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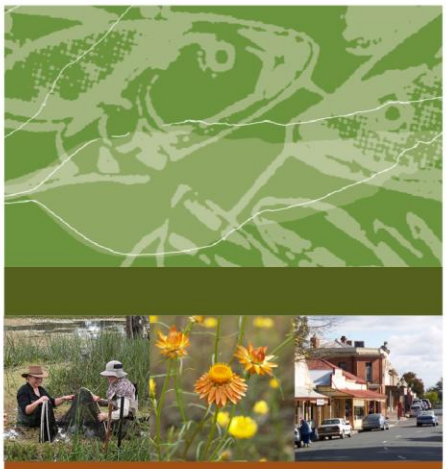

Thurgoona and Wirlinga Community Understanding & Knowledge of Biodiversity

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Abstract

The Thurgoona and Wirlinga region of New South Wales is expected to grow to over 50,000 people in the next 30 years. This growth will mean that the area will transition from a rural setting to a more urban environment. The associated changes will impact biodiversity and available habitat, particularly for key threatened species. This shift from more open grassland to suburban housing with fenced and manicured lawns means that many species will be confined to habitat in planned corridors and reserves.

This research project collected and summarized baseline data about how the Thurgoona and Wirlinga community residents understand and value biodiversity in their own neighbourhoods. The ability to explore community knowledge and attitudes about biodiversity and conservation before projects or education initiatives are conducted (and in this case before population growth) is a rare one. This baseline data could ultimately lead to more effective on the ground projects that take into consideration local values and target increases in local knowledge on biodiversity.

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Background

The Thurgoona and Wirlinga area has been identified as having important conservation values and there is a need to balance urban development while protecting and enhancing threatened species and their habitats (Albury-Wodonga Development Corporation, 2004). The Thurgoona and Wirlinga population is projected to grow to over 50,000 people in the next 30 years (RPS, 2012). This growth will mean that the area will transition from a peri-urban to urban environment. The associated changes will impact biodiversity and available habitat, particularly for key threatened species such as the squirrel glider. This shift from more open grassland to suburban housing with fenced and manicured lawns means that many species will be confined to habitat in planned corridors and reserves.
Looking at neighbourhoods with varying levels of urban development has allowed researchers (Smallbone, Luck & Wassens, 2011) to show the relationship between various species in southeastern Australia and level of urbanization and socio-economic levels in different neighbourhoods. Smallbone, Luck and Wassens (2011) found that resident's socio-economic status greatly influenced the vegetation cover in a neighbourhood, and therefore the quality of habitat for species such as amphibians. Carefully placed nest boxes are commonly used to increase suitable habitat for sugar gliders and squirrel gliders in urban areas (Durant, Luck & Matthews, 2009), particularly when paired with specific vegetation and over time. Although habitat area could be increased through targeted native landscaping or nest boxes placed in gardens these sorts of strategies require community engagement and residents' understanding of the importance of biodiversity. Research suggests that socio-economic factors can influence vegetation levels and biodiversity in neighbourhoods through time. Understanding temporal and socio-economic relationships through the processes of urban development can help to increase vegetation habitat in neighbourhoods (Luck, Smallbone & Sheffield, 2012). Luck et al. also suggest that a greater "Understanding [of] the complex interactions among the natural, built and socio-economic characteristics of urban neighbourhoods, and householder behaviour, is important to achieving successful conservation outcomes in urban areas and improving neighbourhoods for both human and non-human residents." (2012, p.9). This understanding of socio-economic factors influencing biodiversity and conservation outcomes is crucial in a world that is becoming increasingly urbanized.

This study provided a unique opportunity to obtain a baseline set of data about how the Thurgoona and Wirlinga community understands and values biodiversity in their own neighbourhoods. The ability to explore community knowledge and values about biodiversity and conservation before projects, education initiatives or other interventions are conducted (and in this case before population growth) is a rare. The baseline data presented in this report may lead to more effective on the ground projects that take into consideration residents' knowledge, values and behaviours.

Methods

In the initial funding application to the Albury Conservation Company (ACC) the researchers proposed an online survey of residents in the Thurgoona and Wirlinga area (Figure 1). Residents would have been advised of the survey by a mailed postcard and then follow up postcards would have been sent to all residents. Following the funding approval the researchers decided that an online survey would not be suitable for this sample for a number of reasons: this method would exclude households without the Internet and elderly people not familiar with computers and the Internet, and it would be too difficult to expect residents to take the postcard information and then complete the online survey. The researchers decided that a paper postal survey would be more appropriate for this sample.
Ethics approval was sought and gained for this research from the CSU Human Ethics Committee for both the online survey and later for the variation to use a postal survey.

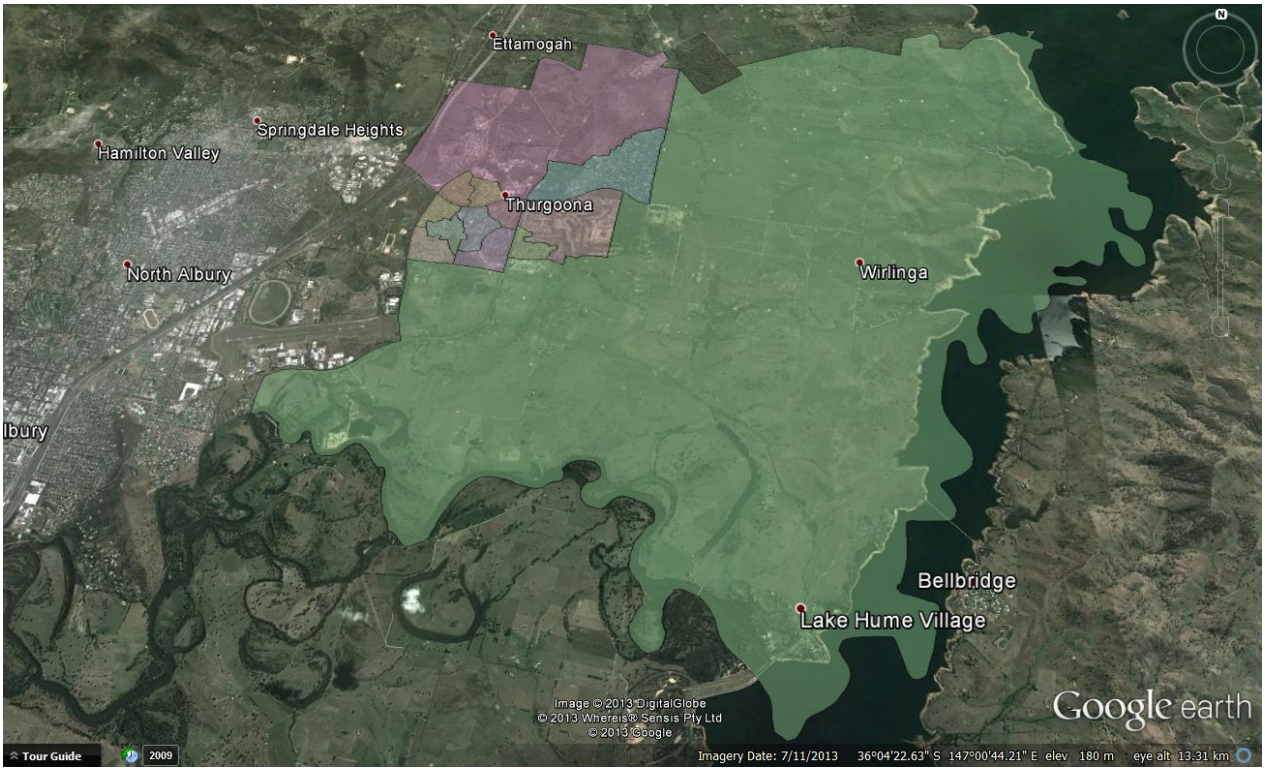


Figure 1: Census Districts of Thurgoona and Wirlinga Study Area (Image: Google Earth 2013)

Survey questions were developed based on the Luck, Davidson, Boxall and Smallbone (2011) study, standardized instruments to determine people's relationship with nature and other demographic data that could relate to their knowledge, attitudes and behaviours towards conservation issues. Draft surveys were distributed and pilot tested with a number of local conservation experts, employees of the ACC and other researchers. Changes were made to some survey questions and then they were pilot tested with 8 local Thurgoona residents and employees of the ACC. Once the survey questions had been finalised a survey booklet was designed and printed. Considerable effort was made to ensure the survey looked professional and interesting to the potential respondents with a photograph on the front cover of the survey (see Appendix A). The survey was accompanied by a covering letter addressed to the Resident (see Appendix B). As an incentive to complete the survey, survey respondents could opt to go into a draw for one of five $50.00 Woolworth vouchers. They could also volunteer to do a face to face interview following completion of the survey. If the respondents decided to go into the prize draw or volunteer to be interviewed they needed to provide their names and contact details. In these cases it was made clear in the survey that their names and contact details would be destroyed once the prize had been drawn and interviews completed. 1,988 surveys were distributed to all households in Thurgoona and Wirlinga by a private distribution service. Surveys were not delivered to houses that displayed 'No junk mail' which may account for approximately about 106 households, or 5.1% of all households. Surveys were distributed to all households in 13 ABS Statistical Areas (1117201-204,206, 209-212, 221, 223, 227, 228) (see Figure 1). It should be noted that survey respondents self selected to complete the survey and the sample of respondents may not be representative of the population of Thurgoona and Wirlinga.
The survey data was analysed using R version 2.15.0 and descriptive statistics created. Pearson's correlation coefficients were calculated to determine potential relationships between various data collected.

Ten follow up semi-structured interviews were undertaken by the two researchers. Interviewees were randomly selected from the pool of volunteers from the survey. Interview questions (see Appendix C) were developed based on an analysis of the three open ended questions in the survey. Key topics and issues were identified from the survey results and selected for further exploration in the interviews. Interviews were conducted face to face and lasted 30 minutes to one hour in length. The interview questions focused on issues around why the interviewees had moved to

the Thurgoona area and why they thought others had moved there, why they thought many survey respondents had indicated that there is a need to protect biodiversity for future generations as well as for plants and animals, if they were aware of any local organisations that help protect biodiversity and the role of the Council, is there a way of balancing conservation and development, what they thought of the projected population increase in Thurgoona and Wirlinga to 50,000 over the next 50 years and what they thought they could personally do about the impact of development on biodiversity. The interview data were manually analysed using content analysis and identification of key issues and topics. It should be noted that the interviewees self selected to complete the survey and agreed to be interviewed. The interviewees may not be representative of the Thurgoona and Wirlinga population.

Key findings

Three hundred residents of Thurgoona and Wirlinga completed the survey. This represents a 15.1% response rate from the 1,988 surveys distributed. There were a total of 4622 residents over the age of 18 in the area of the study during the 2011 census (ABS, 2011a; ABS, 2011b), with approximately 2094 households in this area at the time of the census.

Age

As can be seen from Figure 2, 43% of the respondents were in the 50-69 age group. The majority of respondents were over 30 years old (94%). Estimated numbers from ABS (2011a; 2011b) for Thurgoona alone indicate that actual population percentages of Thurgoona and Wirlinga combined from 2011 are 1137 (24.5%) 18-29, 1886 (40.8%) 30-49, 1224 (26.5%) 50-69, and 375 (8.1%) over 70 for a total of 4622 people over the age of 18 years. These data show that our sample is a biased towards older residents. This result may reflect a number of factors such as elderly people may have been more likely to respond to a paper survey, were interested in the survey topic and/or had more time to complete the survey. It is possible that the 18-29 year olds in the sample were Charles Sturt University students who rent in the area.

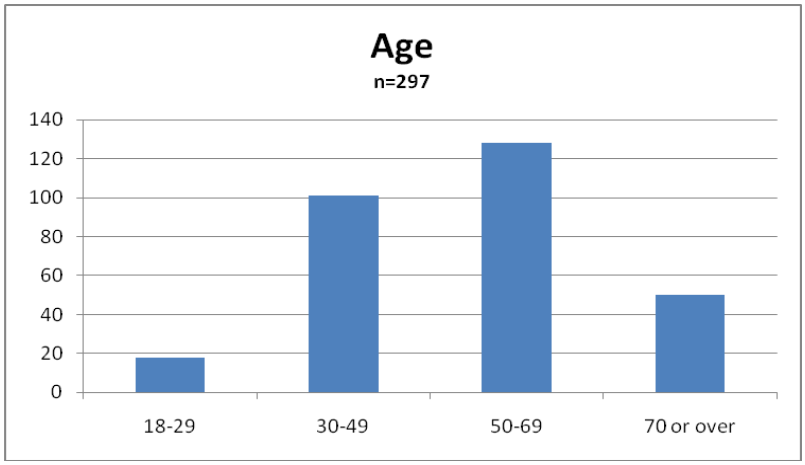


Figure 2: Age groups of survey respondents (n=297).

