>Eucalyptus camaldulensis</i> var. <i>camaldulensis</i> (Red Gum) grassy woodland	1	1		2
10.3 Grassland community	1			1
10.4 <i>Allocasuarina verticillata</i> (Sheoak) & <i>Callitris gracilis</i> (Native Pine) non eucalypt grassy woodland	6	6	9	21
<b>Total</b>	<b>62</b>	<b>49</b>	<b>60</b>	<b>171</b>

Also defined were 3 age classes within the Revegetation sites. These differ slightly to age classes used in previous years, taking into consideration the final spread of surveys across the three year period. These periods are:

- < 1yr old
- 1-5yrs old
- >5yrs

Survey effort across age classes is presented in Table 3.

**Table 3 Survey effort across Ecosystem Types, Treatments and Age Classes**

Vegetation Community	Remnant	Revegetation			Total
		< 1yr	1- 5yrs	>5yrs	
1. <i>Eucalyptus fasciculosa</i> (Pink Gum) Low Open Grassy Woodland	12	1	8		21
3. Coastal Shrubland of the Coorong			4	2	6
4. <i>Eucalyptus diversifolia</i> (Coastal White Mallee) Mallee	10	3	12	2	27
5. <i>Allocasuarina verticillata</i> (Drooping Sheoak) low woodland	6	1	20	2	29
6. Mixed <i>Eucalypt</i> Woodland / Mallee	16	2	10	1	29
9. Samphire +/- <i>Melaleuca halmaturorum</i> (Swamp Paper-bark) Shrubland	11	2	17	2	32
10.1. <i>Gahnia filum</i> sedgeland			3		3
10.2. <i>Eucalyptus camaldulensis</i> var. <i>camaldulensis</i> (Red Gum) grassy woodland	2				2
10.3. Grassland community	1				1
10.4. <i>Allocasuarina verticillata</i> (Sheoak) & <i>Callitris gracilis</i> (Native Pine) non eucalypt grassy woodland	12	4	5		21
<b>Total</b>	<b>70</b>	<b>13</b>	<b>79</b>	<b>9</b>	<b>171</b>



## Results

Across the three survey periods 208 species were recorded. This includes all records, including incidental observations. Of these 183 were bird species, with the remaining 24 species comprising of 12 mammals, 9 reptiles and 4 amphibian species. A full species list is provided in Appendices 2 and 3. There was some variation seen between years as seen in Table 4.

**Table 4. Overall counts of vertebrate species recorded across the CLLMM region. Includes all records (systematic surveys, off survey records and incidental sightings).**

	<b>Total species count</b>	<b>Birds</b>	<b>Amphibians</b>	<b>Reptiles</b>	<b>Mammals</b>
2013	168	155	1	6	6
2014	150	135	2	2	11
2015	151	137	2	5	7

Bird species accumulation can be seen in Figures 7 – 9. Presented is the overall bird species accumulation for the three year study, as well as annual breakdowns. The combined three year species accumulation curve (Figure 7) indicates that for this study the survey effort has, at a landscape scale, been sufficient to detect the majority of species occurring across the landscape. This is seen by the flattening of the curve, which indicates few new species being recorded and subsequently added to the accumulation. For all curves the blue line is the total species count which includes off site and incidental records, and the red shows the species accumulation onsite only. Figure 8a-c are the accumulation curves for each year of the survey period.

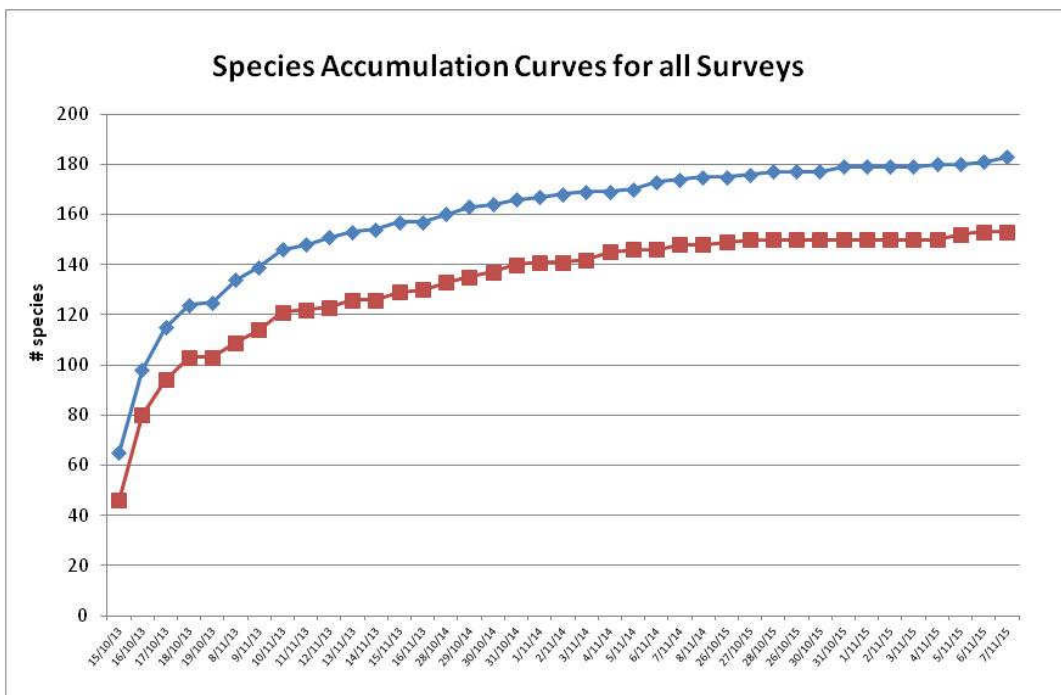
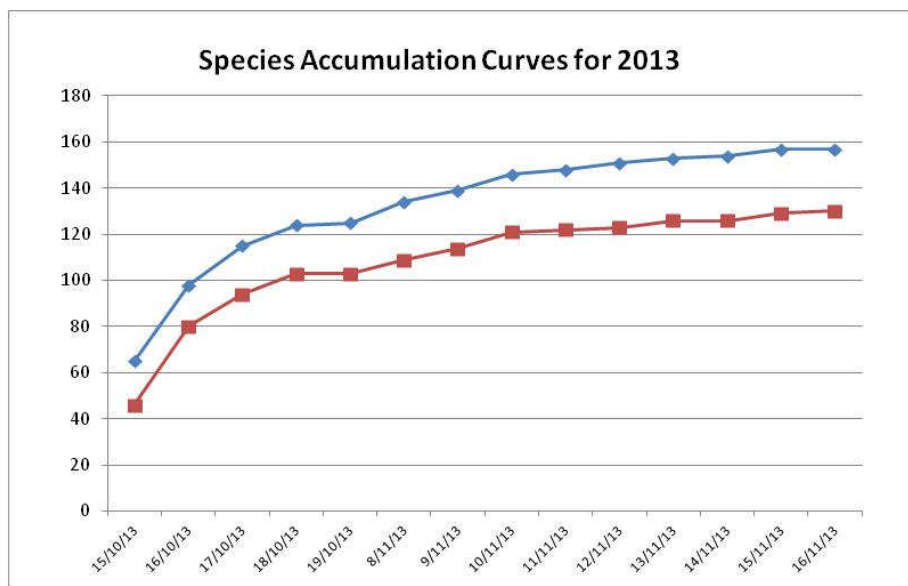
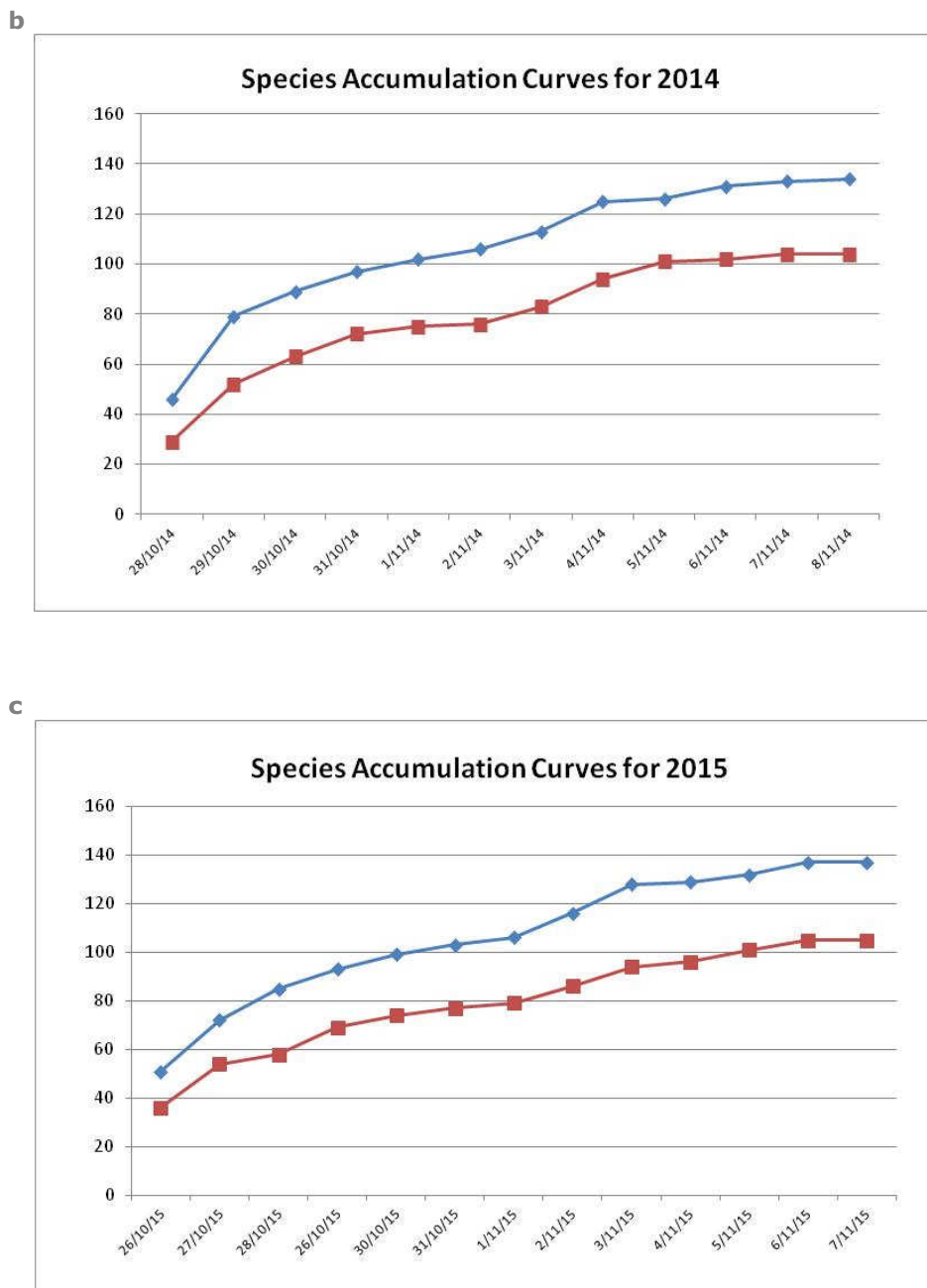


Figure 7 Species accumulation for all surveys undertaken across the CLLMM region between 2013 -2105. Blue diamonds show the total number of bird species recorded, whilst red squares are onsite species only.

