

Riccarton Bush
and the natural and social realities of native trees
in Christchurch, New Zealand

A thesis
submitted in partial fulfilment
of the requirements for the Degree of
Master of Applied Science

at
Lincoln University
by
Brendan J. Doody

Lincoln University
2008

Prologue

Riccarton Bush

An Appeal

The forest springs eternal; gnarled, o'ergrown
With thousand fragile plants that soften age,
The trees of centuries stand mute and hoar,
Their young supplanters tender at their feet.
Shall we erase what ruthless time has spared?
The trees stand mute, but in our hearts we hear:
"Beneath this shade our earliest pioneer
Awaited a young people; in this shade
The ancient Maori rested, ere yet spade
Or sickle touched these teeming plains, or voice
Of man bade this wide fruitful waste rejoice.
Silent the link 'twixt past and present stands;
Shall it be spared, or perish, at your hands?"

Johannes C. Anderson (1924 [1906])

Abstract of a thesis submitted in partial fulfilment of the
requirements for the Degree of M. Appl. Sci.

Riccarton Bush
and the natural and social realities of native trees
in Christchurch, New Zealand
by B. J. Doody

Urbanization has destroyed and fragmented previously large areas of natural habitat. Small remnants that still exist in numerous cities will be unable to sustain many viable wild plant populations if they do not expand into the surrounding urban matrix. Residential gardens surrounding such remnants, and which form a significant component of urban green space in many cities, could play a role in redressing this problem.

Riccarton Bush, a 7.8 hectare forest remnant, and its surrounding suburban residential area, in Christchurch, New Zealand, is a good example. Over 125 years the reported number of native vascular plants in the bush has declined by a third. My study was an attempt to understand: 1) the ecological, social and cultural factors influencing the dispersal and regeneration of 12 native bird-dispersed woody species from Riccarton Bush, into surrounding residential properties; and 2) the potential role residential properties could play in the future of the bush. To examine these diverse factors I adopted an interdisciplinary research approach combining methodologies, concepts and theories from ecology and the social sciences. In a broader context my work was an attempt to demonstrate how urban ecology can further develop and strengthen by adopting and integrating new methodologies, theories and concepts.

The ecological component involved recording individuals of the study species found on 90 randomly selected properties within a 1.4 km radius of the bush. Soil samples were also collected from 31 of those properties and placed in a glasshouse and the study species that germinated were recorded. Results showed some species, particularly kahikatea (*Dacrycarpus dacrydioides*), the most abundant species in the bush, are being dispersed and establishing on properties predominantly within 250 m of

the forest margin. These juveniles are not reaching maturity as most gardeners tend to remove all non-planted woody species.

Qualitative interviews with 16 residents and a quantitative survey of the residents of 85 of the properties provided insights into the social context which these natural processes were operating. Using notions of place and performance I argue that gardens are continuously created and recreated by humans and non-humans. Residents attempt to create and maintain a garden that fulfils their individual and familial needs and desires (e.g., aesthetics, leisure and privacy), and public responsibilities such as ensuring they have a 'neat' and 'tidy' garden. This involves selecting plants for colour, shape and the care they require, and encouraging certain performances (e.g., flowering) while controlling other undesirable plants and performances (e.g. growth, spread and shading). While people make connections between native plants, belonging and identity; the 'scientific' demarcation between native and exotic species often becomes obscured as the garden is co-created by people and plants. Some plants become more significant than others but usually this is attributable to their performances rather than whether they are native or exotic.

Residential gardens have the potential to play a major role in the conservation of species restricted to urban remnants. My research suggests that although the potential exists for woody species restricted to Riccarton Bush to naturally regenerate in nearby gardens, this will not happen without human intervention. Plants will need to be eco-sourced and propagated to avoid detrimental impacts on the genetic health of remnant populations, and then actively planted in gardens. The success of such planting initiatives will be increased by providing residents with information about the plants that are suitable for their performative needs and desires (e.g., the size, colour, and maintenance requirements of plants) and, most importantly, control over the location of plantings. In concluding, I argue that by adopting new concepts, theories and methodologies, the productivity, creativity and relevance of urban ecology can be significantly enhanced.

Keywords: bird dispersal, gardening, interdisciplinary research, fragmentation, native woody species, non-human agency, performance, place, plant conservation, residential gardens, urban ecology, urban forest remnant, weeds

Acknowledgements

My thesis was a long time in the making. The fact that you are now reading the final product owes much to the support and assistance I received from many people during the process. I would like to begin by thanking my supervisors Jon Sullivan, Harvey Perkins, Colin Meurk and Glenn Stewart. Jon thank you for your infectious enthusiasm, good sense of humour, (mostly) sound advice, and hours of assistance especially with all matters statistical. Harvey for helping me to take the thesis in directions that I never imagined it would go and all the tricks of the trade (social science and life) that you taught me along the way. Colin and Glenn thanks for your help throughout, the role you played in the early development of my topic and challenging my thinking. Big thanks as well go to other Lincoln University staff that assisted me including Richard Duncan, Sandy Hammond, Myles MacIntosh, and Brent Richards and his team down at the nursery and glasshouses.

I am grateful for the financial assistance I received from Lincoln University and the Freemasons New Zealand, their generous scholarships allowed me to focus more specifically on my research. The Bio-Protection and Ecology Division, furthermore, provided me with funding and other resources which greatly assisted me during my fieldwork. While, the Court Star of Canterbury No. 2309AOF kindly helped to fund my attendance to the International Conference on Interdisciplinary Social Sciences.

I am indebted to all of my friends who helped me throughout. I want to start by acknowledging my fellow Bio-Protection and Ecology students, please forgive me if I miss anyone there are so many names to mention: Nicola Day, Chrissie Painting, Jenny Hurst, Dale McEntee, Kirsten Campbell, Te Ari Prendergast, Maaike Schotborgh, Robyn Blyth, Kathrin Affeld, Hazel Gatehouse, David Pontin, and Steve and Emily Wangen. Thank you all for the morning teas, lunches, afternoon teas, shared alcoholic beverages, R headaches, and all the laughs along the way! My good friend Joshua Smith deserves recognition for all his help especially his assistance with last minute proof reading and editing. Antje Bednarek also warrants special mention for her fieldwork assistance, encouragement, insightful advice and many hours of thought-provoking conversations.

To my family, thank you all for everything. My parents, Eileen and Peter, I owe you a great debt of gratitude for putting up with me so long, your financial and emotional support, as well as, the time you both spent proof reading and editing my many drafts. A big thank you also to my sister Catherine for helping to make sure there was always a bit of fun in my life and a good home-cooked meal in my stomach! And last, but not least, I would like to acknowledge Stephanie Meyer for the significant role she played towards the end in keeping my spirits up and reminding me that there is more to life than a masters thesis!

Table of contents

Title	i
Prologue	ii
Abstract	iii
Acknowledgements	v
Table of contents	vii
List of tables.....	xii
List of figures	xiii
Chapter 1: Introduction	1
1. Conserving plant populations in urban remnants	2
2. Riccarton Bush and the natural and social realities of native trees in Christchurch, New Zealand	3
2.1 Aims	3
2.2 Objectives	4
2.3 The urban ecological context of the research.....	4
3. Thesis structure.....	5
Chapter 2: Nature and Society: the traditional dichotomy	8
1.1 The natural and social sciences and the traditional dichotomy	10
1.2 Challenges to the status quo: urban ecology, and placing ourselves back in the world	12
Chapter 3: Conducting interdisciplinary research.....	15
1. Terminology and definitions.....	15
2. Modes of interdisciplinary research	16

3. Value and benefits.....	17
3.1 The nature of complex or practical problems	17
3.2 The nature of creative breakthroughs.....	18
3.3 Benefits of an outsider’s perspective.....	19
4. Constraints and limitations	19
4.1 Epistemological and ontological differences.....	19
4.2 Lack of common terminology.....	22
4.3 The disciplinary hierarchy	23
4.4 Other constraints and limitations	25
4.5 Urban ecology and interdisciplinary research.....	26
Chapter 4: Urban ecology: the city, plants, and people	27
1. Main goals of urban ecology.....	28
2. Ecology in cities.....	29
2.1 Plants, gardens, and the consideration of people	30
3. The ecology of cities.....	31
3.1 Plants, gardens, and the consideration of people	35
4. Urban ecological research and the goals of urban ecology	37
4.1 Goal 1: To strengthen and expand the discipline of ecology.....	37
4.2 Goal 2: To create an interdisciplinary field	38
4.3 Goal 3: To contribute to social and ecological wellbeing through applied research and policy engagement.....	39
Chapter 5: Urban realities: converting gardens from sinks to sources in the conservation of urban forest remnants	42
Abstract	42
1. Introduction.....	43
2. Methods.....	44
2.1 Seed source and study species.....	44
2.2 Ecological data collection	45
2.3 Social data collection	48
2.4 Data analysis	49

3. Results	50
3.1 Dispersal and establishment in urban residential gardens	50
3.2 Garden management, awareness and support for native plants.....	52
4. Discussion.....	55
Chapter 6: The social (and natural) realities of native trees in Christchurch, New Zealand	59
1. Introduction.....	59
2. Social methods.....	60
2.1 Qualitative research phase	61
2.2 Quantitative research phase.....	63
3. A reflexive consideration: a critique of my ecological findings	64
4. Place and performance: people, plants and gardens	68
4.1 Place	69
4.2 Performance	75
4.3 Place and performance.....	77
5. Conclusion.....	79
Chapter 7: Natives and exotics: identity, ethics, politics and everyday understandings	80
1. Introduction.....	80
2. Natives and exotics: identity, politics and ethics.....	82
2.1 Native plants and the invention of a national identity	82
2.2 Being a 'native' plant: the ethics and politics of it all.....	84
2.3 'Ecological apartheid': the planting of natives and threats to Christchurch residents' sense of place	86
3. Natives, exotics and material performances.....	89
4. Natives, exotics and everyday understandings	90
4.1 Developing (or not developing) an understanding about, and appreciation of, native and exotic plant species.....	91
4.2 Everyday conceptions of native and exotic plant species	101

5. Discussion.....	109
Chapter 8: People, plants and performance: (re)creating and (re)making gardens.....	111
1. Introduction.....	111
1.1 People, plants and performance.....	112
2. Controlling, ordering and taming plants in gardens	115
2.1 'Doing' the garden: gardening and plant performances.....	116
2.2 Creating a beautiful garden: doing the garden and cues for care	118
3. Creating a desirable garden	123
3.2 A desirable garden and sense of place	129
3.3 Creating low maintenance gardens	130
3.4 Making the cut: colour, shape and form	133
4. Performing 'weeds'	138
4.1 Everyday conceptions of weeds	139
Chapter 9: General discussion	151
1. Introduction.....	151
2. Dispersal and regeneration of native woody species in residential gardens	152
2.1 Dispersal	152
2.2 Regeneration	152
3. Residential gardens and the future of Riccarton Bush	154
3.1 The risks associated with restoration plantings	155
3.2 Increasing native plantings in gardens	156
3.3 Implications of everyday understandings about native and exotic plants for attempts to increase native plantings	158
3.4 Urban intensification and the implications for the expansion of Riccarton Bush and other urban remnants.....	162
4. Urban ecology and interdisciplinary research.....	163
4.1 Hybrid urban ecology and perspectival parallelism	163
References	166

Appendices	191
Appendix 1. Status of the fruit dispersing birds that currently occur in Riccarton Bush.....	191
Appendix 2. Weight, gap size, and diet, of birds that currently occur in Riccarton Bush and potentially disperse fruit.....	192
Appendix 3. The quantitative questionnaire survey used in the study.	193
Appendix 4. Show cards shown to respondents during the questionnaire survey.....	202
Appendix 5. Juvenile study species found on properties.....	207
Appendix 6. Adult study species found on properties.....	208
Appendix 7. Study species that emerged from soil collected from property sites.....	209
Appendix 8. Height class distributions of cabbage tree (Fig. a), karamu (Fig. b) and kahikatea (Fig. c).....	210
Appendix 9. Comments given by respondents when upon being shown and asked how they would treat a live kahikatea seedling if it was to come up in their garden.	212
Appendix 10. Comments given by respondents when they were asked whether they could identify a live kahikatea seedling.....	213
Appendix 11. Percentage of respondents who agreed or disagreed with various statements about Riccarton Bush	214
Appendix 12. Gardens in New Zealand history: design, order and control....	215
Appendix 13. The percentage of properties on which different means are used to actively remove weeds from different sections of the garden.	216
Appendix 14. The percentage of properties on which different means are used to prevent weeds from establishing in different sections of the garden.	217

List of tables

Table 1. Explanations of the five modes of interdisciplinary research identified by Karlqvist (1999).....	17
Table 2. Botanical characteristics and occurrence in Riccarton Bush for the twelve native species in the study.....	47
Table 3. Native study species found in 90 and germinated from 31 randomly selected private urban gardens (sites) within 1.4 km of the urban forest remnant, Riccarton Bush.....	53
Table 4. Percentage of respondents who correctly or incorrectly classified, or were not sure, whether a shrub or tree was in New Zealand prior to the arrival of humans.....	102
Table 5. Percentage of respondents who agreed or disagreed with various statements about native and exotic plants.....	104
Table 6. Time spent by respondents on average per week, in minutes, on gardening practices on their properties during the different seasons of the year.	116
Table 7. Percentage of respondents who considered various features or purposes of their section or garden to be important or unimportant.....	121
Table 8. Time spent by respondents on average per week, in minutes, on actively weeding on their properties during the different seasons of the year...	132
Table 9. The main approach used to treat self-introduced woody seedlings when they established in different areas on the property.	144
Table 10. Some of the performative qualities of native species that could potentially be promoted.....	160

List of figures

Figure 1. The traditional hierarchy of the disciplines (Cartwright, 1999 cited in Evans and Randalls 2008, p. 582).....	24
Figure 2. Different disciplines in a non-hierarchical relationship (Cartwright, 1999 cited in Evans and Randalls 2008, p. 584).....	26
Figure 3. The Human Ecosystem Framework, “which includes a complete roster of the structural and functional variables that can motivate hypotheses and inform models addressing inhabited and managed ecosystems” (Pickett and Cadenasso 2006, p. 118).....	33
Figure 4. Aerial photograph including the 90 residential properties sampled within 1.4 km of the urban forest remnant, Riccarton Bush, Christchurch, New Zealand.....	46
Figure 5. The number of juvenile <i>D. dacrydioides</i> found per property and the distance to Riccarton Bush, an urban forest remnant. Only properties containing <i>D. dacrydioides</i> are plotted.	52
Figure 6. Percentage of time spent on different garden tasks during the seasons. Instances where a percentage equated to zero are not included. “G. maintenance” is short for general maintenance.	119
Figure 7. The remnants of a becoming. The gap left by a self-sown mulberry bush that was taking over and killing the adjacent rhododendron (left) and <i>Pittosporum tennifolium</i> (right). Picture taken by B. J. Doody.	125
Figure 8. Simon’s rose garden as seen from the pedestrian footpath. This is one of the few areas he actively maintains to demonstrate that his property is looked after and lived in for both personal pride and security reasons. Picture taken by B. J. Doody.....	134
Figure 9. One of a number of areas on Simon’s property planted out in mainly shrubs and trees. By leaving these areas to largely ‘do their own thing’, he has significantly reduced the amount of work he is required to do in the garden. Picture taken by B. J. Doody.....	135

Figure 10. The lemonwood and *Pittosporum tenuifolium* seedlings that Joyce allowed to develop into mature plants (the large trees towards the back-right of the picture that have been fashioned into a hedge) on her boundary fenceline. Joyce suggested she would routinely remove similar seedlings but allowed these to develop after her neighbours extended their studio right up to the property boundary compromising her sense of privacy. Picture taken by B. J. Doody.... 150

Chapter 1: Introduction

In 1924, Dr. Leonard Cockayne, an early New Zealand botanist and pioneer ecologist, wrote the following regarding the importance of, and need to preserve, Riccarton Bush:

[D]o those to whom [Riccarton Bush] belongs - not the people of the district alone, but all New Zealanders - recognise how beyond price is this piece of ancient forest? Do they understand it is the last tree-association of the kind in the whole world? Do they know that, if destroyed, it can never be replaced? Do they comprehend that it is an open-air museum of living organisms themselves belonging to species of great age, whose ancestors, far older, came to New Zealand in the dim past? [...] [A]s time goes on, and primitive New Zealand fades away beyond our ken, near to the city's heart should stand, for the long years to come - a natural object to delight in and revere-this historic fragment of our country! (1924, pp. 23-24)

Eighteen years earlier, Cockayne was already acutely aware of the significance of this remnant of lowland podocarp and mixed broadleaved forest. In 1906, he had made a request to his friend Johannes C. Anderson (1924 [1906]) to write a short appeal in verse (see Prologue, p. ii) to the people of Canterbury advocating its preservation (Thomson 1995). Their efforts, and others, including Harry G. Ell, were not in vain, as shortly after, this remnant of native forest was formally protected under the *Riccarton Bush Act 1914* and gifted to the people of Canterbury (Thomson 1995). Today, Riccarton Bush remains the only forest reserve in New Zealand protected by its own act of parliament (Molloy 1995).

This brief account illustrates that the biological significance and historical value of Riccarton Bush for Canterbury and New Zealand has long been recognised. In reality, this recognition can be traced to 1854, when the Deans family set aside the now 7.8-hectare remnant which remained under their guardianship until 1914 (Thomson 1995). The survival of Riccarton Bush today in the urban matrix of Christchurch is a legacy to the efforts of the Deans family, Cockayne and others. It has been reported, however, that from 1870 to 1993, the number of native plant species in the bush declined from 106 to 67 (Norton 2002), which is not unusual in urban remnants (e.g., Drayton and Primack 1996). A central focus of this thesis is endeavouring to understand the role that

surrounding residential gardens could play in redressing this problem. Before introducing this project I discuss the issues faced by plant populations in urban remnants.

1. Conserving plant populations in urban remnants

Urbanization has destroyed and fragmented habitat causing threats to biodiversity and species extinctions (Hobbs and Mooney 1998, McKinney 2002). Plant species in the surviving remnants are often at risk of extinction in the long term due to the ecological processes common in small, isolated populations¹⁸. The term extinction debt was coined by Tilman et al. (1994) to describe the time lag between the process of habitat loss and the eventual collapse of populations. Extinction debts are paid through time as communities in remnant habitats gradually relax to a new equilibrium number of species (Ewers and Didham 2006). Several studies of plant populations in urban remnants have documented in addition to a general decline that a number of native species have become locally extinct (e.g., Drayton and Primack 1996, Thompson and Jones 1999, Duncan and Young 2000, DeCandido 2004). In an isolated conservation area in Metropolitan Boston, for example, 155 of the original 422 species were no longer present, with the proportion of native species having declined at an average rate of 0.36% per year (Drayton and Primack 1996). The long term management of these remnants must, therefore, consider options to expand the effective populations of plants in and around these remnants. In urban areas, this is as much a social challenge as an ecological challenge.

There is an increasing focus worldwide on planting native species in urban areas driven mainly by attempts to enhance native biodiversity (e.g., Seidlich 1997, Mizejewski 2004, TCPA 2004, DOC 2005), but also to conserve rare and endangered species (e.g., Sawyer 1997, 2005). It is rare for native planting programmes, however, to purposely target the residential area surrounding an urban remnant. Recently, Roberts et al. (2007) emphasised how plants in urban fringes and residential gardens could successfully aid the

¹⁸ For example, inbreeding depression, genetic drift, allee effects (Raijmann et al. 1994, Schaal and Leverich 1996, Young et al. 1996, Cunningham 2000), simplified pollinator communities (Sih and Baltus 1987, Kearns et al. 1998, Steffan-Dewenter and Tschardtke 1999), limited or no immigration (Brown and Kodrick-Brown 1977, Hanski 1999), edge effects (Laurance 1991, Young and Mitchell 1994), invasion (Brothers and Spingarn 1992, Ewers and Didham 2006), vulnerability to climate change (Honnay et al. 2002), and habitat loss in a disaster (Shafer 1995)

conservation of threatened plants by increasing genetic diversity, effective size of populations, and levels of genetic connectedness. As residential gardens form a major component of urban green space in many cities (Loram et al. 2007, Mathieu et al. 2007) there is considerable potential for this role. Such an approach, furthermore, presents opportunities to move conservation beyond parks and reserves into people's everyday lives, in turn, personalizing nature and building public support for conservation (Meurk and Swaffield 2000, Miller and Hobbs 2002, Robinson 2006).

2. Riccarton Bush and the natural and social realities of native trees in Christchurch, New Zealand

It is in the midst of these attempts to increase native plant biodiversity and conserve rare and endangered species in urban areas that my own research is positioned. My study is an attempt to understand the ecological, social and cultural factors influencing the dispersal and regeneration of 12 native bird-dispersed woody species from Riccarton Bush, an urban forest remnant, in Christchurch, New Zealand, into surrounding residential properties. To examine these diverse factors I adopted an interdisciplinary research approach combining methodologies, concepts and theories from ecology and the social sciences. By providing insights into the ecological and social context in which these natural processes were operating this interdisciplinary approach enabled me to also explore the potential role residential gardens could play in the future of Riccarton Bush.

2.1 Aims

The two main aims of the study were:

1. To identify the ecological, social, and cultural dimensions influencing the regeneration and dispersal of native woody species from Riccarton Bush, a native forest fragment in Christchurch, into surrounding residential gardens
2. To determine the potential role residential gardens could play in helping to ensure the long-term viability and self-sustainability of an urban forest fragment

2.2 Objectives

To achieve the above aims a number of ecological and social objectives were identified.

The ecological objectives of the study were:

1. To measure the dispersal distances of native woody species from an urban forest fragment
2. To measure the regeneration of native woody species in urban gardens
3. To establish what ecological, social and cultural processes are influencing the regeneration of native woody species

The related social objectives were:

1. To gain an appreciation of how people interpret their neighbourhood
2. To attempt to understand how people interpret their own property
3. To understand what role people's gardens play in their lives
4. To determine people's gardening behaviour
5. To establish what aspects of gardens are most important to people
6. To gain an appreciation of the way people interpret woody plants in their gardens, and particularly, native woody plants
7. To understand people's value for Riccarton Bush

2.3 The urban ecological context of the research

In a broader context my work is placed within the scientific field of urban ecology. My main concern here is to provide insight into how urban ecology can further develop and strengthen by adopting and integrating new methodologies, concepts and theories. While this is an argument that has been made by others (see Grove and Burch 1997, Pickett et al. 1997, Grimm et al. 2000, Alberti et al. 2003), it is my view that the research that has been conducted, particularly relating to urban residential gardens, has been limited largely to traditional methodologies, concepts and theories¹⁹. This is not to say that urban ecologists have not made some significant advances. Most notably they have illustrated the conservation value of urban areas and not only acknowledged but have attempted to understand the role humans play in creating and shaping urban areas. These attempts I

¹⁹ For further details see Chapter 4

argue, however, have tended to only draw on concepts and approaches that are compatible with, or can be easily modified to fit with, well-established ecological practices.

3. Thesis structure

This thesis is presented as nine chapters. In Chapter 2, I argue that as a result of the supposed dichotomy between nature and society, historically urban nature has been under-examined by natural scientists. This nature-society dichotomy has also ensured that social scientists have traditionally neglected the ‘social’ dimensions of nature and the active role nature plays in making the social world. The chapter concludes by outlining separate recent attempts within both scientific disciplines to address these matters. Chapter 3 provides a general introduction to conducting interdisciplinary research, clarifying common terminology and definitions, and identifies the values and benefits as well as constraints and limitations of an interdisciplinary approach. In Chapter 4, I introduce urban ecology and the main goals of the field. A discussion of studies that have been conducted about plant ecology and urban residential gardens, and how humans have been considered within these studies then follows. I conclude this chapter with a discussion about how well urban ecology has addressed the field’s goals.

Chapter 5 contains the main ecological findings and some results from the social component of the research, and, as is common in natural science disciplines, is presented as a stand alone draft manuscript shortly to be submitted to an international ecology journal. I argue in this chapter/paper that the potential for Riccarton Bush species to regenerate in surrounding residential gardens exists, but will be insufficient without positive human intervention. My findings suggest that people are supportive of native plants in general but lack knowledge of the species found in the Bush. This problem I suggest can be in part addressed by providing surrounding residents with Riccarton Bush plants, information, and, most importantly, control over the location of plantings.

I then present a more detailed account of the social scientific component of the research in Chapter 6. I begin by expanding on my social scientific methods. Following this I offer a critique of the material I presented in Chapter 5. Here I suggest that the

ecological component of my research provided a valuable understanding into the natural processes operating but that it did not allow me to gain a detailed appreciation of how plant survival was being influenced by social and cultural factors. I conclude the chapter by introducing the theoretical concepts of place and performance, which I draw on briefly in Chapter 7 and extensively in Chapter 8.

Chapter 7 focuses on the concept of native and exotic plants. I argue that distinctions between the two, aside from their biological basis, are associated with notions of belonging and identity, as well as, being matters of ethical and political concern. Following this I present a largely ethnographic account about Christchurch residents' understandings of, appreciation for, native and exotic plant species. In Chapter 8, I focus on how gardens are ceaselessly 'done', or come into existence, in the midst of a dynamic relationship between people and plants, one typified by affirmation, co-operation and struggle. Through gardening, I argue, people try to control and order the growth and development of plants in an attempt to create a garden to which they are personally attached. As a result of their continuous growth and development, plants, however, can disrupt and challenge such aspirations. In concluding, I focus on the practice of weeding and the plants commonly associated with it, namely 'weeds'. Here I argue that a plant's characterisation as a weed is not pre-determined or pre-figured but is rather *performed*, by both the plant and the gardener.

The last chapter is a general discussion which addresses three matters. First I contend that some native woody species are naturally dispersing and establishing in residential gardens surrounding Riccarton Bush. Despite this, few show evidence of permanent establishment. If the populations of these species are to expand into nearby gardens a programme of active planting will be required. Second, I highlight some potential considerations required in attempts to encourage people to plant native species in their gardens emphasising the need to engage with people in their own terms. In concluding I suggest my research is an example of how urban ecology could move in a new direction towards a more radical, hybrid form. I envisage hybrid urban ecology would be characterised by real attempts to cross the boundaries between the natural and social while still maintaining an underlying unity. Perspectival parallelism is one strategy

which could become a foundation of hybrid urban ecology. I introduce this strategy and illustrate its potential by using my own research findings.

Chapter 2: Nature and Society: the traditional dichotomy

Studies of vegetation in urban areas have a long history. For example, floristic surveys were conducted during the early decades of the 20th Century in many European cities (see Pickett et al. 2001, Zerbe et al. 2003) and as early as 1870 in New Zealand (e.g., in Auckland (Kirk 1871) and Christchurch (Armstrong 1870)). Despite these historical precedents, urban flora, and urban nature more generally, has for a considerable time remained understudied and under-examined by natural scientists²⁰ (Pickett and McDonnell 1993, McDonnell 1997). Similarly, social scientists have traditionally neglected the ‘social’ dimensions of nature (Macnaghten and Urry 1995, Macnaghten and Urry 1998, p. 4) and the active role nature plays in the continuous making and re-making of the social world (Whatmore 1999, 2002, Cloke and Jones 2001). This apparent historical lack of scholarship within both scientific realms can be attributed largely to the supposed dichotomy between nature and society.

Society, in traditional Western representations, has been portrayed as the antithesis of nature (Williams 1972). ‘Nature’ has been held to be something ‘pure’ that is ‘out there’ separate from culture and society (Soper 1995, Whatmore 1999). Alternatively cities, perhaps the most identifiable manifestations of society, were and often still are referred to as ‘dirty’ and ‘unnatural’ places representative of human progress and development (Williams 1972). Unlike nature, cities are often viewed as the products of culture and society, largely devoid of any form of ‘naturalness’ or nature (Soper 1995). This nature-society dichotomy, as Whatmore (1999, p. 25) observes: “is rehearsed in pervasive distinctions between 'built environments' (the social pole) and 'natural environments' (the natural pole), with hierarchies of human 'settlement' in between marking inverse gradations of social/natural presence and absence”. In other words, the extent to which a place, or even a species, is deemed to be ‘natural’ is “marked out precisely by [its] distance from humankind” (Whatmore 1999, p. 25).

²⁰ There are some notable exceptions (e.g., Snow 1958, Kettlewell 1961, 1965, Brickell and Sharman 1986, Esler 1987, 1988, Gilbert 1989).

Macnaghten and Urry (1995, 1998) in their historical overview of the concept of nature²¹ identify two critical transformations which occurred from the sixteenth and seventeenth centuries and both entailed the “separation and abstraction of a state of *nature*, from *God* and from *humanity*” (1995, p. 205, original emphasis). The first involved “the deadening of the state of nature: from a life giving force to dead matter, from spirit to machine” (1995, p. 205). Following the establishment of physics, astronomy, and mathematics, the study of nature became concerned with “how nature was materially constituted” (1998, p. 10). Nature was transformed into a “set of laws, cases and conventions” that could be discovered through new methods of inquiry that placed an emphasis on empiricism, rationality and objectivity enabling such discoveries to be made without any “recourse to a divine purpose or design” (1995, p. 205).

The second transformation involved the contrast between a primeval, pre-social nature, or at least a nature prior to civilised society, and the modern, human-transformed state. As nature came to be viewed as being an abstract, separate and pre-social state, debate surfaced about the “essence of this state of nature as opposed to society” (1995, p. 205). At the heart of the debate was the question as to whether the ‘pre-social state of nature’ was in fact the source of original sin or original innocence. Hobbes, for instance, portrayed the pre-social state of nature as “solitary, poor, nasty, brutish and short”, while Locke referred to this state as one of “peace, goodwill, mutual assistance and co-operation” (1995, p. 205). Hobbes contended, therefore, that the foundation of a civilised society “lay in overcoming ‘natural disadvantages’”; Locke argued, in contrast, that the foundation for a “just society lay in organising society around ‘natural laws’” (1995, p. 205).

Of the two variants, Hobbes’ view became the most influential, subsumed within the Enlightenment tradition (Williams 1972, Macnaghten and Urry 1995). The outcome of the new abstract and geometric ‘natures’ of this tradition legitimated not only theoretical inquiry but also new applications (Williams 1972, Macnaghten and Urry 1995, 1998). The separation of nature from society, Williams (1972) argues, was a precondition for “practices dependent on constituting nature instrumentally: as a set of passive *objects* to be used and worked on by people” (Macnaghten and Urry 1998, p. 11,

²¹ For similar reviews see Williams (1972, 1976) and Soper (1995)

original emphasis). The massive interference which took place from the eighteenth century onwards was morally substantiated by “this construction of a separate nature, whose laws became the laws of physics” (Macnaghten and Urry 1998, p. 11). More importantly, as these were regarded as “God’s laws, physical interference came to represent the continuation of God’s creation” which lead to:

systems of thought that where it became considered fundamentally purposeful for people to interfere on a massive scale for human use, first in the field of agricultural innovation, and later in the industrial revolution. It also led not only to arguments proclaiming the ‘naturalness’ of interference, but also to the argument that interference in and on nature was so inevitable that any criticism of the argument itself became classified as unwarranted interference in the mastery of nature. Hence a particular version of the socio-economic order, that involving a Hobbesian vision of struggle, of self-interest, and of the sanctity of physical intervention on nature for human use, came to be read as an extension of nature and of a naturalised order (Macnaghten and Urry 1998, p. 11).

1.1 The natural and social sciences and the traditional dichotomy

The nature-society dichotomy as, we have seen briefly above, has had an enduring impact on the way that humans have thought, related and interacted with nature²². This perceived dichotomy has been as equally influential in, and remains a significant institution in the study of nature and society. Regarded as separate realms nature and society were able to be examined and explained autonomously, establishing the traditional division between the sciences (Macnaghten and Urry 1995, 1998, Ingold 2000). This division held that the specific and independent realm of facts of the natural or nature, were the concern of natural scientists, and those of the social or society, the concern of social scientists (Macnaghten and Urry 1995, 1998, Ingold 2000). This binary logic has played a significant role in how the natural and social sciences have come to perceive and conduct research about the empirical world; a point aptly made by Herbert Blumer (1969):

The *entire act* of [a natural or social] scientific study is orientated and shaped by the underlying picture of the empirical world that is used. This picture sets the selection and

²² For more extensive accounts see Williams (1972, 1976), Macnaghten and Urry (1995, 1998) and Soper (1995)

formulation of problems, the determination of the data, the kinds of relations sought between data, and the form in which propositions are cast (pp. 24-25, original emphasis).

The natural sciences have been established on the ideology of studying ‘real’ or ‘pure’ nature, the nature ‘out there’ removed from the influences of culture and society. As Blumer (1969) suggests, this ideology manifests itself in the selection and formulation of problems, identification of potential study sites, the type of data collected, procedures used to collect and analyse data and the materials presented to answer the original problem. Fundamental to ideology of the natural sciences is the notion of “a separated mind looking at separated matter” (Macnaghten and Urry 1998, p. 11). Science, and the knowledge scientists produce, in other words, is ‘objective’, existing in the ‘real’ world outside of the human mind, not biased in any way by a scientist’s own social or cultural subjectivities (Simmons 1993, Turnbull 2000). By following the canons of the scientific method, which embodies the “highest form of rationality and objectivity”, any scientist is able to discover truths about a ‘real’ or ‘pure’ nature (Turnbull 2000, p. 7). The scientific method, in other words, ensures that “there can be knowledge [...] without a thinking subject” (Simmons 1993, p. 19).

Part of the ideological justification of scientific objectivity, is what Haraway (1991, p. 189) has termed the “god-trick”. Also referred to as the “view from nowhere”, this is “the illusion that there can be a positionless vision of everything” (Turnbull 2000, p. 11). In other words, that you can uncover knowledge about the world without being a part of that world and shaping the knowledge that you discover. The other ideological justification of scientific objectivity is the presumption of a singular and abstract nature which exists independent of humanity. If nature then is a singular, abstract and independent entity, and the scientific method allows a scientist to objectively study the natural phenomena, it becomes possible to uncover the real laws of nature.

With notions of ‘naturalness’ being determined exactly by how far a place is removed from human society (Whatmore 1999) conservationists have traditionally sought to preserve, and scientists undertake research, in largely ‘natural’ settings characterised by low human activity (Botkin 1990, Pickett and McDonnell 1993, Primack 1993). Such settings ensured “nature’s intrinsic balance” could be preserved and the truths of an “undisturbed” nature could be uncovered without being influenced by the

‘unnatural’ tendencies of humanity (Botkin 1990, Pickett and McDonnell 1993, Miller and Hobbs 2002, p. 331).

The Cartesian desire to consider nature and society independently has been as prominent in the social sciences as it has in the natural sciences. Traditionally, social scientists have maintained that their concern is for the facts and truths of the social or society (Macnaghten and Urry 1995, 1998, Ingold 2000, Law and Urry 2004). Macnaghten and Urry argue such a realm of social facts presumes “its separation from, and antithesis to, nature” (1995, p. 204). Attempts to ‘add nature’ into social theory have conventionally produced either social constructionist or natural realist accounts (Soper 1995). Social constructionists contend nature is a product of the social imagination, an always pre-given artefact of human interpretation (Soper 1995, Whatmore 1999). Unlike constructionists, natural realists argue ‘raw’ nature can, and must, be viewed as “ontologically separate from the ‘Natures’ of social representation” to allow the possibility of an “account of society’s relationship with nature that uniquely corresponds to a real, objective world” (Whatmore 1999, p. 24). From either perspective nature and society are imagined in dualistic or binary terms. Just like their scientific counterparts then, social scientists have traditionally only managed to “understand our...creative involvement in the world by taking [us] out of it” (Ingold 2000, p. 173).

1.2 Challenges to the status quo: urban ecology, and placing ourselves back in the world

Acceptance of the academic division between realms of social and natural facts has been such that until recently it has remained largely uncontroversial. Contemporary thinking within the natural sciences, however, has begun to reconsider nature recognising that “[m]any ecosystems are dominated directly by humanity, and no ecosystem on Earth’s surface is free of pervasive human influence” (Vitousek 1997, p. 494) and as a consequence:

The earth today provides [scientists] the opportunity and challenge to address [scientific] questions in a variety of environments with varying levels of human activities (McDonnell 1997, p. 85).

Further, with population predictions suggesting that humans will continue to become increasingly urbanized it has been argued that it is essential to understand first, how urban ecosystems operate and change, and second, the forces shaping them (Botkin and Beveridge 1997, McDonnell 1997, Pickett et al. 1997). The diverse field of urban ecology that has emerged to address these questions has been suggested to be evidence of a ‘paradigm shift’ (McDonnell 1997) in scientific thinking in two ways. First, the nature and ecology of urban areas have become established as legitimate matters of scientific study (McDonnell 1997, Pickett et al. 1997). Second, and more importantly, humans have been recognised as integral components of urban ecosystems²³ and a critical to attempts seeking to ensure the sustainability of these areas (Grove and Burch 1997, McDonnell 1997, Pickett et al. 1997).

Urban ecology’s emergence has coincided with separate attempts within the social sciences to critically engage with the binary modes of thinking that establish an opposition between ‘the natural’ and ‘the social’. Such efforts have recognised that “being-in-the-world” is an escapable condition of reality; we live in the world and cannot abstract ourselves out of it (Ingold 2000). In this there is no longer any “imagined *separation* between the perceiver and the world”, as natural and social scientists have traditionally held, because in reality the “perceiver [does not] reconstruct the world, in the mind, prior to any meaningful engagement with it” (Ingold 2000, p. 178). Any attempt to understand our creative involvement in the world must, therefore, begin by locating ourselves firmly within the “lively commotion” (Whatmore 2002, p. 3) of the “concrete world we inhabit” (Bingham and Thrift 2000, p. 292) alongside a multitude of other living and non-living beings and entities. Social scientists have subsequently sought to understand our role, as well as that of the host of other non-human occupants, in the continuous making and remaking of such a world. These attempts have drawn on a diverse array of theoretical positions, two of which I introduce and employ elsewhere in the thesis²⁴.

²³ Note the development and rise of conservation biology pre-dates urban ecology. Conservation biology among other matters focuses on the impacts humans have on biodiversity and what can be done to prevent or minimise such impacts (Soule 1986, Primack 1993). It promotes as a consequence the need for multidisciplinary and interdisciplinary collaborations (Soule 1986, Primack 1993).

²⁴ See Chapters 5, 6 and 7

In summary, the supposed nature-society dichotomy has had profound influence on the focus of, and ways in which, research has been conducted within the natural sciences and social sciences. Recently, there has been a renewed interest in nature and society within both of the sciences, which has resulted in increasing calls for interdisciplinary research to be undertaken²⁵. It is in the midst of these recent developments which my own interdisciplinary research is positioned. In the chapter that follows I provide a general introduction about conducting interdisciplinary research by clarifying common terminology and definitions, and identifying the values and benefits as well as the constraints and limitations associated with such approaches.

²⁵ See for example Nissani (1997), Pickett et al. (1997), Miller and Hobbs (2002), Pett et al. (2008) and Newton (2007)

Chapter 3: Conducting interdisciplinary research

1. Terminology and definitions

Confusion over the terminology used in integrative research approaches can hinder communication between participants (Tress et al. 2004, Tress et al. 2007, Petts et al. 2008). As my thesis is specifically concerned with ideas about interdisciplinarity it is necessary to clarify a number of definitions. As Pett et al. (2008) observe, insight into what actually constitutes disciplinary knowledge must be the starting point of any discussion about interdisciplinarity. I consider disciplines, therefore, to be:

constructs borne out of historical processes involving both objects and methods of study; they provide ‘frames of reference, methodological approaches, topics of study, theoretical canons and technologies’. [...] [They also] provide shared languages and concepts, as well as sets of tools; they produce ‘credentialled practitioners’, who accept a set of epistemological and ontological commitments (Petts et al. 2008, p. 596).

To define multidisciplinary, interdisciplinarity and transdisciplinarity, I follow Tress et al.’s (2004) terminology. They describe multidisciplinary as “research efforts of different academic disciplines that relate to a shared goal, but with multiple disciplinary objectives” (p. 485). Participants adopting this approach exchange knowledge “but...do not aim to cross subject boundaries in order to create new integrative knowledge and theory” (p. 485). In their view interdisciplinary research involves:

several unrelated disciplines in a way that forces them to cross subject boundaries. The concerned disciplines integrate disciplinary knowledge in order to create new knowledge and theory and achieve a common research goal (pp. 485-486).

While transdisciplinarity is defined as:

projects that involve academic researchers from different unrelated disciplines as well as non-academic participants, such as land managers, user groups and the general public, to create new knowledge and theory and research a common question (p. 487).

Finally, the terms “integrative research approaches” or “concepts” are used when referring to both interdisciplinary and transdisciplinary approaches (Tress et al. 2004).

2. Modes of interdisciplinary research

Interdisciplinary collaborations, as well as being separated from multidisciplinary and transdisciplinary endeavours, can be at least theoretically separated into different modes or forms (see Karlqvist 1999, Evans and Marvin 2004). Karlqvist (1999) identifies five modes of interdisciplinary research (see **Error! Reference source not found.**). In summarising these modes, Karlqvist (1999, p. 382) observes that the consecutive steps from Mode 1 to Mode 5 “describe the increasing distance between fields of knowledge bearing on a problem and requiring connection, the steps suggests how the character of the gap changes as well”:

1. Doing the same thing in different ways
2. Doing different things that can be combined
3. Doing different things that cannot be combined in the absence of an additional framework
4. Doing things differently
5. Thinking differently

While I agree with Karlqvist’s (1999) Modes 1 – 3, I would argue that Modes 4 and 5, judging by the explanations and examples provided, are too simplistic and should be collapsed into a single mode as in essence the different disciplines are “doing things differently” because they are “thinking differently” (Karlqvist 1999, p. 382, see Section 4.1 of this Chapter for further elaboration).

Evans and Marvin (2004, p. 22) make a distinction between “cognate interdisciplinarity” and “radical interdisciplinarity”. Cognate interdisciplinarity occurs when a given problem is able to be successfully addressed by “interdisciplinary research *within* (say) the natural or social sciences” (Petts et al. 2008, p. 596, original emphasis). For example ecologists, hydrologists and hydrogeologists working collaboratively to understand river systems (Petts et al. 2008). Radical interdisciplinarity, in contrast, involves “synthesis not only within but across the established domains” (e.g., natural and

social scientists working together to address a particular phenomena) (Petts et al. 2008, p. 597).

Table 1. Explanations of the five modes of interdisciplinary research identified by Karlqvist (1999)

Mode	Explanation of the interdisciplinary mode
Mode 1	Involves establishing that two things are different manifestations of the same underlying structure
Mode 2	Is when various fields of knowledge instead of identifying a common set of underlying principles combine their disciplinary knowledges to address a common goal
Mode 3	Is where the possibility of integrating knowledge from different fields exists, but before this can occur additional interpretation is required to ensure a meaningful understanding (e.g., a new theoretical framework).
Mode 4	Is where not only the theories of the disciplines involved in the collaboration are “different but so, too, are the basic underlying assumptions and the paradigmatic bases for theories” (e.g., a collaboration involving natural and social scientists) (p. 381).
Mode 5	“Consider the case where the repertoires of the theories and methods are different and where, in addition, one seeks knowledge from different cultures where fundamental interpretative and conceptual differences exist” (p. 382). Here knowledge “can no longer be combined but must be treated as complimentary” (p. 382).

3. Value and benefits

3.1 The nature of complex or practical problems

Real-world problems are often complex and “do not come in discipline-shaped blocks” (Roy 1979, cited in Nissani 1997, p. 209, Daily and Ehrlich 1999). Complex, as well as practical real-world problems, therefore, “can [often] only be understood by pulling together insights and methodologies from a variety of disciplines” (Nissani 1997, p. 209, Hansson 1999). Those who restrict their analyses to only one dimension of a problem may be limited in the extent to which they can fully appreciate the contextual complexity of the problem (Nissani 1997, Petts et al. 2008). Such tendencies can have significant consequences such as failing:

to recognize the footprint of ... [research] problems on what might be thought of as a multidimensional, multidisciplinary surface [which] ... can lead at best to silly, naive “answers” and, at worst, to bad policies with serious societal consequences (Daily and Ehrlich 1999, p. 277).

Owen et al.’s (2006) discussion of the failure of models employed in the urban energy field to consider the contextual complexity of energy consumption, illustrates the above point:

[T]echnological interventions which, according to models employed in building science, should achieve substantial reductions in energy consumption in buildings, have “failed numerous times to produce real energy savings”. The problem is that such models do not incorporate the effects of specific social, spatial, and temporal configurations of energy consumption in encouraging or militating against effective energy saving. The ways in which people actually use energy, and their complex motivations for doing so, are left out of the equation (p. 639).

This urban energy example demonstrates how an interdisciplinary approach may have increased the likelihood of addressing the problem(s) and successfully implementing viable solutions. In turn, it also highlights how such an approach often has greater potential to bring a researcher “closer to a firm grasp of [a] complex subject than any important but one-sided study” (Nissani 1997, p. 207). Put in other words:

[It is] better, perhaps, [to provide] different coats to clothe the children well than a single splendid tent in which they all shiver (Goffman 1961 cited in Evans and Randalls 2008, p. 581).

3.2 The nature of creative breakthroughs

In the history of intellectual activity most breakthroughs of long lasting significance have commonly been the result of cross-fertilisation between academic disciplines and traditions (Nissani 1997, Hansson 1999). A classical example is Sir Isaac Newton’s celestial mechanics which was based on his theory of gravitation, but also:

a combination of Kepler’s laws for planetary orbits, which themselves are nothing but a piece of applied mathematics, and Descartes’ basically physical preoccupation with the

principles underlying the influence of one piece of matter on another (Hansson 1999, p. 339).

The act of creation occurs in such instances as a result of the permutation of ideas from two or more disciplines (Nissani 1997). For Snow (1964) this is because “the clashing point of two subjects, two disciplines, two cultures – of two galaxies, so far as that goes – ought to produce creative chances” (cited in Nissani 1997, p. 204). Milgram (1969) suggests that the “intellectual cross-pressures generated by an interdisciplinary outlook liberate a person’s thinking from the limiting assumptions of his own professional group, and stimulate fresh vision” (cited in Nissani 1997, p. 204).

3.3 Benefits of an outsider’s perspective

As we have seen, interdisciplinary research can be a source for creative breakthroughs. Similarly, career mobility, particularly the movement of a researcher from one discipline to another, can be one of the most compelling sources of innovation and development within a discipline (Becher 1989). This has been attributed to two main causes. First, immigrants “bring fresh insights and methodologies from their old disciplines [which] may include...a more fruitful way of telling apart wheat from chaff” (Nissani 1997, p. 205). The second, Nissani suggests, is “best approached by noting the resemblance between immigrants to a new discipline and to a new land”:

Foreign observers like...Margaret Mead sometimes see cultural aspects which are invisible to the natives. The natives live and breathe their customs; the perceptive foreigner doesn't. The same goes for the history of ideas: outsiders are less prone to ignore anomalies and to resist new conceptual frameworks (Nissani 1997, p. 205).

4. Constraints and limitations

4.1 Epistemological and ontological differences

Disciplines “become deeply structured and such structuring is too deep to be overcome ‘by good intentions, snappy commonsense thinking or some optimum design fix’” (Degeling 1995 cited in Petts et al. 2008, p. 596) and consequently “working across

disciplines is hard” (Evans and Marvin 2004, p. 26). It is “so hard, in fact, that genuinely interdisciplinary work is rare” (Petts et al. 2008, p. 593). The difficulties associated with conducting interdisciplinary research are often related to epistemological and ontological differences.

Epistemology, or the theory of knowledge, is a branch of philosophy which considers “how it is that people come to have knowledge of the external world” (Abercrombie et al. 2006, p. 133) and “tries to answer questions about the nature, sources, scope and justification of knowledge” (Baert 2006, p. 171). Ontology, also a division of philosophy, is concerned with “the nature of existence. Ontological assumptions are those assumptions that underpin theories about what kind of entities can exist” (Abercrombie et al. 2006, pp. 275-276) or alternatively “what there *is* and what there could be” (Law 2004a, p. 23, original emphasis).

Epistemologies and ontologies are intimately connected. A researcher’s beliefs about ‘what reality is’ (ontology) influences how they attempt to ‘come to know that reality’ (epistemology). Further, as Law (2004a) argues, epistemological positions or, more specifically, “methods, their rules, and even more, method practices, not only describe but also help to *produce* the reality that they understand” (p. 5, original emphasis). In this sense the way we conduct research not only produces knowledge but also enacts a certain kind of reality (Mol 1999, Law 2004a, b). Different disciplines (and sometimes sub-disciplines within a discipline, see for example Massey 1999) hold different epistemological and ontological perspectives. Such differences can be significant barriers to interdisciplinary research. In collaborations between natural scientists and social scientists these barriers are particularly apparent:

typically [natural] scientists treat the topic of study as an object, whereas to the social scientist the topic of study is the subject. As a consequence, [natural] scientists generally use methods to monitor and evaluate the object, whereas social scientists adopt methods that include reflection on their own role and effect on the research subject (Bracken and Oughton 2006, p. 375).