Gender

As shown in Figure 3 the majority of respondents were female (65%). This sample represents a greater number of females than in the Thurgoona and Wirlinga population over 18 overall, which is 53.4% female, 46.6% male (ABS, 2011a; ABS, 2011b)

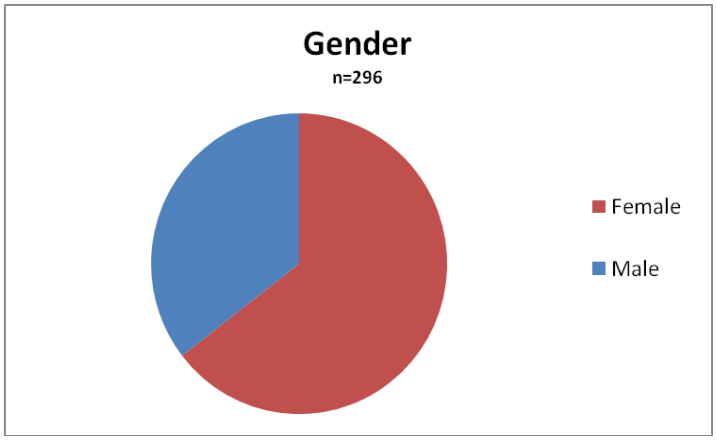


Figure 3: Gender of survey respondents (n=296).

Country of birth

Respondents were asked their country of birth. Eighty six percent were born in Australia, 8% born in the UK, and small numbers born in Asia, New Zealand, South Africa, North and South America and Europe. In the Thurgoona and Wirlinga area, 87.6 % of residents were born in Australia, closely aligning with this survey sample (ABS, 2011a; ABS, 2011b).

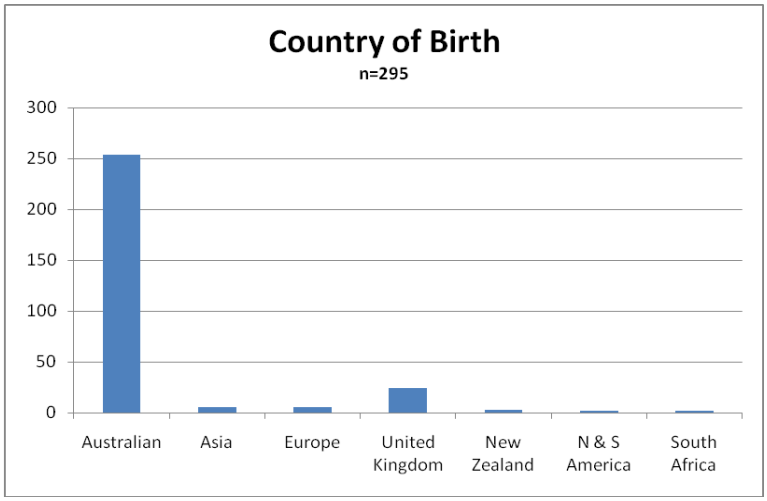


Figure 4: Country of birth of survey respondents (n=295).

Education level

Twenty five percent held a Certificate or Diploma, 20% held a Bachelor's degree, 18% had Year 11 or below education, 10% a Trade qualification, 9% had reached Year 12, 9% postgraduate qualification and 8% held a graduate certificate or diploma. Thirty seven percent of the respondents held Bachelor's degree, postgraduate qualification or graduate certificate or diploma. Comparative census data are not available in the same categories as this question.

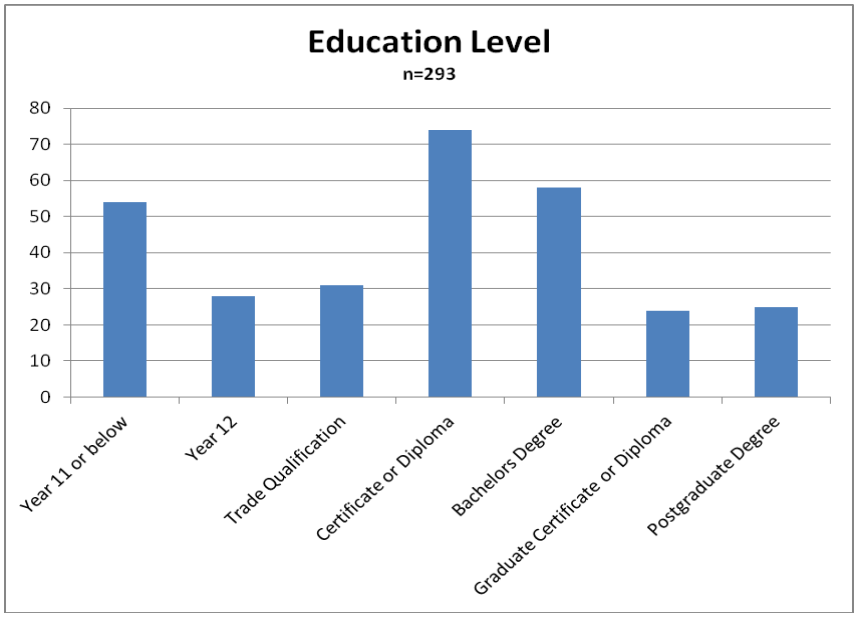


Figure 5: Education level of survey respondents (n=293).

Compostion of household

All the respondent households had an adult. Figure 6 shows the number of households that indicated they have children or own the type of pet or livestock listed. 37.5% of responding households have one or more children and 48.8% of households have one or more dogs. 2011 ABS Census data (2011a; 2011b) show that 846 of 2094 households (40.4%) in Thurgoona and Wirlinga had children under 15 in the home, slightly more than the survey sample. Various pets are common in the area according to respondents, including cats, birds and fish.

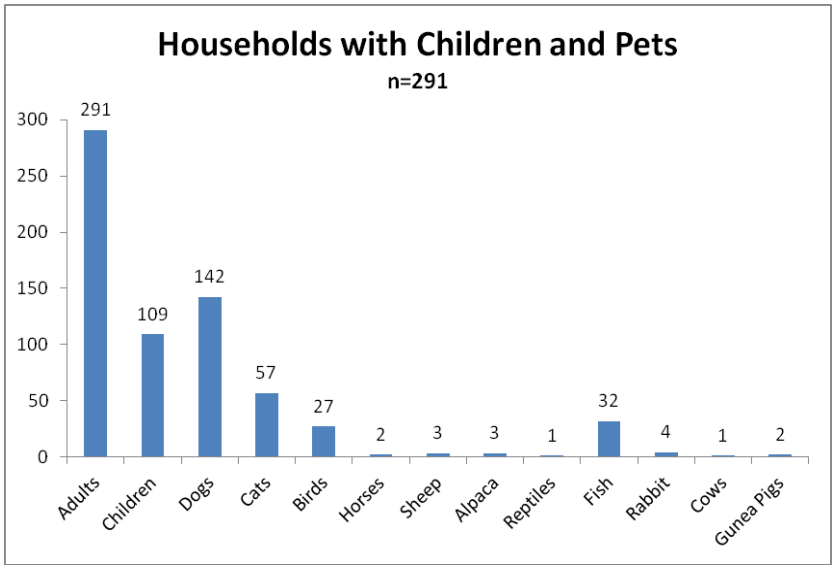


Figure 6: Households with children and pets (n=291).

Residency Period

Respondents were asked how many years had lived in their current house.

14% less than one year, 33% for 1-5 years, 21% 6-10 years and 32% more than ten years.

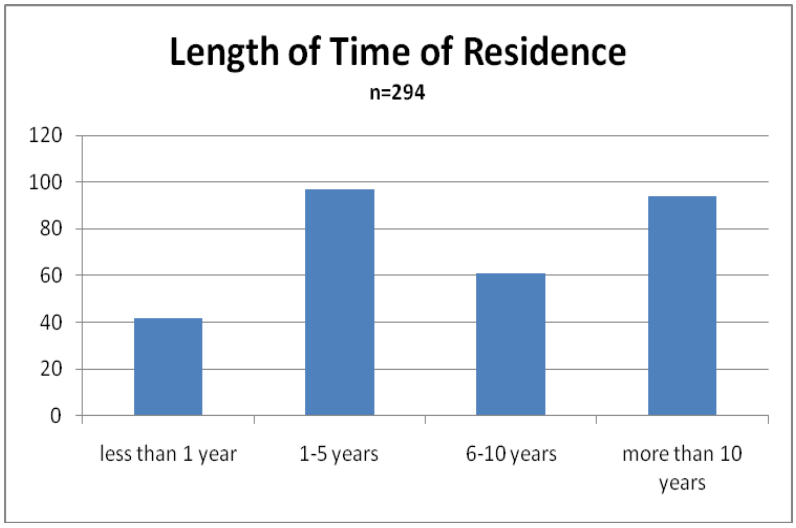


Figure 7: Length of time of residence in Thurgoona and/or Wirlinga (n=294).

Home Ownership

Respondents were asked if they rented or owned their current residence. As shown in Figure 8, 87% owned their own home and 13% rented their current residence.

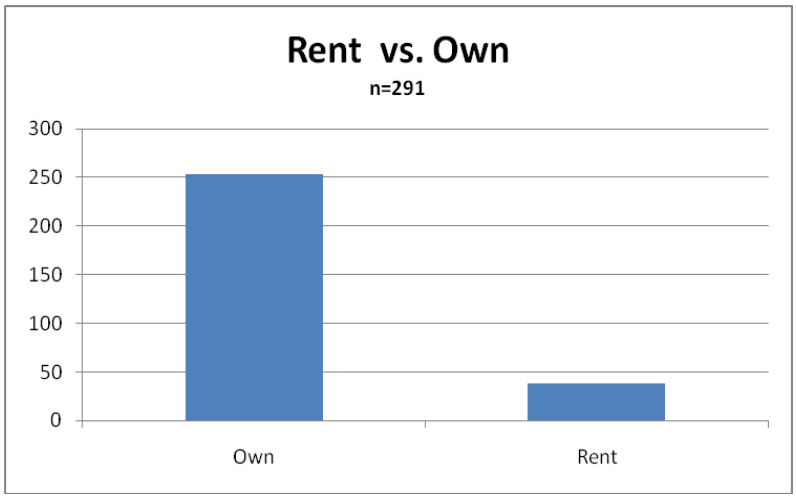


Figure 8: Survey respondents who rent or own their residence (n=291).

Question 1

The first set of questions in the survey asked about the respondents' conservation behaviours. The first question asked the respondents what conservation activity or activities they had participated in the past fortnight. They could select as many behaviours as applicable. As shown in Figure 9, 96% had separate garbage for recycling, 77% had observed birds in their garden/property, 72% had saved electricity, 59% had provided water for the birds, 56% had collected and used rainwater, 52% had composted, 38% had planted native trees and bushes in their garden, and 26% had consciously chosen to walk/cycle or take public transport to reduce greenhouse emissions (Figure 9).

Other activities that fewer respondents mentioned were actively constraining their cat from roaming at night and donating or volunteering for a conservation group. No respondents had observed non-pet animals in their garden/property, though the open ended questions later in the survey indicate that some respondents who live on large properties did observe native wildlife on their properties such as kangaroos.

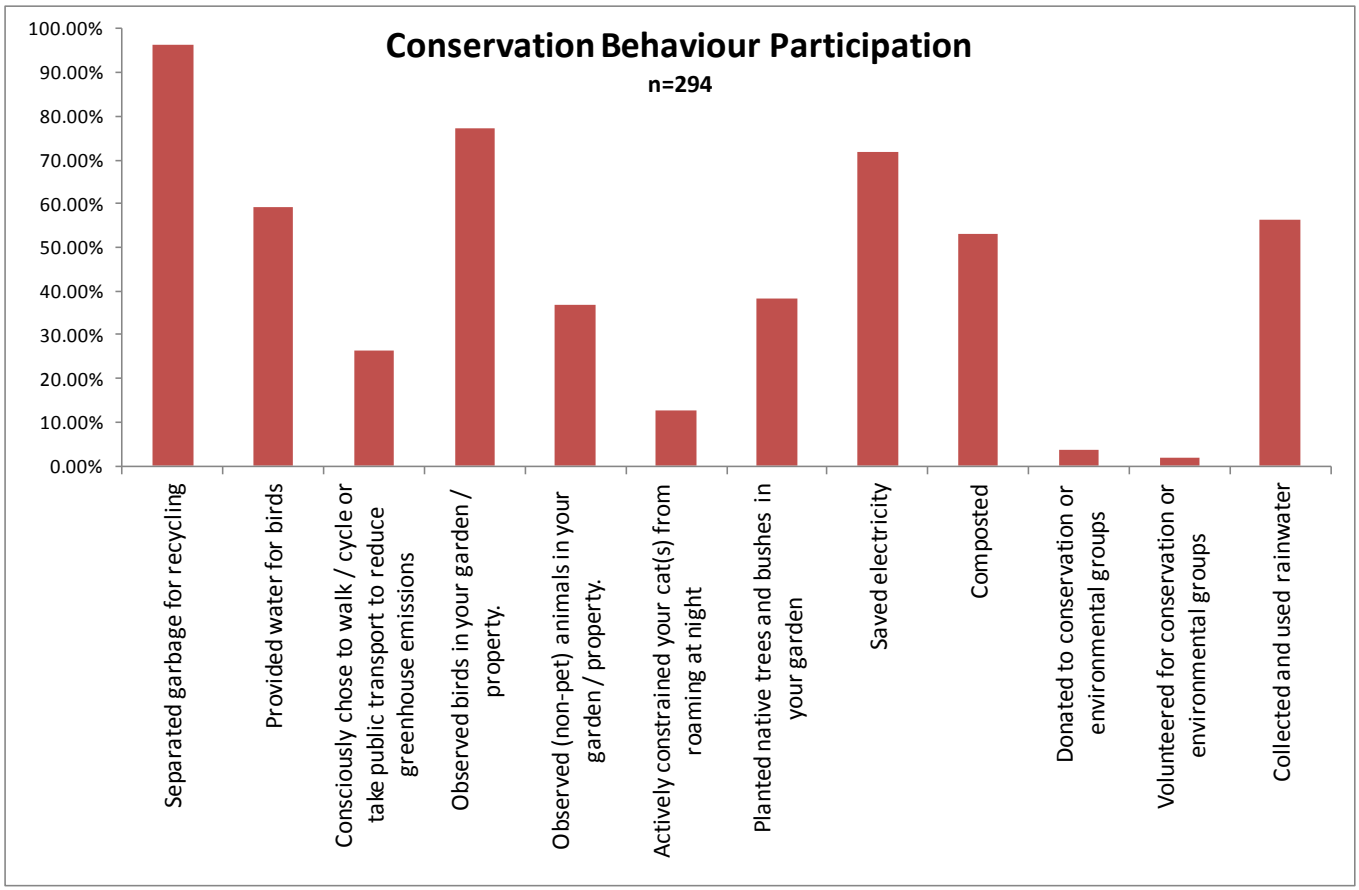


Figure 9: Responses to Question 1 (n=294).

