Evaluating Attitudes to Native Plants in Canterbury

What impact do Trees for Canterbury have on schools?

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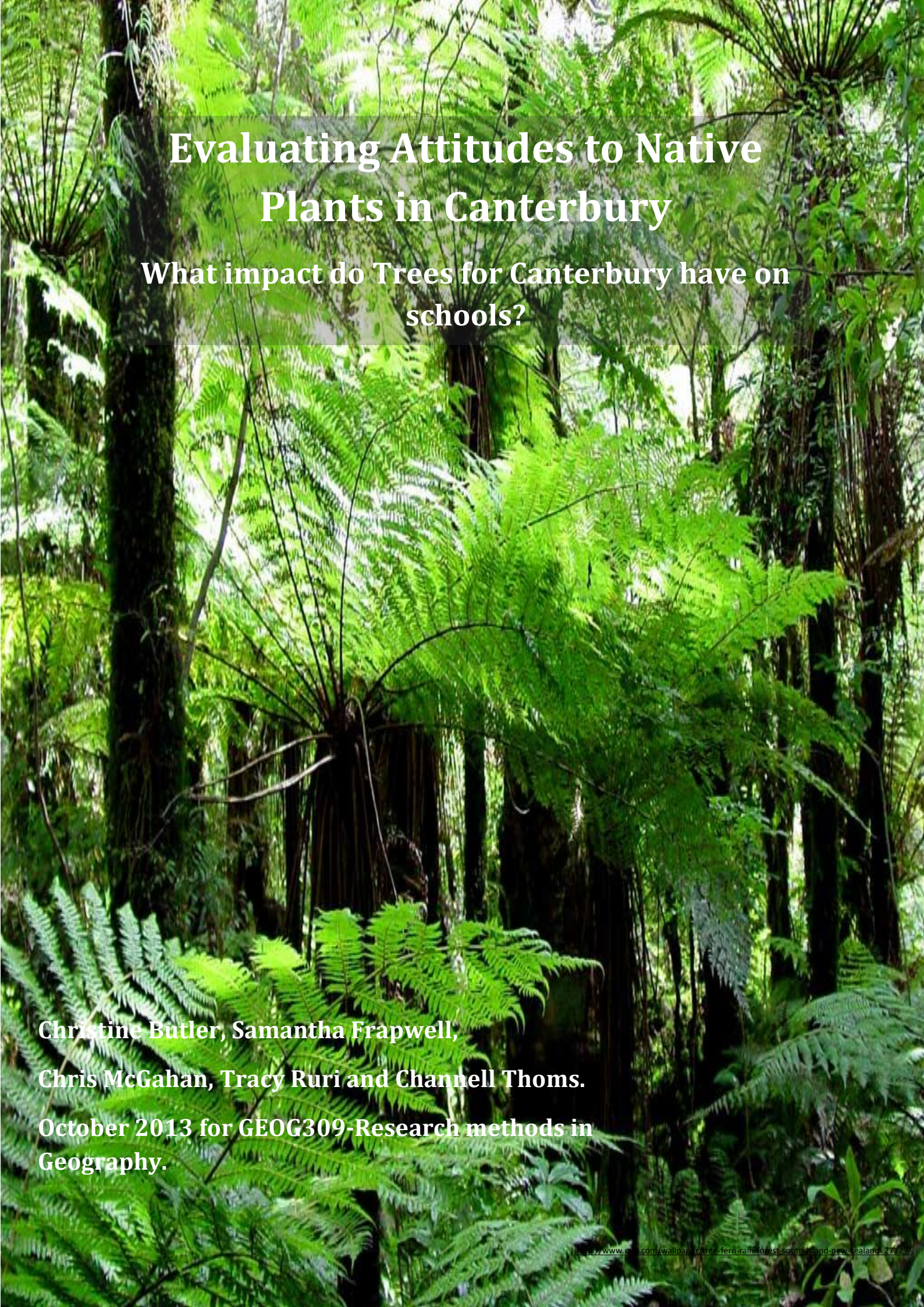

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Abstract

New Zealand's native biodiversity has been greatly impacted through anthropogenic influences to the point, that in Canterbury, native forests are now less than 2% of what they originally were. To gather the information required for analysis an online survey and face-to-face interviews were conducted. Data from the online survey that targeted 114 primary schools throughout the Christchurch region, and in-depth interviews with 10 school principals chosen from those schools, of which 8 participated, suggests that the school curriculum is flexible in how biodiversity is taught in schools. The survey results also revealed that schools are interested in working with Trees for Canterbury to better teach children the importance of understanding New Zealand's native biodiversity. The interview responses showed that principals understand the importance of hands on learning to teach children about native trees and the use of technology as another means of interactive learning. Limitations for the research include human factors such as filling out of the survey forms in a way that may not be truly indicative of the facts, understanding of the questions asked and ethics, that is, due to ethical considerations we were unable to talk to school aged children directly. Future research for the project would be a feasibility study assessing where there would be suitable locations to open a new branch, whether Trees for Canterbury's current location is the most appropriate and a Canterbury wide study to assess Trees for Canterbury's impact at a regional level rather than just at the Christchurch city level given their name "Trees for Canterbury".