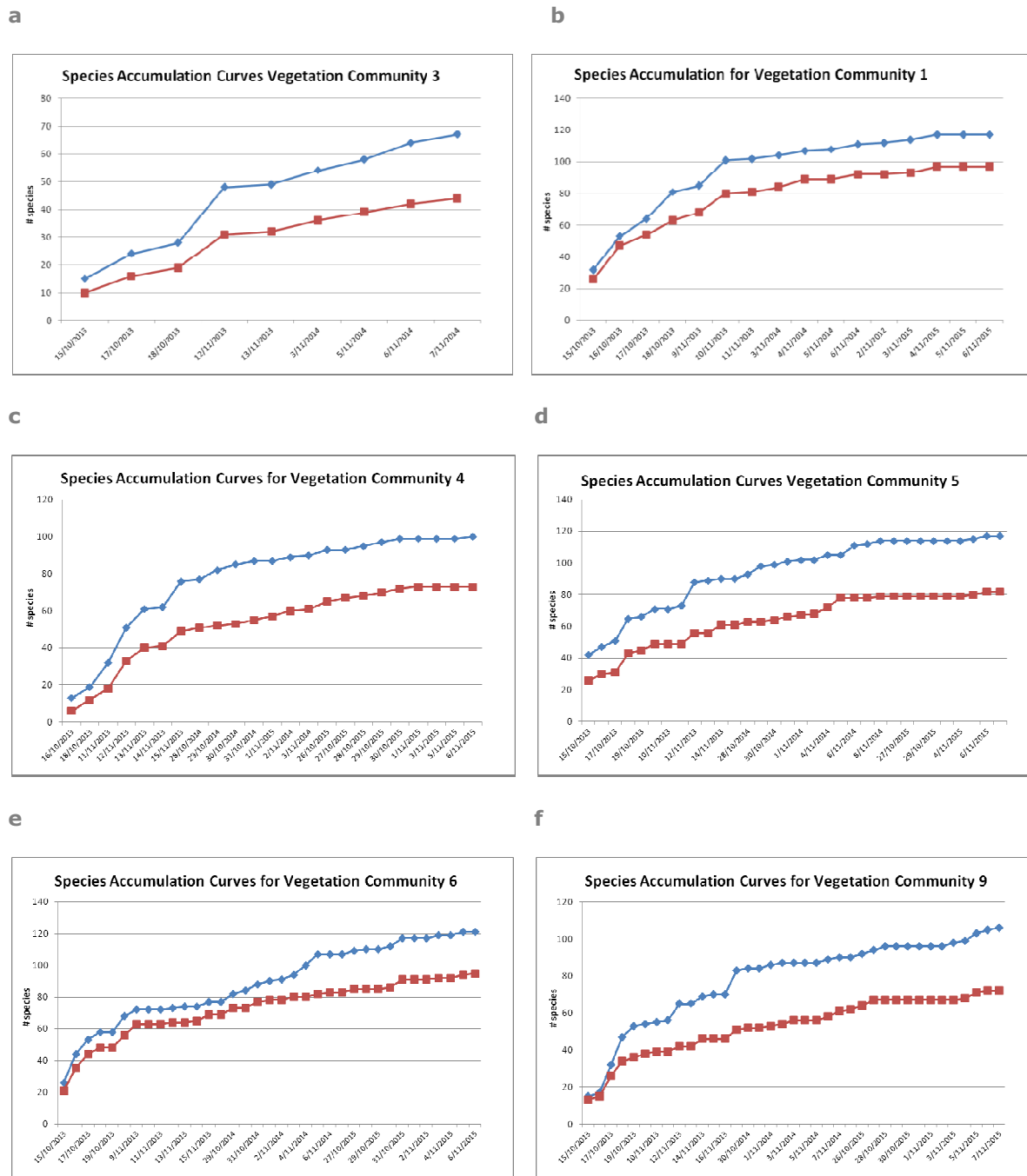
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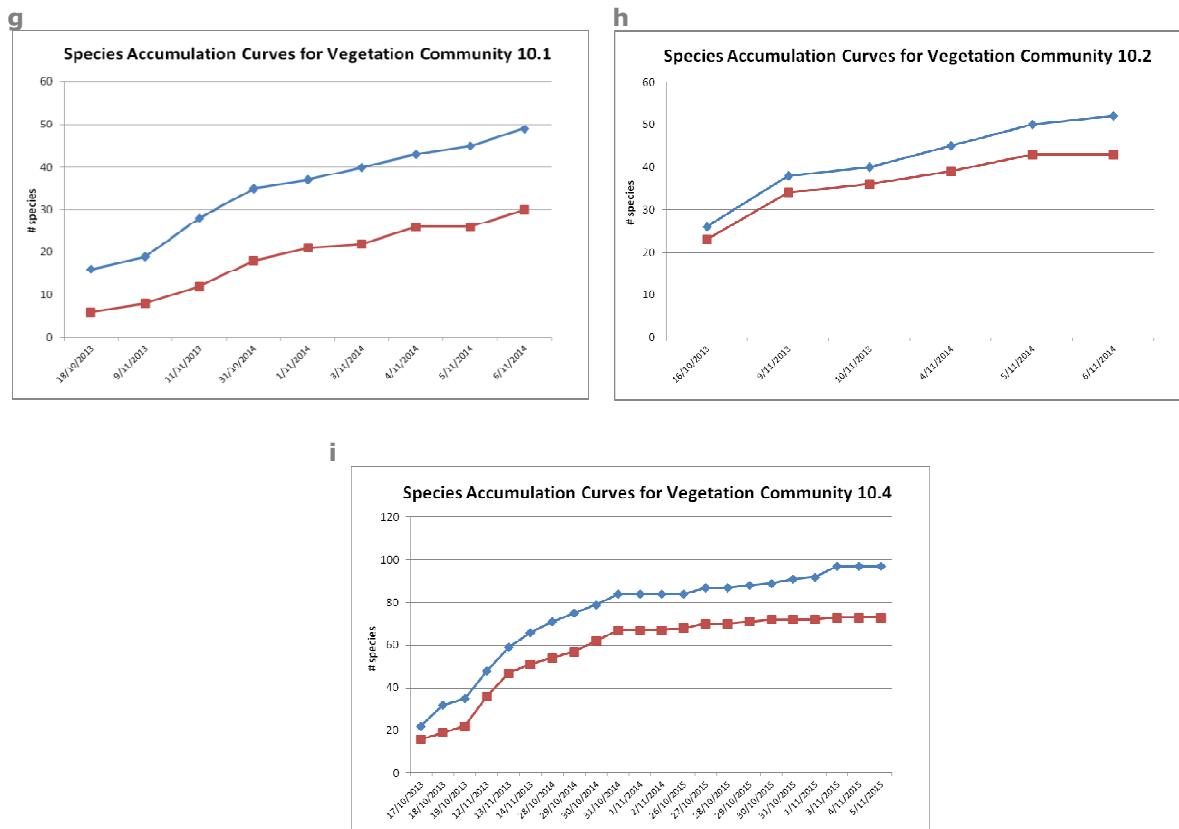
**Figure 8 a-c Species accumulation for surveys undertaken across the CLLMM region between 2013 - 2105. Blue diamonds show the total number of bird species recorded, whilst red squares are onsite species only.**

Similar exploration of the data was undertaken for the vegetation communities surveyed for this project (Figure9a-i). Vegetation communities 3, 10.1, 10.2 and 10.3 are under sampled, however this was unavoidable as the distributions of these vegetation communities within the landscape is extremely limited.



**Figures 9 a-j. Species accumulation curves for vegetation communities1-10.4. All surveys undertaken in the CLMM region 2013-2015 are included. Blue diamonds show the total number of bird species recorded, whilst red squares are onsite species only**





**Figures 9 a-i continued. Species accumulation curves for vegetation communities 1-10.4. All surveys undertaken in the CLLMM region 2013-2015 are included. Blue diamonds show the total number of bird species recorded, whilst red squares are onsite species only**

## Species Richness

As in other years, generally greater numbers of species were recorded per survey within the remnant sites than revegetation sites (Figures 10 - 18). When looking at the differences in the age classes of revegetation compared to remnant sites, species diversity increase with time since planting (Figure 12). The species diversity across each vegetation community with age class is presented in Figures 13 -18.

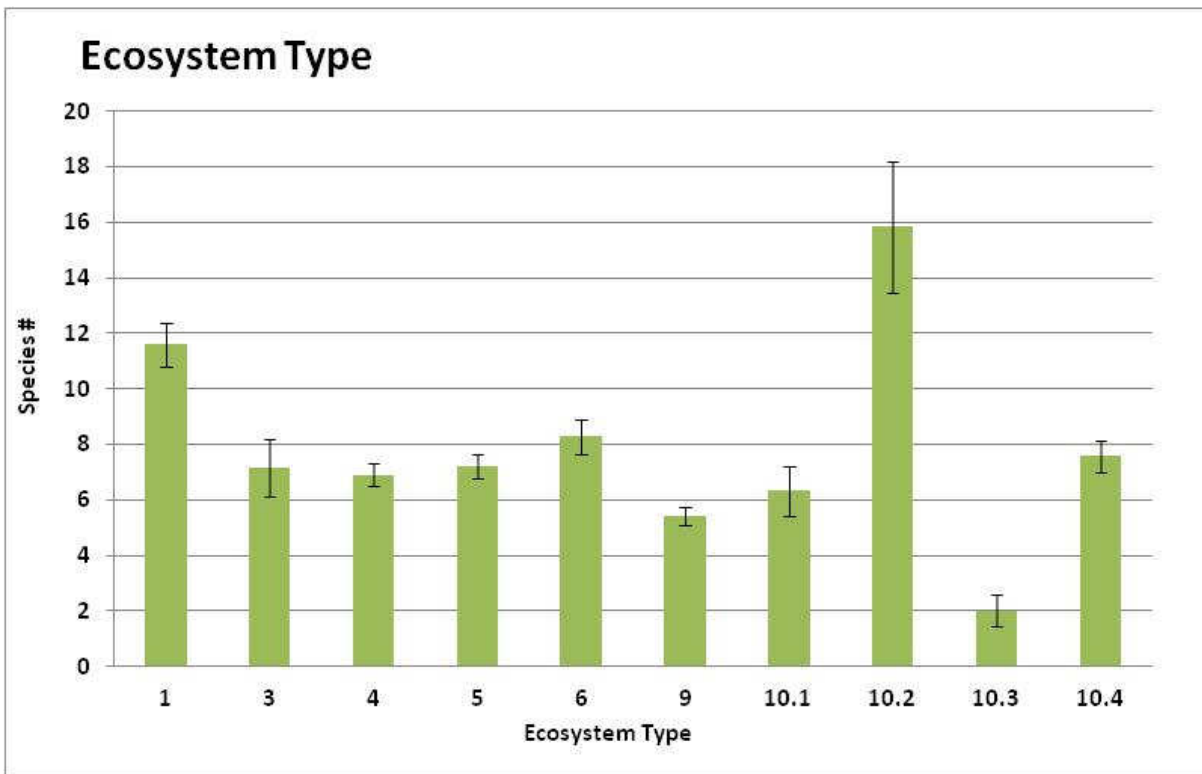


Figure 10 Mean number of species recorded per survey ( $\pm$ s.e.) for each ecosystem type. Data is pooled for all years.

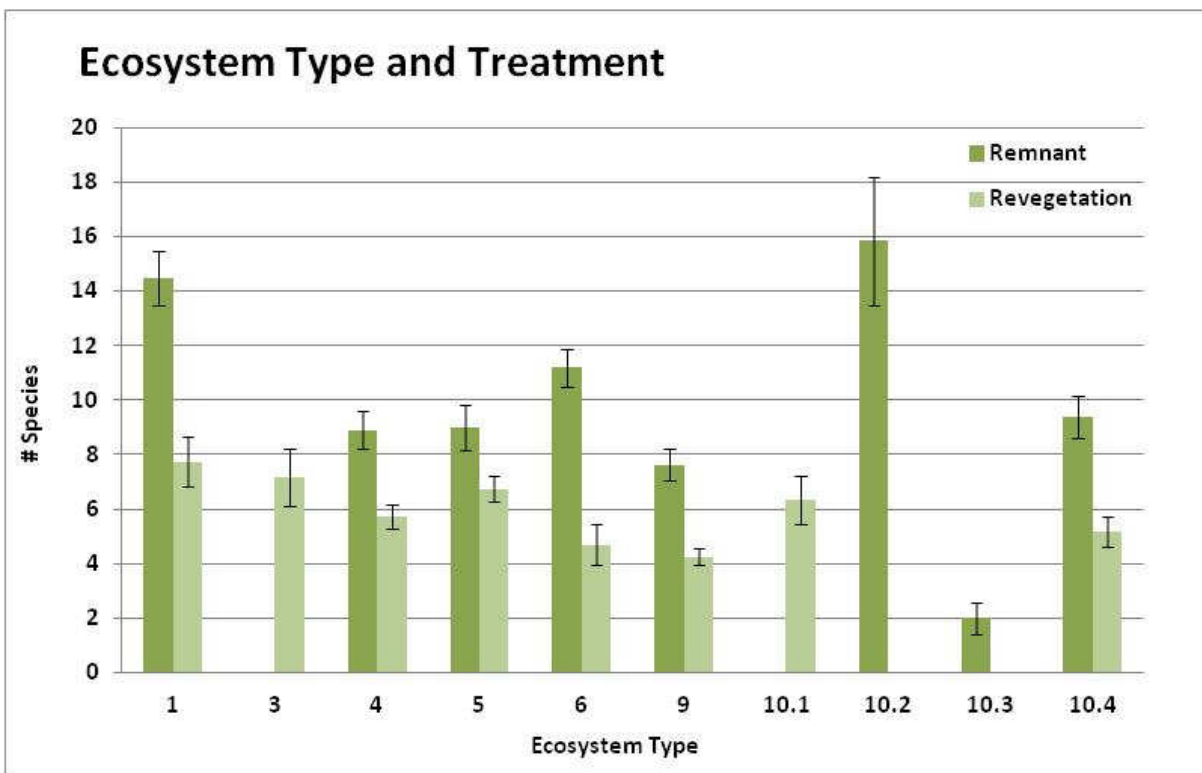


Figure 11 Mean number of species recorded per survey ( $\pm$ s.e.) for each ecosystem type stratified on treatment. Data is pooled for all years.

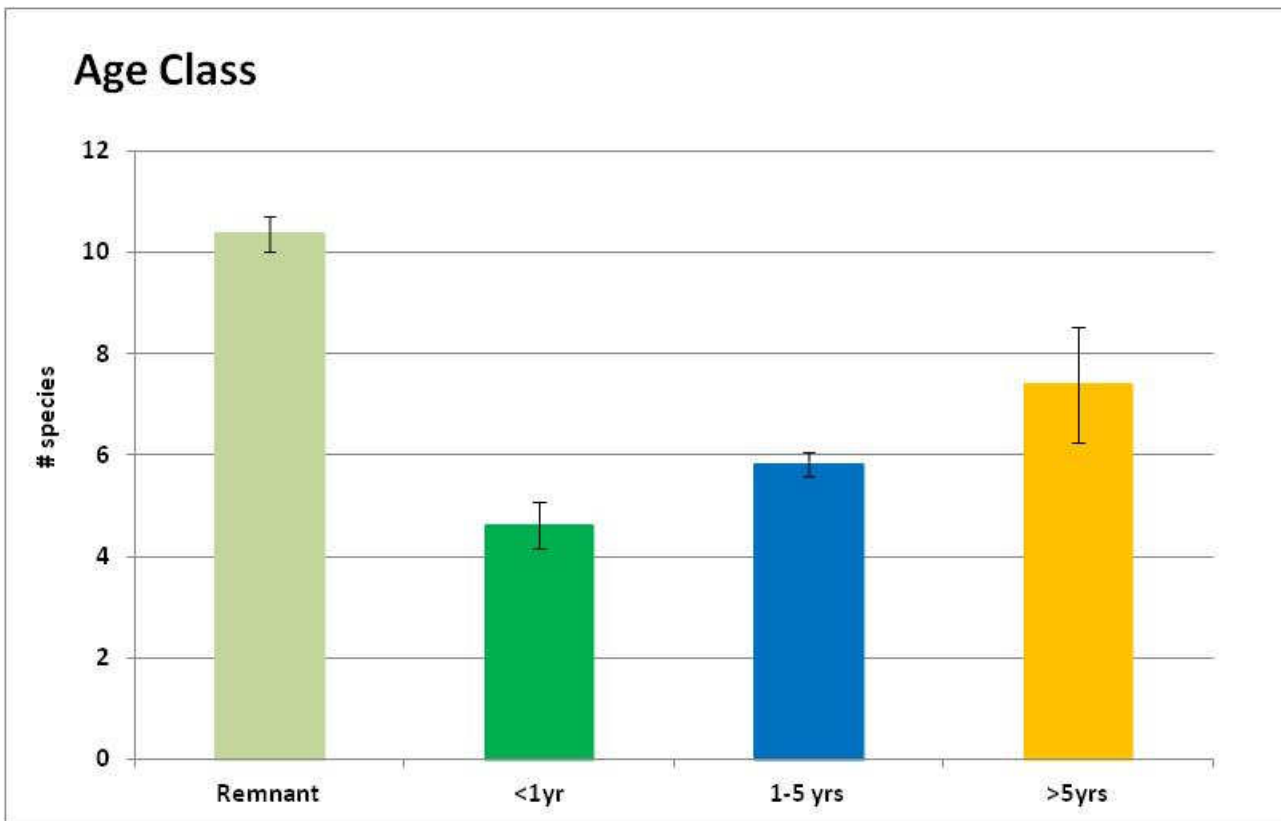


Figure 12 Mean number of species recorded per survey ( $\pm$ s.e.) for each age class. Data is pooled for all years and ecosystem types.