Respondents who indicated that they had observed birds (77%) or non-pet animals in their garden (37%) were asked to list the three most frequent sightings. The listings were quite extensive and reflect a wide variety of types of birds and animals known to residents of Thurgoona and Wirlinga. Various names were given for different birds and animals, so each of those listed in

Table 1 and Table 2 was grouped together. Original names and spellings are left in the answers with more technical common names are given in brackets if known. The most common birds identified are indicated in Table 1 were Magpies, Willy Wagtails and Wrens as a group. Galahs, parrots, pigeons and rosellas were all identified by at least 10% of participants. Of the animals observed in gardens listed in Table 2, lizards, frogs and rabbits were the most common. Even though participants were instructed not to include pets in their observations, cats belonging to other people or feral cats were observed quite commonly.

Table 1: Birds listed by survey participants as observed in their garden. The three most frequent observations are noted in red highlight, with the total of all subgroups given in brackets. Additional large quantity responses are given in bold.

Bird Name Listed More specific name	Number observed
Birds (general)	8
Blackbirds	38
Cockatoos	7 (8)
Sulphur-crested Cockatoos	1
Crows	3
Currawong	3
Doves	16 (21)
Turtle doves	5
Ducks	5 (10)
Black ducks	1
Wild ducks	2
Wood ducks	2
Eagles	2 (4)
Fantail eagles (Wedge-tailed eagles)	1
Sea eagles	1
Finch	9 (11)
Blue Finch (Superb Fairy-wren)	1
Firetail Finch	1
Galahs	**41**
Hawks	1
Honeyeaters	12 (16)
Blue-eye honeyeater	1
Kurrawong honeyeater	1
Regent honeyeater	1
White-plumed honeyeater	1
Kites	2
Kookaburras	16
Lorikeets	2 (4)
Rainbow Lorikeets	2
Magpies	**136**
Miner(minor) birds (Noisy Miner)	5 (8)
Indian Mynar birds (Indian Mynah)	2
Jimmy Minors	1
Mudlarks/ Peewees (Magpie Lark)	31
Owl	1
Parrots	**31 (47)**
Grass Parrots / Red-rumped Parrot / Parakeets	13
Marg parrot	1
SC parrots	1
Swift parrot	1
Turquoise parrot	1

Bird Name Listed More specific name	Number observed
Pigeons	**29 (38)**
Crested pigeons / Top Notch Pigeons	7
Sparrow pigeons	1
Wood pigeons	1
Rosellas	**24 (37)**
Crimson rosellas / Yellow rosellas	8
Eastern rosellas / White-faced rosellas	5
Eastern Shriketit	1
Sparrows	**43**
Starlings (European)	13
Swallows	4 (6)
Welcome swallows	1
Woodswallows (Dusky woodswallow)	1
Unana bird	1
Wattle birds	2
Willy Wagtails	**51**
Wrens	**21 (62)**
Blue Wrens (Superb Fairy-wrens)	34
Fairy Wrens (Superb Fairy-wrens)	4
Jenny Wrens (Superb Fairy-wrens)	3

*Table 2:Animals listed by survey participants as observed in their garden. The three most frequent observations are noted in red highlight, with the total of all subgroups given in brackets. *Participants were asked to list non-pet animals, but for one noted category, cats, it is assumed those observed do not belong to the owner but were instead cats of others seen wandering in their garden. A more technical common name is given in brackets, if possible.*

Animal Name Listed **Different name**	**Number observed**
Ants	4 (5)
Bull ants	1
Bats	1
Bees	2
Beetles	1
Ladybeetle	1
Butterflies	4
Cats	**12 (19) ***
Cat, someone else's	5
Feral Cat	2
Slashed Caterpillar	1
Cows	3
Crickets	2
Dogs	1 (2)
Dog, someone else's	1
Echidnas	4
Fox	7
Frogs	**27**
Horse	2
Kangaroos (Eastern Grey)	11
Legless Lizards	1
Lizards	**26 (50)**
Blue Tongue Lizards (Eastern Blue Tongue)	8
Bobtail Lizards (Shingleback Lizard)	1
Gecko	8
Goanna (Lace Monitor)	1
Skink	6
Bogong High Plains Moth (Bogong Moth)	1
Mouse	4
Possums	5
Praying Mantis	1
Rabbits	**29 (33)**
Hares	4
Sheep	2
Snails	2
Snakes	4 (7)
Brown Snake	2
Waipsnake (Yellow-faced Whip snake)	1
Spiders	4
Worms	1

Question 2

In the second question the respondents were given a list of conservation tools and resources available to them at their current residence such as shower timer, solar electric panels, Austalian plants, nest boxes, and insulation in the ceiling. They were asked which of these items or tools they were using in their home. They could select as many as applicable. As shown in Figure 10, 92% had insulation in the ceiling, 83% used enegy efficient compact flourescent light globes, 76% had Australian plants in their garden, 62% had a water efficient shower head, 56% had a vegetable garden, 56% a rainwater tank, 51% had fruit trees, 48% a compost bin/area, 22% solar panels, 13% shower timer, 11% bird nest boxes and 8% had a solar hot water system.

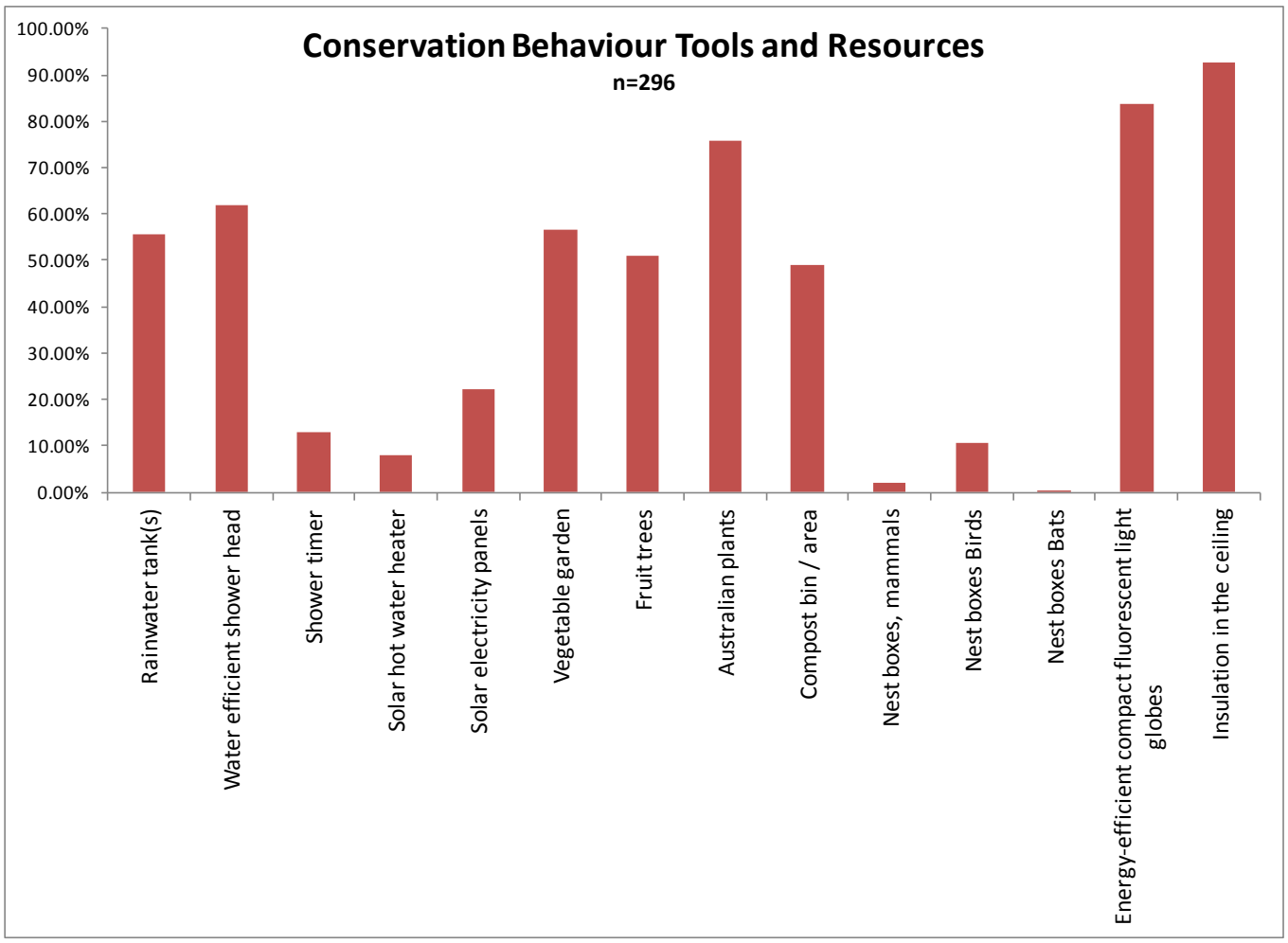


Figure 10: Responses to Question 2 (n=296).

Question 3

The respondents were then asked on a scale of 1-5 (1 = very unimportant and 5 = very important) to rate which of the conservation behaviours they felt were most important, which reflects their values and attitudes towards each behaviour. As seen in Figure 10 the conservation behaviours considered the most important were recycling, saving electricity, water conservation and planting low water use plants. Behaviours considered somewhat important were composting, growing your own food, buying locally sourced food, and buying locally made products. Buying organic food was considered somewhat unimportant.