Further, unlike social scientific writing there is usually no space in the writings of natural scientists “to explore the myriad places in the practices of fieldwork where value

judgements and uncertainties play a role. The institutions of good practice in science in general do not permit this” (Bracken and Oughton 2006, pp 379-380).

On a more practical level as Blumer (1969) suggests these differences determine what problems are selected, how they are formulated, and subsequently the data collected. An interdisciplinary project involving both natural and social scientists before even getting off the ground may struggle to clearly define what the ‘problem’ is (see Tress et al. 2007, Petts et al. 2008). If the participants in the project were to reach an acceptable definition of the problem there would then be differences in what would be defined as ‘data’ and the methods used to collect and analysis that ‘data’ and how it is eventually presented.

To demonstrate the above points I will use the example of plant diversity in residential gardens²⁶. For an (urban) ecologist, the problem could be framed as (e.g., Hope et al. 2003, Grove et al. 2006a): “What ecological and social factors explain the composition and abundance of plant diversity in residential gardens?” Answers would then typically be sought using an approach where the researcher would identify and obtain data about a series of ‘relevant’, measurable and quantifiable ecological (e.g., elevation, soil type and land use) and social (e.g., family income, population density and housing age) variables. Efforts would be made to identify a sampling approach that would enable the collection of a representative or random sample (preferably a large one). More importantly, the approach or method selected needs to be replicable, so that in future other researchers are able to either validate or refute the research findings (Turnbull 2000, Bracken and Oughton 2006). In order to understand which combination of the selected variables best explains plant diversity, statistical tests or modelling would then be used to analyse the data. Finally, the results presented from the research would consist of a series of statistics, tables and figures²⁷.

A interpretative social scientist, in contrast, might define the problem as (e.g., Bhatti and Church 2001, Head and Muir 2005): “How are the meanings of plants structured by personal practices, relationships with family and friends and wider social processes (e.g., housing tenure and consumption patterns)?” Here the focus on meaning is

²⁶ See Chapter 4 for further discussion

²⁷ See Chapter 5 for example

an obvious departure from the approach adopted by the ecologist. The social scientist would argue that such a focus is equally, if not more important, than the ecological and social variables adopted by the ecologist. While these other variables obviously play a role in determining plant diversity, gardens are not generally a random assemblage of plants²⁸. Rather the plants included in gardens reflect personal, familial and place meanings as well as wider gardening trends, which in part determine the popularity of certain garden styles and associated plants and features. To get to the heart of these meanings the researcher would then undertake some form of qualitative data collection, typically but not necessarily interviews (for other approaches see Lofland et al. 2006) to gain insights into matters such as people's everyday experiences of their garden, the meanings they ascribe to plants, their gardens and gardening practices. As the goal of qualitative research is to gather rich and in-depth data the researcher would not necessarily be interested in obtaining a large, representative or random sample as would a quantitative researcher (whether it be a natural or social scientist). The data collected would then be transcribed and analysed along thematic lines (see Lofland et al. 2006) with the results being presented as a series of key findings supported evidentially by residents' accounts of gardening and other relation practices²⁹.

4.2 Lack of common terminology

As well as a commitment to particular epistemologies and ontologies researchers within a discipline also have shared languages and concepts (Wear 1999, Bracken and Oughton 2006). One aspect of language that can cause confusion both in everyday life and interdisciplinary collaborations, are what Wear (1999) refers to as 'dialects'. Dialects correspond to the "difference between everyday use of a word and expert use, and the ways in which different disciplines use the same word to mean different things" (Wear 1999, Bracken and Oughton 2006, p. 376). Dialects are also created by the same word having slightly distinct meanings within different disciplines, again distinct from everyday usage (Bruce et al. 2004, Bracken and Oughton 2006). Not surprisingly, the

²⁸ This is not to suggest that urban ecologists in everyday life view gardens as a random assemblage of plants but rather in the following of statistical conventions this is how gardens would likely be treated.

²⁹ See Chapters 7 and 8

lack of common terminology is often identified as being a major obstacle in interdisciplinary collaborations (Bracken and Oughton 2006, Tress et al. 2007) and sometimes the cause of significant and heated debate (see Bracken and Oughton's (2006) discussion about the word 'dynamic').

4.3 The disciplinary hierarchy

Massey (1999) suggests that within the discipline of geography both physical and human geographers commonly “turn to physics as a kind of higher authority, as a source of unimpugnable truth” (p. 264). This is an attitude Massey goes on to suggest:

built upon implicit understandings that lie deep within us, as both intellectuals and ‘ordinary citizens’. There has developed over the last few centuries (building on even older foundations) an acceptance of a hierarchy among the sciences, between the disciplines, and between forms of knowledge. It operates both in general and with great precision. Within the standard disciplines, physics is at one end and (say) cultural studies and the humanities at the other (1999, p. 264, see Figure 1).

This is not an attitude unique to geography, as geologists (e.g., Frodeman 1995) and biologists (e.g., Rose 1997) alike, have written of their disciplines’ “physics envy”, or the sense of inferiority regarding the status of their disciplines compared with other, “harder” sciences (Massey 1999, Evans and Randalls 2008). Matters of envy aside, however, the notion of a disciplinary hierarchy is seemingly well established (Massey 1999, Evans and Randalls 2008).

Physics’ position at the top of the hierarchy (see Figure 2) can be attributed to the long-standing perception of physics’ ‘status’ and ‘authority’ as a discipline, which stems from its methodology and its truth-claims (Massey 1999, Evans and Randalls 2008). More particularly, it is underpinned by the view of physics as “the one true method of doing science and as the purest form of scientific knowledge” (Massey 1999, p. 264). The underlying reductionist assumption was that the complexities of the world were “in principle reducible to simple systems” or, “in terms of knowledge-production, would need to be if ‘scientific’ knowledge were to be gained from them” (Massey 1999, p. 265, Turnbull 2000). The disciplinary or scientific hierarchy then “is part of the canon of

positivism”, which arises from a “false premise that there is a single picture that concepts can help build up” (Evans and Randalls 2008, p. 582).



Figure 1. The traditional hierarchy of the disciplines (Cartwright, 1999 cited in Evans and Randalls 2008, p. 582).

In summary, the disciplinary hierarchy is underpinned by the epistemological and ontological premises of Western scientific knowledge, which in practical terms places ‘harder’ sciences (e.g., physics and chemistry) at the top and ‘softer’ sciences (e.g., sociology and the humanities) at the bottom. These premises, as I have touched upon already, include notions of scientific rigour, appropriate empirical observations that can be replicated, validated, and refuted, and that the truths of nature exist independent of humans in that “there can be knowledge [...] without a thinking subject” (Simmons 1993, p. 19, Turnbull 2000, Law 2004a).

The disciplinary hierarchy has significant implications for interdisciplinary research endeavours, specifically those involving natural and social scientists. Social scientists sometimes feel as if they are in a ‘no-win’ situation when invited to be involved in such collaborations (Petts et al. 2008, p. 598). The authority of social scientists is often undermined as the field is portrayed as “‘soft science’ [which is] seen as arbitrary, replete with simple insights and open to competition from ‘common sense’ views of the world” (Horlick-Jones and Sime 2004, Petts et al. 2008, p. 598). Further, the social sciences are commonly considered to be “epistemologically homogenous” (Horlick-Jones and Sime

2004, p. 446), with a tendency “to sideline concepts and approaches that are incompatible with dominant, hard knowledges” (Horlick-Jones and Sime 2004, p. 452, Petts et al. 2008). These perceptions of social science once again reflect epistemological and ontological differences and serve to reinforce the established disciplinary hierarchy.

A number of observers have argued developing mutual respect for others’ disciplines is a necessary condition for increasing the likelihood of successful collaborations (Evans and Marvin 2004, Petts et al. 2008). Creating a non-hierarchical disciplinary framework will be an important step in the development of mutual respect and the capacity for interdisciplinary research. Such a framework (see Figure 2) will need to:

juxtapose disciplines in such a way as to allow for such exchanges of meaning, a kind of arrangement [...] that accepts a certain loss of philosophical rigour in order to avoid implicating any (decisive or divisive) power hierarchy that would see the insights of one discipline reduced to those of another (Evans and Randalls 2008, p. 584).

In my general discussion I introduce the notion of “perspectival parallelism” suggesting it is one strategy which has the potential to establish a non-hierarchical relationship between disciplines (see Newton 2007).

4.4 Other constraints and limitations

There are a number of other constraints and limitations associated with conducting interdisciplinary research. Above I have elaborated on areas that are particularly pertinent to my current research. The time required for interdisciplinary endeavours is often a lot longer than that required by researchers within a single discipline (Hansson 1999, Tress et al. 2007). This is because although familiarisation with the methods, concepts and terminology of another discipline can greatly increase the likelihood of a successful collaboration, it also can take a lot of time to reach such an understanding (Bracken and Oughton 2006, Petts et al. 2008). Interdisciplinary research, therefore, cannot be produced on demand (Hansson 1999, Tress et al. 2007).

4.5 Urban ecology and interdisciplinary research

In the remainder of this thesis I seek to illustrate how combining ecological and social scientific methods, concepts and theories has allowed me to develop a fuller understanding of the ecological, social and cultural factors influencing the dispersal and regeneration of native woody species in residential gardens. Such an approach I show has enabled me to gain a greater understanding of the complexity of these processes and the possible role residential gardens could play in the future of Riccarton Bush. In the next chapter I introduce urban ecology and the main goals of this field, one of which is to create an interdisciplinary field. Despite many urban ecologists promoting the need for interdisciplinary research I contend those studies that have been undertaken have made few attempts to do things differently, to think differently or to undertake radical interdisciplinary research.



Figure 2. Different disciplines in a non-hierarchical relationship (Cartwright, 1999 cited in Evans and Randalls 2008, p. 584)³⁰.

³⁰ Note the poor quality of this figure is the result of the quality of the source image. The balloons in the figure read from left to right: 'social psychology'; 'wave theory of light'; 'particle theory of light'; 'hydro dynamics'; 'accounting'; 'optical'; 'ecology'; 'sociology' and 'psychology'.

Chapter 4: Urban ecology: the city, plants, and people

Contemporary urban ecology is a diverse field of research, which McDonnell (1997) and others (Grove and Burch 1997, McDonnell 1997, Pickett et al. 1997), have suggested is founded on a paradigm shift. This shift is characterised by the recognition of the need to understand the nature and ecology of urban or ‘human dominated’ areas, and more significantly, how humans shape the natural and ecological components, and processes, of these areas. Urban ecology is commonly divided into ecological and planning perspectives. As a sub-discipline of ecology, urban ecology addresses the patterns and abundance of organisms within and around cities, and the biogeochemical features of urban areas (Rebele 1994, Pickett et al. 2001). From a planning perspective it considers the living situations of people in urban areas, the related environmental problems including water, air and soil pollution (Rebele 1994, Botkin and Beveridge 1997) and establishing ecological rationale for particular planning approaches and objectives (Pickett et al. 2001).

A division has also been recognized in the sub-discipline of ecology between ecology in, and the ecology of cities. The former, it is argued, is concerned with the biophysical environment without specifically addressing the role of humans in urban processes (Grimm et al. 2000, Pickett et al. 2001). While, the latter, the ecology of cities, considers urban ecosystems from a systems-oriented approach that envisages cities arising out of the elaborate interactions between social, political, economic and natural forces (Grimm et al. 2000, Pickett et al. 2001). Researchers adopting this perspective contend that such forces can only be appreciated through interdisciplinary or transdisciplinary research endeavours (Grimm et al. 2000, Pickett et al. 2001). Studies of plant ecology and urban domestic gardens have been conducted from both perspectives. I elaborate on this research, as well as, how people have been considered from both perspectives, after I have outlined the main goals of urban ecology. Having addressed both of these matters I then examine how successfully urban ecologists have met the

goals of the field, focusing particularly on plant ecology and in the process discussing my own research project in the context of the goals of urban ecology.

1. Main goals of urban ecology

To date there has been no programmatic statement of the goals of urban ecology (Young and Wolf 2006). Young and Wolf (2006) in conducting a bibliographic review of the goal attainment of urban ecology research from 1975-2004, however, considered the field to have three main goals. They formulated these around what the Institute for Ecosystem Studies (2007), a significant global centre for ecological research, has described as the ‘three central questions’ underlying urban ecology:

1. How do urban ecosystems operate?
2. How are they affected by drivers from a wide range of disciplines?
3. How can this knowledge be used to address contemporary urban and environmental problems?

The first of these questions, Young and Wolf (2006) interpreted as a “challenge to extend theories and tools of ecology for application in urban settings” (p. 181). The second promotes the need “to engage multiple intellectual traditions and perspectives” (p. 181). And the third encourages urban ecology “to engage in applied research and policy-relevant work” (p. 181). Subsequently, Young and Wolf (2006) outlined the three main goals or commitments of urban ecology as being:

1. To strengthen and expand the discipline of ecology
2. To create a transdisciplinary field
3. To contribute to social and ecological wellbeing through applied research and policy engagement

The goals and commitments Young and Wolf (2006) have identified are often reiterated in writings on urban ecology. Many urban ecologists emphasise the potential of urban ecological research to strengthen and expand the discipline of ecology (e.g., Pickett et al. 1997, Collins et al. 2000, Grimm et al. 2000), and to produce applied research that can be employed in policy engagement, in turn, contributing to the social and ecological wellbeing of cities (e.g., Botkin and Beveridge 1997, Alberti et al. 2003, Musacchio and

Wu 2004). Unlike Young and Wolf (2006), however, the need to create an interdisciplinary (and occasionally a multidisciplinary), rather than a transdisciplinary field, is most commonly highlighted (e.g., Grimm et al. 2000, McIntrye et al. 2000, May 2004, Musacchio and Wu 2004). Young and Wolf's justification for identifying the commitment to creating a transdisciplinary, rather than interdisciplinary, field is the fact many urban ecologists have argued:

Linkages between scientists and practitioners—interaction among scientists and people working as policy makers, business professionals, urban planners, advocates and educators—are [...] an important resource for enhancing [the] productivity, creativity and relevance of urban ecological science (2006, p. 182).

Although I agree with Young and Wolf's (2006) contention about the need to create a transdisciplinary field, in the context of my thesis, I also want to argue for the importance of creating an interdisciplinary field. My focus will be on, therefore, how interdisciplinary research can enhance the “productivity, creativity and relevance of urban ecological science” (Young and Wolf 2006, p. 182). In my discussion of urban ecology's two main perspectives it should become apparent that it has been researchers adopting the ecology of cities approach who have mainly promoted creating an interdisciplinary field. In concluding the chapter I will discuss how well urban ecologists have addressed the main goals of the field suggesting that while they have had some success, there are still numerous opportunities to pursue.

2. Ecology in cities

Studies adopting this approach have demonstrated that the establishment of an urban area alters the landscape and the biological and physical characteristics of an environment (Rebele 1994, Kinzig and Grove 2001). Cities are warmer than surrounding areas due to increased heat production and a reduced rate of heat loss (Miess 1979, Botkin and Beveridge 1997). Urban soils are characterised by increased disturbance and compaction of the soil (Hough 1995), higher total nitrogen concentration, and lower leaf litter depth, mass and density (Kostel-Hughes et al. 1998b). Compaction of soil and hardened surfaces such as roads, footpaths and buildings have had major implications on the urban water

cycle (Botkin and Beveridge 1997) reducing the supply of nutrients and lowering groundwater levels (Hough 1995, Vitousek et al. 1997).

These changes, in addition to the resulting fragmentation and destruction of natural habitats, create new habitats and alter the composition of species assemblages (Hobbs and Mooney 1998, Sukopp and Starfinger 1999, McKinney 2002). Despite being a developing field of study, a number of studies have focused on the flora of urban areas. Two common areas of investigation have been surveys to establish the floristic biodiversity of a city (e.g., Franceschi 1996, Dana et al. 2002, Zerbe et al. 2003, Turner et al. 2005) and attempting to establish the relationship between flora and land-use types (e.g. urban residential, industrial and rural, see McDonnell and Pickett 1990, McDonnell et al. 1997, Maurer et al. 2000, Dana et al. 2002). A number of these have highlighted that the most common and abundant species are those with a greater tolerance of disturbance (e.g., Richards et al. 1984, Franceschi 1996, Maurer et al. 2000, Zerbe et al. 2003).

The identification of rare species and plant communities, however, in some surveys has illustrated that suitable habitat sites are available within the urban areas (Maurer et al. 2000, Dana et al. 2002, Zerbe et al. 2003). Such sites can help to ensure the survival of rare species and plant communities by providing habitat refuges and seed sources for dispersal (Maurer et al. 2000). Vacant lots (Franceschi 1996, Maurer et al. 2000), old stone walls (Jim 1998), and gardens (Rudd et al. 2002, Thompson et al. 2003, Smith et al. 2006), within urban areas, have, for example, been found to be areas of relatively high diversity. Gardens have also been suggested as potential sites for the re-emergence of native woody species in urban areas (Stewart et al. 2004, Turner et al. 2005).

2.1 Plants, gardens, and the consideration of people

The ways in which humans shape and influence natural processes and patterns of floristic diversity in urban areas are often alluded to, but not specifically examined, by those conducting research from this perspective (Grimm et al. 2000, Pickett et al. 2001). In studies examining the relationship between flora and land-use types, for instance, humans have been viewed or described, as being a novel or a unique 'disturbance' or an

‘anthropogenic disturbance’ (see McDonnell and Pickett 1990, McDonnell et al. 1997, Maurer et al. 2000, Lehvavirta and Rita 2002). Such researchers contend that land-use gradients provide an indication of how plant diversity changes with increasing levels and intensity of human activity. Social and cultural factors, in other words, are ‘considered’ without being explicitly investigated.

People have specifically been acknowledged as being important in the creation and composition of private residential gardens. Garden management practices have been recognised as contributing to the unnatural capacity of garden plants to persist at astonishingly low population sizes (Thompson et al. 2003) and the high levels of floristic diversity found in gardens (Thompson et al. 2003, Turner et al. 2005, Smith et al. 2006). For example, Turner et al. (2005) in Halifax, Nova Scotia, were unable to detect any differences in plant diversity based on the age of the neighbourhood or proximity to other residential sites. As a result they suggested diversity was most likely to be associated with “site-specific management practices (such as horticultural choices of landowners)” (2005, p. 191). In concluding, they argued, as others have (see Stewart et al. 2004), that the regeneration of native species in private residential gardens could be promoted by modifications to management practices and increased plantings.

In these studies of residential gardens, we again see despite recognition of the importance of social and cultural factors, no specific attempt to examine them. For instance, Stewart et al. (2004) and Turner et al. (2005) although suggesting modifications to garden management practices which could promote the regeneration of native plant species, they did not consider how these practices influence the environmental conditions required by species to germinate, establish and, more importantly, survive in gardens.

3. The ecology of cities

The ecology of cities approach arose as a critique of what its adherents described as ‘ecology in cities’. Those who undertake ecology in cities they argued were simply ecologists conducting traditional ecological studies using conventional methods in a new setting, the city (Grimm et al. 2000, Pickett et al. 2001). No particular attention was paid as to how urban ecosystems and natural processes were influenced and shaped by the

economy, political systems, legislation and various other social and cultural forces. Subsequently, there has been a proliferation of conceptual frameworks and models attempting to consider such forces (see Grove and Burch 1997, Machlis et al. 1997, Pickett et al. 1997, Niemelä 1999, Dow 2000, Grimm et al. 2000, Alberti et al. 2003). A reoccurring theme in these frameworks and models has been the acknowledgement that urban ecosystems are complex systems arising out of various ecological, social, and cultural processes and their interactions. To fully appreciate this complexity those adopting this perspective promote the need to integrate and adopt diverse social, planning and ecological approaches, concepts and theories.

Conceptually there are a number of common features underpinning these numerous models and frameworks. In all instances urban areas are viewed as ecosystems, often referred to as ‘human’ or ‘human-dominated’ ecosystems (see Figure 3, Grove and Burch 1997, Machlis et al. 1997, Pickett et al. 1997, Niemelä 1999, Dow 2000, Grimm et al. 2000, Alberti et al. 2003). The concept of an ecosystem is attributed to Tansley (1935) who observed that ecosystems can be of “any size as long as the concern is with the interaction of organisms and their environment in a specified area” (Pickett et al. 2001, p. 148). The ecosystem is a multifaceted concept, therefore, that can be applied to a variety of circumstances, as Pickett et al. (1997) observe:

Ecosystems can be large or small, so that both the entire biosphere and a rotting log on a forest floor can be delimited as ecosystems. Ecosystems can be founded on terrestrial substrates, or occupy volumes of water. Hence, the assemblage of organisms and physical environment of a desert shrubland and of mountain stream are both examples of ecosystems (p. 186).

The ecosystem concept it has been argued is flexible enough to consider humans and their institutions (Rebele 1994, Pickett et al. 1997). However, to apply an ecosystem approach to the study of human ecosystems requires additional analytical components (Grove and Burch 1997, Dow 2000, Pickett et al. 2001). The two main components these frameworks and models³¹ have drawn on are: 1) spatial heterogeneity; and 2) social differentiation (see Figure 3).

³¹ See Grove and Burch (1997), Machlis et al. (1997), Pickett et al. (1997), Dow (2000), Grimm et al. (2000), Pickett et al. (2001), Alberti et al. (2003).



Figure 3. The Human Ecosystem Framework, “which includes a complete roster of the structural and functional variables that can motivate hypotheses and inform models addressing inhabited and managed ecosystems” (Pickett and Cadenasso 2006, p. 118).

Landscapes are commonly viewed in ecological studies as being spatially heterogeneous, comprised of a series of patches, rather than homogenous or uniform entities (Pickett and White 1985, Pickett and Cadenasso 1995). Ecological processes are associated with patches, such as disturbance regimes (e.g., fire and wind throw events), and patch structure can be a major determinant of those processes (Grimm et al. 2000). Patch structure and arrangement can also change through time, and so patches must be viewed as non-equilibrium, dynamic entities (Pickett and White 1985, Grimm et al. 2000). Furthermore, as patches at a given scale are frequently themselves composed of smaller patches, and can be aggregated into larger patches, there is also then a hierarchical aspect to patch dynamics (Pickett and Cadenasso 1995, Grimm et al. 2000).

Traditionally, the patch dynamics concept has been applied to natural areas. For example, the composition of a forest through space and time reflects both the underlying environmental conditions (e.g., soil type, altitude) and the type and intensity of the most recent disturbance event (e.g., earthquakes, wind throw events, and floods) (Pickett and White 1985). Ecologists of the city, however, contend these ideas are equally applicable to urban areas as such an:

approach focuses explicitly not only on the spatial pattern of heterogeneity at a given time but also on how and why the pattern changes through time and on how that pattern affects ecological and social processes (Grimm et al. 2000, p. 580).

Social differentiation has also become a concept integral to attempts to understand the functioning of urban ecosystems. This is unsurprising given the similarity of the notion to ideas of spatial heterogeneity. All social species, it is suggested, are characterised by patterns and processes of social differentiation (Grove and Burch 1997). It is here that ecologists of the city draw on ideas from the sociological field of urban or human ecology developed at the University of Chicago during the 1920s and 1930s. Commonly referred to as the Chicago School, its members considered human ecology to be an extension of the developing fields of plant and animal ecology (Schwab 1993, Grove and Burch 1997, Bounds 2004). Urban social life, they believed, developed in the same spontaneous, natural manner as plant life (Bounds 2004) and could, therefore, be explained by adopting and extending the ideas of plant ecologists like Clements (Grove and Burch 1997). For instance, ecological notions of succession, competition and metabolism were used to depict stages of human community structure (organization) and function (processes) and in particular as signs of social disorganisation such as delinquency, prostitution and disorder (Schwab 1993, Bounds 2004).

Although the Chicago School's conception of human ecology was strongly criticized³², concepts developed there have played an important role in the development of social indicators and social area mapping exercises in geography and social policy (Grove and Burch 1997, Bounds 2004). Burgess' concentric zone theory of

³² Social scientists criticized the Chicago School's failure to account for human agency and culture, its reductionist approach and reliance on macro-scale processes to explain individual behaviour (Schwab 1993, Grove and Burch 1997, Bounds 2004).

neighbourhood change and residential differentiation, for example, has been vastly adapted to represent the socio-demographic distributions of the city (Bounds 2004). In the current context, these ideas are drawn on to differentiate urban areas by social identity (e.g. age, gender, class, caste and clan) and social hierarchies (e.g. wealth, power, status, knowledge, and territory) (Grimm et al. 2000, Pickett et al. 2001). As Grove and Burch (1997) argue social differentiation is an important concept in the study of human ecosystems as it affects:

the allocation of critical resources (natural, socioeconomic, and cultural). In essence, it determines “who gets what, when, how and why”. This allocation of critical resources is rarely equitable (p. 268).

3.1 Plants, gardens, and the consideration of people

Ecologists of the city in critiquing the ecology in cities approach to urban ecology argued that it paid too little attention to the social and cultural aspects of urban areas and how these shape and influence urban ecosystems. To redress this problem, ecologists of the city have promoted the need to adopt and integrate interdisciplinary approaches to urban ecology. As I suggested ecologists in the city often alluded to the influence of people without directly researching such matters. Ecologists of the city, in contrast, have attempted to consider these matters. The manner, in which they have, however, has been relatively restricted. This is not particularly surprising given the conceptual foundations of their work that has relied primarily on notions of spatial heterogeneity and social differentiation.

Proponents of this systems-oriented perspective have drawn on measures of social differentiation including predominantly broad-scale socio-economic and political characteristics such as median household income, housing age and population density. Combined with information on differences in land-use, urban areas are represented as a series of patches or a spatially heterogeneous ecosystem (see Grove and Burch 1997, Machlis et al. 1997, Pickett et al. 1997, Grimm et al. 2000, Pickett et al. 2001, Alberti et al. 2003). Well established statistical approaches have then been used to identify the most important predictors of a particular ecological pattern such as vegetation cover or floristic diversity.

Hope et al. (2003), for example, argued that plant diversity in the Central Arizona-Phoenix region could be best predicted by focusing on elevation, land use, family income and housing age. Similarly, Grove et al. (2006b) have sought to characterise household vegetation in Baltimore, Maryland, by examining population density, lifestyle behaviour, social stratification and housing age. They found that lifestyle behaviour was the best predictor of vegetation cover on private land and public rights of way. These accounts are very good examples of the majority of attempts to consider the 'role' of humans in shaping and influencing the functioning of urban ecosystems (see also for example Martin et al. 2004, Kinzig et al. 2005, Hope et al. 2006, Gaston et al. 2007). People are effectively reduced to a series of typologies which are then used to explain a particular ecological pattern, in these cases the diversity and distribution of vegetation in an urban area.

The above examples again demonstrate that there has been no attempt to consider how garden management practices could influence the environmental conditions required by species to germinate, establish and, more importantly, survive in gardens. Further, despite promoting the need to adopt interdisciplinary methods, theories and approaches there is no effort to investigate established social scientific concerns. For instance, the manner in which plant diversity reflects personal and place meanings and values, individual and familial needs and ecological knowledge (Bhatti and Church 2001, Head and Muir 2005). These factors, as well as wider processes such as the marketing and the production priorities of the garden industry, influence people's plant purchase choices, and how they manage their including what they keep and what they remove (Bhatti and Church 2001, Head and Muir 2005).

4. Urban ecological research and the goals of urban ecology

4.1 Goal 1: To strengthen and expand the discipline of ecology

Urban ecologists have made some significant advances towards strengthening and expanding the discipline of ecology (Grimm et al. 2000, Pickett et al. 2001, Young and Wolf 2006). Prior to the development of the field:

urban and suburban landscapes [were] understudied and underutilized by ecologists throughout the world. The reasons for this [were] many, but the primary underlying cause can be attributed to the reluctance of ecologists to work in areas dominated by humans (McDonnell 1997, p. 85).

By undertaking research in these locales urban ecologists have been able to dispel well established myths about the nature and ecology of cities. Most notably they have illustrated that a great diversity of plant and animal life forms inhabit urban areas and that in some instances cities can be more biologically diverse than surrounding areas (Alvey 2006). Further, the identification of rare species and plant communities in cities has highlighted the conservation value of these areas. Urban areas are now recognised as having the potential to aid the conservation of threatened plants and animals by providing habitat refuges, increasing genetic diversity, effective size of populations, and levels of genetic connectedness (see Sawyer 1997, 2005, Whelan et al. 2006, Roberts et al. 2007). Overall, the work of urban ecologists has ensured that the nature and ecology of urban areas have become established as legitimate topics for scientific study.

With human activity being increasingly recognised as having a major influence on large-scale ecological processes (Vitousek et al. 1997), urban ecosystems are also viewed as being potentially useful models for studying global ecosystem interactions and strengthening theories, methods and empirical knowledge (McIntrye et al. 2000). In this sense, the attempts of ecologists of the city to understand the role of humans in urban ecosystems is possibly the most significant contribution urban ecology as a field has made to the discipline of ecology. Particularly when considered in light of McDonnell's (1997) observation that previously ecologists were reluctant to work in these because of

the presence of humans let alone consider them as part of ecosystems. I will consider the significance of this last point in the following two sections. I argue that a stronger focus on creating an interdisciplinary field will serve to strengthen and expand the discipline of ecology and increase the likelihood of producing policy-useful, applied research.

4.2 Goal 2: To create an interdisciplinary field

Ecologists of the city, as we have seen, have explicitly acknowledged the need to integrate and adopt diverse social, planning and ecological approaches, concepts and theories. Integrated approaches they suggest will ensure a more in-depth understanding of how ecological, social and cultural processes and their interactions shape urban ecosystems. Urban ecology, as a consequence, has promoted itself as an interdisciplinary field. This mantle is not unjustified either as the field has been characterised by numerous collaborations between researchers within various disciplines including sociology, geography, planning, economics, engineering and psychology. It has been observed, however, that over time there has been a “substantial rise in research grounded in the discipline of ecology” (Young and Wolf 2006, p. 191). Others have noted that there is reluctance in the field to embrace new ideas, theories and approaches (Dooling et al. 2006). Both of these observations lend support to my own assertion that while attempts have been made to consider the role of humans, and to integrate and adopt interdisciplinary approaches generally, such efforts have been of a restricted nature.

In this regard it is certainly true that ecologists in cities have often alluded to but not specifically examined how humans shape and influence natural processes and patterns of floristic diversity in urban areas. Meanwhile ecologists of the city have explicitly sought to examine the role of humans but have tended to only draw on broad-scale socio-economic and political indicators to guide their work. The reliance on such measures is by no means restricted to researchers investigating patterns of floristic diversity. Studies focused on birds (Roarke and Marzluff 2006) and wildlife gardening (Gaston et al. 2007) have also drawn on them. The prominence of these indicators I believe reflects how easily they fit, or can be modified to fit, with more traditional and well-established approaches and concepts. Often obtained from national censuses such indicators are already in, or can be without difficulty transformed into a quantifiable

form, as well as providing researchers with an assurance that the data has been collected in a seemingly ‘objective’, rigorous and replicable manner. Such indicators also have the further benefit of providing useful information without the need for additional data collection.

Considered in the context of the different modes of interdisciplinary research (see Chapter 2) it appears that most interdisciplinary urban ecological research is subsumed under Modes 1-3 (see Karlqvist 1999) and is more aligned with cognate rather than radical interdisciplinarity (see Evans and Marvin 2004). There are few attempts to do “things differently” (Mode 4) and to “think differently” (Mode 5) (Karlqvist 1999, p. 382) in an effort to produce a “synthesis not only within (cognate interdisciplinarity) but across ... established domains” (radical interdisciplinarity) (Petts et al. 2008, p. 597). While there are some notable exceptions (e.g., May 2004, O’Rourke 2005, Dooling et al. 2006)³³, it appears Horlick-Jones and Sime’s observation about the tendency of natural scientists “to sideline concepts and approaches that are incompatible with dominant, hard knowledges” is equally applicable to urban ecology. Given the increasing influence of ecological science in the field (Young and Wolf 2006) coupled with the epistemological and ontological commitments ecologists subscribe to (see Chapter 2) this trend is completely understandable. In my thesis I seek to demonstrate how urban ecology could benefit from doing things differently, thinking differently and embracing a “radical” approach to interdisciplinary research. I begin by highlighting in the following section the theoretical and practical limitations of studies that focus on broad-scale socio-economic and political indicators, or in other words, typologies of people.

4.3 Goal 3: To contribute to social and ecological wellbeing through applied research and policy engagement

Urban ecology’s reliance on typologies of people has major theoretical limitations which I want to suggest have very real and practical implications. The main problem with this approach is that it is a mistake to study typologies of people as “no one ever acts completely in character, just like their type”:

³³ It should be noted, however, that these are not interdisciplinary studies per se but are illustrative of attempts to embrace theories and concepts from outside of the discipline of ecology.

Everyone's activity is always more various and unexpected than that... Types that don't actually predict what they are supposed to aren't much use...[Because] taking everything into consideration, people do whatever they have to or whatever seems good to them at the time, and that, since situations change, there's no reason to expect that they'll act in consistent ways (Becker 1998, p. 44-45).

Not surprisingly the reality of Becker's insight is beginning to surface within urban ecological studies. For instance, Hope et al. (2006) in a study of urban plant diversity recently observed that "it may not be possible to predict which plants people would desire for their [gardens] based on variables like ethnicity, class, or place of origin" (p. 112, see also Martin et al. 2003).

Becker (1998) suggests the solution to this predicament is to substitute "types of activity for types of people" (p.45). Such an approach, he goes on to contend allows the researcher to pay attention to "change rather than stability" and "ideas of process rather than structure" (Becker 1998, p.45). There are many theoretical concepts and methodological approaches adopted by social scientists to attend to these matters. From a theoretical perspective, ideas and concepts include dwelling (see Macnaghten and Urry 1998, Ingold 2000, Cloke and Jones 2001), actor-network theory (see Murdoch 1997, Whatmore 1999), place (see Jones and Cloke 2002, Cresswell 2004, Egoz et al. 2006) and performance (see Nash 2000, Thrift and Dewsbury 2000, Crouch 2003a, Szerszynski et al. 2003a)³⁴. Methodologically social scientists often draw on various qualitative research methods including interviews, focus groups and observations (see Lofland et al. 2006) to operationalize these concepts. These methods enable researchers to obtain rich and diverse information about their subjects and the social and cultural contexts in which their subject's everyday lives unfold.

By drawing on such theoretical concepts and methodological approaches I want to suggest that urban ecologists can increase the application and policy relevance of their research. This is particularly pertinent when dealing with urban residential gardens as while residents have significant control over them they are also shaped by wider social and cultural processes. Gaston et al.'s (2005a) study illustrates an attempt to be more realistic about the social and cultural context in which urban conservation initiatives may

³⁴ I elaborate on concepts and ideas surrounding place and performance in Chapters 6, 7 and 8.

potentially undertaken. They investigated how successful recommendations made to increase biodiversity (e.g., artificial nests for bumblebees; dead wood for fungi), particularly invertebrate diversity, were, by conducting experiments in residential gardens. They found some of these approaches had a low likelihood of success on what they described as “timescales and spatial scales” that many garden owners may find “unacceptable” (Gaston et al. 2005a, p. 411). In concluding, they contended that:

If one of the functions of small scale biodiversity enhancement is to develop and encourage awareness of biodiversity and its conservation, then encouragement to conduct particular activities must be balanced with a realistic appraisal of their likely success (Gaston et al. 2005a, p. 411).

Social scientific theories and methodologies not currently employed in urban ecological research can contribute to initiatives, such as those investigated by Gaston et al.’s (2005a), to conserve and enhance native biodiversity in urban areas. These theories and methodologies, for instance, can provide an understanding about the likely success of such measures by offering insight into the likelihood of them being acceptable, and the particular circumstances under which this may occur. In the following chapter I present the results of an ecological and social scientific study exploring the natural regeneration of native woody species from an urban forest fragment into surrounding residential gardens. My findings highlight the importance of understanding the social context in which these natural processes are occurring and being interpreted and that an interdisciplinary study that moves beyond social indicators can provide much greater insight into the potential conservation role of urban residential gardens.

Chapter 5: Urban realities: converting gardens from sinks to sources in the conservation of urban forest remnants³⁵

Abstract

Urbanization has destroyed and fragmented previously large areas of habitat. Small remnants that still exist in numerous cities will be unable to sustain many viable wild plant populations if they do not expand into the surrounding urban matrix. Residential gardens form a significant component of urban green space in many cities and therefore could play a role in redressing this problem. My ecological and social scientific study examined factors influencing the dispersal and regeneration of 12 bird-dispersed native woody species from Riccarton Bush, an urban 7.8 ha forest remnant, into surrounding residential properties in Christchurch, New Zealand.

Over 125 years, the reported number of native vascular plants in the bush has declined by a third. Some species, particularly *Dacrycarpus dacrydioides*, the most abundant woody species in the bush, are being dispersed by birds and establishing in residential gardens predominantly within 250 m of the forest margin. These juveniles are not reaching maturity as most gardeners tend to remove all non-planted woody species. This suggests natural potential for regeneration exists but is insufficient without active human intervention. My survey results show people are supportive of native plants in general but lack knowledge of the species. They are willing to plant locally appropriate woody species if provided with plants, information, and, most importantly, control over the location of plantings. Residential gardens consequently have the potential to play a major role in the conservation of urban biodiversity.

³⁵ Note this chapter is presented in the form of a draft manuscript for intended submission to an international conservation journal it, therefore, has a different form from other chapters. For this reason the Latin names of species are used throughout.

1. Introduction

Urbanization has destroyed and fragmented habitat causing threats to biodiversity and species extinctions (Hobbs and Mooney 1998, McKinney 2002). Plant species in the surviving remnants are often vulnerable to extinction in the long term due to the ecological processes common in small, isolated populations (see Young et al. 1996, Hanski 1999, Aguilar et al. 2006, Ewers and Didham 2006). The long term management of these remnants must therefore consider options to expand the effective populations of plants in and around these remnants. In urban areas, this is as much a social as an ecological challenge.

Several studies have documented the ecological and genetic threats to native plant populations in urban remnants (e.g., Drayton and Primack 1996, Thompson and Jones 1999, Duncan and Young 2000, DeCandido 2004, Tait et al. 2005, Whelan et al. 2006, Roberts et al. 2007). These studies highlight the urgency, as well as risks, of restoration planting in areas surrounding urban remnants. The reduced genetic diversity in small, isolated populations (e.g., Jump and Peñuelas 2006, Van Rossum 2007a) can paradoxically be most pronounced in small populations with the highest levels of recruitment (e.g., Van Rossum 2007a), such as when relatively few nearby parents dominate recruitment (Aldrich and Hamrick 1998). When plants in urban remnants breed with con-specifics in neighbouring residential gardens, this can be either beneficial or detrimental to the genetic health of an urban remnant population depending on the source and diversity of genotypes in nearby gardens (Stewart and Woods 1997, Whelan et al. 2006, Roberts et al. 2007). A thorough understanding of the social realities of residential gardens is required to implement planting around urban remnants in a way that avoids the risks of inbreeding and genetic contamination while securing the long term survival of plant populations in these remnants.

There is an increasing focus worldwide on planting native species in urban areas for various reasons (Seidlich 1997, Mizejewski 2004, TCPA 2004, Sawyer 2005). However, rarely do native planting programmes specifically target the residential area surrounding an urban remnant. Roberts et al. (2007) recently emphasized how plants in urban fringes and residential gardens could successfully aid the conservation of threatened plants by increasing genetic diversity, effective size of populations, and levels

of genetic connectedness. Given that residential gardens form a major component of urban green space in many cities (Loram et al. 2007, Mathieu et al. 2007) there is considerable potential for this role. Additionally, such an approach provides opportunities to move conservation beyond parks and reserves into people's everyday lives, in turn, personalizing nature and building public support for conservation (Meurk and Swaffield 2000, Miller and Hobbs 2002, Robinson 2006).

My study explored the ecological and social opportunities and barriers to using residential gardens to increase the effective population size of plants restricted to isolated urban remnants. I conducted an ecological and social scientific study to examine the factors influencing the dispersal and regeneration of 12 bird-dispersed native woody species from Riccarton Bush, an urban forest remnant, in Christchurch, New Zealand, into surrounding residential properties. Adding urgency to my research was the finding that, from 1870 to 1993, the number of native plant species in the bush declined from 106 to 67 (Norton 2002), which is not unusual in urban remnants (e.g., Drayton and Primack 1996). I addressed three questions:

1. Are native woody species naturally dispersing and establishing in urban residential gardens surrounding an urban forest remnant?
2. How are garden management practices influencing the establishment of native woody species in urban residential gardens?
3. What is the awareness of and support for the use of native plants among local residents?

2. Methods

2.1 Seed source and study species

Riccarton Bush (Putaringamotu) is a 7.8 ha area of old growth lowland podocarp and mixed broadleaved forest (Molloy 1995, see Figure 4) and is the only surviving remnant of alluvial flood plain forest in Christchurch, New Zealand. Prior to human settlement such areas of forest dominated by the podocarp *Dacrycarpus dacrydioides* were scattered throughout extensive areas of wetland (Knox 1969). Now, the nearest comparable *D.*

dacrydioides dominated forest remnant, itself only 6 ha, is 28 km away. Nationwide, only 2% of the pre-settlement *D. dacrydioides* forests remains (Taylor and Smith 1997). For a number of native woody species, Riccarton Bush is their only locality in Christchurch. Two thirds of New Zealand's native woody plant species are bird-dispersed (Burrows 1994). Although the majority of birds in the Riccarton area are now naturalised (O'Donnell 1995, see Appendices 1 and 2) these species are known to be efficient dispersers of native woody species (Clout and Hay 1989, Williams and Karl 1996).

Twelve native woody bird-dispersed plant species were used in my study (see Table 2); ten 'Riccarton Bush species' and two 'locally widespread species', referred to in the remainder of the paper as 'bush species' and 'widespread species'. The bush species selected met the following criteria:

1. not typically planted in residential gardens;
2. not typically sold at garden centres or nurseries;
3. an easily identifiable juvenile form;
4. were described in Riccarton Bush plant records (Molloy 1995) as being reasonably common.

The widespread species were selected on the basis that they were relatively common in residential gardens, public parks and reserves (Stewart et al. 2004) and occur naturally in the bush. I included the widespread species to help control for any confounding association between proximity to the bush and environmental conditions favouring seedling establishment (e.g., better soil conditions near the bush).

2.2 Ecological data collection

I visited 126 randomly selected residential properties within 1.4 km of Riccarton Bush to obtain 90 properties for sampling (see Figure 4). Twenty-one residents would not participate, no-one was home after three call backs on 10 properties and 5 properties were being subdivided or renovated. All data collection was carried out between July 2005 and June 2006 and properties were visited in a random order.

A thorough search of each property was made to locate individuals of the bush and widespread species. When individuals (usually seedlings) were found, they were recorded by height category (<15 cm; 16–45 cm; 46–75 cm; 76–105 cm; 106–135 cm;

>135 cm). I also recorded the presence/absence of tree(s) ≥ 8 m tall on each property and obtained the total area of each property from Environment Canterbury (2007).

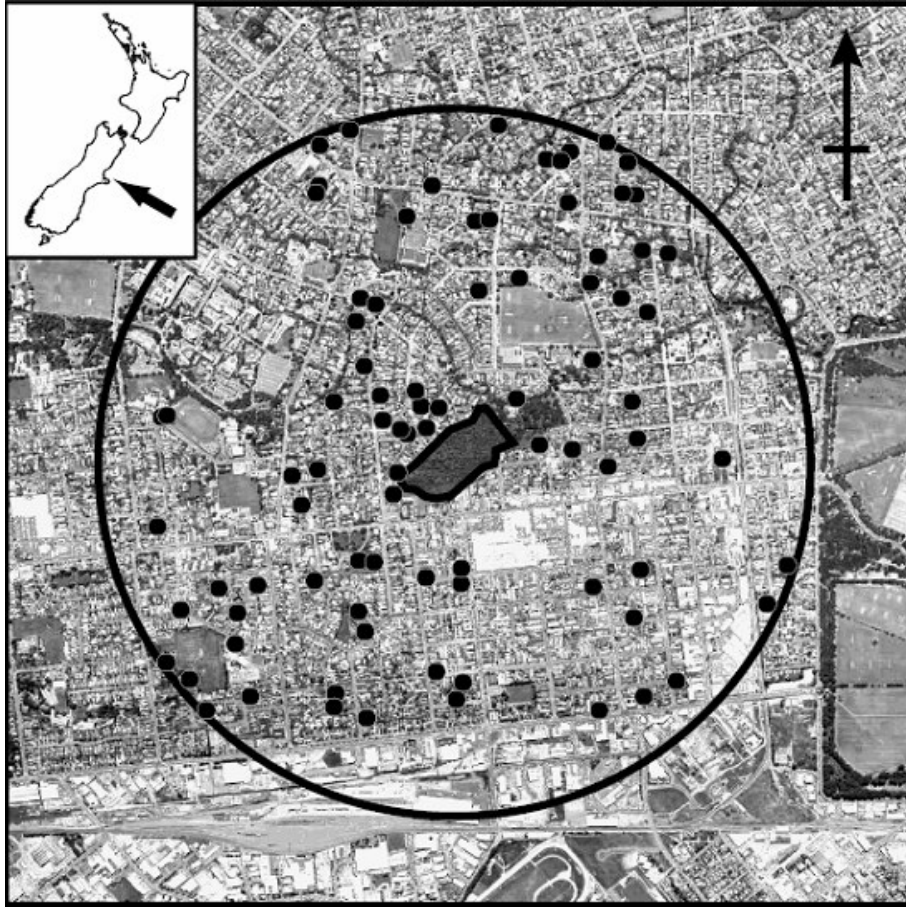


Figure 4. Aerial photograph including the 90 residential properties sampled within 1.4 km of the urban forest remnant, Riccarton Bush, Christchurch, New Zealand.

Between July 2005 and January 2006 soil samples were collected from the first 31 properties with at least one tree ≥ 8 m tall (being likely bird perches). Soil was taken from under the most frequently visited trees on properties by birds, based on my bird observations and consultation with the resident. Three trays of soil with a surface area of 0.22 m², taken to a depth of 0.09 m, were collected underneath the main branches of each tree.

Table 2. Botanical characteristics and occurrence in Riccarton Bush for the twelve native species in the study

Species	Family	Diameter class ³⁶ of fruit/seed	Comments about presence ³⁷	% of basal area ³⁸
Locally widespread species				
<i>Coprosma robusta</i> Raoul	Rubiaceae	1	Common	0.23
<i>Cordyline australis</i> (Forster f.) Steud.	Agavaceae	1-2	Common	11.23
Riccarton Bush species:				
<i>Aristotelia serrata</i> (Forster et Forster f.) W. Oliver	Elaeocarpaceae	1-2	Natural & planted; increasing	0.01
<i>Carpodetus serratus</i> Forster et Forster f.	Escalloniaceae	2	Natural & planted; increasing	0
<i>Coprosma rotundifolia</i> Cunn.	Rubiaceae	1	Common	0
<i>Dacrycarpus dacrydioides</i> ³⁹ (A. Rich.) Laubent.	Podocarpaceae	1	Common	60.61
<i>Elaeocarpus dentatus</i> (Forster et Forster f.) W. Oliver	Elaeocarpaceae	2-3	Always present; four adults, several saplings, many seedlings	0
<i>Elaeocarpus hookerianus</i> Raoul	Elaeocarpaceae	2	Common	2.06
<i>Lophomyrtus obcordata</i> Hook. f.	Myrtaceae	2	Common	0.05
<i>Melicytus ramiflorus</i> Forster et Forster f.	Violaceae	1-2	Dominant hardwood	9.24
<i>Pennantia corymbosa</i> Forster et Forster f..	Icacinaceae	1-2	Natural & planted; increasing	0
<i>Streblus heterophyllus</i> (Blume) Corner	Moraceae	1	Common	0.01

³⁶ Diameter of eaten fruit or seed 1 (<4 mm); 2 (4 to 8 mm); 3 (8 to 12 mm). Species for which most fruit are in one class, but a few are large, are shown as being in two classes (e.g., 1-2). Source: Burrows (2000)

³⁷ Molloy (1995)

³⁸ D. A. Norton (unpub. data)

³⁹ The only gymnosperm of the species; all others are angiosperms

The soil was transferred into larger trays (0.7 cm depth) on a base of sand and placed in a temperature-controlled glasshouse. Two additional control trays were filled with sterilized soil. The trays were watered daily and seedlings of the twelve study species were identified and removed after germination. Other plant species were removed to encourage germination. The trays were left outside during the winter months (July–October 2006) for cold stratification (Burrows 1997). The trays were then returned to the glasshouse for another eleven months (November 2006 – September 2007). Each tray was kept in the glasshouse, depending on when they were collected, for a total of 17–23 months.