Key words: biodiversity, education, New Zealand school curriculum.

Table of Contents

1. Introduction

The impact of urbanisation throughout the world has altered former large areas of natural habitat to the point of destruction and fragmentation. Urbanisation of much of the planet is incredibly prevalent with at least half of the planet's population living in urban areas in the year 2010. This is expected to be fast approaching 69% by the year 2050 (United Nations, 2011). Furthermore, it has rapidly become apparent that the effects of urbanisation have displaced much of the native fauna and flora that once inhabited the regions where cities are now located. This occurrence of urbanisation has an effect in many biodiversity hotspots worldwide and has been acknowledged as the major cause of decline in endangered species globally (Millar & Hobbs, 2002). Also Lerman et al. (2012) identified that urbanisation had at this time impacted on the homogenisation of urban diversity. A study in Southern Australia indicated that the restoration of habitats regarding re-vegetation plantings of different structure and floristics were specified as re-establishing bird communities. These restorations attract different species of avifauna to certain areas of reclaimed native remnants (Munro et al., 2011), this is turn allows for increased biodiversity, closely resembling what was originally present. The deforestation of several vegetated high density areas has put pressure on Earth's natural landscapes and has expedited the extinction of many of the planets unique biota. As a consequence, it would be in the best interest of those concerned to assess the effects of urbanisation on biotic communities and facilitating changes in public perception. Since urban development is expected to increase in both scope and magnitude, knowledge about how the urban ecosystem functions will be useful in planning future urban developments that could minimise environmental impacts and enhance urban biodiversity.

Canterbury, among other regions in New Zealand is included in much of the existing literature on native tree prevalence within cities. It has been documented, that New Zealand, along with other countries worldwide has experienced a transformation in native flora to exotic species in both city and rural landscapes as a result of anthropogenic processes (Doody et al., 2010; Ignatieva & Faggi, 2004; Lerman et al., 2012; Stewart et al., 2004; Stewart et al., 2009). When the first European settlers arrived on New Zealand shores, they encountered a rich and highly distinctive native ecology (Meurk & Swaffield, 2000). Now much of that

ecology has changed, so much so, that the landscapes no longer resemble how they once existed. These disturbances destroyed the habitat for much of the indigenous avifauna and altered the landscape to one where only very few species have the ability to adapt. Furthermore, the changes in terrain has transformed the city landscape into a biotic homogenisation of few non-native species, which have become specialised to a metropolitan environment (McKinney, 2006; Stewart et al., 2007; cited in Stewart et al., 2009). They also demonstrate colonial and post-colonial landscapes where in the modern era, they impart a tension between introduced and native human and natural histories respectively (Meurk & Swaffield, 2000). The Canterbury region, in particular Christchurch has seen the advent of a transformed flora landscape from a once thriving native forest area to a barren environment, decimation has occurred with less than 1% of the once prevalent native plant life to a new landscape which consists of 99% exotic species (Faggi & Ignatieva, 2004). However, Faggi & Ignatieva (2004) also identified that in New Zealand the speed and scale regarding the establishment and naturalisation of introduced biota was exceptional due to the climatic suitability of the environment. As urban ecology is such a young science in New Zealand, ecological principles are as pertinent in cities as they are in the great open spaces and they should receive much attention to satisfy the environmental and social issues facing growing cities (Stewart et al., 2009). Also, Wehi and Wehi (2010) suggested that the active participation by Maori within communities of New Zealand would be beneficial towards the development and management of collecting resources in urban areas through the implementation of traditional ecological knowledge (TEK).

It is often the affluence of a community that defines its vegetative variability (Lerman et al., 2012). Diversity of vegetation in a cultural landscape frequently reflects the wealth of the community and often the preferences for specific species as well as the availability of financial resources to be able to promote these landscapes (Hope et al., 2003). One of the biggest challenges facing society today is perhaps the encouragement to educate the public regarding native flora. Therefore, promotion in the planting and tending of native flora and fauna could quite possibly have flow on effects that may enhance economic and political pressure to promote conservation policies, it could also prove to be the most important application of urban ecology because it promotes the protection of native species (McKinney, 2002). Also, Stewart et al. (2009) discussed various ecosystem services where urban forests would contribute to their respective environments and therefore promote the benefits to both

cultural and ecosystem values. It has been well acknowledged that people in general are ignorant to different species of both native flora and fauna, therefore, educating them on their variation may be all that is needed to boost the prevalence of native woody species on private land. Doody et al. (2010) ascertained that although the public was supportive in the propagation of native plants, people were ignorant to the visual appearance of native flora and therefore eliminated native species from their gardens that would otherwise have self-propagated. Doody et al. (2010) also found the public were quick to remove self-seeding native plant life when they did not grow in desired locations. Stewart et al. (2004) determined that there is more prevalence of native trees on private land in the suburb of Opawa when compared with that of Fendalton, despite Fendalton properties having a much greater land area. However, according to Doody et al. (2010) and Stewart et al. (2009) higher socio-economic communities had higher native plant diversity, and that public education and knowledge of native plant species would benefit both the ecological and social aspects of society.