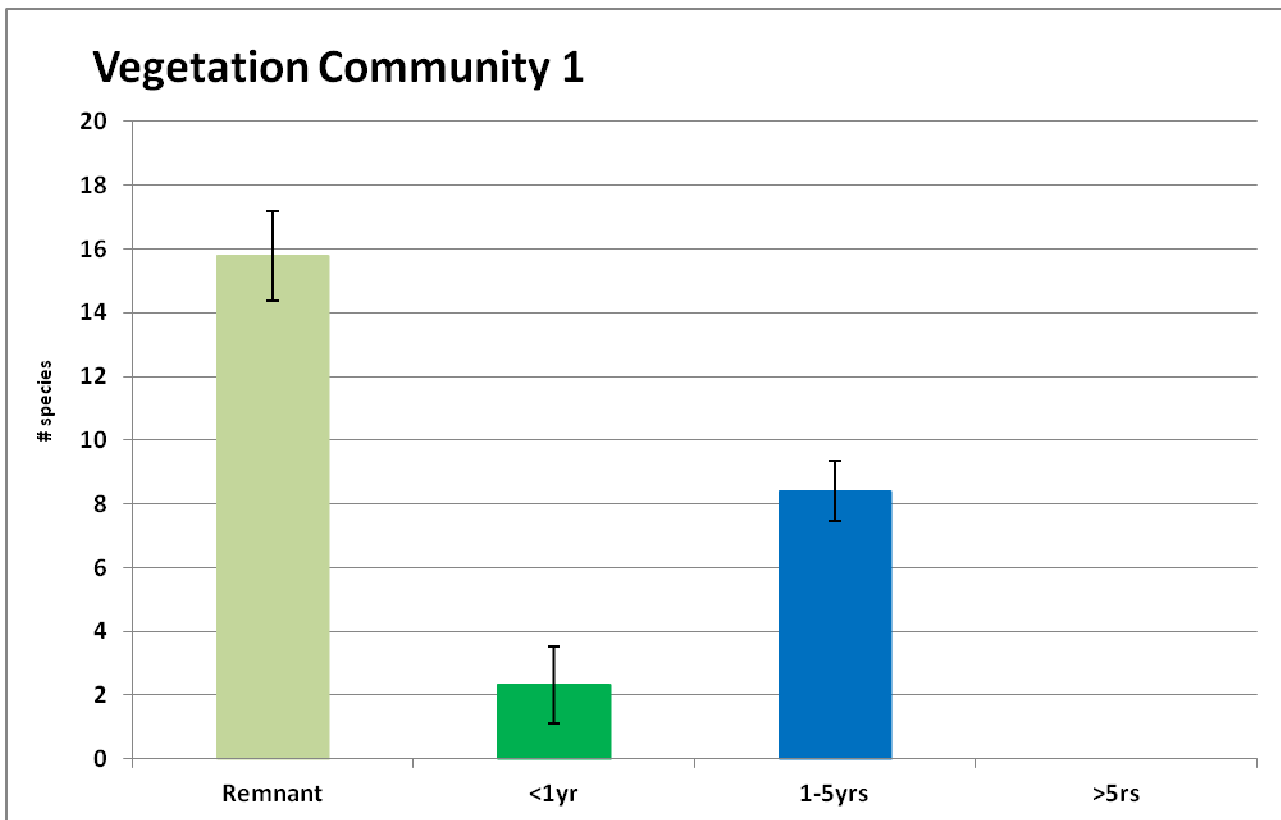


Figure 13 Mean species counts for vegetation community 1 ( $\pm$ s.e.) across different age classes of revegetation.

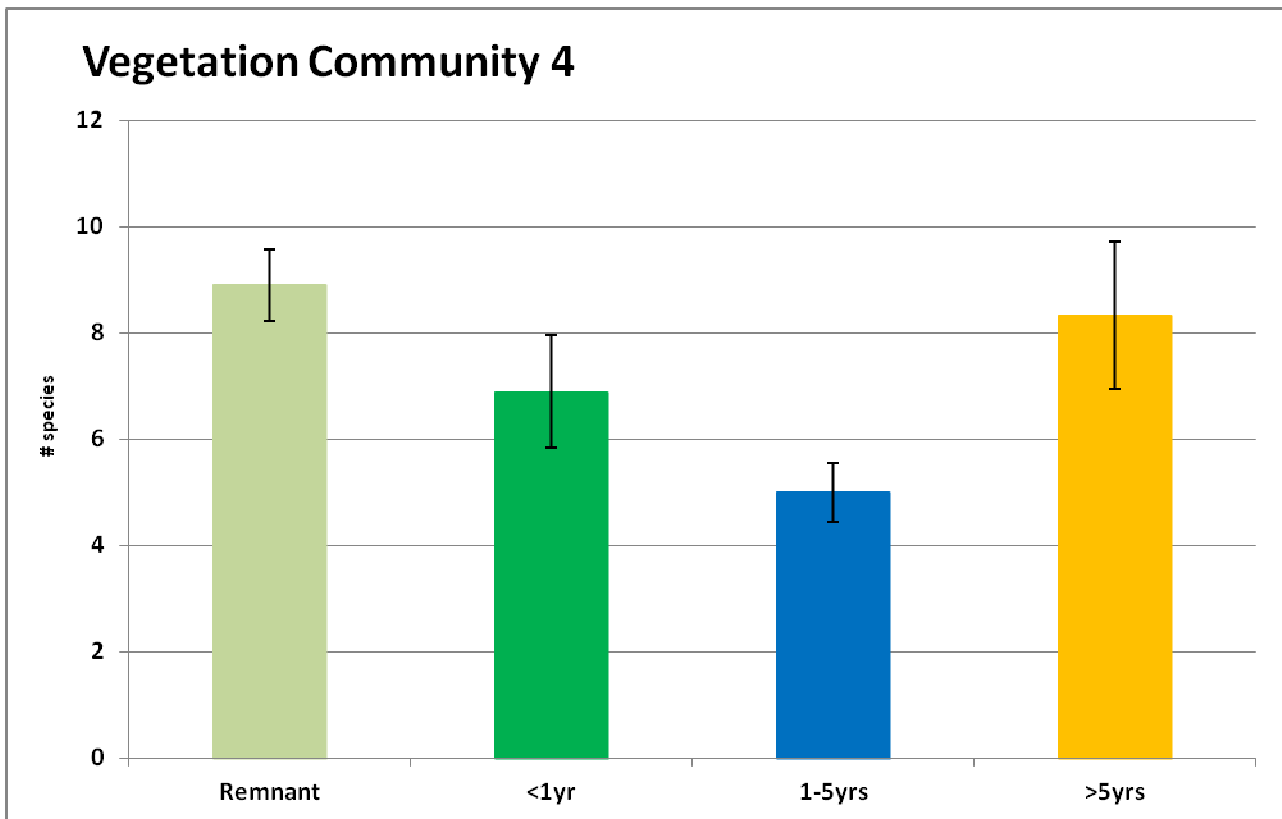


Figure 14 Mean species abundance for vegetation community 4 ( $\pm$ s.e.) across different age classes of revegetation.

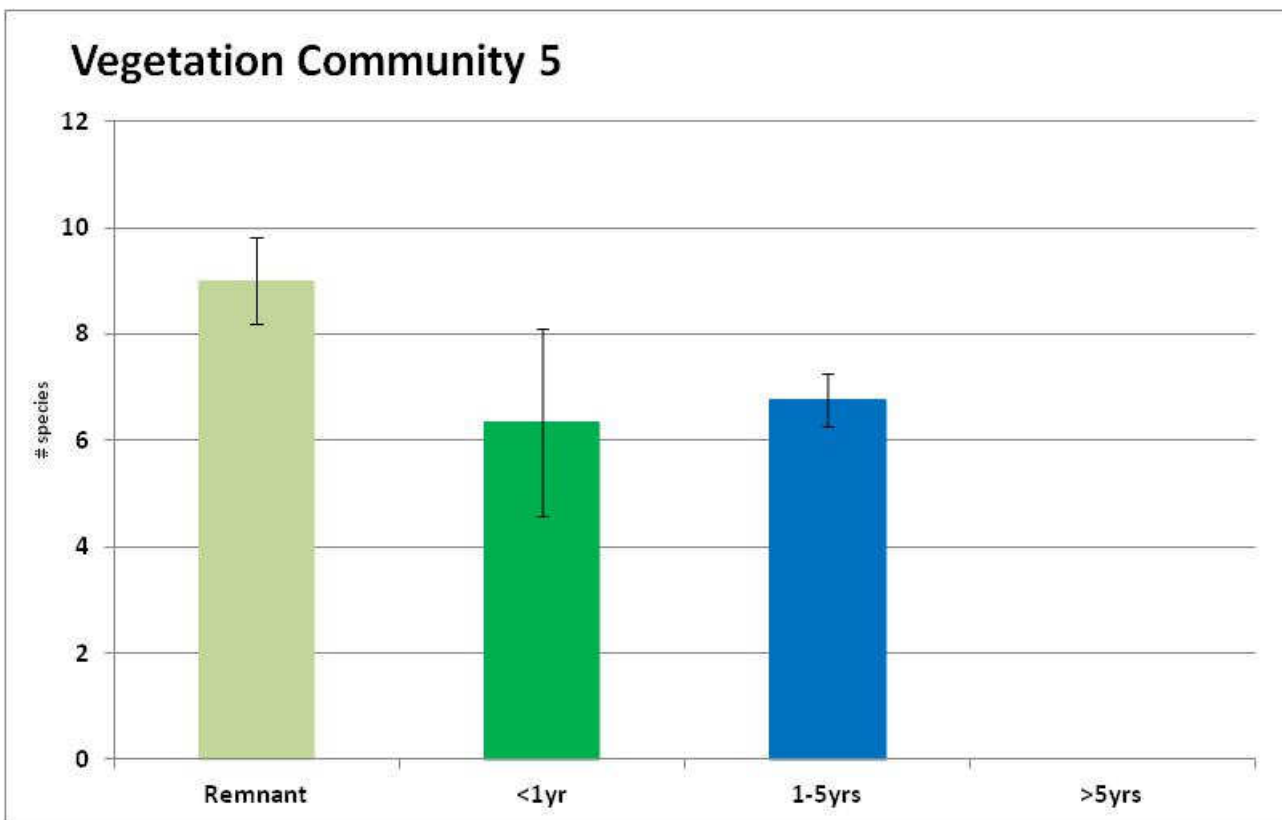


Figure 15 Mean species counts for vegetation community 5 ( $\pm$ s.e.) across different age classes of revegetation.

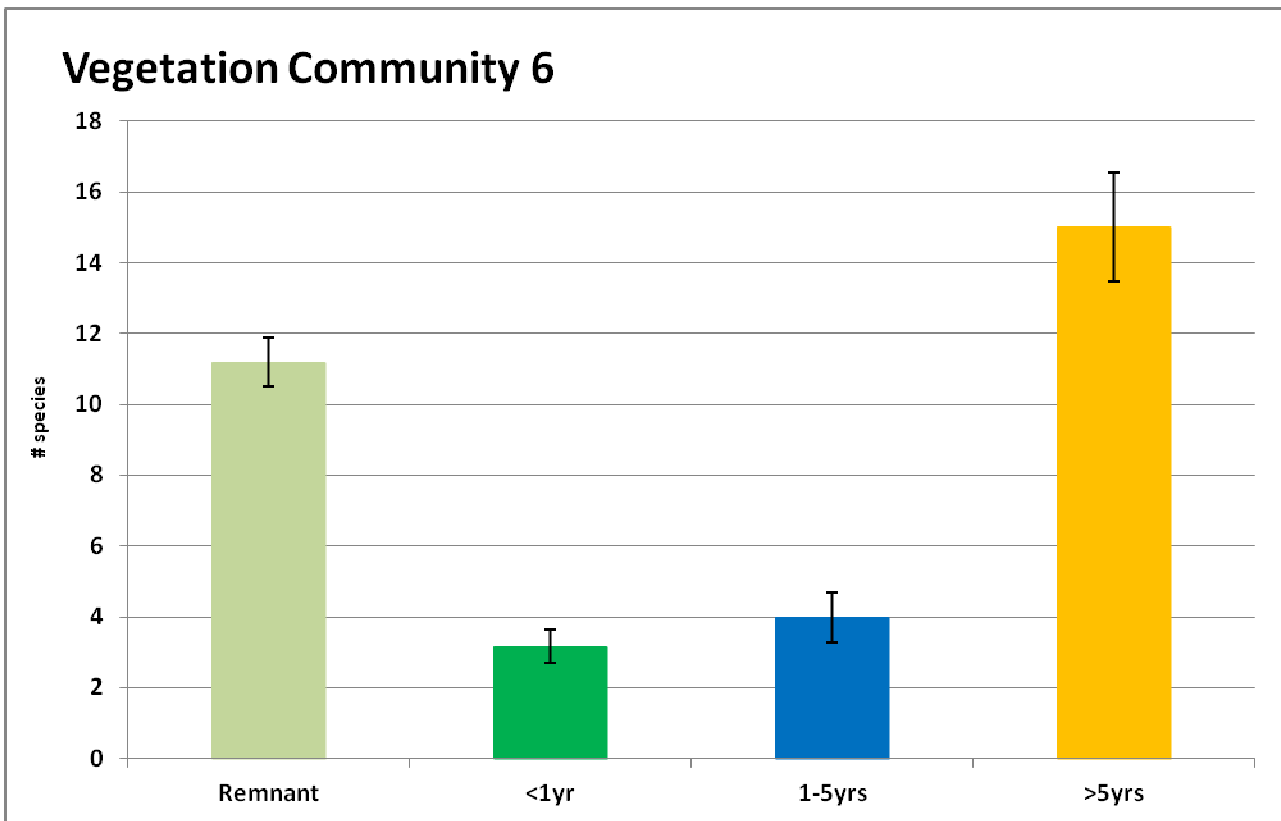


Figure 16 Mean species counts for vegetation community 6 ( $\pm$ s.e.) across different age classes of revegetation.

