

**PRESERVING BIODIVERSITY IN THE EXURBAN REGION: BARRIERS AND
OPPORTUNITIES FOR LANDSCAPE ECOLOGICAL PLANNING IN THE RURAL
MUNICIPALITY OF SPRINGFIELD**

BY

ALEXANDRA MORRISON

**A Thesis
Submitted to the Faculty of Graduate Studies
in Partial Fulfillment of the Requirements
for the Degree of**

MASTER OF ARTS

**Department of Geography
University of Manitoba
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for Landscape Ecological Planning in the Rural Municipality of Springfield**

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Abstract

As humans alter the physical environment to suit their needs, they destroy natural areas and habitat. These changes have resulted in a decline in biological diversity, or biodiversity. Biodiversity has been called the cornerstone of an ecologically sustainable future and for numerous reasons it must be preserved. The Bruntland Commission (1987) stressed that current development patterns must be altered to make land use and development patterns more compatible with the preservation of the extremely valuable biological diversity of the planet. Traditional conservation efforts in this regard have focused on the selection and management of large tracts of land that have been designated as national and provincial parks. However, there is growing recognition that these types of preserves are too small to support healthy indigenous plant and animal populations in perpetuity.

In recent years there has been a growing recognition that regional land use regulation may be a key component in the preservation of biodiversity. Forman (1996) has identified landscapes as the optimum scale for biodiversity conservation and planning. Eagles (1984) identified municipal governments as the first-line decision-makers in matters of land use. Thus it is appropriate that solutions for biodiversity conservation be identified and implemented at the local level.

The objectives of this thesis are to uncover barriers to and opportunities for the implementation of Forman's model of regional landscape ecological planning in an exurban context. This research uses a case-study approach and surveys the opinions of three different community groups in the Rural Municipality of Springfield, in southern Manitoba. Both quantitative and qualitative data analysis are conducted. The findings reveal that as well as explicit barriers to the implementation of the model, there are also hidden and unexpected ones.

The research concludes that biodiversity preservation and landscape ecological planning are complex subjects and that there are varying levels of acceptance of a

landscape ecological planning model. The study also reveals that additional research is needed to determine if the findings can be extended beyond the study area into other exurban regions.

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Chapter 1: Introduction

1.0 Background

The large and continuing increase in the human population and the associated development of the land is causing widespread alterations in the world's natural ecological systems (Eagles, 1984). The World Commission on Environment and Development (1987) indicates that the current global population of five billion will almost triple, to 14 billion sometime in the next century. These ballooning numbers result in increasing demands on the land for all the resources that it provides. The corresponding increase in consumption of resources will result in the on-going loss of critical aspects of food webs, which in turn will compromise the way in which ecosystems function. Currently, nutrient cycles are being altered, displaced and diminished. Overall, ecological diversity is decreasing in both species and structure, largely as a result of this increase in demand for land resources (Gilpin and Soulé, 1986). In the most densely populated areas of Europe, Asia and North America less than 10% of the natural terrestrial ecosystems remain in their natural state (Eagles, 1984, Forman, 1995). The related loss of biological diversity has lead some researchers to issue warnings about the potentially dire consequences of this phenomenon (Wilson, 1992). These consequences range from forfeiture of aesthetic value to loss of important genetic building blocks for agriculture and medicine, to the disruption of ecological services and functions, such as air quality and flood control (Bidwell and Barro, 1996).

During the last few decades, however, there has been increased awareness that action must be taken to prevent this degradation. This emerging understanding of the natural environment has made it clear that the preservation of biological diversity, or biodiversity is the key to global world health (Wilson, 1992). The goal of biodiversity preservation is not to stop natural evolutionary processes, but rather to abate the accelerating pace of species loss associated with human dominance of the biosphere (Erlich and Erlich, 1981). Traditionally, this has involved the careful selection and

management of large tracts of land that have been designated as national parks by federal authorities, and in provincial parks by lower government levels. However, there is growing recognition that most ecological preserves are too small to support healthy, indigenous plant and animal communities in perpetuity, and the links made to achieve natural area integrity are too tenuous. In recent years, ecologists and environmental managers have begun to realise that additional land use strategies must be developed in order to preserve landscapes and habitats *outside* these formal reserves and *within* the human occupied habitat (WRI, 1990; Adams, 1996). The Brundtland Commission (1987) clearly indicates that development patterns must be altered to make them more compatible with the preservation of the extremely valuable biological diversity of the planet. It stresses that altering economic and land use patterns seems to be the best long-term approach to ensuring the survival of species and their ecosystems.

Land use planning techniques must therefore be developed which fully incorporate biodiversity conservation. Because landscapes and regions are the optimal spatial scales for such planning and action (Forman, 1995) and because municipal governments are the first-line decision-makers on matters of land use policy (Eagles, 1984), it is appropriate that solutions be identified and implemented at the local level.

1.1 The Issue

Biodiversity is a minor consideration in environmental policy (Noss, 1989). Biodiversity conservation has not been adequately considered in regional planning or in land use plans (Tamminga, 1996). Many reasons exist for this shortcoming. Noss stated that it has been regarded as too broad and vague a concept to be applied to real-world regulatory and management problems. Another reason that it has been absent from planning policy is that no practical and comprehensive method has been developed that can address the multiple priorities of biodiversity conservation and human needs (Forman, 1995). However, Forman (1995) has developed a model of regional land use planning based on the principles of landscape ecology. This model

is of interest because it can be applied on a regional scale and implemented by the local level of government. In addition, the model aims to preserve local biodiversity in habitats that are not formally protected, while at the same time allowing regional development and multiple human activities.

1.2 Statement of the Problem

How will people respond to regional-scale, locally implemented, conservation-based land use plan? Since reactions to ongoing, local, non-catastrophic environmental degradation such as the decline of biodiversity, are not well documented, and factors that lead to pro-environmental behaviour and activism on community issues are poorly understood (Syme et al, 1993), this study will attempt to fill part of this gap in the literature by identifying community barriers to landscape ecological planning.

This thesis will explore the level of community acceptance of landscape ecological planning as described in a conceptual model proposed by R.T.T. Forman (1995). Specifically the objectives of this thesis are to identify barriers to and opportunities for the application of landscape ecological planning in an exurban municipality using Forman's model as the foundation of land use plan. In addition, the study will identify the degree of acceptance of several land use control techniques that can be implemented to support landscape ecological planning.

1.2 Objectives

The specific objectives of this thesis are:

- 1.) to identify barriers to landscape ecological planning as a method to preserve biodiversity in exurban rural residential developments;
- 2.) to identify opportunities for landscape ecological planning in exurban rural residential developments;

- 3.) to identify land use controls that support landscape ecological planning;
- 4.) to identify public opinion of the suitability of land use controls.

1.3 Limits of the Study

This study discusses, as its main thrust, issues associated with implementing new methods of biodiversity preservation in exurban rural planning. It will not consider other aspects of planning that ought to be considered in exurban residential development, such as aquifer sensitivity, groundwater recharge zones, mineral deposits and proximity to agricultural complexes, and economic and social impacts. These issues, while important components of development plans, have been widely debated elsewhere in the literature (Bryant, Russwurm and McLellan, 1982). It is the aim of this research however, to enhance these discussions by adding the additional important component, biodiversity preservation, which has not been commonly included in planning exercises (Tamminga, 1996).

1.4 Assumptions

This research assumes that the scientific principles of landscape ecological planning are valid and that Forman's model will indeed preserve biodiversity when applied in a manner consistent with these principles.

This study also assumes that rural residential development in exurban areas will not take place on prime agricultural land, as this is a caveat of existing rural development plans (McLean, 1994). Accordingly, the recommendations that arise from this research project will concentrate on developing biodiversity conservation options for rural residential developments that are planned or that might be considered, on wooded or other non-agricultural landscapes.

1.5 Organisation of the Thesis

This thesis is organised into six chapters. The first chapter is an introduction to the thesis. The second chapter provides background and a review of literature that concerns biodiversity, land use planning, and landscape ecology. In the first section, the importance of biodiversity is established along with a discussion of traditional conservation methods. The public's understanding of biodiversity is also reviewed. This is followed by a review of literature surrounding planning for biodiversity, including what others have identified as barriers to the land use planning process. The Third Chapter describes Forman's model in which the principles of landscape ecology are embodied. This chapter also identifies land use controls that can be used to support the model in its practical application. The chapter concludes with a short case study that illustrates how these controls can be used in a regional planning environment. The fourth chapter presents the study methodology including the description of the study area, data sources, and data collection procedures. The fifth chapter provides the results of the research and the final chapter presents a discussion of the data, conclusions to the findings and recommendations for policy development and for future research.