Trees for Canterbury, henceforth referred to as T4C, are a non-profit organisation aspiring to deliver native trees to the province of Canterbury. When the early settlers inhabited Christchurch their preference for the English style gardens was considered more aesthetically pleasing than the natural habitat, but over the last 20 years there has been a greater acceptance of native plants. This is highlighted in work already noticeable throughout Christchurch and Canterbury, where the objective of T4C is to reforest the Christchurch and Canterbury regions in native flora for all to enjoy, whilst creating an urban forested landscape. Trees for Canterbury's mission statement is to "Employ, Educate and Regenerate" (retrieved from http://www.treesforcanterbury.org.nz/, n.d.). The aim of T4C was to ascertain what impact they have on schools and to evaluate communities perceptions and attitudes towards their organization. It is via this method that T4C would like to encourage public involvement in the community and promote the planting of native trees.

To determine this, our research focused on 'what do school children know about native trees?' We obtained information regarding the primary schools of the wider Christchurch region via email and an online survey questionnaire. This was to enable us to determine the current knowledge of schools and school children about native biodiversity. Our prediction

was that schools closer to the periphery of the outskirts of the city were more likely to be more receptive to the encouragement of children's participation in learning about native ecosystems. We also were of the belief that a higher decile school would be more responsive to interaction with T4C. Therefore, we hypothesised that:

1. Higher decile schools are likely to have greater funding and resources so are more likely to participate in extra-curricular activities including visiting venues such as Trees for Canterbury.
2. Primary schools further from the CBD would have much more interaction with native ecosystems because of a greater accessibility to rural areas.

The objective of this study is emphasised in our main research question:

> What determines attitudes and knowledge of native ecosystems in primary schools within the Christchurch region?

Most of the articles reviewed in this research are in reference to New Zealand, but they are applicable to many nations and the theories have relevance to most situations. Although most of our literature that is cited has been authored by New Zealand academics, there are a few international examples that have also provided an outside perspective.

2. Methods

T4C already has a working relationship with some primary schools; therefore we chose to omit these from our study. In order to obtain a representative sample, primary schools within the Canterbury region were surveyed, of which there were 114. Ethical constraints restricted the gathering of information directly from schoolchildren. Therefore, the collection of data had to be captured independently and indirectly, this was achieved by sampling via the school principals. We devised a survey that addressed the aspects that would give us an understanding of what might be taught in a classroom and to gain an appreciation of what teachers are implementing in terms of the curriculum.

We approached school principals in order to determine what pupils were being taught within the classrooms with regard to native landscapes and fauna. To ascertain social geographical statistics, two methods were used to capture data and these comprised of an online survey and short interview. We approached the 114 schools via email by sending them an introductory letter introducing ourselves, our course of study and explaining why our research was important to the community. A survey of 10 questions was sent to these schools, with questions ranging from informing to investigative. The 10 question survey was distributed in the form of an online electronic questionnaire via www.docgoogle.com. The survey was conducted as a ratio scale with some questions ranging in scale from 1-4 and others from 1-5 dependent on question type.

A GIS map was generated to investigate if there were any visual correlations between school location and respondents. Pearson's correlation co-efficient was used to ascertain whether there was a relationship between survey answers and school decile. We also selected 10 of the schools to participate in a short five question personal interview to collect qualitative data. The 10 schools were randomly selected from five categories, in order to control for bias, two from each category were selected. The five categories were; Religious, Rural, Private, State/Public and Alternative.

3. Results and discussion

Surveys

The response rate for the survey conducted was 68 (60%) of the 114 schools that were invited to participate. This high response rate indicates that our sample size is a good representation of the population. From this we were able to make inferences that could apply to the population of schools in Christchurch and some surrounding districts.