2.3 Social data collection

Both qualitative interviews (Lofland et al. 2006) and a quantitative questionnaire survey (Frazer and Lawley 2000) were undertaken. Interviews provided the opportunity to gain understanding and insight into the most important social and cultural facets by enabling rich and diverse information to be gathered (Lofland et al. 2006). Sixteen in-depth interviews were conducted from June to August 2005, with a random subset of willing residents from the 90 properties. Interviews were predominantly conducted with the person most involved with the garden on the property. All interviews were recorded, transcribed, and analyzed along thematic lines (see Lofland et al. 2006). I report only the responses about⁴⁰

1. whether people would be prepared to plant in, or let self-introduced Riccarton Bush species become a permanent part of their garden; and
2. what incentives would encourage people to plant in, or let Riccarton Bush species become a permanent part of their garden.

The recurring and important themes identified in the interviews were used to construct a meaningful quantitative questionnaire survey (see Appendices 3 and 4) that was administered at all of the properties. Eighty-five questionnaires were completed out of the 90 properties sampled. Efforts were made to conduct the survey with the person mainly responsible for looking after the garden. In some instances (6% of properties), this

⁴⁰ See Chapters 7 and 8 for further details

was not the resident or tenant (e.g., landlord or hired gardener). However, as some of the questions were specifically about the property, the resident or tenant was also surveyed when willing.

The survey was interviewer administered and consisted of a series of close-ended and open-ended questions, and a five-point rating scale with options of strongly disagree (=1), disagree (=2), neutral (=3), agree (=4) and strongly agree (=5).

The information collected for analysis centred on three areas.

1. Garden management practices
 - Time respondents spent on various tasks per season including weeding, fertilizing, planting, general maintenance, mowing and watering.
 - How they treated self-introduced woody species in different sections of their garden (lawn, flowerbeds, vegetable gardens, shrubs/trees).
 - After being shown a live *D. dacrydioides* seedling (the most common species in the bush), how they would treat it in their garden.
2. Respondent awareness of native plants
 - Knowledge about New Zealand native trees was evaluated by asking respondents to identify whether 16 species, listed by common name(s) and scientific name, were in New Zealand before people arrived. Half the species were native and half exotic, and all were present in the local area.
 - Identify a live *D. dacrydioides* seedling.
3. Appreciation of native plants
 - Whether respondents found native plants attractive and if they considered them important to New Zealand's identity.
 - Respondents' value and appreciation of Riccarton Bush and an indication of their willingness to plant or let self-introduced species from the bush become part of their garden.

2.4 Data analysis

I used generalized linear models (GLMs) to assess the influence of:

1. ecological factors and garden management practices on the number of juvenile bush or widespread species on properties;

2. distance of a property from Riccarton Bush on the number of bush or widespread species seedlings that emerged from the soil samples;
3. a respondent's socio-demographic and gardening characteristics on their knowledge about tree origins;
4. a respondent's socio-demographic and gardening characteristics on the likelihood of them agreeing or disagreeing with various rating scale statements about native plants and Riccarton Bush.

Models were only run on properties with completed questionnaires (n = 85). Individual models were built for the two widespread species, and *D. dacrydioides*, the only bush species found in sufficient numbers for a separate analysis. As *D. dacrydioides* was found on only 21 of the properties (25%), I built a presence/absence binomial GLM for all properties and an abundance quasi-Poisson GLM of properties with *D. dacrydioides*. Analyses of the rating scale statements about native plants and Riccarton Bush excluded neutral responses. They were conducted when neutral responses were <20% of all responses and the least popular non-neutral response was $\geq 20\%$ of all non-neutral responses.

All models were run using R 2.5.0 (R Development Core Team 2007). Explanatory variables were log transformed when appropriate. Quasi-Poisson models were used when count data was over-dispersed and quasi-binominal models when proportional data was over-dispersed. All models were simplified by backward selection.

3. Results

3.1 Dispersal and establishment in urban residential gardens

Some species were successfully dispersing from Riccarton Bush into surrounding residential gardens and germinating. I found seeds and juveniles <135 cm tall of four of my ten bush species in gardens (see Table 3, Appendices 5 and 7). Of the 90 properties searched, 28% had juveniles <135 cm tall of one or more bush species. Of the 31 properties from which soil was sampled, 26% produced seedlings of one or more bush species. The two widespread native species were significantly more common than the

bush species, making up more than 95% of all juveniles <135 cm tall, and occurring on 90% of properties (see Table 3, Appendix 5).

While c. 25% of properties showed evidence of dispersal and germination, few showed evidence of permanent establishment by bush species. For example, of the 176 wild *D. dacrydioides* juveniles (<135 cm tall) I found, only one was ≥ 15 cm tall (<45 cm tall), suggesting substantial juvenile mortality (Appendix 8). Of the 89 *Aristotelia serrata*, *Carpodetus serratus* and *Melicytus ramiflorus* juveniles, 86% were <15 cm tall. The only two individuals >45 cm tall (*C. serratus* and *M. ramiflorus*), had been planted by residents. In comparison, for *Cordyline australis*, I found 2919 juveniles <135 cm tall, of which, 88% were <15 cm tall and 2.5% were >45 cm tall. For *Coprosma robusta*, 2171 juveniles were found, of which, 94% were <15 cm tall and 1.6% were >45 cm tall (Appendix 8).

I found saplings or young adults (>135 cm tall) of five bush species on 8% of properties, including two species not found as seeds or smaller juveniles (Table 3, Appendix 6). On six of these properties, residents confirmed that these trees had been planted and this is also likely for the seventh. In no case were any seeds or juveniles <135 cm tall of the same species found on these properties, suggesting that dispersal and recruitment from non-bush sources was limited or absent.

The distance of a property from Riccarton Bush was a factor in determining the number of *D. dacrydioides* juveniles found (Figure 5). These were more often found and in greater numbers on properties closer to Riccarton Bush (presence: $P < 0.001$, L.R.T. = 13.6, d.f. = 1, 77; abundance: $P < 0.001$, $F = 27.1$, d.f. = 1, 13) (Figure 5) and were more likely to emerge from soil samples collected closer to the bush ($P < 0.001$, $F = 96.4$, d.f. = 1, 29). Juveniles of the widespread species, *C. robusta*, were more abundant closer to the bush ($P < 0.05$, $F = 6.4$, d.f. 1, 82), although they were still present in 84% of properties ≥ 1 km from the bush. No relationship was found between distance and the locations of juveniles of the other widespread species, *C. australis*.

Other factors also correlated with the abundance of some species in gardens. For example, juvenile *D. dacrydioides* were more often found on properties where fertilizer was applied ($P = 0.05$, LRT = 4.4, d.f. = 1, 77) and in greater numbers on properties where the garden received on average ≥ 6.5 hours per week of watering throughout the

year ($P < 0.01$, $F = 7.5$, d.f. = 2, 13). *C. robusta* was found in greater numbers on properties with tree(s) ≥ 8 m tall ($P < 0.05$, $F = 6.4$, d.f. = 1, 82). *C. australis* was found in greater numbers where higher observations of the New Zealand pigeon or kereru (*Hemiphaga novaseelandiae* Gmelin) were made ($P < 0.01$, $F = 7.7$, d.f. = 1, 80).

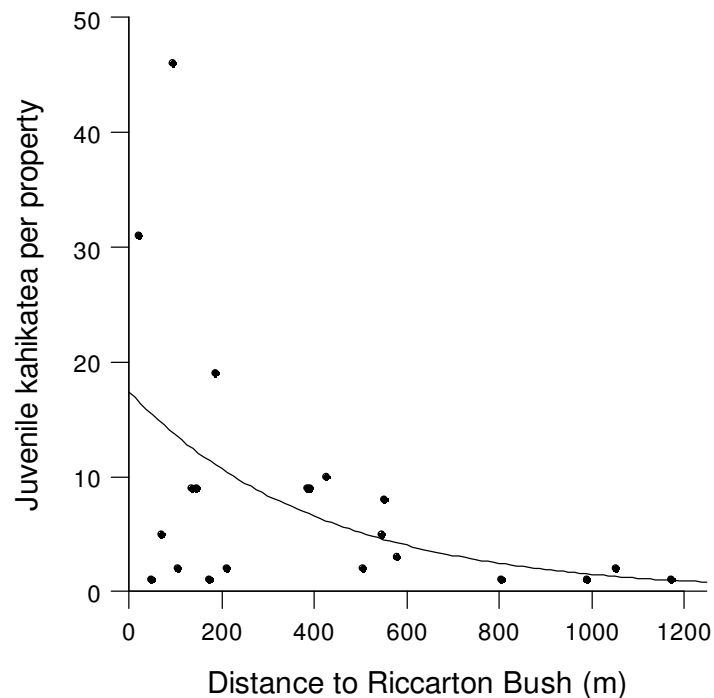


Figure 5. The number of juvenile *D. dacrydioides* found per property and the distance to Riccarton Bush, an urban forest remnant. Only properties containing *D. dacrydioides* are plotted.

3.2 Garden management, awareness and support for native plants

Most (78%) of people surveyed said they would remove all seedlings of self-introduced woody plants from at least one area of garden on their property. In addition to those who removed everything, 12% agreed with the statement that “If it is something I like I will let it grow there” and 5% with the idea of transplanting seedlings to more appropriate areas.

Table 3. Native study species found in 90 and germinated from 31 randomly selected private urban gardens (sites) within 1.4 km of the urban forest remnant, Riccarton Bush.

Species found ⁴¹	Seeds germinated ⁴²		Juveniles		Adults	
	No. sites	Mean (range) per site	No. sites	Mean (range) per site	No. sites	Mean (range) per site
Locally widespread species:						
<i>Coprosma robusta</i>	21	7.74 (0–62)	68	24.12 (0–291)	25	0.78 (0–9)
<i>Cordyline australis</i>	29	79.80 (0–553)	73	32.43 (0–655)	32	0.86 (0–7)
Riccarton Bush species:						
<i>Aristotelia serrata</i>	3	0.45 (0–5)	4	0.31 (0–25)	1	0.04 (0–2)
<i>Carpodetus serratus</i>	3	0.42 (0–12)	2	0.6 (0–53)	2	0.02 (0–1)
<i>Coprosma rotundifolia</i>	0	0	0	0	1	0.01 (0–1)
<i>Dacrycarpus dacrydioides</i>	6	0.52 (0–4)	21	1.96 (0–46)	4	0.08 (0–4)
<i>Lophomyrtus obcordata</i>	0	0	0	0	1	0.01 (0–1)
<i>Melicytus ramiflorus</i>	0	0	3	0.089 (0–4)	0	0

⁴¹ Riccarton Bush species not found were *Pennantia corymbosa*, *Streblus heterophyllus*, *Elaeocarpus dentatus* and *E. hookerianus*.

⁴² Seeds were germinated from 0.0044 m³ of soil sampled from each site.

Seedlings were treated differently depending on where they established in the garden. Only 67% of respondents indicated they would remove all self-introduced plants in areas with shrubs and trees compared to 79% for flowerbeds and 93% for vegetable gardens. More respondents were also prepared to leave seedlings they liked in areas with shrubs and trees (20%) than others (flowerbeds: 2%; vegetable garden: 3%).

When shown a live *D. dacrydioides* seedling and asked how they would treat it, 44% of surveyed people stated they would “remove” it or “pull out” it (see Appendix 9). For others it was dependent on, if left, what the seedling would eventually develop into (31%) or where the seedling established in the garden (15%).

On average, respondents could only identify whether half of the 16 tree species originated in New Zealand²⁶. Only 2% of respondents could identify all the origins correctly, while 4% did not know any. The percentage of origins correctly identified increased with age ($P < 0.05$, $F = 3.9$, d.f. = 2, 81). Those aged 20-39 averaged 35% compared to 46% for 40-59 year olds and 64% for those over 60.

When presented with a live *D. dacrydioides* seedling, 28% of respondents could not identify the seedling in any way (see Appendix 10). Those who did attempt to identify it often made reference to species belonging to the conifer families Podocarpaceae and Pinaceae (33%), in particular, totara (*Podocarpus totara* D. Don) (11%). Only 2% of respondents correctly identified the seedling as *D. dacrydioides* (by its common name, kahikatea) while a further 3% named *D. dacrydioides* among other species the seedling might be.

Overall, there was general support for native plants. Eighty-four percent agreed or strongly agreed that ‘species unique to New Zealand are important to our identity’ and 81% that ‘native plants are attractive’²⁷. Additionally, 71% disagreed or strongly disagreed that ‘people should plant less native plants on their properties’.

Riccarton Bush was highly valued; 95% agreed or strongly agreed that ‘Riccarton Bush is an asset for Christchurch’ and 91% disagreed or strongly disagreed that the

²⁶ For further details see Table 4 in Chapter 7

²⁷ For further details see Table 5 in Chapter 7

‘future of Riccarton Bush is not important to them’ (see Appendix 11). Further, 79% agreed or strongly agreed that ‘the expansion of Riccarton Bush is a good thing’²⁸.

There were indications that gardens could play some role in the future of the bush. Fifty four percent either agreed or strongly agreed ‘they would be prepared to plant Riccarton Bush species in their garden’ and 47% were ‘prepared to let self-introduced Riccarton Bush species become a permanent part of their garden’. In particular, those who rented rather than owned their property, and those who lived closer to the bush, were more likely to agree with either statement (planting statement: $P < 0.05$, LRT = 5.3, d.f. = 1, 58, and $P < 0.05$, LRT = 5.7, d.f. = 1, 58; self-introduced plants statement: $P < 0.01$, LRT = 7.3, d.f. = 1, 60, and $P < 0.05$, LRT = 4.8, d.f. = 1, 60).

Many people interviewed suggested that their willingness to allow self-introduced bush species to become a permanent part of their garden was dependent on where they established (50%) and being allowed to transplant them to a more suitable location (38%). For many (75%), the loss of sunlight due to shading by trees was a particular concern and, therefore, by confining trees to certain areas (e.g., property boundaries) they could minimize these impacts.

Most (69%) suggested a monetary incentive would not encourage them to plant a Riccarton Bush plant in their garden or let a self-introduced bush plant establish. Instead 38% felt they would be willing if they were educated on the value of and need to conserve Riccarton Bush species. Others considered that the provision of plants (13%) and advice (13%) would provide a sufficient incentive.

4. Discussion

To ensure their long term viability, remnant areas of vegetation must be considered within the context of the surrounding landscape and complementary management strategies developed (Saunders et al. 1991). With many remnants surviving in or close to many urban areas (Whelan et al. 2006), conservation biologists face often new and challenging circumstances. While the significant role urban environments can play in

²⁸ A few people suggested they were supportive of the idea in general but their actual support would be dependent on the specific details such as whether the planned expansion would include residential properties

maintaining biodiversity has been recognized (Seidlich 1997, TCPA 2004, Meurk 2005, Sawyer 2005, Meurk and Hall 2006), few studies have examined the contribution urban areas could make to conserving plant species restricted to remnants (e. g., Whelan et al. 2006, Roberts et al. 2007). My study suggests that ecological, social, and cultural factors are important in determining the establishment and survival of native woody species. However, urban areas are largely shaped by social and cultural processes. Expanding plant populations from urban remnants into surrounding gardens is primarily a social challenge.

Half of the Riccarton Bush species I searched for were absent in gardens. Some were relatively uncommon in the bush (Table 2), suggesting they may be providing insufficient propagule pressure (Maina & Howe 2000) to commonly establish in gardens. Others, notably *Elaeocarpus hookerianus*, were common and their absence from gardens may be due to limiting ecological factor(s) (e.g., not favoured by the local, naturalised birds) (Primack and Miao 1992). Of those bush species I found, the proportion of juveniles found in taller height classes was similar to these proportions for the two widespread native species, which had adults in almost half of the local gardens. This suggests that the juvenile mortality rates in gardens were similarly high for bush and widespread species (people pulled them out from most, but not all, areas in their gardens). This offers hope that the bush species would naturally recruit in suitable areas of people's gardens if higher densities of cultivated individuals could be achieved. Expanding populations of the bush species into nearby gardens will require active planting, as some species were being poorly dispersed (if at all), and, for those that were, gardens were acting as sinks rather than sources (Pulliam 1988, Dias 1996).

There is considerable potential for converting gardens into sources around remnants, in residential gardens throughout the world, including Christchurch. People have a strong interest in and support for conserving native biodiversity (Craig et al. 1995, Jacobson and Marynowski 1997) and a growing appreciation of the practical and aesthetic value of native plants (TCPA 2004, US Environmental Protection Agency 2007). In Christchurch, for example, 58% of residents wanted more native plants in their neighbourhood and 82% in the city's parks, riversides and streets (NRB 2003). Similarly, I found widespread support for native plants and Riccarton Bush. More specifically, 8%

of gardens already had planted saplings or adults of the sampled bush species, and over 50% of respondents, suggested they were prepared to plant bush species in their garden, particularly those living closer to the bush.

Education is essential to building social capital, creating public awareness and support (Schwartz 2006). I found residents wanted to help conserve native biodiversity but lacked knowledge (see also Craig et al. 1995, Jacobson and Marynowski 1997). Organizations and government agencies are increasingly making practical, easy to use and often free information readily available in a variety of media (e.g., DOC 2005, US Environmental Protection Agency 2007). In my context, educational programmes could raise awareness of the risks neighbouring urban remnants face and the contribution their gardens could play in their future. In Auckland, New Zealand, these ideas are being integrated into the Nature for Neighbourhoods Project, a community and local government collaboration aimed at increasing native biodiversity in residential gardens (Kaipataki Project 2007). The project is specifically interested in enhancing gardens surrounding streams and native forest patches, using information, incentives and free garden consultation.

Reflecting the highly personalized character of residential gardens, planting initiatives need to be undertaken in a sensitive manner that recognizes and respects the non-conservation roles and meanings of gardens in people's everyday lives (see Bhatti and Church 2001, Macnaghten 2003). Residents still typically plant or remove species based on aesthetic value, personal attachment, and practical and safety concerns (Head and Muir 2005). Attempts to increase native species in gardens need to take seriously people's planting considerations for two reasons. First, the most popular native species tend to be commercially developed hybrid cultivars (Leach 2002, Head and Muir 2004) which could contaminate the gene pool of species within existing remnants (Roberts et al. 2007). Second, promoting species more closely aligned with people's needs and desires will increase the likelihood of success. For example, I found residents were concerned about the loss of sunlight due to shading. Smaller understorey bush species such as *Coprosma rotundifolia* (reaches 4 m) and *Lophomyrtus obcordata* (reaches 5 m) are likely to be more acceptable therefore than canopy species such as *D. dacrydioides* (reaches up to 60 m).

The Nature for Neighbourhoods project and others (e.g., Chicago Wilderness 1999) demonstrate how, through effective collaboration and innovative policies and planning, local governments can engender public awareness and support. If gardens are to act as buffers, local government and planning authorities will need to adopt policies and approaches which maintain the capacity for conservation initiatives in established areas and encourage the development of gardens in new suburbs. At present, average garden sizes are declining (Gaston et al. 2005b, Loram et al. 2007) as planning authorities promote urban intensification (e.g., infill housing) as a means of directing growth towards existing residential areas (MftE 2002, Communities and Local Government 2006) in response to population growth and decreasing household size (DETR 2000, Statistics New Zealand 2001b). Christchurch is no exception, and during my study, urban intensification continued apace around the margins of Riccarton Bush. This will hamper the potential for residential gardens to expand bush plant populations. Urban intensification also results in the loss of large (noble) native trees in residential gardens. These can be important genetic resources and provide major food sources for local wildlife. Their loss could be compensated by ensuring a substantial proportion of public spaces are planted with such species.

My work illustrates the increasing value of conducting interdisciplinary research (Mascia et al. 2003, Robinson 2006, Schwartz 2006) that integrates methods, perspectives and knowledge, from a diversity of disciplines including ecology, social science, landscape architecture and urban planning. Drawing on interdisciplinary sensibilities, I am confident that residential gardens can be converted from 'sinks' into 'sources' to reinvigorate and buffer urban forest remnants and their plant populations.

Chapter 6: The social (and natural) realities of native trees in Christchurch, New Zealand

1. Introduction

In the proceeding chapter I presented some of the results from my ecological and social scientific in order to discuss the dispersal and regeneration of native woody species in residential gardens surrounding an urban remnant. In the context of my thesis, this chapter fulfilled two purposes. First, it provided some insight into whether or not these natural processes are occurring, and, if so, how they are influenced by the social context in which they are occurring. This allowed me to gain insights into the possible role residential gardens could play in conserving plant species restricted to urban remnants, such as Riccarton Bush. Second, to demonstrate how urban ecology could gain a more comprehensive understanding of the social context in which these natural processes are occurring by adopting social scientific methods that are not necessarily compatible with, or can be easily modified to fit with, well-established ecological practices.

By addressing these matters the proceeding chapter has laid the foundation for the second part of my masters thesis. Here I endeavour to demonstrate the value that urban ecology can gain by adopting not only more unfamiliar methods but also concepts and theories from sociology, anthropology and human geography. This chapter provides some background for the two chapters that follow. It is divided up into three sections. First, I elaborate on the social scientific methods that I adopted during the study. This is followed by a critique of my ecological work highlighting the constraints and limitations associated with my data and the type and nature of the data I collected. Third, I introduce and develop two theoretical concepts which I draw on in the remaining two chapters of my thesis.

2. Social methods

My research fieldwork has been conducted in residential properties, where seedlings of native woody species were able to become established, and potentially grow, and mature into adults. Gardens are areas of land within property boundaries where plants are grown, ordered and arranged spatially with various other objects (Bhatti and Church 2000, Kimber 2004). On properties gardens were the main localities that presented such possibilities for native woody species. In this context, I identified four main tasks that were required if I was to fulfil my main aims:

1. To understand the role of the garden in people's everyday experiences of, and encounters with, their properties
2. To gain some insight into people's gardening practices, and how these in turn create, and shape their garden over time
3. To gain an appreciation of the way people interpret trees in their gardens, and particularly, native trees. Here, I was particularly interested in how people's everyday experiences of their gardens guide their gardening practices and what possibilities, if any, these create for self-introduced seedlings to establish, and mature into adults
4. To gather quantitative data to enable the building of statistical models that consider the role of social, cultural and ecological factors in the dispersal and regeneration of my focus species.

The first three tasks required an in-depth understanding of what are commonly referred to as "subjective" experiences, and meanings, held by residents about their gardens, gardening and trees, as well as their gardening 'discourses'. In contrast, the fourth involves the establishing some consensus based on "objectively" measurable criteria. Here we are encountering two different ontological views of the world (Moran-Ellis et al. 2006). The first, a constructionist account, holds there are many worlds and many interpretations and understandings of those worlds (Lofland et al. 2006). The former, a realist account suggests that it is possible to objectively measure people's experiences, meanings and discourses (Macnaghten and Urry 1998).

Those who embrace interpretative positions to knowing the world are commonly accused of being incapable of providing information and results that can be generalised to

the wider population and, therefore, assist in policy formation (Macnaghten and Urry 1998, Moran-Ellis et al. 2006). These critics contend that the subjective understanding of a restricted number of people is an inadequate basis on which to establish a regulatory framework. Adherents of the interpretative approach, however, argue that “environmental realist’s” dependence often on surveys and polls fail to adequately understand how people really interpret and interact with their everyday environments (Macnaghten and Urry 1998). Macnaghten and Urry (1998), for instance, assert that these techniques are not capable of sufficiently encompassing and understanding the complex manner in which people make sense of, and interact with their environment.

In recognising that both positions have strengths and weaknesses, I chose to undertake a “mixed method” research approach. This entailed trying to conduct my research in a manner that adequately addressed the concerns raised by those in both camps. In order to “capture the different forms in which nature is sensed” and the “density of feeling attached to dwelling in particular environments” (Macnaghten and Urry 1998, p. 77), I combined both qualitative and quantitative research methods. Such an approach presented the opportunity for triangulation of evidence and overlapping methods, which are fundamental strategies in the building of rigorous explanations and cases (Denzin 1989).

2.1 Qualitative research phase

The qualitative phase of the research enabled me to gain a detailed insight into, and comprehensive understanding of, people’s gardens and gardening. Sixteen in-depth qualitative interviews were conducted and recorded, with residents in their homes between June and August 2005. All respondents were randomly selected as part of the ecological component of the research and interviews were conducted typically with the person most involved in looking after the garden. The main aim of these interviews was to explore the ways people created, experienced and interpreted their gardens. In particular I was interested in their everyday experiences of their gardens, their gardening practices and how they interpreted woody plants in their gardens, particularly, native woody plants. In addition, I sought to gain an appreciation of the role Riccarton Bush played in their lives and the contribution they saw their gardens playing in its future.

The location where an interview is conducted may seem to be a relatively simple design issue but in fact is a complicated decision that has wide-reaching implications (Elwood and Martin 2000). Elwood and Martin (2000) argue that the interview site itself “embodies and constitutes multiple scales of spatial relations and meaning, which construct the power and positionality of participants, places, and interactions discussed in the interview” (p. 649). Interviewers, they argue, can:

... observe interactions with other people [and non-humans] that are relevant to understanding a participant’s experience in a particular place... At the most basic level, interview locations provide an important opportunity for researchers to make observations that generate richer and more detailed information than can be gleaned from the interview content alone (p. 653).

For example, by interviewing people in their homes Perkins et al. (forthcoming) were able to obtain ‘additional’ information not just about “the materiality or feel people’s house/home but also the social interaction and relations that underpinned everyday living” (Winstanley et al. 2002, p. 819). Audio-taping and photography have also been used by others (e.g., Perkins 1988a, b, 1989, Vallance et al. 2005) to record research participants’ interpretations of residential infill as they confronted it during visits to parts of a rapidly changing urban setting.

By conducting interviews both within a resident’s house and garden I was able to obtain additional information about everyday experiences of their homes and gardens. The majority of the interview was conducted wherever the participant felt most comfortable, which sometimes was in the garden, but most often inside the house. For the latter part of the interview I walked around the garden with the participants, asking them to show me what gardening they had been doing most recently. Hitchings (2003) used a similar approach in an effort to move between “a social research paradigm of human feeling and identity and a natural science concern for plant biology and behaviour” (p. 102). He argues that by walking around the actual garden site both the researcher and participant are “constantly reminded of the material presence of the plants in the garden” (p. 103).

During these walks residents frequently talked about the positive and negative aspects of various plants in their own, and neighbouring gardens, such as colour, shape,

and size. On occasion they also sought advice on weed eradication and asked me to identify self-introduced plants in their garden. Throughout, I took digital photographs of the aspects of their gardens they brought to my attention. Additionally, while undertaking the ecological data collection on all properties (whether associated with the interviews or not), I also made observations, photographed gardens and houses, and kept notes on the conversations I had with all homeowners. All of the interviews were transcribed and analysed along thematic lines (see Lofland et al. 2006).

2.2 Quantitative research phase

The quantitative phase of the research used a questionnaire survey based on themes identified as important during the interviews. The survey was administered face-to-face between May 2006 and January 2007 at the properties where the ecological data collection had occurred. An effort was made to conduct the survey with the person primarily responsible for taking care of the garden which on five occasions was not the resident or tenant, but rather landlord or hired gardener. In these latter cases the tenant or resident was also surveyed when willing as some of the questions were specifically about the property.

The survey consisted of a series of close-ended and open-ended questions, and Likert scales. The information collected in the survey (see Appendices 3 and 4) was focused around five areas:

1. Garden management
 - Time spent on various tasks per season including weeding, fertilising, planting, general maintenance, mowing and watering
2. Treatment of weeds and self introduced plants
 - Means of removing and preventing weeds, and how they are typically treated in various sections of the garden
3. Views about, and knowledge of, native and exotic plants and trees
 - Whether they could identify a live kahikatea seedling, and how they would treat it in their garden
 - Whether they could correctly identify the origin of sixteen tree species
4. Potential bird dispersers seen on the property

- Whether or not they had seen or heard a number of birds on the property, and if they had, how frequently. One species (sulphur-crested cockatoo, *Cacatua galerita*) was included as a control to evaluate the reliability of responses

5. Socio-demographic information

- Age, gender, ethnicity, employment, income and household characteristics

In total, 85 questionnaires were completed out of the 90 properties sampled during the ecological data collection. The remaining five were unable to be completed for various reasons including being unable to reach the person responsible for the property, the former tenant or property owner having shifted, and the respondent's lack of English language skills resulting in them being unable to complete the survey. The conduct of all surveys, except where respondents refused the request, were recorded in order to pick up any additional comments made during the administration of the questionnaire.

The questionnaire survey was designed with two purposes in mind. First, to provide quantitative data on respondent views, knowledge and garden management practices are, and how common these are and how they are influenced by socio-demographic characteristics. Second, as I have already suggested to enable the collection of quantitative data on some of the most important social and cultural factors that could be built into the statistical models for the ecological component of the study (see Chapter 5). In the section that follows I describe how these social scientific methods allowed me to better address the two main aims of my thesis.

3. A reflexive consideration: a critique of my ecological findings

In this section I provide a short critique of the ecological component of my study that I presented in Chapter 5. Before I begin I feel it is important to acknowledge that the ecological component of my research did allow me to quantitatively measure dispersal and regeneration. Without the ecological component of the study I would have not have been able to gain as a thorough understanding of my research topic. In a similar manner, as I highlight here, in the absence of the social component of my research I would not

have been able to appreciate as fully as I have the complexities of my topic, in part due to the constraints and limitations of my data, as well as differences in the nature and types of data collected. For the ecological component of my study I followed various natural scientific conventions, many of which I have already discussed²⁹, that are promoted as ways of assisting the researcher in reduce their own personal and cultural biases from influencing the results that they produce.

These conventions included random sampling, developing a sampling technique that could be consistently replicated by me and other researchers, and using statistical approaches to examine and identify the most important explanatory variables. The latter involved a process of reducing the complexities of the factors influencing the processes of dispersal and regeneration down to a series of quantifiable variables that could then be tested using Generalised Linear Models (GLMs). For instance, seasonal variations in time spent watering, fertilising and weeding were combined into total times spent on each of those activities. Further, because of the large variation in the amount of time spent fertilising and watering, these were further collapsed into discrete categories (e.g., for watering: ‘none’, ‘medium’ and ‘high’ levels) to ensure that all the variables meet the assumptions of GLMs.

My botanical survey of the 90 residential properties, as I have already reported, revealed that some species were successfully dispersing from Riccarton Bush into surrounding residential gardens and germinating. Based on the proportion of juveniles found in taller height classes, I concluded that juvenile mortality rates in gardens were similarly high for bush and widespread species. Having established this, I then sought to determine which explanatory variables were important in explaining the distribution of the Riccarton Bush and widespread species. I was, however, only able to examine the variables that influenced the distribution of juvenile kahikatea, the only bush species found in sufficient numbers for a separate analysis, and the juveniles of the two widespread species, cabbage tree and karamu.

Three main trends emerged from these statistical analyses. First, juvenile kahikatea and karamu were found in greater numbers on properties closer to Riccarton Bush. Second, the activities of seed dispersing bird the New Zealand pigeon or kereru

²⁹ See Chapter 3

influenced the number of juvenile cabbage tree found on properties. Although, bird activity did not influence the number of karamu found, more were found on properties with woodland, which indicates some relationship with bird activity³⁰. Third, the variables used in the analysis to account for gardening practices did appear to have some affect on whether or not kahikatea were located on, and the number of juveniles found on properties. Juveniles were more likely to be on properties where some fertiliser was applied and in greater numbers where the garden was watered on average for longer than six and half hours a week. In contrast, none of the gardening practice variables significantly influenced the number of cabbage tree or karamu found on properties.

While these statistical analyses provided some insight into the phenomena under study, during the analysis and the subsequent writing up of the results the limitations of this approach became increasingly apparent. In the process of reducing the data to a set of quantified variables much of the rich complexity that I was trying to understand was lost. This was in part the result of the constraints and limitations of my dataset and is not necessarily an inherent characteristic of the method. It is possible to build more complex statistical models but these require large datasets. Due to the small size of my dataset relative to the number of explanatory variables I was interested in, model simplification was an unavoidable requirement.

Law (2004a) argues that when we are trying to describe things that are complex, diffuse and messy we usually end up making a “mess of it” because “simple clear descriptions don’t work if what they are describing is not itself very coherent” (p. 2). More importantly, he argues that “methods, their rules, and even more, methods practices, not only describe but also help to *produce* the reality that they understand” (p. 5, original emphasis). In this sense the way we conduct research does not only produce knowledge but enacts a certain kind of reality (Mol 1999, Law 2004a, b).

It is necessary to illustrate this point I have made above. I will do so by drawing on my own work. In the process of investigating the processes of dispersal and regeneration from an ecological perspective I have not only produced a reality but then also made particular statements about the reality I have produced. In the process of

³⁰ Note this may also be related to the suitability of these properties for seed germination and seedling survival

reducing the diverse social, cultural and ecological factors operating to a set of quantified variables certain realities were enacted, whilst other realities were, to use Law's terminology, "othered" (2004a). Of the realities that were othered in the ecological account, the first that come to mind are the everyday experiences and encounters of the residents living on the property. That is not to say that there were not traces of their realities in the account, particularly with respect to their gardening practices. But simply including these as an explanatory variable does not begin to capture the cultural context of these practices, how they vary seasonally and contribute to the lives of my respondents. More importantly, such variables do not illustrate how people live with, and encounter plants in their everyday experiences.

On a more practical level there were two other implications associated with my ability to analyse and interpret my dataset using statistical models. First, the size of, and variability within, a dataset, is important in determining the complexity of analysis that can be undertaken and the conclusions that can be drawn from those analyses (Crawley 2005). Due to the high variability³¹ in my data, and the low incidence of kahikatea on properties³², the models I built only had low statistical power (see Crawley 2005). As a consequence, I was unable to conclude that something was not important if a significant result was not detected. In other words, if a non-significant effect was found no knowledge was gained about the effect of this variable³³. Second, there needs to be appropriate variation in the data to detect an effect (Crawley 2005). 'Weeding' well illustrates the limitations of lack of power and data with high variability. Statistical analyses revealed that the total time spent by residents weeding was not a significant determinant in the number of juvenile kahikatea, cabbage tree or karamu found on a property. This finding provided me, therefore, with no understanding about the effect of this gardening practice. The results of the quantitative survey that I presented in support of the ecological data, however, highlighted that most people (78 %) said they would remove all seedlings of self-introduced plants from at least one area of garden on their

³¹ This reflects for example the variation in the amount of time that respondents spent gardening. See Chapter 8 for further details

³² Kahikatea were only found on 21 properties

³³ This contrasts with a model that has high statistical power where a non-significant result can be interpreted as implying that nothing really happened.

property. This suggests that weeding does play an important role in determining the survival of these and other woody species seedlings in gardens which due to the limitations of my data I was otherwise unable to detect.

In light of my two aims, therefore, the ecological account alone:

1. provides important but limited insight into the ecological, social and cultural dimensions influencing the regeneration and dispersal of native woody seedlings; and
2. only partially demonstrates the possibilities of native woody seedlings from Riccarton Bush becoming established and maturing into adults on residential properties.

The additional material that I included from the social component of my research in the predominantly ecological chapter went some way to addressing both of these issues. Again the reductionist manner in which I presented these findings, however, ensured that a number of other realities were also othered. In the following two chapters I will attempt to consider some of these realities and in the process demonstrate the value of adopting methods, concepts and theories from sociology, anthropology, and human geography, and combining them with ecology to create an interdisciplinary urban ecology. Before doing so I now introduce the two main theoretical concepts of performance and place which I will draw on in Chapter 7 and Chapter 8.

4. Place and performance: people, plants and gardens

Social scientific re-conceptions of the world(s) or environments(s) we inhabit are numerous, diverse and conceptually divergent. Typically they share, however, two ontological commitments. First, environments are considered to be relative, “that is, to the being whose environment it is”:

Just as there can be no organism without an environment, so there can be no environment without an organism. Thus [*our*] environment is the world as it exists and takes on relation to [*us*], and in that sense it came into existence and undergoes development with [*us*] and around [*us*] (Ingold 2000, p. 20, my emphasis).

Second, all environments are regarded as never being complete; they are always in process, in a constant state of change, continuously being made and re-made. This is because:

[i]f environments are forged through the activities of living beings, then so long as life goes on, they are continually under construction. So too, of course, are organisms themselves. Thus [if we speak of] ‘organism plus environment’ as an indivisible totality, [it should be acknowledged] that this totality is not a bounded entity but a process in real time: a process, that is, growth or development (Ingold 2000, p. 20).

Underlying both of these commitments then is an effort to place ourselves back in the world that we inhabit with a multitude of other living (e.g., animals and plants) and non-living (e.g., machines and devices) beings and entities. Efforts are being made to understand not only how we shape these beings and entities but more importantly how they shape us in our everyday lives. Moreover, these are attempts to move away from mechanistic views of the world which present it as predictable, pre-figured and already-given. For as Law (2004a) contends the “world is not a structure, something we can map with our social scientific charts”:

We might think of it, instead, as a maelstrom or a tide-rip. Imagine that it is filled with currents, eddies, flows, vortices, unpredictable changes, storms, and with moments of lull and calm. Sometimes and in some locations we can indeed make a chart of what is happening round about us. Sometimes our charting helps to produce momentary stability...But the great deal of the time this is close to impossible (p. 7).

In the remainder of this section I introduce the theoretical concepts of place and performance which are attempts to become more in tune with the fluid, unpredictable, ever-changing nature of the world. In the process I seek to illustrate how these ideas can enable urban ecologists to pay attention to types of activity instead of types of people; change rather than stability; and ideas of process instead of structure (Becker 1998, Thrift and Dewsbury 2000, Jones and Cloke 2002, Crouch 2003a, Watson 2003).

4.1 Place

Sense of place has been imagined in numerous ways by social scientists and as a field of enquiry continues to move in new directions while also retaining a recursive aspect to it

(Perkins 1989, Cresswell 2004, Egoz et al. 2006). For the purposes of my thesis both early and contemporary writings on place are relevant. There are two aspects of the concept, in particular, that are of interest to me. The first is the notion of sense of place, and the second is that places are continuously made and remade. Having introduced these two aspects I will then elaborate on the early writings which can illustrate how people's experiences of their garden are shaped by personal practices, relationships with friends and family and wider social and cultural processes. Following on from this I briefly touch on more contemporary conceptions of place as there is some degree of overlap with the notions of performance that I subsequently develop.

4.1.1 Sense of place

Sense of place, in its most basic and fundamental form, encompasses the idea that humans develop "close relationships with the spaces in which they live. It relates to positive experiences of, and ascriptions of meaning to, the defining landscapes of locations, but it is also clear that negative meanings may be ascribed to localities, thus creating a negative sense of place"³⁴ (Egoz et al. 2006, p. 59). This occurs, "through familiarity and the accumulation of memories; through the bestowal of meanings ... through the actual experience of meaningful or moving events and the establishment of individual or community identity, security and concern" (Pred 1983, p. 49). As an everyday space in which people live, work and relax, gardens can contribute to people's home-related sense of place (Tuan 1990, Perkins and Thorns 2001).

4.1.2 Place-making

Ideas of sense of place are formulated around the notion of 'local distinctiveness' (Perkins 1989, Jones and Cloke 2002). The concept can be applied to any form of physical/imaginative space, independent of scale³⁵ (e.g., a residential garden, a forest, a city, a region or a country), so long as it is identified as having some internal characteristics distinct from that around it (Jones and Cloke 2002). These distinctions can

³⁴See, for example, Relph (1976), Meinig (1979), Buttimer (1980) and Perkins (1988a, b, 1989).

³⁵ In this respect the concept of place shares similarities with the application of the concept of an ecosystem (see Chapter 4, for a brief discussion of this concept).

be material or cultural, and will often be a complex assemblage of various elements (Jones and Cloke 2002, Watson 2003). There may well be overlapping scales of distinctiveness involved, and any “sense of place-identity will usually be subject to contestation, change, partiality, fading and reforming” (Perkins 1989, Jones and Cloke 2002, p. 9). Embodied in ideas of place and sense of place, therefore, is the notion of ‘place-making’ (Perkins 1989). People’s sense of place, and places, in general, in this sense, are not static, pre-figured and already-established, but rather are continuously made and remade (Perkins 1989, Watson 2003, Egoz et al. 2006).

4.1.3 Social interactive approaches and structurationist theory

Early and contemporary writings on sense of place can be distinguished by their portrayal of the nature of places and place-making. For Tuan (1974) and Jackson (1984), a person’s sense of place arose out of his or her relationship with the environment, more particularly individual activities both within social and physical settings. From the perspectives of Tuan (1974) and Jackson (1984), the sense of place someone ascribes to their garden would be made within an individual’s cultural contexts and reinforced by direct, personal experience. The ideas conveyed by writers such as Tuan and Jackson, were critiqued for being too individualistic and disregarding the deeply social nature of place-making and the ascription of meaning (Duncan 1978, Ley and Samuels 1978, Ley 1981). Ley (1981, p. 219), for instance, suggested that:

Place is a negotiated reality, a social construction by a purposeful set of actors. But the relationship is mutual, for place in turn develop and reinforce the social identity of the social groups that claim them.

Here, the place meanings of the garden are structured by personal practices as well as relationships with friends, family and the wider community (Bhatti and Church 2001). An individual’s experiences and meanings of the garden, for example, could be compromised by the supposed sense of public responsibility associated with having to maintain a garden that conforms reasonably closely with the aesthetics of one’s neighbours (Blomley 2005).

Although recognising the significance of this social interactive approach to understanding place and sense of place, others, drawing on Giddens (1984) and his

structuration theory, argued that it did not successfully attend to the structural factors also inherent in place relationships (Pred 1983, Eyles 1985, Gregory 1989). Those adopting this structurationist approach argued that a sense of place does not develop anywhere and at any time, but is located somewhere, at some point in time (Agnew 1993), and, therefore, is also influenced:

by historically specific power relationships that enable some to impose upon others their view of the natural and acceptable, or by social and economic constraints on action and thereby thought (Pred 1983, p. 50).

By analysing structures, institutions and agents, structurationist theory (Giddens 1979, 1984), endeavours to establish how social practices are structured across space and time. In this context, structures are referred to as the traditional social conventions or underlying regularities, that govern everyday life, and institutions, represent the remarkable forms of those structures (Giddens 1984). Influential human actors are viewed as agents who establish the particular, observable results of any social interaction (Giddens 1984). From this perspective then:

place and sense of place should be viewed as a product of the ongoing relationships between individuals, society, practice and structure, occurring in historically specific situations. Place and sense of place arise from historical development of local and extra-local social interaction, deeply imbedded cultural values and economic activity (Perkins 1989).

Unlike earlier writers, those adhering to this perspective would be likely to highlight how gardens as sites of cultural consumption (Chevalier 1998) are “shaped by changing consumerism and the production priorities of the garden industry in the form of garden centres and Do-It-Yourself (DIY) retailers who sell garden products” (Bhatti and Church 2001, p. 367).

4.1.4 A global sense of place

Place, as it has been portrayed in these earlier writings is now held by many to be “too sedentary, static, [localised,] and parochial” as contemporary social theorists become increasingly concerned with “tracing the flows, processes and hybridity of subjects, identities and spaces” (Doel 1999, Thrift 1999, 2004, Watson 2003, p. 145). Massey

(1994a, 1994b, 1995), for instance, recognises the manner in which, the local and the global, have consistently been implicated, in the past and present, in the construction of one another. “They intersect in the construction of place” (Watson 2003, Egoz et al. 2006, p. 60). Meanings of places, from this stance, are directly concerned with matters of power and its distribution (Egoz et al. 2006, see also Berg and Kearns 1996). Power, in this context, should not be seen to be dominant and unchangeable (Egoz et al. 2006). Rather, as Egoz et al. (2006, p. 60) drawing on Williams (1977) observe:

[power] is open to challenge, and as its basis has “continually to be renewed, recreated, defended, and modified” so too will it be “continually resisted, limited, altered and challenged”.

In Massey’s view then, “(t)he identity of places, indeed the very identification of places *as* particular places, is always in that sense temporary, uncertain, and in process” (1995, pp. 188-190). Such a view of place is particularly evident in gardens. Here, through their gardening practices, people try to establish the conditions necessary for the continued growth and survival of their plants, to promote and encourage desired plant shapes and forms, and to control those traits and plants regarded as unwanted or undesirable. The growth and spread of plants, however, can be erratic and unpredictable, sometimes challenging, disrupting and unsettling people’s positive experiences of, and ascription of meaning to, their garden (Hitchings 2003, Power 2005, Egoz et al. 2006). This results in a dynamic relationship between people and plants typified by affirmation, co-operation and struggle in which gardens are continually made and remade (see Chapter 8). This conception of place shares a number of similarities with the notions of dwelling and performance, which I will now introduce.

4.1.5 Dwelling

Paul Cloke and Owain Jones (2001) in their analysis of West Bradley, a traditional orchard in Somerset, England, have considered the contemporary relevance of the dwelling perspective for examining place. The orchard is seemingly a site where authentic practices of productive and direct relations between humans and non-human nature continue to persist, practices entirely embedded in local cultural heritage (Cloke and Jones 2001). Upon closer analysis, however, Cloke and Jones (2001) demonstrate the

extensive and far-reaching flows of ideas, people and materials that converge in the orchard.

Cloke and Jones' (2001) analysis provides a good example of an attempt to study the non-human agency of trees and the role it plays in reproducing nature-society relations and places. They argue that orchards "self-evidently are landscape places which illustrate the material, active, presence of trees, which are networked into complex social and material relations, and therefore co-constitute the place where they stand and are rooted" (Cloke and Jones 2001, p. 649). This understanding, is influenced by actor network theory (Murdoch 1997, Braun and Castree 1998, Whatmore 1999) with its focus on networks and flows and a view of places as "dynamic entities, co-constituted and performed by human and nonhuman actants alike" (Cloke and Jones 2001, p. 650). In particular, Cloke and Jones (2001) are interested in attempting to understand the manner in which places assume and reproduce their character(s). A dwelling perspective enables them to, therefore, gain an appreciation of the ways human and non-humans actants are "embedded in landscapes and places as well as networks, how nature and culture are bound together in place, and how their formations invariably have a time-depth where past, present and future are interconnected" (2001, p. 650). They continue:

Dwelling is about the rich and intimate ongoing togetherness of beings and things which makes up landscapes and places, and which bind together nature and culture over time. It thus offers conceptual characteristics which blur the nature-culture divide, emphasise the temporal nature of landscape, and highlight performativity and nonrepresentation (Cloke and Jones 2001, p. 651).

Place and space are not, therefore, "neutral grids" or "containers" (Thrift 1999, p. 301). Places are "dynamic and their landscapes will arouse a different sense of place in different people or cultures" (Egoz et al. 2006, p. 61). In the following section I discuss three aspects of performance which I want to relate to ideas of place. One of which, is the notion that plants perform and that their performances play an active role in constituting places. As a result they have the potential to not only re-enact or legitimise a person's positive experiences of, and ascriptions to, particular localities or places, but also to alter, challenge and disrupt it, thus creating a negative sense of place. This is a notion that I

explore more fully in Chapter 8 where I discuss how gardens ceaselessly come into existence, through the relational performances of people and plants.

4.2 Performance

Researchers and theorists from a range of disciplines have begun to view nature and nature-human relations in terms not of static structures and rules but *activity* (see Rose and Thrift 2000, Thrift and Dewsbury 2000, Franklin 2001, Macnaghten and Urry 2001, Szerszynski et al. 2003b). These together cognise what is known as the ‘performative turn’, a shift in ways of thinking about the environment and society has not simply been driven by intellectual curiosity alone. Rather, there is a growing sense that present ways of thinking about nature do not adequately address contemporary needs (Szerszynski et al. 2003a, Law and Urry 2004). This concern has arisen from a growing appreciation of the dynamic quality of both nature and society and the sense in which this dynamism “is not well served by the noun-dominated languages used for describing both” (Szerszynski et al. 2003a, p. 1). Having touched on this concern elsewhere³⁶, the focus of the remainder of this section will be on introducing the aspects of the concept of performance³⁷ that I will draw on in my own research. To do this I briefly identify three of the relevant meanings that have become associated with interpretations of the term.