Chapter 2: Background and Literature Review

2.1 Introduction

This thesis synthesises information from several disciplines including geography, ecology, rural planning, environmental perception and policy formulation. Issues in any one of these areas have the possibility of becoming barriers to landscape ecological planning. Consequently, this study is interdisciplinary and must explore aspects of these different subject areas. As a result, the literature review is broadly based and will cover issues concerning biodiversity, attitudes about the environment, environmental behaviour, attitudes about local development issues, conservation, and community issues that exist in exurban regions.

This chapter describes the literature that discusses the importance of biodiversity and outlines the problems associated with traditional conservation methods. It then provides an overview of research that has focused on biodiversity and the general public. Further review centres on exurban development and biodiversity. Additional review of the literature indicates that regional planning in an exurban region is fraught with opposing views and perceptions about the environment and conservation. The next section of this chapter describes landscape ecology and its role in planning and introduces the conceptual model developed by Forman. The chapter concludes with a discussion of the potential barriers to a landscape ecological plan, such as the one being proposed.

Before embarking on a discussion of the factors influencing the community acceptance of landscape ecological based planning in an exurban context, it is important to elaborate on the background and importance of biodiversity and society-wide biodiversity conservation activities. The following section will highlight current thinking about biodiversity and land use and conservation.

2.2 Biodiversity

Biological diversity, or biodiversity, is a world resource made up of the variety and variability of life forms on Earth – all the plants, animals, micro-organisms, the genes they contain and the ecosystems they form (WRI, 1992). The extent of this resource can be examined in three ways. On the smallest level, it consists of **genetic diversity** - the differences in the genetic makeup among individual organisms; on an intermediate level, there is the most commonly used measure, **species diversity**; and the third level is made up of **ecosystem diversity**, comprising the distinctive assemblages of organisms that occur in different biological settings

Biodiversity conservation is a cornerstone of an ecologically sustainable future (Biodiversity Unit of the Department of Environment, Sport and Territories, 1993). Wilson (1992) stresses that biodiversity is the key to global world health, contributing to "holding the world steady." To lay solid foundation to support these arguments, it is first necessary to understand the concept of "biodiversity". The following section will outline the customary interpretations of biodiversity and it will highlight its important functions in ecosystems.

2.2.1 Genetic Diversity

Genetic diversity refers to the variation of genes within species. This covers both distinct populations of the same species, such as the thousands of traditional rice varieties in India, and genetic variation *within* a species. Until recently, measurements of genetic diversity were only applied to domesticated populations and to wild species held in zoos or botanical gardens, but now more frequently, these techniques are being applied to species in the wild. This classification assists in determining the environmental adaptations that have occurred within populations and ecosystems. New genetic variation is produced in populations of organisms that can reproduce sexually by recombination and in individuals by gene and chromosome mutations.

The pool of genetic variation present in interbreeding populations is shaped by selection. Selection leads to certain genetic attributes being preferred and results in changes to the frequency of genes within this pool. The large differences in the amount and distribution of genetic variation can be attributed in part to the enormous variety and complexity of habitats, and the different ways organisms have adapted to them in order to survive.

2.2.2 Species Diversity

Species diversity refers to the variety of species that exist within a region, landscape or area. Such diversity can be measured in many ways and scientists have not yet settled on a single best method (WRI, 1992). The number of species in a region, or species richness, is one often-used measure of biodiversity, but a more precise measure is taxonomic diversity, which considers the relationship of one species to another. For example, an island with two species of birds and one species of lizard has a greater taxonomic diversity than an island with three species of birds but no lizards. Thus even though there may be more species of beetles on earth than all other species combined, they do not account for the greater part of species diversity because they are so closely related. Similarly, many more species live on land than in the sea (WRI, 1992), but terrestrial species are more closely related to each other than are ocean species, so diversity is higher in marine ecosystems than a strict count of species would suggest. In general, there are more species per unit area in the tropics than in temperate regions and far more species in temperate regions than in polar regions. In addition, diversity in land ecosystems generally decreases with increasing altitude.

2.2.3 Ecosystem Diversity

Ecosystem diversity refers to the different habitat and ecosystem types, and the diversity of those habitats and processes that occur within each ecosystem (Biodiversity Unit, DEST, 1993). Ecosystem diversity is harder to measure than the other kinds of diversity because the boundaries between associations of species or

communities are much more difficult to identify, if in fact there are any boundaries at all. However, as long as consistent sets of criteria are used to define communities and ecosystems, their number and distribution can be measured. Ecologists speak of estuarine ecosystems, marine ecosystems, forest ecosystems, and so on, based on some of the more obvious structural characteristics, such as vegetation, geomorphology, soils and climate, that, on the surface, seem to make up a system boundary (Odum, 1971).

Ecosystem diversity, though, is much more than species richness and genetic and geographic variability. A strong ecosystem hierarchy is required to maintain population and species stability in the face of "aperiodic or chaotic" external influences (Dony and Denholm, 1985). It is this diversity of habitats that insures healthy biological populations and the variety of biodiversity. After all "a habitat is not just the place where a species happens to live, it is the place where it is biologically suited to live" (Greenwood and Edwards, 1973)

2.2.4 The Value of Biodiversity

Despite the complexity of the concept of biodiversity, it is clear that biodiversity conservation is important. It provides a foundation for the resources and biological processes on which humans depend. There are many arguments for protecting existing biological diversity. All these polemics apply in different cases, however, the overriding argument central to all of these is that the functions of biodiversity provide benefits greater than just the value of individual species alone. This can be exemplified in the Erlichs' analogy likening the disappearance of species to rivets being popped from an aeroplane (Erlich and Erlich, 1981). No particular rivet is crucial for keeping the plane intact, but if enough rivets pop, a crash will be inevitable. Likewise, the identity and characteristics of any one species are not the central concern of biodiversity conservation. It is the cumulative effect of altering nature by hastening extinctions and decreasing local diversity which leads to the upset of the global environmental balance,

Notwithstanding the recognition that biodiversity and its functions are crucial to the survival of human kind, the number of species continues to decline at an alarming rate. Although little is known about the exact number of species in the world, it is widely accepted that the rate of extinctions, is, because of human activities, dramatically higher than "normal" (Soulé, 1991). This pace is highest in tropical regions (Wilson, 1985), but species loss on the Canadian prairies continues to accelerate as well, largely as a result of habitat fragmentation (Government of Canada, 1991). Yet, only minor measures have been implemented to mitigate this global loss. The next section of this paper will explore why traditional methods of protecting biodiversity, through the establishment of protected areas alone, is inadequate. It will argue that the integration of conservation practices must be made a part of ordinary activities including planning of regions and exurban residential developments.

2.3 Biodiversity, Land Use and Conservation

To illustrate the relationship between biodiversity, land use and conservation, the World Conservation Strategy developed the image of a segmented iceberg (IUCN, 1989). The tip of the iceberg is off-site protection of species in zoos, seed banks, botanic gardens and similar institutions. These are obvious and important facets, but minor parts of the whole. The middle of the iceberg is the on-site protection of landscapes, habitats and species, in parks and reserves. These protected areas are a more important, but still inadequate response to the needs of biodiversity protection. The third and most important part is the coexistence of economic and biodiversity values together in the larger portion of the landscape that does not receive special status. These three levels of protection and recognition, when undertaken properly, can work together to yield synergistic benefits for biodiversity. To date, very little preservation activity has occurred beyond the boundaries of traditional parks and formally protected spaces, despite Adams' (1996) strong suggestion that conservation should be moved beyond the boundaries of protected areas and into the landscape as a

whole. This section of the report discusses the problems of traditional conservation initiatives, and will develop the idea that conservation activities must extend into the broader landscape and be included in routine planning activities.

2.3.1 Traditional Conservation Methods

Currently, there are two main approaches for the protection and conservation of biodiversity. One arrangement emphasises the preservation of species *ex situ*, such as in zoos and botanic gardens, while the other stresses the preservation of habitats and species *in situ*, such as are found in formally protected spaces known as parks and preserves. Each of these arrangements has benefits and drawbacks. But, as the IUCN (1989) illustrated, the benefits of these two methods are small compared to what might be accomplished outside of these protected areas.