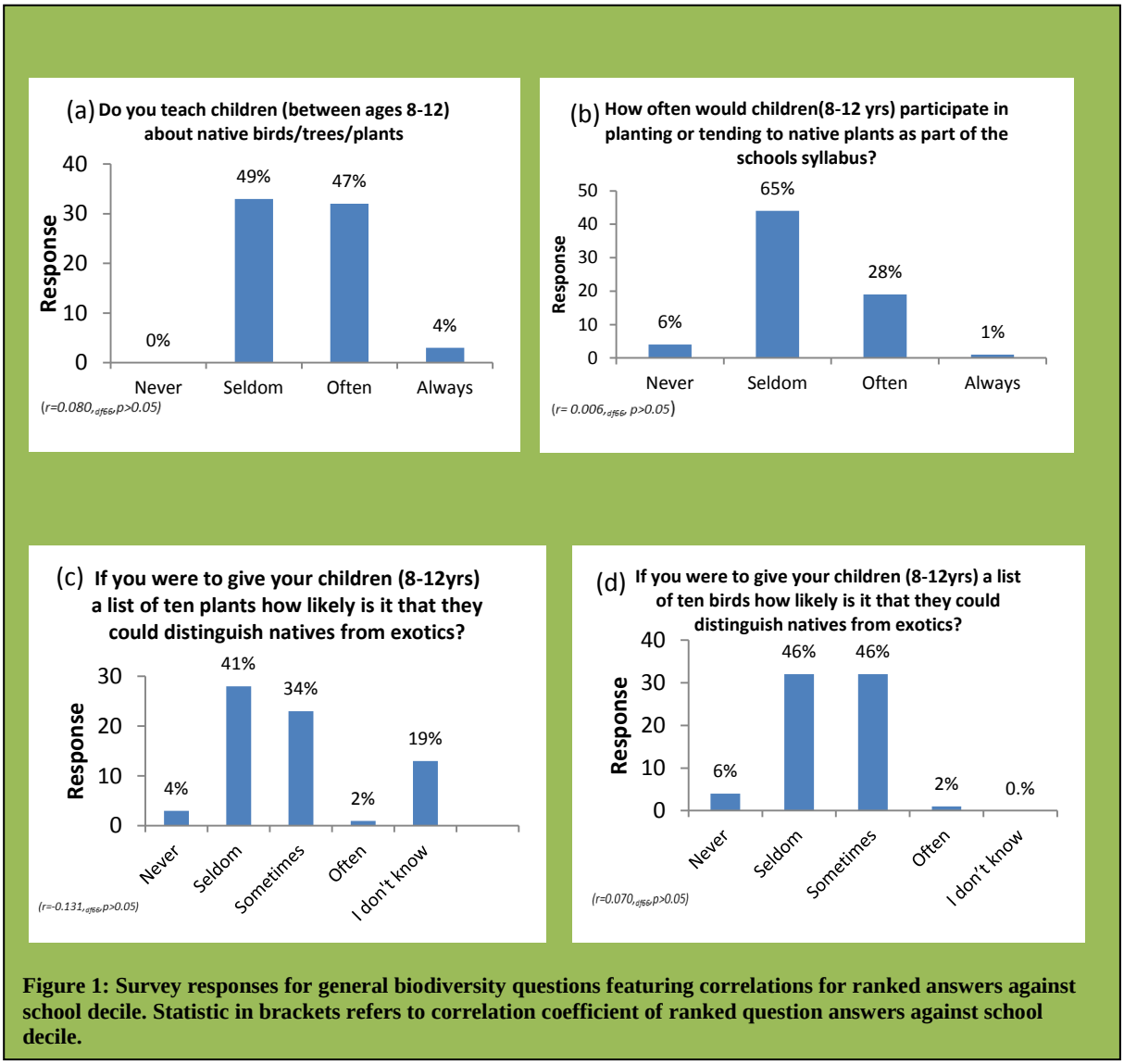


Figure 1: Survey responses for general biodiversity questions featuring correlations for ranked answers against school decile. Statistic in brackets refers to correlation coefficient of ranked question answers against school decile.

Results of survey responses for general native biodiversity knowledge (figure 1) show that most schools do include this in their curriculum. Figure 1 (a) shows that 51% (n=35) of schools teach children about native birds, trees and plants, with a further 49% (n=33) practicing this only seldom. Therefore we can assume that children are exposed to native biodiversity at differing levels in their primary school years. This is further evident as participation for planting or tending to native plants as part of the school syllabus was 94% (n=64) for involvement, with only 6% (n=4) never incorporating this in their syllabus (figure 1 b). This suggests that children are gaining some degree of practical experience; however there is ample room to promote interaction between schools and T4C thereby increasing children's knowledge and skills in tending to native plants. For identification of native plants