4.2.1 Performativity

To begin, performance is “something that is *done*, an activity” (Szerszynski et al. 2003a, p. 3). The term ‘practice’, in this sense, is one particularly relevant cognate term of performance (see Bourdieu 1977, de Certeau 1984, Crouch 2003a). Another related term is ‘performativity’ which is used in two differing ways. Some authors use the term in a looser manner to represent the performative-like characteristics of any given actant (e.g., humans, plants and animals) (Szerszynski et al. 2003a). People’s gardening practices in this sense can be described as a performance or performances. The term can equally be used to describe the different shapes and forms plants take on as they grow and develop

³⁶ See Chapter 2

³⁷ For overviews see Schechner (1995), Parker and Sedgwick (1996), Carlson (1996), States (1998), Bell (1999), Bell (2000), Thrift and Dewsbury (2000) and Dewsbury (2000).

such as the production of flowers or the loss of leaves (Hitchings 2003, Power 2005). In a more technical sense, performativity is commonly used to convey the notion “both that language *does* something – that its power is not just to represent but to bring about effects – but also that certain phenomena only exist in the doing of them – that they have to be continually performed to exist at all” (Austin 1962, Butler 1997, Szerszynski et al. 2003a, pp. 2-3).

Recently, this notion of performativity has been extended from language and culture to the body (Clark 2003). Bodies are viewed as contingent and articulate, implicated in the play of signification (Butler 1990, Grosz 1995). Judith Butler (1990), for instance, in her classic application of the term to gender, as Nash (2000, pp. 654-655) observes, argues that “women and men learn to perform the sedimented forms of gendered social practices that become so routinized as to appear natural. Gender does not exist outside of its ‘doing’ but its performance is also a reiteration of previous ‘doings’ that become naturalized as gender norms”. In my current context it is gardens, and the various actants involved in their making and remaking, particularly humans and plants, which are revealed to be performative in this sense. Hitchings (2003) and Power (2005) have demonstrated how gardens are actively created and recreated through people’s attempts to control and order plants, and the growth and development of those plants. This is demonstrative of how a garden as a place is continually made and remade through the performances of people and plants, a notion which I develop in Chapter 8. Here I also adopt the idea that some phenomena do not exist outside of their doing by illustrating how the notion of a weed is not pre-determined or pre-figured but rather is performed by people and plants.

4.2.2 Repetition

Butler’s (1990) view of gender as being performed, with its focus on reiteration, alludes to the second aspect of performance that has become a salient feature of many interpretations of the term. Repetition, the ‘twice-done’ in Schechner’s (1988) theatrical terms, or the iterative as Butler (1990) theorizes it, is viewed as being an important feature of performance. Characteristically, performances entail the “repetition of gestures, tasks, actions”, which could be viewed as “the following of scripts, or the acting out of

codes” (Thrift and Dewsbury 2000, Szerszynski et al. 2003a, p. 3). As Szerszynski et al. observe, however, “at the same time the perfect reproduction of an earlier performance would not be a performance at all but a copy of one; similarly, the automatic acting out of a code would not have about it the ‘spirit’ of an appropriate performance according to that code (2003a, p. 3). Power (2005) illustrates, for example, how people routinely try to create the garden they desire by controlling and ordering the performances of plants in the garden. Some plants she observes, however, through their ability to grow and spread challenge such attempts (Power 2005). This can be, as I demonstrate in Chapter 8, viewed in terms of people’s ability to re-enact and legitimise the positive sense of place they associate with their having some degree of control and order over their gardens. The ability of plants, however, to grow and spread in space and time, however, can challenge and disrupt such attempts thus potentially contributing to a negative sense of place.

4.2.3 Variation and difference

The manner in which “variation and difference emerge in the spontaneous, creative moments between iterations, and the application of codes to contexts” is equally as important as iteration to performance (Thrift and Dewsbury 2000, Crouch 2003a, Szerszynski et al. 2003a, p. 3). Performance is the “manifestation of agency and the action through which agency and creativity emerge”, and consequently it is, “ephemeral, unpredictable, improvisatory, always contingent on its context” (Thrift and Dewsbury 2000, Crouch 2003a, Szerszynski et al. 2003a, p. 3). Pre-figured scripts and codes, in this context, could be viewed as not “primary but secondary phenomena, mere abstractions from this flow of performance” (Szerszynski et al. 2003a, p. 3). I illustrate this point during my discussion about how whether or not a plant is constituted as a weed in Chapter 8 is always dependent on context. Having introduced both the concepts of place and performance I now briefly illustrate how they are interconnected.

4.3 Place and performance

Performance, as Cloke and Jones observe, is “an entirely relevant gateway to the conceptualisation of place” (2002, p. 84). They make this suggestion, in light of assertions such as Schechner’s about the analytical value of a performative approach:

Any event, action, item or behaviour may be examined 'as' performance. Approaching phenomena as performance has certain advantages. One can consider things as provisional, in process, existing and changing over time (Schechner 1998, cited in Thrift 2000, p. 84)

For Jones and Cloke (2002) then, such notions are equally applicable to notions about place as "places slip away as they form":

They are never entirely static, yet they can remain identifiable as themselves. There will be comings and goings, twists and turns, excitements and calms. Like a performance, a place can never be represented or reproduced fully; to be fully appreciated they have to be experienced 'live' (p. 84).

In continuing, they observe that place, like performance, involves some form of audience (Jones and Cloke 2002). For in addition to the "production of the now, there is the consumption of the now, even if audiences are performers and vice versa" (Jones and Cloke 2002, p. 84). Even though such consumption can include past memories and images of the future, these are "always produced in the now" (Jones and Cloke 2002, p. 84).

Trees have the potential to "make a place, or can 'gather places around themselves' through their growing/changing physical presence/permanence over time" (Jones and Cloke 2002, p. 87). The place making qualities of trees, can be viewed in performative terms, in the sense that, they:

are restless life-forms, growing slowly, maybe really slowly, but ever so surely, if they can. Exhaling oxygen, inhaling carbon-dioxide, sucking up nutrients from the soil, engaging with the sun, they are continually growing or shedding buds, leaves, flowers, and fruit, maybe bark. They die over time. They move and make sound in the wind and reflect and filter light as they do. They play host to other beings and of course they constantly aspire to propagate themselves, by seed or by suck (Jones and Cloke 2002, p. 85).

In other words, "many of the attributes of trees form common currencies in our understandings and appreciation of place; their size, rich materiality, their interconnectivity, their longevity, their life cycles and seasonal cycles all offer qualities which are readily and vividly drawn into...concepts of place" (Jones and Cloke 2002, p. 85). The next two chapters, for example, illustrate how such attributes are linked to

notions of nativeness and exoticness, and can contribute to people's home-related sense of place.

5. Conclusion

By providing a critique of my own research findings in this chapter it was my ambition to demonstrate how in the process of reducing the diverse social, cultural and ecological factors operating to a set of quantified variables certain realities were enacted, while other realities were "othered". In the two chapters that follow I want to consider some of these realities. In doing so, I endeavour to demonstrate the value that urban ecologists can gain from adopting social scientific research methods, concepts and theories. Both chapters illustrate how qualitative research can provide a more in-depth understanding into the social context in which the natural processes under investigation are operating. In Chapter 7, I discuss people's everyday understandings, value and appreciation of, native and exotic plant species. As we shall see people value native plant species for a range of reasons including notions of identity and belonging but also appreciate exotic plant species. Drawing more extensively on the notions of place and performance, in Chapter 8, I seek to illustrate how gardens and people's experiences and meanings they ascribe to these spaces, are continuously created in their own performances and the performances of plants. This chapter highlights how such theoretical concepts have the potential to allow the researcher to consider the world as in process, provisional, existing and changing over time, rather than as a static and sedentary, and the types of insights that one can acquire as a result.

Chapter 7: Natives and exotics: identity, ethics, politics and everyday understandings

1. Introduction

The distinction between native and exotic species has a number of significant implications. In efforts to maintain biological diversity native species are commonly revered and exotics are often despised. This perspective, in turn, has and continues to shape the nature and focus of scientific research and the formulation of various policies, management plans and strategies, at local, regional, national and global levels. Notions of nativeness and exoticness have also become associated with ideas of ‘belonging’ or rather ‘not belonging’ (Gröning and Wolschke-Bulmahn 2003, Head and Muir 2004). Consequently, these terms, in particular, their projection onto certain species of fauna or flora, have become intimately linked with discourses on local, regional and national identities (Kendle and Rose 2000, Jones and Cloke 2002). Definitions surrounding the terms, however, are far from unproblematic (see Coates 2003, Warren 2007). Natives can be ‘indigenous’ while exotics can be ‘introduced’, ‘non-indigenous’, ‘non-native’ or ‘alien’. Adding another level of complexity, natives and exotics, can also in some instances be ‘weedy’, ‘noxious’ or ‘invasive’.

Given the significant implications, it is not surprising that the concepts, language and practices associated with the demarcation between native and exotic species have come under greater scrutiny (see Kendle and Rose 2000, Richardson et al. 2000, Coates 2003, Gröning and Wolschke-Bulmahn 2003, Rooney 2003, Simberloff 2003, Head and Muir 2004, Pyšek et al. 2004, Bremner and Park 2007, Warren 2007). While such debate is crucial these discussions tend to focus on the nationalist, political and ethical dimensions associated with policies, management plans and strategies that promote native instead of exotic species. Little consideration has been given to how applicable and relevant the distinction is in people’s everyday lives. Head and Muir (2004, p. 215) have argued that the “nativeness, or presumed belonging” of a species is only one of the factors that influence the meanings people ascribe to plant weeds and their everyday

practices related to weediness in their residential gardens. Meanwhile, Kilvington et al. (1998) have shown that people frequently make no distinction between native and exotic plant species. Both studies highlight that in an everyday context the meaning of nativeness and exoticness are far from clear-cut.

These findings are notable as recent attempts to increase native plant biodiversity have sought to encourage the planting of native species in residential gardens (e.g. Seidlich 1997, TCPA 2004, DOC 2005, Kaipataki Project 2007). Such attempts, as well as my own efforts to understand the role that residential gardens could play in the future of Riccarton Bush, have the potential to benefit substantially from insights into lay people's everyday understandings about, and appreciation of, native and exotic plants. Insights of this nature may allow political and scientific institutions to promote their policies and initiatives in a manner more attune to people's everyday lives. In this chapter I explore the various ideas, beliefs and discourses surrounding the terms 'native species' and 'exotic species'. In the process I try to problematise the commonly accepted 'scientific' distinction by focusing on people's everyday understandings about, appreciation for, and conceptions of, native and exotic plant species.

The chapter is divided into four sections. I begin by elaborating the implications for a species being either defined as native or exotic. Focusing on the New Zealand context I identify how this distinction becomes bound up with notions of identity, ethics and politics. Concentrating on Christchurch I then demonstrate that the nationalist, ethical and political viewpoints or the issue, in this case, of scientific institutions, do not coincide with the everyday experiences and identities held by members of the 'general' public. Second, I briefly consider how the distinction between native and exotic plant species is made manifest in the material performances of shrubs and trees. Third, I present a largely ethnographic account about Christchurch resident's understandings about, and appreciation for, and conceptions of, native and exotic plant species. In the final section I discuss the main findings arising out of this chapter.

2. Natives and exotics: identity, politics and ethics

2.1 Native plants and the invention of a national identity

In New Zealand, like many other countries, a distinction is made between native or indigenous plants; and exotic, introduced, non-indigenous, non-native and alien plants. These distinctions are founded on a plant's "presumed belonging in a certain place" and, therefore, have become:

entwined in many areas with national belongings, partly because the late nineteenth and early twentieth centuries were an important period for establishing both the idea of nation and the research areas of plant geography, plant ecology, and plant sociology (Head and Muir 2004, p. 199, p. 201).

Examining the history of the distinction between 'native' and 'exotic' plants, Gröning and Wolschke-Bulmahn assert that "the idea of classifying plants as 'native' or 'foreign' may be as old as concepts of nations and of native and foreign people" (2003, p. 75).

There is certainly some evidence for this proposition in New Zealand, as Europeans associated the concept of nationhood with a connection to the land (Bell 1996, Clark 2004). In this context, settlers had not only come from somewhere else but also arrived to find a land already settled by others whose "claim to be 'native' was clearly much better founded – according to the logic of nationhood" (Bell 1996, Clark 2004, p. 11) Confronted by such trying circumstances, then:

what the invention of a distinct New Zealand nation called for was the invention of a distinct New Zealand nature. A nature so unique, so pure, primordial, and enduring that it would be capable of drawing in and anchoring *all* the people of New Zealand (Clark 2004, p. 11, original emphasis).

In other words, it was held that "nature was always already there" and all "true New Zealanders had to do was learn to see it clearly and to appreciate its distinctive qualities" (Clark 2004, p. 11). Poets and artists were not alone in their attempts to forge an authentic national identity in emphasising the unrivalled qualities of New Zealand nature (Craw 1990, Clark 2004). As Robin Craw (1990) highlights, prior to their artistic counterparts, New Zealand scientists had endeavoured to make an argument for the

unique characteristics of local biology, geology, and even physics. Scientists joined the poets and artists to celebrate the isolation of New Zealand's islands, asserting the feats of a "nature that evolved without man ... a rare and separate evolution" (Thom 1987, cited in Clark 2004, p. 12).

In his book about New Zealand's search for national identity, Keith Sinclair (1986) describes the deliberate but premature attempts of largely Pakeha groups called the New Zealand Natives Associations to express a national consciousness in the 1890s:

Their adoption of symbols such as the silver fern, and their interest in native flora and fauna ... suggest one hundred years ago indigenous elements were already seen as some sort of key to national identity (Leach 1994, p. 28).

Thirty years later, in his attempt to encourage people to cultivate native plants in their gardens, botanist and pioneer ecologist Dr. Leonard Cockayne appealed to the national consciousness these groups had sought to foster. In his practical manual on the cultivation of New Zealand native plants he declared that they:

are part of ourselves...they are our very own! That innate patriotism which compels us to feel that our country stands high above all other lands must also make us love its natural characteristics, so that in our gardens, of all the trees, or shrubs, or herbs, which we cherish, none can ever rank quite as high as those which slowly took their shape on New Zealand soil in the far-distant past (Cockayne 1923, p. 8).

The sentiments of the New Zealand Natives Associations and Cockayne are still prevalent in New Zealand society today. *The New Zealand Biodiversity Strategy*, for instance, in endeavouring to highlight the importance of New Zealand's biodiversity is full of nationalist overtones:

Our indigenous biodiversity — our native species, their genetic diversity, and the habitats and ecosystems that support them — is of huge value to New Zealand and its citizens; to our economy, our quality of life, and *our sense of identity* as a nation (Anonymous 2000, p. ii, my emphasis).

The early accounts that proclaimed the wonders of a nature that evolved in the absence of humans remain the foundation on which current definitions of native and exotic species rest in New Zealand. A plant or animal species is considered native if it

“naturally” occurs or “evolved” in New Zealand, or if it “arrived *without* direct [deliberate] or indirect [accidental] *human assistance*” (Anonymous 2000, p. 140, Wardle 2005, p. 37, my emphasis). In contrast, exotic species are any plants or animals that have been “*brought* to New Zealand, deliberately or accidentally, *by humans* or their agents, such as ships, planes and livestock” (Anonymous 2000, Wardle 2005, p. 37, my emphasis) and can never be or become native. Exotic plants are often further classified into “naturalised” and “invasive” plants. An exotic is considered naturalised when it “reproduce[s] consistently and sustain[s] populations over many life cycles without *direct intervention by humans* ... often recruit offspring freely, usually close to adult plants, [but] do not necessarily invade natural, semi[-]natural or human-made ecosystems” (Richardson et al. 2000, p. 98, my emphasis). Invasive plants³⁸, on the other hand, “produce reproductive offspring, often in very large numbers, at considerable distances from parent plants ..., have the potential to spread over a considerable area” (Richardson et al. 2000, p. 98) and can “adversely affect [native] species and ecosystems by altering genetic variation within species, or affecting the survival of species, or the quality or sustainability of natural communities” (Anonymous 2000, p. 140). While native plants can also be invasive, in New Zealand, invasive plants “are *almost always* species that have been *introduced* to the country” (Anonymous 2000, p. 140, my emphasis)³⁹.

2.2 Being a ‘native’ plant: the ethics and politics of it all

In the above accounts native plants are of greater value for national identity and conservation than their exotic counterparts because they are *our* plants and part of *our* country. Evolving in isolation for around 65-80 million years, and with birds, in the absence of mammalian browsers, being the dominant evolutionary pressure, the New Zealand flora is extremely rare and unique (Taylor and Smith 1997)⁴⁰. Over 80 percent of the native flowering plants are endemic to New Zealand – “they are found nowhere else” (Taylor and Smith 1997, Spellerberg and Given 2004b, p. 9). Furthermore, New Zealand’s native animals and plants, and the natural communities they form, have been

³⁸ Which are a subset of naturalised plants

³⁹ Richardson et al. suggest that “invasive plants” can only ever be naturalised as they are a subset of naturalised plants

⁴⁰ But see Lee et al. (2001) McGlone (2005)

acknowledged “worldwide as a global 'hot spot' of biological diversity. Thus *we have a responsibility* to care for, conserve and restore our unique natural heritage” (Spellerberg and Given 2004b, p. 9, my emphasis). There is then an ethical dimension to the distinction between native and exotic plants; we have a responsibility to conserve our native plants as they are unique to New Zealand and therefore rare.

There is also a political dimension underlying the distinction. Not only does New Zealand have an ethical responsibility, we also have an international responsibility to meet commitments under the Convention on Biological Diversity. The Convention, ratified by New Zealand in 1993, was a “ground-breaking international initiative” that established “scientific and moral imperatives” for the “proactive management of biodiversity on a worldwide scale” (Anonymous 2000, p. 10). As a signatory, New Zealand is required to prepare strategies or plans that establish national goals to conserve and sustainably use biodiversity (Anonymous 2000). New Zealand’s national strategy is outlined in *The New Zealand Biodiversity Strategy*, which also demonstrates the political element of the distinction between natives and exotics plants. While the strategy recognises “that many introduced [or exotic] species have become an important part of New Zealand’s total biodiversity”, the “primary focus” is “New Zealand’s indigenous [or native] biodiversity”. In recognising the value of some exotic species the strategy also sets goals to conserve and sustainably use (Anonymous 2000, p. 9):

- domesticated and cultivated species which are important to New Zealand’s primary production industries and economy;
- introduced species that help to conserve indigenous biodiversity, for example by providing habitat or as agents for pest control (that is, biological control agents);
- introduced species in New Zealand that are extinct or endangered in their country of origin; and
- other introduced species established in New Zealand that have become an important part of our non-indigenous biodiversity, for example, statutorily managed sports fish and game.

The strategy does, however, contain a disclaimer that states “where conflicts arise between introduced and indigenous species, priority will be given to conserving indigenous biodiversity” (Anonymous 2000, p. 9).

Native plants are also prioritised over exotics in various pieces of national legislation that pre-date the Biodiversity Strategy including the *Reserves Act 1977*, the *National Parks Act 1980*, and the *Resource Management Act 1991* (RMA). The RMA is the principal piece of legislation governing resource use and environmental management. Under an amendment to the act (*Resource Management Amendment Act 2003*) local or city councils are to act as the custodians of their cities' biodiversity, including their native plants. City councils also have a responsibility to meet the goals of the *New Zealand Biodiversity Strategy* at a local level. To meet these obligations the Christchurch City Council has prepared its own biodiversity strategy (see Christchurch City Council 2004). The Council's vision for suburban Christchurch demonstrates how native trees are implicated in the search for a new identity and have been given greater priority politically:

Indigenous nature is celebrated as an essential part of the city's fabric. Trees and shrubs (of whatever origin) in private gardens and public spaces across the City function as a woodland, providing habitat and food for Christchurch's bird and insect life. A wide variety of local native trees, shrubs, grasses and herbs are found in home gardens. The central City's streets and buildings are greened and in some cases act as refuges for vulnerable native plants and animals. Park and green spaces feature clusters of larger 'noble' native trees, providing critical food sources for bird and animal life. Wildlife such as tui, bellbird and kereru are once again common in the Christchurch area (Christchurch City Council 2004, p. 9).

2.3 'Ecological apartheid': the planting of natives and threats to Christchurch residents' sense of place

The Christchurch biodiversity strategy has a section headed up 'The threats to biodiversity'. Here it acknowledges that culture "plays an important role in both creating and sustaining threats" (Christchurch City Council 2004, p. 27). It continues,

[a]s a general principle, people are most comfortable with what is familiar, and that is reinforced by what is visible, startling or dominant in the landscape, media, literature and art. What is familiar, leads to identity, which defines the world view, and in turn generates protectiveness towards what is familiar. In relation to biodiversity, dominance of exotic

species - both in terms of overall bulk and showiness - continually reinforces identification with it. This is particularly so in Christchurch and its surrounds because the transformation of the original landscape, along with its biodiversity has been particularly thorough (p. 27).

It is not surprising to see the last statement in the strategy which was written subsequent to ongoing debates over the role of native plants in the future development of parks, roadsides, and riverbanks by the Council. These debates arose when the Council, while replacing boxed or piped drains along urban waterways, sought to ‘restore native elements’ in these areas (Barham 2006). The proposal to plant more native plants created a heated debate that was largely played out through Letters to the Editor of the city’s daily newspaper, *The Press*. At the heart of the debate was the concern over the cultural and ecological heritage of the city. Those opposed to the proposal were concerned about the “devaluation of Christchurch’s English heritage” (Barham 2006, p. 7) and the removal of ‘English’ trees and shrubs, most notably willow trees (*Salix* spp.). One of the core questions for horticulturalist Derrick Rooney was “whether we should practise *ecological apartheid* in landscaping our public places” (2003, p. 23, my emphasis). For him it is “like telling an artist to paint with any colour, as long as it is black” (p. 23). Like many members of the general public opposed to the proposals (see Kilvington and Wilkinson 1999, Barham 2006) Rooney argued that exotic plants are an equally important part of Christchurch’s heritage. Touching on the notion of familiarity referred to in Christchurch’s biodiversity strategy he argues ‘English’ trees and shrubs:

that have been a dominant element in the parks, gardens, and streets of urban New Zealand since the middle of the 19th century also have social and aesthetic values that reflect the cultural heritage of many in the population. These too must be worthy of preservation (p. 24).

The debate over native and exotic plants in Christchurch highlights that the nationalist, ethical and political viewpoints of, in this case, environmental groups, government departments and scientific institutions, do not coincide with the everyday experiences and identities held by members of the ‘general’ public. This is critical in the context of my current study which is being conducted predominantly from an ecological perspective. The New Zealand scientific, particularly the ecological community, is

founded on the distinction between native and exotic species. The studies undertaken⁴¹, and potential management implications that often arise from these studies reflect, the nationalist, ethical and political viewpoints I have been outlining. My own study is a prime example. I have examined the dispersal and regeneration of *native* woody species from Riccarton Bush, into surrounding gardens, and the role these gardens could potentially play in the future of these woody species. Focusing on natives and their future in gardens demonstrates that my project is founded on a variety of underlying general assumptions about the value of native plants, more specifically that they are worthwhile conserving. As we have seen already in preceding debate, these values may not necessarily be shared by those involved in my study, and as Kilvington et al. (1998) have shown, my respondents may not recognise the ‘scientific’ distinction between natives and exotics.

Kilvington et al. (1998) who examined the social opportunities and constraints for restoring areas of native vegetation in Christchurch found that people expressed feelings of identity in response to being shown photographs of (exotic) willows alongside the Avon, the Botanic Gardens or the Port Hills and many were surprised to find that Riccarton Bush, (the native) urban forest remnant my thesis is concerned with, is even within Christchurch City’s borders. Of particular note was that people made no clear distinction between native and exotic plants, rarely introducing the topic independently and were rather more interested in the aesthetics and age of vegetation.

People were also rarely concerned with ideas of endemism and eco-sourcing (collecting and growing plants from locally sourced seed) that permeate the ecological community. Participants who openly admitted that they could not tell the difference between a native and an exotic plant were, however “happy to enter the debate on the grounds of colonial heritage being displaced by the ‘politically correct’” (p. 8). Those more likely to favour natives were those who “strongly identified with Aotearoa/New Zealand or had an ‘ecological faith’” (p. 8). Finally, they found that people “strongly identified localities by their vegetation, and often by a specific type or individual tree” (p. 8) illustrating Jones and Cloke’s (2002) argument that trees play an active role in the making of places and people’s sense of place.

⁴¹ Although these can be driven by curiosity

3. Natives, exotics and material performances

The material performances of shrubs and trees are another way in which the distinction between native and exotic plants is made manifest. Native plants are often viewed as being dull and boring, “lacking the brilliant colour and form, attractive flowers and fruits and utility value of [exotic] plants” (Edwards and Given 2004, p. 74). Indeed, native flowers are “relatively inconspicuous” as they are “often small, simple in structure, not showy”, usually white in colour (60%), only rarely being blue, purple or red (Webb and Kelly 1993, p. 442-443). In fact it has been suggested that “[t]he fruit produced [are] ... in many cases showier than the flowers of the same species” (Edwards and Given 2004, p. 88). But this seems to be changing as there are an increasing number of books about gardening with native plants (e.g., Spellerberg and Given 2004a, Gabites and Lucas 2007)

A significant number of natives change form as they mature from a juvenile into an adult. Often as well as having a “very tangled growth phase..., sometimes with zigzag stems or a divaricate form” when they are juveniles, some species exhibit changes in their leaf shape and form as they mature (Edwards and Given 2004, p. 83). Many species also have small leaves of varying shades of green although some species have yellow, purple, silver, blue and brown shades (Edwards and Given 2004). In promoting the planting of natives, Edwards and Given contend, that these “unusual ... form[s] and textures” mean that “innovation and imagination are important in using them to the best advantage” (Edwards and Given 2004, p. 74). In other words, the unusual material performances of native shrubs and trees do not conform in the same manner as many of their exotic counterparts do with historical ideas that favour certain aesthetics of form, structure and colour.

Almost every native shrub and tree species, with a few exceptions (e.g. lowland ribbonwood (*Plagianthus regius*) and lacebarks (*Hoheria* spp.)), are evergreen, whereas, many of the most prominent exotic species are deciduous (e.g. oaks (*Quercus* spp.), elms (*Ulmus* spp.) and maples (*Acer* spp.)). As Jones and Cloke observe the “very different nature and life pattern of these two categories are”:

appropriated and developed culturally in a number of ways. Perhaps most obviously, the seasonal cycle of deciduous trees is deeply embedded in our cultures of landscape and seasonality... [And] the glory of certain trees in the autumn is repeatedly celebrated in a thousand glossy calendars and 'higher' art (Jones and Cloke 2002, pp. 32-33).

In Christchurch, I contend, the bursting of various exotic plants into flower or blossom in the spring and summer are also acutely fixed in our cultures of landscape and seasonality. This is a point Rooney draws upon in arguing for the importance of preserving exotic plants in Christchurch:

I guarantee that springtime tourists leave Christchurch with stronger memories of Hagley Park's blossoming avenues of [the exotic] Yoshino cherries [*Prunus x yedoensis*] than of Riccarton Bush's [native] kahikatea trees (2003, p. 24).

4. Natives, exotics and everyday understandings

Few would dispute that the scientific definitions of what constitutes a 'native' or 'exotic' species are the most authoritative and commonly accepted. While this may be the case, how applicable are these definitions in an everyday context? By drawing on material from my interviews and questionnaire survey I can demonstrate that the scientific distinction between native and exotic plants often is associated with, but does not necessarily translate into, lay people's conceptions. I begin by examining how people develop an understanding about, and appreciation for, native and exotic plant species. In this context my argument is that other people, particularly an individual's parents, as well their own personal encounters with plants, are important in shaping the values they ascribe to, and their awareness of, native and exotic species.

Having laid this foundation I will then attempt to delve into how people conceptualise native and exotic species. Here I present the results from my interviews as well as a series of Likert scale statements about native and exotic plants that I included in the questionnaire survey. While reasons underlying people's responses to Likert scale statements are not necessarily always clear, these responses can be used to infer at least to some degree common conceptions or misconceptions about certain native and exotic plants. Further, as I audio-recorded the conduct of most survey questionnaires additional

comments made during the administration of the survey can provide further insights into some of these responses, as can the interview material. As we shall see, ideas of identity and belonging commonly underpin lay people's conceptions, and symbolic or "iconic" species, to use Spellerberg et al.'s (2004, p. 110) term, are also equally, if not more important in attempts to articulate the distinction.

4.1 Developing (or not developing) an understanding about, and appreciation of, native and exotic plant species

People's appreciation and understandings of, native and exotic plants are not pre-given but rather develop through their associations and interactions with plants, people, and to some degree the media and the plant nursery industry. In particular, the interest of interviewees' parents in plants, gardens and gardening, as well as their own opportunities to encounter plants, are significant in shaping the value they ascribe to, and awareness of, native and exotic species.

4.1.1 Growing up with a mixture of native and exotic plants

Catherine, Jennifer and Robert all hold an appreciation for native and exotic species and currently have planted or intend plant out their gardens in a mixture of species:

Catherine You can have both [natives and exotics] in a garden ... and it doesn't really matter. [...] It's just nice to have a mixture I think.

Robert [In the future] I'd say [my garden will be] predominantly native with some ornamental [exotic species] like roses.

Jennifer I think the notion that we should preserve areas, vast areas of native forest is very important and I think it's rather nice to see domestic gardens having a mixture of both introduced trees and native trees. I'm not a purist at all [and] I think that is unnecessary.

Their current perspectives on plants appear to stem in part from growing up with parents, particularly mothers in the case of Catherine and Jennifer, who were "keen" or "serious" gardeners and who also planted out their gardens in a mixture of native and exotic species.

Catherine, who grew up “in Hoon Hay, [Christchurch, on] a back section”, suggested that when thinking about her current garden she “still goes back to that big garden and big lawn”. Having “inherited plants” on her property, for instance, she said:

I’d like to see a few native things in here [and] when we get around to landscaping the garden there will be ... just because it’s a bit too rhododendronish.

For Jennifer, it was her mother’s love of shrubs and trees, which translated into an interest both on and off her property which had a profound effect. Particularly significant was when she became involved with a trust that planted out rhododendrons in the midst of native trees in the ranges of Mount Taranaki. Jennifer and her family, as consequence often visited this area. Playing and looking around here, Jennifer suggests, provided her with “a lot of exposure” to various shrubs and trees, particularly natives. Her experiences there had considerable impact on her, for as she said they are the “sort of situations [which] don’t ever leave you when you grow up”.

Robert grew up in the country on a hundred acre farm in an old historic home with extensive gardens. Forty acres of the farm, located just outside of Invercargill, was in native bush, which had been “predominantly ... felled totara and was at that stage about half manuka and ... regenerating bush”. His father was “so passionate about the bush” that:

he used to go in his evenings and cut down manuka to allow the kind of regenerating broadleaf and stuff that come up and ... move things along. [He] would go in and take out blackberry and stuff I remember my dad ... caught in blackberry bushes, *huge* great big blackberry bushes, as he wanted everything else to come through quicker.

The bush played an equally significant role in Robert’s life as after school he used to “build huts and [go] tooting around” in there, and he was “big [into] trying to bonsai [rimu seedlings], playing around with them and keeping them”. This area of bush played such a significant role in his life that, as he recalls:

When I was a student in Auckland but still living in Invercargill [with] my parents I took rimu seedlings [from home] and I had them in my room [in an attempt to maintain] ... that sort of connectiveness with the environment.

Growing up Robert was exposed to a variety of ornamental exotic species both at home and on his auntie's property where he spent his holidays. His mother was "passionate" about "a few plants" and he recalls *Lily giganteum* being "central to life when [he] was a kid" as his dad "used to collect all the seeds [and] try to propagate them everywhere". His parents also shared a fondness for "old world roses once again ones that are very aromatic". Meanwhile his aunt who was a "passionate gardener" had "huge [...] predominantly flower gardens ... the kind busloads of people would come [to visit]."

4.1.2 Growing up with exotic plants

Unlike those who grew up on properties which comprised a mixture of native and exotic species, Mark, David and Mary were raised on properties with largely exotic gardens. Mark was brought up on a section an acre and three quarters in size, in Fendalton, Christchurch. He described his childhood garden in the following way:

Well being close to where we are now, [the garden had] similar style[s] of trees and [was similar in terms of] section size. We had chickens and all sorts of lambs and everything in town. So it was ... reasonable in size ... [and] pretty established. It was well maintained [and] we were fortunate to have help, but again [it featured] a lot of the traditional sort of [plants]. We had chestnut trees and ... your typical rhododendrons and camellias and sycamore trees.... You know big rose gardens and yew hedges. [It was] just your typical sort of traditional English ... style [garden] [...] I suppose.

Mark suggested that although he "appreciated what was there ... because it was a nice garden" he did not pay "much attention to it" at the time. This, however, changed as he observes:

later in life when you get your own section I suppose you do start looking to recreate some of that look or atmosphere in your own way with whatever size section you've got. So, I suppose, ... you know, ... what some of the parts were from ... being told to get away from [he says laughing] *stuff* or *stop kicking the ball into it*. You [learn] what some of the [plants] sort of are.

In contrast, to the others interviewees who gained an appreciation, and awareness of, native plants through their parents and own encounters, this was not the case for Mark. While his parents were and still are "gardeners" it seems their interest in plants did

not extend to natives. As a result of his lack of familiarity during his upbringing and the absence of any subsequent influences or encounters that would have resulted in him developing an interest towards natives, he remains relatively ambivalent toward and unaware of them. For instance, in discussing whether he would be prepared to let self-introduced natives become a permanent part of his garden he commented:

I don't really know a lot about natives so I'd have to actually look at what it looked like all year round. I lived [for] a long time in Canada so I'm used to the maples and those sorts of things and the autumn colours. So I'm probably used to more of the English species [such as] the oaks and those sorts of things than a lot of the natives. Nothing against the natives but I don't really know a lot about them.... I don't really know if there are a lot in [our garden] or not to tell you the truth.

In reiterating his lack of knowledge Mark later contended that: "I [would not] know what a native was to really look at, unless you were to point it out".

According to David his interest in gardens developed from an early age, even though he "came from a family that had gardens [but that were] not well looked after". Describing his parents as gardeners he suggested they were "a bit hopeless really" in that they "never spent time in the garden" and as a result "there was very little beauty in the garden in comparison to what there could've been". He suggests that from the age of six or seven, in his words he:

developed a keen interest in things that are now critical in my life; flowers, trees, all the beauty that is out there in the garden. So that love was fostered and ... my first job ever was in a nursery. Didn't work out but however I've retained a love of gardens, trees, things of beauty from nature and ... the environment.

Unlike other interviewees discussed so far, whose ideas were shaped and influenced by their parents, David contends that his interest in gardens has always been largely "self-driven". He does accept, however, that he may have been influenced somewhat by the times he grew up in:

the only thing I'd say to that, [is] that living in the sixties and seventies or the fifties, sixties and seventies, you were exposed to far greater beauty out there in people's property than you are today.

In his eyes he suggests today we are witnessing the:

disintegration and the destruction of what I always grew up with whether it's public gardens, ... corporate gardens, [or] private gardens and land. It's all just disappearing. ... We are shoving up everything we can on the property and ... forgetting [about] what's outside ... simply because people don't want it. ... They have a life that's different and they are lazier today [it] isn't important in their life to have beauty around their house. They see the fact that they live inside the house [as] the issue of greatest concern. [...] There is very little effort put into creating anything of significant beauty outside, other than just a few Hebes and what I call 'junk', sorry to offend you [*laughs out loud*] ha-ha-ha".

Hebes, are a family of native shrubs, which have become popular recently in gardens, largely as they have been promoted for their low-maintenance qualities. David is not impressed by this recent development. This can to a large degree be attributed to David's reflection that the "style of garden I really like to have is a very English type of garden with lots of structure to it". This is a view that he suggests has not only been shaped by the times he grew up in but also by encountering such gardens in person:

I've been ... to England a lot of times. I've seen a lot of beauty overseas and that's really the place that typifies my objectives about that part of my life.

Evidently, David holds exotic plants, specifically trees, in high regard:

I love them. If I could have them all in my garden I would. Because they are ... big growing trees, they look beautiful, have lovely foliage, lovely colour and are deciduous where as most of the natives I guess are evergreen. So you see the beauty of the autumn leaves.

The description David offered in response to the question "When someone uses the term native plant what do you think they mean" demonstrates his indifference towards them:

Ugliness, spindly, unstructured, wild growing [plants of] little value [and] little beauty to me [which], unfortunately won't please you.

He carries on, in his description of how he feels about them:

I'm a bit ambivalent about them really. ... [T]o me they serve a purpose in probably reserves and areas of natural growth and nature like around water and ponds and lakes and

that type of thing. I wouldn't pull them out [of my garden] necessarily but I don't have a lot of affinity with them because I like something of a more structured tree. The problem with natives is they just grow anywhere and ... just grow wild.

It is this indifference or lack of appreciation for natives that has contributed to David's lack of awareness about them:

I suppose that's the strange thing I know little about New Zealand natives. I do know what they are and I know what they look like but I don't know much about them because they don't feature in my view[s] about ... gardening.

4.1.3 Growing up with 'plants': not recognising the scientific demarcation

Mary and Sharon, like David, were brought up on properties with parents who were not particularly passionate about gardening. Mary's description of the garden she grew up in suggests it was mainly comprised of exotic species and that work in the garden, or at least the areas worked in, was demarcated by gender:

it had a front lawn, a back lawn and a chook house. And we had a big veggie garden that my father and grandfather, [who] lived with us, ... used to look after. And mum more or less did the front garden [which featured] mainly flowers, rose bushes, camellia bush[s], clematis, dahlias [and] chrysanthemums.

Her mother, she suggests, was a "reluctant" gardener and her father "just did it" but "vegetables [were all] that he [ever] grew".

Sharon suggested that her parents were not gardeners at all. This she attributes to the fact they grew up in the absence of gardens:

They grew up in Scotland both of them, Mum grew up in the main street [of] Glasgow. And their houses were like you see on Coronation Street you know with just the footpath and then the front door.... There was no garden ... and they didn't have gardens like this because they didn't have the room for it [in the city] [...] [over] there. And of course they came here [to this property] and [thought] "this is nice but what do we do with it? This is our plot of land". But really compared to what they grew up in this was huge. ... So they never had the opportunity to be gardeners.

For Sharon this has contributed to her own lack of knowledge suggesting that she has not "been taught" about gardening. Her ability to develop her own interest in gardening has

also been severely hampered by a physical disability that prevents her from being actively involved in the garden.

Mary, on the other hand, has developed her own interest in gardens and gardening. She describes herself as being sometimes a “reluctant” gardener and at “other times quite keen to get out there”:

I mean some weeks I might not go out there at all. But then some weekends I might be out there all day Saturday, all day Sunday.

While Mary is more actively involved in the garden, she is similar to Sharon in that she does not appear to personally recognise a distinction between native and exotic plants. Other interviewees such as Jennifer, Catherine, Robert and David at least at some point prior to being asked directly about native and exotic plants made some distinction between the two. This was not the case with both Mary and Sharon. Both were happy to enter discussions about native and exotic plants but only after being directly asked about them. Even then both remained fairly ambivalent about the distinction between the two. For instance, Mary when queried as to what she thought people meant when they used the term exotic plant she responded: “Oh I don’t know. It [is] just another name for a native plant isn’t it?” Meanwhile, Sharon observed: “I don’t know what a native plant is to an exotic imported plant”. In this sense then it appears that in each of their everyday lives the demarcation between the two is not particularly meaningful.

4.1.4 Learning to appreciate native plants in later life

In the various accounts so far I have highlighted the important role individual’s parents and their own personal encounters have played in shaping their appreciation and understanding about native and exotic species. While childhood experiences can be influential in shaping an individual’s ideas, experiences in later life can be equally important. In both Michael and Rebecca’s accounts it became apparent that their ideas had been influenced by working in positions where they frequently encounter traditional scientific discourses about native and exotic species. The recent media attention native plants have been receiving and their promotion by the gardening industry has also increased both individuals’ awareness about natives.

Michael's parents were Dutch immigrants whom he suggests "weren't gardeners at all". He goes on to describe the gardens he grew up with as being:

very bare gardens, mostly lawns and a few trees. One of the properties that my father had he subdivided and exchanged any grass for concrete; with sort of a bit of a strip around it, so [it was] low care. [...] There was one garden that sort of got worked over once a year when it got really bad, but generally it was a chore and a bore. [They did] not [have] a lot of pride in the garden. And then [a] part of that ... large section [of garden] was ... replaced with polythene, shingle and shrubs. So um yeah you know very maintenance free and minimalist really.

Although Michael was generally "not very receptive or open to" his gardens at home growing up, he has to some extent adopted his parents "minimalist" easy-care approach to gardening:

it is just sort of a chore and a bore [that] has to be done. ... I'm ... a cruisy sort of a gardener that just ... pulls a few weeds and moves along... Generally when I garden I go for it. And so [I] do quite a lot of work in a short space of time. [...] I'm definitely an easy care gardener. I don't like pulling weeds but I'm prepared to do it a few times a year.

Michael suggests that the first gardening influence he had was his father-in-law who "had a veggie garden [around] 300 square metres. So he was a keen gardener and influenced me into veggie gardening":

that is where I first enjoyed gardening and that just progressed and progressed and gardens got bigger and bigger. And then once I had children they got smaller and smaller [...] [and] I began filling in all my veggie gardens. And then I got into growing natives.

For Michael it was his brother-in-law's example that initially sparked his interest in natives after he "[planted] a whole lot of native trees from Nelson in his garden". Michael set about transforming his own Nelson property of 800 square metres. In his backyard which was previously "just grass and vegetable garden", he "put natives right down one whole side [creating a] thirty metre ... round strip".

Michael's interest in natives continued when he arrived on his current Christchurch property with his family:

when we came here the garden was pretty bare [but] there was a lot of ... pungas and quite a few natives. And I ... continued on my native interest ... especially once when this infill started. The only way to actually reduce that infill ... and maintain privacy was [to plant] more natives. And then [after that I] got onto the Christchurch City Council's scheme for stream enhancement.

The Christchurch City Council scheme Michael mentions is aimed at attempting to 'restore native elements' banks boarding streams and rivers by planting them out in native species that would have traditionally been associated with those areas. His involvement with the programme has been important but he suggests that working for the Hurunui, and Banks Peninsula District Councils have been influential as he has developed "very much ... an awareness of natives through that". He also contends the media has been important "to a certain extent". Both Michael's job and the media have increased his exposure to natives allowing him to become "aware of what other people are doing, native nurseries and those sorts of things". Further, Michael's job has exposed him to various ecological ideas and notions. For instance, he recounted the time that a "gardener" from work visited his property:

he came around one day and I was quite proud of what I've done [with my native section]. [He] had a look and said, "You're not a purist though you know?" And I said, "What do you mean?" He said, "Well all these natives, yeah sure you've got natives but a lot of them are hybrids". ... [T]o be a real [or] true native gardener you actually have [to] collect the seed from where it comes [from] and that sort of thing.

As a result of his personal experiences both growing, and his association with natives through his job, Michael appreciates natives for a variety of reasons including that "they are easy, look good, [and] add to the environment [in that] they are good for birds and things like that". Michael hopes with further development his native garden in future will not only fulfil the functional role of screening out neighbours but also become an educational resource:

I [would like] to have a good variety of natives in my garden. So that I can show them to other people who don't know what kahikatea, kauri, or those sorts of things look like. So [I would like] a little bit of a garden that people can be educated in.

Unlike Michael, Rebecca's parents were both interested in gardens. She recalls growing up on a huge property with "lots of plants, shrubs and trees" at "the front [including] a big lemon tree, cherry blossom and roses" and huge "vegetable gardens" at the back. During her childhood she remembers always being "encouraged to grow plants, herbs and things and [being given her] own little area". Her parent's encouragement has seen Rebecca develop and retained an interest in gardening to the point that when she only had a concrete patio with no garden she:

always had pots with geraniums [and] bulbs. And [I] always ... have had herbs. [...] I would have liked to have had a vege garden [so] at one time [I] experiment[ed]. [...] I've got lots of books that ... tell you how to plant in containers and things. So [I] had a go at growing things on patios ... like lettuces and tomatoes, and potatoes [were] quite an exciting one. So yeah [my parents influence is] definitely coming through a little bit more.

Rebecca's early childhood experiences have, therefore, been significant in shaping her interest in gardening. Her experiences in later life, however, have been critical in influencing her appreciation of, and understanding about, native species in particular. She suggests that this new found interest can be traced both to the general push towards native plants and her job:

Oh [natives] are quite good [and] quite exciting. I mean early on I wasn't particularly interested and I think the rest of New Zealand wasn't interested but there has been a big change and push to[wards] native plants. [...] I know a little bit about them but not a great deal. But ... I guess working in zoology with a bit of spin ... from botany you see some of the plants around ... in the glasshouses and stuff.

Rebecca's exposure to traditional scientific discourses about native and exotic species became most apparent when she discussed how she felt about exotic species:

[O]ver ... time it has changed. Before I guess ... plants were plants [and] I didn't really care as long as it was green and it was nature. But ... now with the idea of stuff taking over and getting rid of the native I think it is important that we keep an eye on that.... You know like all those plants that are parasitic or like old man's beard, stuff you need to get rid of and just keep an eye on so that doesn't take over. It's a bit like with the animals you need to make sure the exotic doesn't take over the native. ... [E]ach ha[ve] their own niche and it's important that nature is nature but you can't have one overtaking the other ...

particularly the native because ... usually ... it's endemic to your area. [...] So if you lose [a native] it is gone forever.

4.1.5 Everyday exposure to, and awareness of, native and exotic plants

The accounts above all highlight the importance of having opportunities to learn and appreciate native and exotic plants through social interaction with others and personal encounters with plants. In Chapter 5, I presented the results of a test to examine how many people could identify whether 16 tree species originated in New Zealand. I reported how the percentage of origins correctly classified was influenced by an individual's age. No consideration was given to which species were correctly classified most commonly. Examining the percentage of respondents who correctly classified the origin of each species (see Table 4) reinforces the importance of everyday exposure in influencing an individual's awareness. As Table 4 shows those species that are correctly classified more often are those that people regularly encounter in their everyday lives in Christchurch such as cabbage tree, radiata pine (*Pinus radiata*), cedar elm (*Ulmus crassifolia*) and common oak (*Quercus robur*). In contrast, individuals seem less likely to correctly identify species they rarely experience such as wineberry (*Aristotelia serratus*), marbleleaf (*Carpodetus serratus*) and milk tree (*Streblus heterophyllus*). The only exception to this rule is kahikatea, and this may be attributed in part to its Maori name, as some respondents in the survey suggested it must, therefore "be a native".

4.2 Everyday conceptions of native and exotic plant species

In the previous section I examined some of the ways that people develop an understanding and appreciation of native and exotic species. Here I want to elaborate how people define native and exotic species and identify some of the ideas held by individuals surrounding both terms.

4.2.1 Native plants, identity and belonging

Connections between a plant's origin, particularly its presumed belonging, and national identity, were made by a number of interviewees. Catherine, for instance, talked about

returning to New Zealand after having lived overseas for a period of time and upon return possessing a greater appreciation for native species that are “unique” to New Zealand:

Well I think ... [natives] are part of New Zealand. They are plants that you don't see elsewhere in the world. And perhaps that comes from living away from New Zealand. [When] you come back ... you recognise the plants and think oh yes that is [that], you know? And it's nice too ... when you go out into the bush and things.... It's just part of New Zealand and part of being a New Zealander.

Sharon echoed Catherine's sentiment:

Oh we need [natives] there is no doubt about that because they are part of us. [...] I know they can grow in other places ... but ... they are actually indigenous to our country.

Table 4. Percentage of respondents⁴² who correctly or incorrectly classified, or were not sure, whether a shrub or tree was in New Zealand prior to the arrival of humans⁴³

Common/(Species Name)	% Correct	% Incorrect	% Not Sure
Cabbage tree (<i>Cordyline australis</i>)	81	11	8
Kahikatea/white pine (<i>Dacrycarpus dacrydioides</i>)	76	7	16
Radiata pine (<i>Pinus radiata</i>)	71	18	12
Cedar Elm (<i>Ulmus crassifolia</i>)	66	8	26
Common oak (<i>Quercus robur</i>)	65	19	16
Sycamore (<i>Acer pseudoplatanus</i>)	62	15	22
Lemonwood (<i>Pittosporum eugenioides</i>)	60	14	26
Elder/Elderberry (<i>Sambucus Nigra</i>)	60	16	24
Macrocarpa (<i>Cupressus macrocarpa</i>)	54	29	16
Crack Willow (<i>Salix fragilis</i>)	51	11	39
Lancewood (<i>Pseudopanax crassifolius</i>)	49	12	39
Rowan (<i>Sorbus aucuparia</i>)	47	6	47
Broadleaf (<i>Griselinia littoralis</i>)	38	18	45
Wineberry (<i>Aristotelia serrata</i>)	22	22	55
Marbleleaf (<i>Carpodetus serratus</i>)	15	25	60
Milk tree (<i>Streblus heterophyllus</i>)	5	33	62

⁴² Due to rounding rows may not always total 100%.