2.3.1.1 Ex situ Arrangements

Ex situ, or off site arrangements for biodiversity protection, such as zoos and botanic gardens certainly have some value as scientific and educational resources, although recently their overall contributions in this regard are being questioned. As understanding about biodiversity and ecosystem becomes clearer, most scientists recognise that preservation of habitat is preferable to the preservation of species alone (Slobodkin, 1986). Organisms can be more readily preserved in natural or nearly natural habitats than in artificial ones, largely because the latter require a much higher level of management expertise. A natural reserve may be moderately successful in preserving biodiversity despite human ignorance or ineptitude, which is not true for zoos or botanic gardens. Zoos are also subject to political pressures. For example, many kinds of soil bacteria and fungi, micro-organisms and insects have vital roles to play in ecosystem function and habitat maintenance, however, the general public is uninterested in these creatures as inhabitants of zoos or gardens. Loveday (in Kellert, 1986) has facetiously labelled this public bias as “vertebrate chauvinism” reflecting the fact that most people tend to view these creatures with a mixture of anxiety and

disdain. According to this public sentiment, funding is often unavailable for species other than those with which the public identifies. With a less than representative sampling of species, then, a zoo's educational value appears to be limited.

According to the World Resources Institute, zoos house approximately 540,000 animals, including birds, reptiles and amphibians, but they only have the capacity to sustain viable populations of, at most, 900 species (Conway, 1988). This is an extremely small fraction of those species whose existence is threatened, but it is infinitesimal compared to the total known number of organisms. *Ex situ* conservation and preservation is therefore not an adequate, long-term solution.

2.3.1.2 In situ Arrangements

The goal of *in situ* conservation arrangements, such as formally protected areas and parks, is ostensibly, to allow natural forces to drive ecological processes, such as succession and competition, on the short term; and evolution over the long term, with as little human intervention as possible (Stephenson, 1994). This, it is hoped, will protect the creative sources of biodiversity. The restricted human uses that are permitted can often serve to educate the public and create a valuable awareness of the many values of nature and biodiversity. Formally protected areas also have advantages in that they are well recognised and understood by the general public and can play a role in the local economy through tourism initiatives and recreational activities (Adams, 1996). Recently however, conservationists, who assert that the preservation mandate has been surreptitiously altered, have challenged some governments. This group claims that the erosion of the conservation ethic in favour of resource extraction, unsustainable cottage developments, resorts and roads further reduces the "supply" of natural, semi-pristine, large-scale ecosystems. This degradation can result in the continued loss of biodiversity in areas that had supposedly been protected because of their unique contribution to the diversity of life.

In parks in which such development has not occurred, the broad goals of biodiversity preservation might be partially achieved, but Stephenson, (1994) questions their actual contributions in this regard, in terms of both quantity and quality, as well as future potential. He argues that since most Canadian protected areas have no buffer zones surrounding them, their boundaries and the ecological processes that cross them are adversely impacted by any number of human activities. Most protected areas are subject to overly simplistic management strategies that fail to adequately recognise the complexity of ecosystems. Most protected areas are not large enough to have a real impact on biodiversity conservation especially in the case of large mammals.

A conservation strategy based on protected areas of habitat alone can make integrated and holistic approaches to conservation difficult. The existence of protected areas, in the absence of any other initiatives, can also imply that the needs of conservation and biodiversity preservation have been met. This makes it harder to achieve integrated policies that cut across economic and social sectors. Protected areas also tend to be treated as separate entities from the surrounding landscape, absorbing available financial resources used for conservation projects. Furthermore, once natural area protection has been established, governments as well as the general public believe that they now have "free-licence" to do whatever they want outside the boundaries, which makes unprotected natural and semi-natural habitat even more isolated and fragmented (Brussard, et al, 1992; Adams, 1996).

Hence, conserving habitat and species through *in situ* and *ex situ* arrangements alone is not adequate to preserve biodiversity. Conservation and preservation efforts must be concentrated in the zone of resource use-- where humans and the landscape interact so that economic and biodiversity values can coexist. Biodiversity conservation must take place beyond the confines of protected areas, over the whole landscape. Links must be built between protected areas and the needs and economic activities of the communities around them. Creating natural reserves and protected areas is not the goal of biodiversity conservation, rather these are one of a series of

important pieces in a land use mosaic where every piece counts. As Aldo Leopold (1953) suggested, the secret to intelligent tinkering is in keeping all the parts. All the parts cannot be contained within protected zones.

2.4 Biodiversity and the General Public

As the preceding section shows, conservation activities are most often planned as separate activities in "special" areas. One possible reason that biodiversity is absent from routine planning policy activities is because the North American public is generally unaware of the idea of biodiversity and correspondingly, the issues surrounding its loss (Bidwell and Barrow, 1996). There is not a well-developed body of knowledge in this area however this section of the chapter deals with what has been reported about the general public and its knowledge of biodiversity.

2.4.1 Knowledge of Biodiversity

Several studies in the United States have discovered that most people do not understand what the term "biodiversity" means. In a state-wide survey conducted in Missouri in 1994 by Witter (1995), only 30% of the respondents indicated that they understood what "biodiversity" meant. Belden and Russonello (1995), in researching biodiversity, found that almost no one in any of 10 focus groups held in four cities knew of the word "biodiversity". In subsequent discussions, the focus groups participants indicated that, to them, the word implied "difference" but not "connection". Further analysis revealed that many in the target audience did not believe that the earth is losing enough species to impact on human well being. The researchers also found that the public's real concern over habitat or species extinction is "paper thin" and its understanding of biodiversity superficial. Initial "lip service" to the circle of life quickly disintegrated when any number of other issues entered the discussion. Belden and Russonello concluded that "participants showed themselves to be both poorly informed about biodiversity and unconvinced of its importance.

"In discussion with dozens of people from all walks of life I have found a rather startling naivete on what biodiversity is, why it is important, and why we are all concerned about it" wrote P. F. Brussard, the president of the Society for Conservation Biology. "It comes as a rather rude surprise to find out how many people in the world are ignorant of, indifferent toward, or opposed to the conservation of biodiversity. Among these are many elected officials, some state and federal employees, most people working in the extractive industries, a goodly number of farmers, ranchers, a few environmentalists and a generous share of the public at large." (Brussard, 1994)

Because of this lack of knowledge, the public in general, does not appear to see the reduction of biodiversity as a threat. Staff at the Chicago Museum conducted a nation-wide telephone survey in 1992 and spoke with 1209 randomly selected adults. Seventy three percent were unfamiliar with the notion of the loss of biodiversity. Moreover, very few people connected the destruction of habitat with the loss of species. (Chicago Museum, 1993)

Decision Sciences Inc. (1992) conducted a series of 15 focus groups in 5 cities to rank 19 environmental issues by personal interest. Biodiversity ranked lowest overall in personal interest. Air quality received the highest ranking.

A similar study by Krause (1993) reported that population growth-- which is associated with habitat destruction and, in turn biodiversity loss--received the lowest overall ranking for level of concern of nine environmental issues. Hazardous waste received the highest ranking.

2.4.2 Response to Biodiversity Issues

Because of this lack of knowledge, people respond in different ways to biodiversity issues. Even though they may support the concept of healthy ecosystems, they may not understand or follow through on or support processes or activities essential for the maintenance of these systems when it is close to home.

For example, Martinez (1995) in an article in the Chicago Tribune, reported on a move by a local district to convert a vacant 20 acre lot into a nature preserve, complete with native species and a restored wetland. Local residents complained that such restoration was redundant because they believed that the vegetation that was already there was good enough. Kupkowski (1995) indicates that this distinction between nature and biodiversity is important because nature to some may mean any type of setting in which plants can be found, such as typical manicured urban parks, while biodiversity is much more complex.

Witter (1995) found, in his 1994 survey of the Missouri public, that there was strong support for conservation and rehabilitation of wild lands, but that support stopped at the implementation of habitat management. In this survey, 70% of respondents agreed that the Missouri Department of Conservation should make an effort to restore rare, native animals to the state. Only 23% agreed that wetlands and marshes should be "drained for better uses". Eighty-nine percent agreed that it was important to re-establish native prairie areas wherever possible. But only 33% agreed that using fire to manage the prairies and forests was a good idea. Alder (1995) indicates that while ecologically aware homeowners can appreciate wild natural areas in their neighbourhoods, housing developers state that most home buyers prefer manicured lawns and flower gardens. He goes on to report that one developer complained that residents of a subdivision regularly dumped dirt into a natural wetland in the subdivision so they could put up swing sets and picnic tables.