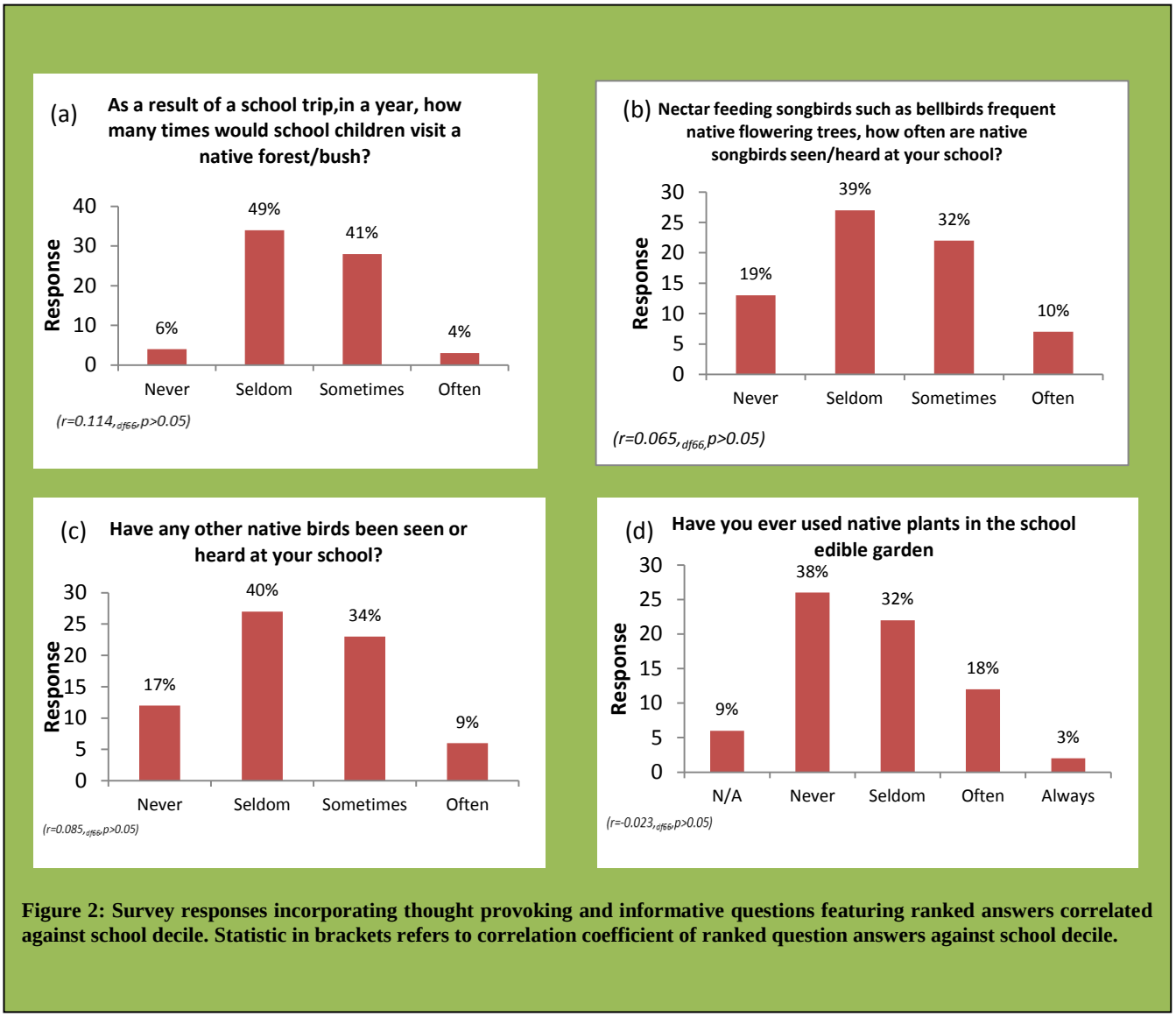


Figure 2: Survey responses incorporating thought provoking and informative questions featuring ranked answers correlated against school decile. Statistic in brackets refers to correlation coefficient of ranked question answers against school decile.

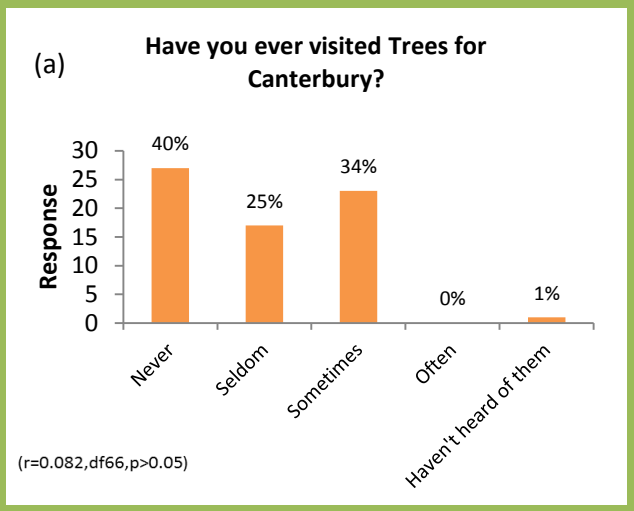
In addition to assessing what children may already know about native flora and fauna, we also wanted to encourage more interest in New Zealand's unique biota, this has been documented as being a precursor to facilitating biodiversity restoration (McKinney, 2002). This was achieved by devising questions that we considered to be both thought provoking and informative.

Results shown in figure 2 are believed to be indicative of these types of questions. For informing and thought provoking questions, results show that 6% (n=4) of schools never visit a native forest or bush as a result of a fieldtrip, however 45% (n=31) visit sometimes or often and 49% (n=33) will seldom visit (figure 2 a). Considering that New Zealand has a reputation

for being “clean and green” it was surprising to find that 55% of schools rarely visited native natural environments. This is definitely an area that needs to be addressed and in itself presents an ideal niche opportunity that T4C could utilise to aid in educating school children of native forests. This in turn may also enhance T4C’s public profile. This could be achieved by informing children about natural corridors, how they operate and how they can contribute to the creation of these by encouraging them to grow natives in their own backyards.

As it has been suggested, the creation and maintenance of natural corridors are paramount to ensuring that urban biodiversity thrives (Lerman et al., 2012). Nectar feeding songbirds were reported to be seen or heard in 83% (n=56) of schools surveyed, with only 17% (n=12) of schools indicating that they were never present (figure 2b). As bellbirds are more often associated with native flora it could be suggested that many of the schools that responded are in proximity to or may have natives growing within their school grounds. Other native birds were determined to be absent from 17% (n=12) of schools surveyed with 43% (n=29) reporting they were present sometimes or often and 40% (n= 27) stating that they were seldom in the area (figure 2 c). These results closely resemble those for the previous question which could further support the suggestion that these schools may indeed be associated with some form of native flora.