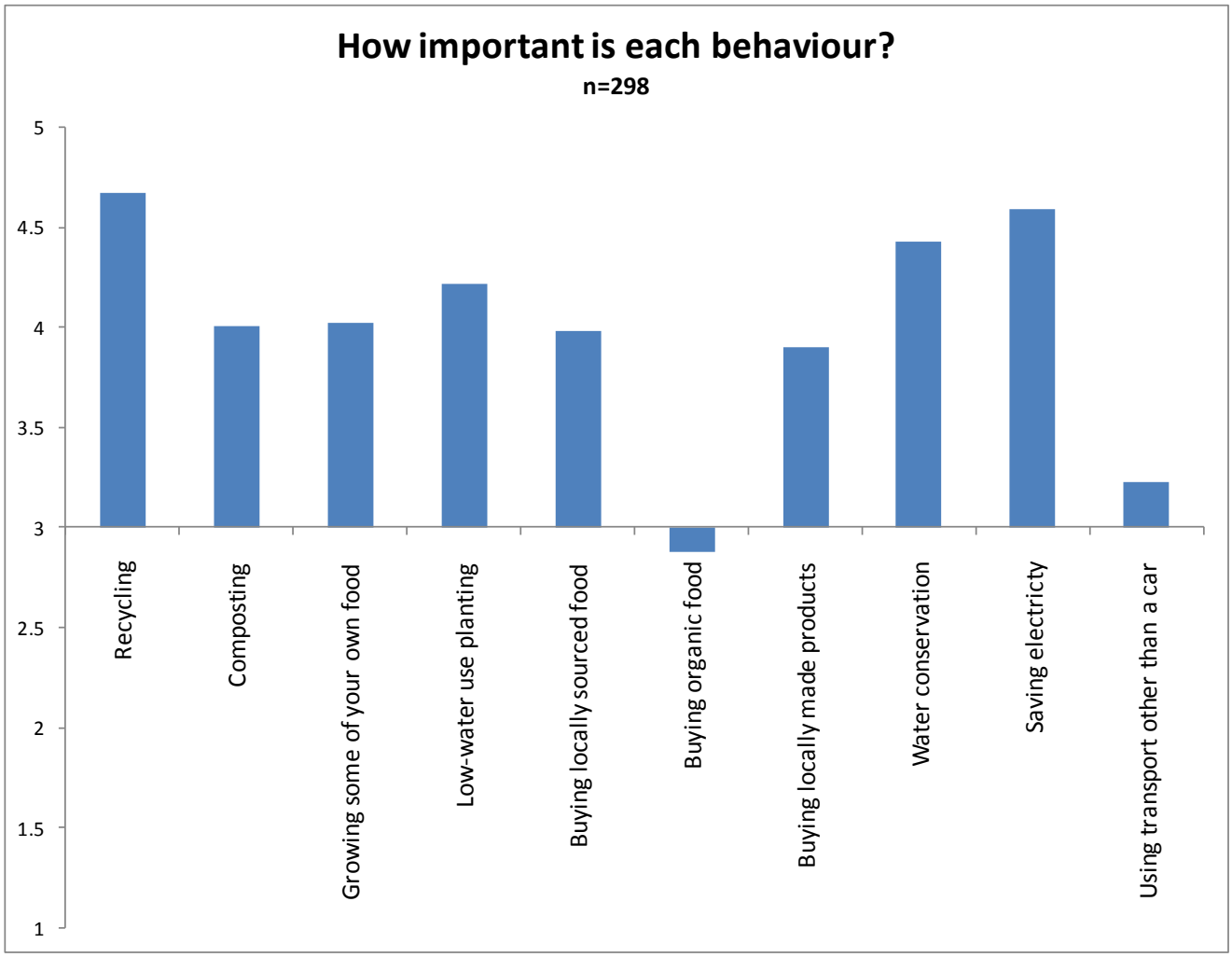


Figure 11: Responses to Question 3 which indicates values and attitudes towards conservation behaviour (n=298).

Question 4

In this question, respondents were asked to identify each animal as being native or introduced and additionally if it was rare or threatened. As is indicated in Table 3, most respondents gave the correct answers for each question, with some species much easier to identify than others.

Table 3: Question 4 Answers, Fauna. Bold indicates "correct" choice.

	Native to Australia	Introduced / Non-native	Rare or Threatened	Unknown / Don't Know
Brush-tailed possum (n=262)	**231**	1	30	42
Fox (n=274)	17	**247**	1	16
Kangaroo (n=285)	**280**	2	5	8
Sulphur Crested Cockatoo (n=280)	**248**	8	8	33
Squirrel Glider (n=266)	**204**	7	**104**	42
Rabbit (n=283)	20	**262**	5	8
Wallaby (n=272)	**256**	2	17	21
Sloane's Froglet (n=251)	**89**	9	**53**	153
Eastern Rosella (n=279)	**246**	3	12	32

Kookaburra (n=285)	**278**	3	6	8
Regent Honeyeater (n=271)	**203**	1	**90**	62
Swift Parrot (n=272)	**151**	7	**52**	117

Question 5

Respondents were asked how many different types of native birds they thought lived in theThurgoona and Wirlinga area. Forty five percent said 11-30 birds, 34% 31-100, 8% 101 or more birds. There are more than 101 native bird species living in the area.

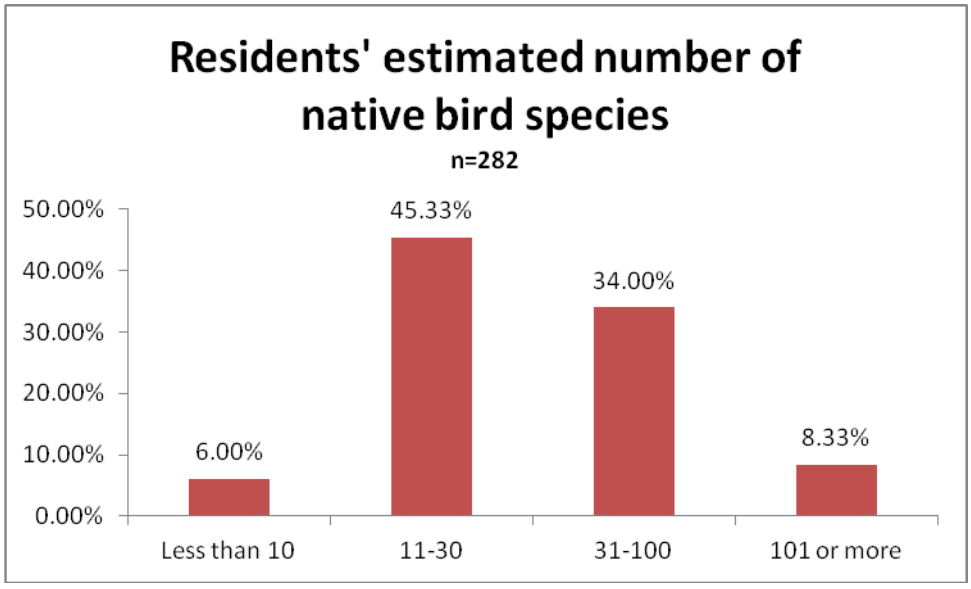


Figure 12: Residents' estimated number of native bird species in the Thurgoona-Wirlinga area (n=282).

Question 6

Plants were also identified as being native or introduced and additionally if rare or threatened. From this question, one row was removed from analysis because of the two common species exist that are casually called 'Tussock Grass'. That information is not shown in Table 4 below.

Table 4: Question 6 Answers, Flora. Bold indicates "correct" choice.

	Native to Australia	Introduced / Non-native	Rare or Threatened	Unknown / Don't Know
Hawthorn (n=257)	10	**118**	1	131
Broom (n=258)	42	**87**	1	132
Eucalyptus (n=283)	**279**	1	2	6
Bottlebrush (n=287)	**277**	6	2	7
Rose (n=274)	16	**244**	0	18
Wattle (n=281)	**274**	4	2	6
Lavender (n=273)	21	**234**	0	25
Grevillea (n=273)	**195**	36	0	50
Cotoneaster (n=266)	18	**78**	0	174

Question 7

In this question, respondents were to identify landscape features that are beneficial for wildlife in order to assess their knowledge of these landscape features. The majority of respondents have a good idea of what landscape features are helpful for wildlife, although these issues can sometimes be confusing given that scientists may argue about which landscape features are important for specific plants and wildlife. Many roadside strips have been left in Thurgoona, but as is indicated here, only slightly more than half of respondents indicated these areas are important for native plants and animals.

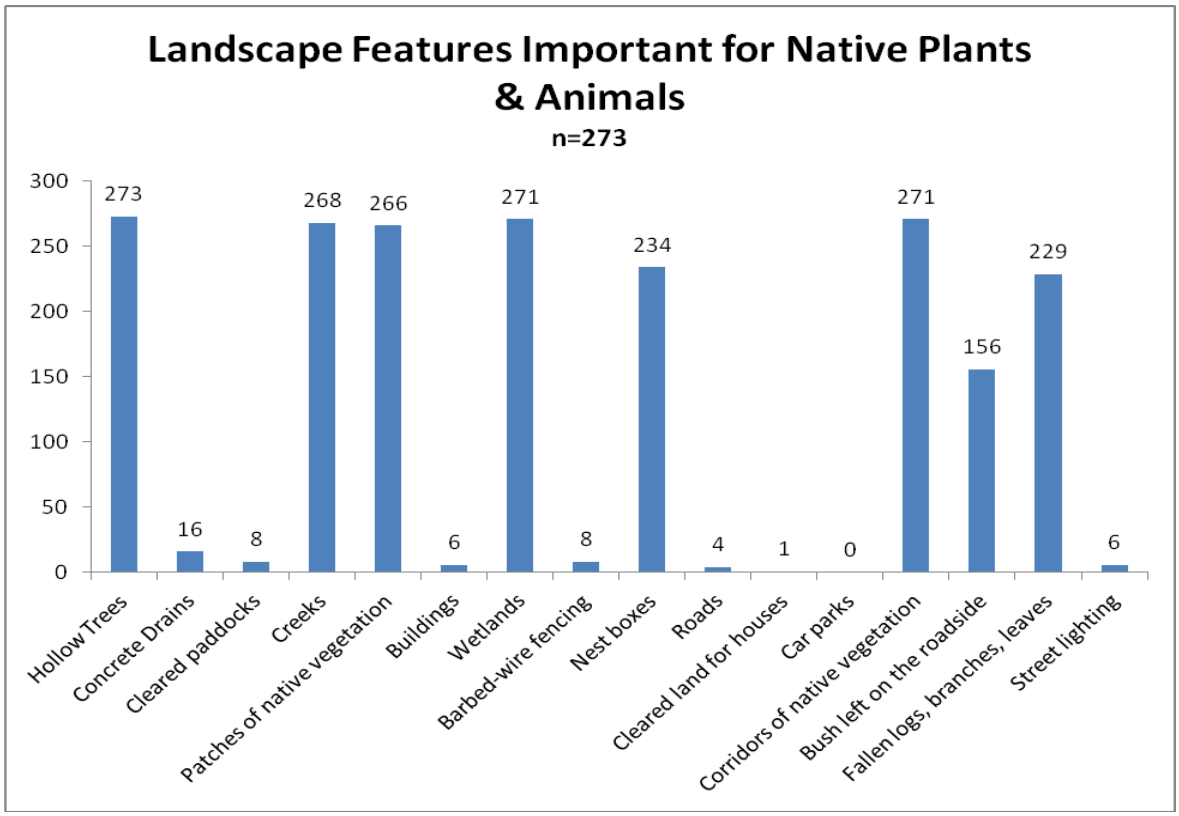


Figure 13: Landscape Features Important for native plants & animals (n=273).

Question 8

Part 3 of the survey included questions that aimed to understand the respondents' connection to nature.

In Question 8 they were provided with seven different pictures that depicted two circles, one was a 'nature circle' and the other circle was a 'self circle'. The seven pictures ranged from the two circles not touching to the two circles completely overlapping. The respondents were asked to circle the picture that best described their relationship with the natural environment and how interconnected they were with nature. As shown in Figure 14: Inclusion of Nature in Self (INS) scale of respondents (n=284). The average score was 4.39 which indicates that they felt slightly more connected to nature than they felt disconnected.

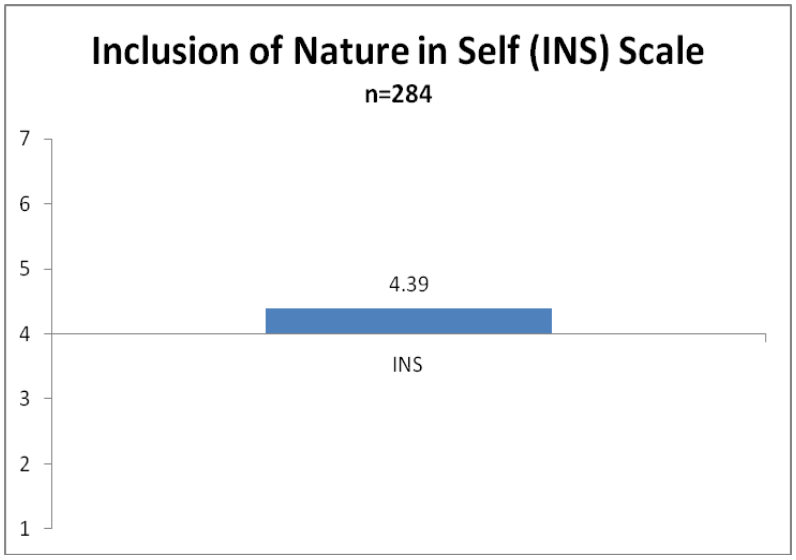


Figure 14: Inclusion of Nature in Self (INS) scale of respondents (n=284).

Question 9

Question 9 provided the respondents with six statements about their relationship to nature. They were asked to rate the statements on a scale of 1 to 5 where 1 was strongly disagree and 5 meant strongly agree. They were asked to respond based on their feelings, rather than how they thought 'most people' feel.