2.4.3 Communication and Biodiversity

It is difficult to communicate the importance of biodiversity. The two components that are factors in this problem are the complexity of the issues and people's lack of experience with biodiversity. Villeneuve (1994) reports that while the layperson can appreciate the diversity of landscapes or higher animals, it seems to be beyond the general public's capabilities to evaluate the diversity of genetic forms of plant varieties, not to mention the insects, arachnids, fungi, and algae which make up

the majority of living organisms. Chipeniuk (1995) believes that while most people in Canada, the US, and Europe are capable of recognising biodiversity, their primarily urban upbringing fails to give them the kinds of experiences needed to develop the competent and rich sense of biodiversity possessed by humans in other parts of the world. Rodger Schlickeisen, president of Defenders of Wildlife, suggests changing the language used to describe the issue; replacing biodiversity with a more jarring descriptor on par with "acid rain" or "global warming". Two possibilities he proposes are "biocrisis" or "extinction crisis" (Bidwell and Barrow, 1995).

Although awareness of ecological issues is higher than it was 20 years ago, messages received by the public about biodiversity have not stressed the interconnected nature of the issues, and the explanations of the issue have tended to be too simplistic. Hart (1992) found out that although young people are keenly aware that the world faces serious environmental problems, their understanding of ecological issues is limited. His open-ended survey revealed a very simplistic view of ecology, the key elements being recycling, littering and pollution. He also indicates that the environmental movement has done little to educate people about ecology and the interconnectedness of all living things to better provide a base from which a more sophisticated understanding of environmental problems and solutions can be built.

Cultural values characterising some animals as pests make the value of saving all habitats of species unattractive. Beledn and Russonello (1995) reported that respondents in a series of focus groups expressed the view that not all species are desirable and it could be good for some species to become extinct. Examples offered in the group of species which are considered pests or harmful to humans included roaches, termites, mosquitoes, snakes, and rats. Osterman and Parker (1987) indicated that articles about endangered species often concentrate on dichotomies, i.e. species versus jobs; species versus private property rights. Furlow (1994) found that the majority of articles about the spotted owl debate did not cover important biological sub-issues and ecological concepts such as structure in habitat, fragmentation effects,

edge effects, territory and range, and population trends. Instead, they described the jobs and species dichotomy.

2.5 Exurban Land Use Planning and Biodiversity

While there is no universally accepted definition of exurbia (Davis et al, 1994), the semi-rural fringe beyond a city's suburbs can be classified as the exurban region. It contains rural areas, large farms, suburban subdivisions, small towns, some manufacturing plants, ranches and hobby farms. Nelson and Dueker (1990) classify it in this way - if it is not urban, suburban or rural, it is exurban.

Davis et al (1994) report that there is no major policy that deals with the management of exurban development. They also report that there is no universally accepted settlement form for exurban development to guide planners. These gaps complicate the planning process. However, exurbia is a complicated place to undertake planning for many reasons.

Perhaps because of these complications or because of the lack of understanding of biodiversity land use planning anywhere has not adequately recognised biodiversity (Tamminga, 1995). Exurban developments, either rural or in bedroom communities, involves a spectrum of public issues including environmental quality, adequacy of water supply, equity in housing and economic opportunity, energy consumption, traffic congestion, visual blight, and rising public costs per capita for the provision of utilities and services (Platt, 1991). However biodiversity has not been specifically identified as an issue in this literature. In recent rural and exurban planning literature, biodiversity is not mentioned. In literature about rural biodiversity it is mentioned only as something that is impacted upon by agricultural practices. Without a comprehensive strategy that addresses both biodiversity and the human demands of the exurban region, biodiversity in exurbia is compromised.

2.5.1 Exurban Development Problems

Among the many issues of exurbia, there appear to be two distinct issues that make up the exurban development problem in the main (Bryant, Russwurm and McLellan, 1982); both complicate planning and conservation initiatives. The first concerns the natural environment and the second deals with the complex social makeup of the exurban region.

2.5.1.1 The Natural Environment and Biodiversity

It is clear that biodiversity preservation beyond traditional reserves, such as parks, is an expedient activity. As the land provides humans with food and resources, which ultimately come from biodiversity, land can be said to be the primary capital of a nation (Forman, 1995). Yet, increasingly, the misuse of the land is causing a decrease in biodiversity. This effect is disturbingly apparent on the Canadian prairies, as first, agriculture and now exurban developments continue to degrade ecosystems. In terms of environmental quality, Soule (1994) has identified habitat fragmentation, ecosystem degradation, and the introduction of exotic species as the three primary threats to biodiversity. All three of these processes are highly evident in the exurban landscapes of Canada where urban and rural lifestyles converge.

Generally, land use in exurban areas consists of agricultural lands that produce food for humankind, and non-agricultural lands that consist of various types of woodlands and wetlands. This duality presents a peculiar paradox that is central to the issue of biodiversity preservation and rural development. The paradox is this: most Canadian municipalities prohibit non-agricultural development on farmlands (Bryant, Russwurm and McLellan, 1982; Municipality of Rockwood, 1997; Municipality of Springfield, 1996)--lands for reasons that Soulé outlined, are comparatively devoid of biodiversity. According to this restriction, most development, including rural residential development will take place on drained wetlands, woodlands and other

areas that once provided rich habitats in a currently impoverished landscape. In addition, several studies have identified that a high degree of vegetative cover as the most desirable characteristic of exurban residential building lots (Manitoba Municipal Planning Branch, 1974; Bryant, Russwurm and McLellan, 1982). Thus, the biodiversity that does persist in rural landscapes seems doomed to dwindle into oblivion as residential and other non- agricultural developments proceed to impact on biologically diverse and productive habitats (Mineault et al, 1994).

2.5.1.2 The Social Environment

Conservation and development considerations are further complicated in the exurban region by the social environment. The exurban social milieu is characterised by two distinct "communities", the long-time rural residents and the exurban newcomers; "refugees" from the city (Spain, 1993). While sociological literature has delved into the social aspects of this duality, little has been done to explore the impact of this community diversity on land use planning and the relationship to conservation. Two studies in particular, however, help to shed light on these dilemmas.

In an effort to further define exurbia and to uncover its impacts on planning, Davis et al (1994) utilised a case study approach in Portland, Oregon. They investigated three questions, two of which are relevant to this thesis: what types of people move to exurbia? Why are these people moving to exurbia?

Davis found that although exurban home buyers were similar to suburban home buyers in terms of occupation, income and job locations, their locational choices were strongly influenced by a desire for more space and a rural environment. Their reasons for wanting a rural environment included wanting a quiet peaceful place to live, to wanting to engage in part-time agricultural pursuits, such as hobby farming. Most wanted large lots, but did not want to engage in full time farming pursuits. Most in the survey indicated that they thought a rural environment was better for raising a

family. They also commented on the open space, greenspace, and recreational opportunities.

Taking the migration of people from one place to another one step farther, Spain (1993) studied the types of conflicts that arise in gentrifying neighbourhoods and rural counties in the wake of rapid immigration. She studied a rural area, Lancaster County, Virginia and compared it to Queen Village in Philadelphia. Both areas were experiencing a rapid influx of newcomers. In this research, she discovered that whether newcomers moved into downtown areas or countryside regions, they become a critical mass with greater access to resources than the long term residents. This results in a redistribution of resources and the resulting conflict over these resources is often cloaked in the language of differing values regarding the community's identity.

Spain found that in a rural setting, the resources in question may include scenic views, ability to keep animals, such as horses, and the resulting opportunity to earn income from semi-agricultural pursuits. All these contribute to the subjective assessment of "quality of life". Spain compared "conspicuous consumption" and its effects on the long-time residents. In the rural areas this consumption expressed itself in the form of hobby farms on which the owners were not economically dependent. These operations tend to compete with commercial farms for the same land and drive land prices up beyond what working farmers can pay. This sets the stage for more conflict. This confirms research by Baldassare (1986) and Burby (1979) who have concluded that length of residency in a community influences attitudes towards growth and perceptions of change in the quality of life and the community's identity.

In terms of land use, Spain, indicates that this conflict becomes evident in the comparison of newcomers and long-term residents preferred mix of land uses. Newcomers to rural areas are more interested in the scenic value of land rather than its income potential. In an important finding, Spain states:

The control of resources is a mediating factor in land use preferences in Lancaster County. Among newcomers and old-timers, there were few disagreements over priorities for land uses and taxation: there were no statistically significant differences between the two groups on three-quarters of all attitudinal and taxing priority questions. Among the four land use issues on which there was statistically significant disagreement, old-timers were more likely to want the lumber industry protected, while the newcomers were more likely to want the shoreline view protected, more parks, and future growth to occur in existing towns.