⁴³ For further details see Chapter 4

Joyce's comments illustrated her appreciation of the performative values of having native species in the garden and also a sense of identity and patriotism. When I asked her how she felt about native plants she responded: "Oh I love them. I love them. Yes, I like the native plants". Her love she suggests can be attributed to the fact they "are evergreen and that's nice for the winter. And they are [part of] our country, part of my country". Michael's perceived value of natives can also be traced to an appreciation of their performative values, as well as, the role they play in the environment and a view that no-one else outside of New Zealand is going to grow "our plants":

[I like natives a] lot because of the ... bird life they ... attract and things like that. So I think that goes hand and hand with [those species]. But also because some of them are quite beautiful, quite majestic, outstanding trees, and I think that they just are part of our landscape [and] no-one else is going to grow them.

The interviewees were not alone in their sentiments about native plants and identity. As shown in Table 5 most respondents (84%) either agreed or strongly agreed with the statement that "Species unique to New Zealand are important to our identity".

Rebecca was the only interviewee to explicitly make the link between a native plant being any species that has not been introduced by humans from another country. She defined a native as:

A plant that is native to New Zealand, that it is a New Zealand original plant. ... [O]ne that hasn't been bought over from other countries or introduced.

Other interviewees, however, made specific mention of New Zealand:

Michael Something that is native to New Zealand and or hybrid there of

Ken A New Zealand native plant is what I would suggest [if they] are using [the term] in this country.

Catherine A New Zealand plant, you know it's grown here ... it's from New Zealand. Like cabbage tree [or a] beech tree.

The survey results revealed that the notion of a native being a plant that was in New Zealand before the arrival of people appears to be reasonably well accepted. Almost two-thirds of respondents (65%) agreed or strongly agreed with the statement that "Only plants in New Zealand before the arrival of humans are native plants".

Table 5. Percentage of respondents⁴⁴ who agreed or disagreed with various statements about native and exotic plants

Statement about native and exotic plants	%	%	%
	Agree	Neutral	Disagree
Species unique to New Zealand are important to our identity	83.5	10.6	5.9
An indigenous plant is the same as a native plant	67.1	8.2	24.7
Only plants in New Zealand before the arrival of humans are native plants	64.7	16.5	18.8
An introduced plant is the same as an exotic plant	54.1	11.8	34.1
A native plant is any plant that has been in New Zealand for more than 150 years	50.6	15.3	34.1
An exotic plant is any plant brought to New Zealand by humans	44.7	10.6	44.7
An exotic plant is a plant that is unusual	36.5	14.1	49.4
Most exotic plants are weeds	2.4	11.8	85.9

Half of the respondents (51%) agreed or strongly agreed with the statement: “A native plant is any plant that has been in New Zealand for more than 150 years”. This illustrates that the public’s ideas about native plants are not necessarily unambiguous. Although people’s underlying reasons for their responses are unclear this finding can be interpreted in a number of ways. For some respondents it may be that if a plant has been in New Zealand for more than 150 years, no matter whether it was in New Zealand before the arrival humans or subsequently introduced, they then consider it to be a native species.

The notion above was not raised during any of the interviews or questionnaire surveys and no-one explicitly expressed this point of view. At the completion of the questionnaire survey, however, I had an extended discussion with David about natives and exotics as follows:

⁴⁴ Due to rounding rows may not always total 100%

Me A few people, including myself, are starting to think a bit about how long a tree needs to be in New Zealand before it can be considered a native tree or an indigenous tree.

David Well I suppose when you interbred them and cross pollinate them I suppose. But I think you would always refer to an oak tree as ... an introduced, exotic tree because they go hand in hand with England or wherever they originated from. And the fact that they have been introduced knowingly not blown here by way of seed is probably more determinable. [T]hey are not seen as, or wouldn't be seen as anything [other] than, an introduced tree.

After further discussion I put the proposition to him again in slightly different terms. As it transpired even if an exotic tree had been in New Zealand for some length of time in David's eyes it could never become a "native":

Me I've just been thinking, a bit about [whether] a tree should become native after it [ha]s been here [for] a while.

David No I don't think they would be right. I don't think it would ever be right to call an oak tree a native of New Zealand. Not unless its, they propagate from it ... And then again you'd be hard pushed to describe something which you genetically make out of something else to be a native would you not, if it comes from something that is not a native?

Another possible explanation for this finding was raised by Robert in his interview, and some other respondents who during their survey contemplated out loud, whether or not plants introduced by Maori were in fact native. Robert, considering what constitutes a native plant, for instance, observed:

[natives] would be plants that precede ... European arrival certainly. I guess it could also sort of include things like kumara or whatever [was] introduced by Polynesians. [But] I think generally [of] things[s] that ... were intentionally introduced from England or whatever.

These respondents appear to be employing the logic that if Maori are considered to be the 'native' or 'indigenous' people of New Zealand does that not by way of association make the plants and animals they introduced indigenous or native too. Finally, it is also likely some respondents did not reflect on the significance of this timeframe to any great degree and just agreed with the statement as they felt it sounded acceptable.

4.2.2 Exotic plants, humans and being introduced

The definition for what constitutes an ‘exotic’ plant centres on the notion that a plant has been brought to New Zealand deliberately or accidentally by humans. Many interviewees in their attempts to establish what they believe people to mean when they use the term exotic plant, made reference directly or indirectly to plants associated with humans:

Michael Anything introduced to New Zealand.

Rebecca I sort of think of things that have been brought over from England or imported from other countries. ... Things that were definitely not here when man first arrived.

Sharon Plants that have been brought in from ... other countries.

Robert Something that was sort of introduced.

As well as suggesting exotics are those plants that have been “introduced”, Jim contended that exotics are “the ones that don’t belong here”, whereas, Joyce views them as being “foreign”. While the interviews suggest people are fairly familiar with the central notion of what constitutes an exotic plant, in a scientific context, the questionnaire results were not as obvious, however. Only 45% of respondents agreed or strongly agreed with the statement that “An exotic plant is any plant brought to New Zealand by humans”. A common reason cited by respondents before disagreeing or strongly disagreeing with this statement was that birds could also introduce new plant species into New Zealand. Adopting this logic then, these species, which in the commonly accepted definition of a native species would be native, in the eyes of respondents, are exotic, even though they have arrived in New Zealand without any human assistance.

4.2.3 Symbolic or ‘iconic’ plants

Interviewees identified a suite of native species in their attempts to articulate what they believe people to mean when they say native plant. Usually these are species with which they are personally familiar or encounter in their everyday life:

Simon Well I’m lucky because I can refer to [Riccarton] Bush. So obviously there is a kahikatea or a matai.

Mark Oh I would think of something like a ... Pittosporum or a cabbage tree or something like that. I suppose there [are] native grasses and ... there [are]

native trees [like] kahikatea [one of which] we had ... on the farm [and it] was [a] very old tree.

Mary I probably think about [kowhai] or cabbage tree

Jennifer Well ... I mean a great variety of things like beeches and totaras and Pittosporums. And I grew up with pungas, totaras and kauri trees. [...] Karaka trees and things like that. So probably [a] different group than you get ... down here [in Christchurch like] kahikateas and things.

Similarly, a number of exotic plants were identified during attempts to articulate what they believe people to mean when they say exotic plant:

David I've always looked on exotic plants [as] being oaks, beeches or birches, elm trees and a whole variety that were brought out from England.

Simon Exotic plants are ones which ... are bought in. The oak, the walnut, things like that isn't it?

Jennifer Well the conifer that you see everywhere, [...] the pine forest[s] and then of course things likes chestnuts and oaks, the introduced beeches, elms, ash. [And] willows [as they are] for the mile here in Christchurch.

4.2.4 Performative aspects of trees

In attempts to articulate the distinction between native and exotic plants some interviewees highlighted the differences in the growth, shape and life-cycle of plants. As I reported earlier the “ugl[y], spindly, unstructured” nature of natives, for David, does not compare to the “lovely foliage” and “lovely colour” of exotic species. He continued that because exotic plants are “deciduous” they also provide you with the “beauty of the autumn leaves” unlike the natives which are mostly evergreen. These performative differences for David explained why native species do not figure in his ideas about gardening. David's latter distinction, based on seasonal performances, was shared by Joyce and Jennifer. Jennifer, for instance, recalled being taught to demarcate between natives and exotics based on these performances:

We were brought up to think ... [that] all deciduous trees [were] to be thought of as foreign ... at home. And [in] my early childhood schooling we were [also] taught very strongly the difference between deciduous and non-deciduous trees and there was a strong demarcation

that the evergreens were all natives. ... [P]eople had macrocarpa hedges, but basically the deciduous trees were all ones that had been introduced. And I think living in Taranaki where we had vast quantities of native trees in pockets all over the town ... I was probably very aware of it from quite an early age.

Some interviewees made associations between native plants and plants capable of seeding, establishing and growing independent of human activity. Elizabeth suggested that a native was “something that grows that you haven’t necessarily put in [i.e. planted]”. While Joyce observed that some native species “seed [...] very easily”. For David and Ken the distinction between native and exotic were linked with the ability of plants to seed, establish, and survive without human involvement. David contended that natives “grow wild [...] wherever they are generally, I suspect [they are] carried [around] by the birds”. In his eyes, therefore, he has:

more sympathy for the trees that you have to plant. You go to the nursery and buy it because you want to spend a lot more time.

Ken also saw an exotic as being something “precious” in that it is “perhaps not easily grown” whereas he talked about having had native plants such as “akeakes” which “still seed” and establish as “seedlings” even after the removal of adult plants from the property.

Rebecca was the only interviewee to make an explicit link between the performances of exotic plants and their negative impacts on the native flora talking about them “taking over and getting rid of the native[s]”. This may be because, as responses to the statement “Most exotic plants are weeds” shows, there is a general appreciation that only a few exotic species become problem weed species. Two per cent of respondents agreed or strongly agreed with this statement compared to 86% who disagreed or strongly disagreed.

4.2.5 Interchangeable terms: native vs. indigenous and exotic vs. introduced

A number of terms are often used interchangeably for native and exotic. In the survey I investigated how successfully two of these terms, ‘indigenous’ and ‘introduced’ could be used instead of ‘native’ and ‘exotic’. Over two-thirds (67%) agreed or strongly agreed that “An indigenous plant is the same as a native plant”. Illustrating that there is some

potential to use the terms interchangeably but doing so may result in some misunderstandings. Those who disagreed with the statement possibly did so because they associate indigenous plants with Maori, the indigenous peoples of New Zealand.

Using the term ‘introduced plant’ in place of ‘exotic plant’ could potentially create even more confusion. Only 54% of respondents agreed or strongly agreed that “An introduced plant is the same as an exotic plant”. The confusion between the terms ‘exotic’ and ‘introduced’ may be partly attributed to the connotations associated with the word ‘exotic’. Ken, for instance, was unsure about the term and associated it with a number of ideas:

I don't really know to be perfectly frank. I think its probably [refers to] introduced sort of plants. [...] I don't know but I wouldn't think that particularly. But exotic is something that sort of precious which is [...] perhaps not easily grown.

Mark was also somewhat confused by what constitutes an exotic plant, but mainly associated the term with plants that were “different” or “rare”:

Exotic to me would [be] something like an orchid. I don't know. I can't stand them but something like a cactus or something that I perceive as slightly different or rarer. Oh monkey puzzle tree or something like that, no not even that actually ... [would] fall into that, I don't know actually (Mark).

The idea that exotics are somewhat different, rare or unusual was echoed by over a third of respondents (37%) who agreed or strongly agreed with the statement that “An exotic plant is a plant that is unusual”.

5. Discussion

In this chapter I have provided some insights into how lay people develop an appreciation for, and understanding of, native and exotic species and how they conceptualise the two. As we have seen there are a diversity of values associated with native and exotic plants. In the context of my current research, however, if I am to more comprehensively understand the potential role residential gardens can play in the future of Riccarton Bush, these insights need to be grounded in everyday people's lives and realities. A point that is equally applicable to other attempts to increase native plantings in residential gardens.

This necessitates an understanding of not only how people create, but also how they manage, their gardens. More specifically, given my focus on the natural dispersal and regeneration of native woody seedlings into residential gardens this requires, in particular, an appreciation of people's conceptions of weeds and their weeding practices.

In the next chapter that follows I address these matters in three sections. I begin by discussing how, for many people, gardening is simply something they do in a taken-for-granted way. The time and effort they commit to gardening varies and influences the type of garden they perform. Generally, people try to exhibit signs of care by controlling and ordering plant performances, which stems in part from a sense of public obligation. Second, I discuss the personal reasons for such attempts by illustrating people's efforts to reduce the amount of work required to create a garden. This reflects their personal attachment to particular plants and a consequent process of positive selection of some plants and the removal of others.. In the final section I focus on the practice of weeding and what constitutes a 'weed'. Here I argue that whether a plant is determined to be a weed is not pre-determined or pre-figured but rather is *performed* by people and plants. Consequently, I contend that people's weeding practices create multiple realities for native woody seedlings.

Chapter 8: People, plants and performance: (re)creating and (re)making gardens

1. Introduction

Residential gardens have recently been the site of unprecedented and diverse inquiry⁴⁵. Among these inquiries, a number of studies have sought to understand the composition and diversity of plant species in gardens (e.g., Hope et al. 2003, Thompson et al. 2003, Stewart et al. 2004, Zagorski et al. 2004, Turner et al. 2005, Grove et al. 2006b, Smith et al. 2006). The extent to which these studies have examined the role of people has varied. Some have simply acknowledged that gardening practices contribute to the unnatural capacity of garden plants to survive at incredibly low population sizes (Thompson et al. 2003) and the high levels of floristic diversity found in gardens (Thompson et al. 2003, Turner et al. 2005, Smith et al. 2006). Others have drawn on broad-scale socio-economic and political characteristics (e.g., household income, housing age and population density) to explain patterns of vegetation cover or floristic diversity (Hope et al. 2003, Grove et al. 2006b). Only one study (Zagorski et al. 2004) has to some degree investigated how plant composition and diversity reflects personal and place meanings and values, individual and familial needs (Bhatti and Church 2001, Head and Muir 2005). This is significant, as these factors and wider processes including the marketing and the production priorities of the gardening and horticulture industries, influence people's plant choices and how they manage their gardens including what they keep and what they remove (Bhatti and Church 2001, Head and Muir 2005).

The importance of understanding the social context in which gardens are created and managed should not be downplayed. Recent efforts to increase native plant biodiversity have attempted to promote the planting of native species in residential gardens (Seidlich 1997, TCPA 2004, DOC 2005, Kaipataki Project 2007). Similarly,

⁴⁵ For example, in ecology (e.g., Thompson et al. 2003, French et al. 2005, Gaston et al. 2005a, Sullivan et al. 2005, Roarke and Marzluff 2006), human geography and sociology (Francis and Hester 1990b, Bhatti and Church 2000, 2001, Hockey et al. 2001, Hitchings 2003, Blomley 2005, Power 2005).

some argue the regeneration of native species in gardens could be promoted by modifications to gardening practices and increased plantings (Stewart et al. 2004, Turner et al. 2005). These intersecting ideas coincide with my own attempts to understand: 1) the dispersal and regeneration of native woody species from Riccarton Bush into surrounding residential gardens; and 2) the role these gardens could play in the future of Riccarton Bush. In this chapter I provide some insight into this social context by presenting a largely ethnographic account about how and why people create and manage their gardens. Before outlining the structure of this chapter I will outline the theoretical social scientific thought that I will draw on as I develop this account.

1.1 People, plants and performance

Social scientific inquiries have revealed that gardens are places and spaces that have multiple, sometimes contradictory, roles and meanings (Francis and Hester 1990, Longhurst 2006). They provide private havens from the public world (Francis and Hester 1990, Blomley 2005), functional spaces for leisure and household duties (Williams 1995), and sites where individuals can express their own identity and creativity (Francis and Hester 1990, Bhatti and Church 2001). Although private, gardens are freighted with public responsibility (Francis and Hester 1990, 2001, Blomley 2005), notably maintaining a garden that conforms reasonably closely with the aesthetics of one's neighbours (Blomley 2005). Thus gardens are sites of cultural consumption (Chevalier 1998) where the design, maintenance and conspicuous display of plants and associated elements can be attributed to one's pride and status (Bhatti and Church 2000). Gardens are closely associated with gardening practices (Bhatti and Church 2001, Kimber 2004), which are characterised by planning, decision-making, physical work, and expert and lay knowledge about cultured nature.

As an everyday space, the roles and meanings of, and the practices associated with, the garden, are structured by personal practices, often reflecting relationships with friends and family, and a variety of wider social and economic processes (Bhatti and Church 2001, Bhatti 2006). These various forces, I suggest, influence the way in which people create and manage their gardens over the course of their lives. Human agency in

this context plays a considerable role in creating and shaping both the garden and its place-meanings (Tuan 1990, Bhatti and Church 2001, Perkins and Thorns 2001, Crouch 2003a). Equally as influential are the diverse assemblage of nonhumans, including plants, insects and animals, who are materially and actively present in these spaces. Drawing on notions of nonhuman agency (Murdoch 1997, Whatmore 1999), place (Cresswell 2004, Egoz et al. 2006) and performance (Nash 2000, Thrift and Dewsbury 2000) my starting point is the view that nature is not simply “a backdrop for human activity and the material from which gardens are created” (Power 2005, p. 41). Rather I consider the nonhuman agents of nature to be active co-constituents, in conjunction with humans, in the creation and changing nature of gardens, and the performances which help to define gardens as places (Jones and Cloke 2002, Power 2005).

The numerous non-humans who co-occupy gardens with humans are not simply a “set of passive *objects* to be used and worked on by people” (Macnaghten and Urry 1995, p. 206). Instead they possess agency in their own right and relationally with humans (Murdoch 1997, Whatmore 1999). Plants are a prime example. They are “restless life-forms” continuously growing and shedding buds, leaves, flowers and fruit, maybe bark, as well as, attempting to propagate and spread by seed, rhizomes or suckers, and over time die (Jones and Cloke 2002, p. 87). The changes plants undergo, and the different forms they take on, during their lifecycles are ‘material performances’ illustrative of their performativity (Jones and Cloke 2002, Szerszynski et al. 2003a). Performance, in this sense, is understood to be “the everyday improvisations which are the means by which the ‘now’ and ‘here’ of time and space are produced” (Thrift 1996, Cloke and Perkins 2005, p. 905). As Rose (1999) suggests “space is a doing ... that does not pre-exist its doing, and ... its doing is the articulation of relational performances” (p. 248). The exact means, by which improvisations are ‘done’, and their subsequent nature, can entail different performative practices and skills (Cloke and Perkins 2005). Here, a garden can be seen as space that is continuously ‘done’ or performed by people, plants and various other non-human beings and entities.

Plants have the potential through their performances to help establish, create and reaffirm various people’s hopes, needs and desires for a garden that is perhaps beautiful, neat and tidy, and practical and the sense of place they associate with it. These

performances are not pre-written or pre-figured. Rather, they unfold as plants endlessly grow and develop in the context of the garden (Hitchings 2003, Power 2005). Consequently, plant performances can be volatile and unpredictable, sometimes challenging, disrupting and unsettling people's positive experiences of, and ascription of meaning to, their garden (Hitchings 2003, Power 2005, Egoz et al. 2006). People, through their gardening practices, attempt to provide conditions necessary for the continued growth and survival of their plants while promoting and encouraging desired performances (Hitchings 2003, Power 2005). These practices, furthermore, are a means through which people control those plants and performances deemed unwanted or undesirable (Power 2005) and in the process recreate and reaffirm their positive home-related sense of place (Tuan 1990, Perkins and Thorns 2001, Egoz et al. 2006). A dynamic relationship emerges, therefore, between people and plants typified by affirmation, co-operation and struggle.

Using this theory, this chapter focuses on how gardens ceaselessly are 'done', or come into existence, through the relational performances of people and plants. In order to develop this notion the chapter is divided up into three main sections. I begin by discussing how, for many people, gardening is simply something they do in a taken-for-granted way. The time and effort they commit to gardening varies and influences the type of garden they perform. Generally, people try to exhibit signs of care by controlling and ordering plant performances, which stems in part from a sense of public obligation. Second, I discuss the personal reasons for such attempts by illustrating people's efforts to reduce the amount of work required to create a garden. This reflects their personal attachment to particular plants and a consequent process of positive selection of some plants and the removal of others.. In the final section I focus on the practice of weeding and what constitutes a 'weed'. Here I argue that whether a plant is determined to be a weed is not pre-determined or pre-figured but rather is *performed* by people and plants. Consequently, I contend that people's weeding practices create multiple realities for native woody seedlings.

2. Controlling, ordering and taming plants in gardens

Contemporary New Zealand gardens are typically a mixture of styles and native and exotic plant species (Barnett 1995, Leach 2002). This reflects differences in people's individual and familial needs and desires, shaped by factors such as marketing, expert and lay knowledge, and cultural and emotional connections (Bhatti and Church 2001, Hitchings 2003, Head and Muir 2005). Consequently, the types of gardens people find attractive, attempt to create and maintain are diverse, as was reflected in my interviews. The following two accounts about what attracted people to their current property illustrates this point:

David The style of garden I really like to have is a very English type garden with lots of structure to it. [...] [So] I was very keen to get a place that had significantly mature trees. We were fortunate to get that [and] as a bonus [it was] backed up with nice rhododendrons, camellias, azaleas [and] that type of thing. So the garden had a visual appeal ... but also a structural appeal to me. In other words it had good tree structure in it [with which] you could [then] bring the garden forward and have whatever else you wanted.

Elizabeth [My] initial thoughts were oh my God. Because I think the people that were in the place before us were a couple of very, very old Asian people and before that it was a student flat. So nothing had been touched for about fifteen years. And my husband [is] not a gardener and neither am I. We were like [*laughs*] "ok this will be good". [B]ut we liked it because of all the trees and stuff ... I mean we looked at loads of places and most of them had nice driveways, and little beautiful paths, [but] we're not [those] sort of people we like something different. [...] We just like the sort of the ... natural ... unstructured look. And it's like every season something will pop up, like there are bulbs all round the place.... [Y]ou go into some areas and they have all the different season flowers up and I think *nah* that's not me ... we [won't be] all of a sudden putting in paths and water fountains (original emphasis).

In these examples we see two very contrasting accounts. David was attracted to his current property by the structured, formal, English garden, typically characterised by displays of control and order. Meanwhile, the "unstructured look", of a less controlled or "untouched", more "natural" garden was what appealed to Elizabeth. Despite their

differences, however, David and Elizabeth, like all the respondents who took part in this study, attempt to control, order, and tame the performances of plants in their gardens to some degree through their gardening practices (see Table 6)⁴⁶.

Table 6. Time spent by respondents on average per week, in minutes, on gardening practices⁴⁷ on their properties during the different seasons of the year.

Season	Mean (\pm S.E.)	Median	Range
Spring	194 (\pm 20.5)	120	0-840
Summer	216 (\pm 22.8)	120	7.5-900
Autumn	158 (\pm 15.6)	120	0-600
Winter	105 (\pm 13.0)	60	0-600
Average	168 (\pm16.7)	120	7.5-630

2.1 'Doing' the garden: gardening and plant performances

Creating and maintaining a garden that meets one's individual and familial needs and desires, typically involves physical gardening work. As the results presented in Table 6 show, some form of gardening was undertaken on all of the properties surveyed. The time committed to these practices varies considerably across properties but on average most people spend approximately two hours a week gardening through the year. My finding is reasonably consistent with a time use survey that investigated the amount of unpaid work undertaken by New Zealanders. This survey found on average gardening occupies around one hour, per person, a week (Statistics New Zealand 2001a). People, as these findings illustrate, take part in 'doing' the garden (cf. Rose 1999), in other words, they are actively involved in the continuous making and re-making of the garden as a place (Crouch 2003b, Hitchings 2003).

The sense in which the garden is 'done' or performed by people became apparent during the interviews and surveys. Doing the garden, for example, is part of Dianne's

⁴⁶ The notions and ideas underlying these attempts are well established (see Appendix 13, Nassauer 1997, Leonard et al. 2004).

⁴⁷ This excludes time spent on maintaining the lawn, spraying and watering

taken-for-granted everyday life and she found it difficult, therefore, to go into details about how often she gardens:

Oh well in summer time you go around the garden don't you? And you start doing things and you just do. [It is] ... one of those [things] you just do. [I] sit on the front terrace out there and I see something that needs doing. So I pick up the secateurs [to do something that was] supposed to take five minutes and [I] come in a couple of hours [later] because I've been pottering around further.

Similarly, Rebecca, when asked to break down the percentage of time she spends on different gardening practices during the seasons (see Appendices 3 and 4), observed:

It is quite hard to break down [the] things you do over a year ... because sitting here you kind of think I do it all the time and I just do it because it needs to be done, I do it. But when you think about what you doing you are right. Here I am minus four degrees and I'm out there pulling out weeds and raking up some of the dirt the cats have been in scuffing up ... and it's like blast them. So you know [you are] constantly doing things to try and keep on top of [the garden].

The types of things people are doing, or rather, the gardening practices they are undertaking (see Figure 6) and the length of time taken to carry them out (see Table 6), typically change throughout the year. Such changes reflect the nature of the tasks undertaken, which are in turn, shaped by the performances of plants often connected with variations in humidity, temperature and sunlight during the seasons. Mary discussed how her involvement in the garden varies, observing that: "Some weeks I might not go out there at all. But then some weekends I might be out there all day Saturday, all day Sunday. It depends on the weather; it depends [on] what needs doing". In Jennifer's eyes there is always something to do, but what requires doing, and the time it takes changes:

In the winter [there] is leaf raking by the mile and that takes a lot [*laughs while saying*] of *time and energy*, very good for keeping warm. And really right [through] until July the leaves come [and] I guess April onwards they start. So that's a big job and takes me a lot of the time. And the pruning [*laughs while saying*] *starts* in the winter. The roses seem to take a lot of time. Then the spring comes and dead heading roses and ... the lawn mowing begins. After that the there are times I actually do sit in the garden [*laughs while saying*] *but not really*. And the weeding and I do try to keep the place sort of reasonably tidy..... So

I do a bit of weeding here and there. And then the autumn comes and we have a plum tree which has huge quantities of plums so that seems [*laughs while saying*] *to take a lot of sorting out*. Cleaning and all the rest of [it] and then we are back to winter again. So there are different things but it is constant.

Jennifer's account again gives the impression that there is always something that requires attention in the garden. We begin to see how the garden is made and remade throughout the year through the different performances of plants and people. The seasons, in this sense, are performed and experienced by people in the midst of their own physical involvement in the garden as they rake, remove and tidy up leaves after they have fallen. As Figure 6 shows this is predominantly a seasonal task largely undertaken in autumn and winter. Further, the changing of the seasons, and people's associated experiences are performed visually through the material performances of deciduous shrubs and trees as they undergo their lifecycles. These colourful, visual performances are one reason why David has more affiliation with exotic rather than native species: "They look beautiful, they have lovely foliage and ... lovely colour and they are deciduous where as most of the natives I guess are evergreen. So you see the beauty of the autumn leaves and then you clean them up [*laughs*] they make a real mess".

2.2 Creating a beautiful garden: doing the garden and cues for care

People, as we have seen, are continuously involved in the 'doing' of gardens and the types of gardening activities they undertake change in association with the seasons and the performances of plants as they undergo their lifecycles. The time people commit to gardening, as observed earlier, differs substantially across properties (see Table 6). In summer, for example, some respondents (6%) spend less than 20 minutes a week on the garden compared with others who spend 12 hours (5%) or more. Differences in the time committed to doing the garden reflects not only an individual's interest in gardening but, as a number of people observed, the type or style of garden one is capable of performing, as Alex explains:

I had a friend he was a gardener by trade He had a prize garden and ... used to win competitions and I always used to think yeah very nice and all the rest of it but there was a lot of work [there]. And I wasn't quite prepared to put that time in you know. And it's nice

to see good gardens but ... you just have to put a lot of time in. Another one was ... we had a house at Akaroa and ... our neighbour ... just below us ... had a prize garden there. Yeah but him and his wife [were] dedicated and ... [were] in the garden all the time.

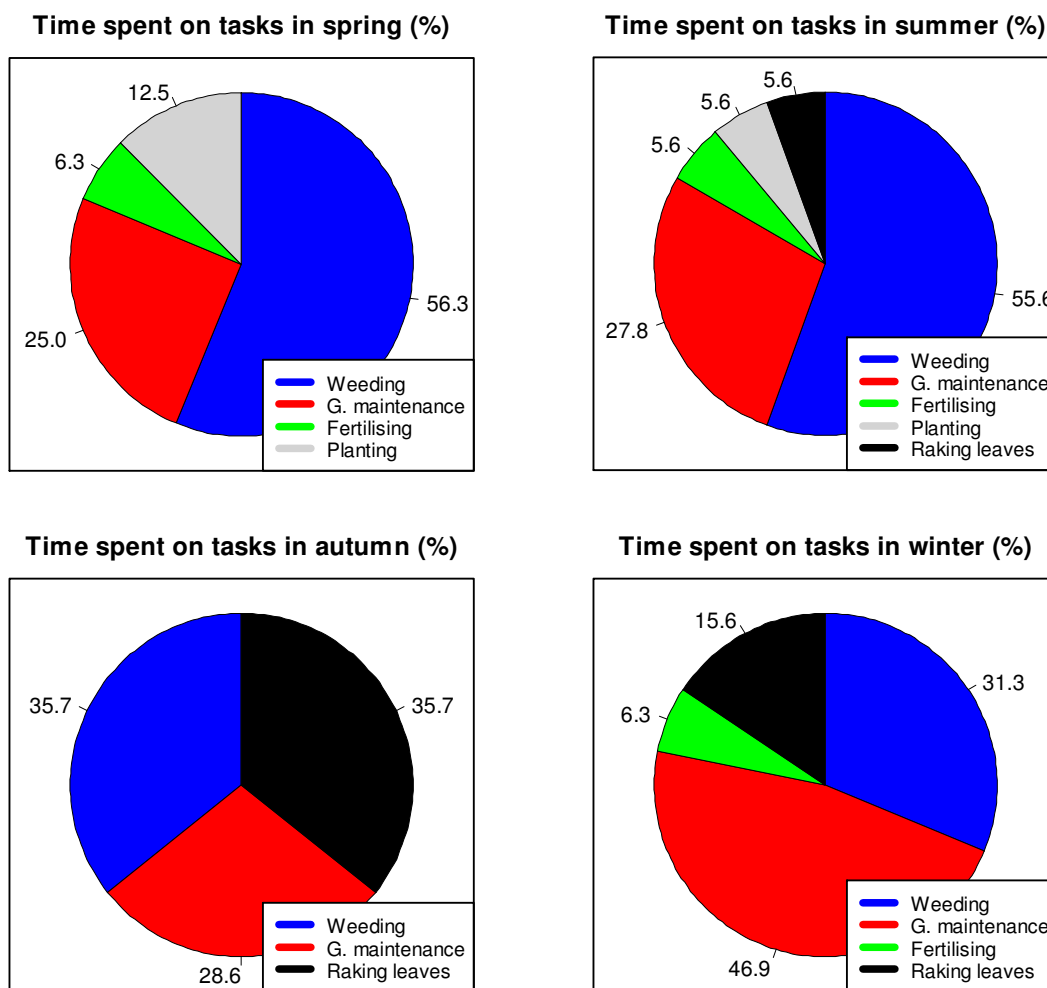


Figure 6. Percentage of time spent on different garden tasks during the seasons. Instances where a percentage equated to zero are not included. “G. maintenance” is short for general maintenance.

By dedicating a considerable amount of time to doing the garden, people are able to create and maintain prize winning gardens. These gardens are where, in Alex’s words, “everything [is] immaculate ... everything [is in a] straight line [...] everything [is] in

flower and everything [is] neat”. Plants, and their performances, in a prize-winning garden are extremely ordered, controlled, and arranged very deliberately. This involves, as Alex observes, significant work, time and effort. Nassauer (1997) argues that the attractiveness of any landscape, including a garden, is judged by the degree to which it visibly exhibits care⁴⁸. With plants ordered, controlled and arranged in abstract rather than naturalistic forms, these prize winning gardens display obvious ‘cues for care’ (Nassauer 1995) through which they can be deemed to be attractive and beautiful.

The private roles and meanings of gardens are entangled with, and often compromised by, associated public responsibilities (Francis and Hester 1990, Blomley 2005). Maintaining a garden that conforms relatively closely with the aesthetics of one’s neighbour is a prominent responsibility (Nassauer 1997, Blomley 2005). A socially acceptable garden, like a prize-winning one, displays ‘cues for care’ (Nassauer 1995) evidenced by the creation and maintenance of a neat and tidy garden form (Nassauer 1997, Blomley 2005). Those that do not are typically perceived as neglected, “abandoned and messy” (Nassauer 1997, p. 75). Most people share the idea, therefore, that a neat and tidy garden reflects “good intentions and social meaning: stewardship, a work ethic, personal pride, contributing to a community” (Nassauer 1997, p. 69, Blomley 2005).

The apparent need to do the garden stems in part from the desire to maintain its neat and tidy appearance by showing signs of care. The importance of this task was expressed in the survey where 77% of respondents felt having a ‘neat and tidy garden’ was either ‘important’ or ‘very important’, 79% having a ‘garden that compliments the house’ and 82% having ‘an aesthetically pleasing garden’ (see Table 7). Further, the significance of having a neat and tidy garden was illustrated by the fact that interviewees commonly used these terms to talk about other people’s gardens in their neighbourhood:

Beatrice: People keep their places ... neat and tidy.

Ken: Some of them are quite interesting, others are a bit more boring and some of them are tidy and some of them are untidy.

Dianne: In this locality here they are all neat and tidy and one or two are quite outstanding.

⁴⁸ She traces these ideas back to the picturesque and gardensque landscape movements (see Appendix 12)

Table 7. Percentage of respondents⁴⁹ who considered various features or purposes of their section or garden to be important or unimportant

Feature or purpose of the section/garden	% Important	% Indifferent	% Unimportant
Sunlight	96.1	2.4	1.2
Privacy	91.7	7.1	1.2
Outdoor living	82.1	9.5	8.3
An aesthetically pleasing garden	82.1	10.7	7.1
A garden that compliments the house	79.8	8.3	11.9
Trees	78.6	13.1	8.3
A neat and tidy garden	77.4	16.7	6.0
Room for kids to play	71.4	11.9	16.7
A low maintenance garden	71.4	19.0	9.5
A garden where you can entertain guests	71.4	15.5	13.1
Shape and form in a garden	70.2	19.0	10.7
Colour	67.9	23.8	8.3
Flowers	66.7	26.2	7.1
Shade	58.3	21.4	20.2
Trees that lose their leaves in winter	46.4	25.0	28.6
A vegetable garden	40.5	16.7	42.9

Plants require some form of maintenance to appear looked after as a result of the agency embodied in their ability to grow and spread in space and time. By maintaining plants in the garden people are able to display signs of care, evidence of a neat and tidy garden, which conforms to others in neighbourhood. Left unattended, as many people observed, plants could, and would ‘take over’ the garden. Jim captured these sentiments and suggests this is even more of a problem in New Zealand’s temperate climate as the “growth is so prolific ... that if [the garden] is not tended it really runs riot”. There is

⁴⁹ Due to rounding rows may not always total 100%

very much a sense of the possibility here of plants in the garden creating something else through their prolific growth. In the absence of a gardener, the garden will lose all of its order becoming a disorderly, unruly disturbance, a riot. The uncontrolled performances of plants, therefore, can contribute to the perception that the garden is neglected, abandoned and messy (Nassauer 1997).

The above points were reinforced by a number of interviewees particularly when they discussed the state of the garden they inherited. Mark, for example, talked about the condition his family found their current garden in upon arrival and the changes they have subsequently made:

This whole area was a *forest* ... overgrown with [rhododendrons].... They were *so* old and ... massive. They were ... so uncared for they were in [a] dreadful condition. They'd gone past it. It could've been beautiful but it had been left for like years. The people who were in here just let it go or they didn't know what they were doing. [...] So we carted everything out ... and cut it all down. Then [we] filled it in, put the ready lawn down and just moved the garden back out, obviously because it was in here. [There was] a big old rose garden in the middle there but again the roses, they'd been let go. They obviously didn't have a gardener and they didn't really care (original emphasis).

The rhododendrons and roses on Mark's property as he describes prior to their removal had continued to grow and develop, to perform. Without any maintenance, however, these woody plants which are capable of taking on and being crafted into, aesthetically pleasing forms, have "gone past it". These plants have lost their visual appeal as they no longer clearly exhibit any signs of care. In the process of their becomings they had transformed themselves and the garden into something else which did not conform to any garden styles or conventions associated with order and control, as Mark explains:

There was no structure to the garden. No formality, it didn't have a theme it wasn't a classical garden or a contemporary [one]. It had just been let go and it really needed a total overhaul.... So we thought let's just strip it all back ... [and] just live with it for a year or two ... and see what we need.

This total overhaul will possibly enable Mark and his wife to more successfully establish a garden that suits their personal and familial hopes, needs and desires thus creating a positive home-related sense of place. These changes enable them, furthermore,

to create and maintain a garden that provides cues for care demonstrating that unlike the previous owners, they “care” and take pride in their property (Nassauer 1997, Blomley 2005). By doing so they are contributing to the aesthetics of the neighbourhood and demonstrating their stewardship and work ethic. A garden, therefore, is not only a place where you grow plants, but as Joyce suggests also influences people’s perception of you, as it reflects who you are:

[I]f you saw people that owned [a] property [that was] just neglected ... I’m sure that would influence you, and what you thought about those people. Wouldn’t it? You know I’m sure it would. [Y]ou’d be surprised or I think you would be. You’d think oh dear. I think it would reflect [who] they are.

Joyce, not surprisingly, suggested one of her main motivations for gardening was display signs of care: “I like [the garden] to look nice. No I wouldn’t like to see all [the] weeds I’d be ashamed. [I] tidy it all up and try to keep the weeds down and trim a wee bit off and keep it tidy”. This sentiment was echoed by Simon: “my main purpose is to present a caring environment, a caring place ... I’d hate [my garden] to be known as weed city or something” (see Figure 8). There are, in addition, to this sense of public responsibility personal reasons for controlling, ordering and taming plants as elaborated on below.

3. Creating a desirable garden

The ability to control and order the performances of plants can allow people to create a garden which they are personally attached to as illustrated in Mark’s above account. Through their continued growth and development, plants, some more than others, can disrupt and challenge such aspirations. Plants with the embodied agency for fast, vigorous growth, which can shade, spread and smother, can potentially exclude, out compete, impact on or damage, other plants that cannot perform in this way. Rebecca, for instance, described how when they arrived on the property the garden was “unruly and it was not healthy” as “stuff came way out to here”. In particular a self-sown mulberry bush was causing a lot of damage:

There was a huge mulberry bush growing up the middle of [that plant] at the end there. [W]e had to get that out ... I think a bird had gone [and] pooped and the seed had grown. It

was horrendous and was just taking over and ... killing everything...you can...see there is...a big gap in there where it had taken over ... Some of [the plants] are still coming back (see Figure 6).

Rebecca's account demonstrates two points. First, plants do not grow anywhere, they grow somewhere. And in the process of growing or becoming somewhere they affect, and are affected by others around them. The mulberry bush becomes mulberry bush, in relation to, most noticeably in her account, the surrounding plants, which it was managing to take over and kill. Alternatively, it could be argued that the adjacent rhododendron and *Pittosporum tenuifolium* were spatially limiting the mulberry bush from fully realising its form. It was the mulberry's capacity to negatively impact on their health, however, which encouraged Rebecca to have it removed. Second, in becoming mulberry bush it was able to create and change the character of the garden as a place. The mulberry bush before it was removed, in becoming, was shaping not only Rebecca's garden but also her sense of place, challenging her desire to have an ordered, tamed and controlled garden full of healthy plants.

Rebecca's aspiration to have such a garden she suggested reflects who she is: "that's just me I'm a neat and tidy person to a point so I discovered on a trip around Europe. I couldn't stand chaos and I rather like neat and tidy". For her and others the apparent public responsibility is intimately linked with, or even stems from personal motives for gardening. Among these, some share an aspiration to live in surroundings with order and control. These reactions to the idea of leaving their garden to go wild, illustrate this feeling:

Mary: It would *drive me mad*. I mean I do forget about the front. But when it gets to be an eyesore *I have to* go out and tidy it (my emphasis).

Joyce: Would I want to live with clothes strewn all around the place [or] dishes piled up in the sink. Would I want to live like that? No.

Ken: I wouldn't be very keen on that idea ... *I just couldn't bare it*. It would be just *too horrible*, I contemplate I'd be shifting out to go to a smaller place (my emphasis).

Here we see expressions of the sense of ownership, identity and attachment that has developed around maintaining the garden to a certain standard. Mary *has to* go out to tidy

the front garden when it becomes an “eyesore” or otherwise it will “drive her mad”. Joyce does not want to live in a state of disorder either inside or outside of her home. The thought alone of not having his garden under his control is “horrible” for Ken. He seems to imply that if he was no longer able to maintain it to his desired standard that he would be most likely to move to a smaller property where he could. As he explains many of the positive experiences and meanings he ascribes to this space are connected with performing a neat and tidy garden: “It gives me pleasure to keep the place looking good. That would be my main purpose [in gardening] to ... keep the place tidy really. And it might as well be nice ... while you’re [around] it”.



Figure 7. The remnants of a becoming. The gap left by a self-sown mulberry bush that was taking over and killing the adjacent rhododendron (left) and *Pittosporum tennifolium* (right). Picture taken by B. J. Doody.

3.1.1 Growing flowering plants

Controlling and ordering plants in the garden has another implication as David and Robert explain. David contends “there is no sense in just allowing nature to take over [as

you] get no response”. An uncontrolled garden does not “fulfil” his “needs” or “desires” for an “English type garden” with “colour, visuality, significance, depth [and] obviously beauty”. He also wants “tidiness to some degree” and “some order in it”, therefore, he explains: “It is better that I take control than it takes control of me ... [If] I’m in control of it ... [then] someone [or something] else isn’t making decisions about what’s important in my life”.

Robert shares David’s sentiments. In discussing the idea of leaving his garden to go wild, he suggested that there are problems with such a philosophy as “when things go wild ... they make life difficult ... or they start to. I mean this was the problem that we had [with] a holly tree, two kiwifruit vines and some other nasty big ... multi finger[ed] thing ... [they were] all over the place”. In making life difficult, some plants can damage other plants in the garden, but there is something more involved for Robert. Left unattended, certain plants will not only damage other plants but also determine what you can grow in your garden: “I do like daffodils and...irises. I do...like those flowering annuals. [S]o I don’t ... think I would be totally comfortable with just letting it [go] wild, just because I want more, ultimately”. Keeping the garden under control allows Robert and David to include plants which hold significant meaning for them in their gardens. In preventing, removing and controlling some plants they are both able to establish conditions suitable for growing flowering plants; a point David reiterated in recalling his experiences with weeds and flowers:

Weeds always bloody grew when flowers wouldn’t [*laughs*]. So weeds always had the ... strength ... and the dominance in the garden. And it was always get rid of the weeds or they’ll take over and force ... the flowers to die.

Similarly, Jennifer, who has a number of large trees on her property, spoke about the compromises associated with having such trees. Having planted the trees with her husband forty years ago she suggested that “one has to adapt” with large trees as they grow:

We [had] quite a big vegetable garden at one stage [but] ... that got overshadowed [by] the trees so one had to ... make a decision about that. ... [...] We ... have [also] got very little in the way of flower garden[s] and again that is basically a time thing and the fact that the trees have grown so big so that block out a lot of the light [...]. I do enjoy the trees but I do

think they are [*laughs*] pretty big. I am ... conscious of the fact we have had one or two neighbours [down the] back [who] are not very happy with that and we've had to compromise a bit there. I don't know as time has gone on and with the children growing up it was a wonderful backyard for them. So those things have been amazingly positive. I don't really regret not having a large flower garden.

Jennifer's account demonstrates how through their sheer size trees can shape gardens as they come into being playing a role in determining what other plants are capable of growing in the garden. The size and shapes plants can become inconvenient in other ways, as well as, functional as we shall now see.

3.1.2 Woody plants and the practicalities of everyday life

In the absence of care, plants can take on shapes and forms which can become impractical in the context of people's everyday lives. Sharon, for example, spoke about her annoyance with her brother for planting shrubs on the border of the driveway that require constant attention: "He put these stupid bushes in which I think don't [belong as] they take over the driveway. We need that driveway to get into the garage ... They are forever getting cut back [because] they are growing outward. They are not a round tree they are just wide. [I]f you look up ... the driveway you can see if you don't cut them what is going to happen". Elizabeth, as she described earlier, inherited a property which had not been "touched for about fifteen years". She spoke about her husband's attempts to create a more practical and safe garden:

When we moved here ... you couldn't even see in these windows here [because] of the trees So my husband had to get out [there] and he cut [a] load of stuff back and down. Out the front we couldn't even see the road. It was really, really badly overgrown and so he just went nuts. ... Trailer loads and trailer loads of bits and pieces ... went to the dump. [It was mainly] trees ... that were leaning, broken [or had] died.

The foliage and sheer size of some woody plants can provide shade from the sun. Shade is a valued resource; sunlight, however, is more commonly sought after. A point illustrated by the survey where sunlight was considered either "important" or "very important" by 96% of respondents compared to 58% for shade (see Table 7). Large trees by casting shade on nearby properties can cause tension between neighbours, and

contribute to neighbours' experiences in their gardens and the negative ascription of meaning to those trees. Mary spoke of living adjacent to a property and how it affected her family's everyday lives:

We used to have a great big hundred foot macrocarpa tree at the back that used to shade [our property] from about half past ten, eleven o'clock till about three o'clock in the afternoon in the winter time. The ground was wet; the kids couldn't play out here or anything because it was just so cold. [We] couldn't get the washing dry. We ask[ed] [our neighbour] if it could come down and she said no. [...] She didn't want it down. We put up with it for ... years and then it [...] fell down and she had to live with it and it fell ... on her place [*laughs*].

For those with the trees on their residential property, shade created by a tree can be of equal concern. Catherine discussed how the red beech (*Nothofagus fusca*) in her garden needed to be pruned at the top "because in winter it's shading this side [of the property]". Others who experience the loss of sunlight cut down trees. Robert explained his decision to remove "two huge conifers": "I can remember driving into the house and thinking, oh, those conifers have got to go. Partly because they were shading the house and we never got any sun in our bedroom and partly it was just a personal thing about conifers".

While trees create shade, as Michael observed, they can "screen out neighbours" too. The native section he has created has been especially important "in actually reduc[ing] the [impact of] infill [housing] and maintain[ing] privacy". As the survey highlighted, privacy was considered either "important" or "very important" by 92% of respondents (see Table 7). Many interviewees valued woody species, especially trees, for the privacy they afford. Elizabeth suggested "with all the trees ... it's important not to cut anything down or get rid of anything because it gives you a bit of privacy". Simon observed that his garden and the trees within it do more than just surround his house, rather they create "a little oasis":

What sort of role does [my garden] play in my property? It just surrounds a square rectangle. But if you are in the rectangle, that's the house, and you're looking out and you can see green leaves and trees of various shapes ... right around, that's shit hot. Now [at this time of year] it's relatively bare but you're still blocked in. When it's spring and

summer and times like that you are completely surrounded and you see no other. You may see some lights through the greenery if you are lucky. So in that respect that puts you in a little oasis by yourself it's great, it's good, it's good. It's also a sound [deadener] as well.

3.2 A desirable garden and sense of place

By controlling and ordering the performances of plants through their gardening practices people are able to re-enact and legitimise the positive sense of place connected to their gardens. When this level of care is unattainable due to a variety of circumstances, negative meanings may be ascribed to gardens, thus contributing to or creating a negative sense of place, as these accounts highlight:

Beatrice: I think our [garden] is average ... it could do with a tidy. In the last year since things have been tricky [with Jim's health] it [has] not [been] as neat and tidy as we'd like it to be.