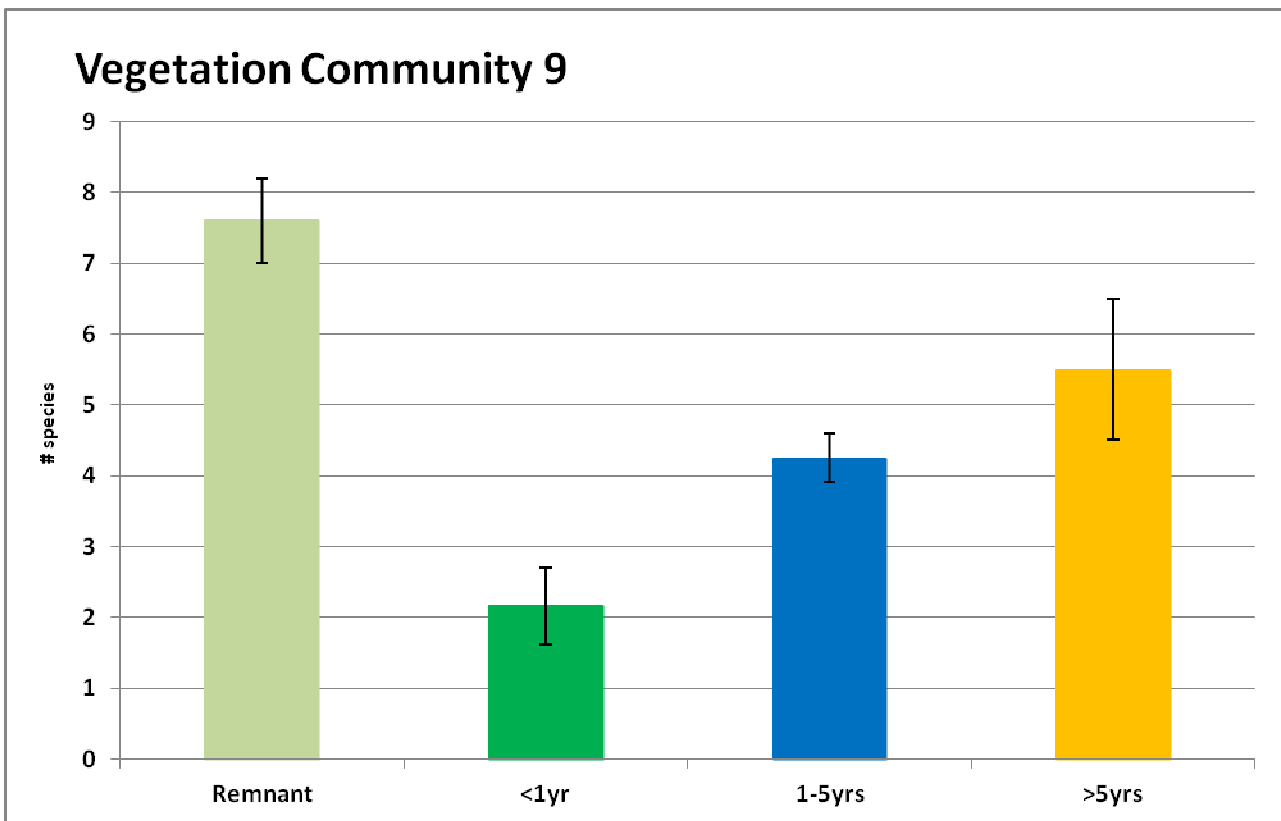


Figure 17 Mean species counts for vegetation community 9 ( $\pm$ s.e.) across different age classes of revegetation.

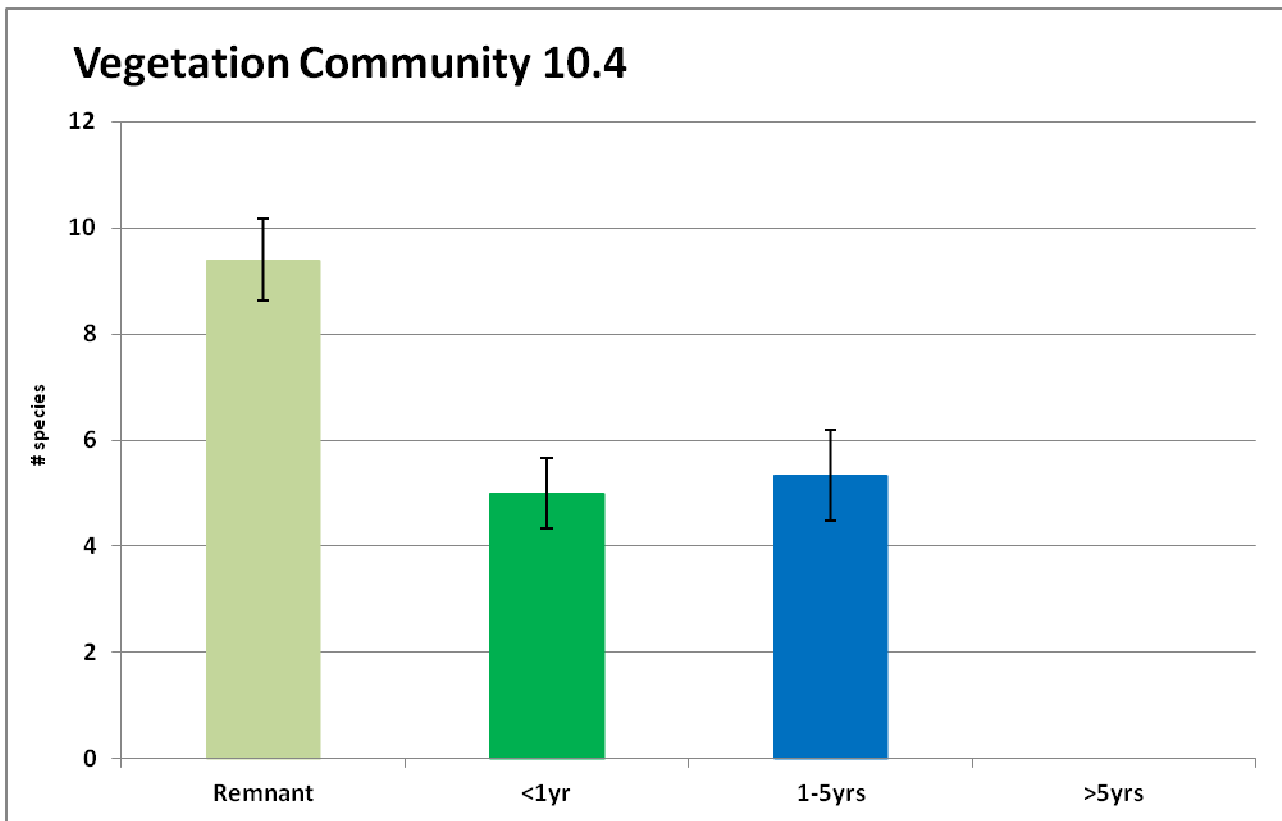


Figure 18 Mean species counts for vegetation community 10.4 ( $\pm$ s.e.) across different age classes of revegetation.

## Reporting Rates

Table 5 presents the reporting rates for the 25 most recorded species across the CLLMM region. Reporting rates for these species vary with year and treatment, however most of these species are recorded across all years, treatments and ecosystem types. Reporting rates for ecosystem types 10.1, 10.2 and 10.3 were not included due to the low survey effort.

Fifty-one of species of birds were recorded only in remnant vegetation, and 30 species of bird were recorded only in revegetation sites. These are listed in table 6 with their overall calculated reporting rate as well as their rate within the appropriate treatment. Most of these species have a generally low reporting rate in the landscape and the list comprises many of the more specialist species, for example Hooded Robin (*Melanodryas cucullata*), Black-chinned Honeyeater (*Melithreptus gularis*) and Southern Scrub-robin (*Drymodes brunneopygia*) being recorded only in remnants. Revegetation sites also had some unique bird records. Interestingly Stubble Quail were recorded at twice the frequency in revegetation (0.122), than across the landscape generally (0.069). Species in **bold** are those that were only ever recorded in either treatment type when all bird records were included (not just systematic surveys).



Table 7 presents 15 bird species that appear to show changes in their reporting rate (frequency of occurrence) across different age classes of revegetation and remnants. This group of species includes only those found across all vegetation communities as vegetation community may exert a stronger effect on occurrence than age class. Six general trends can be seen in these species:

- ^ bird species reporting rate increases as the revegetation ages with maximum reporting rate in remnant vegetation;
- v reporting rate declines as vegetation ages. Remnant reporting rate lower than in maximum (>5yrs) age class;
- ^/ reporting rate increases with age class, but declines (or equal) in remnant vegetation;
- v/ reporting rate declines as vegetation ages, but increases in remnant vegetation;
- / reporting rate peaks in middle age class; and
- -- reporting rate is uniform across all classes and age of vegetation doesn't appear to affect the frequency of reporting of a species.

Most species show an increase in reporting rate as vegetation ages. The three honeyeater species (White-plumed Honeyeater *Lichenostomus penicillatus*, Red Wattlebird *Anthochaera carunculata* and New Holland Honeyeater *Phylidonyris novaehollandiae*) all increase in reporting rate as revegetation ages.

Weebill (*Smicrornis brevirostris*) reporting rates increase with age of revegetation. Reporting rates for this species peak in older revegetation. Whilst lower in remnant vegetation the reporting rates for Weebills are still relatively high. A similar trend is seen in the introduced House Sparrow (*Passer domesticus*) however this species of bird does not occur in remnant vegetation at a high frequency.

Species such as Eurasian Skylark (*Alauda arvensis*) and Brown Songlark (*Cincloramphus cruralis*) are generally grassland rather than woodland species. Both these species decline as the vegetation ages and are generally absent from older and remnant vegetation. Crested Pigeons (*Ocyphaps lophotes*) also decline as the vegetation ages. Australian Magpies (*Cracticus tibicen*) are fairly consistent across all age classes.

For a complete listing of all species recorded across the three year surveys and their relevant reporting rates see Appendix 2.





## Conservation Priority Species

Across the 2013, 2014 and 2015 surveys, 24 bird species were recorded that are listed under the South Australia *National Parks and Wildlife Act 1972* as endangered, vulnerable or rare. A further six species included in JAMBA, CAMBA or ROCAMBA<sup>1</sup> agreements within the federal *Environment Protection and Biodiversity Conservation Act 1999* were also recorded. Table 8 lists these species as well as reporting rates over the study duration. Species that don't have reporting rates were recorded either off site, out of standardised surveys or incidentally.

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<sup>1</sup> JAMBA Japan Australia Migratory Bird Agreement, CAMBA China Australia Migratory Bird Agreement, ROKAMBA Republic of Korea Australia Migratory Bird Agreement



**Table 5. Reporting Rates for the 25 most frequently recorded species across systematic surveys. VC-vegetation community**

	All	2013	2014	2015	Remnant	Revegetation	<1yr	1-5 yrs	>5yrs	VC1	VC3	VC4	VC5	VC6	VC9	VC10.4
Superb Fairy-wren	0.430	0.554	0.379	0.350	0.690	0.287	0.154	0.300	0.370	0.619	0.167	0.444	0.310	0.433	0.500	0.492
Singing Honeyeater	0.276	0.333	0.190	0.300	0.248	0.320	0.231	0.338	0.296	0.063	0.444	0.457	0.345	0.200	0.240	0.444
Silvereye	0.254	0.349	0.207	0.200	0.443	0.145	0.077	0.160	0.111	0.302	0.278	0.420	0.333	0.200	0.188	0.175
Australian Magpie	0.246	0.333	0.230	0.172	0.248	0.264	0.154	0.287	0.222	0.365	0.333	0.272	0.345	0.244	0.135	0.127
Grey Fantail	0.215	0.312	0.161	0.167	0.495	0.040		0.042	0.074	0.444	0.111	0.235	0.138	0.233	0.115	0.365
New Holland Honeyeater	0.215	0.344	0.201	0.094	0.310	0.168	0.077	0.173	0.259	0.302	0.278	0.321	0.253	0.311	0.094	0.095
Spiny-cheeked Honeyeater	0.207	0.237	0.201	0.183	0.362	0.119	0.179	0.105	0.148	0.190	0.278	0.370	0.207	0.189	0.073	0.365
Willie Wagtail	0.202	0.247	0.178	0.178	0.205	0.218	0.308	0.198	0.259	0.254	0.278	0.185	0.253	0.156	0.146	0.286
Common Starling	0.196	0.301	0.138	0.144	0.195	0.215	0.179	0.232	0.111	0.444	0.111	0.111	0.264	0.178	0.167	0.095
Red Wattlebird	0.196	0.226	0.201	0.161	0.329	0.122	0.154	0.101	0.259	0.175	0.111	0.346	0.161	0.378	0.115	0.079
Grey Shrike-thrush	0.193	0.269	0.126	0.178	0.443	0.036	0.103	0.021	0.074	0.270		0.309	0.092	0.211	0.073	0.413
Crested Pigeon	0.178	0.220	0.149	0.161	0.114	0.238	0.256	0.241	0.185	0.143	0.278	0.136	0.299	0.167	0.104	0.302
Welcome Swallow	0.176	0.263	0.172	0.089	0.100	0.241	0.103	0.262	0.259	0.190	0.278	0.136	0.287	0.144	0.156	0.111
Little Raven	0.163	0.210	0.132	0.144	0.229	0.132	0.077	0.148	0.074	0.238	0.111	0.198	0.218	0.167	0.115	0.127
Eurasian Skylark	0.157	0.183	0.115	0.172	0.048	0.241	0.051	0.300		0.016	0.333	0.086	0.241	0.144	0.302	0.095
Yellow-rumped Thornbill	0.144	0.194	0.080	0.156	0.219	0.106	0.231	0.084	0.111	0.190		0.222	0.161	0.167		0.238
Yellow Thornbill	0.130	0.167	0.121	0.100	0.305	0.020		0.025		0.159	0.056	0.123	0.069	0.211	0.063	0.286
Galah	0.122	0.151	0.086	0.128	0.143	0.119	0.103	0.135		0.302		0.062	0.161	0.144	0.031	0.095
White-fronted Chat	0.119	0.065	0.086	0.206	0.081	0.155	0.308	0.148		0.016	0.167	0.099	0.103	0.078	0.323	0.079
Common Blackbird	0.115	0.204	0.080	0.056	0.186	0.076	0.026	0.072	0.185	0.206	0.167	0.136	0.172	0.100	0.083	0.032
Common Bronzewing	0.107	0.151	0.057	0.111	0.219	0.040	0.103	0.025	0.074	0.222		0.173	0.046	0.178	0.042	0.095
Peaceful Dove	0.100	0.118	0.098	0.083	0.210	0.033	0.026	0.021	0.148	0.143	0.167		0.057	0.078	0.010	0.333
Weebill	0.096	0.145	0.086	0.056	0.210	0.026		0.021	0.111	0.270		0.086	0.057	0.233		0.032
'Adelaide Rosella'	0.083	0.161	0.029	0.056	0.157	0.040		0.051		0.349		0.012	0.023	0.178		
Striated Pardalote	0.081	0.151	0.034	0.056	0.176	0.023		0.030		0.349		0.012	0.034	0.122		0.032