In another important finding, Spain indicates that rural newcomers are more likely to want change stopped, or at least controlled. Long-term residents, who may have survived decades of economic "disinvestment", are more likely to welcome development of any kind. Dubbink (1984) attributes the resulting conflict to competing views of ruralness. "The long-time residents are bewildered by the growth controllers efforts to save something that they think no longer exists. But the growth controllers, who never experienced the towns when they were smaller, are fiercely protective of the perceived rural qualities of their settlements and determined that further modernity shall not intrude" (Dubbink, 1984).

Healy and Short (1979) have indicated that this effort to preserve the past often takes the form of preservation of the environment. Whether eager to protect the rural quality of life or to "ward off pollution", newcomers are more likely than long term residents to be concerned with the quality of the environment. Environmental politics are often dominated by the conflict between those whose livelihood depends on development and those with little economic stake in development (Costantini and Hanf, 1972).

2.5.2 Planning and Attitudes about Conservation

While the literature about planning does not specifically address the issues surrounding community acceptance of landscape ecological planning, it does provide background into issues concerning the public and environmental issues such as

conservation. This knowledge can shed light on why and how people are motivated to act on environmental issues, such as conservation. Maloney and Ward (1977) in fact, characterise the "environmental crisis" as a crisis of maladaptive behaviour.

Arbuthnot (1977) claims that "the success of public policy decisions, educational programs, and other efforts dependent upon specific individual action in our realm of environmental issues may well hinge on our understanding of the relationships among personality characteristics, and environmental values, knowledge, and behaviours." He goes on to quote Maloney and Ward (1973), who argue in *American Psychologist* that "we must determine what the population knows regarding ecology, the environment and pollution; how they feel about it; what commitments they are willing to make; and what commitments they do make."

Obviously, much has been written about attitudes and behaviours and it is a very complex topic. It is beyond the scope of this thesis to undertake a comprehensive analysis of all the factors influencing and affecting individual behaviour. However, this section will review some of this research as it relates to the thesis subject. It will include a review of studies related to environmental behaviour, environmental attitudes and attitudes about community growth, planning and development. This review will further highlight areas that may be barriers to new land use planning techniques such as landscape ecological planning.

2.5.2.1 Environment, Attitudes and Behaviour

There is a large and diverse body of knowledge related to the environment and behaviour and has been studied by scholars in a wide range of fields (Borden, 1977). This section highlights relevant findings as they relate to this thesis. Hines et al (1987) explored factors that are most influential in motivating individuals to take responsible environmental action such as might be required to support a new conservation strategy. This study involved a meta-analysis (an analysis of the findings of several studies that analysed self-reported environmentally responsible behaviour). Several factors were found to be associated with this kind of behaviour. Ones relevant to this

study include the knowledge of the issues, knowledge of action strategies, locus of control, attitudes, and the individual's sense of responsibility. In addition, several demographic variables were also included. They were age, income, education and gender. The "knowledge of issues" included not only knowledge of environmental problems and their consequences, but also pertained to knowledge of how to take action on a particular environmental problem. Hines reported that a positive correlation coefficient indicated that those individuals with greater knowledge of environmental issues and/or knowledge about how to take action on those issues were more likely to have reported engaging in environmentally responsible behaviour than those who did not possess this knowledge. This supports the results of a study by Asch and Shore (1975), that showed that before an individual can act on an issue, the individual must know that the issue exists. However, Ajzen and Fishbein (1977) caution that normative influences could exert a strong force over behaviour that may prevent an individual from acting the way they would like to. So, given that an individual has knowledge of an environmental issue, and may wish to engage in responsible behaviour towards that issue, social norms may prevent them from doing so.

The remaining influencing factors were categorised by Hines as psycho-social and are related to the perceptions people have of themselves and of others as well as individual personality characteristics. Hines discovered that those individuals with more positive attitudes were more likely to have reported engaging in responsible environmental behaviours than those with less positive attitudes. Locus of control represents the individuals' perception of whether or not he or she has the ability to bring about change through his or her own behaviour. This study showed that people who believe they can bring about change reported engaging in responsible environmental behaviours. A person's sense of responsibility was determined to be a factor influencing environmental behaviour. This sense of obligation was either expressed in reference to the environment as a whole or to one environmental issue. It was found that those who felt some degree of responsibility towards the environment were more likely to have engaged in positive environmental behaviour.

Demographics also had influence. Peoples' cost consciousness and concern about economic impacts of certain environmental behaviours was analysed. However this aspect was inconclusive. The correlation coefficient was non-significant and therefore did not support the existence of a relationship between an individual's economic orientation and their environmental behaviour. Likewise, only a weak correlation was found between income and environmentally responsible behaviour. The study revealed that more highly educated people were slightly more likely to report engaging in environmentally responsible behaviour than less educated persons. Finally, the analysis revealed that younger individuals were more likely to have reported engaging in environmentally responsible behaviour. Based on gender data, Hines found no relationship between gender and environmentally responsible behaviour. A similar study in Germany in 1987 by Schahn and Holzer had similar findings. One limitation of this type of research is that it is a measure of self-reported behaviour and not actual behaviour. Other researchers have pointed out that what is reported on surveys is often inconsistent with their real actions (Brickman 1972).

Arbuthnot (1977) concluded that it would appear that liberal-minded people, who are flexible in their behaviours and beliefs and less traditionally oriented, were more likely to respond by behaviour to the need for pro-environmental commitment. As well, these individuals had a greater belief that they could control events in their lives.

2.5.2.2 Rural Conservation and Attitudes

In the United Kingdom, Carr and Tait (1990) undertook a survey of farmers and their attitudes towards conservation in an effort to understand how to achieve successful voluntary conservation measures on private land. They interviewed both farmers and members of local conservation groups about their views on conservation on farms.

Farmers, they concluded were generally sympathetic to conservation when it was discussed in general terms. Large differences began to appear when specific issues were discussed. Conservationists saw the loss of habitat and species as the main issue, while farmers tended to see the main problem as the loss of their freedom to do what ever they wanted to do on their land. Carr and Tait also noted the differences in the words used to describe the land. Farmers saw woodlands as "wasted land, overgrown, or neglected" and causing "inefficient farming". Farmland, on the other hand, was described as "decent, productive, and orderly". The conservationists, however, preferred the wildlands and hedgerows and wished that there were more. Farmers also viewed many of the native plant species as weeds and a nuisance. Along the same lines, farmers' attitudes about wild animals were very different from those of the conservationists. Many wild animals, such as rabbits, many species of birds, and rodents were thought of as "vermin" while the term "wildlife" included beneficial animals such as earthworms and pheasants.

Many farmers also expressed strong views of property rights. Many felt that no one ought to be able to dictate the types of activities that were conducted on their land. Often the researchers heard, "It's his land and he should be able to do anything he wants with it." Conservationists on the other hand, thought that farmers should be more like stewards, than owners.

In this study, once again, the topic of norms arises. Carr's study investigated the extent to which farmers were influenced by the opinions of others, both within and outside the farming community. Farmers described original village people as "salt-of-the-earth", but resented the newcomers, referring to them as "townies" and "Joe Public". The farmers felt that the newcomers were responsible for changing the nature of the rural communities and the subsequent land use conflicts. Carr also surveyed farmers' sources of advice on several environmentally related activities. Most often, others in the farming community were the ones consulted, while the conservationists were largely, ignored.

In a similar study conducted in Australia by Vogel (1996) 2095 farmers were interviewed about a number of issues surrounding conservation and farming practices. The question was to test whether there was a strong link between attitudes and conservation behaviour. The most important finding was that practical knowledge of environmental issues and personal experience with nature had one of the strongest influences on farmers' behaviour. Another finding was that the more education farmers had, the more likely they were to engage in conservation behaviour. However, the authors indicate that Australia has a very comprehensive education program for farmers, which may have had additional influence on developing positive conservation attitudes and consequently, behaviour.

2.5.2.3 Planning, Attitudes and Behaviour

In literature that discusses attitudes and local developments or specific conservation initiatives, none addresses barriers that may be met while promoting landscape ecological planning. However, some of the issues encountered in these studies may be indirectly related to what one might expect in developing a regional landscape-based planning scheme such as the one developed by Forman.

Syme et al (1993) explored factors that determined the motivation to become involved in a local wetland conservation project. The roles of knowledge and disposition in determining an individual's reported activity were investigated. The wetland project was chosen because it was seen as typical of many non-personally threatening environmental problems, which do still have the potential to noticeably affect the quality of life in the community. The hypothesis was that those who related most favourably to the natural environment would be more *emotively* aroused when viewing degradation of natural wetlands than those who consistently did not have that view.