Jennifer: I would like to have a bit more of a beautiful garden but it's a time factor. [...] I have to be realistic and realise [my garden] isn't going to be as tidy as it should be. [...] I guess that's for me a personal reason. My husband dropped dead and none of the children are living here and now I'm living on my own. So I would like ... to stay here for a while [and] to cut down [on the work because it is] really [too] high maintenance [at] present for me.

Catherine: I probably get just a little down because I can't maintain it [...] [But] at the moment [I'm] too busy with my children as much as I'd love to be out [t]here sorting this garden out. I don't have the time at the moment [...] It's not that I detest [the garden] but I have to ration my time and its bottom the list.

In each account we see how particular circumstances have made it difficult to maintain the garden to a previous or desired level of care. The ill health of Beatrice's husband and the loss of Jennifer's, has increased the amount of gardening they both have to undertake personally if they wish to continually recreate previous performances or, in Butler's (1990) terms 'iterations', of the garden. In such instances, the garden can come to be viewed as a burden, a perception that can also develop as the ageing body "becomes subject to physical limitations, illness and disability" (Bhatti 2006, p. 318). In some

cases, people may choose relocate to a smaller, more manageable property, as Dianne, who is now in her nineties, described doing:

I lived [on my last property] for thirty years. My husband died and I stayed on for seven. [I] had a big garden there that I was trying to do myself and it was too much. So the family suggested that I pick up and move into something smaller that I could handle myself so we chose here.

As both Jennifer and Catherine want to continue living on their current property this may involve two alternative decisions: 1) accepting that the type of garden they aspire to have is not currently, or may never be achievable; and 2) attempting to create a garden which requires less maintenance. Both accept their current situation and like many people are trying to reduce the time and effort it requires to be maintained.

3.3 Creating low maintenance gardens

3.3.1 The desire for low maintenance gardens

The movement towards low maintenance or easy care gardens (Leach 2002, Menzies 2004) has been attributed to people's growing desire to look at, sit and relax in, instead of working in, these spaces (Bhatti and Church 2001). In New Zealand, this has been traced to the adoption of Californian concept of the garden as an outdoor room, in the 1950s, which often involved considerable expenditure on hard landscaping (Walker 1995, Leach 2002). The house and garden, in an idealised 'Californian' lifestyle, were "the setting for family leisure and not simply places in which to labour in one's spare time" (Walker 1995, p. 167, Leach 2002). With the intensification of work and the rise of dual worker households the notion of the garden as an 'outdoor room' has slowly gained momentum (Williams 1995, Bhatti and Church 2001). My findings lend some support to these claims: 82% of respondents felt "outdoor living" was either an "important" or "very important", and 71% having "a low maintenance garden" (see Table 7).

This low maintenance aspiration is associated with the sense of obligation, personal attachment and identity people attribute to creating a garden which exhibits signs of care, commonly manifested in its neat and tidy appearance. Circumstances, as illustrated above, can dictate the amount of time and effort people can dedicate to this

endeavour. Mark, for example, observed that he and his wife, who are raising two children, “work long days and ... just like to come home and relax”. He elaborated on this saying:

I mean I want to come home and enjoy my garden I don't want to work in it as much... I would just like to start enjoying it. [...] [So we get] the garden done at the moment and it is nice to come home and ... be able to sit out there and eat and something and not feel the urge to get up and start weeding and things like that. [It is] nice to just actually sit back and take it in [rather] than to feel obliged to work in it.

Mark shows how he and others have reduced their involvement by getting additional help. For those unable to afford to so, or who chose not to, the alternative is creating and maintaining a garden where they are able to control and order the performances of plants, thus displaying signs of care with minimal involvement as now discussed.

3.3.2 Creating a low maintenance garden: weeds and the selection of plants

Creating a garden that is low maintenance can be achieved through careful planning, arrangement and selection of plants. Weeding is a significant way by which people control undesirable or unwanted plants in, and maintain control and order of, the garden. Weeding is characterised by active, physical and bodily engagement with plants, the earth, and sometimes tools (see Appendix 13). Rebecca exemplifies this in her description of weeding, “it is getting out there and using a fork or a knife and digging [plants] out or putting the gloves on and pulling out the weeds”. The physical nature of this practice and the ability of, some plants, to grow, spread, and reproduce, rapidly (e.g., chickweed (*Stellaria media*), milkweed (*Euphorbia peplus*) and *Oxalis* spp.) means that for most people⁵⁰ this task, often requires a lot of time and effort, typically throughout the year (see Figure 6 and Table 8).

⁵⁰ Only three respondents (4%) reported not spending any time actively weeding throughout the year.

Table 8. Time spent by respondents on average per week, in minutes, on actively weeding on their properties during the different seasons of the year.

Season	Mean (\pm S.E.)	Median	Range
Spring	76 (\pm 8.7)	60	0-378
Summer	99 (\pm 11.5)	60	0-495
Autumn	43 (\pm 5.0)	27	0-234
Winter	23 (\pm 3.2)	12	0-165
Average	60 (\pm6.1)	42	0-250

Endeavours to reduce the work involved in garden maintenance commonly involve attempts to prevent weeds from establishing and growing (see Appendix 14). Joyce, who is in her late eighties, was finding “by the time I would do [the gardens] ... I didn’t have time to do all of them. [I would] get all the around it would all need doing again”. As a consequence, she has put down pebbles in some parts of the garden. Mary has used stones and polythene plastic to reduce the time she is forced to spend weeding on her property as they “would prefer to go away in the caravan than spend time mucking around here”. Walking around the garden, Sharon suggested “the weeding is probably due now but getting time to do it is the main issue. We know it’s got to get done”. As she explains they “hope to bark [mulch] a lot of the area [so] it won’t need to be done again”; an approach that has been reasonably successful on their former vegetable garden:

The idea of barking came in ... as my husband was forever weeding it [...] When you first see our garden ... up the driveway it looks clear [...] visual[ly] [...] So that makes you feel a lot happier when you drive up [as] before you actually look at anything else you say ... that’s nice [*laughs while saying*] *when you know very well every other part of the garden has got to be weeded.*

Creating a low-maintenance garden can involve the careful selection, planting and arrangement of plants, and the removal of others. Woody plants are increasingly selected for their growth habit and limited care requirements and used in the creation of low maintenance borders (Leach 2002, Hitchings 2003, Menzies 2004). These attempts often coincide with various attempts to prevent weeds establishing (see Appendix 14). Robert

has noticed the benefits of using mulch, suggesting “[I’m] actually having to look quite hard now for weeds”. He has also enlisted the help of a nurseryman to remove high maintenance plants and replace them with ones more easily they are managed:

One of my patients ... is a nurseryman and so I asked him to come a year ago. [...] He knows that I don’t have a huge amount of time. And it was good for him to just walk around and say look this is something that takes a huge amount of care so in terms of you know feeding, trimming that sort of stuff.. So we just largely got rid of all of those things, so he’s been quite influential. [...] [He] was [also] the person who advised us about the plants for the back of the garage there. And once again [he said] these are slow growing, [do] not [require] much trimming, frost hardy, [and do] not need a lot of sun. [...] Basically our criteria [was for plants that] ... would be easily manageable.

Ken described how he has begun to create a garden that is “a little bit less intensive” by “filling things with permanent plants”:

There is an area over by the garage there that I’ve just put about four things in I’m going to fill that up with bits and pieces ... and then I won’t have to sort of look after that. But ... so you see a bit like that in front of the room there it doesn’t take much looking after either. And the rhododendrons don’t need looking after there is about twenty or so of them over there. ... So that’s what I’m intending to do a bit more of.

Simon, in contrast, is content he is “not a slave in the garden”. He attributes this to having “a couple of wee focal areas [...] with flowers and things” (see Figure 8), while the remainder as he explains: “Can get watered and lives away with its leaves and the trees and things like that. [...] It’s quite happy by itself. [...] Probably if you put it down to anything it is more letting things lie; letting things do their own [thing]. Not moving too much off the section but letting the leaves go down. Obviously ... you’ve got to move something off [but] otherwise it would [be as I] say just letting things lie [and] mulch up” (see Figure 9).

3.4 Making the cut: colour, shape and form

Woody plants, as highlighted above, increasingly are selected by their growth habit and required care which favours plants capable of performing in this manner. Performances then can be viewed as skills, strategies or techniques by which plants can persuade people

to plant and let them survive in the garden (Hitchings 2003, Power 2005). Some plants, for example, can “gradually draw [a] person ... into their world, and make for an understanding of their concerns and a commitment to their care” (Hitchings 2003, p. 107). Native plants as a result of their unusual character⁵¹ possess a set of skills that do not necessarily conform to established garden conventions that place importance on aesthetic qualities of colour, shape and form; characteristics often associated with exotic plants (Leach 2002, Edwards and Given 2004). These unusual skills I suggest reflect the types of native woody plants are included in gardens. Before demonstrating this point I discuss some of the reasons why people value more conventional, exotic, performances.



Figure 8. Simon’s rose garden as seen from the pedestrian footpath. This is one of the few areas he actively maintains to demonstrate that his property is looked after and lived in for both personal pride and security reasons. Picture taken by by B. J. Doody.

⁵¹ Chapter 6 and sections of this chapter provide a brief discussion of these characteristics. For more detailed accounts see Webb and Kelly (1993) and Edwards and Given (2004).



Figure 9. One of a number of areas on Simon’s property planted out in mainly shrubs and trees. By leaving these areas to largely ‘do their own thing’, he has significantly reduced the amount of work he is required to do in the garden. Picture taken by B. J. Doody.

3.4.1 The changing of the seasons: deciduous and flowering plants

Deciduous woody plants, as discussed earlier, which produce and lose colourful leaves as part of their lifecycle, play a significant role in performing the seasons. These colourful performances can be enough to convince some people of the value of retaining them despite the work they create, as Ken observes: “I like deciduous trees. I don’t so much like cleaning up the leaves after they fall [...] [but] if you want to have the trees ... you’ve got to put up with the leaves”. Such lifecycles, however, have associated benefits and some trees create more work than others, as Alice illustrated:

The one great variegated elm is the only big tree I can cope with because it’s not a tree that bothers me. Its leaves ... can go in the compost and rot down well. They are soft [and] ... I can gather them without having to pick [up] each individual [leaf]. [...] [Although big trees can] shade the house [...] that isn’t a problem because when its leaves are all off it allows the sun through anyway.

Catherine reiterated a number of Alice's points describing how she wants to plant a small "weeping maple or something similar":

Because ... you don't want big roots to go through the foundations. But you know it looks quite nice and then also if I can get one with good colours for the autumn it will be nice to look at as well. Because the autumn leaves are good around here. But I don't want a huge big tree because we have enough leaf fallout from all the other trees around us.

Woody plants that produce colourful flowers, further, can contribute to people's experiences of the changing seasons. Jennifer highlighted the importance of the camellias and roses she has planted in her experiences of spring:

It is lovely in spring when ... [the] bank of camellias that come out all along that area with different colours [...] and the roses start coming out in their burst[s] of colour. It is so exciting when the first ones come.... Spring especially [is] always lovely in Canterbury.

Spring is an equally joyous time of year for Joyce as this is when her rhododendrons, azaleas and white magnolia unveil their "beautiful" flowers and fragrant "perfumes". Even though she has been living with these plants for more or less 17 years, they still provide her with great deal excitement. This was no more evident than when I was walking around the garden with her and she noticed the buds of her rhododendrons were beginning to unfold: "Oh there's my rhodies starting to come [out] *oh look, oh look*. The girl across the road says she can see this. Oh look at it (original emphasis)".

Being capable of such colourful performances has ensured that roses, rhododendrons and camellias are plants that have commonly been added to, and have remained in people's gardens. The only instances where my respondents reported removing them was when they had not received any or sufficient maintenance and/or had grown too old. Even then often the removed plants are replaced, particularly in the case of roses, with the same or similar species. Camellias and rhododendrons provide the added attraction of being, as Mark observes, "low maintenance" in that "they can do their thing" and "look after [themselves]".

Maintenance is often required, however, to promote and encourage roses to provide desirable performances. Michael's description of his wife's involvement in their front garden, of predominantly roses, is illustrative: "She does lots of weeding, rose-pruning, fertilising, quite a lot of watering, [...] dead heading just to keep the flowers

looking really good [and] a lot of spraying mostly for insects”. Dianne reiterates Michael’s point: “you spend more time on your roses than anything else with the dead heading and pruning and all that. But they are worth it. [They are] lovely [...] and flower from July through”. These accounts are illustrative of how roses through their colourful floral performances draw people into their world compelling her to understand their concerns and commit to their care.

3.4.2 Evergreen plants and ‘exotic’ natives

Native plants produce rather inconspicuous flowers and are usually evergreen (Webb and Kelly 1993, Edwards and Given 2004) and, therefore, are rarely capable of producing performances that vividly display the seasons. By not losing their leaves, evergreens possess the ability to provide colour throughout the year. Joyce attributes this skill to one of the reasons why she “likes natives”, as the retention of their leaves ensures they remain “nice for winter”. Exotic evergreens such as camellias and rhododendrons, unlike natives are capable of producing brilliantly coloured, attractive flowers, which are greatly admired. With small leaves, usually of varying shades of green, and inconspicuous flowers, natives do not commonly conform to traditional conventions which value plants deemed to be ‘beautiful’ or ‘ornamental’ based on qualities such as colour (Edwards and Given 2004). Michael illustrated this point in talking about his native section suggesting that it is “definitely not a beautiful garden”. Robert touched on this notion too: “I think ... a lot of the exotic plants [were] introduced because they are beautiful and I really like [...] seeing [those]. I think another thing is [that] ... I always [...] tend to think of native New Zealand plants as [being] much less ornamental. ... I can sort of think of five or six colourful New Zealand natives”.

This conventional emphasis on colour has shaped how native plants have been incorporated into gardens in New Zealand (Leach 1994, 2002). Leach argues the natives that “people proudly display do not really look like native species to be seen in wild habitats, being generally much more highly coloured” (Leach 1994, 2002, p. 214). They are “exotic natives” to use her term, appreciated by and large not because they are natives

but because they look exotic (Leach 2002, p. 223)⁵². This observation appeared equally as applicable to my research. Michael spoke passionately about his own native section⁵³, but suggested he is not “a purist” because he has a lot of “hybrids”. Although “disappointed”, he readily recognises and accepts this: “I know I actually garden for some colour and if it means bringing in hybrids it doesn’t worry me”. “The native planting [in my garden]”, Ken suggested, “is probably not so natural” as many of them have been “cross-bred” making them “different from the native ones”. Robert envisages his current garden will become “predominantly native with some ornamental [plants such as] ... roses”. He contends, however, that the natives he selects will “perhaps [be] more ornamental, bird attracting and flowering” species. This he suggests is because: “I do really like ratas and ... those sorts of things with the flashes of colour [such as] [...] reds and purples and variegated [plants]”.

4. Performing ‘weeds’

Gardens, I have been arguing, are spaces that are continuously ‘done’ or performed by people and plants. They are places that continuously made and remade; ceaselessly coming into existence. Gardening is a means through which people control and order the performances of plants in an effort to create or perform a garden which re-enacts and legitimises the positive sense of place they associate with this space. This can involve creating a neat and tidy garden, a place where they can grow plants that hold personal attachment or one that is practical. Weeding, I have suggested, is a critical method by which people control undesirable or unwanted plants in, and maintain control and order of, the garden. The focus of this final section is on this practice and the plants commonly associated with it: ‘weeds’. Drawing again on the ideas of performance and performativity (Thrift and Dewsbury 2000, Crouch 2003a, b, Szerszynski et al. 2003b) I want to demonstrate how a plant’s status as a weed is not pre-determined or pre-figured

⁵² Leach (2002) suggests hybrid cultivars such as *Pseudopanax lessonii* Gold Splash and *Phormium cookianum* Cream Delight are good examples of ‘exotic natives’

⁵³ He has included a number of species here rarely planted in gardens such as marbleleaf, wineberry and kahikatea

but rather is *performed* by people and plants. As a consequence, I contend, people's weeding practices create multiple realities for native woody seedlings.

4.1 Everyday conceptions of weeds

Exactly what constitutes a 'weed' has received considerable attention, with numerous efforts having been made to capture the essence of the term (see Harlan and de Wet 1965, Ross and Lembi 1999, Pyšek et al. 2004). Blatchley's (1912) contention that a weed is either "a plant out of place or growing where it is not wanted" has been suggested to be the most widely accepted (cited in Harlan and de Wet 1965, p. 18). A number of weed ecologists argue these definitions fail to differentiate between plants that exhibit weedy characteristics, such as heavy seed production, rapid growth and the ability to out compete other plants (e.g., choking growth, allelochemicals), and those regarded as "only occasional nuisances" (Ross and Lembi 1999, p. 1). In the context of residential gardens, however, conceptions of a weed often encompass Blatchley's contention, as well as, the identification of plants that display weedy characteristics.

The multiple interpretations of, the term 'weed' by interviewees demonstrates the uncertainty and ambiguity surrounding the term. The elusiveness of the concept, I suggest, can be attributed to its 'performativity' (Butler 1990, Thrift and Dewsbury 2000). Weeds, in other words, only exist in the doing of them; they have to be continually performed to exist at all (cf. Butler 1997, Crouch 2003a). This notion is highlighted in a number of interpretations provided in response to the question "when someone uses the term weed what do you think they mean", as illustrated by the following two examples:

Jennifer I don't know that's a hard question It would *depend entirely* on the sort of garden that they had how they would define a weed I guess. If they had a very pristine well kept place anything that they hadn't put in, they would see as a weed. Whereas to me it is more something that's, um oh, I don't know, dandelion that's growing out of the, ... I don't mind dandelions in the lawn, so it's whe[n] they are in the ... paving stones [that] I'd say it is [a weed] (my emphasis).

Michael A plant that's not desirable in the position ... basically. So *it could be anything*. It's like ... foxglove you know really cool stuff very nice but

generally for me it's a weed. I don't want to encourage [it because] I use to ... so generally *now it's a weed where in the past it wasn't*. Yeah anything [that is] in my lawns that [is not] grass: *Hydrocotyle* and all that sort of stuff. Any grass that's in my, in our native or [other] gardens [as well] right is a weed but all grass in the lawn are qualified. So it's something that's not wanted (my emphasis).

These accounts all allude to how the concept of a weed is performed by people and plants. Jennifer describes the importance of the context in which the interpretation occurs. In a pristine garden she suggests everything not planted is a weed, where in her garden it is dependent on where the plant is growing, and whether she deems that to be appropriate. Michael, in a similar manner, touches on the importance of the context in which the plant becomes established but also demonstrates the role the performances of plants play in constituting the scope and meaning of the term 'weed'. Michael talked about how he initially encouraged foxglove (*Digitalis purpurea*). It appears now that this species' ability to reproduce and spread (Roy et al. 2004) has resulted in Michael considering foxglove to be a weed.

Michael's account demonstrates the role that personal experiences of a plant's performances plays in determining whether a plant is considered to be a weed. The importance of such experiences was equally as evident in other accounts. Alex talked about his attempts to eradicate convolvulus (*Convolvulus arvensis*) and how such encounters provide a means through which "you learn" to identify weeds: "you soon get to know that convolvulus is [*laughs*] [a weed]. It is very hard to dig it out and get rid of it. Man it was like a carpet and it was so thick round there ... because it came from the back neighbours as well. You soon learn to know what is a weed and what isn't [*laughs*]". Catherine observed that whether a plant is determined to be a weed is a personal decision but in discussing her own interpretation described how her 'battles' with Japanese anemones (*Anemone hupehensis* var. *japonica*) have influenced her ideas:

It can depend on the person [*laughs*]. Some people will say a dandelion is a weed whereas I'd say ... Japanese anemones [which] we've got in the garden. Now I'd call them a weed because unless we are on top of them they can just spread and when I do weeding I battle them.

These personal experiences can be influenced by and shaped through social interactions with others. Elizabeth recalled how someone had suggested she should remove a ‘weed’ on her property but had paid no attention to them as in her eyes it was an aesthetically pleasing plant: “A weed is something that ... doesn’t look good [and, therefore,] it comes out. Like someone said something up our driveway is a weed [*puts on a different voice*] “you should pull that out it’s a weed”. I said “oh no it’s all good it looks good”. If it looks good it isn’t a weed [*laughs*]”. Rebecca, unlike Elizabeth, talked about how her conceptions have been shaped through social interactions with others, reading and her own personal experiences and observations of her garden:

I don’t know [how I’ve learnt about weeds]. I guess you learn from your elders. If you did pull out something and someone yelled at you, you thought oh won’t do that again [*laughs*]. ... Now days I’d look up a book or ask somebody or get them to come round and say “what do I pull out?” Like this garden when I first came it had been done over and so it was nice and tidy and then weeds popped up and I bought someone around whose a reasonably good gardener and she said that’s a weed and that’s a weed or this is such and such.... And I thought well I’ll just leave it and see what it’ll develop into because I don’t know what it’s going to develop into and then we got someone in to just clean up all the trees and then all the weeds [have] grown back so all the stuff that looks weedy is going to go. So I don’t I suppose you just ask people and you learn from your mistakes you pull up something *oops* (original emphasis).

Robert described how his thoughts about weeds have been influenced by having children, and in the process, also discussing how he is comfortable having a single sycamore tree, on his property but not its progeny:

We’ve had some deadly nightshade [and] gone and intentionally taken out ... several of those and a couple of other berry things that no one else could identify because with kids little orange berries are great. So I would say those are weeds. Deadly nightshade is a deadly one when you’ve got little kids. To me a weed is something that might be alright but it’s not where I want it. I mean I would see all these seedlings that are coming up from the [sycamore] tree, which is ok as a single, but I don’t want five hundred of them in the garden. It is a weed.

4.1.1 Weeding and the multiple realities of native seedlings in gardens

Interpretations of what constitutes a weed will always be fleeting, volatile, improvisatory, always contingent on its context (Thrift and Dewsbury 2000, Crouch 2003a). People's weeding practices therefore create multiple realities for native woody seedlings on different properties and within an individual property.

If a weed is constituted through the practice of weeding, numerous woody seedlings⁵⁴, including the self-introduced native Riccarton Bush species that are the focus of my current study have the potential to be classified as valuable plants, or as weeds, or as both, depending on age and location, when found in residential gardens. Kahikatea, the dominant emergent canopy species in Riccarton Bush, was also the most common bush species that I found dispersing and establishing in surrounding gardens⁵⁵. After looking at a live seedling Elizabeth, Ken and William⁵⁶, all identified kahikatea as a species they have seen in their garden and have pulled out. Ken admitted to regularly pulling out other native woody species including lacebark (*Hoheria* spp.), akeake (*Dodonaea viscosa*), *Pittosporum tenuifolium* and lemonwood (*Pittosporum eugenioides*). Michael, David, Joyce, and Jennifer, were among other interviewees who all indicated that they too pull a variety of native seedlings out of their gardens, mentioning cabbage tree and karamu, as well as species identified by Ken.

4.1.2 A question of value or a matter of location

The above accounts raise the question as to why people pull native woody seedlings out of their gardens. Simply suggesting that they do not value native species is insufficient. I have reported in Chapter 7 that people value native species for a variety of reasons including as markers of national identity and belonging. Among the interviewees who acknowledged they are pulling out native seedlings a number expressed an appreciation for native plants and have already planted natives in their gardens. Of all the interviewees David made his lack of appreciation for natives most apparent by suggesting that he finds them of "little value" and "little beauty". As to how he would treat native seedlings in his

⁵⁴ I focus here on native woody species but many of these arguments apply equally to exotic species

⁵⁵ For further details see Chapter 5

⁵⁶ Kahikatea seedlings were found on Ken and William's properties and in soil taken from Elizabeth's

garden he maintains, “I wouldn’t pull them out necessarily but [I] don’t have a lot of affinity with them”. There is a distinction for him between weeds and natives: “I suspect that everything that is out there that wasn’t a weed would be a native”. Ken is similar in that he “wouldn’t call a native a weed but might pull some out”.

Ken recounts how he has relocated a kowhai (*Sophora microphylla*) seedling and has contemplated shifting a totara (*Podocarpus totara*), an approach others such as Michael are willing to adopt: “[if] it is something that I reasonably want and it’s just in the wrong place I’ll encourage it for a while and then transplant it somewhere else”. Michael’s suggestion that a native seedling can be in the “wrong place” demonstrates that a conceptual differentiation is made between the various sections of a garden, ensuring that what is deemed to be ‘appropriate’ in one section may not be in another. This distinction is not purely conceptual as people’s weeding practices can differ between sections as the survey highlighted. Although, 66% of respondents indicated that they typically removed everything that was not planted⁵⁷, the manner in which a self-introduced woody seedling is treated appears somewhat dependent on the location in which it becomes established (see Table 9). Of those who indicated that seedlings grow in their flowers, 79% suggested they would remove everything not planted, compared with 66% in areas of shrubs and trees. A greater number of respondents also suggested they were likely to leave a seedling they liked to grow in areas of shrubs and trees, than in flowers.

The distinction between the ways seedlings and weeds are treated in sections of garden was evident in the interviews too. On some properties, such as Mary’s, “anything [she] didn’t plant” is a weed while on others it varies according to location. Jennifer alluded to this point: “I like to keep the fence line reasonably clear of things other than the camellias, the roses and the primulas so that they have a chance to keep going. [While in] the little patch out the front here ... we have always let things ... come up to see what they’ve been”. Elizabeth, a self-confessed non-gardener, focuses all her attention and efforts on only two sections of their garden: “[T]he only gardens [that] I weed [are] this one and the one out here. And there is nothing in it except roses and a couple of [bushes].

⁵⁷ This calculation is based only on areas of flowers, and shrubs and trees, as seedlings rarely established in lawns (6%) and only half of the respondents had vegetables (52%).

So anything other than those get[s] pulled out”. Simon, who has created a low-maintenance garden by essentially leaving it to its own devices, likewise reiterated this notion when I queried him about whether he leaves all the weeds on his property:

Yeah I do actually make a point of that. ... I’m quite into just letting things go the way they are meant to go. *Apart from* ... areas where one is trying to train [plants] into [something] or [to] show [them]. But the rest of it is quite happy by itself (my emphasis).

Table 9. The main approach used to treat self-introduced woody seedlings when they established in different areas on the property⁵⁸.

Statement	% Lawn	% Flowers	% Vegetables	% Shrubs /Trees
I don’t get any self-introduced plants in that section	93.8	2.4	34.8	0
I remove everything that’s not planted	6.2	77.4	60.9	66.7
If it is something I like I will let it grow there	0	10.7	2.2	20.2
If it is something I like but don’t consider appropriate for that area I will transplant it	0	4.8	2.2	6.0
I leave everything to grow in that section	0	1.2	0	3.6
Other	0	3.6	0	3.6

These complementary findings provide additional support to the argument I have made elsewhere that the survival of any woody seedling in a residential garden “is a *personal and completely situational* matter” (see Doody 2005, p. 21, original emphasis). I contend that the location in which a native seedling becomes established is significant in determining its fate because if it is:

in a section of the garden that, within the owner’s concept of his or her garden, sets a very narrow definition of appropriate species, the seedling *becomes a weed* (Doody 2005, p. 21, original emphasis).

This notion of appropriateness rather than value appears to be an underlying motive for why people are pulling native seedlings out of their gardens. The appropriateness of a

⁵⁸ Due to rounding errors columns do not always total 100%

woody seedling is determined largely by the aspirations people have for the various sections of their garden and their knowledge and/or interpretation of what that woody seedling is and will become.

The interrelated nature of people's aspirations and weeding and other gardening practices, such as pruning, is most evident in the more 'formal' sections of the garden characterised by plants that provide colourful and beautiful performances, notably the production of flowers. These performances, as I reported earlier, draw people into their world persuading people to understand their concerns and commit to their care. In the absence of care the plants that provide such performances may be overtaken and out competed by plants capable of fast, vigorous growth, which can shade, spread and smother. By concentrating her weeding efforts on removing any self-introduced plants in the areas with roses, camellias and primulas (*Primula* spp.) Jennifer believes that it gives these plants "a chance to keep going". Simon echoes this sentiment when he talks about only weeding the gardens where he is trying to "train" plants into something or to "show" them. His motive, in addition, to ensuring the survival of these plants, is a desire to best encourage, display and present the feature plant or plants of the section.

4.1.3 Routine performances and the removal of native woody seedlings

On some properties everything that is not planted is removed while on others it is dependent on the location in which the plant or seedling becomes established. This point was reinforced in the way in which respondents suggested they would treat a live kahikatea in their garden, upon being shown a sample, potted, seedling (see Appendix 9)⁵⁹. Forty-four per cent said they would, or probably would, pull the seedling out, while others suggested its survival would be dependent on where it established in the garden, mentioning specific locations:

Susan Probably out in the flower gardens I would pull it out. If I saw it out there [in the native section] I would see what it did.

Anthony In the trees and the shrubs I'd leave it unless I happen to be hoeing. In other words, I wouldn't treat it in any ... special way.... In the flowers [and] ... the vegetables it would be pulled out.

⁵⁹ For further details see Chapter 5

The seedling again would be removed from the more formal sections of the garden, suggesting the removal of plants from these sections is a routine practice. The origins of this routine can be traced to ideas developed in early Victorian gardens and over time it has become an established gardening convention (Raine 1995b, Nassauer 1997, see Appendix 13) that is learnt and reinforced through experience. A prime illustration of this was when Mark was discussing his thoughts about weeds and his four-year-old son suggested to him “Dad you don’t call a plant a weed”. Mark’s son was yet to learn or develop his ideas about weeds. Jennifer, in contrast, recalled learning that when weeding the “beds of roses if you did have anything [in this area] it was a weed so it was quite straightforward”. Michael has also learnt to make this differentiation as illustrated by his argument why he would let his front garden ‘go wild’: “it’s the formal garden; it’s the flower garden you know. You can’t have flowers and weeds. They just don’t go together”.

Michael’s claim that flowers and weeds “don’t go together”, I argue, can be explained through the notion of performance. Repetition is considered to be an important feature of performance (Schechner 1988, Butler 1990). Weeding practices involve the reiteration of gestures, tasks and actions which can be viewed as the following of conventions, scripts or the acting out of codes (Thrift and Dewsbury 2000). In a performative sense the weeding practices people learn to associate with some sections of the garden become so routinised as to appear natural (cf. Butler 1990). In conventional gardening terms any self-introduced plant or seedling encountered in these sections during weeding is repetitively *performed* as a *weed*. Similarly, plants capable of rapid, and sometimes furious, growth, re-growth or regeneration, and spread in gardens are routinely encountered in the midst of weeding and, therefore, can become “common weeds” such as oxalis (*Oxalis* spp.), chickweed (*Stellaria media*) and milkweed (*Euphorbia peplus*) (see Roy et al. 2004). These plants only remain weeds, however, through being repeatedly performed into existence. Weeds only exist in, to reinforce my earlier point, the doing of them; they have to be continually performed to exist at all. This is because, performance, as a routine act, “assumes that no performance outlasts the moment of its acting, the act must be repeated in order to reassert its meaning” (Rose

1999, p. 250). This perspective is also important in understanding the fate of native woody seedlings.

The survival of native woody seedlings in residential gardens, I have argued, is dependent not on whether they are valued by people but rather if they are deemed appropriate in a particular garden or section of garden. People's general lack of knowledge about native plants (Craig et al. 1995, see also Chapter 4) may also contribute to them unknowingly removing seedlings they value. Ken and Elizabeth, who both pulled out kahikatea on their properties, for example, were unaware of what the seedlings were. As Ken observes: "I wouldn't have known that was a kahikatea at that stage". William who also pulls out kahikatea, however, was one of only two respondents who correctly identified a live kahikatea seedling. The performances of kahikatea, or rather those embodied in their seedlings, in contrast, to the value he ascribes to them, or his knowledge about them, is why William removes them from his garden, as he explains:

We get a lot of plants coming up because of ... Riccarton Bush ... and we simply can't let them all grow. [W]hen I came here [the] garden out there [was] all over the place ... and there was kahikateas coming up everywhere. So the birds just eat the berries and they come and leave them here. And they germinate and mostly I'm going to have a kahikatea forest out here [if I do not pull them out]. That is pretty obvious.

Williams's sentiment that the performances embodied in woody seedlings may not be appropriate in the context of his garden, were echoed by others. Eileen suggested the reason why she would pull a seedling out of her garden is related to the size of her property and the plants she wants to have in her garden:

I haven't got room for anything to grow terribly big. And it's a tree. I don't need any more trees here. The ones that I've got here are going to get too big before to much longer anyway. [...] I like trees but I think this [property] isn't big enough to have trees that are too big [as] I like to have roses and flowers as well as foliage type plants. If you get to many trees the canopy is going to block out the light and things aren't going to flower. And because of the size of the section I feel can't have larger trees. We've got smaller ones and keeping those to a certain size.

Jennifer, as she explains, is "reluctant" to remove seedlings but does so because of the impacts she contemplates they would have on her everyday life otherwise:

I find it very hard to get rid of little seedlings ... even though we've got thousands of akeakes I'm always reluctant to throw them out. But I guess they are really a weed [*laughs while saying*] *sort of* as they are growing at such great numbers. [...] They'll be a real nuisance if [I] don't. As you can see there are seedlings that have grown up all over the place that have become quite large and one could be utterly surrounded without being able to look out of the windows if you let them grow. So one has to be realistic in terms of that I think.

4.1.4 Routine performances and the multiple realities of native woody seedlings

Despite the fact that native woody seedlings are routinely removed from residential gardens there are possibilities for seedlings to establish on properties. This is supported by the results presented in Table 9, which demonstrate some people are commonly prepared to let woody seedlings “they like” grow in their gardens or to transplant seedlings into more appropriate locations. These sentiments were expressed by both interviewees and survey respondents. Simon is content for seedlings to establish anywhere in his garden except in its formal sections. Meanwhile, despite routinely pulling out kahikatea seedlings, William “would like to grow one”. Instead of removing every seedling from his garden he, therefore, has allowed a seedling to establish in an area of shrubs bordering his fence and had transplanted a seedling into his lawn.

These differences in weeding practices on different properties and within individual property demonstrate that there is no singular or *definitive* way in which seedlings are treated in residential gardens. The treatment of a seedling, is always dependent on context, consequently the realities of seedlings performed in a garden is always momentary, unpredictable, improvisatory and *multiple*. The context in which weeding is undertaken in a residential garden is itself always changing, in flux, as it comes into being in the midst of the performances of the people and nonhumans who co-occupy the space (Hitchings 2003, Power 2005). People, for example, have families, take on other interests, develop illnesses or disabilities as they age; thus they may no longer be able to recreate the garden they previously had or desired (Bhatti 2006). Meanwhile plants, as we have seen, continually grow or shed buds, leaves, flowers, and fruit, maybe bark and over time die (Jones and Cloke 2002).

The multiple realities of native woody seedlings, therefore, can additionally emerge unpredictably or spontaneously through the routine practice of weeding and the performances of plants. The unique performances or character of some seedlings, for example, can draw in curious people who are intrigued by what they might develop into. The live kahikatea seedling, people were shown and asked as to how they would treat for some respondents held such qualities:

Beth I would just put it in a place where there was a place for it ... [and] leave it alone and see what happens to it

Karen I'd wait [to] see how it would grow [to tell] if I liked the colour [and] the shape. So I'd be waiting to see what it looked like.

Embodied in this seedling's performance of becoming kahikatea is the possibility of something else. A seedling has the potential to develop into an appropriate and acceptable plant that can remain in the garden, or alternatively, become an unsuitable plant that will be removed. Of particular interest can be the size, shape and colour that the seedling takes on or its overall look or appearance, as Rebecca contends: "If it looks like a huge big weed then obviously it goes out but if it turns into a shrub or something and looks tidy or nice, it's fine".

Unlike William's more planned and deliberate attempts to grow a kahikatea, Joyce, discussed how she had let a lemonwood and a *Pittosporum tenuifolium* seedling, which she would usually remove, mature into adults. The underlying motive for this decision and change in her weeding practices was a need to re-establish a sense of privacy, as she explains:

I've let those big ones along the fence line ... sprout [up to provide] a little bit of a protection now. The people in the back ... they've built, they got my permission, and they've got a studio at the back and that's fine. But they wanted to later on extend it right along the border. But it was too near the ... the back bedroom. And so also these trees will come up and hide that fence line.

Here we see how the multiple realities of native woody seedlings can also surface in the midst of the changing context of the garden. The seedlings that commonly would be performed as weeds are not and instead are allowed develop and mature into shrubs and become permanent, functional plants in the garden. Joyce's account is illustrative,

therefore, of how difference and variation can emerge in the spontaneous, creative moments between routines, and the application of conventions to contexts (Thrift and Dewsbury 2000).



Figure 10. The lemonwood and *Pittosporum tenuifolium* seedlings that Joyce allowed to develop into mature plants (the large trees towards the back-right of the picture that have been fashioned into a hedge) on her boundary fenceline. Joyce suggested she would routinely remove similar seedlings but allowed these to develop after her neighbours extended their studio right up to the property boundary compromising her sense of privacy. Picture taken by B. J. Doody.

Chapter 9: General discussion

1. Introduction

My thesis has been an attempt to understand the ecological, social and cultural factors influencing the dispersal and regeneration of 12 native bird-dispersed woody species from Riccarton Bush, an urban forest remnant, into surrounding residential properties. To investigate these diverse factors I adopted an interdisciplinary research approach combining methodologies, concepts and theories from ecology and the social sciences. By offering insights into the ecological and social context in which these natural processes were operating this interdisciplinary approach has allowed me also to examine the possible role residential gardens could play in the future of Riccarton Bush. In this final chapter I develop ideas touched upon during this thesis by focusing on three matters which I shall now briefly outline.

I begin by discussing whether native woody species are naturally dispersing and regenerating in residential gardens surrounding Riccarton Bush. Here I demonstrate how the ecological component of the study (Chapter 5) provided a means to quantitatively measure dispersal and regeneration. Meanwhile, the social component allowed me to examine the social context in which these processes are occurring by offering valuable insight into the role gardens play in people's everyday lives (Chapter 8). Second, I consider the potential role residential gardens could play in the future of Riccarton Bush. In the process I also highlight the implications of my findings for attempts to increase native plantings in residential gardens and the possible implications of urban intensification. In concluding I discuss the contribution my thesis has made to the field of urban ecology. I suggest that my work is an example of an attempt to undertake what I describe as hybrid or radical urban ecology. Central to this form of urban ecology is a non-hierarchical relationship between disciplines. I suggest that 'perspectival parallelism' presents a useful strategy through which such a relationship could be achieved.

2. Dispersal and regeneration of native woody species in residential gardens

2.1 Dispersal

Some of the 12 native woody species were successfully dispersing from Riccarton Bush into surrounding residential gardens and germinating (Chapter 5). Differences were evident between the ten ‘Riccarton Bush species’ and the two ‘locally widespread species’⁶⁰. Half of the Riccarton Bush species I looked for were absent in gardens. Those found occurred on 28% of the 90 properties searched. Their distribution appears to be associated with propagule pressure. Some species absent in gardens were relatively uncommon in the bush, indicating they may be providing insufficient propagule pressure (Maina and Howe 2000). The most often found bush species, kahikatea, is also most common in the bush. Juvenile kahikatea were more often found and in greater numbers, furthermore, on properties closer to the Riccarton Bush. In comparison, the two locally widespread native species studied were significantly more common in gardens than the largely bush restricted species, making up the majority of juveniles found (95% of all juveniles), occurring on 90% properties.

2.2 Regeneration

2.2.1 The ecological evidence

Despite evidence of some species dispersing and germinating in residential gardens, few showed evidence of permanent establishment (Chapter 5). Of those bush species I found, however, the proportion of juveniles found in taller height classes was similar to those for the two widespread species, which had adults in almost half of the local gardens. This indicates that juvenile mortality rates in gardens were similarly high for bush and widespread species. If higher densities of cultivated individuals could be achieved, there is, therefore, the prospect that bush species would naturally recruit in people’s gardens. Expanding populations of the bush species into nearby gardens will entail active planting,

⁶⁰ For an explanation of how this distinction was made see Chapter 5

as some species were being poorly dispersed (if at all), and, for those that were, gardens were acting as sinks rather than sources (Pulliam 1988, Dias 1996). Weeding by residents appeared to be a major cause of juvenile mortality, and likely the dominant cause of mortality. This finding was reinforced by the insights gained during the social component of my research. I demonstrate this point in the remainder of this section.

2.2.2 The social evidence

Stewart et al. (2004) and Turner et al. (2005) have also argued that the regeneration of native species in gardens could be promoted through increased plantings, as well as by people modifying their gardening practices. Here, they allude to the importance of understanding the social context in which these natural processes are occurring, although the relevant social research was not done. I found that the survival of woody species that do disperse and establish in gardens is determined by how people interpret these species during their gardening practices, notably weeding (Chapter 5 and Chapter 8). Most people in my study said they would remove all seedlings of self-introduced woody plants from their garden suggesting that there are limited opportunities for species to successfully regenerate (Chapter 5). Through the practice of weeding people do, however, create multiple realities for native woody seedlings on different properties and on an individual property (Chapter 8).

On some properties everything not planted is routinely removed while on others the survival of a seedling is dependent on the location in which it becomes established. The treatment of a seedling, in other words, is often determined by context rather than necessarily people's value for, or knowledge and awareness about, that seedling, although these may play some part. In some sections of the garden, in particular, areas with more traditionally formal species such as roses, there is a narrow definition of appropriate species. Here the performances embodied in a seedling (e.g., to develop into a shrub or tree) are interpreted as unsuitable. If allowed to grow and develop a seedling can potentially impact on the health and survival of plants that produce desirable performances (e.g., colourful flowers) by physically influencing their growth and/or reducing the amount of light they receive by casting shade. Removing seedlings in these areas prevents this from occurring.

The performances embodied in a seedling also influence people's decisions to remove them from their properties. By creating shade or growing too close to the house (e.g., reducing the amount of sunlight, obscuring windows or impacting on foundations) woody species also have the potential to influence people's everyday lives in significant ways. These potential influences affect the locations, if any, in which people are prepared to let seedlings grow and develop. For some their property is simply too small to have some woody species. On other properties people are prepared to transplant into, or let some individual seedlings establish in areas of shrubs and trees, especially on their property margins. In these locations woody species are potentially less likely to influence other plants or other important aspects of their daily lives such as the availability of sunlight.

Even in instances where people allow seedlings to grow and develop there is a limit to the number of seedlings people are prepared to allow to establish in their garden again, as outlined above, arising from the potential impacts woody species can have. This brings me to the contention of Stewart et al. (2004) and Turner et al.'s (2005) that the regeneration of native woody species could be promoted by people modifying their gardening practices. Less intensive gardening practices, they argue, would increase the likelihood of regeneration occurring. My findings add some support to their perspective. With the increasing desire to move towards lower maintenance gardens there is certainly a willingness to adopt less intensive gardening practices (Bhatti and Church 2001, Leach 2002, Menzies 2004); but given the significant effects woody species can have on gardens and people's everyday lives (Chapter 8) there are only limited opportunities for native woody species to naturally regenerate in gardens. Despite this, there is still great potential to expand populations of Riccarton Bush species into nearby gardens through active planting. In the following section I discuss this potential providing some insight into the risks involved and how this may be undertaken.

3. Residential gardens and the future of Riccarton Bush

Over 125 years, the reported number of native plant species in Riccarton Bush has declined from 106 to 67 (Norton 2002), which is not unusual in urban remnants (e.g.,

Drayton and Primack 1996). My research suggests that although a few bush species are successfully dispersing and establishing, few show evidence of permanent establishment in surrounding residential gardens (Chapter 5). The failure of these species to naturally regenerate can be attributed to, among other factors (such as propagule pressure), the social context in which these processes are occurring (Chapter 8). This ensures that without active human intervention these populations will remain small and isolated within the urban matrix.

The current distributions of bush species in the neighbouring residential gardens are restricted to some extent by social and cultural factors. My view is that these same factors present opportunities to expand existing populations into the surrounding landscape. By encouraging people to actively plant bush species, gardens may be able to successfully aid the conservation of these species by increasing genetic diversity, effective size of populations, and levels of genetic connectedness (Whelan et al. 2006, Roberts et al. 2007). I begin by highlighting some of the risks that may be associated with such attempts and how these might be addressed. This is followed by a discussion about some of the considerations that may contribute to increasing the likely success of this initiative and recent attempts to promote the planting of native species in residential gardens.

3.1 The risks associated with restoration plantings

Several studies have emphasised the risks associated with restoration planting in areas surrounding urban remnants (e.g., Stewart and Woods 1997, Whelan et al. 2006, Roberts et al. 2007, Van Rossum 2007b). These studies demonstrate that programmes to undertake restoration plantings in areas surrounding remnants need to be undertaken carefully to avoid creating further problems within these remnant populations. There are two main implications that arise from the results of these studies for the programme I am proposing to expand populations of Riccarton Bush species into surrounding residential gardens.

First, the seed used to produce the cultivars needs to be sourced from an appropriately high number of parent plants as the genetic diversity of a population can be reduced when recruitment is dominated by relatively few parents (Aldrich and Hamrick

1998, Van Rossum 2007b). Second, the seed should be locally sourced (eco-sourced) as cultivars produced from seed collected at other locations may contaminate the existing gene pool within the remnant population (Whelan et al. 2006, Roberts et al. 2007). The likelihood of this occurring will be increased if residents are encouraged to obtain plants on their own volition for two reasons. First, the most popular native species tend to be commercially developed hybrid cultivars (Leach 2002, Head and Muir 2004).

Second, people are rarely concerned about eco-sourcing (Kilvington et al. 1998). To avoid such risks I recommend a co-ordinated approach that ensures production and distribution of suitable cultivars to residents in the wider community. Such an operation could be undertaken in co-operation with the existing nursery associated with Riccarton Bush. Currently the nursery cultivates material for use in supplementary plantings in the bush from seed sourced within the reserve (Molloy 2000).

3.2 Increasing native plantings in gardens

Some people have a strong interest in and support for conserving native biodiversity (e.g., Craig et al. 1995, Jacobson and Marynowski 1997, NRB 2003). My research illustrates that many people appreciate and value native species, and have planted native species in their gardens, with others planning to in future (Chapter 5 and Chapter 7). Similarly, Riccarton Bush was valued very highly by those who participated in the study (Chapter 5, see also Appendix 11). A number of people indicated willingness for their garden to play a role in the future of Riccarton Bush. Over half of the respondents (54%) suggested, for example, that they would be prepared to plant Riccarton Bush species in their gardens. These findings all illustrate the potential to expand populations of Riccarton Bush species into surrounding residential gardens. This is particularly encouraging because it would still be of considerable benefit to the long term viability and self-sustainability of Riccarton Bush if only a few people planted these species in their nearby gardens.

The question is then how to go about encouraging people to actively plant these, or any other native species for that matter, in their gardens. In my view the starting point for any attempts must be the acknowledgement that conservation and biodiversity rarely are among people's immediate everyday concerns (see Macnaghten 2003, Davison and Ridder 2006). Planting initiatives should be undertaken in a sensitive manner which

recognises the highly personalised character of residential gardens and respects the non-conservation roles and meanings of gardens in people's everyday lives (Bhatti and Church 2001, Macnaghten 2003). There is a need, in other words, to “engage with people *in their own terms*” (Macnaghten 2003, p. 82, original emphasis) and to respect the plurality of values associated with native and exotic species.

3.2.1 Respecting the plurality of values associated with native and exotic species

Cities “are the scene of many complex, intense and heart-felt responses to the non-human world, both wild and domestic, native and exotic” (Davison and Ridder 2006, p. 313). An approach that advocates the value of native biodiversity may run the risk of increasing and deepening divisions within the community over the relative importance of native species within the cultural landscape (Kilvington et al. 1998, Davison and Ridder 2006). For as my research suggests, and others have argued (e.g., Kilvington and Wilkinson 1999, Kendle and Rose 2000, Jones and Cloke 2002), exotic plant species play a significant part in people's lives, both in their gardens and other everyday locations (e.g., streets, parks and neighbourhoods). The diversity of views, both shared and contradictory to those held within the environmental, governmental and scientific communities, about the value of native and exotic plants need to be acknowledged and respected (Kilvington et al. 1998, Davison and Ridder 2006). This point is reiterated by Davison and Ridder (2006) who recommend:

Rather than seeking to impose a biodiversity agenda as objective science while simultaneously manipulating public feelings of connection to nature so as to create political support for this agenda, nature conservation professionals might be better advised to accept and even welcome the plurality of values (2006, p. 313).