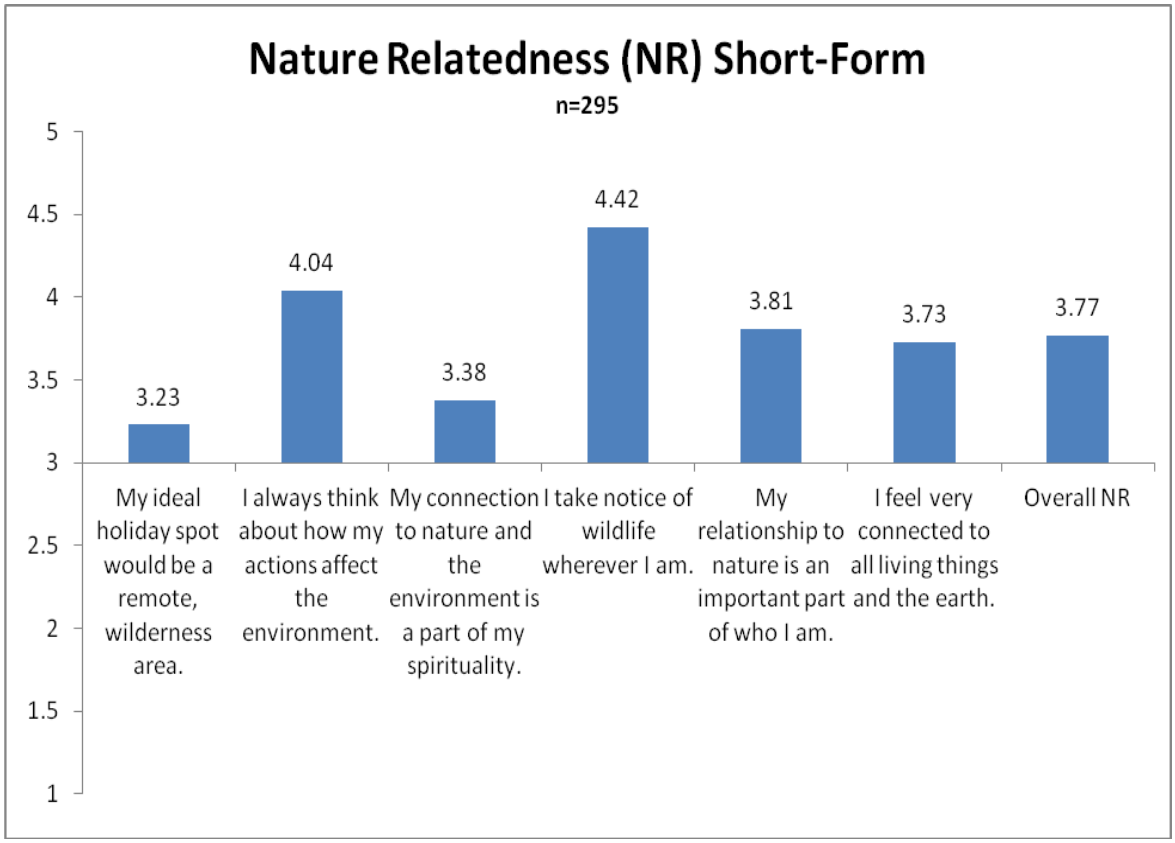


Figure 15: Nature Relatedness (NR) of respondents including overall average (n=295).

Figure 15 presents the average responses to the statements. Many people agreed that 'they took notice of wildlife wherever they were' (4.42), the average for the statement 'I always think about how my actions affect the environment was 4.04, and the average for 'my relationship to nature is an important part of who I am' was 3.81. The average for

the statement ‘I feel very connected to all living things and the earth’ was 3.73. The lowest average score of 3.23 was for the statement ‘my ideal holiday spot would be a remote, wilderness area’.

Part 4 of the survey asked the respondents about their values and opinions on conservation. There were three open ended questions in this part of the survey.

Question 10

The first open ended question asked how important it was to the respondents that the area where they lived provides places for a variety of native plants and animals, and why it is important or unimportant. There were 253 responses to this question. 143 responses (57%) indicated that they thought it was very important or important. Many people (17%) felt it was important to protect and set aside areas for native plants and animals and that is was important for future generations. Many people expressed the importance of having a balance between nature and people/development and there was concern about the increase in development and housing in the area with a perception that people and development were forcing nature out. In particular they mentioned the loss of habitats, plants, wildlife and possible extinctions.

Many people (8%) indicated that they liked living in the area and had chosen to live in the Thurgoona-Wirlinga area because of the natural bushland/country feel and rural lifestyle that it offered. Some expressed the unique nature of the area and that it differed from other areas and offered a place to live away from suburbia. Some people also said that it was important to protect the plants and animals for their children to enjoy and an opportunity for their children to learn about the biodiversity.

Some people also mentioned the personal benefits of living with and near nature including peace/tranquillity, relaxing and calming and it made some people happy and gave them a lot of pleasure. Many people talked about the enjoyment and benefit they got from seeing, hearing, feeding and interacting with wildlife, especially birds. Many of these interactions were in their own gardens. They also expressed their pleasure in exploring and walking in bushland areas. Some people mentioned that they were planting native tress and recognised the benefits of native plants in terms of being drought resistant and needing less water than introduced species.

Question 11

The next open ended question asked the respondents about their understanding of the word ‘biodiversity’. They question said: ‘A word that is often used when people talk about nature is ‘biodiversity’. Please describe in your own words what the word ‘biodiversity’ means to you’. There were 200 responses to this question.

Nearly half (91 responses) of the respondents described biodiversity in terms of a range/variety/diversity of plants and animals/living things. About 25% of the respondents suggested that biodiversity meant living in harmony, balance and/or coexistence with plants and animals. A few suggested they thought it meant protecting the natural environment/plants and animals, while others thought it meant living naturally or in an environmentally friendly way. Nine percent of the respondents were not familiar with the word or had looked the word up on the Internet or in a dictionary.

Question 12

There were 223 responses to this question though respondents could mention as many areas as they liked. This finding indicates a high awareness of areas of biodiversity conservation.

Seventeen percent mentioned the importance of creeks, wetlands and dams, with 6% specifying Woolshed Creek and some mentioning Seven/Eight/Nine Mile Creek. Twelve percent of the respondents mentioned the importance of the green belts and wildlife corridors, while 11% mentioned the Thurgoona Golf Course and the area east and south of it,

and 8% mentioned the Mitchell Park area and wetlands. Other areas mentioned by a number of respondents were Corrys Wood and St John's Hill, the area between Trinity Anglican College and the Freeway, Lake Hume area, Fairway Gardens/Forest Drive area, Kerr's Road/Thurgoona Drive, Corrys Road, Old Sydney Road and Tabletop Road, roadside reserves/travelling stock routes, the area around the football oval/church, the Riverina Highway to the Hume Dam, the Kinross area and the area north of it and the River Murray. A complete list of all areas mentioned can be found in Appendix D.

Correlations

Data were analysed for correlations to determine potential relationships between demographic factors or one question or question part with another. This analysis provided some insight into the survey internal validity through looking at a few parts of Questions 1 and 2 that should be correlated, such as having participated in composting in the last week and having a compost bin at your residence(0.84, $p<0.01$) and collected and used rainwater and having rainwater tanks at the residence (0.78, $p<0.01$).

Looking at correlations by question reveals interesting information about environmental behaviours of residents of Thurgoona and Wirlinga. Other studies have shown a correlation between environmental behaviours and connection to nature measures, and this seems to be the case here as well with most of the behaviours for at least one of the connection to nature scales (Mayer & Frantz, 2004; Nisbet, Zelenski & Murphy, 2009). Correlations seem to show that older residents as well as residents with longer residence time and home owners are more likely to have compost bins and to provide water for birds. Home owners and older residents were also more likely to plant native plants in their garden. The high correlation between cat owners and those who actively restrain their cats at night indicates our sample may be biased towards cat owners willing to put their cats in at night. Curiously, being in a family was negatively correlated to providing water for birds and to planting native trees in the garden. Dog ownership was also correlated with observing animals in the garden.

Table 5: Correlations for Question 1 with connection to nature and demographic information.

Behaviour	**Question 1: In the past fortnight, have you participated in any of the following activities or activity types? Please place a tick or cross the boxes for all your activities.**										
	INS	**NR**	**Age**	**Gender**	**Country of Birth**	**Education**	**Residence Time**	**Rent vs Own**	**Families**	**Dog Owners**	**Cat Owners**
1a: Separated garbage for recycling	0.02	0.09	-0.08	0	0.08	0.11	0	**0.2 p<0.01**	0.04	**0.12 p<0.05**	-0.04
1b: Provided water for birds	**0.19 p<0.01**	**0.25 p<0.01**	**0.33 p<0.01**	-0.06	0.05	**-0.16 p<0.01**	**0.26 p<0.01**	**0.15 p<0.05**	**-0.2 p<0.01**	0.07	0.04
1c: Consciously chose to walk / cycle or take public transport to reduce greenhouse emissions	**0.21 p<0.01**	**0.28 p<0.01**	-0.07	0.02	0.05	0.04	**-0.13 p<0.05**	-0.09	-0.06	-0.02	-0.08
1d: Observed birds in your garden / property.	0.11	**0.24 p<0.01**	0.12	0	-0.03	-0.05	0.09	0.09	-0.06	0.02	-0.01
1e: Observed (non-pet) animals in your garden / property.	**0.2 p<0.01**	**0.23 p<0.01**	0.04	0.06	-0.08	-0.06	0.06	0.07	0.11	**0.13 p<0.05**	0.03
1f: Actively constrained your cat(s) from roaming at night	-0.1	-0.03	-0.09	0.05	-0.01	0.04	0.04	0.08	0.10	0.08	**0.7 p<0.01**
1g: Planted native trees and bushes in your garden	**0.21 p<0.01**	**0.19 p<0.01**	**0.18 p<0.01**	-0.05	0	-0.03	0.02	**0.22 p<0.01**	**-0.13 p<0.05**	0	0.04
1h: Saved electricity	0.09	0.10	0.07	-0.05	-0.02	-0.10	-0.08	0.02	-0.03	-0.04	0.01
1i: Composted	**0.28 p<0.01**	**0.31 p<0.01**	**0.14 p<0.05**	-0.1	0.11	-0.05	**0.12 p<0.05**	**0.28 p<0.01**	-0.05	0.07	0.01
1j: Donated to conservation or environmental groups	0.05	**0.14 p<0.05**	0.05	0.07	0.03	0	0	-0.03	0.03	-0.05	0.08
1k: Volunteered for conservation or environmental groups	0.1	**0.12 p<0.05**	-0.03	0.01	0.06	0.1	0.02	-0.02	0.04	-0.04	-0.01
1l: Collected and used rainwater	0.1	0.1	0.1	-0.05	-0.05	0.01	-0.09	0.09	0.02	0	-0.01

Question 2 correlations are similar, but this varies as this question dealt with the residence having tools and resources available to participate in the behaviours. Residence time was positively correlated with having a shower timer, vegetable garden, fruit trees, a compost bin or area and insulation in the ceiling and negatively correlated with rainwater tanks. Home ownership was positively correlated with having solar electricity panels, vegetable garden, fruit trees, a compost bin or area, and insulation in the ceiling. Older residents were more likely to have a water efficient showerhead and to have insulation in the ceiling.

Table 6: Correlations with Question 2 and connection to nature and demographics.

Tools and Resource Availability	**Question 2: Looking at the list below which, if any, of the following are in use where you currently live? Please tick or cross the boxes that apply to you.**										
	INS	**NR**	**Age**	**Gender**	**Country**	**Education**	**Residence Time**	**Rent vs Own**	**Families**	**Dog Owners**	**Cat Owners**
2a: Rainwater tank(s)	0.11	0.07	0.05	-0.02	-0.07	0.04	**-0.23 p<0.01**	0.04	0.05	-0.01	0.02
2b: Water efficient shower head	-0.02	-0.03	**0.19 p<0.01**	-0.03	-0.04	**-0.24 p<0.01**	-0.07	0.03	**-0.18 p<0.01**	0.01	-0.08
2c: Shower timer	0.01	0.01	0.04	0.05	0.06	-0.01	**0.12 p<0.05**	0.11	0.02	**0.14 p<0.05**	-0.03
2d: Solar hot water system	0.06	0.01	-0.03	-0.02	-0.07	-0.03	-0.08	0.08	**0.15 p<0.05**	-0.08	0.11
2e: Solar electricity panels	-0.02	0.03	-0.04	-0.03	0.02	0.01	0.03	**0.21 p<0.01**	0.06	0.07	0.01
2f: Vegetable garden	**0.12 p<0.05**	**0.20 p<0.01**	0.01	0.05	0.07	0.01	**0.16 p<0.01**	**0.22 p<0.01**	0.04	0.08	0.05
2g: Fruit trees	0	0.03	-0.07	-0.08	-0.04	0.05	**0.21 p<0.01**	**0.16 p<0.01**	0.08	0.07	**0.18 p<0.01**
2h: Australian plants	**0.24 p<0.01**	**0.23 p<0.01**	0.1	-0.05	-0.05	-0.05	0	0.1	-0.05	0.05	-0.02
2i: Compost bin/ area	**0.14 p<0.05**	**0.19 p<0.01**	0.04	-0.03	0.1	0	**0.18 p<0.01**	**0.25 p<0.01**	0	0.09	0.07
2j: Nest boxes Mammals	-0.02	0.11	0.09	0.04	0.05	-0.04	0.01	0.05	-0.10	-0.08	0.07
2k: Nest boxes Birds	0.02	0.12	0.1	-0.06	0.05	-0.1	0.04	0.1	-0.07	-0.05	0.07
2l: Nest boxes Bats	-0.02	0.03	0.02	0.04	**-0.15 p<0.05**	-0.04	-0.04	0.02	-0.05	0.06	-0.03
2m: Energy-efficient compact fluorescent light globes	-0.07	0.05	0.1	0.03	0.02	0	0	0	-0.11	0.03	0.01
2n: Insulation in the ceiling	0.11	0.1	**0.14 p<0.01**	-0.02	0.1	-0.04	**0.17 p<0.01**	**0.24 p<0.01**	0	0.12	0.06

Values and attitudes about environmental behaviours are reflected in the items from Question 3 in the survey (Table 7). Age was positively correlated with positive attitudes towards composting, buying locally sourced food, buying locally made products and water conservation. Being female was positively correlated with attitudes regarding low-water use plantings. Time of residence in the area was negatively correlated with attitudes regarding buying locally sourced food, buying organic food, buying locally made products and using transport other than a car. Being in a family was negatively correlated with attitudes towards composting, buying locally sourced food and buying locally sourced products.