Figure 2 (d) shows that 53% (n= 36) have used edible native plants in their school gardens with 38% (n= 26) stating that they have never used native plants and 8% (n= 6) do not have vegetable gardens in their school. Although more than half of the schools surveyed do use native plants in their edible gardens, this could be another vehicle for promoting native diversity and practicality for people growing natives in their home vegetable gardens. This might be another avenue that T4C could investigate further and could also aid in raising their public profile.



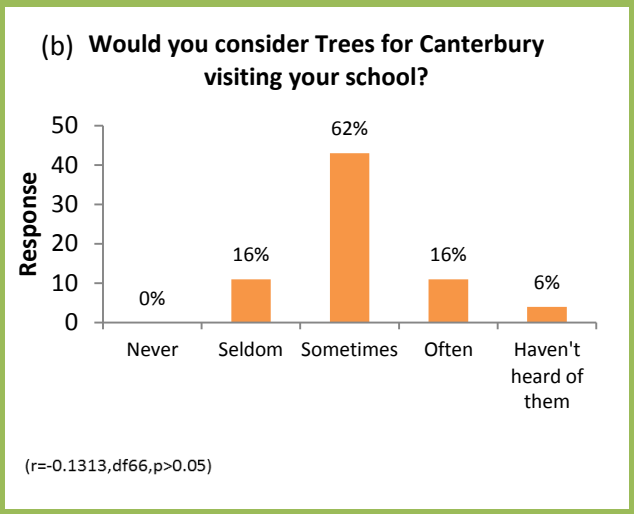


Figure 3: Survey responses for involvement with Trees for Canterbury featuring ranked correlations against school decile.

None of the schools surveyed have visited T4C often, however 59% (n= 40) have visited sometimes or seldom and 40% (n=27) have never visited T4C, only 1% (n=1) had responded that they have never heard of them (figure 3a). Conversely, when asked if schools would consider having T4C visit them, 94% (n= 65) were open to visits, and 16% (n= 11) answering often, however 6% (n= 4) stated that they had never heard of them (figure 3 b). Raising awareness of T4C, particularly in the Christchurch area would quite likely improve their interaction with schools. Although T4C mention that their connection with schools was more frequent before the earthquakes, they have seen a significant decline in T4C-school interaction. However, as much time has lapsed since the earthquakes this should no longer be an issue limiting interaction.

Results were statistically non-significant for correlation of school decile to ranked answers for all survey questions as is depicted in each graph. Ranks were determined by assigning a number from 1-4 or 1-5 for each of the survey questions, these were then correlated against school decile using Pearson's correlation co-efficient. The calculated correlation coefficient is depicted in the graphs for each question. The results suggest that there is no correlation between decile level and response, signifying that the wealth of a school or its community does not determine whether a school is likely to visit T4C or not, or the extent to which

biodiversity and natural environments is taught. Therefore this does not support our first hypothesis that higher decile schools would have greater exposure than lower decile schools, which might be disadvantaged due to limited resources.

Interviews

Table 1: Summary for the individual schools interview questions.

School (Decile)	As an educational provider do you feel a responsibility to teach children about native biodiversity/eco-systems?	As a teaching professional what teaching tools do you think are the most effective to encourage children to learn about native ecosystems?	In the last ten years has the school curriculum changed in respect to teaching children about native ecosystems and if so how. If not what is taught?	Have the earthquakes had an impact on your school's ability to go on field trips and if so how?	Would you consider fieldtrips to Trees for Canterbury whereby children could learn about native plants and have hands on experience in the nursery?
Papanui (5)	Yes	Fieldtrips, Hands on	Yes, Can customise content	Yes, Primary focus on children's wellbeing	No, Co-ordinated effort
Tamariki (4)	Yes	Fieldtrips, Taught by experienced people	Yes, Can customise content	Yes, Primary focus on families	Yes
Broadfield (10)	Yes	Hands on, Internet	Yes, Can customise content	Not really, positive spin off Red Cross grant	Yes
Springston (10)	Yes	Hands on, Internet	Yes, Can customise content	No	Yes
Our Lady of Fatima (8)	Yes	Hands on, Taught by experienced people	Yes, Can customise content	Yes, Less places to visit	Yes
Selwyn House (10)	Yes	Hands on	Yes, Can customise content	No	Yes
Sacred Heart (3)	Yes	Hands on, Internet, Virtual classrooms	Yes, Can customise content	No	yes
Waltham (2)	Yes	Hands on	Yes, Can customise content	Not really, positive spin off Red Cross grant	Yes

Results for the interviews are summarized in table 1. It is reassuring to note that all schools interviewed agree that teaching children about native biodiversity and ecosystems is considered to be an important responsibility for education providers, however, the fact that so many schools stated that children could seldom or would not be able to identify native plants

is concerning. This is an area that T4C could assist schools with educating children on identification of natives. Promoting this aspect could increase enthusiasm for T4C-school interaction. The fact that all schools interviewed listed "hands on" as being an effective tool for teaching children about natives is also a factor that works well in T4C's favour.