**Table 6 Bird species which showed limited reporting with treatment type.**

	<b>Overall</b>	<b>Remnant</b>		<b>Overall</b>	<b>Revegetation</b>
Grey Butcherbird	0.035	0.090	Stubble Quail	0.069	0.122
<b>Purple-gaped Honeyeater</b>	0.024	0.062	Australian White Ibis	0.028	0.050
<b>Variiegated Fairy-wren</b>	0.022	0.057	Swamp Harrier	0.017	0.026
<b>Red-capped Robin</b>	0.020	0.052	Great Cormorant	0.013	0.023
<b>Rainbow Bee-eater</b>	0.019	0.048	Australian Pelican	0.009	0.017
Brown Goshawk	0.015	0.038	Little Black Cormorant	0.007	0.013
Shining Bronze-Cuckoo	0.015	0.038	Australian Shelduck	0.006	0.010
<b>Hooded Robin</b>	0.013	0.033	<b>White-winged Black Tern</b>	0.006	0.010
<b>Crescent Honeyeater</b>	0.011	0.029	Brown Falcon	0.004	0.007
<b>Southern Scrub-robin</b>	0.011	0.029	Long-billed Corella	0.004	0.007
<b>Brown Treecreeper</b>	0.009	0.024	<b>Australian Bustard</b>	0.002	0.003
<b>Buff-rumped Thornbill</b>	0.009	0.024	<b>Australian Hobby</b>	0.002	0.003
<b>Shy Heathwren</b>	0.009	0.024	Black Swan	0.002	0.003
Yellow-tailed Black-Cockatoo	0.009	0.024	Cape Barren Goose	0.002	0.003
Diamond Firetail	0.007	0.019	Emu	0.002	0.003
<b>Little Lorikeet</b>	0.007	0.019	<b>Eurasian Coot</b>	0.002	0.003
<b>Jacky Winter</b>	0.006	0.014	<b>Nankeen Night-Heron</b>	0.002	0.003
<b>Little Eagle</b>	0.006	0.014	<b>Purple Swamphen</b>	0.002	0.003
<b>White-backed Swallow</b>	0.006	0.014	<b>Sharp-tailed Sandpiper</b>	0.002	0.003
<b>White-fronted Honeyeater</b>	0.006	0.014	<b>Australasian Darter</b>	Off Survey	
White-necked Heron	0.006	0.014	<b>Australian Wood Duck</b>	Off Survey	
<b>Yellow-faced Honeyeater</b>	0.006	0.014	<b>Banded Lapwing</b>	Off Survey	
Blue Bonnet	0.004	0.010	<b>Banded Stilt</b>	Off Survey	
<b>Chestnut Quail-thrush</b>	0.004	0.010	<b>Common Greenshank</b>	Off Survey	
<b>Crested Shrike-tit</b>	0.004	0.010	<b>Eastern Rosella</b>	Off Survey	
<b>Eastern Spinebill</b>	0.004	0.010	<b>Hardhead</b>	Off Survey	
Gull-billed Tern	0.004	0.010	<b>Intermediate Egret</b>	Off Survey	
Laughing Kookaburra	0.004	0.010	<b>Pink-eared Duck</b>	Off Survey	
<b>Sulphur-crested Cockatoo</b>	0.004	0.010	<b>Red-kneed Dotterel</b>	Off Survey	
<b>Tawny-crowned Honeyeater</b>	0.004	0.010	<b>Rock Dove</b>	Off Survey	
<b>Varied Sittella</b>	0.004	0.010			
<b>Yellow-plumed Honeyeater</b>	0.004	0.010			
Australian Pied Oystercatcher	0.002	0.005			
Black Falcon	0.002	0.005			
<b>Black-chinned Honeyeater</b>	0.002	0.005			
<b>Cockatiel</b>	0.002	0.005			
<b>Dusky Moorhen</b>	0.002	0.005			
<b>Fan-tailed Cuckoo</b>	0.002	0.005			
<b>Flame Robin</b>	0.002	0.005			
<b>Grey Goshawk</b>	0.002	0.005			
<b>Pied Butcherbird</b>	0.002	0.005			
Royal Spoonbill	0.002	0.005			
<b>Sacred Kingfisher</b>	0.002	0.005			
<b>Yellow-billed Spoonbill</b>	0.002	0.005			
<b>Budgerigar</b>	Off survey				
<b>Little Button-quail</b>	Off survey				
<b>Mulga Parrot</b>	Off survey				
<b>Red-chested Button-quail</b>	Off survey				
<b>White-throated Treecreeper</b>	Off Survey				
<b>Yellow-tufted Honeyeater</b>	Off Survey				
<b>Zebra Finch</b>	Off Survey				



**Table 7 Common species that show changes in reporting rate with aging revegetation.** ^ bird species reporting rate increases as the revegetation ages with maximum reporting rate across remnant vegetation, v reporting rate declines as vegetation ages. Remnant reporting rate lower than in maximum (>5yrs) age class; ^/ reporting rate increases with age class, but declines (or equal) in remnant vegetation; v/ reporting rate declines are vegetation ages, but increases in remnant vegetation; / reporting rate peaks in middle age class; and reporting rate is uniform across all classes and age of vegetation doesn't appear to affect the frequency of reporting of a species.

Common Name	All	Remnant	Revegetation	<1yr	1- 5 yrs	>5yrs	Trend
Crested Pigeon	0.178	0.114	0.238	0.256	0.241	0.185	v
Superb Fairy-wren	0.430	0.690	0.287	0.154	0.300	0.370	^
Weebill	0.176	0.100	0.241	0.103	0.262	0.259	^/
White-plumed Honeyeater	0.081	0.114	0.066		0.068	0.148	^
Red Wattlebird	0.196	0.329	0.122	0.154	0.101	0.259	^
New Holland Honeyeater	0.215	0.310	0.168	0.077	0.173	0.259	^
Grey Shrike-thrush	0.193	0.443	0.036	0.103	0.021	0.074	v/
Australian Magpie	0.246	0.248	0.264	0.154	0.287	0.222	--
Grey Fantail	0.215	0.495	0.040		0.042	0.074	^
Little Raven	0.163	0.229	0.132	0.077	0.148	0.074	/
Eurasian Skylark	0.157	0.048	0.241	0.051	0.300		^/
Brown Songlark	0.072	0.019	0.116	0.026	0.143		^/
Silvereye	0.254	0.443	0.145	0.077	0.160	0.111	^
Common Blackbird	0.115	0.186	0.076	0.026	0.072	0.185	^
House Sparrow	0.080	0.048	0.109	0.026	0.122	0.111	^/



**Table 8 Conservation Priority Species recorded across the CLLMM region between 2013-2015. Species include those recorded during systematic surveys and species that were recorded incidentally or outside of survey periods. Priority species that were not recorded during systematic surveys can be identified by the lack of reporting rates. VC- vegetation community**

	Status	All	2013	2014	2015	Remnant	Revegetation	<1yr	1 -5 yrs	>5yrs	VC1	VC3	VC4	VC5	VC6	VC9	VC10.4
Australian Darter	Rare																
Australian Pied Oystercatcher	Rare	0.002			0.006	0.005										0.010	
Banded Stilt	Vulnerable																
Black-chinned Honeyeater	Vulnerable	0.002	0.005			0.005					0.016						
Brown Quail	Vulnerable	0.019	0.038	0.017		0.005	0.030		0.030	0.074			0.037	0.057		0.021	
Cape Barren Goose	Rare	0.002		0.006			0.003					0.056					
Caspian Tern	CAMBA/JAMBA	0.020		0.046	0.017	0.005	0.033	0.026	0.030	0.074	0.016	0.056		0.034		0.063	
Chestnut Quail-thrush	Rare	0.004	0.011			0.010									0.022		
Common Greenshank	CAMBA/JAMBA/ROKAMBA																
Crested Shrike-tit	Rare	0.004	0.011			0.010											
Crested Tern	JAMBA	0.004		0.011		0.005	0.003		0.004		0.016					0.010	
Curlew Sandpiper	CAMBA/JAMBA/ROKAMBA																
Diamond Firetail	Vulnerable	0.007	0.016		0.006	0.019					0.063						
Elegant Parrot	Rare	0.074	0.134	0.029	0.056	0.119	0.050		0.063		0.206	0.278	0.074	0.046	0.056	0.042	0.048
Flame Robin	Vulnerable	0.002		0.006		0.005									0.011		
Great Crested Grebe	Rare																
Great Egret	CAMBA/JAMBA	0.006	0.011	0.006		0.010	0.003		0.004								
Grey Goshawk	Endangered	0.002			0.006	0.005							0.012				
Hooded Robin	Rare	0.013	0.022		0.017	0.033					0.111						
Intermediate Egret	Rare																
Jacky Winter	Rare	0.006	0.005		0.011	0.014					0.048						
Lathams Snipe	Rare/CAMBA/JAMBA/ROKAMBA																
Little Lorikeet	Endangered	0.007	0.022			0.019					0.032				0.022		
Purple-gaped Honeyeater	Rare	0.024	0.032	0.023	0.017	0.062							0.074		0.078		
Rainbow Bee-eater	JAMBA	0.019	0.043		0.011	0.048					0.016						0.143



	Status	All	2013	2014	2015	Remnant	Revegetation	<1yr	1 -5 yrs	>5yrs	VC1	VC3	VC4	VC5	VC6	VC9	VC10.4
Red-chested Button-quail	Rare																
Rufous Bristlebird	Rare																
Shy Heathwren	Rare	0.009	0.027			0.024							0.012		0.044		
Southern Emu-wren	Rare	0.017	0.038		0.011	0.019	0.017		0.021					0.023		0.042	
White-winged Black Tern	JAMBA	0.006		0.017			0.010		0.013							0.031	
Yellow-tailed Black-Cockatoo	Vulnerable	0.009	0.011		0.017	0.024					0.048				0.022	0.042	



## Discussion

The Department of Environment, Water and Natural Resources (DEWNR) has undertaken a long-term project to restore the ecological values of the Coorong, Lower Lakes and Murray Mouth (CLLMM). This project works with landholders and managers to revegetate the landscape. As a component of this project BirdLife Australia was contracted to collect baseline data on the bird species at a selection of pre-determined survey sites located within the CLLMM region. BirdLife undertook these surveys in 2013, 2014 and 2015. Reporting of each baseline survey has comprised of a simple, summary of results. The current document is the final summary report for this project, and focuses more on overall finding than specific yearly comparisons.

The Coorong National Park Management plan (DEP 1990) identifies 227 species of birds known to occur within the region. Of these 85 species (36.1%) are water birds (DEH 2000) and are not specifically the target of the current surveys. Pooled data over the three years, which equates to 513 individual surveys, has resulted in the detection of 82.3% of all previously recorded species in the region. This, combined with the species accumulation curves confirms that generally the baseline surveys undertaken by BirdLife Australia for DEWNR have been adequate to detect the majority of terrestrial species expected in the region. Some species, such as the Orange-bellied Parrot (*Neophema chrysogaster*), a nationally listed, critically endangered species would not have been recorded due to the timing of the current surveys. The orange-bellied parrot is a migratory species, spending its breeding season (September – March) in south-western Tasmania (SPRAT 2015). The current surveys, undertaken in late October were probably a little too late in the year to detect this species in the region.

Treatment types (remnant sites and revegetation sites) have sufficient survey effort, however a number of the vegetation communities are under surveyed, and so care should be taken with drawing any conclusions from the current project. Vegetation communities 3, 10.1, 10.2 and 10.3 are communities that generally occur on highly fertile soils in the CLLMM landscape (Jellinek and Te 2015). This made finding good quality remnants difficult as much of these communities have been cleared. It also made finding revegetation sites difficult, as few landholders were interested in revegetating their prime agricultural land (Jellinek pers. comm.). These limitations are reflected in the survey effort for these communities. Similarly survey effort across <1yr and >5yr age classes was limited by the availability of these treatments in the landscape.

Vegetation communities with appropriate survey effort reflect those communities that have been identified as priorities in the landscape for remediation (Bonifacio et al. 2014). Because of this priority status extensive areas of revegetation were available to survey, and sufficient remnants of appropriate quality have also been





retained in the landscape. The definition of these site qualities was undertaken by DEWNR and is beyond the scope of this report.