Seventy-three residents were sampled in this study. They were asked to answer questions relating to their knowledge of the issues and were then shown slides

of local wetland areas that had been subjected to pollution. They were then asked about their involvement in wetland conservation activities. The results of this study indicated that knowledge of wetland issues did lead to increased assessment of the problem and increased arousal. Syme found that these variables, in turn, influenced reported behaviour and activism on local non-threatening environmental issues. These factors may well be dependent on feelings of control, since the issue was localised and respondents may have felt increased confidence to act.

Some interesting results arose from a study conducted by deHaven-Smith concerning public opinion on land use regulation in Florida (deHaven-Smith, 1988). The main objective of the research was to apply a mass belief system approach to attitudes about land use regulation to uncover whether a narrow environmental issue is conceptualised by the public in many ways. Some of the findings are of interest to this thesis.

deHaven-Smith interviewed 388 respondents and asked questions relating to land use regulations, for example, should land use regulations, such as zoning and planning, be strengthened, weakened or stay the same? They were then asked why they responded in the way that they did. Responses were categorised based on the basis of their reasons.

A majority of those who wanted regulations strengthened indicated that they thought zoning decisions were arbitrary, developers got preferential treatment, and that future development was unpredictable. A smaller group cited environmental degradation as the main reason for wanting stronger controls. Most of the respondents who wanted land use regulations relaxed or left unchanged were unable to provide clear reasons for their positions. They tended to say that the existing regulations were good enough or they thought that current policies did enough for the environment. Tangible reasons included a desire for more economic growth, lower housing costs and broader property rights. Finally, about 8% indicated that existing regulations gave too much weight to the environment at the expense of people.

The overall conclusions of the study found that "peoples concerns appear to be rooted in the mundane conditions of everyday life, rather than in abstract philosophical or ideological principles". "At the grassroots level, the strong support that was shown for land use regulations in this study is best considered a coalition of many groups with very focused "peeves" rather than a broad-based, unified, environmental movement." (de Haven-Smith, 1988)

2.6 Chapter Summary

Biodiversity is an important component of human existence. Only recently have attempts been made to preserve biodiversity, rather than preserving only species. Preserving large areas of habitat appears to be the best way to accomplish this goal. Accordingly, zoos, botanical gardens and protected areas are by themselves, inadequate. One of the best ways to conserve habitat is to incorporate the natural patterns of the landscape into routine planning activities. Up till now, this has not been a priority in the development plans of most communities. Because the public lacks knowledge of the concept of biodiversity, biodiversity is being compromised by its lack of consideration in planning. Exurban planning is a complex process with its goals further obscured by the land use paradox, and differing attitudes towards nature and conservation. The complexity of issues surrounding biodiversity, as well as those issues specific to the exurban region, indicates that there may be many barriers to be overcome when attempting to introduce new conservation oriented planning schemes. These barriers have not specifically been researched before and this thesis will contribute to this gap by identifying barriers to novel land use planning ideas in the exurban region.

Chapter 3. The Theoretical and Applied Basis for Landscape Ecological Planning and Forman's Model

This chapter will describe the study of landscape ecology and its role in planning. It will then discuss landscape ecological planning in relation to Forman's model. It will also explain some land use control mechanisms that can be used to ensure the long term viability of a landscape ecological plan. The chapter will conclude with a brief presentation of a case study that highlights the use of the controls.

3.1 Landscape Ecology

Ecology is defined as the study of interactions between and among organisms within environment. A landscape is described as a wide mosaic on the land, extending over many kilometres, over which ecosystems recur; or simply, a large, spatially heterogeneous area. Landscape ecology then, is simply the study of the spatial and temporal interactions among and between landscapes. It emphasises large areas extending from tens to hundreds of kilometres, and the ecological effects of the spatial patterns of ecosystems. It recognises that ecosystems operate on many spatial scales, from the largest region to the smallest microhabitat. This study of spatial patterns distinguishes landscape ecology from traditional ecological studies, which frequently assume that systems are spatially homogeneous (Turner and Gardiner, 1990).

Carl Troll was the first to use the term "landscape ecology" when he viewed some of the world's first aerial photographs and recognised mosaic-like patterns on the land (Forman, 1995). The concept of patterns on the land evolved to become the study of "the entire complex cause-effect network between the living communities and their environmental conditions which prevail in a specific section of the landscape and becomes apparent in a specific landscape pattern or in a natural space classification of different orders of size". Vink (1975) considered landscape ecology to be the "study of key variables to be controlled by human intelligence". Zonneveld (1979) indicated

that landscape ecology is an aspect of geographical study “which considers the land as a holistic entity made up of different elements, all influencing each other”. Naveh and Liebman (1993) viewed landscape ecology as a “trans-disciplinary ecosystem education approach based on general systems theory, biocybernetic, and ecosystemology as a branch of total human ecosystem science.” Risser *et al* (1984) concluded that landscape ecology “considers (1) the development and dynamics of spatial heterogeneity, (2) spatial and temporal interactions and exchanges across heterogeneous landscapes, (3) influences of spatial heterogeneity on biotic and abiotic processes, and (4) the management of spatial heterogeneity.”

The land mosaic as described by these scholars, is indicative of processes that effect the movement of energy, nutrients and species. It is the recognition that there is a relationship between these patterns and the corresponding processes in a landscape that make landscape ecology a viable tool for environmentally sensitive regional rural planning. By maintaining an optimal pattern of landscape elements –patches, matrix, and corridors--the natural ecosystem functions and processes can also be maintained. Thus, biodiversity can be preserved.

3.2 Landscape Ecological Planning

Traditionally, planners and land managers have ignored the interactions among the different elements in landscapes and have generally viewed ecosystems as separate, homogeneous elements. They have ignored the natural, curvilinear patterns of nature (O'Neil *et al*, 1989) and substituted the very geometric form typical of human development. A symmetric geometric form placed within an asymmetric natural pattern is generally unsustainable, unstable and costly to maintain (Forman, 1995). This approach, as has been discussed, yields little benefit over the long term, for biodiversity. Yet it is possible to replace the current destructive imposition of urban form on the rural landscape by developing the exurban countryside in a manner which recognises the contributions to the vast array of life-forms it supports. One

promising approach to reconciling the land use/conservation/sustainable development dilemma is landscape ecological planning.

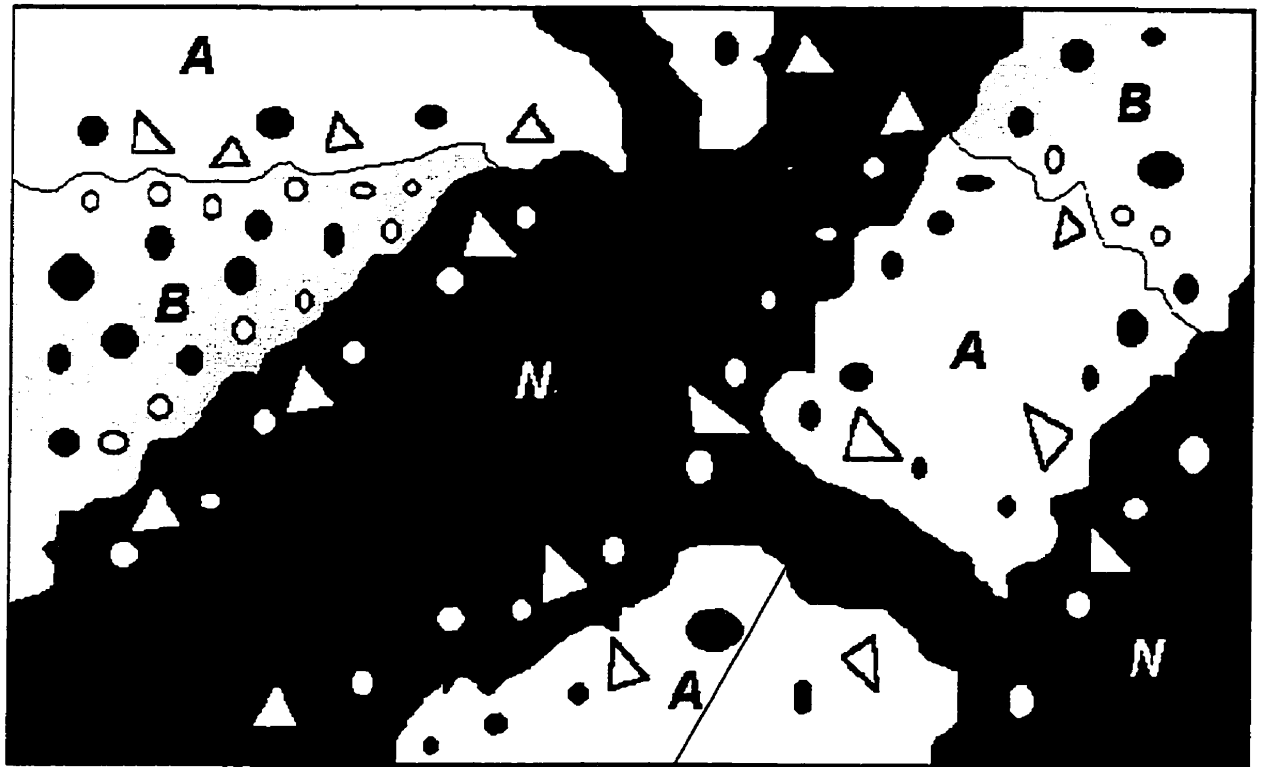
Landscape ecological planning incorporates the critical spatial arrangement of landscape elements into the planning process to accommodate the life-forms that have adapted to that particular area. It is the arrangement and consideration of these landscape elements and patterns that can provide not only an abundance of suitable habitat for the preservation of biodiversity, but can also well accommodate the needs of humans. This section describes the planning model proposed by Richard Forman and explains how it may be implemented to protect biodiversity, particularly in the exurban region and in exurban rural residential developments.