Another tool often mentioned was the use of the internet, having a "virtual teacher" available online for a set period of time per day, whereby children can "ask someone in the field" might encourage schools to become more involved with T4C. This would serve to also incorporate the area mentioned in the interviews where schools stated that they prefer to be "taught by experienced people." As there has been a major change in school curriculum within the last ten years, schools are now able to customise their science content to include areas that they believe are of importance for their students. This presents another opportunity for T4C to become more involved with schools.

Only three of the schools interviewed claimed that the earthquakes had affected their ability to participate in fieldtrips, while this may not be indicative of the population, it would be safe to assume that this is no longer a limiting factor for the majority of schools within the Canterbury region. All but one of the schools interviewed indicated that they would be interested in fieldtrips to T4C whereby the children could learn about native plants and participate in a "hands on" experience in the nursery. The only school that indicated otherwise would consider a co-ordinated planting venture nearby; they suggested that the Northern Arterial proposed for QE11 Drive near the school could be ideal. This might be something to consider, however certain undertakings of this magnitude are usually contracted out to more commercial companies.

There appears to be no visual pattern for geographical location of schools that responded to the survey (figure 4), however this was not statistically tested. Figure 4 identifies most schools in Christchurch (year range 1-13) as of the 2006 national census. Secondary and intermediate schools (years 7-13) were omitted from the study range as they were not our study focus. The use of a GIS map was generated to represent the majority of schools in Christchurch and to ascertain any prominent visual patterns that may have been present. The map was unremarkable and no patterns resulted. This did not support our second hypothesis

that primary schools further from the CBD would have much more interaction with native ecosystems because of a greater accessibility to rural areas. However, these findings could be compromised due to the fact that the 2006 census was lacking in some data, this meant that not all schools were listed.