Table 7: Correlations with Question 3 and connection to nature and demographics.

Attitudes	**Question 3: For each of the following activities, please indicate how important each of these are to you using the scale from 1 to 5, where 1 means you feel it is "very unimportant" and 5 means you feel it is "very important". Please circle on each line to indicate your level of agreement with each item.**										
	INS	**NR**	**Age**	**Gender**	**Country**	**Education**	**Residence Time**	**Rent vs Own**	**Families**	**Dog Owners**	**Cat Owners**
3a: Recycling	**0.16 p<0.05**	**0.19 p<0.01**	0.09	0.1	0.01	0.02	0.02	0.12	-0.02	0.04	-0.08
3b: Composting	**0.32 p<0.01**	**0.33 p<0.01**	**0.15 p<0.05**	-0.01	0.01	0.04	-0.01	0.11	**-0.12 p<0.05**	-0.01	-0.03
3c: Growing some of your own food	**0.28 p<0.01**	**0.24 p<0.01**	0	0.04	0	0.06	-0.04	0.12	-0.04	-0.04	-0.03
3d: Low-water use planting	**0.18 p<0.01**	**0.15 p<0.01**	-0.01	**0.13 p<0.05**	0.03	0.03	0	0.01	0.01	0.09	-0.06
3e: Buying locally sourced food	**0.20 p<0.01**	**0.16 p<0.01**	**0.14 p<0.05**	0.03	0.03	-0.02	**-0.14 p<0.05**	-0.03	**-0.18 p<0.01**	-0.07	**-0.18 p<0.01**
3f: Buying organic food	**0.26 p<0.01**	**0.34 p<0.01**	0.04	0.08	-0.07	0.09	**-0.14 p<0.05**	-0.07	-0.01	-0.03	**-0.15 p<0.05**
3g: Buying locally made products	0.12	0.11	**0.18 p<0.01**	0.02	0.12	-0.05	**-0.13 p<0.05**	-0.12	**-0.27 p<0.01**	-0.07	**-0.15 p<0.05**
3h: Water conservation	0.11	**0.12 p<0.05**	**0.13 p<0.05**	0.02	0.02	0.02	-0.07	0.04	-0.1	0.08	-0.08
3i: Saving electricity	0.05	0.07	0.03	0.05	0.02	-0.03	-0.04	0.05	-0.01	0.12	-0.06
3j: Using transport other than a car	**0.28 p<0.01**	**0.34 p<0.01**	-0.06	0.03	-0.04	0.11	**-0.15 p<0.05**	-0.03	0.06	-0.04	-0.08

Knowledge correlates with connection to nature, and has a negative correlation with our sample to age and positively with education and those who currently live with their children (Table 8).

Table 8: Question 5 correlation of knowledge with connection to nature and demographic data

	Question 5: How many different types of native birds do you think live in the Thurgoona and Wirlinga area? Please tick or cross one of the boxes. (Options: Less than 10, 11-30, 31-100 & 101 or more)										
	INS	**NR**	**Age**	**Gender**	**Country**	**Education**	**Residence Time**	**Own or Rent**	**Families**	**Dog Owners**	**Cat Owners**
As ranking 1-4	**0.18 p<0.01**	**0.19 p<0.01**	**-0.13 p<0.05**	-0.01	0.03	**0.15 p<0.05**	-0.07	-0.02	**0.13 p<0.05**	0.12	0.03
As either wrong or right	0.11	**0.15 p<0.05**	-0.04	-0.02	0.01	0.10	0	-0.03	0	-0.01	0.01

Looking for influences on connection to nature by comparing to the demographic data reveals very few significant influences on connection to nature by demographic variables (Table 9). Only age is slightly positively correlated to the

INS only, not the Nature Relatedness scale. There must be qualities beyond those studied in this survey that help to illustrate how a person develops their connection to nature.

Table 9: Connection to nature related to demographic data available.

	Age	Gender	Country	Education	Residence Time	Own or Rent	Families	Dog Owners	Cat Owners
Q8: Inclusion of Nature in Self (INS)	**0.15 p<0.05**	-0.06	0.08	0	-0.08	0.07	-0.02	-0.03	-0.10
Q9: Nature Relatedness (Average)	0.07	0.03	0.02	0.03	-0.06	0.02	-0.05	0.04	-0.05

Interviews

Ten semi structured interviews were undertaken with self selecting residents. The length of time interviewees had lived in the area varied from two years to 34 years. Six of the interviewees had lived in the area over ten years suggesting that they are long term and committed residents who have a strong interest in the area.

When asked why they had moved to the area they all indicated that it was the rural and country feel, the trees and that it was not "citified". Several mentioned they had moved to the area for work reasons;

> *Here everything is close but still open – didn't get the claustrophobic feeling of suburbia.*
>
> *We liked the idea of being a little way of the hurley-burley ...*
>
> *We wanted to move to Albury but we didn't want to go to the urban area that's downtown. We like the look of out here ...*
>
> *Thurgoona was a bit more like semi-rural area at the time whereas Albury had cars going up and down all the time and established old red-brick houses and we wanted something newer. So we moved out here.*

The reasons why they thought others moved to the area were similar – the country feel (trees, open space) and a few mentioned that the large block size attracted some people. A few interviewees mentioned that the area was convenient to work and other facilities in the Albury and Lavington area;

> *Young families with schooling, shops, sporting facilities. Everything is so close. I like to think they come because of the environment: the trees and the open spaces. Looking at it realistically, they come because of supermarkets and doctors. I would like to think they come because of the surrounding environment, who knows.*
>
> *All the new housing estates are coming out this way. It's where all the land is being released now. I think that's what's bringing them out here, plus you have the services out here now, the schools.*

I think exactly the same reasons [that we moved here], the plot sizes for the houses are a really good size; there's plenty of open space. People say it's got a rural feel about it. It still does in spots, but not quite what I'm used to. It's got space and it's still an open area.

Many of the interviewees noted though that the semi rural/country feel of the area was changing with increased development and in some cases new residents were moving in who they thought did not care about the natural environment, in the same way they did;

Of course things have changed – that's progress for you. I'm not anti-progress but I'm hoping that someone is looking after the basic philosophy behind Thurgoona.

Look, it's similar [to 20 years ago] but obviously there's a lot more estates now. It still does, it still has that [bush] feel about it, I think.

It's close to Albury – you've got country but you've got a lot of what the big cities have – the shops. Got the facilities close by – 8 kms ... and the countryside. But that will change once Thurgoona expands and that will be the downside of Thurgoona expansion.

Asked why they thought survey respondents had indicated that biodiversity needs to be protected for future generations they indicated they thought it was necessary to protect biodiversity or it will disappear and it is important for future generations to have plants and animals;

I think we need to care, we won't be here but we should care about the people who will come.

Every now and then I get this horrible feeling that my grandchildren's' children, the only tree they'll ever get to see will be in a museum.

In the last 50 odd years it all started to dwindle away so I would like it all to go back to the way it was when I was a boy. In my opinion we can't keep on doing what we are doing now. Else in another 50 years time, it won't be there to do anymore. We have to reassess what we do now and take a step backwards and start protecting else we won't have anything left to protect.

If we don't save it now it won't be there. I have a lot of instances where I've seen things gone and I think: 'why didn't I do something about that, I didn't believe that they would go ahead and do that'. I think the whole world's doomed anyway, from an environmental point of view.

They were asked why they thought survey respondents said it was important to have areas to protect biodiversity and how could areas best be set aside. They all agreed that areas needed to be set aside to protect biodiversity. They suggested that areas could be protected using a range of mechanisms including reserves, green buffer zones, wildlife corridors;

We're wasting our time unless we can get planners on side. We all have our views on things but nothing happens unless you get the people who make the decisions to think the same way. Sometimes money dictates what you do.

People follow the dollar and don't necessarily do what's right. If people who make decisions could be made to see that the environment is important, that would be a plus. And that we're willing to spend the money in order to do that.

I do agree with that. If we don't, wants going to happen is that they'll just keep expanding Thurgoona so what will happen is that those animals and birds and little wildlife that most people don't notice, they'll be gone.

I think the Council has a lot to do with that. The Council has got to stop subdividing.

You need to have those preserved spaces and spread out from there, create corridors for them that are a decent size, not those little things.

Asked if they knew of any organisations that are involved in protecting biodiversity, four interviewees said they were not aware of any organisations. Some people mentioned Albury City but some commented that the Council needs to listen to resident's voices and that the Council is too focused on development and the financial benefits of development. Other organisations mentioned included the Lands Department, Crown Lands, Albury Parklands, Slopes2Summit, Federal and State governments and Landcare. Some suggested that governments had vested interests and there was a need to get government involved and some leadership was needed;

They were asked about the role of Albury Council with regards to the issue of conservation and development.

I don't have a lot of good things to say about this. In some parts, they are pretty good. You have to listen to everybody and everybody comes in with a different angle.

They're quick to put up houses and car parks because there's money in it. No money in saving wildlife unfortunately.

I don't think their role is good enough in Thurgoona. They are more head up with what's going on in Albury with things like spending more money for the Art Gallery...

Asked if there was a way of balancing development and conservation half the interviewees mentioned the need to set aside and protect natural areas through reserves, zoning, greenbelts and corridors and protecting endangered species. Several interviewees said they thought it was possible to achieve a balance through education;

I do because they'll get used to having, well especially the birds get used to having people around. I think if the people just do their little bit to look after the animals it will balance itself out. I think simple things like keeping the cats out of the garden and baiting the foxes every now and then.

Yeah, I do with education. I don't think they [development companies] do know.

No. Because it's the almighty dollar all the time, isn't it?

When asked how they felt about the projected increase in population in the area most of the interviewees thought the projection was an unrealistic projection and a “silly idea”, a few were unhappy about it and one felt resigned to the increased population. Some said that if the population increased there was a need for more infrastructure and planning. Only three interviewees were aware of the Albury City plans for expansion in the area;

> *Not happy, like I said before. We moved for here for a lifestyle change. And where I live we have empty land behind us which eventually will be subdivided but I don’t know why they want to come out to Thurgoona, there’s other places they can go to.*

> *Very unrealistic. Gone from making it look like a nice little suburb/town to making it look just like anywhere else*

> *That’s a lot of people. I think it’s too much. Yeah, it’s too much. It’s just going to be all pushed out and pushed to its limits. We have enough trouble with cats at the moment. No, I don’t think you can sustain that. I don’t think this area can support that many people because, we might be able to fit the houses in but all the services are lacking and the biodiversity will suffer.*

When they were asked what they thought they as individuals or others could do to get involved in conservation activities, half of the interviewees were not sure what they can/should be doing at an individual level. Some interviewees mentioned planting trees, getting involved in endangered species programs (squirrel glider, regent honeyeater), volunteering, signing petitions, complaining to the Council, being more vocal and the channelling concerns through existing organisations such as the Thurgoona Progress Association;

> *Not a lot an individual can do in this day and age. Gotta do it through recognised organisations, like councils*

> *Probably not, depending if their land isn’t big enough. From what I can see of some of the estates, they don’t have any gardens. They’re not going to get the wildlife into their gardens, but they probably don’t care either.*

> *There’s a Regent Honeyeater project around here. And I think that’s been a wonderful saviour for the local area. And that was a campaign that was hugely successful that was brought on by the community.*

> *Yeah, there is. They can plant some native plants in their garden that will help the native birds in a time where there other food might be hard to find.*

Interviewees were asked what conservation activities they were currently involved in. Three mentioned recycling and others mentioned providing water and food for native birds on their blocks, installing nest boxes and attending the Thurgoona planning meetings;

> *We do what we can. Recycle, nesting boxes, water for birds all the time, feed the birds but not to have them reliant.*

> *I’ve tried to do as much as I can like sorting the rubbish – there’s not enough recycling in the district because the stuff that goes in the hole, we should be able to recycle.*

And I take a bag when I go walking and when I see rubbish around the reserve I do a rubbish run. I suppose that's about it – ride my bike as often as possible and use the car as little as possible

All the interviewees were asked if they had any other comments they wanted to make about this topic. Half of the interviewees expressed strong opinions on the problems associated with cats;

I know cats provide a lot of comfort for a lot of older people, but maybe they should keep them indoors. I don't know what they do with them I just find them destructive. "I do a lot of walking in national parks and I talk to rangers and they're tearing their hair out because of cats"

I hate cats. They always kill the birds.