3.2.2 Promoting the performative values of plants

A potentially non-threatening and sensitive way through which to engage with people is to draw on the notion of performance. A focus on the performances of native plants rather than their conservation value is more likely to resonate with people's desires, needs and experiences of their gardens (Chapter 8). The performances of plants, as I have demonstrated, matter to people. Consequently, there is a greater possibility to engage

with people in a manner that is more meaningful in the context of their own life experiences (Macnaghten 2003). On a positive note those advocating the use of native plants in gardens are increasingly adopting such an approach. Native plants, for example, are being promoted as safe alternatives to species that can have detrimental effects on other plants (e.g., DOC 2005). They have also increasingly been promoted for their low-maintenance qualities (Edwards and Given 2004, Menzies 2004) and their ability to attract native birds into gardens (Barnett 1995, Edwards and Given 2004).

The performative qualities that are being promoted, and the others I have identified (see Table 10), are important to many people (Chapter 8) and, as a result, may increase the appeal and appreciation of native plants in the wider community. A number of organisations and government agencies are making practical, easy to use and often free information readily available about native plants, in a variety of media (e.g., Chicago Wilderness 1999, DOC 2005, Kaipataki Project 2007, US Environmental Protection Agency 2007, Ignatieva et al. 2008). My research suggests that education about the value of and need to conserve the bush, the provision of Riccarton Bush plants and advice about those species would encourage some people to include these species in their gardens. Allowing individuals to have control over the location in which they plant cultivated bush species will be essential. The remainder of this section identifies some implications from my research into people's everyday understandings about native and exotic plant species. This is followed by a discussion which highlights some of the implications recent urban intensification may have on the role gardens can play in the future of Riccarton Bush.

3.3 Implications of everyday understandings about native and exotic plants for attempts to increase native plantings

There are three main implications that arise from my attempt to examine people's everyday understandings of native and exotic plants (Chapter 7). I discuss each of these before elaborating their implications. First, as the Christchurch biodiversity strategy and others (see Nassauer 1997, Meurk and Swaffield 2000) have observed, familiarity plays a critical role in shaping people's appreciation for, and understanding about, native biodiversity. Meurk and Swaffield (2000) in presenting a framework for increasing native

biodiversity in New Zealand's agricultural landscape emphasise the need to create a new landscape that remains culturally familiar, non-threatening and productive. They suggest this can be done through integrating native species into familiar landscape elements such as roadsides, shelterbelts, gardens and riparian margins. Such "transitional landscapes" they argue "can reinforce a sense of identity with the unique characteristics of New Zealand, and in the longer term ... transform the way landscapes are perceived, valued and utilised" (Meurk and Swaffield 2000, p. 129).

My findings add support to the recognition of the role of familiarity. Further, they highlight that personal encounters play an important role in shaping an individual's appreciation for, and understandings about, native and exotic plants, in their formative years and later life. Encounters of this nature can take place on the family property or in one's immediate neighbourhood (e.g., gardens, parks and street trees). These encounters are essential in helping people identify and relate with native and exotic species. This is evidenced by the fact that the species interviewees commonly made reference to in order to differentiate between native and exotic plants were those they had at some stage encountered regularly. More importantly, they also accentuate the significant role others, notably parents or close relatives, play in fostering an individual's interest in, and awareness about, plants. For it appears some individuals without any childhood or later life experiences and social interactions to assist them, do not learn to meaningfully differentiate between native and exotic plants in their everyday lives.

Second, my findings illustrate how successful the attempts of advocates such as Leonard Cockayne, Muriel Fisher and Lawrie Metcalf, have been in linking notions of identity and belonging with *our* unique native plant species. These notions now appear to be integrated into popular discourse, suggesting that native plants have become generally accepted as markers of identity and belonging. Third, they highlight the uncertainty surrounding the demarcation between native and exotic species, and the identification of species in this framework. Suggesting that what seems to be a clear, simple distinction in an academic/scientific context, in everyday reality is much more complicated and problematic, which can be associated with the lack of relevance of this distinction in people's lives.

Table 10. Some of the performative qualities of native species that could potentially be promoted

Performative quality	Explanation of potential value
Low maintenance life-cycle	Many divaricating shrubs and tussock grasses after initial regular watering and the provision of nutrients can grow with relatively little maintenance (Edwards and Given 2004, Greville 2007). With people increasingly wanting to work less in the garden (Bhatti and Church 2001) such qualities could be appealing
Providing food sources to attract birds into gardens	There has been for some time a growing interest in attracting birds into gardens (Barnett 1995, Greville 2007). This is unlikely to change as illustrated by recent interest in community bird surveys (Landcare Research 2007)
A source of colour	Few native species produce conspicuous flowers. Some can, however, produce colourful and potentially attractive fruits (Edwards and Given 2004). Further, by retaining their leaves throughout the leaves they can provide a continual source of colour during autumn and winter.
Small size	With the average size of gardens declining (Leach 2002, Gaston et al. 2005b, Loram et al. 2007) and people's concerns over loss of sunlight resulting from shade there is an opportunity to promote smaller understory species. Two potential bush species are for example <i>Coprosma rotundifolia</i> (reaches 4 m) and milk tree (reaches 5 m).
Shape and form	The unusual shape and forms of a number of native species could potentially be endorsed for their novelty (Leach 2002). The shape and form of some species are already widely recognised and appreciated and are being incorporated into contemporary gardens such as cabbage tree and lancewoods (<i>Pseudopanax</i> spp.).
The provision of privacy	Privacy is an important part of life in New Zealand (Mitchell 1972, Vallance et al. 2005). Given that most native plants are evergreen the potential for these species to screen out neighbouring properties throughout the year could be endorsed
Safe alternatives	People are aware of the impacts problem 'weed' species can have on the growth and survival of plants in their gardens. Raising awareness of the ability of some native species to happily co-exist with other plants, therefore, may be a beneficial approach (DOC 2005).

Three main implications can be linked with the above points. First, given the significance familiarity plays in people's understandings about, and appreciation for, native plants, efforts to increase plantings of these species must be promoted and supported. These efforts ideally need to be associated with attempts to integrate native species into elements of the landscape that people are familiar with, and regularly encounter (Nassauer 1997, Meurk and Swaffield 2000, Miller and Hobbs 2002). Such an integrated approach presents better opportunities to personalize native biodiversity, and in the process, moving conservation beyond parks and reserves into people's everyday lives and building public support (Meurk and Swaffield 2000, Miller and Hobbs 2002, Robinson 2006).

Second, increasing public exposure to native species alone will be inadequate as these efforts need to be associated with education initiatives (Craig et al. 1995, Jacobson and Marynowski 1997, Schwartz 2006). As native plants appear to be now considered as markers of identity and belonging this suggests more attention should be directed towards increasing awareness about these plants rather than promoting their identity-related qualities. Given the uncertainty surrounding the demarcation between natives and exotics, ensuring that any media used to educate people is easily understood is paramount (see Kaplan et al. 1998).

Third, a framework that enables the lay public to distinguish easily between native and exotic plant species would be beneficial in attempts to raise awareness. One approach could be to promote the notion that most native trees tend to be evergreen while exotic non-conifer trees are usually deciduous. This distinction provides a simple, general rule which people can easily remember and visually experience during the changing seasons. While there will be a number of exceptions (mainly exotic species) to this rule, its potential is evidenced by the fact some interviewees recalled being taught this distinction during their childhood. There are also distinctive growth forms typical of New Zealand plants – divaricating shrubs, tussocks, evergreen large-leaved forbs, cushion plants, multi-stemmed trees. These can be conveyed to mass audiences in simplified forms as groupings of species or plant signatures (Ignatieva et al. 2008).

3.4 Urban intensification and the implications for the expansion of Riccarton Bush and other urban remnants

At present, average garden sizes are declining (Gaston et al. 2005b, Loram et al. 2007) as planning authorities encourage urban intensification (e.g., infill housing) as a way of directing growth towards existing residential areas (MftE 2002, Communities and Local Government 2006) in reaction to population growth and decreasing household size (DETR 2000, Statistics New Zealand 2001b). Christchurch is no exception, and during my study, urban intensification continued apace around the margins of Riccarton Bush. This will hamper the potential for residential gardens to expand bush plant populations. Opportunities to encourage the planting of smaller understorey bush species may remain. With space becoming a premium it is likely to become increasingly difficult to convince people to include such species in their garden ahead of those to which they already ascribe personal meanings and attachments. Similarly, the reduction in the size of gardens could decrease the willingness of people to allow self-introduced native woody seedlings to naturally regenerate in certain areas on their properties.

Urban intensification also results in the loss of large (noble) native trees in residential gardens. These can be important genetic resources and provide major food sources for local wildlife. Their loss could be compensated by ensuring a substantial proportion of public spaces are planted with such species. Even outside of concerns with urban intensification, it is likely that public spaces will have to play a role for some of the larger bush species. Given concerns over the shade cast by large trees species such kahikatea, which can grow up to 60m⁶¹, are in the long term unlikely to be compatible with in people's aspirations for their gardens. If gardens are to act as buffers, for remnants such as Riccarton Bush, local government and planning authorities will need to adopt policies and approaches which maintain the capacity for conservation initiatives in established areas, encourage the development of gardens in new suburbs and endorse the planting of these species in public spaces.

⁶¹ Note kahikatea only grow to 30m in Canterbury

4. Urban ecology and interdisciplinary research

4.1 Hybrid urban ecology and perspectival parallelism

As a result of conducting an interdisciplinary study that has combined methods, concepts and theories from ecology and the social sciences I have attempted to demonstrate how urban ecology could move in a new direction towards a more radical, hybrid form. Despite the promotion of the need to adopt such an approach to research by urban ecologists (see Grove and Burch 1997, Pickett et al. 1997, Grimm et al. 2000, Alberti et al. 2003), it appears such a form does not currently exist within the field. Hybrid urban ecology, I envisage, will be characterised by real attempts to cross the boundaries, or in Spinoza's (1996) terms, to move 'back and forth' between the natural and the social. The foundation of such a form of urban ecology then could be, following Spinoza and Hampshire, "perspectival parallelism" (Connolly 2002, p. 88). Here instead of trying to collapse all differences between the natural and the social into a single framework as some social scientists have attempted⁶², and many urban ecologists currently try to do⁶³, parallelism "provides a strategy to work across difference whilst accepting a Spinozist 'unity of substance'" (Newton 2007, pp. 17-18). In order to clarify and demonstrate this strategy, I now will use my own work as an example.

Adopting the strategy of "perspectival parallelism" the ecological component of my study provided an approach through which to quantitatively measure and analyse the dispersal and regeneration in gardens surrounding Riccarton Bush. This allowed me to gain a general understanding of the extent to which these natural processes were operating within nearby gardens. It did not enable me to gain, however, a detailed appreciation of how their survival was being influenced by social and cultural factors. The interviews and questionnaire survey, which formed the basis of my social component, enabled me to obtain rich and diverse information about, and a detailed insight into, these social and cultural factors. The ecological factors involved in the study

⁶² Actor Network Theory (ANT) is an example. For a discussion on the limitation of this approach see Murdoch (2001) and Newton (2007)

⁶³ See for example Grove and Burch (1997), Machlis et al. (1997), Pickett et al. (2000), Dow (2000), Grimm et al. (2001), Pickett et al. (2003), Alberti et al. (2003).

are intimately linked with the social and cultural and vice versa. The ecological is not reducible to the social and the cultural, and in the same way, the social and the cultural are not reducible to the ecological. The findings from both components of my research sit parallel to one another, while still being united or woven together. Parallelism presents a means through which to establish a non-hierarchical relationship between disciplines. A relationship which is viewed as being central to successful interdisciplinary collaborations (Cartwright 1999, Evans and Randalls 2008).

By applying parallelism to my own research I have been able to avoid attempts to collapse the complexity of the ecological and the social into a single framework or analysis. Urban ecologists, in contrast, who have attempted to do so, have relied typically on broad-scale socio-economic and political indicators to guide their work. These indicators are not able to capture the variability of human activity, which is always more diverse and unanticipated than any character or type that may be assigned to an individual (Becker 1998). Social indicators cannot provide any detailed insights, therefore, into how natural processes and patterns of diversity are shaped and influenced by the social context in which they are occurring. By adopting alternative research methods, concepts and theories, that did not rely on these indicators I was able to pay attention to types of activity instead of types of people; change rather than stability; and ideas of process instead of structure (Becker 1998, Thrift and Dewsbury 2000). In doing so, I have been able to gain a fuller understanding of the complexity in which these natural processes are operating and greater insight into the potential conservation role of urban residential gardens in the future of an urban remnant, Riccarton Bush.

In conclusion, I recognise that it may not always be necessary to employ a hybrid form of urban ecology⁶⁴. If the commitments of urban ecology really are, however, to strengthen and expand the discipline of ecology, to create an interdisciplinary field and increase the application and policy relevance of their research, then this will require more critical engagement with the social context in which these natural processes are occurring. This will entail adopting social science methods, concepts and theories which

⁶⁴ For example urban soil quality (e.g., Kostel-Hughes et al. 1998a) or urban water cycles (Botkin and Beveridge 1997) can be adequately studied using traditional ecological methods, concepts and theories, without explicitly taking the role of humans into consideration

can better capture the complex, elusive, ephemeral, and unpredictable 'nature' of urban areas and the 'nature' within those urban areas. My thesis has been an attempt to illustrate how this could potentially be done and the benefits of such an approach. It is an example, in other words, of how the productivity, creativity and relevance of the field can be enhanced by moving in towards a more radical, hybrid, urban ecology.

References

- Abercrombie, N., S. Hill, and B. S. Turner, editors. 2006. *The Penguin dictionary of sociology*. Penguin Books Ltd, London.
- Agnew, J. 1993. Representing space: Space, scale and culture in social science. Pages 251-271 *in* J. Duncan and D. Ley, editors. *Place/culture/representation*. Routledge, London.
- Aguilar, R., L. Ashworth, L. Galetto, and M. Adrian Aizen. 2006. Plant reproductive susceptibility to habitat fragmentation: review and synthesis through a meta-analysis. *Ecology Letters* **9**:968–980.
- Alberti, M., J. M. Marzluff, E. Shulenberger, G. Bradley, C. Ryan, and C. Zumbunnen. 2003. Integrating humans into ecology: Opportunities and challenges for studying urban ecosystems. *Bioscience* **53**:1169-1179.
- Aldrich, P. R. and J. L. Hamrick. 1998. Reproductive dominance of pasture trees in a fragmented tropical forest mosaic. *Science* **281**:103-105.
- Alvey, A. A. 2006. Promoting and preserving biodiversity in the urban forest. *Urban Forestry & Urban Greening* **5**:195-201.
- Andersen, J. C. 1924 [1906]. Riccarton Bush: An appeal. Page 2 *in* C. Chilton, editor. *Riccarton Bush: A remnant of the kahikatea swamp forest formerly existing in the neighbourhood of Christchurch, New Zealand*. The Canterbury Publishing Co. Ltd., Christchurch.
- Anonymous. 2000. *The New Zealand biodiversity strategy*. Department of Conservation; Ministry for the Environment, Wellington.
- Armstrong, J. F. 1870. On the vegetation in the neighbourhood of Christchurch, including Riccarton, Dry Bush, etc. *Transactions of the New Zealand Institute* **48**:315-353.
- Austin, J. L. 1962. *Gow to do things with words*. Clarendon Press, Oxford.
- Baert, P. 2006. Epistemology. Page 171 *in* B. S. Turner, editor. *The Cambridge dictionary of sociology*. Cambridge University Press, Cambridge.

- Barham, J. 2006. Cues to care or cues not to complain? The aesthetics of waterway naturalisation in Christchurch, New Zealand. *New Zealand Garden Journal* **9**:6-11.
- Barnett, R. 1995. The eclectic gardens. Pages 172-191 *in* M. Bradbury, editor. *A history of the New Zealand garden*. Viking, Auckland.
- Becher, T. 1989. *Academic tribes and territories*. SRHE/Open University Press, Milton Keynes.
- Becker, H. S. 1998. *Tricks of the trade: How to think about your research while you're doing it*. University of Chicago Press, Chicago; London.
- Bell, C. 1996. *Inventing New Zealand: Everyday myths of Pakeha identity*. Penguin, Auckland.
- Bell, C. 1998. Performance. Pages 205-244 *in* M. C. Taylor, editor. *Critical terms for religious studies*. University of Chicago Press, Chicago and London.
- Bell, V., editor. 1999. *Performativity and belonging*. Sage/TCS, London.
- Berg, L. D. and R. A. Kearns. 1996. Naming as norming: 'race', gender, and the identity politics of naming places in Aotearoa/New Zealand. *Environment and Planning D: Society and Space* **14**:99-122.
- Bhatti, M. 2006. 'When I'm in the garden I can create my own paradise': Homes and gardens in later life. *The Sociological Review* **54**:318-341.
- Bhatti, M. and A. Church. 2000. "I never promised you a rose garden": gender, leisure and home-making. *Leisure Studies* **19**:183-197.
- Bhatti, M. and A. Church. 2001. Cultivating natures: Homes and gardens in late modernity. *Sociology* **35**:365-383.
- Bingham, N. and N. Thrift. 2000. Some new instructions for travellers: the geography of Bruno Latour and Michel Serres. Pages 281-301 *in* M. Crang and N. Thrift, editors. *Thinking space*. Routledge, London.
- Blomley, N. 2005. The borrowed view: Privacy, propriety, and the entanglements of property. *Law and Social Inquiry* **30**:617-662.
- Blumer, H. 1969. *Symbolic interactionism*. Prentice-Hall, Englewood Cliff, New Jersey.
- Botkin, D. B. 1990. *Discordant harmonies: a new ecology for the twenty-first century*. Oxford University Press, Oxford.

- Botkin, D. B. and C. E. Beveridge. 1997. Cities as environments. *Urban Ecosystems* **1**:3-19.
- Bounds, M. 2004. *Urban social theory: City, self and society*. Oxford University Press, Oxford.
- Bourdieu, P. 1977. *Outline of a theory of practice*. Cambridge University Press, Cambridge.
- Bracken, L. J. and E. A. Oughton. 2006. 'What do you mean?' The importance of language in developing interdisciplinary research. *Transactions of the Institute of British Geographers* **31**:371-382.
- Bradbury, M. 1995a. A history of the garden in New Zealand. Pages 5-15 *in* M. Bradbury, editor. *A history of the garden in New Zealand*. Viking, Auckland.
- Bradbury, M. 1995b. Seventeenth-, eighteenth- and early nineteenth-century gardens in England and America. Pages 38-51 *in* M. Bradbury, editor. *A history of the garden in New Zealand*. Penguin Books Ltd, Auckland.
- Braun, B. and N. Castree. 1998. *The production of nature at the end of the Twentieth century*. Routledge, London.
- Bremner, A. and K. Park. 2007. Public attitudes to the management of invasive non-native species in Scotland. *Biological Conservation* **139**:306-314.
- Brothers, T. S. and A. Spingarn. 1992. Forest fragmentation and alien plant invasion of central Indiana old-growth forests. *Conservation Biology* **6**:91-100.
- Brown, J. H. and A. Kodrick-Brown. 1977. Turnover rates in insular biogeography: effect of immigration on extinction. *Ecology* **58**:445-449.
- Bruce, A., C. Lyall, J. Tait, and R. Williams. 2004. Interdisciplinary integration in Europe: the case of the Fifth Framework Programme. *Futures* **36**:457-470.
- Burrows, C. J. 1994. Fruit, seeds, birds and the forests of Banks Peninsula. *New Zealand Natural Sciences* **21**:87-107.
- Burrows, C. J. 1997. Reproductive ecology of New Zealand forests: 2. Germination behaviour of seeds in varied conditions. *New Zealand Natural Sciences* **27**:53-69.
- Butler, J. 1990. *Gender trouble: feminism and the subversion of identity*. Routledge, London.
- Butler, J. 1997. *Excitable speech: A politics of the performative*. Routledge, New York.

- Buttimer, A. 1980. Home, reach, and the sense of place. Pages 166-187 *in* A. Buttimer and D. Seamon, editors. *The human experience of space and place*. St. Martins Press, New York.
- Carlson, M. 1996. *Performance: A critical introduction*. Routledge, London and New York.
- Cartwright, N. 1999. *The dappled world: a study of the boundaries of science*. Cambridge University Press, Cambridge.
- Chevalier, S. 1998. From wollen carpet to grass carpet: bridging house and garden in an English suburb. Pages 47-71 *in* D. Miller, editor. *Material cultures: why things matter*. UCL Press, London.
- Chicago Wilderness. 1999. Biodiversity recovery plan. Chicago Wilderness, Chicago. Available at: <http://www.chicagowilderness.org/pubprod/brp/index.cfm> (accessed December 2007).
- Christchurch City Council. 2004. *Christchurch Naturally: The biodiversity strategy: Working towards a sustainable city (Draft)*. Christchurch City Council, Christchurch.
- Clark, N. 2003. Feral ecologies: performing life on the colonial periphery. Pages 163-182 *in* B. Szerszynski, W. Heim, and C. Waterton, editors. *Nature performed: Environment, culture and performance*. Blackwell Publishing, Oxford.
- Clark, N. 2004. Cultural studies for shaky islands. Pages 3-18 *in* C. Bell and S. Matthewman, editors. *Cultural studies in Aotearoa/New Zealand*. Oxford University Press, Melbourne.
- Cloke, P. and O. Jones. 2001. Dwelling, place and landscape: an orchard in Somerset. *Environment and Planning A* **33**:649-666.
- Cloke, P. and H. C. Perkins. 2005. Cetacean performance and tourism in Kaikoura, New Zealand. *Environment and Planning D: Society and Space* **23**:903 – 924
- Clout, M. N. and J. R. Hay. 1989. The importance of birds as browsers, pollinators and seed dispersers in New Zealand forests. *New Zealand Journal of Ecology* **12**:27-33.
- Coates, P. 2003. Editorial postscript: the naming of strangers in the landscape. *Landscape Research* **28**:131-137.

- Cockayne, L. 1923. The cultivation of New Zealand plants. Whitcomb and Tombs Ltd, Auckland.
- Cockayne, L. 1924. The history and importance of the Bush. Pages 11-13 *in* C. Chilton, editor. Riccarton Bush: A remnant of the kahikatea swamp forest formerly existing in the neighbourhood of Christchurch, New Zealand. The Canterbury Publishing Co. Ltd., Christchurch.
- Collins, J. P., A. Kinzing, N. B. Grimm, W. F. Fagan, D. Hope, J. Wu, and E. T. Borer. 2000. A new urban ecology. *American Scientist* **88**:416-425.
- Communities and Local Government. 2006. Policy planning statement 3: housing. Communities and Local Government, London.
- Connolly, W. E. 2002. *Nueropolitics: thinking, culture and speed*. University of Minnesota Press, Minneapolis.
- Craig, J. L., C. J. Craig, B. D. Murphy, and A. J. Murphy. 1995. Community involvement for effective conservation: what do the community want? Pages 130–139 *in* D. A. Saunders, J. L. Craig, and E. M. Mittlebach, editors. *Nature Conservation 4: the role of networks*. Surrey Beatty and Sons, Chipping Norton.
- Craw, R. 1990. Visible difference: Nationalist repertoires and the semiotics of place in New Zealand science. *Antic* **8**:4-7.
- Crawley, M. J. 2005. *Statistics: An introduction to using R*. John Wiley and Sons Ltd, Chichester, West Sussex; New York.
- Cresswell, T. 2004. *Place: A short introduction*. Blackwell Publishing Ltd, Malden; Oxford; Carlton.
- Crouch, D. 2003a. Performances and constitutions of natures: A consideration of the performance of lay geographies. Pages 17-30 *in* B. Szerszynski, W. Heim, and C. Waterton, editors. *Nature performed: Environment, culture and performance*. Blackwell Publishing, Oxford.
- Crouch, D. 2003b. Spacing, performing, and becoming: tangles in the mundane. *Environment and Planning A* **35**:1945-1960.
- Cunningham, S. A. 2000. Effects of habitat fragmentation on the reproductive ecology of four plant species in Mallee woodland. *Conservation Biology* **14**:758-768.

- Daily, G. C. and P. R. Ehrlich. 1999. Managing earth's ecosystems: An interdisciplinary challenge. *Ecosystems* **2**:277–280.
- Dana, E. D., S. Vivas, and J. F. Mota. 2002. Urban vegetation of Almeria City - a contribution to urban ecology in Spain. *Landscape and Urban Planning* **59**:203-216.
- Davison, A. and B. Ridder. 2006. Turbulent times for urban nature: conserving and re-inventing nature in Australian cities. *Australian Zoologist* **33**:306-314.
- de Certeau, M. 1984. *The practice of everyday life*. University of California Press, Berkley.
- DeCandido, R. 2004. Recent changes in plant species diversity in urban Pelham Bay Park, 1947–1998. *Biological Conservation* **120**:129–136.
- Denzin, N. 1989. *The research act: A theoretical introduction to sociological methods*. 3 edition. Prentice Hall, Englewood Cliffs, NJ.
- DETR. 2000. *Our towns and cities: the future – delivering an urban renaissance*. Department of Environment, Transport and the Regions, London.
- Dewsbury, J.-D. 2000. Performativity and the event: enacting a philosophy of difference. *Environment and Planning D: Society and Space* **18**:473-496.
- Dias, P. C. 1996. Sources and sinks in population biology. *Trends in Ecology and Evolution* **11**:326-330.
- DOC. 2005. *Plant me instead: Plants to use in place of common and invasive environmental weeds in the lower North Island*. Department of Conservation, Wellington.
- Doel, M. 1999. *Poststructuralist geographies. The diabolical art of spatial science*. Edinburgh University Press, Edinburgh.
- Doody, B. 2005. Is kahikatea a weed: The rise and subsequent demise (?) of native seedlings in residential gardens. *Canterbury Botanical Society Journal* **39**:13-22.
- Dooling, S., G. Simon, and K. Yocom. 2006. Place-based urban ecology: A century of park planning in Seattle. *Urban Ecosystems* **9**:299–321.
- Dow, K. 2000. Social dimensions of gradients in urban ecosystems. *Urban Ecosystems* **4**:255–275.

- Drayton, B. and R. B. Primack. 1996. Plant species lost in an isolated conservation area in metropolitan Boston from 1894 and 1993. *Conservation Biology* **10**:30-39.
- Duncan, J. 1978. The social construction of unreality: An interactionist approach to the tourist's cognition of environment. Pages 269-282 *in* D. Ley and M. S. Samuels, editors. *Humanistic geography prospects and problems*. Maaroufa Press, Chicago.
- Duncan, R. P. and J. R. Young. 2000. Determinants of plant extinction and rarity 145 years after European settlement of Auckland, New Zealand *Ecology* **81**:3048-3061.
- Edwards, R. and D. Given. 2004. Native plants for amenity use. Pages 73-96 *in* I. Spellerberg and D. Given, editors. *Going native: Making use of New Zealand's native plants*. Canterbury University Press, Christchurch.
- Egoz, S., J. Bowring, and H. C. Perkins. 2006. Making a 'mess' in the countryside: Organic farming and the threats to sense of place. *Landscape Journal* **1**:54-66.
- Elwood, S. A. and D. G. Martin. 2000. 'Placing' interviews: location and scales of power in qualitative research. *Professional Geographer* **52**:649-657.
- Environment Canterbury. 2007. Environment Canterbury online GIS. Environment Canterbury, Christchurch. Available at: <http://www.ecan.govt.nz> (accessed April 2007).
- Evans, J. and S. Marvin. 2004. Disciplining the sustainable city: moving beyond science, technology or society? Leverhulme International Symposium on the Resurgent City, London School of Economics. Available at: <http://www.lse.ac.uk/collections/resurgentCity/Papers/marvinevans.pdf>.
- Evans, J. and S. Randalls. 2008. Geography and paratactical interdisciplinarity: Views from the ESRC–NERC PhD studentship programme. *Geoforum* **39**:581-592.
- Ewers, R. M. and R. K. Didham. 2006. Confounding factors in the detection of species responses to habitat fragmentation. *Biological Review* **81**:117–142.
- Eyles, J. 1985. *Senses of place*. Silverbrook Press, Chesire.
- Franceschi, E. A. 1996. The ruderal vegetation of Rosario City, Argentina. *Landscape and Urban Planning* **34**:11-18.

- Francis, M. and R. T. Hester. 1990. The garden as idea, place and action. Pages 2-19 in M. Francis and R. T. Hester, editors. *The meaning of gardens*. The MIT Press, Cambridge, Massachusetts.
- Franklin, A. 2001. *Nature and social theory*. Sage, London.
- Frazer, L. and M. Lawley. 2000. *Questionnaire design and administration: a practical guide*. John Wiley and Sons, Brisbane.
- French, K., R. Major, and K. Hely. 2005. Use of native and exotic garden plants by suburban nectarivorous birds. *Biological Conservation* **121**:545-559
- Frodeman, R. 1995. Geological reasoning: geology as an interpretive and historical science. *Bulletin of the Geological Society of America* **107**:960-968.
- Gabites, I. and R. Lucas. 2007. *The native garden: Design themes from wild New Zealand*. 2nd edition. Random House, Auckland.
- Gaston, K. J., R. A. Fuller, A. Loram, C. MacDonald, S. Power, and N. Dempsey. 2007. Urban domestic gardens (XI): variation in urban wildlife gardening in the United Kingdom. *Biodiversity and conservation* **16**:3227-3238.
- Gaston, K. J., R. M. Smith, K. Thompson, and P. H. Warren. 2005a. Urban domestic gardens (II): Experimental tests of methods for increasing biodiversity. *Biodiversity and conservation* **14**:395-413.
- Gaston, K. J., P. H. Warren, K. Thompson, and R. M. Smith. 2005b. Urban domestic gardens (IV): The extent of the resource and its associated features. *Biodiversity and conservation* **14**:3327-3349.
- Giddens, A. 1979. *Central problems in social theory*. MacMillan, London.
- Giddens, A. 1984. *The constitution of society: Outline of the theory of structuration*. University of California, Los Angeles.
- Gregory, D. 1989. Areal differentiation and post-modern human geography. *in* D. Gregory and R. Walford, editors. *Horizons in human geography*. Barnes and Nobel Books, Totowa, New Jersey.
- Greville, D. 2007. *The native plant garden*. Penguin Books, Auckland.
- Grimm, N. B., J. M. Grove, S. T. A. Pickett, and C. L. Redman. 2000. Integrated approaches to long-term studies of urban ecological systems. *Bioscience* **50**:571-584.

- Gröning, G. and J. Wolschke-Bulmahn. 2003. The native plant enthusiasm: ecological panacea or xenophobia? *Landscape Research* **28**:75-88.
- Grosz, E. 1995. *Space, time and perversion*. Routledge, London.
- Grove, J. M. and W. R. J. Burch. 1997. A social ecology approach and applications of urban ecosystem and landscape analyses: A case study of Baltimore, Maryland. *Urban Ecosystems* **1**:259-275.
- Grove, J. M., M. L. Cadenasso, W. R. Burch Jr., S. T. A. Pickett, S. Kirsten, J. O'Neil-Dunne, M. Wilson, A. Troy, and C. Boone. 2006a. Data and methods comparing social structure and vegetation structure of urban neighborhoods in Baltimore, Maryland. *Society and Natural Resources* **19**:117-136.
- Grove, J. M., A. R. Troy, J. P. M. O'Neil-Dunne, W. R. Burch Jr., M. L. Cadenasso, and S. T. A. Pickett. 2006b. Characterization of households and its implications for the vegetation of urban ecosystems. *Ecosystems* **9** 578–597.
- Hanski, I. 1999. *Metapopulation ecology*. Oxford University Press, Oxford.
- Hansson, B. 1999. Interdisciplinarity: For what purpose? *Policy Sciences* **32**:339-343.
- Haraway, D. 1991. *Simians, cyborgs and women: the reinvention of nature*. Free Association Books, London.
- Harlan, J. R. and J. M. J. de Wet. 1965. Some thoughts about weeds. *Economic Botany* **19**:16-24.
- Head, L. and P. Muir. 2004. Nativeness, invasiveness, and nation in Australian plants. *Geographical Review* **94**:199.
- Head, L. and P. Muir. 2005. Living with trees - perspectives from the suburbs. Pages 85-94 *in* M. Calver, H. Bigler-Cole, G. Bolton, A. Gaynor, P. Horwitz, J. Mills, and G. Wardell-Johnson, editors. *A forest consciousness: Proceedings of the 6th National Conference of the Australian Forest History Society*. Millpress, Rotterdam.
- Hitchings, R. 2003. People, plants and performance: on actor network theory and the material pleasures of the private garden. *Social and Cultural Geography* **4**:99-112.
- Hobbs, R. J. and H. A. Mooney. 1998. Broadening the extinction debate: population deletions and additions in California and Western Australia. *Conservation Biology* **12**:271-283.

- Honnay, O., K. Verheyen, J. Butaye, H. Jacquemyn, B. Bossuyt, and M. Hermy. 2002. Possible effects of habitat fragmentation and climate change on the range of forest plant species. *Ecology Letters* **5**:525–530.
- Hope, D., C. Gries, D. Casagrande, C. L. Redman, N. B. Grimm, and C. Martin. 2006. Drivers of spatial variation in plant diversity across the central Arizona-Phoenix ecosystem. *Society and Natural Resources* **19**:101–116.
- Hope, D., C. Gries, W. Zhu, W. F. Fagan, C. L. Redman, N. B. Grimm, A. L. Nelson, C. Martin, and A. Kinzig. 2003. Socioeconomics drive urban plant diversity. *PNAS* **100**:8788-8792.
- Horlick-Jones, T. and J. Sime. 2004. Living on the border: knowledge, risk and transdisciplinarity. *Futures* **36**:441-456.
- Hough, M. 1995. *Cities and natural processes*. Routedledge, New York.
- Ignatieva, M. E., C. D. Meurk, M. van Roon, R. Simcock, and G. H. Stewart. 2008. How to put nature into our neighbourhoods: Application of Low Impact Urban Design and Development (LIUDD) principles, with a biodiversity focus, for New Zealand developers and homeowners. Manaaki Whenua Press, Lincoln.
- Ingold, T. 2000. *The perceptions of the environment: Essays in livelihood, dwelling and skill*. Routedledge, London.
- Institute of Ecosystem Studies. 2007. Mission statement. Available at: <http://www.ecostudies.org/about.mission.html>.
- Jackson, J. B. 1984. *Discovering the vernacular landscape*. Yale University Press, New Haven.
- Jacobson, S. K. and S. B. Marynowski. 1997. Public attitudes and knowledge about ecosystem management on Department of Defense Land in Florida. *Conservation Biology* **11**:770-781.
- Jim, C. Y. 1998. Old stone walls as an ecological habitat for urban trees in Hong Kong. *Landscape and Urban Planning* **42**:29-43.
- Jones, O. and P. Cloke. 2002. *Tree cultures: the place of trees and trees in their place*. Oxford University Press, Oxford.

- Jump, A. S. and J. Peñuelas. 2006. Genetic effects of chronic habitat fragmentation in a wind-pollinated tree. *Proceedings of the National Academy of Sciences, USA* **103**:8096–8100.
- Kaipatiki Project. 2007. The nature for neighbourhoods programme. Kaipatiki Project, Auckland. Available at: <http://www.kaipatiki.org.nz> (accessed December 2007).
- Kaplan, R., S. Kaplan, and R. L. Ryan. 1998. *With people in mind: design and management of everyday nature*. Island Press, Washington, D.C. .
- Karlqvist, A. 1999. Going beyond disciplines: The meanings of interdisciplinarity. *Policy Sciences* **32**:379-383.
- Kearns, C. A., D. W. Inouye, and N. M. Waser. 1998. Endangered mutualisms: the conservation of plant–pollinator interactions. *Annual Review of Ecology and Systematics* **29**:83–112.
- Kendle, A. D. and J. E. Rose. 2000. The aliens have landed! What are the justifications for 'native only' policies in landscape plantings? *Landscape and Urban Planning* **47**:19-31.
- Kilvington, M., J. Rosier, R. Wilkinson, and C. Freeman. 1998. Urban restoration: social opportunities and constraints. *in* *Symposium on Restoring the Health and Wealth of Ecosystems*, Christchurch, New Zealand.
- Kilvington, M. and R. Wilkinson. 1999. *Community attitudes to vegetation in the urban environment: a Christchurch case study*. Manaaki Whenua Press, Lincoln.
- Kimber, C. T. 2004. Gardens and dwelling: People in vernacular gardens. *Geographical Review* **94**:263.
- Kinzig, A. P. and J. M. Grove. 2001. Urban-suburban ecology. Pages 733–745 *in* S. A. Levin, editor. *Encyclopaedia of biodiversity*. Academic Press, San Diego.
- Kinzig, A. P., P. Warren, C. Martin, D. Hope, and M. Katti. 2005. The effects of human socioeconomic status and cultural characteristics on urban patterns of biodiversity. *Ecology and Society* **10**:23-36.
- Kirk, T. 1871. On the botany of the isthmus of Auckland and the Takapuna district. *Transactions of the New Zealand Institute* **3**:148–161.
- Knox, G. A., editor. 1969. *The natural history of Canterbury*. Wellington, Reed.

- Kostel-Hughes, F., T. P. Young, and M. M. Carreiro. 1998a. Forest leaf litter quantity and seedling occurrence along an urban-rural gradient. *Urban Ecosystems* **2**:263–278.
- Kostel-Hughes, F., T. P. Young, and M. J. McDonnell. 1998b. The soil seed bank and its relationship to the aboveground vegetation in deciduous forests in New York City. *Urban Ecosystems* **2**:43-59.
- Landcare Research. 2007. Progress report on the garden bird survey, July 2007. Available at:
<http://www.landcareresearch.co.nz/research/biocons/gardenbird/results2007.asp>.
Landcare Research, Lincoln, Canterbury.
- Laurance, W. F. 1991. Edge effects in tropical forest fragments: Application of a model for the design of nature reserves. *Biological Conservation* **57**:205-219.
- Law, J. 2004a. *After method: Mess in social science research*. Routledge, London; New York.
- Law, J. 2004b. *Enacting naturecultures: a note from STS*. Centre for Science Studies, Lancaster University, Lancaster, available at:
<http://www.comp.lancs.ac.uk/sociology/papers/law-enacting-naturecultures.pdf>.
- Law, J. and J. Urry. 2004. Enacting the social. *Economy and Society* **33**:390-410.
- Leach, H. M. 1994. Native plants and national identity in New Zealand gardening: An historical review. *Horticulture in New Zealand (Journal of the Royal New Zealand Institute of Horticulture)* **5**:28-33.
- Leach, H. M. 2002. Exotic natives and contrived wild gardens: The twentieth-century home garden. Pages 214-229 *in* E. Pawson and T. Brooking, editors. *Environmental histories of New Zealand*. Oxford University Press, Auckland.
- Lee, D. A., W. G. Lee, and N. Mortimer. 2001. Where and why have all the flowers gone? Depletion and turnover in the New Zealand Cenozoic angiosperm flora in relation to palaeogeography and climate. *Australian Journal of Botany* **49**:341–356.
- Lehvävirta, S. and H. Rita. 2002. Natural regeneration of trees in urban woodlands. *Journal of Vegetation Science* **13**:57-66.

- Leonard, L., H. C. Perkins, and D. Thorns. 2004. Presenting and creating home: the influence of popular and building trade print media in the construction of home. *Housing, Theory and Society* **21**:97-110.
- Ley, D. 1981. Behavioural geography and the philosophies of meaning. Pages 209-230 in K. R. Cox and R. G. Gollege, editors. *Behavioural problems in geography revisited*. Methuen, London.
- Ley, D. and M. S. Samuels, editors. 1978. *Humanistic geography prospects and problems*. Maaroufa Press, Chicago.
- Lofland, J., D. Snow, L. Anderson, and L. H. Lofland. 2006. *Analyzing social settings: A guide to qualitative observation and analysis*. 4th edition. Wadsworth/Thomson Learning, Belmont.
- Longhurst, R. 2006. Plots, plants and paradoxes: contemporary domestic gardens in Aoteroa/New Zealand. *Social and Cultural Geography* **7**:581-593.
- Loram, A., J. Tratalos, P. H. Warren, and K. J. Gaston. 2007. Urban domestic gardens (X): The extent and structure of the resource in five major cities. *Landscape Ecology* **22**:601-615.
- Machlis, G. E., J. E. Force, and W. R. Burch Jr. 1997. The human ecosystem part I: the human ecosystem as an organizing concept in ecosystem management. *Social Natural Resources* **10**:347-367.
- Macnaghten, P. 2003. Embodying the environment in everyday life practices. *The Sociological Review* **51**:63-84.
- Macnaghten, P. and J. Urry. 1995. Towards a sociology of nature. *Sociology* **29**:203-220.
- Macnaghten, P. and J. Urry. 1998. *Contested natures*. Sage Publications, London.
- Macnaghten, P. and J. Urry, editors. 2001. *Bodies of nature*. Sage, London.
- Maina, G. G. and H. F. Howe. 2000. Inherent rarity in community restoration. *Conservation Biology* **14**:1335-1340.
- Martin, C. A., K. A. Peterson, and L. B. Stabler. 2003. Residential landscaping in Phoenix, Arizona, U.S.: Practices and preferences relative to covenants, codes and restrictions. *Journal of Arboriculture* **29**:9-17.
- Martin, C. A., P. S. Warren, and A. P. Kinzig. 2004. Neighborhood socioeconomic status is a useful predictor of perennial landscape vegetation in residential

- neighborhoods and embedded small parks of Phoenix, AZ. *Landscape and Urban Planning* **69**:355–368.
- Mascia, M. B., J. P. Brosius, T. A. Dobson, B. C. Forbes, L. Horowitz, M. A. McKean, and N. J. Turner. 2003. Conservation and the social sciences. *Conservation Biology* **17**:649-650.
- Massey, D. 1994a. Double articulation: A place in the world. *in* A. Bammer, editor. *Displacements*. Indiana University Press, Bloomington.
- Massey, D. 1994b. *Space, place and gender*. Polity Press, Cambridge.
- Massey, D. 1995. Places and their pasts. *History Workshop Journal* **39**:182-192.
- Massey, D. 1999. Space-time, ‘science’ and the relationship between physical geography and human geography. *Transactions of the Institute of British Geographers* **24**:261-276.
- Mathieu, R., C. Freeman, and J. Aryal. 2007. Mapping private gardens in urban areas using object-oriented techniques and very high-resolution satellite imagery. *Landscape and Urban Planning* **81**:179-192.
- Maurer, U., T. Peschel, and S. Schmitz. 2000. The flora of selected urban land-use types in Berlin and Postdam with regard to nature conservation in cities. *Landscape and Urban Planning* **46**:209-215.
- May, R. 2004. Editorial—On the role of the humanities in urban ecology: The case of St. Petersburg. *Urban Ecosystems* **7**:7-15.
- McDonnell, M. J. 1997. Guest editorial: A paradigm shift. *Urban Ecosystems* **1**:85–86.
- McDonnell, M. J. and S. T. A. Pickett. 1990. Ecosystem structure and function along urban-rural gradients: an unexploited opportunity for ecology. *Ecology* **71**:1232–1237.
- McDonnell, M. J., S. T. A. Pickett, P. Groffman, P. Bohlen, R. V. Pouyat, W. C. Zipperer, R. W. Parmelee, M. M. Carreiro, and K. Medley. 1997. Ecosystem changes along an urban-to-rural gradient. *Urban Ecosystems* **1**:21–36.
- McGlone, M. S. 2005. Goodbye Gondwana. *Journal of Biogeography* **32**:739–740.
- McIntyre, N. E., K. Knowles-Yanez, and D. Hope. 2000. Urban ecology as an interdisciplinary field: differences in the use of “urban” between the social and natural sciences. *Urban Ecosystems* **4**:5-24.

- McKinney, M. L. 2002. Urbanization, biodiversity, and conservation. *Bioscience* **52**:883-890.
- Meinig, D. W. 1979. Symbolic landscapes: Some idealizations of American communities. Pages 164-192 *in* D. W. Meinig, editor. *The interpretation of ordinary landscapes*. Oxford University Press, New York.
- Menzies, D. 2004. Landscape design with natives. Pages 110-120 *in* I. Spellerberg and D. Given, editors. *Going native: Making use of New Zealand plants*. Canterbury University Press, Christchurch.
- Meurk, C. D. 2005. Cities are cultural and ecological keys to biodiverse futures. Pages 301-310 *in* M. I. Dawson, editor. *Greening the city: Bringing biodiversity back into the urban environment*. Royal New Zealand Institute of Horticulture, Lincoln, Canterbury.
- Meurk, C. D. and G. M. J. Hall. 2006. Options for enhancing forest biodiversity across New Zealand's managed landscapes based on ecosystem modelling and spatial design. *New Zealand Journal of Ecology* **30**:131-146.
- Meurk, C. D. and S. R. Swaffield. 2000. A landscape ecological framework for indigenous regeneration in New Zealand-Aotearoa. *Landscape and Urban Planning* **50**:129-144.
- MftE. 2002. *People, places, spaces: A design guide for urban New Zealand*. Ministry for the Environment, Wellington.
- Miess, M. 1979. The climate of cities. Pages 91-114 *in* I. C. Laurie, editor. *Nature in cities*. John Wiley and Sons Ltd, Surrey.
- Miller, J. R. and R. J. Hobbs. 2002. Conservation where people live and work. *Conservation Biology* **16**:330-337.
- Mitchell, A. 1972. *The half gallon, quarter-acre, pavlova paradise*. Whitcomb and Tombs, Christchurch.
- Mizejewski, D. 2004. *Attracting birds, butterflies and other backyard wildlife* (National Wildlife Federation). Creative Homeowner, Upper Saddle River.
- Mol, A. 1999. Ontological politics: A word and some questions. *in* J. Law and J. Hassard, editors. *Actor Network Theory and After*. Blackwell and the Sociological Review, Oxford and Kele.

- Molloy, B., editor. 1995. Riccarton Bush: Putaringamotu. The Riccarton Bush Trust, Christchurch.
- Molloy, B. 2000. History and Management of Riccarton Bush. *The New Zealand Garden Journal (Journal of the Royal New Zealand Institute of Horticulture)* **3**:13-18.
- Moon, G. 1994. *The Reed field guide to New Zealand birds*. Reed, Auckland.
- Moon, G. 2002. *A photographic guide to the birds of New Zealand*. New Holland Publishers, Auckland.
- Moran-Ellis, J., V. D. Alexander, A. Cronin, M. Dickinson, J. Fielding, S. Judith, and H. Thomas. 2006. Triangulation and integration: processes, claims and implications. *Qualitative Research* **6**:45–59.
- Murdoch, J. 1997. Towards a geography of heterogeneous associations. *Progress in Human Geography* **21**:321-337.
- Murdoch, J. 2001. Ecologising Sociology: Actor-Network Theory, co-construction and the problem of human exemptionalism. *Sociology* **35**:111-133.
- Musacchio, L. R. and J. Wu. 2004. Collaborative landscape-scale ecological research: Emerging trends in urban and landscape ecology. *Urban Ecosystems* **7**:175–178.
- Nash, C. 2000. Performativity in practice: some recent work in cultural geography. *Progress in Human Geography* **24**:653-664.
- Nassauer, J. 1995. Messy ecosystems, orderly frames. *Landscape Journal* **14**:161-170.
- Nassauer, J. I. 1997. Cultural sustainability: aligning aesthetics and ecology. Pages 65-83 *in* J. I. Nassauer, editor. *Placing nature: culture and landscape ecology*. Island Press, Washington DC.
- National Parks Act 1980. Government Printer, Wellington.
- Newton, T. 2007. *Nature and sociology*. Routledge, London and New York.
- Niemelä, J. 1999. Is there a need for a theory of urban ecology? *Urban Ecosystems* **3**:57-65.
- Nissani, M. 1997. Ten cheers for interdisciplinarity: the case for Interdisciplinary knowledge and research. *The Social Science Journal* **34**:201-216.
- Norton, D. A. 2002. *Edge effects in a lowland temperate New Zealand rainforest*. Department of Conservation, Wellington.
- NRB. 2003. *Annual survey of residents*. National Research Bureau, Auckland.