As with previous reports, the general trend of greater species richness per survey in remnant sites compared to revegetation sites continues to hold true with the inclusion of the 2015 data. Complex habitat structure has consistently been shown to influence the bird species richness within woodland remnants (Wilson 2003). Upper storey attributes such as tree height and canopy cover are important attributes for some bird species (e.g. Crested Shrike-tit *Falcunculus frontatus*) and tree hollows are important nesting sites for a range of species (e.g. parrots and kingfishers). A suite of woodland bird species require shrubby understoreys (e.g. thornbills) whilst species such as Brown Treecreeper (*Climacteris picumnus*) have been shown to be strongly associated with woody debris (Antos and Bennet 2006). Leaf litter and bare ground are also important for some woodland bird species (Antos and Bennet 2006). This variation in habitat is present within the established remnants, unlike the younger revegetation sites that are generally even aged, with little structural complexity. This structure also influences the overall diversity of bird species recorded in remnant vegetation. As seen in table 6 there were 44 species of birds recorded only in remnant sites during systematic surveys (compared to 19 in revegetation sites). Of these 44 species, 32 were only ever reported in remnant vegetation, even when all records (including systematic survey, miscellaneous records and off survey records) were pooled.

These 32 species are typically specialist woodland species, with some for example Purple-gaped Honeyeater, Tawny-crowned Honeyeater and Hooded Robin further restricted to specific vegetation forms (Purple-gaped and Tawny-crowned honeyeaters were only recorded in *Eucalyptus diversifolia* (Coastal White Mallee) Mallee, and Hooded Robins were restricted to *Eucalyptus fasciculosa* (Pink Gum) Low Open Grassy Woodland. It is a positive sign that these species still persist within the CLLMM landscape, indicating that those remnants present still retain high quality bird habitat. These species may be key in monitoring the changing ecological resilience across the landscape.

Similarly, revegetation sites were also found to support a number of species not present in the remnants. Many of these are water/wetland species and their presence possibly reflects the physical locations of many of the revegetation sites in the landscape, rather than specific "revegetation" species. Many of the revegetation sites were located along the shoreline of Lake Alexandrina, Lake Albert and the Coorong (see Figures 1-6).

Research into the use by birds of revegetation in Australia is limited, as it takes time to collect the necessary data, as well as allow for the revegetation to age enough to detect changes. Surveys undertaken by Lindenmayer *et. al.* (2012) over a 10 year period across the south-western slopes of New South Wales found marked differences in the bird communities in different aged revegetation. Their findings "suggest a range of vegetation growth types are likely to be required in a given



farmland area to support the diverse array of bird species that have the potential to occur in Australian temperate woodland ecosystems”; a finding that resonates with the aim of building habitat connectivity and diversity in the CLLMM project. The planting of a number of vegetation communities, and the staggering of planting across a 5 year period within the CLLMM project should allow for a range of growth types in this revegetation. Should the findings on the Lindenmayer *et al.* (2012) hold true for the Coorong, this planting regime will provide the best chance to maximise the bird diversity in the landscape, and retain species across the landscape.

Temporal changes in the bird species over the limited survey period are hard to interpret, and should not be taken as indicative of the influence of increasing vegetation in the landscape at this time. Different survey sites of differing habitat types limit the usefulness of making annual comparisons. Differences between years may be because of the survey design or larger landscape variables (such as climate) rather than driven by increasing vegetation. Many Australian bird species have erratic movement patterns which are driven by a range of variables, such as rainfall, food availability or seasonality. How birds respond to these variables is poorly understood, which makes it difficult to determine if species moving into the CLLMM landscape during the 2013-2015 surveys is due to the influence of the revegetation program, or something else. Ongoing surveys and the collation of this data is necessary if the success of the CLLMM program is to be measured. Changes in the avifauna in the region in response to the revegetation efforts are dependent on the establishment and growth of this vegetation, and subsequently constrained by the time it takes for vegetation to establish and mature. Surveys should be replicated at the same sites in the future, with a recommendation of a minimum replication every 5 years.

The aim of these initial surveys was to collect baseline bird data for the CLLMM project implemented by DEWNR. The results of these surveys show a diverse avian assemblage retained across the landscape, in spite of a history of land clearance and habitat loss. The revegetation program can only be beneficial to the birds across the region.

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**Appendix 1. Treatment, Age Class and Ecosystem ID associated with survey sites. Survey sites are identified by WptID and correspond with numbers in Figure 2-6.**

<b>WptID</b>	<b>Survey Year</b>	<b>Treatment</b>	<b>Age Class</b>	<b>Ecosystem ID</b>
5	2013	Revegetation	1-5yrs	1
77	2013	Revegetation	1-5yrs	1
78	2013	Revegetation	1-5yrs	1
204	2013	Revegetation	1-5yrs	9
208	2013	Revegetation	1-5yrs	10.1
232	2013	Revegetation	1-5yrs	3
255	2013	Revegetation	1-5yrs	3
270	2013	Revegetation	1-5yrs	9
322	2013	Revegetation	1-5yrs	5
323	2013	Revegetation	1-5yrs	5
325	2013	Revegetation	1-5yrs	9
328	2013	Revegetation	1-5yrs	5
345	2013	Revegetation	1-5yrs	5
348	2013	Revegetation	1-5yrs	5
351	2013	Revegetation	1-5yrs	10.4
360	2013	Revegetation	1-5yrs	6
363	2013	Revegetation	1-5yrs	10.4
364	2013	Revegetation	1-5yrs	3
406	2013	Revegetation	1-5yrs	9
408	2013	Revegetation	1-5yrs	5
417	2013	Revegetation	1-5yrs	1
444	2013	Revegetation	1-5yrs	5
454	2013	Revegetation	1-5yrs	9
464	2013	Remnant		4
465	2013	Remnant		10.4

<b>WptID</b>	<b>Survey Year</b>	<b>Treatment</b>	<b>Age Class</b>	<b>Ecosystem ID</b>
466	2013	Remnant		10.4
468	2013	Remnant		4
470	2013	Remnant		4
471	2013	Remnant		4
472	2013	Remnant		10.4
473	2013	Remnant		5
475	2013	Remnant		9
476	2013	Remnant		10.4
477	2013	Remnant		10.3
478	2013	Remnant		9
479	2013	Remnant		1
480	2013	Remnant		6
482	2013	Remnant		1
485	2013	Remnant		6
488	2013	Remnant		1
489	2013	Remnant		1
490	2013	Remnant		1
491	2013	Remnant		6
492	2013	Remnant		10.2
493	2013	Remnant		6
494	2013	Remnant		1
495	2013	Remnant		1
497	2013	Remnant		6
498	2013	Remnant		6
500	2013	Remnant		5
501	2013	Remnant		5
503	2013	Remnant		9
505	2013	Remnant		1

<b>WptID</b>	<b>Survey Year</b>	<b>Treatment</b>	<b>Age Class</b>	<b>Ecosystem ID</b>
507	2013	Remnant		9
509	2013	Revegetation	>5yrs	5
510	2013	Revegetation	1-5yrs	6
511	2013	Revegetation	1-5yrs	4
512	2013	Revegetation	1-5yrs	5
513	2013	Revegetation	1-5yrs	5
514	2013	Revegetation	1-5yrs	5
515	2013	Revegetation	1-5yrs	5
516	2013	Revegetation	1-5yrs	4
518	2014	Remnant		10.2
520	2014	Revegetation	>5yrs	5
521	2014	Revegetation	>5yrs	3
522	2014	Revegetation	>5yrs	3
523	2014	Revegetation	>5yrs	9
524	2014	Remnant		10.4
526	2014	Remnant		4
527	2014	Remnant		6
528	2014	Remnant		4
529	2014	Remnant		6
530	2014	Remnant		5
532	2014	Remnant		6
533	2014	Remnant		10.4
534	2014	Remnant		10.4
535	2014	Remnant		5
536	2014	Remnant		9
537	2014	Remnant		9
538	2014	Remnant		10.4
539	2014	Remnant		6

<b>WptID</b>	<b>Survey Year</b>	<b>Treatment</b>	<b>Age Class</b>	<b>Ecosystem ID</b>
541	2014	Revegetation	1-5yrs	6
542	2014	Revegetation	1-5yrs	5
544	2014	Remnant		9
545	2014	Revegetation	>5yrs	6
546	2014	Revegetation	>5yrs	4
547	2014	Revegetation	>5yrs	4
548	2014	Revegetation	>5yrs	9
549	2014	Revegetation	1-5yrs	9
550	2014	Revegetation	1-5yrs	4
552	2014	Revegetation	1-5yrs	10.4
553	2014	Revegetation	1-5yrs	6
554	2014	Remnant		4
556	2014	Revegetation	1-5yrs	10.1
557	2014	Revegetation	1-5yrs	5
558	2014	Revegetation	1-5yrs	5
559	2014	Revegetation	1-5yrs	5
560	2014	Revegetation	1-5yrs	5
561	2014	Revegetation	1-5yrs	1
562	2014	Revegetation	1-5yrs	1
563	2014	Revegetation	1-5yrs	6
564	2014	Revegetation	1-5yrs	5
565	2014	Revegetation	1-5yrs	10.1
566	2014	Revegetation	<1yr	10.4
567	2014	Remnant		6
569	2014	Revegetation	1-5yrs	3
570	2014	Revegetation	1-5yrs	9
571	2014	Revegetation	1-5yrs	9
572	2014	Revegetation	1-5yrs	9



<b>WptID</b>	<b>Survey Year</b>	<b>Treatment</b>	<b>Age Class</b>	<b>Ecosystem ID</b>
573	2014	Revegetation	1-5yrs	4
575	2014	Remnant		6
576	2015	Revegetation	1-5yrs	1
579	2015	Revegetation	1-5yrs	9
580	2015	Revegetation	1-5yrs	4
581	2015	Revegetation	<1yr	5
589	2015	Revegetation	1-5yrs	6
592	2015	Revegetation	1-5yrs	6
595	2015	Revegetation	1-5yrs	4
596	2015	Revegetation	1-5yrs	4
597	2015	Revegetation	<1yr	6
602	2015	Revegetation	1-5yrs	9
604	2015	Revegetation	1-5yrs	4
609	2015	Revegetation	1-5yrs	6
613	2015	Revegetation	1-5yrs	10.4
618	2015	Revegetation	1-5yrs	9
623	2015	Revegetation	1-5yrs	4
624	2015	Revegetation	1-5yrs	9
625	2015	Revegetation	1-5yrs	9
626	2015	Revegetation	1-5yrs	5
627	2015	Revegetation	1-5yrs	9
628	2015	Revegetation	1-5yrs	4
629	2015	Revegetation	1-5yrs	9
631	2015	Revegetation	1-5yrs	9
632	2015	Revegetation	<1yr	6
634	2015	Revegetation	<1yr	9
635	2015	Revegetation	<1yr	4
636	2015	Revegetation	<1yr	4

<b>WptID</b>	<b>Survey Year</b>	<b>Treatment</b>	<b>Age Class</b>	<b>Ecosystem ID</b>
637	2015	Revegetation	<1yr	1
638	2015	Revegetation	<1yr	4
640	2015	Revegetation	<1yr	10.4
641	2015	Revegetation	<1yr	10.4
645	2015	Revegetation	1-5yrs	5
646	2015	Revegetation	1-5yrs	4
650	2015	Revegetation	1-5yrs	6
654	2015	Revegetation	1-5yrs	6
655	2015	Revegetation	1-5yrs	10.4
657	2015	Revegetation	1-5yrs	4
660	2015	Revegetation	1-5yrs	1
663	2015	Revegetation	1-5yrs	5
679	2015	Revegetation	<1yr	10.4
681	2015	Revegetation	<1yr	9
682	2015	Remnant		1
683	2015	Remnant		1
684	2015	Remnant		1
685	2015	Remnant		4
686	2015	Remnant		4
687	2015	Remnant		4
689	2015	Remnant		5
690	2015	Remnant		6
692	2015	Remnant		6
693	2015	Remnant		6
694	2015	Remnant		9
695	2015	Remnant		9
696	2015	Remnant		9
697	2015	Remnant		9

<b>WptID</b>	<b>Survey Year</b>	<b>Treatment</b>	<b>Age Class</b>	<b>Ecosystem ID</b>
698	2015	Remnant		10.4
699	2015	Remnant		10.4
700	2015	Remnant		10.4
701	2015	Remnant		10.4
702	2015	Remnant		1
703	2015	Remnant		6

**Appendix 2 Complete List of Birds Recorded over surveys (2013 – 2015). Species without calculated Reporting Rates are those that were recorded as incidentals, off site or outside of otherwise standardised surveys. Species are listed in taxonomic order as per the BirdLife Australia Working List of Australian Birds.**

Common Name	Scientific Name	All	2013	2014	2015	Remnant	Revegetation	<1yr	1 - 5 yrs	>5yrs	VC1	VC3	VC4	VC5	VC6	VC9	VC10.4
Emu	<i>Dromaius novaehollandiae</i>	0.002	0.005				0.003		0.004				0.012				
Stubble Quail	<i>Coturnix pectoralis</i>	0.069	0.145	0.023	0.033		0.122	0.103	0.139		0.016	0.389	0.025	0.172	0.011	0.063	0.063
Brown Quail	<i>Coturnix ypsilophora</i>	0.019	0.038	0.017		0.005	0.030		0.030	0.074			0.037	0.057		0.021	
Cape Barren Goose	<i>Cereopsis novaehollandiae</i>	0.002		0.006			0.003			0.037		0.056					
Black Swan	<i>Cygnus atratus</i>	0.002		0.006			0.003		0.004				0.011				
Australian Shelduck	<i>Tadorna tadornoides</i>	0.006		0.011	0.006		0.010	0.026	0.008				0.011			0.010	
Australian Wood Duck	<i>Chenonetta jubata</i>																
Pink-eared Duck	<i>Malacorhynchus membranaceus</i>																
Grey Teal	<i>Anas gracilis</i>	0.004	0.005	0.006		0.005	0.003		0.004								
Pacific Black Duck	<i>Anas superciliosa</i>	0.015	0.022	0.023		0.014	0.017		0.017	0.037		0.056	0.086	0.023		0.010	
Hardhead	<i>Aythya australis</i>																
Great Crested Grebe	<i>Podiceps cristatus</i>																
Rock Dove	<i>Columba livia</i>																
Spotted Dove	<i>Streptopelia chinensis</i>	0.043	0.059	0.057	0.011	0.019	0.063		0.055	0.222		0.167	0.062	0.069	0.044	0.021	0.048
Common Bronzewing	<i>Phaps chalcoptera</i>	0.107	0.151	0.057	0.111	0.219	0.040	0.103	0.025	0.074	0.222		0.173	0.046	0.178	0.042	0.095