3.3 Forman's Model

Forman developed a land use planning model in response to the lack of land planning and management based on principles of landscape ecology, and answers the question "what is the optimum arrangement of land uses in a landscape?". It is based on the theoretical "aggregate-with-outliers" principle of landscape ecology. It is a model in the sense that the complexity of the system is filtered out, and apparently less important variables not included. As such, Forman indicates, it does not describe the complexity of any real landscape. It is also a theory in as much as it is a synthesis of many diverse areas of knowledge. It has not been tested but considerable evidence exists for each of its foundations (see Appendix B).

The aggregate-with-outliers principle, on which the model is based, states that land uses should be aggregated, with corridors of natural vegetation connecting small and large patches of natural vegetation. These patches should be interspersed with human activities and developed areas, which should be spatially arranged along the borders of adjacent land uses. Figure 1 graphically depicts this model.

Figure 1: Forman's Aggregate with Outliers Model



Corridors of natural
vegetation



Outliers of agriculture



Outliers of built up areas



Outliers of natural
vegetation

N = Large patches of
natural vegetation

B= Built up areas

A=Agricultural areas

This land use planning model has numerous ecological benefits. As well, a range of benefits for humans is also suggested by this approach. These include the provision of a wide range of aesthetic settings; locations for suburban dwellers as well as those who prefer more isolation; concentrated areas for jobs; and commercial activities and industry. It allows for the efficiency of human movement along corridors; promotes large areas of natural vegetation across transportation corridors preventing strip type development; allowing for land use specialisation in built areas; and aggregation of agricultural activities.

3.3.1 Applying the Model to a Regional Development Plan

In applying the model to an entire region, such as an exurban municipality, there are several components that must be included. These are: maintaining the indispensable vegetation patterns and connections, identifying the key environmental locations and applying the principles to development.

On a regional basis there are top priority patterns for biodiversity for which no substitute is known.

1. large patches of natural vegetation,
2. wide natural vegetation corridors along water courses,
3. maintaining connectivity for movement of key species among the large patches,
4. maintain heterogeneous bits of natural vegetation throughout human development areas, including rare habitats

The first part of a regional plan is to identify these patterns. The second task is to insure that they remain intact during subsequent development. Another important consideration is to include the curvilinear and irregular form of nature in the built environment. The next step is to identify the key ecological locations in the landscape. These could be unusual geomorphic features, endangered habitats or ecosystems, or other areas that show a high sensitivity to human disturbance.

Protecting these areas as "flux centres" for the movement of biodiversity is a critical factor because movements of organisms and flows of energy and nutrients through them affect many other landscape elements.

A key issue arises when considering the landscape in terms of human development especially residential development which is fraught with conflict even under ideal conditions. Can the human impacts on biodiversity be minimised using this approach? Forman states that the model can certainly be used for planning not only the region, but for residential developments themselves and it can even be applied to the resultant building lots. By using landscape ecological planning and land use control tools to maintain the spatial arrangements and patterns on the landscape, biodiversity can be preserved and human activity allowed.

One of the most important aspects of planning is the implementation. The most sophisticated, sound and well-balanced plans are useless unless they can be implemented properly. One of the most important tasks in this area is the design and choice of appropriate policy tools that are able to achieve the desired objectives. The tools must be effective, efficient, and produce equitable results. Moreover the attainment of the policy objective must be feasible from many different points of view, including technical, political, legal, social and environmental. The planning solution is neither to eliminate private property nor the market, but to mould private decisions in such a way that the public interest is also achieved. In this case, the public interest may be best served by the protection of biodiversity. Land use controls can be such a solution.

Land use control mechanisms are thus, an important component of any development plan. There must be ways to enforce planning and zoning bylaws. Strathcona County in Alberta has developed a land use plan using several land use control mechanisms and alternative residential development forms to preserve important natural areas, although they did not apply the principles of landscape ecological planning according to Forman's model. However, these control tools may

have applications in a land use plan that uses landscape ecological planning as its foundation. These controls enforce the ecological principles underpinning the model and they help in shaping development that follows nature's patterns rather than the linear configurations of human made systems. The next section will highlight the Strathcona County plan as a case study and example of a municipality where these land use control tools have been successfully implemented.

3.3.1.1 Land use Controls to Support the Model: The Strathcona County Experience

The model developed by Forman uses principles of landscape ecological planning to graphically illustrate an idealised landscape that has been planned for biodiversity conservation. A missing element in a plan using this model is a method or methods by which to insure the pattern will persist. Strathcona County in Alberta, Canada has used a series of land use controls that may be used to support landscape ecological planning in practice. This section will describe the Strathcona County experience. The knowledge of land use planning using the controls may be applied to the situation in this thesis' study area as there are many commonalities between the two areas.

Strathcona County in Alberta is a rural/urban municipality of 1,280 km² located between the City of Edmonton to the west and Elk Island National Park to the east. A large portion of it is contained within the Cooking Lake moraine, a highly productive habitat for wetland and upland species. Past development pressures for rural residential lots and recreational areas has fragmented much of the region's corridors and large patches. Today, Strathcona County continues to be a rapidly growing municipality with a population of over 64,000. It is poised to become Alberta's third most populous area in the next few years (Strathcona County 1996).

Because of these increasing demands on the land, in 1992, the County placed a moratorium on rural residential development, until comprehensive development policies could be implemented. Through a series of planning exercises, the Transition

Area Master Plan was developed and approved by Council in July 1995. This is perhaps the most detailed application of what Strathcona County officials call ecosystem-based planning. While not entirely the same as landscape ecological planning, the intent of this type of planning is essentially alike: to protect and respect the existing natural landscapes of a region while accommodating human needs. Wildlife habitat, rather than biodiversity preservation is identified as the goal, and the critical spatial landscape configurations are not specifically addressed; however, the process and outcomes comprise one part of landscape ecological planning. In this case, this type of landscape-sensitive planning was accomplished through the use of an innovative land use control known as a conservation easement which then enabled creative planning alternatives such as cluster developments, bonus and bareland condominiums. The intent of these alternative tools was to mould land use decisions by means of economic incentives so that private land use decisions were more in line with the public interest of nature conservation.

Land use control known as Conservation Easements are at the heart of Strathcona County's initiative. Their use enabled Strathcona County to use non-conventional planning concepts to preserve habitat and important landscapes without setting aside large tracts of land designated "protected areas". Conservation easements allow private landowners to become stewards of their land without sacrificing ownership of the land. Essentially, conservation easements are used to protect important natural, educational, scientific, cultural and recreational resources from specified disturbances. Certain activities and land uses can be specifically restricted or prohibited, but in all cases, the landowner and the holder of the easement agree to the conditions. This technique is based on the legal definition of land ownership, which bestows a number of rights on the property holder. By placing an easement on the land, the owner transfers some of these rights to a qualified recipient organisation. The organisation is responsible for monitoring the land, often through annual site visits, to ensure that easement restrictions are being met. This arrangement allows landowners to protect certain areas of their land and still retain some benefits of ownership. One attractive feature of easements is that they are flexible. Easements

can be placed on some parts of the property, but not on others, and can be structured to accommodate present and future needs of the landowner. Conditions of the easement run with the property title in perpetuity even though ownership may change. See Figure 2.