- O'Donnell, C. 1995. Birdlife of Riccarton Bush. Pages 247-259 *in* B. Molloy, editor. Riccarton Bush: Putaringamotu. The Riccarton Bush Trust, Christchurch.
- O'Rourke, E. 2005. Socio-natural interaction and landscape dynamics in the Burren, Ireland. *Landscape and Urban Planning* **70**:69-83.
- Owens, S., J. Petts, and H. Bulkeley. 2006. Boundary work: knowledge, policy, and the urban environment. *Environment and Planning C: Government and Policy* **24**:633-643.
- Parker, A. and E. K. Sedgwick, editors. 1995. Performance and performativity. Routledge, New York and London.
- Perkins, H. C. 1988a. Bulldozers in the Southern Part of Heaven: defending place against rapid growth. Part 1: local residents' interpretations of rapid urban growth in a free-standing service-class town. *Environment and Planning A* **20**:285-308.
- Perkins, H. C. 1988b. Bulldozers in the Southern Part of Heaven: defending place against rapid growth. Part 2: the Alliance strikes back. *Environment and Planning A* **20**:435-456.
- Perkins, H. C. 1989. The country in the town: The role of real estate developers in the construction of meaning of place. *Journal of Rural Studies* **5**:61-74.
- Perkins, H. C. and D. Thorns. 2001. Houses, homes and New Zealanders' everyday lives. Pages 30-51 *in* C. Bell, editor. *Sociology of everyday life in New Zealand*. Dunmore Press Limited, Palmerston North.
- Perkins, H. C., D. C. Thorns, and A. Winstanley. forthcoming. House and home: Methods and methodology for exploring meaning and structure. *in* P. Mangin, M. Tonks, and S. Thompson, editors. *Qualitative housing analysis: An international perspective*. Elsevier, London.
- Petts, J., S. Owens, and H. Bulkeley. 2008. Crossing boundaries: Interdisciplinarity in the context of urban environments. *Geoforum* **39**:593-601.
- Pickett, S. T. A., W. R. J. Burch, S. E. Dalton, T. W. Foresman, J. M. Grove, and R. Rowntree. 1997. A conceptual framework for the study of human ecosystems in urban areas. *Urban Ecosystems* **1**:185-199.
- Pickett, S. T. A. and M. L. Cadenasso. 1995. Landscape ecology: spatial heterogeneity in ecological systems. *Science* **269**:331-334.

- Pickett, S. T. A. and M. L. Cadenasso. 2006. Advancing urban ecological studies: Frameworks, concepts, and results from the Baltimore Ecosystem Study. *Austral Ecology* **31**:114-125.
- Pickett, S. T. A., M. L. Cadenasso, J. M. Grove, C. H. Nilon, R. V. Pouyat, W. C. Zipperer, and R. Costanza. 2001. Urban ecological systems: Linking terrestrial ecological, physical, and socioeconomic components of metropolitan areas. *Annual Review of Ecology and Systematics* **32**:127-157.
- Pickett, S. T. A. and M. J. McDonnell. 1993. Humans as components of ecosystems: a synthesis. Pages 310-316 *in* M. J. McDonnell and S. T. A. Pickett, editors. *Humans as components of ecosystems*. Springer-Verlag, New York.
- Pickett, S. T. A. and P. S. White, editors. 1985. *The ecology of natural disturbance and patch dynamics*. Academic Press, New York.
- Power, E. R. 2005. Human–nature relations in suburban gardens. *Australian Geographer* **36**:39–53.
- Pred, A. 1983. Structuration and place - on the becoming of sense of place and structure of feeling. *Journal for the Theory of Social Behaviour* **13**:45-68.
- Primack, R. B. 1993. *Essentials of conservation biology*. Sinauer Associates, Sunderland.
- Primack, R. B. and S. L. Miao. 1992. Dispersal can limit local plant distribution. *Conservation Biology* **6**:513-519.
- Pulliam, H. R. 1988. Sources, sinks, and population regulation. *American Naturalist* **132**:652–661.
- Pyšek, P., D. M. Richardson, M. Rejmánek, G. L. Webster, M. Williamson, and J. Kirschner. 2004. Alien plants in checklists and floras: towards better communication between taxonomists and ecologists. *Taxon* **53**:131–143.
- R Development Core Team. 2007. R: A language and environment for statistical computing, available at: <http://www.R-project.org>. R Foundation for Statistical Computing, Vienna.
- Raijmann, L. E. L., N. C. Van Leeuwen, R. Kersten, J. G. B. Oostermeijer, H. C. M. Den Nijs, and S. B. J. Menken. 1994. Genetic variation and outcrossing in relation to population size in *Gentiana pneumonanthe* L. *Conservation Biology* **8**:1014–1026.

- Raine, K. 1995a. 1840-1860s The settlers' gardens. Pages 64-85 *in* M. Bradbury, editor. A history of the garden in New Zealand. Penguin Books Ltd, Auckland.
- Raine, K. 1995b. 1860s-1900: Victorian gardens. Pages 87-111 *in* M. Bradbury, editor. A history of the garden in New Zealand. Penguin Books, Auckland.
- Raine, K. 1995c. 1900-1920: Early twentieth-century gardens. Pages 113-134 *in* M. Bradbury, editor. A history of the garden in New Zealand. Penguin Books, Auckland.
- Rebele, F. 1994. Urban ecology and special features of urban ecosystems. *Global Ecology and Biogeography Letters* **4**:173-187.
- Relph, E. 1976. Place and placeness. Pion, London.
- Resource Management Act 1991. Government Printer, Wellington.
- Riccarton Bush Act 1914. Government Printer, Wellington.
- Richards, N. A., J. R. Mallette, R. J. Simpson, and E. A. Macie. 1984. Residential greenspace and vegetation in a mature city: Syracuse, New York *Urban Ecology* **8**:99-125.
- Richardson, D. M., P. Pysek, M. Rejmanek, M. G. Barbour, F. D. Panetta, and C. J. West. 2000. Naturalization and invasion of alien plants: concepts and definitions. *Diversity and Distributions* **6**:93-107.
- Roarke, D. and J. Marzluff, M. . 2006. Relative importance of habitat quantity, structure, and spatial pattern to birds in urbanizing environments. *Urban Ecosystems* **9**:99-117.
- Roberts, D. G., D. J. Ayre, and R. J. Whelan. 2007. Urban plants as genetic reservoirs or threats to the integrity of bushland plant populations. *Conservation Biology* **21**:842-852.
- Robinson, J. G. 2006. Conservation biology and real-world conservation. *Conservation Biology* **20**:658-669.
- Rooney, D. 2003. Last word. *New Zealand Garden Journal* **6**:23-24.
- Rose, G. 1999. Performing space. Pages 247-259 *in* D. Massey, J. Allen, and P. Sarre, editors. *Human geography today*. Blackwell Publishers Ltd., Cambridge.
- Rose, G. and N. Thrift, editors. 2000. *Environment and Planning D: Society and Space*. Special issue: 'spaces of performance'. 18 (4-5).

- Rose, S. 1997. *Lifelines: biology, freedom, determinism*. Penguin, Harmondsworth.
- Ross, M. A. and C. A. Lembi. 1999. *Applied weed science*. Prentice Hall, New Jersey.
- Roy, B., I. Popay, P. Champion, T. James, and A. Rahman. 2004. *An illustrated guide to common weeds of New Zealand*. 2nd edition. New Zealand Plant Protection Society, Lincoln, Canterbury.
- Rudd, H., J. Vala, and V. Schaefer. 2002. Importance of backyard habitat in a comprehensive biodiversity conservation strategy: A connectivity analysis of urban green spaces. *Restoration-Ecology* **10**:368-375.
- Saunders, D. A., R. J. Hobbs, and C. R. Margules. 1991. Biological consequences of ecosystem fragmentation: a review. *Conservation Biology* **5**:18-32.
- Sawyer, J. 1997. Plant conservation outside reserves in the lower north island, New Zealand. Pages 458-462 *in* P. Hale and D. Lamb, editors. *Conservation outside nature reserves*. Centre for Conservation Biology, The University of Queensland, Brisbane.
- Sawyer, J. 2005. Saving threatened native plant species in cities - from traffic islands to real islands. Pages 111-117 *in* M. I. Dawson, editor. *Greening the city: Bringing biodiversity back into the urban environment*. Royal New Zealand Institute of Horticulture, Lincoln, Canterbury.
- Schaal, B. A. and W. J. Leverich. 1996. Molecular variation in isolated plant populations. *Plant Species Biology* **11**:33-40.
- Schechner, R. 1988. *Performance theory*. Routledge, New York.
- Schwab, W. A. 1993. Recent empirical and theoretical developments in sociological human ecology. Pages 29-57 *in* R. Hutchison, editor. *Research in urban sociology: Urban sociology in transition*. Jai Press Inc., Greenwich.
- Schwartz, M. W. 2006. How conservation scientists can help develop social capital for biodiversity. *Conservation Biology* **20**:1550-1552.
- Seidlich, B. 1997. *Green web Sydney. A vegetation management plan for the Sydney region*. Sydney Regional Organisations of Councils, Sydney.
- Shafer, C. L. 1995. Values and shortcomings of small reserves. *BioScience* **45**:80-88.
- Sih, A. and M. S. Baltus. 1987. Patch size, pollinator behaviour, and pollinator limitation in catnip. *Ecology* **68**:1679-1690.

- Simberloff, D. 2003. Confronting introduced species: a form of xenophobia. *Biological Invasions* **5**:179-192.
- Simmons, I. 1993. *Interpreting nature: Cultural constructions of the environment*. Routledge, London.
- Sinclair, K. 1986. *A destiny apart: New Zealand's search for a national identity*. Allen and Unwin, Wellington.
- Smith, R. M., K. Thompson, J. G. Hodgson, P. H. Warren, and K. J. Gaston. 2006. Urban domestic gardens (IX): Composition and richness of the vascular plant flora, and implications for native biodiversity. *Biological Conservation* **129**:312-322.
- Soper, K. 1995. *What is nature?: Culture, politics and the non-human*. Blackwell, Oxford.
- Soule, M. E., editor. 1986. *Conservation biology: the science of scarcity and diversity*. Sinauer, Sunderland.
- Spellerberg, I., M. Bradstock, R. Edwards, D. Given, and M. Parsons. 2004. Plants as icons. Pages 51-62 *in* I. Spellerberg and D. Given, editors. *Going native: Making use of New Zealand plants*. Canterbury University Press, Christchurch.
- Spellerberg, I. and D. Given, editors. 2004a. *Going native: making use of New Zealand plants*. Canterbury University Press, Christchurch.
- Spellerberg, I. and D. Given. 2004b. Introduction. Pages 9-14 *in* I. Spellerberg and D. Given, editors. *Going native: Making use of New Zealand plants*. Canterbury University Press, Christchurch.
- Spinoza, B. 1996. *Ethics*, edited and translated by Edwin Curley with an introduction by Stuart Hampshire. Penguin, Harmondsworth.
- States, B. O. 1996. Performance as metaphor. *Theatre Journal* **48**:1-26.
- Statistics New Zealand. 2001a. *Measuring unpaid work in New Zealand 1999*. Statistics New Zealand, Wellington.
- Statistics New Zealand. 2001b. *New Zealand census of population and dwellings: Housing*. Statistics New Zealand, Wellington.
- Steffan-Dewenter, I. and T. Tschardtke. 1999. Effects of habitat isolation on pollinator communities and seed set. *Oecologia* **121**:432-440.

- Stewart, G. H., M. E. Ignatieva, C. D. Meurk, and R. D. Earl. 2004. The re-emergence of indigenous forest in an urban environment, Christchurch, New Zealand. *Urban Forestry and Urban Greening* **2**:149-158.
- Stewart, G. H. and D. Woods. 1997. A second generation at Matawai Park. Pages 62–63 *in* M. C. Smale and C. D. Meurk, editors. Proceedings of a workshop on scientific issues in ecological restoration. Landcare Research Science Series 14, Lincoln, Canterbury.
- Sukopp, H. and U. Starfinger. 1999. Disturbance in urban ecosystems. Pages 397-412 *in* L. R. Walker, editor. Ecosystems of disturbed ground. Elsevier, London.
- Sullivan, J. J., S. M. Timmins, and P. A. Williams. 2005. Movement of exotic plants into coastal native forests from gardens in northern New Zealand. *New Zealand Journal of Ecology* **29**:1-10.
- Szszynski, B., W. Heim, and C. Waterton. 2003a. Introduction. Pages 1-14 *in* B. Szszynski, W. Heim, and C. Waterton, editors. Nature performed: Environment, culture and performance. Blackwell Publishing, Oxford.
- Szszynski, B., W. Heim, and C. Waterton, editors. 2003b. Nature performed: Environment, culture and performance. Blackwell Publishing, Oxford.
- Tait, C. J., C. B. Daniels, and R. S. Hill. 2005. Changes in species assemblages within the Adelaide metropolitan area, Australia, 1836-2002. *Ecological Applications* **15**:346–359.
- Tansley, A. G. 1935. The use and abuse of vegetation concepts and terms. *Ecology* **16**:284-307.
- Taylor, R. and I. Smith. 1997. The state of New Zealand's environment. The Ministry for the Environment, Wellington.
- TCPA. 2004. Biodiversity by design: a guide for sustainable cities. Town and Country Planning Association, London.
- Thompson, K., K. C. Austin, R. M. Smith, P. H. Warren, P. G. Angold, and K. J. Gaston. 2003. Urban domestic gardens (I): Putting small-scale plant diversity in context. *Journal of Vegetation Science* **14**:71-78.
- Thompson, K. and A. Jones. 1999. Human population density and prediction of local plant extinction in Britain. *Conservation Biology* **13**:185–189.

- Thomson, A. 1995. The Riccarton Bush Reserve. Pages 14-34 *in* B. Molloy, editor. Riccarton Bush: Putaringamotu. The Riccarton Bush Trust, Christchurch.
- Thrift, N. 1996. Spatial formations. Sage, London.
- Thrift, N. 1999. Steps to an ecology of place. Pages 295-322 *in* D. Massey, J. Allen, and P. Sarre, editors. Human geography today. Blackwell Publishers Ltd., Cambridge.
- Thrift, N. 2000. Afterwords. Environment and Planning D: Society and Space **18**:213-255.
- Thrift, N. 2004. Intensities of feeling: Towards spatial politics of affect. Geografiska Annaler **86**:57-78.
- Thrift, N. and J.-D. Dewsbury. 2000. Dead geographies - and how to make them live. Environment and Planning D: Society and Space **18**:411-432.
- Tilman, D., R. M. May, C. L. Lehman, and M. A. Nowak. 1994. Habitat destruction and the extinction debt. Nature **371**:65-66.
- Tress, G., B. Tress, and G. Fry. 2004. Clarifying integrative research concepts in landscape ecology. Landscape Ecology **20**:479-493.
- Tress, G., B. Tress, and G. Fry. 2007. Analysis of the barriers to integration in landscape research projects. Land Use Policy **24**:374-385.
- Tuan, Y.-F. 1990. Topophilia: A study of environmental perception, attitudes, and values. Columbia University Press, New York.
- Tuan, Y. F. 1974. Topophilia. Inglewood Cliffs Inc., New Jersey.
- Turnbull, D. 2000. Masons, tricksters and cartographers : comparative studies in the sociology of scientific and indigenous knowledge. Harwood Academic, Amsterdam.
- Turner, K., L. Lefler, and B. Freedman. 2005. Plant communities of selected urbanized areas of Halifax, Nova Scotia, Canada. Landscape and Urban Planning **71**:191-206.
- US Environmental Protection Agency. 2007. Greenlandscaping: Greenacres. U. S. Environmental Protection Agency, Washington D.C. Available at: <http://www.epa.gov/greenacres> (accessed December 2007).

- Vallance, S., H. C. Perkins, and K. Moore. 2005. The results of making a city more compact: neighbours' interpretation of urban infill. *Environment and Planning B: Planning and Design* **32**:715 - 733.
- Van Rossum, F. 2007a. Conservation of long-lived perennial forest herbs in an urban context: *Primula elatior* as study case. *Conservation Genetics* **OnlineFirst**.
- Van Rossum, F. 2007b. Conservation of long-lived perennial forest herbs in an urban context: *Primula elatior* as study case. *Conservation Genetics* **OnlineFirst**.
- Vitousek, P. M. 1997. Human domination of Earth's ecosystems. *Science* **275**:494-499.
- Vitousek, P. M., H. A. Mooney, J. Lubchenco, and J. M. Melillo. 1997. Human domination of Earth's ecosystems. *Science* **277**:494-499.
- Walker, P. 1995. Towards the modern garden. Pages 153-171 in M. Bradbury, editor. *A history of the garden in New Zealand*. Penguin Books Ltd, Auckland.
- Wardle, P. 2005. How can we be sure whether a plant is naturalised, and when does it matter? *Canterbury Botanical Society Journal* **39**:37-45.
- Warren, C. R. 2007. Perspectives on the 'alien' versus 'native' species debate: a critique of concepts, language and practice. *Progress in Human Geography* **31**:427-446.
- Watson, M. 2003. Performing place in nature reserves. Pages 145-160 in B. Szerszynski, W. Heim, and C. Waterton, editors. *Nature performed: Environment, culture and performance*. Blackwell Publishing, Oxford.
- Wear, D. N. 1999. Challenges to interdisciplinary discourse. *Ecosystems* **2**:299-301.
- Webb, C. J. and D. Kelly. 1993. The reproductive biology of the New Zealand flora. *Trends in Evolution and Ecology* **8**:442-447.
- Whatmore, S. 1999. Hybrid geographies: Rethinking the 'human' in human geography. Pages 22-41 in D. Massey, J. Allen, and P. Sarre, editors. *Human geography today*. Blackwell Publishers Ltd., Cambridge.
- Whatmore, S. 2002. *Hybrid geographies: natures cultures spaces*. Sage Publications Ltd, London.
- Whelan, R. J., D. G. Roberts, P. R. England, and D. J. Ayre. 2006. The potential for genetic contamination vs. augmentation by native plants in urban gardens. *Biological Conservation* **128**:493-500.

- Williams, P. A. and B. L. Karl. 1996. Fleshy fruits of indigenous and adventive plants in the diet of birds in forest remnants, Nelson, New Zealand. *New Zealand Journal of Ecology* **20**:127-145.
- Williams, R. 1972. Ideas of nature. Pages 146-164 *in* J. Renthall, editor. *Ecology, the shaping of enquiry*. Longman, London.
- Williams, R. 1976. *Keywords: A vocabulary of culture and society*. Fontana, London.
- Williams, R. 1977. *Marxism and literature*. Oxford University Press, Oxford.
- Williams, S. 1995. *Outdoor recreation and the urban environment*. Routledge, London.
- Winstanley, A., D. C. Thorns, and H. C. Perkins. 2002. Moving house, creating home: Exploring residential mobility. *Housing Studies* **17**:813-832.
- Young, A., T. Boyle, and T. Brown. 1996. The population genetic consequences of habitat fragmentation for plants. *Trends in Ecology and Evolution* **11**:413-418.
- Young, A. and N. Mitchell. 1994. Microclimate and vegetation edge effects in a fragmented podocarp-broadleaf forest in New Zealand. *Biological Conservation* **67**:63-72.
- Young, R. F. and S. A. Wolf. 2006. Goal attainment in urban ecology research: A bibliometric review 1975-2004. *Urban Ecosystems* **9**:179-193.
- Zagorski, T., J. B. Kirkpatrick, and E. Stratford. 2004. Gardens and the bush: Gardeners' attitudes, garden types and invasives. *Australian Geographical Studies* **42**:207-220.
- Zerbe, S., U. Maurer, and H. Sukopp. 2003. Biodiversity in Berlin and its potential for nature conservation. *Landscape and Urban Planning* **62**:139-148.

Appendices

Appendix 1. Status of the fruit dispersing birds that currently occur in Riccarton Bush⁶⁵.

Species name ⁶⁶	Common name	Resident	Breeding	Vagrant
Native				
<i>Hemiphaga novaseelandiae</i> *	Kereru	×	×	
<i>Rhipidura fuliginosa</i>	Fantail	×	×	
<i>Anthornis melanura</i> *	Bellbird			×
<i>Zosterops lateralis</i>	Silvereye	×	×	
Naturalised				
<i>Turdus philemelos</i>	Song thrush	×	×	
<i>Turdus merula</i>	Blackbird	×	×	
<i>Sturnus vulgaris</i>	Starling	×	×	

⁶⁵ Source: O'Donnell .

⁶⁶ Endemic birds are marked with an asterisk.

Appendix 2. Weight, gap size, and diet, of birds that currently occur in Riccarton Bush and potentially disperse fruit⁶⁷.

Species name ⁶⁸	Weight (g)	Gap Size (cm)	Diet
Native			
<i>Anthornis melanura</i>	34 (M) 26 (F)	0.6	Diet varies seasonally on invertebrates, fruit and nectar
<i>Hemiphaga novaseelandiae</i>	650	1.4	Major frugivore, also includes some leaves and buds
<i>Rhipidura fuliginosa</i>	8	>0.5	Major insectivore, minor frugivore
<i>Zosterops lateralis</i>	13	0.5	Major insectivore but consume fruit throughout the year
Naturalised			
<i>Turdus merula</i>	90	0.9	Major frugivore but also include invertebrates
<i>Turdus philemelos</i>	70	1.0	Major frugivore
<i>Sturnus vulgaris</i>	85	0.9	Major insectivore, minor frugivore

⁶⁷ Sources: Clout and Hay ; O'Donnell and Dilks ; Robertson and Heather .

⁶⁸ See Appendix 1 for common names.

Appendix 3. The quantitative questionnaire survey used in the study⁶⁹.

Site Number: _____

Date: _____

Dispersal and regeneration of native trees from Riccarton Bush

Section A

Using the scale from 1 to 5, which number best indicates how important or unimportant you believe the following features or purposes are in regards to your section and garden

(SHOW CARD A)

Feature/purpose	Scale
1. Outdoor living	1 2 3 4 5
2. Privacy	1 2 3 4 5
3. Sunlight	1 2 3 4 5
4. Flowers	1 2 3 4 5
5. Colour	1 2 3 4 5
6. Shade	1 2 3 4 5
7. A vegetable garden	1 2 3 4 5
8. Trees	1 2 3 4 5
9. Trees that lose their leaves in winter	1 2 3 4 5
10. Room for kids to play	1 2 3 4 5
11. Shape and form in a garden	1 2 3 4 5
12. A garden that compliments the house	1 2 3 4 5
13. A low maintenance garden	1 2 3 4 5
14. A neat and tidy garden	1 2 3 4 5
15. A garden where you can entertain guests	1 2 3 4 5
16. An aesthetically pleasing garden	1 2 3 4 5

⁶⁹ To meet the necessary formatting requirements this version of the questionnaire differs from the original version.

2.1 Who is mainly responsible for looking after these sections of your garden?

2.2 Who is mainly responsible for the planning of these sections? (SHOW CARD B)

2.1/2.2 Person	2.1 L	2.1 F	2.1 V	2.1 S	2.2 L	2.2 F	2.2 V	2.2 S
1) Yourself								
2) Partner/spouse								
3) Mother/s								
4) Father/s								
5) Your children								
6) Hired gardener								
7) The landlord								
8) Landscaper								
9) Other:								

For these questions I want to know about the time spent looking after your garden during the seasons.

3.1 Could you please tell me what the total time is spent by everyone on active tasks in your garden, per week in summer/spring/autumn/winter in full or half hours excluding maintaining the lawns, spraying and watering? (SHOW CARD C)

3.2 What percentage/hours of that total time during summer/spring/autumn/winter would you spend on 1) areas of flowers; 2) areas of vegetables; 3) areas of shrubs and trees? (SHOW CARD D)

3.3 What percentage/hours of that total time during summer/spring/autumn/winter would you spend on the following tasks? 1) weeding; 2) fertilising; 3) planting; 4) raking up and removing leaves; 5) general maintenance (SHOW CARD E)

3.4 During summer/spring/autumn/winter how many hours per week would be spent on mowing the lawns? (SHOW CARD F)

3.5 During summer/spring/autumn/winter how many hours per week of watering would the garden and lawns receive? (SHOW CARD G)

3.6 Over the whole summer/spring/autumn/winter how many hours would you spend spraying the garden and lawns? (SHOW CARD H)

Variable	Spring	Summer	Autumn	Winter
3.1 Total time (per wk)				
3.2 Flowers (% of time)				
3.2 Vegetables (% of time)				
3.2 Shrubs/trees (% of time)				
3.3 Weeding (% of time)				
3.3 Fertilising (% of time)				
3.3 Planting (% of time)				
3.3 Leaves (% of time)				
3.3 General maintenance (% of time)				
3.4 Mowing (hrs)				
3.5 Watering (hrs)				
3.6 Spraying (hrs)				

4.1 How are weeds actively removed in each of these sections? (SHOW CARD B & J)

4.2 How do you prevent weeds from establishing in each of these sections?

4.1 Remove	L	F	V	S
1) Pull by hand				
2) Remove by hoeing				
3) Use a weed eater				
4) Spray herbicide				
5) Remove by digging out				
6) Other:				
4.2 Prevent	L	F	V	S
1) Bark chips				
2) Straw/mulch				
3) Stones				
4) Weed mat				
5) Spray herbicide				
6) Don't remove leaf litter				
7) Other:				

For these questions I'm interested in woody plants only, those with hard stems, rather than herbaceous plants like chickweed.

5. Which of the following statements explains how you would typically treat weeds/self-introduced [non-planted] plants in these areas on your property: 1) lawns; 2) flowerbeds; 3) vegetable gardens; 4) shrubs and trees? (SHOW CARD K & L)

Statement	L	F	V	S
I don't get any self-introduced plants in that section				
I remove everything that's not planted				
If it is something I like I will let it grow there				
If it is something I like but don't consider appropriate for that area I will transplant it				
I leave everything to grow in that section				
Other				

6.1 Do you know what this is? (SHOW SEEDLING) Y N NS

6.2 IF YES: What is it? _____

6.3 How would you treat it if it came up in your garden? _____

Section B

1. Using the scale from 1 to 5, which number best indicates whether you agree or disagree with the following statements about native and exotic plants and plants in your garden (SHOW CARD M)

1. Natives, exotics and plants in garden statements	Scale
1. A garden should be a mix of native and exotic plants	1 2 3 4 5
2. A native plant is any plant that has been in New Zealand for more than 150 years	1 2 3 4 5
3. An exotic plant is a plant that is unusual	1 2 3 4 5
4. An indigenous plant is the same as a native plant	1 2 3 4 5
5. An exotic plant is any plant brought to New Zealand by humans	1 2 3 4 5
6. An introduced plant is the same as an exotic plant	1 2 3 4 5
7. I find native plants attractive	1 2 3 4 5
8. Only plants in New Zealand before the arrival of humans are native plants	1 2 3 4 5
9. I find exotic plants unattractive	1 2 3 4 5
10. Most exotic plants are weeds	1 2 3 4 5
11. People should plant less native plants on their properties	1 2 3 4 5
12. Plants that provide food for wildlife are important in gardens	1 2 3 4 5
13. People should plant more exotic plants on their properties	1 2 3 4 5
14. Self-introduced plants in your garden are weeds	1 2 3 4 5
15. Species unique to New Zealand are important to our identity	1 2 3 4 5

2. Using the scale from 1 to 5, which number best indicates whether you agree or disagree with the following statements about Riccarton Bush (SHOW CARD M)

2. Riccarton Bush statements	Scale
1. I would be prepared to plant Riccarton Bush species in my garden	1 2 3 4 5
2. I would be prepared to let self-introduced Riccarton Bush plants become a permanent part of my garden	1 2 3 4 5
3. Riccarton Bush is an asset for Christchurch	1 2 3 4 5
4. The expansion of Riccarton Bush is a good thing	1 2 3 4 5
5. The future of Riccarton Bush is not important to me	1 2 3 4 5

3. Can you please tell me whether or not each of the following trees were in New Zealand before people arrived? (SHOW CARD N)

Common Name	Species Name	Y	N	NS
Lancewood	<i>Pseudopanax crassifolius</i>			
Radiata pine	<i>Pinus radiata</i>			
Cabbage tree	<i>Cordyline australis</i>			
Sycamore	<i>Acer pseudoplatanus</i>			
Kahikatea/white pine	<i>Dacrycarpus dacrydioides</i>			
Crack Willow	<i>Salix fragilis</i>			
Wineberry	<i>Aristotelia serrata</i>			
Marbleleaf	<i>Carpodetus serratus</i>			
Rowan	<i>Sorbus aucuparia</i>			
Cedar Elm	<i>Ulmus crassifolia</i>			
Milk tree	<i>Streblus heterophyllus</i>			
Broadleaf	<i>Griselinia littoralis</i>			
Common oak	<i>Quercus robur</i>			
Lemonwood	<i>Pittosporum eugenioides</i>			
Elder/Elderberry	<i>Sambucus Nigra</i>			
Macrocarpa	<i>Cupressus macrocarpa</i>			

4.1 Over the past year, have you seen or heard a _____ on your property?

4.2 IF YES: How frequently do you see this species?

(SHOW BIRD PICTURES & SHOW CARD O)

Bird	Y	N	NS	1.MD	2.MW	3.MM	4. R
1. Bellbird							
2. Blackbird							
3. Cockatoo							
4. Fantail							
5. Kereru/wood pigeon							
6. Silvereye/waxeye							
7. Song thrush							
8. Starling							

Section C

1. a) male _____ b) female _____

2. Into which age bracket do you fall? (SHOW CARD P)

- | | | |
|---------------------|---------------------|----------------------|
| 1) 15-19 yrs _____ | 2) 20-24 yrs _____ | 3) 25-29 yrs _____ |
| 4) 30-34 yrs _____ | 5) 35-39 yrs _____ | 6) 40-44 yrs _____ |
| 7) 45-49 yrs _____ | 8) 50-54 yrs _____ | 9) 55-59 yrs _____ |
| 10) 60-64 yrs _____ | 11) 65-69 yrs _____ | 12) 70-74 yrs _____ |
| 13) 75-79 yrs _____ | 14) 80-84 yrs _____ | 15) 85 years + _____ |

3. What is your marital status? _____

4. With which ethnic group do you identify? (SHOW CARD Q)

- | | | |
|-------------------------------|-----------------|-----------------|
| 1) New Zealand European _____ | 2) Maori _____ | 3) Samoan _____ |
| 4) Cook Island Maori _____ | 5) Tongan _____ | 6) Niuean _____ |
| 7) Chinese _____ | 8) Indian _____ | 9) Other _____ |

5.1 Where you born in New Zealand? Y N

5.2 If No: How long have you been living in New Zealand, to the closest half year? _____

6. What is your employment status? (SHOW CARD R)

1) Employed: What is your job? _____

2) Unemployed _____ 3) Retired _____ 4) House person _____

5) Student: What are you studying? _____

6) Other: (please state): _____

7. Into which income bracket does the person who earns the highest income in your house, before tax, fall? If you are flatting, indicate your income only (SHOW CARD S).

- | | | | |
|-----------------------|-------|------------------------|-------|
| 1) Loss | _____ | 2) \$0 | _____ |
| 3) \$1 - 5 000 | _____ | 4) \$5 001 - 10 000 | _____ |
| 5) \$10 001 - 15 000 | _____ | 6) \$15 001 - 20 000 | _____ |
| 7) \$20 001 - 25 000 | _____ | 8) \$25 001 - 30 000 | _____ |
| 9) \$30 001 - 40 000 | _____ | 10) \$40 001 - 50 000 | _____ |
| 11) \$50 001 - 70 000 | _____ | 12) \$70 001 - 100 000 | _____ |
| 13) \$100 001 or more | _____ | | |

8. How long have you lived in, to the closest half year:

8.1 This house? _____ 8.2 This neighbourhood? _____

8.3 How much longer do you intend living at this address? _____

9.1 Do you know how many owners this property has had in the last 50 years? Y N

9.2 IF YES: How many? _____

10. Do you: (SHOW CARD T)

- | | | | |
|------------------------------|-------|--------------------|-------|
| 1) Own this house | _____ | 2) Rent this house | _____ |
| 3) Rent a room in this house | _____ | 4) Other: | _____ |

11.1 Which of the following best describes this household? (SHOW CARD U)

- | | | | |
|---|-------|-------------------------|-------|
| 1) A couple without children | _____ | 2) One person household | _____ |
| 3) 2 parent family with 1 child or more at home | _____ | | |
| 4) Non family household (i.e. flatting) | _____ | | |
| 5) 1 parent family with 1 child or more at home | _____ | | |
| 6) Other: | _____ | | |

IF ANSWERED c) or e) above:

11.2 How many children do you have at home? _____

11.3 What are their ages and gender (put M for male and F for female)?

- | | | | |
|----------|----------|----------|----------|
| 1. _____ | 2. _____ | 3. _____ | 4. _____ |
|----------|----------|----------|----------|

12.1 Do you have any cats? Y N

12.2 IF YES: How many do you have? _____

12.3 Do you have any dogs? Y N

12.4 IF YES: How many do you have? _____

Appendix 4. Show cards shown to respondents during the questionnaire survey⁷⁰.

SHOW CARD A

5 = Very Important

4 = Important

3 = Indifferent

2 = Unimportant

1 = Totally unimportant

SHOW CARD B:

Sections of garden

1. Areas of lawns
2. Areas of flowers
3. Areas of vegetable garden
4. Areas of shrubs and trees

SHOW CARD D:

Percentage/hours of total time spent on areas of 1) flowers; 2) vegetables; 3) shrubs and trees. For example:

Area	1	2	3	4
Flowers	33.3	50	60	10
Vegetables	33.3	25	20	80
Shrubs	33.3	25	20	10
Total	100.0	100	100	100

⁷⁰ As most of the categories are included in the questionnaire survey I have only included cards that provide additional information. For ease of reading, font size 36 was used on the show cards shown to respondents.

SHOW CARD E: Percentage/hours of total time spent on these tasks: 1) weeding; 2) fertilising; 3) planting; 4) removing or raking leaves; 5) general maintenance. For example:

Area	1	2	3	4
Weeding	20	50	5	100
Fertilising	20	10	5	0
Planting	20	15	5	0
Raking leaves	20	5	80	0
G.maintenance	20	20	5	0
Total	100	100	100	100

SHOW CARD K

Some examples of woody plants (showed pressed woody species)

SHOW CARD M

5 = Strongly agree

4 = Agree

3 = Indifferent

2 = Disagree

1 = Strongly Disagree

SHOW CARD O

1. Most days

2. Most weeks

3. Most months

4. Rarely

BIRD PICTURES⁷¹1) Bellbird (*Anthornis metanura*)

**Image has been removed
due to copyright
restrictions. To view see
Moon (1994; 2002).**

**Image has been removed
due to copyright
restrictions. To view see
Moon (1994; 2002).**

2) Blackbird (*Turdus merula*)

**Image has been removed
due to copyright
restrictions. To view see
Moon (1994; 2002).**

**Image has been removed
due to copyright
restrictions. To view see
Moon (1994; 2002).**

3) Sulphur crested cockatoo (*Cacatua galerita*)

**Image has been removed
due to copyright
restrictions. To view see
Moon (1994; 2002).**

**Image has been removed
due to copyright
restrictions. To view see
Moon (1994; 2002).**

⁷¹ All bird pictures obtained from: Moon (1994; 2002) except first kereru picture taken by Maaik Schotborgh

4) Fantail (*Rhipidura fuliginosa*)

**Image has been removed
due to copyright
restrictions. To view see
Moon (1994; 2002).**

**Image has been removed
due to copyright
restrictions. To view see
Moon (1994; 2002).**

5) Kereru/Wood pigeon (*Hemiphaga novaeseelandiae*)

**Image has been removed
due to copyright
restrictions. To view see
Moon (1994; 2002).**

6) Silvereye (*Zosterops lateralis*)

**Image has been removed
due to copyright
restrictions. To view see
Moon (1994; 2002).**

**Image has been removed
due to copyright
restrictions. To view see
Moon (1994; 2002).**

7) Song thrush (*Turdus philomelos*)

**Image has been removed
due to copyright
restrictions. To view see
Moon (1994; 2002).**

**Image has been removed
due to copyright
restrictions. To view see
Moon (1994; 2002).**

8) Starling (*Sturnus vulgaris*)

**Image has been removed
due to copyright
restrictions. To view see
Moon (1994; 2002).**

**Image has been removed
due to copyright
restrictions. To view see
Moon (1994; 2002).**

Appendix 5. Juvenile study species found on properties⁷².

Species	No. sites present (n=90)	Range	Mean no. per site \pm SE	Total no. found
Locally widespread species				
Cabbage tree	73	0-655	32.43 \pm 8.21	2919
Karamu	68	0-291	24.12 \pm 5.55	2171
Combined:	81	0-704	56.56 \pm 10.71	5090
Riccarton Bush species				
Kahikatea	21	0-46	1.96 \pm 0.68	176
Marbleleaf	2	0-53	0.6 \pm 0.59	54
Wineberry	4	0-25	0.31 \pm 0.28	28
Mahoe	3	0-4	0.089 \pm 0.056	8
Combined:	25	0-62	2.96 \pm 0.98	266

⁷² Species that were not found (NZ Myrtle, kaikomako, milk tree, hinau and pokaka) are not included.

Appendix 6. Adult study species found on properties⁷³.

Species	No. sites found on (n=90)	Range	Mean no. per site \pm SE	No. sites with juveniles not adults	Total no. found
Locally widespread species					
Cabbage tree	32	0-7	0.86 \pm 0.17	73	77
Karamu	25	0-9	0.78 \pm 0.18	68	70
Combined:	41	0-10	1.63 \pm 0.27	81	147
Riccarton Bush species					
Kahikatea	4	0-4	0.078 \pm 0.048	21	7
Marbleleaf	2	0-1	0.0020 \pm 0.016	2	2
Wineberry	1	0-2	0.022 \pm 0.022	4	2
<i>Coprosma rotundifolia</i>	1	0-1	0.011 \pm 0.011	1	1
N.Z. Myrtle	1	0-1	0.011 \pm 0.011	1	1
Combined:	7	0-6	0.14 \pm 0.073	29	13

⁷³ Species that were not found (mahoe, kaikomako, milk tree, hinau and pokaka) are not included.

Appendix 7. Study species that emerged from soil collected from property sites⁷⁴.

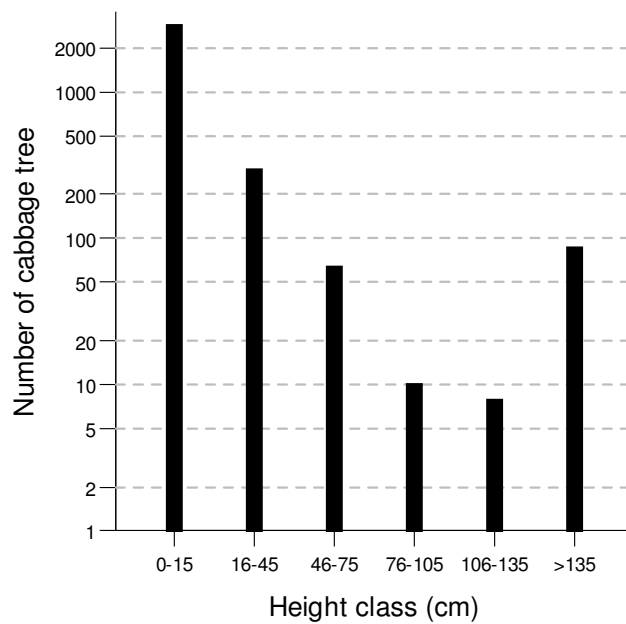
Species	No. of properties (n=31)	Range	Mean no. per property \pm SE	Variance	Total no. established
Locally widespread species					
Cabbage tree ⁷⁵	29	0-553	79.80 \pm 21.02	13691.29	2474
Karamu	21	0-62	7.74 \pm 2.71	227.66	240
Combined:	30	0-562	87.548 \pm 21.61	14470.12	2714
Riccarton Bush species					
Kahikatea	6	0-4	0.52 \pm 0.21	1.39	16
Wineberry	3	0-5	0.45 \pm 0.39	4.66	14
Marbleleaf	3	0-12	0.42 \pm 0.25	1.98	13
Combined:	8	0-13	1.39 \pm 0.53	8.85	43

⁷⁴ As no mahoe, New Zealand myrtle, kaikomako, milk tree, *Coprosma rotundifolia*, hinau or pokaka emerged from any of the samples they are not included here.

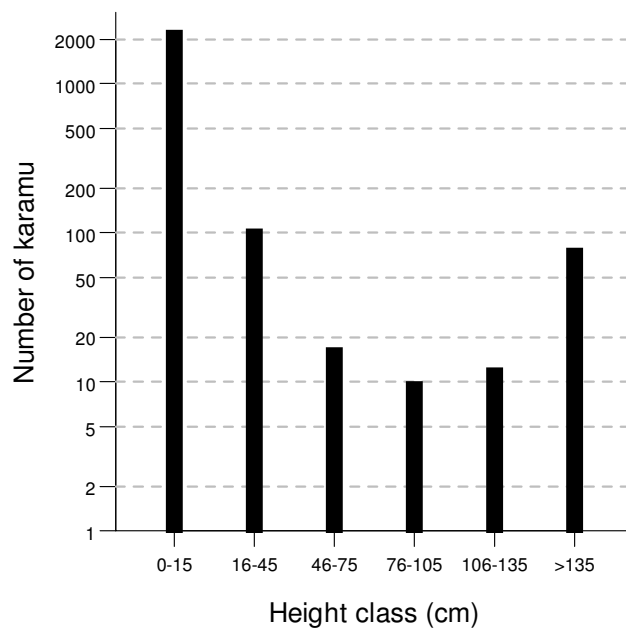
⁷⁵ One of the soil samples was collected under a cabbage tree and so values for cabbage tree but not the other species have been excluded from the analysis

Appendix 8. Height class distributions of cabbage tree (Fig. a), karamu (Fig. b) and kahikatea (Fig. c)⁷⁶.

a)

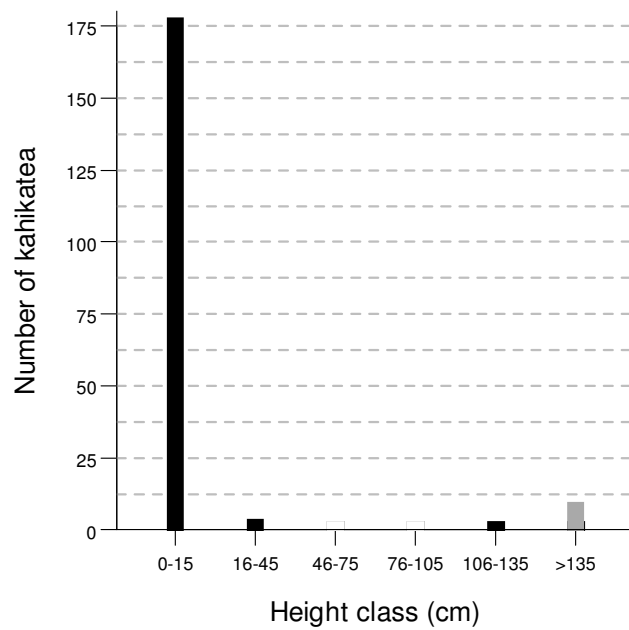


b)



⁷⁶ Note cultivated individuals are represented by a grey bar on the kahikatea figure.

c)



Appendix 9. Comments given by respondents when upon being shown and asked how they would treat a live kahikatea seedling if it was to come up in their garden.

Comment given	No. times mentioned	% of responses
Remove or pull it out		
Pull it out	24	20.5
Probably pull it out	12	10.3
Probably would not notice it and remove during weeding	5	4.3
Would leave to see how it develops		
Leave it and see how it develops	12	10.3
Probably let it grow	11	9.4
If looked appropriate it would stay	5	4.3
Depends on where it was		
Depends on where it established in the garden	9	9.4
If an appropriate place would let it grow	7	6.0
Mentioned specific area of the garden in which it would be removed	4	3.4
Reason for removing it		
Concerns over how large it would grow	7	6.0
Looks like a weed	2	1.7
Not appropriate for my garden	2	1.7
Transplant, move or give away		
Transplant on the property	4	3.4
Transplant off the property	4	3.4
Give away	3	2.6
Depends on recognising the seedling		
Would depend if I recognised it	3	2.6
Would depend on the advice of others	3	2.6
Total	117⁷⁷	100

⁷⁷ As respondents often provided more than one response the total number of comments made does not equate to 85.

Appendix 10. Comments given by respondents when they were asked whether they could identify a live kahikatea seedling⁷⁸

Comment given	No. times mentioned	% of responses
Did not know what it was or the name		
No I do not know what it is	30	27.4
I could not give you its name	2	1.9
Conifer/Pine species or family		
Totara	12	11.3
Rimu	9	8.5
Pine tree	6	5.7
Kahikatea	5	4.7
Kauri	4	3.8
From conifer/pine family	4	3.8
Douglas fir	3	2.9
Other exotic pine species	3	2.9
Matai	2	1.9
A New Zealand pine	2	1.9
A fern		
A fern	7	6.7
A native or native tree species		
A native	4	3.8
Other native tree species ⁷⁹	3	2.9
Rata	2	1.9
Other comments		
Other explanations ⁸⁰	4	3.8
Other tree species ⁸¹	2	1.9
I feel like I should	2	1.9
Total comments	106	100

⁷⁸ As respondents often provided more than one response the number of times a comment was mentioned does not equate to 85.

⁷⁹ These were lacebark, kowhai and beech

⁸⁰ Two of these were accompanied by tree species names: 1) something that takes long to grow such as rata; and 2) a spruce, a Christmas thingy. The other two were 'a prickly plant' and 'a shrub sort of thingy'

⁸¹ These were wattle and Stewart eye

Appendix 11. Percentage of respondents⁸² who agreed or disagreed with various statements about Riccarton Bush

Statement about Riccarton Bush	% Agree	% Disagree	% Neutral
Riccarton Bush is an asset for Christchurch	95.3	0	4.7
The expansion of Riccarton Bush is a good thing	78.8	4.7	16.5
I would be prepared to plant Riccarton Bush species in my garden	54.1	21.2	24.7
I would be prepared to let self-introduced Riccarton Bush plants become a permanent part of my garden	47.1	30.6	22.4
The future of Riccarton Bush is not important to me	3.5	90.6	5.9

⁸² Due to rounding errors rows may not always total 100%

Appendix 12. Gardens in New Zealand history: design, order and control

The origin of many contemporary notions and ideas about design, control and order in the garden landscape can be traced to two landscape movements that arose in Britain: the picturesque and gardensque (Bradbury 1995a, Nassauer 1997). Arising in the late eighteenth century, the picturesque garden fashion centred on the notion that when planning the garden it should look like a painting (Bradbury 1995b). Although restricted to a “small group of wealthy intellectuals, gardeners and landscape designers, the idea that a garden or landscape should look like a picture became widespread in England and in European culture” (Bradbury 1995a, p. 6).

The gardensque movement arose as a reaction to the picturesque, promoting the idea that the garden should be distinctly different from the surrounding landscape. To avoid the dilemma of simply imitating nature it was recommended the garden should be laid out in abstract rather than naturalistic forms (Raine 1995a). Raine (1995a) argues this was one of the major turning points in British design as these gardens became an expression of human dominance over nature. A prominent theme was the display of individual plants. With further distinctions between the artificial garden and nature being established through “trellis-work, colourful flowers in bedding-out schemes and exotic trees and shrubs from around the world” (Bradbury 1995a, p. 6).

European settlers and subsequent generations born in New Zealand continued to followed British customs and innovations closely. When the suburban residential garden, therefore, appeared in New Zealand it is not surprising that it was very similar to that of its British counterpart. From the 1830s onwards when the suburbs had arisen in Britain, the gardensque style had emerged as a suitable method for producing the most out of small sections (Raine 1995c). Sections in this style were characterised by “neat paths, velvety lawns, gently curving colourful beds, small, exotic specimen trees and shrubs displayed singly” (Raine 1995c, p. 128). All of these elements illustrated the ability of the owner-gardener to maintain a garden in which everything was neat, tidy, and under control (Raine 1995c). While these elements were initially “novelties”, they were to become “the conventions of” future generations (Raine 1995b, p. 98, Nassauer 1997).

Appendix 13. The percentage of properties on which different means are used to actively remove weeds from different sections of the garden⁸³.

Means of removing	% Lawn	% Flowers	% Vegetables	% Shrubs/ Trees
Pull by hand	8.5	97.6	88.9	89.3
Removing by hoeing	0	56.0	62.2	52.4
Remove by digging out	7.9	40.5	42.2	36.9
Spray herbicide	70.8	22.6	2.2	23.8
Use a weed eater	2.4	5.0	0	8.3
Other	7.9	11.9	13.3	9.5

⁸³ Note as respondents were able to provide multiple answers the columns do not tally to 100%.

Appendix 14. The percentage of properties on which different means are used to prevent weeds from establishing in different sections of the garden⁸⁴.

Means of preventing	% Lawn	% Flowers	% Vegetables	% Shrubs/ Trees
Straw/mulch	1.2	22.6	31.1	20.2
Bark chips	0	23.8	4.4	20.2
Don't remove leaf litter	0	13.1	2.2	35.7
Spray herbicide	12.2	9.5	4.4	11.9
Weed mat	0	13.1	4.4	8.3
Stones	0	9.5	0	6.0
Other	2.4	10.7	2.2	16.7

⁸⁴ Note as respondents were able to provide multiple answers the columns do not tally to 100%.