Common Name	Scientific Name	All	2013	2014	2015	Remnant	Revegetation	<1yr	1 - 5 yrs	>5yrs	VC1	VC3	VC4	VC5	VC6	VC9	VC10.4
Brush Bronzewing	<i>Phaps elegans</i>	0.033	0.022	0.040	0.039	0.057	0.020		0.025			0.111	0.074	0.046	0.022	0.010	0.048
Crested Pigeon	<i>Ocyphaps lophotes</i>	0.178	0.220	0.149	0.161	0.114	0.238	0.256	0.241	0.185	0.143	0.278	0.136	0.299	0.167	0.104	0.302
Peaceful Dove	<i>Geopelia striata</i>	0.100	0.118	0.098	0.083	0.210	0.033	0.026	0.021	0.148	0.143	0.167		0.057	0.078	0.010	0.333
Australasian Darter	<i>Anhinga novaehollandiae</i>																
Little Pied Cormorant	<i>Microcarbo melanoleucos</i>																
Great Cormorant	<i>Phalacrocorax carbo</i>	0.013		0.034	0.006		0.023	0.026	0.025		0.016			0.046			0.016
Little Black Cormorant	<i>Phalacrocorax sulcirostris</i>	0.007		0.017	0.006		0.013		0.008	0.074				0.011			
Pied Cormorant	<i>Phalacrocorax varius</i>																
Australian Pelican	<i>Pelecanus conspicillatus</i>	0.009	0.011	0.017			0.017		0.017	0.037	0.016		0.012		0.011	0.010	
White-necked Heron	<i>Ardea pacifica</i>	0.006	0.011		0.028	0.014									0.011		
Great Egret	<i>Ardea alba</i>	0.006	0.011	0.006		0.010	0.003		0.004								
Intermediate Egret	<i>Ardea intermedia</i>																
White-faced Heron	<i>Egretta novaehollandiae</i>	0.119	0.065	0.086	0.206	0.081	0.155	0.308	0.148		0.016	0.167	0.099	0.103	0.078	0.323	0.079
Nankeen Night-Heron	<i>Nycticorax caledonicus</i>	0.002		0.006			0.003		0.004					0.011			
Australian White Ibis	<i>Threskiornis moluccus</i>	0.028	0.011	0.052	0.022		0.050	0.026	0.059		0.016			0.046	0.022	0.042	0.032
Straw-necked Ibis	<i>Threskiornis spinicollis</i>	0.031	0.022	0.057	0.017	0.019	0.043	0.051	0.046		0.016		0.025	0.034	0.033	0.021	0.016
Royal Spoonbill	<i>Platalea regia</i>	0.002	0.005			0.005											

Common Name	Scientific Name	All	2013	2014	2015	Remnant	Revegetation	<1yr	1 - 5 yrs	>5yrs	VC1	VC3	VC4	VC5	VC6	VC9	VC10.4
Yellow-billed Spoonbill	<i>Platalea flavipes</i>	0.002	0.005			0.005											
Black-shouldered Kite	<i>Elanus axillaris</i>	0.022	0.032	0.029	0.006	0.019	0.026	0.026	0.030		0.016		0.012	0.011	0.022	0.010	0.079
Whistling Kite	<i>Haliastur sphenurus</i>	0.006		0.006	0.011	0.014										0.021	0.016
Black Kite	<i>Milvus migrans</i>	0.015	0.022	0.006	0.017	0.033	0.003		0.004					0.011			0.111
Brown Goshawk	<i>Accipiter fasciatus</i>	0.015	0.022	0.006	0.017	0.038					0.016		0.012		0.033		
Collared Sparrowhawk	<i>Accipiter cirrocephalus</i>	0.006	0.005	0.006	0.006	0.005	0.007		0.008		0.016	0.056	0.012				
Grey Goshawk	<i>Accipiter novaehollandiae</i>	0.002			0.006	0.005							0.012				
Spotted Harrier	<i>Circus assimilis</i>	0.013	0.022	0.011	0.006	0.014	0.013	0.051	0.008		0.032			0.011			0.048
Swamp Harrier	<i>Circus approximans</i>	0.017	0.005	0.023	0.022		0.026	0.051	0.025		0.032			0.011	0.044	0.010	
Wedge-tailed Eagle	<i>Aquila audax</i>	0.096	0.145	0.086	0.056	0.210	0.026		0.021	0.111	0.270		0.086	0.057	0.233		0.032
Little Eagle	<i>Hieraaetus morphnoides</i>	0.006	0.005		0.011	0.014											0.048
Nankeen Kestrel	<i>Falco cenchroides</i>	0.039	0.043	0.046	0.028	0.029	0.046	0.026	0.046	0.074	0.016	0.056	0.049	0.034	0.100	0.031	
Brown Falcon	<i>Falco berigora</i>	0.004	0.005		0.006		0.007		0.008		0.016						0.016
Australian Hobby	<i>Falco longipennis</i>	0.002	0.005				0.003		0.004					0.011			
Black Falcon	<i>Falco subniger</i>	0.002	0.005			0.005											
Purple Swamphen	<i>Porphyrio porphyrio</i>	0.002		0.006			0.003			0.037						0.010	
Red-legged Crane	<i>Rallina fasciata</i>																

Common Name	Scientific Name	All	2013	2014	2015	Remnant	Revegetation	<1yr	1 - 5 yrs	>5yrs	VC1	VC3	VC4	VC5	VC6	VC9	VC10.4
Black-tailed Native-hen	<i>Tribonyx ventralis</i>	0.019	0.054			0.029	0.013		0.017			0.167				0.031	0.016
Dusky Moorhen	<i>Gallinula tenebrosa</i>	0.002	0.005			0.005											
Eurasian Coot	<i>Fulica atra</i>	0.002		0.006			0.003		0.004				0.011				
Australian Bustard	<i>Ardeotis australis</i>	0.002	0.005				0.003		0.004		0.016						
Australian Pied Oystercatcher	<i>Haematopus longirostris</i>	0.002			0.006	0.005										0.010	
Black-winged Stilt	<i>Himantopus leucocephalus</i>																
Banded Stilt	<i>Cladorhynchus leucocephalus</i>																
Red-capped Plover	<i>Charadrius ruficapillus</i>	0.006			0.017	0.005	0.007		0.008							0.021	0.016
Red-kneed Dotterel	<i>Erythronyctes alpinus</i>																
Banded Lapwing	<i>Vanellus tricolor</i>																
Masked Lapwing	<i>Vanellus miles</i>	0.028	0.032	0.023	0.028	0.010	0.043	0.026	0.051			0.056	0.034	0.011	0.083	0.016	
Latham's Snipe	<i>Gallinago hardwickii</i>																
Common Greenshank	<i>Tringa nebularia</i>																
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>	0.002		0.006			0.003			0.037						0.010	
Curlew Sandpiper	<i>Calidris ferruginea</i>																
Red-chested Button-quail	<i>Turnix pyrrhothorax</i>																
Little Button-quail	<i>Turnix velox</i>																



Common Name	Scientific Name	All	2013	2014	2015	Remnant	Revegetation	<1yr	1 - 5 yrs	>5yrs	VC1	VC3	VC4	VC5	VC6	VC9	VC10.4
Gull-billed Tern	<i>Gelochelidon nilotica</i>	0.004			0.011	0.010								0.011		0.021	
Caspian Tern	<i>Hydroprogne caspia</i>	0.020		0.046	0.017	0.005	0.033	0.026	0.030	0.074	0.016	0.056		0.034		0.063	
Whiskered Tern	<i>Chlidonias hybrida</i>	0.026	0.027	0.046	0.006	0.024	0.026		0.030	0.037	0.016		0.012	0.011	0.022	0.031	0.063
White-winged Black Tern	<i>Chlidonias leucopterus</i>	0.006		0.017			0.010		0.013							0.031	
Crested Tern	<i>Thalasseus bergii</i>	0.004		0.011		0.005	0.003		0.004		0.016					0.010	
Silver Gull	<i>Chroicocephalus novaehollandiae</i>	0.017		0.034	0.017	0.010	0.023	0.026	0.025		0.032	0.056			0.011	0.031	
Yellow-tailed Black-Cockatoo	<i>Calyptorhynchus funereus</i>	0.009	0.011		0.017	0.024					0.048				0.022	0.042	
Galah	<i>Eolophus roseicapillus</i>	0.122	0.151	0.086	0.128	0.143	0.119	0.103	0.135		0.302		0.062	0.161	0.144	0.031	0.095
Long-billed Corella	<i>Cacatua tenuirostris</i>	0.004	0.005	0.006			0.007		0.008		0.032						
Little Corella	<i>Cacatua sanguinea</i>	0.007	0.005	0.011	0.006	0.014	0.003	0.026					0.012		0.011		
Sulphur-crested Cockatoo	<i>Cacatua galerita</i>	0.004	0.011			0.010									0.022		
Cockatiel	<i>Nymphicus hollandicus</i>	0.002	0.005			0.005					0.016						
Rainbow Lorikeet	<i>Trichoglossus haematodus</i>	0.037	0.043	0.011	0.056	0.081	0.010	0.026	0.008		0.079		0.012	0.046	0.111		
Musk Lorikeet	<i>Glossopsitta concinna</i>	0.043	0.070	0.017	0.039	0.081	0.020		0.025		0.190			0.011	0.089		
Little Lorikeet	<i>Glossopsitta pusilla</i>	0.007	0.022			0.019					0.032				0.022		

Common Name	Scientific Name	All	2013	2014	2015	Remnant	Revegetation	<1yr	1 - 5 yrs	>5yrs	VC1	VC3	VC4	VC5	VC6	VC9	VC10.4
Purple-crowned Lorikeet	<i>Glossopsitta porphyrocephala</i>	0.009	0.011	0.006	0.011	0.019	0.003			0.037	0.016		0.012		0.033		
Adelaide Rosella	<i>Platycercus elegans fleuriensis</i>	0.083	0.161	0.029	0.056	0.157	0.040		0.051		0.349		0.012	0.023	0.178		
Eastern Rosella	<i>Platycercus eximius</i>																
Australian Ringneck	<i>Barnardius zonarius</i>	0.011	0.027		0.006	0.024	0.003		0.004		0.079				0.011		
Blue Bonnet	<i>Northiella haematogaster</i>	0.004		0.006	0.006	0.010											0.032
Red-rumped Parrot	<i>Psephotus haematonotus</i>	0.074	0.151	0.011	0.056	0.138	0.036		0.046		0.397				0.100		0.063
Mulga Parrot	<i>Psephotus varius</i>																
Budgerigar	<i>Melopsittacus undulatus</i>																
Elegant Parrot	<i>Neophema elegans</i>	0.074	0.134	0.029	0.056	0.119	0.050		0.063		0.206	0.278	0.074	0.046	0.056	0.042	0.048
Horsfield's Bronze-Cuckoo	<i>Chalcites basalis</i>	0.057	0.108	0.011	0.050	0.110	0.026	0.026	0.025	0.037	0.159		0.062		0.067	0.021	0.111
Shining Bronze-Cuckoo	<i>Chalcites lucidus</i>	0.015	0.027	0.006	0.011	0.038					0.095		0.012	0.011			
Fan-tailed Cuckoo	<i>Cacomantis flabelliformis</i>	0.002	0.005			0.005									0.011		
Laughing Kookaburra	<i>Dacelo novaeguineae</i>	0.004	0.005	0.006		0.010					0.016					0.031	
Sacred Kingfisher	<i>Todiramphus sanctus</i>	0.002			0.006	0.005									0.011		
Rainbow Bee-eater	<i>Merops ornatus</i>	0.019	0.043		0.011	0.048					0.016						0.143
White-throated Treecreeper	<i>Cormobates leucophaea</i>																

Common Name	Scientific Name	All	2013	2014	2015	Remnant	Revegetation	<1yr	1 - 5 yrs	>5yrs	VC1	VC3	VC4	VC5	VC6	VC9	VC10.4
White-browed Treecreeper	<i>Climacteris affinis</i>	0.009	0.016	0.011		0.014	0.007		0.008				0.023				
Brown Treecreeper	<i>Climacteris picumnus</i>	0.009	0.011		0.017	0.024								0.056			
Superb Fairy-wren	<i>Malurus cyaneus</i>	0.430	0.554	0.379	0.350	0.690	0.287	0.154	0.300	0.370	0.619	0.167	0.444	0.310	0.433	0.500	0.492
Variiegated Fairy-wren	<i>Malurus lamberti</i>	0.022	0.016	0.046	0.006	0.057							0.049		0.056	0.010	0.032
Southern Emu-wren	<i>Stipiturus malachurus</i>	0.017	0.038		0.011	0.019	0.017		0.021				0.023			0.042	
Rufous Bristlebird	<i>Dasyornis broadbenti</i>																
White-browed Scrubwren	<i>Sericornis frontalis</i>	0.044	0.118		0.011	0.081	0.023		0.030		0.175	0.056	0.012	0.046	0.033		0.063
Shy Heathwren	<i>Calamanthus cauta</i>	0.009	0.027			0.024							0.012		0.044		
Weebill	<i>Smicronis brevirostris</i>	0.176	0.263	0.172	0.089	0.100	0.241	0.103	0.262	0.259	0.190	0.278	0.136	0.287	0.144	0.156	0.111
Striated Thornbill	<i>Acanthiza lineata</i>	0.022	0.038	0.017	0.011	0.052	0.003		0.004		0.111				0.044		0.016
Yellow Thornbill	<i>Acanthiza nana</i>	0.130	0.167	0.121	0.100	0.305	0.020		0.025		0.159	0.056	0.123	0.069	0.211	0.063	0.286
Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>	0.144	0.194	0.080	0.156	0.219	0.106	0.231	0.084	0.111	0.190		0.222	0.161	0.167		0.238
Buff-rumped Thornbill	<i>Acanthiza reguloides</i>	0.009	0.016		0.011	0.024							0.012		0.033		0.016
Inland Thornbill	<i>Acanthiza apicalis</i>	0.019	0.016	0.023	0.017	0.043	0.003		0.004			0.056	0.062		0.033	0.010	
Brown Thornbill	<i>Acanthiza pusilla</i>	0.043	0.086	0.017	0.022	0.081	0.020		0.025		0.079	0.056	0.037	0.057	0.022	0.042	0.048
Spotted Pardalote	<i>Pardalotus punctatus</i>	0.072	0.113	0.057	0.044	0.176	0.007		0.008		0.222		0.025	0.023	0.222		
Striated Pardalote	<i>Pardalotus striatus</i>	0.081	0.151	0.034	0.056	0.176	0.023		0.030		0.349		0.012	0.034	0.122		0.032