Last words from one interviewee: *We all need to be very conscious of the future, biodiversity and everything. Otherwise in the future we'll have a planet of houses and nothing else. ... we have to be careful with what we do and how we do it.*

Discussion

The following discussion is based on the survey and interview data and summarises the key findings from this study.

Who were the people we surveyed and interviewed?

The survey sample was biased towards older, female residents who did not have their children living at home with them. This high number of female respondents reflects previous research that demonstrates that women are generally more concerned about the environment than men (MacGregor, 2006). This sample may not be representative of the area's population and of newer residents in Thurgoona and Wirlinga since 2011 who have families, though our percentage of families with children is very similar to the 2011 Census numbers (ABS, 2011a; ABS, 2011b). Many of the respondents (67%) have lived in Thurgoona and Wirlinga for more than 5 years and about 4 out of 5 own their residence. Respondents self-selected to be a part of the interview group while completing the survey. Interview participants may have been more inclined to care about environmental issues than other residents due to this self selection.

Why do they live in Thurgoona and Wirlinga?

The survey results and interviews indicated that many people enjoyed living in the area **and** had chosen to live in the Thurgoona and Wirlinga area because of the natural bushland/country feel and rural lifestyle that it offered. Some expressed the unique nature of the area and that it differed from other areas surrounding Albury and offered a place to live away from suburbia. However, the interviews indicated that people are concerned about the increasing development in the area and some did not know about the projected increase in development in the area.

What conservation behaviours are they involved in?

Both the survey data and interviews suggest that these people have high participation rates and support conservation behaviours. The majority were involved in recycling which is a 'regulated' behaviour, however, even with more optional behaviours such as observing birds in their garden and providing water for birds there was still high participation rates. The results suggest these people are involved in conservation behaviours at home and in their own gardens but are less interested or lack the knowledge to act beyond their own homes for example joining or supporting local conservation groups, volunteering, donating or other forms of community action. This was supported by the interview

data which indicated that people were concerned about conservation and biodiversity but did not know what to do or where to express their concerns (a lack of individual agency). Buying organic food and using transportation other than a car were considered the least important environmental behaviours. The former behaviour could be a result of the perceived higher prices of organic food and lack of availability. The latter behaviour could be due to a reliance on cars given the poor public transport in Thurgoona.

In addition to participating in many conservation behaviours they also indicated that they used or had installed many conservation tools and resources in their homes. Items such as insulation and energy efficient compact fluorescent globes and planting native plants were positively correlated with house ownership, length of residence in the area and older residents. Interestingly given that many people observed birds in their garden and gave them water the number of people who had nest boxes was very low.

Renters were significantly less likely to engage in certain conservation behaviours: recycling, providing water for wildlife, planting natives and composting. They were also significantly less likely to have conservation tools or resources at their residence, including solar electricity panels, vegetable gardens, fruit trees, compost bins and insulation in the ceiling. However, when looking at knowledge, attitudes and connection to nature, renters were not significantly different than those who own their own home. These findings may also reflect the positive correlation between residence time in the current home and home ownership (0.38, $p<0.01$), as many renters are short-term residents and unlikely to invest in solar electricity panels or fruit trees. Renters were also younger, with home ownership correlating to age (0.20, $p<0.01$). Planting a vegetable garden and having a compost bin are also unlikely for short-term or rental residents, which may not be due to a lack of interest but instead lack of willingness to make an investment in a property they do not own or fear of losing a rental deposit. This finding could present opportunities for landlords to make small investments or support their tenants in rental properties by permitting such activities as planting native vegetation or fruit trees or setting aside space for compost bins or vegetable gardens. This group of renters could take advantage of these resources and may even prefer those types of properties when choosing a rental property.

Participant's connection to nature seemed to be correlated with many of their conservation behaviours and also their attitudes towards different behaviours, but was correlated to less of the conservation behaviour tools or resources. This latter finding could be due to lack of knowledge to install different items at home or lack of funding could be preventing some conservation behaviour tools or resources such as solar electricity panels.

What are their opinions, values and attitudes?

There were almost no significant correlations between connection to nature and any of the demographic factors, demonstrating that across this group, connection to nature was at a similar level regardless of education, gender, country of birth or family status. Age was significantly correlated to the INS scale, indicating that there could be some differences between older residents feeling more connected to nature than those that are younger. As there is some evidence that connection to nature is developed when a person is young (<12 years old) it could be important for more environmental programs to be offered in some of the natural land in the area for school aged children (Ernst & Theimer, 2011; Wells & Lekies, 2006). Survey respondents noted the value they gain from the peacefulness, calm and tranquillity that nature provides to them, suggesting this group is connected to nature and assigns value to the tranquillity that nature provides. Through the interviews and survey open-ended responses it was also noted that participants place a high value on nature to be projected for future generations to enjoy. These values suggest that opportunities for nature walks or experiences outdoors with children or grandchildren might be appreciated by the local community.

Over half of the survey respondents thought it was very important or important that the area where they lived provides places for a variety of native plants and animals, a finding supported by the interviews. 17% of survey respondents and all the interviewees felt it was important to protect and set aside areas for native plants and animals and that is was important for future generations. Some people said that it was important to protect the plants and animals for their children and grandchildren to enjoy and learn about the biodiversity. The need for education of children about biodiversity and conservation was mentioned by some survey respondents and interviewees, suggesting opportunities for school based education and outreach programs for school aged children or families.

The survey results and interviews indicate that many people thought that it was important to have a balance between nature and people/development yet there were concerns expressed about the increase in development in the area and that it was forcing nature out, with mention of loss of habitats, plants and wildlife. The interviewees felt the proposed increase in population was unrealistic with some expressing concern and indicating that if the population did expand careful planning was needed. The interviewees generally did not hold positive feelings about Albury City and felt the council was too development focussed and had strong financial interests. Most of the interviewees did not know of any conservation organisations particularly in the local area, though some mentioned Albury City.
Some of the survey respondents mentioned the personal and wellbeing benefits of living with and/or near nature particularly interacting with wildlife in their own gardens. These attitudes and feelings were supported by the connection to nature results that showed they felt more connected to nature than disconnected.

Cats were an issue mentioned in both the survey and the interviews. People generally held strong views about the damage caused by cats to native animals and birds. Cats seemed to be implicated by many survey respondents and interviewees as responsible for the destruction of native wildlife and birds. In our survey, we found that owning a cat was correlated with the behaviour of restraining the cat at night (0.70, $p<0.01$), and about 67% of cat owners indicated they restrained their cat(s) at night. It is possible our data reflect more of the residents of Thurgoona and Wirlinga who would be more likely to restrain their cats, as there seemed to be large numbers of free-roaming cats in the neighbourhoods.

What is their conservation knowledge level?

The results indicate that the people were generally highly knowledgeable about conversation and biodiversity in the area. This is illustrated by the bird and animals that people observed in their gardens, their knowledge of native and non-native plants and animals and landscape features beneficial to wildlife. They were less knowledgeable about the total number of birds in the area. They were highly knowledgeable about birds and native plants in particular. Knowledge of the numbers of birds living in the area was significantly correlated to connection to nature as well as education level and being in a family with children in the home. Age was negatively correlated, meaning older people in the sample were less likely to know the number of bird species that live in this area. Perhaps school children are educating their parents about these issues or those with higher levels of education answering the survey were already inclined to have greater environmental knowledge.

Overall, participants had a high level of knowledge of the native species and endangered or threatened species living in the area, particularly the Squirrel Glider and the Regent Honeyeater, suggesting that existing education programs have increased some people's awareness of these species. However, some of the less well known threatened species were confusing for some respondents e.g. Sloane's Froglet and Swift Parrot. The people demonstrated a high level of knowledge of native plants though nearly half did not know if hawthorn and broom were native or introduced species.

Many of the survey respondents appeared to understand the basic concept of the term biodiversity though 9% were not familiar with the term suggesting there is still room for education programs and activities to increase residents' understanding of the concept. Finally, many of the survey respondents identified a range of areas that they thought were important for biodiversity though most generally mentioned the importance of creeks, wetlands, dams, green belts and wildlife corridors, rather than specific locations. The survey data indicated a low awareness of the value of roadside vegetation. However, there seemed a high level of awareness and knowledge of areas of biodiversity importance in the area among the survey respondents.

Recommendations

These recommendations are presented based on the discussion as potential interventions that could possibly increase the knowledge and/or attitudes towards or acts of conservation behaviour in the Thurgoona and Wirlinga area.

Education

- Education of children - opportunities for school based education programs and well as outreach activities for school aged children or families.
- Education programs and activities could be used to increase residents' understanding of the concept of biodiversity.
- Educational workshops or give-aways of conservation tools such as compost bins might support more residents to participate in certain conservation behaviours.
- Education interventions or communication programs to promote the status of threatened species such as Sloane's Froglet and the Swift Parrot.
- Cats - public education programs and the introduction of a Council policy to keep cats in at night would address this issue to some extent.

Backyard Actions

- Develop and distribute guidelines to residents on how to attract and support biodiversity on their properties. A simple 'what can I do in my backyard to help protect native plants and animals' (see Lindenmayer, 2011).
- The use and installation of bird and bat nest boxes could be promoted by ACC. Subsidies for the boxes as well as workshops on how to install boxes correctly could be promoted.
- Low donation and volunteering rates suggest that ACC could tap into these people who are concerned and highly knowledgeable people.
- Educational and financial support for landlords and renting populations to install conservation tools and resources into the rental properties.

Promotion of ACC and Resident Ideas

- Low donation and volunteering rates suggest that ACC could tap into these people who are concerned and highly knowledgeable people. Perhaps holding events that target families with children might help to recruit new types of volunteers. Any event should be planned with small landholders and renters in mind to tap into the potential these residents hold.

- Promotion of the Albury Conservation Company and other local conservation organisations to encourage participation and engagement with local residents.
- The list of areas the survey respondents thought were important for biodiversity can be used by ACC to target and identify areas for permanent protection or purchase.

Appendix A: Survey Instrument

Institute for Land, Water and Society
Charles Sturt University

Albury Conservation Company

A survey about

COMMUNITY UNDERSTANDING & KNOWLEDGE OF NATURE AND CONSERVATION

Please complete this survey and return it within the next **two weeks** in the enclosed reply-paid envelope.

Part 1.

This first set of questions are about your conservation behaviours.

1. In the past fortnight, have you participated in any of the following activities or activity types? Please place a tick or cross the boxes for all your activities.

   - ☐ Separated garbage for recycling
   - ☐ Provided water for birds
   - ☐ Consciously chose to walk / cycle or take public transport to reduce greenhouse emissions
   - ☐ Observed birds in your garden / property. If so, list the three most frequent:
     .....
   - ☐ Observed (non-pet) animals in your garden / property. If so, list the three most frequent:
     .....
   - ☐ Actively constrained your cat(s) from roaming at night
   - ☐ Planted native trees and bushes in your garden
   - ☐ Saved electricity
   - ☐ Composted
   - ☐ Donated to conservation or environmental groups
   - ☐ Volunteered for conservation or environmental groups
   - ☐ Collected and used rainwater
   - ☐ Other, please specify
     .....

2. Looking at the list below which, if any, of the following are in use where you currently live? Please tick or cross the boxes that apply to you.
   - ☐ Rainwater tank(s)
   - ☐ Water efficient shower head
   - ☐ Shower timer
   - ☐ Solar hot water system
   - ☐ Solar electricity panels
   - ☐ Vegetable garden
   - ☐ Fruit trees
   - ☐ Australian plants
   - ☐ Compost bin/ area
   - ☐ Nest boxes
     ☐ Mammals ☐Birds ☐Bats
   - ☐ Energy-efficient compact fluorescent light globes
   - ☐ Insulation in the ceiling

3. For each of the following activities, please indicate how important each of these are to you using the scale from 1 to 5, where 1 means you feel it is "very unimportant" and 5 means you feel it is "very important".

   Please circle on each line to indicate your level of agreement with each item.

	Very Unimportant	Somewhat Unimportant	Neutral	Somewhat Important	Very Important
Recycling	1	2	3	4	5
Composting	1	2	3	4	5
Growing some of your own food	1	2	3	4	5
Low-water use planting	1	2	3	4	5
Buying locally sourced food	1	2	3	4	5
Buying organic food	1	2	3	4	5
Buying locally made products	1	2	3	4	5
Water conservation	1	2	3	4	5
Saving electricity	1	2	3	4	5
Using transport other than a car	1	2	3	4	5

Part 2.

This set of questions asks what you know about plants and animals in this area.

4. Look at the list below of animals and birds that live in the Thurgoona and Wirlinga area. Please tick the box that applies to each animal. You may tick more than one box.

	Native to Australia	Introduced / Non-native	Rare or Threatened	Unknown / Don't Know
Example: Barking Owl	*X*		*X*	
Brush-tailed possum				
Fox				
Kangaroo				
Sulphur Crested Cockatoo				
Squirrel Glider				
Rabbit				
Wallaby				
Sloane's Froglet				
Eastern Rosella				
Kookaburra				
Regent Honeyeater				
Swift Parrot				

5. How many different types of native birds do you think live in the Thurgoona and Wirlinga area? Please tick or cross one of the boxes.