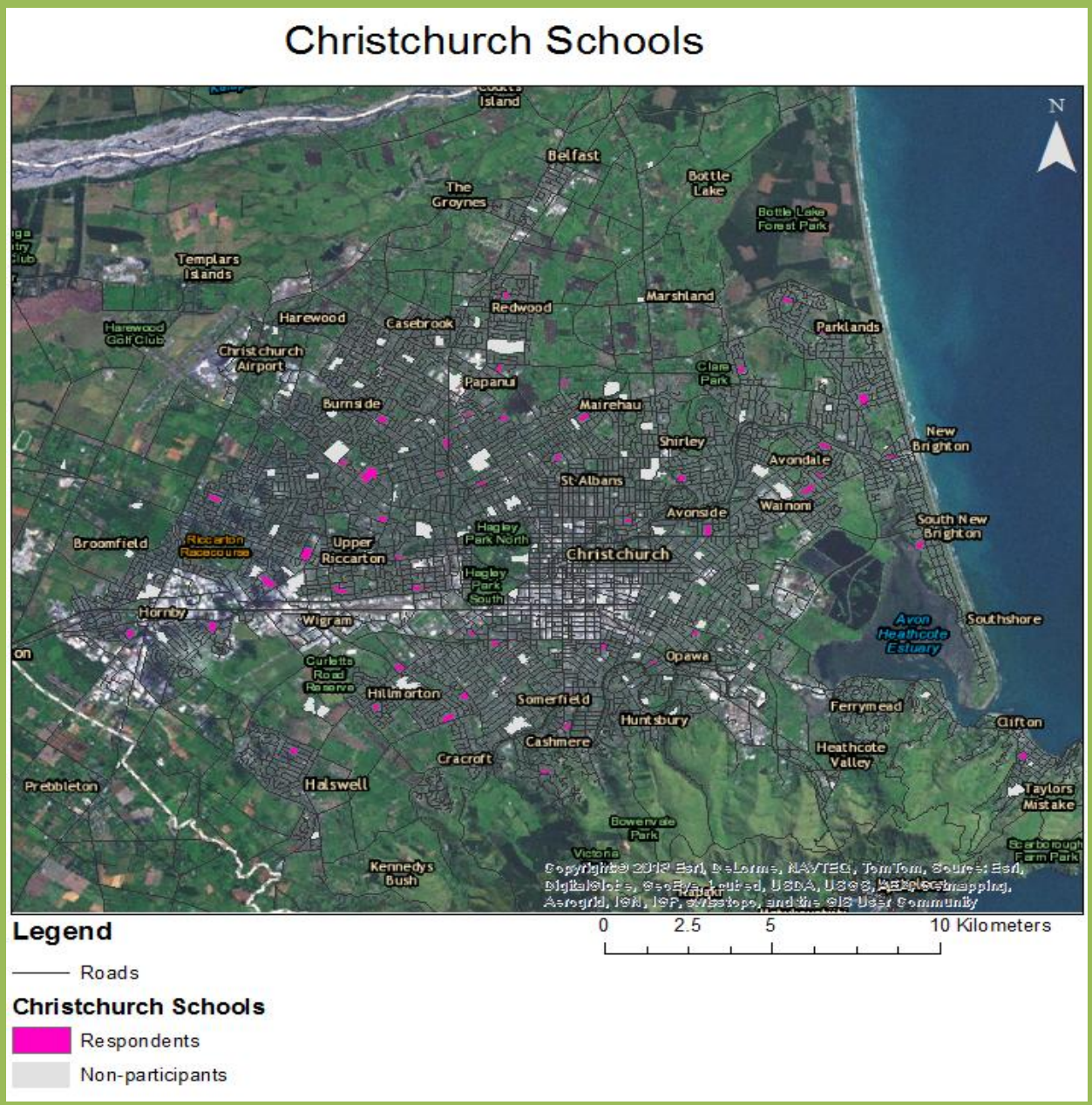


Figure 3: Map of Christchurch depicting respondent schools in pink and non-participants in grey. Note that non-respondents also incorporate secondary schools which were not invited to participate in the study.

As people are becoming increasingly environmentally aware, this presents the perfect opportunity for T4C to become more proactive within communities and schools alike. Catch phrases such as reduce, reuse, recycle are becoming prominent shibboleths in the public realm (The Guides Network, n.d.), and therefore this is the perfect opportunity for T4C to capitalise on their own motto of "Employ, Educate, Regenerate."

In general it appears that most schools would be amenable to developing a relationship or increasing involvement with T4C. This is evident in responses that we received for the survey questions and also for comments made in the interviews. The majority of schools surveyed indicated that they were unaware of the type of interactive repertoire that T4C provided. This suggests that raising awareness of the products and services that T4C provide would increase involvement with schools, and possibly spill over to the general public.

4. Limitations

The main limitation that we encountered was that we were unable to control for human error and this was made evident when one respondent had indicated "never" to the survey question "how often are native songbirds seen/heard at your school?" however after interviewing this school, the interviewee walked out to hear a bellbird singing in a tree directly above the entrance to the school. Another human error we were unable to control for was if the respondents answered survey questions in a way that may not have been entirely indicative of the facts, or whether they fully understood the questions asked. Ethical considerations were also limiting to the study as we were not able to administer our questionnaire directly to the children.

Map generation was also limited as we were restricted to working from the 2006 Census, it was observed that some of the schools that responded were not included in the 2006 Census metadata that we used, therefore they were not represented on the map document. Also map extent omitted schools from certain Christchurch and Selwyn districts. In total only 55 of the 68 schools that responded are shown on the map.

5. Recommendations

We suggest that T4C raise public awareness by way of informing people of the products and services that they provide, this could be achieved by investing in a regional wide advertising campaign. Further recommendations include establishing a formal working relationship with enviro-schools as many principals are already working towards creating sustainable schools; having a dedicated school liaison person to work with schools to ensure long term relationships are established; and looking to the future viability of T4C, the possibility of opening another nursery in a different part of Christchurch as this could give them a much higher profile throughout the Canterbury region.

6. Conclusion

How biodiversity is taught in schools and specifically, what is being taught in schools can determine how children feel and treat the native flora and fauna they interact with. Trees for Canterbury's focus was understanding how they could become more involved with the learning process to foster encouragement of children's appreciation for New Zealand's native biodiversity.

The online survey we conducted received a 60% response rate with 68 out the 114 schools surveyed participating and an 80% response rate from principals approached to participate in face-to-face interviews. These schools are a mix of high and low decile rated schools. We received a high volume of responses to the survey and interviews. We believe this is due to the fact that people are becoming more aware of issues facing our environment, that attitudes towards sustainability and recycling are changing and that people are becoming ever more aware of how fragile our ecosystems actually are as well as just how unique New Zealand's own flora and fauna is. This is reflected in the online survey results that show the willingness of those schools that completed the survey in establishing a relationship or some form of involvement with T4C. In the interview data, three key elements were uncovered regarding the most effective ways to facilitate learning about native flora and fauna. These being; fieldtrips, a hands-on approach in learning by doing and experiencing, as well as being instructed by people who share the same passion and knowledge of the subjects being taught.

These findings certainly open the door for T4C to be able to engage effectively with schools.

Taking into account all of our results four key recommendations that we propose are; T4C look at establishing a formal working relationship with enviro-schools; have a dedicated school liaison person to help become more established in schools; invest in some advertising to help lift their profile. One last recommendation is looking towards the future – Trees for Canterbury as a company, could possibly expand and open another branch in a different suburb. This could give them a much higher profile throughout Christchurch.

Overall we found that native ecosystem awareness and sustainability is evident in a large number of schools in Christchurch. Trees for Canterbury have the chance to further enhance and strengthen the relationship with schools now and in the future.

7. Acknowledgements

We would like to extend our appreciation to our community partners from Trees for Canterbury Tim Jenkins and Steve Bush, our tutor advisor Eric Pawson, Geography 309 tutors, the principals and schools that participated in the interviews and online survey, our class colleagues and our families.

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