Common Name	Scientific Name	All	2013	2014	2015	Remnant	Revegetation	<1yr	1 - 5 yrs	>5yrs	VC1	VC3	VC4	VC5	VC6	VC9	VC10.4
Eastern Spinebill	<i>Acanthorhynchus tenuirostris</i>	0.004	0.005		0.006	0.010					0.016				0.011		
Yellow-faced Honeyeater	<i>Lichenostomus chrysops</i>	0.006	0.011	0.006		0.014									0.022	0.010	
Singing Honeyeater	<i>Lichenostomus virescens</i>	0.276	0.333	0.190	0.300	0.248	0.320	0.231	0.338	0.296	0.063	0.444	0.457	0.345	0.200	0.240	0.444
Yellow-tufted Honeyeater	<i>Lichenostomus melanops</i>																
Purple-gaped Honeyeater	<i>Lichenostomus cratitius</i>	0.024	0.032	0.023	0.017	0.062							0.074		0.078		
Yellow-plumed Honeyeater	<i>Lichenostomus ornatus</i>	0.004	0.011			0.010									0.022		
White-plumed Honeyeater	<i>Lichenostomus penicillatus</i>	0.081	0.156	0.057		0.114	0.066		0.068	0.148	0.286	0.111	0.012	0.046	0.133	0.010	0.016
Noisy Miner	<i>Manorina melanocephala</i>	0.030	0.005	0.046	0.039	0.019	0.040	0.128	0.030		0.048		0.037	0.023	0.011	0.021	0.048
Spiny-cheeked Honeyeater	<i>Acanthagenys rufogularis</i>	0.207	0.237	0.201	0.183	0.362	0.119	0.179	0.105	0.148	0.190	0.278	0.370	0.207	0.189	0.073	0.365
Little Wattlebird	<i>Anthochaera chrysoptera</i>	0.026	0.070	0.006		0.033	0.023		0.030		0.095	0.111	0.025	0.034		0.010	
Red Wattlebird	<i>Anthochaera carunculata</i>	0.196	0.226	0.201	0.161	0.329	0.122	0.154	0.101	0.259	0.175	0.111	0.346	0.161	0.378	0.115	0.079
White-fronted Chat	<i>Epthianura albifrons</i>	0.006	0.016		0.006	0.014									0.033		
Tawny-crowned Honeyeater	<i>Glyciphila melanops</i>	0.004		0.006	0.006	0.010							0.025				
Crescent Honeyeater	<i>Phylidonyris pyrrhopterus</i>	0.011	0.022		0.011	0.029					0.063				0.022		
New Holland Honeyeater	<i>Phylidonyris novaehollandiae</i>	0.215	0.344	0.201	0.094	0.310	0.168	0.077	0.173	0.259	0.302	0.278	0.321	0.253	0.311	0.094	0.095
Black-chinned Honeyeater	<i>Meliphaga gularis</i>	0.002	0.005			0.005					0.016						

Common Name	Scientific Name	All	2013	2014	2015	Remnant	Revegetation	<1yr	1 - 5 yrs	>5yrs	VC1	VC3	VC4	VC5	VC6	VC9	VC10.4
Brown-headed Honeyeater	<i>Melithreptus brevirostris</i>	0.024	0.054		0.017	0.052	0.007		0.008		0.095		0.012		0.022		0.063
White-naped Honeyeater	<i>Melithreptus lunatus</i>																
White-browed Babbler	<i>Pomatostomus superciliosus</i>	0.037	0.070	0.011	0.028	0.076	0.013		0.017		0.048	0.111	0.025	0.023	0.011	0.083	0.032
Chestnut Quail-thrush	<i>Cinclosoma castanotus</i>	0.004	0.011			0.010									0.022		
Varied Sittella	<i>Daphoenositta chrysoptera</i>	0.004	0.011			0.010					0.032						
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>	0.035	0.032	0.052	0.022	0.052	0.026		0.030	0.037	0.079		0.012	0.057	0.044	0.010	0.016
White-winged Triller	<i>Lalage tricolor</i>	0.019	0.054			0.033	0.010		0.013		0.127		0.011				0.016
Crested Shrike-tit	<i>Falcunculus frontatus</i>	0.004	0.011			0.010											
Golden Whistler	<i>Pachycephala pectoralis</i>	0.054	0.070	0.046	0.044	0.133	0.003		0.004		0.127		0.062		0.078	0.073	0.032
Rufous Whistler	<i>Pachycephala rufiventris</i>	0.072	0.124	0.029	0.061	0.171	0.010		0.013		0.190	0.056	0.049	0.057	0.089		0.143
Grey Shrike-thrush	<i>Colluricincla harmonica</i>	0.193	0.269	0.126	0.178	0.443	0.036	0.103	0.021	0.074	0.270		0.309	0.092	0.211	0.073	0.413
Masked Woodswallow	<i>Artamus personatus</i>	0.020	0.059			0.029	0.017		0.021		0.048	0.056	0.012	0.034	0.011		0.032
Black-faced Woodswallow	<i>Artamus cinereus</i>																
Dusky Woodswallow	<i>Artamus cyanopterus</i>	0.024	0.048		0.022	0.052	0.007		0.008		0.206						
Grey Butcherbird	<i>Cracticus torquatus</i>	0.035	0.059	0.034	0.011	0.090					0.032		0.074	0.046	0.056		0.032
Pied Butcherbird	<i>Cracticus nigrogularis</i>	0.002		0.006		0.005							0.011				
Australian Magpie	<i>Cracticus tibicen</i>	0.246	0.333	0.230	0.172	0.248	0.264	0.154	0.287	0.222	0.365	0.333	0.272	0.345	0.244	0.135	0.127

Common Name	Scientific Name	All	2013	2014	2015	Remnant	Revegetation	<1yr	1 - 5 yrs	>5yrs	VC1	VC3	VC4	VC5	VC6	VC9	VC10.4
Grey Currawong	<i>Strepera versicolor</i>	0.033	0.038	0.011	0.050	0.057	0.020	0.077	0.013		0.063		0.099		0.044		0.032
Grey Fantail	<i>Rhipidura fuliginosa</i>	0.215	0.312	0.161	0.167	0.495	0.040		0.042	0.074	0.444	0.111	0.235	0.138	0.233	0.115	0.365
Willie Wagtail	<i>Rhipidura leucophrys</i>	0.202	0.247	0.178	0.178	0.205	0.218	0.308	0.198	0.259	0.254	0.278	0.185	0.253	0.156	0.146	0.286
Australian Raven	<i>Corvus coronoides</i>	0.009	0.022	0.006		0.014	0.007		0.008		0.016		0.037		0.011		
Little Raven	<i>Corvus mellori</i>	0.163	0.210	0.132	0.144	0.229	0.132	0.077	0.148	0.074	0.238	0.111	0.198	0.218	0.167	0.115	0.127
Magpie-lark	<i>Grallina cyanoleuca</i>	0.074	0.108	0.057	0.056	0.071	0.083	0.128	0.076	0.074	0.063		0.025	0.126	0.100	0.083	0.063
Victoria's Riflebird	<i>Ptiloris victoriae</i>	0.004	0.011			0.005	0.003		0.004		0.016					0.010	
Jacky Winter	<i>Microeca fascinans</i>	0.006	0.005		0.011	0.014					0.048						
Red-capped Robin	<i>Petroica goodenovii</i>	0.020	0.038	0.011	0.011	0.052					0.016		0.012		0.022		0.111
Flame Robin	<i>Petroica phoenicea</i>	0.002		0.006		0.005									0.011		
Hooded Robin	<i>Melanodryas cucullata</i>	0.013	0.022		0.017	0.033					0.111						
Southern Scrub-robin	<i>Drymodes brunneopygia</i>	0.011	0.032			0.029							0.037		0.033		
Horsfield's Bushlark	<i>Mirafra javanica</i>	0.026	0.011	0.034	0.033	0.005	0.043	0.051	0.038	0.074		0.056		0.046	0.011	0.052	0.032
Eurasian Skylark	<i>Alauda arvensis</i>	0.157	0.183	0.115	0.172	0.048	0.241	0.051	0.300		0.016	0.333	0.086	0.241	0.144	0.302	0.095
Golden-headed Cisticola	<i>Cisticola exilis</i>	0.061	0.065	0.086	0.033	0.024	0.092	0.026	0.114		0.079			0.092	0.022	0.115	0.016
Australian Reed-Warbler	<i>Acrocephalus australis</i>	0.031	0.043	0.052		0.010	0.050		0.055	0.074	0.032			0.069		0.063	
Little Grassbird	<i>Megalurus gramineus</i>	0.037	0.065	0.046		0.029	0.046		0.059		0.063			0.069		0.063	

Common Name	Scientific Name	All	2013	2014	2015	Remnant	Revegetation	<1yr	1 - 5 yrs	>5yrs	VC1	VC3	VC4	VC5	VC6	VC9	VC10.4
Rufous Songlark	<i>Cincloramphus mathewsi</i>	0.015	0.043			0.029	0.007		0.008		0.063			0.011	0.033		
Brown Songlark	<i>Cincloramphus cruralis</i>	0.072	0.113	0.006	0.094	0.019	0.116	0.026	0.143		0.032	0.167	0.062	0.115	0.056	0.104	0.016
Silvereeye	<i>Zosterops lateralis</i>	0.254	0.349	0.207	0.200	0.443	0.145	0.077	0.160	0.111	0.302	0.278	0.420	0.333	0.200	0.188	0.175
White-backed Swallow	<i>Cheramoeca leucosterna</i>	0.081	0.161	0.034	0.044	0.171	0.026	0.051	0.017	0.074	0.190	0.111	0.099	0.034	0.100	0.010	0.143
Welcome Swallow	<i>Hirundo neoxena</i>	0.072	0.016	0.121	0.083	0.024	0.106	0.103	0.118			0.111		0.115	0.056	0.198	0.032
Fairy Martin	<i>Petrochelidon ariel</i>	0.019	0.005	0.011	0.039	0.005	0.030	0.051	0.030				0.037	0.046			0.032
Tree Martin	<i>Petrochelidon nigricans</i>	0.031	0.038	0.017	0.039	0.057	0.017		0.021		0.127			0.011	0.056		
Common Blackbird	<i>Turdus merula</i>	0.115	0.204	0.080	0.056	0.186	0.076	0.026	0.072	0.185	0.206	0.167	0.136	0.172	0.100	0.083	0.032
Common Myna	<i>Sturnus tristis</i>	0.196	0.301	0.138	0.144	0.195	0.215	0.179	0.232	0.111	0.444	0.111	0.111	0.264	0.178	0.167	0.095
Mistletoebird	<i>Dicaeum hirundinaceum</i>	0.026	0.038		0.039	0.043	0.017		0.021		0.175				0.022		0.016
Zebra Finch	<i>Taeniopygia guttata</i>																
Red-browed Finch	<i>Neochmia temporalis</i>	0.013	0.032		0.006	0.019	0.010		0.013		0.016			0.011	0.044	0.010	
Diamond Firetail	<i>Stagonopleura guttata</i>	0.007	0.016		0.006	0.019					0.063						
House Sparrow	<i>Passer domesticus</i>	0.080	0.086	0.092	0.061	0.048	0.109	0.026	0.122	0.111	0.048	0.111	0.025	0.149	0.078	0.063	0.143
Australasian Pipit	<i>Anthus novaeseelandiae</i>	0.056	0.070	0.052	0.044	0.010	0.089	0.103	0.097		0.032	0.056		0.092	0.067	0.094	0.063
European Goldfinch	<i>Carduelis carduelis</i>	0.063	0.065	0.034	0.089	0.105	0.040	0.077	0.038		0.159		0.049	0.057	0.033	0.052	0.095



### Appendix 3 Other vertebrate fauna recorded over surveys (2013 - 2015)

Amphibians		Reptiles		Mammals		
Common Froglet	<i>Crinia signifera</i>	Common Scaly-foot	<i>Pygopus lepidopodus</i>	Short-beaked Echidna	<i>Tachyglossus aculeatus</i>	
Banjo Frog	<i>Limnodynastes dumerilii</i>	Central Bearded Dragon	<i>Pogona vitticeps</i>	Western Grey Kangaroo	<i>Macropus fuliginosus</i>	
Spotted Marsh Frog	<i>Limnodynastes tasmaniensis</i>	Sand Goanna	<i>Varanus gouldii</i>	Common Brushtail Possum	<i>Trichosurus vulpecula</i>	Rare
Burrowing Frog	<i>Neobatrachus pictus</i>	Eastern Bluetongue	<i>Tiliqua scincoides</i>	Brown Rat	<i>Rattus norvegicus</i>	Introduced
		Sleepy Lizard	<i>Tiliqua rugosa</i>	House Mouse	<i>Mus musculus</i>	Introduced
		Black Tiger Snake	<i>Notechis ater (NC)</i>	Brown Hare	<i>Lepus capensis</i>	Introduced
		Red-bellied Black Snake	<i>Pseudechis porphyriacus</i>	Rabbit	<i>Oryctolagus cuniculus</i>	Introduced
		Eastern Brown Snake	<i>Pseudonaja textilis</i>	Dog	<i>Canis lupus familiaris</i>	Introduced
		Common Long-necked Tortoise	<i>Chelodina longicollis</i>	Red Fox	<i>Vulpes vulpes</i>	Introduced
				Feral Cat	<i>Felis catus</i>	Introduced
				Fallow Deer	<i>Cervus dama</i>	Introduced
				Cattle (Feral)	<i>Bos taurus</i>	Introduced
				Sheep (Feral)	<i>Ovis aries</i>	Introduced