- ☐ Less than 10
- ☐ 11-30
- ☐ 31-100
- ☐ 101 or more

6. Look at the list below of plants that grow in the Thurgoona and Wirlinga area. Please tick the box that applies to each plant. You may tick more than one box.

	Native to Australia	Introduced / Non-native	Rare or Threatened	Unknown / Don't Know
Example: Swamp Wallaby Grass	*X*		*X*	
Hawthorn				
Broom				
Eucalyptus				
Bottlebrush				
Rose				
Wattle				
Lavender				
Grevilla				
Tussock Grass				
Cotoneasters				

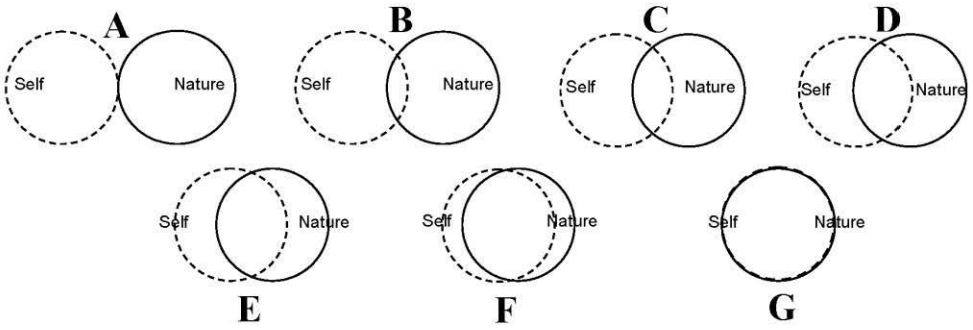
7. Which of the landscape features in the Thurgoona and Wirlinga area in the list below do you think are most important for helping support native plants and animals? You may tick more than one box.

- ☐ Hollow Trees
- ☐ Concrete Drains
- ☐ Cleared paddocks
- ☐ Creeks
- ☐ Patches of native vegetation
- ☐ Buildings
- ☐ Wetlands
- ☐ Barbed-wire fencing
- ☐ Nest boxes
- ☐ Roads
- ☐ Cleared land for houses
- ☐ Car parks
- ☐ Corridors of native vegetation
- ☐ Bush left on the roadside
- ☐ Fallen logs, branches and leaves
- ☐ Street lighting

Part 3.

The following questions are trying to understand your connection to nature.

8. Please circle the picture below which best describes your relationship with the natural environment. How interconnected are you with nature?



9. For each of the following, please rate the extent to which you agree with each statement, using the scale from 1 to 5, where 1 means you "strongly disagree" and 5 means you "strongly agree". Please respond as you really feel, rather than how you think "most people" feel.

	Strongly Disagree	Disagree a little	Neither Agree nor Disagree	Agree a little	Strongly Agree
My ideal holiday spot would be a remote, wilderness area.	1	2	3	4	5
I always think about how my actions affect the environment.	1	2	3	4	5
My connection to nature and the environment is a part of my spirituality.	1	2	3	4	5
I take notice of wildlife wherever I am.	1	2	3	4	5
My relationship to nature is an important part of who I am.	1	2	3	4	5
I feel very connected to all living things and the earth.	1	2	3	4	5

Part 4.

This section ask questions about your values and opinions on conservation.

10. How important is it to you, that the area where you live provides places for a variety of native plants and animals? Why is it important or unimportant?

11. A word that is often used when people talk about nature is "biodiversity." Please describe in your own words what the word "biodiversity" means to you.

12. Are there any areas of Thurgoona or Wirlinga that you feel are important for wildlife? Please name the location and explain why you think they are important.

Part 5.

This section asks about your general demographic information.

Please tick the box or fill in the information that best represents you.

13. Age group:
    - ☐ 18-29
    - ☐ 30-49
    - ☐ 50-69
    - ☐ 70 or over

14. Gender:
    - ☐ Female
    - ☐ Male

15. In which country were you born?
    - ☐ Australia
    - ☐ Other (please list): _____

16. Highest level of education and/or qualification:
    - ☐ Year 11 or below
    - ☐ Year 12
    - ☐ Trade Qualification
    - ☐ Certificate or Diploma
    - ☐ Bachelor Degree
    - ☐ Graduate Certificate or Diploma
    - ☐ Postgraduate Degree

17. Composition of your household. How many people regularly share this house?

    Adults (including independent children): _____

    Dependent children (including those who live here as a part of shared parenting): _____

    Dogs: _____

    Cats: _____

    Other Pets (type and number): _____

18. How many years have you lived in your house?
    - ☐ Less than 1 year
    - ☐ 1-5 years
    - ☐ 6-10 years
    - ☐ more than 10 years

19. Do you rent or own your current residence?
    - ☐ Rent
    - ☐ Own

---

20. As a follow up to this survey, we are looking for people to interview about conservation and environmental issues in the Thurgoona and Wirlinga area. Please tick the box below if you are willing to be interviewed as a part of this project. The interview would be about one hour in length at a time and place convenient to you.

    ☐ Yes, I am willing to be contacted about a possible interview

    Name: _____

    Contact Information (phone and/or email address):

    _____

    ☐ No, please do not contact me for an interview

21. If you would like to be entered in the draw for one of 5 $50 Woolworth's Gift Vouchers, please tick or cross the box and enter your contact information below.

    ☐ Yes, please enter me in the draw.

    First Name & Contact Information (phone and/or email address):

    _____

Thank you for completing this survey.

We appreciate your time and interest.

Institute for Land, Water and Society
Charles Sturt University

Fold here & return in the envelope provided.

Appendix B: Survey covering letter

Institute for Land, Water and Society
Charles Sturt University

PO Box 789
Elizabeth Mitchell Drive
Albury NSW 2640
Australia
Tel: +61 2 6051 9992
Fax: +61 2 6051 9992
Email: ilws@csu.edu.au
www.csu.edu.au/research/ilws

25 February 2013

Dear Resident of Thurgoona and Wirlinga,

We are writing to seek your help in completing a survey of people's understanding and knowledge of nature and conservation in the Thurgoona and Wirlinga area. This survey will contribute to finding out what residents think and value about the local natural environment. All the households in the Thurgoona and Wirlinga area are being surveyed.

The results of the survey will help conservation organisations and State and Local governments plan their future conservation activities. We want to know what conservation activities you do, what you know about plants and animals living in the area, and how connected to nature you feel. This information will be made available to the public, conservation organisations and government departments to help them make decisions about Thurgoona and Wirlinga that could benefit local residents and the natural environment. Your answers are completely anonymous and confidential. We will only use a summary of information from the area, and it will be impossible to identify the answers from any one household.

Participation in the survey is voluntary. The survey will take about 10-15 minutes to complete.

Steps to complete the survey

1. Select one member of your household who is over 18.
2. Complete the enclosed survey using a pen or pencil. Please answer all questions in Part 1 through Part 5.
3. Once completed, fold and return the survey in the reply paid, addressed envelope provided.

As a token of our appreciation for you completing the survey, you can go into a draw for one of five $50 Woolworth gift vouchers – just fill in your contact details (phone or email) at the end of the survey. Once we have drawn the winners your contact details will be destroyed.

If you have any questions or comments we would be happy to talk with you. You can ring Dr Shelby Laird on 02 6051 9764 , email her at slaird@csu.edu.au , or write to us at the address on the letterhead.

Thank you very much for helping with this important study.

Sincerely,

Dr Shelby Gull Laird
ILWS
Charles Sturt University

Dr Rosemary Black

Appendix C Interview Questions

Biodiversity interview questions

Thank you for agreeing to be interviewed and thank you for completing the survey and sending it back to us. We got about 300 completed surveys which is about 15% of the Thurgoona and Wirlinga households. Firstly we need to just do some paper work for our ethics committee – to ensure that you are happy to do this interview. Please can you read the Information Sheet – which you can keep and if you are happy with that – please can you sign the Informed Consent Form. We will be audio taping the interview so can capture the entire interview – is that ok? We would like you to be honest in answering the questions and there are no right or wrong answers. Thank you for your time. First of all I'd like to ask you...

1. How long have you been living in Thurgoona?
2. What do you do – job wise?
3. Why did come and live in Thurgoona?
4. Why do you think most people come to live in Thurgoona?
5. In the survey a lot of people said that we need to protect native plants and animals – (the biodiversity) - for future generations. Why do you think people talked about the importance of protecting biodiversity for future generations? Why do you think this is important to some people?
6. In the survey, a lot of people also said they thought having **areas** to protect for a variety of native plants and animals was important. Do you agree with that? Why do you think it's important to set aside areas to protect biodiversity? How do you think we can best set aside areas to protect native plants and animals?
7. Are there any organisations that you know that could help protect areas for biodiversity? What about the role of the Council?
8. Do you think there is a way of balancing development and protecting the biodiversity in Thurgoona? If so how do you think we can do that? Prompt: global, national, regional levels?
9. The population of Thurgoona is projected to increase to 50,000 over the next 50 years (it's currently about 6,000). How do you feel about this? You've / you've not mentioned the impact of this proposed development on the biodiversity of the area. How do you feel about that?
10. We've talked quite a bit about the impact of development on the biodiversity – do you think there is anything you can do – say at home or work? If so, what? If not, why not? Can you give me some examples of what you could do? What about others – what do you think they can do?
11. Is there anything else that you would like to mention about these issues?

Thank you very much for your time I really appreciate it. If you are interested in finding out about the results of this study we will be putting an article in the Border Mail later in the year.

Appendix D: List of areas of high conservation importance indentified by survey respondents in Question 12

Presented in no particular order of importance.

Thurgoona golf course
Corry's Wood and St John's Hill
The Elms/Kensington Gardens and Riverina Highway
Hume Highway and behind Trinity Anglican College
Area around Lake Hume
Fairway Gardens Road
Forest Drive/Fairway Gardens
Thurgoona Drive and Kerr's Road
Woolshed Creek
Top of Corry's Road
Old Sydney Road and Tabletop Road
Thurgoona Regent Honeyeater area and Wattlebird Reserve
Crown Land
Freeway/roadside reserves
Dams, creeks, wetlands
Corridors, buffer zones, green belts
Thurgoona Park
CSU area and wetlands
Bowna
Mitchell Park and wetlands/corridors
Paddock area/creek around and next to the Thurgoona football club
St John's Road
Eight/Nine/Seven Mile Creek
Hawksview
Hawks view to Thurgoona
North and behind the Kinross
Travelling stock routes (Sliders Avenue/Catherine Crescent)
Opposite Thurgoona Plaza and retirement village
Tree plantations on Tabletop Road
Knobles Road
Kerr's Road and Hartigan Street
Hume and Hovell Track
North east Thurgoona
Thurgoona Road (east)
Elizabeth Mitchell Drive (north)
Red Hills
South Corry's Wood
Kywong
Dead trees
St Hillarie
Dunne Crescent
Catholic Church
Riverina TAFE
Thurgoona Public School and Earnest Grant Park
Dryandra Way
Somerset Park Estate
Freeway to Ettamogah
Need an underpass from Springdale Heights and corridor to Jindera
Riverina Highway to weir

Appendix E: Budget

Main Task / Activity	Estimated Total Cost $ (inc GST)	Actual Total Cost $	Cash from Researchers $	Actual Total In-Kind $
SurveyMonkey Subscription (one year)	$330	n/a		
Survey Incentive	$330	**$250 ***		
Postage for postcards to 2,500 residents (+ 2,500 reminder postcards)	$722.70	n/a		
Printing of 2,500 postcards (+ 2,500 reminder postcards)	$902	n/a		
Printing of 2200 surveys, envelopes and return envelopes		**$1928.30**		
Postage for 2000 surveys		**$1200 ***		
Advertising for online survey	$440	n/a		
Data entry of surveys into database (contract hours researcher cash, 50 hours at $50 in-kind)			**$696.17**	**$2500**
Conducting Interviews (20 hours at $50 in-kind)				**$1000**
Interview Transcription x 10 interviews (6 interviews contract hours researcher cash, 4 interviews 4 hours at $50 in-kind)	$1320		**$267.54**	**$200**
Stuffing of envelopes with survey (approximately 20 hours at $25 per hour)				**$500**
Delivery of surveys via contractor		**$110**		
Delivery of surveys by researchers to areas not covered by contractor (8 hours at $50)				**$400**
Data analysis of survey data (44 hours at $50)				**$2200**
Data analysis of interviews (22 hours at $50)				**$1100**
Final Report writing (42 hours at $50)				**$2100**
CSU Administrative Research Levy		**$411.40**		
Unspent GST *starred items did not include GST		**$145**		
ESTIMATED TOTAL COST OF THE PROJECT	**$4044.70**	**$4044.70**	**$963.71**	**$10,000**

Total Project Cost (including in-kind, matching cash and project cash): $15,007.41

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