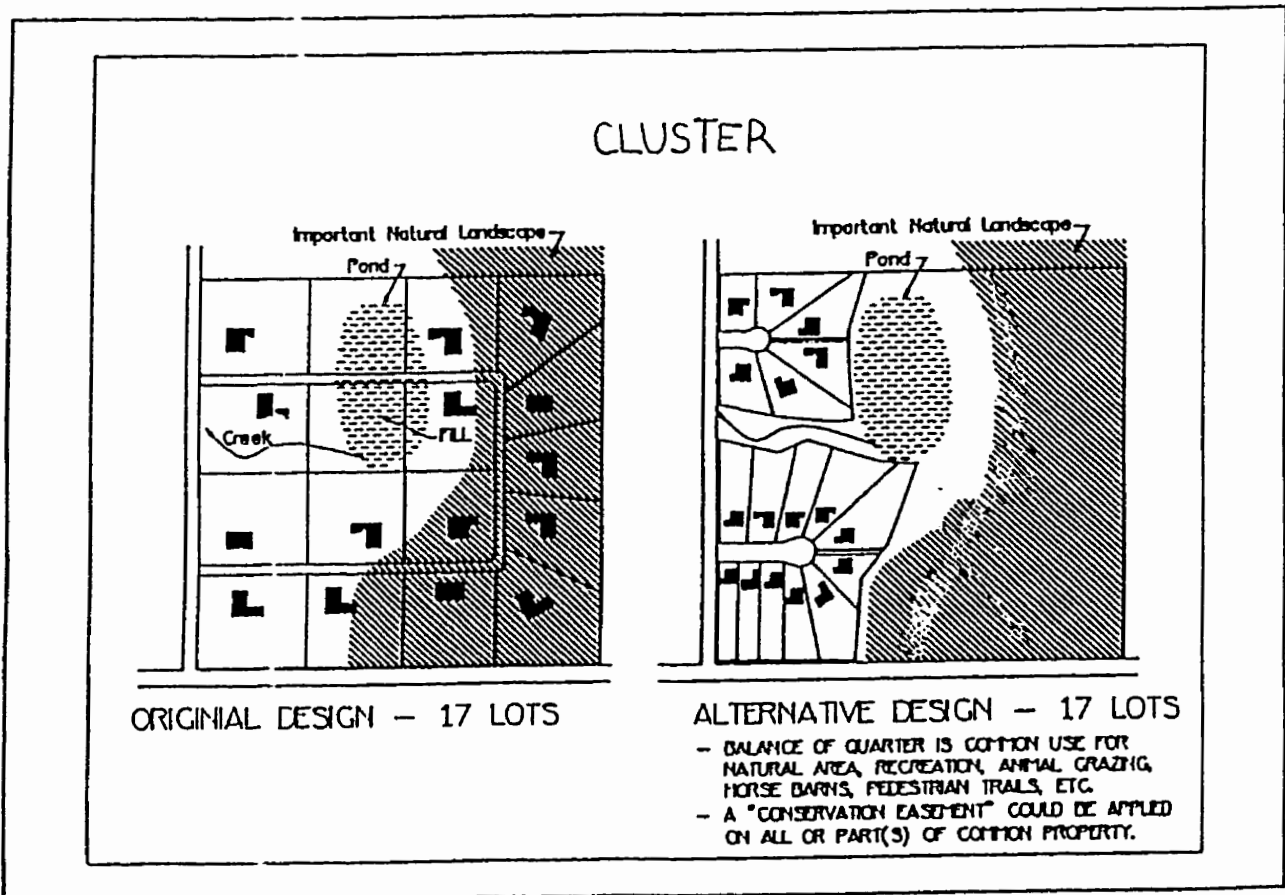
The initial step in the Strathcona County plan was to identify "wildlife habitat units" on the landscape by undertaking a biophysical inventory of the county. This enabled a conceptual plan to be devised, locating the areas that were suitable for both development and the application of the innovative tools. Once so identified, these smaller areas were inventoried for species composition and habitat type, and finally, spatially appropriate land use plans were conceived. Based on the quality and quantity of habitat, land uses were aggregated. Lands that were designated as suitable for rural residential development were also assigned a conceptual subdivision plan according to the quality of the extant habitat and landscape.

To ensure these conceptual plans were realised at the time of development, the county enacted conservation easement regulations under the Environmental Protection and Enhancement Act. Strathcona County used the transaction of land subdivision as the entry point for beginning the conservation easement process. Once the easement has been put in place, a variety of land use techniques may be implemented to insure the developments have minimal impact on the landscape. While there are numerous land use control tools currently in use in North America, Strathcona County chose three, which will be discussed in the following sections. These are "bonusing", "clustering of subdivisions", and "bareland condominiums (BLC)". Any, or all of these may be suitable in supporting the implementation of Forman's model.

3.3.1.1.1 Bonusing

Bonusing is a land use policy in which the approving authority provides added subdivision or development potential in return for certainty of protection for specified land. A basic density allotment is established by the municipality, for example, 4-20

Figure 4 Cluster Design



From: Strathcona County

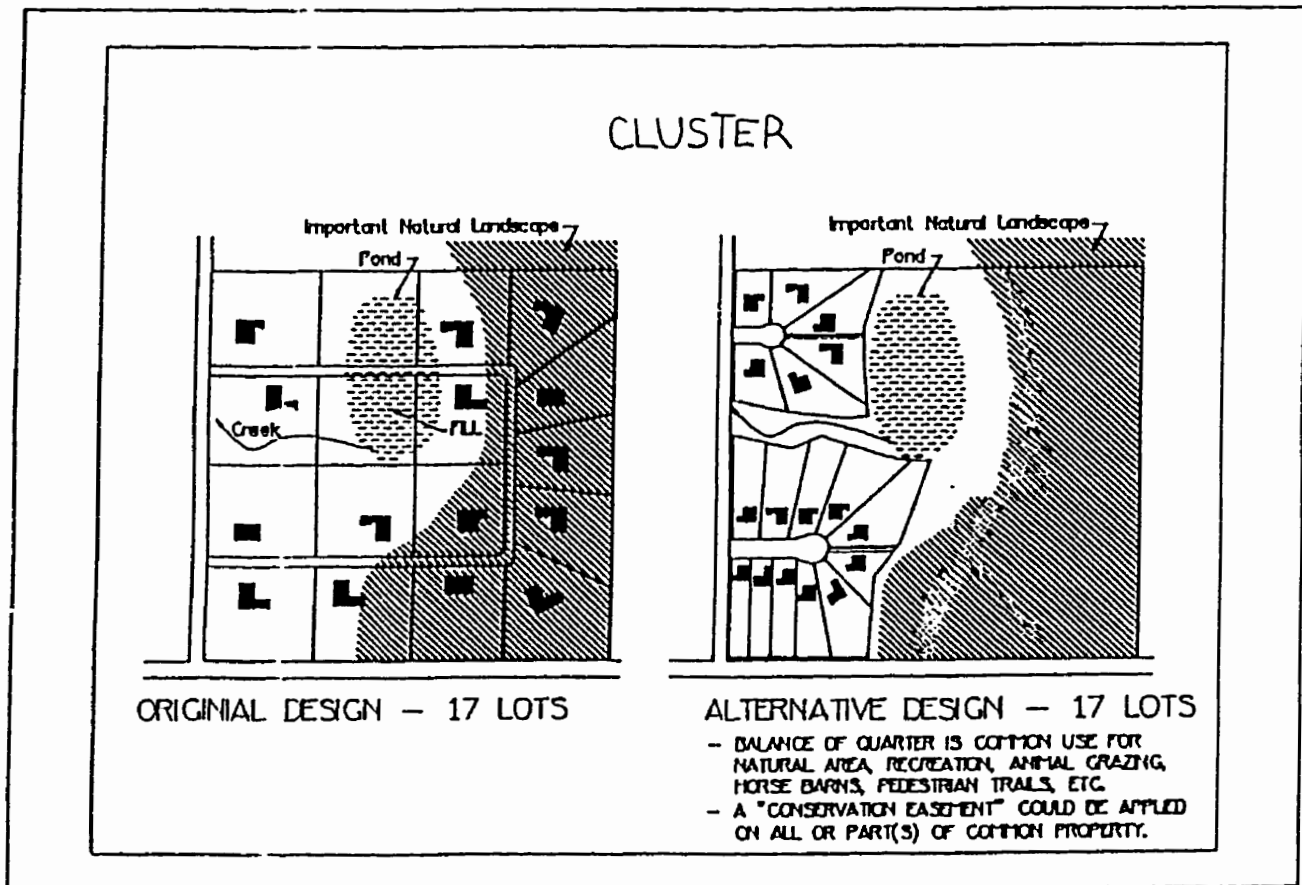
acre lots per quarter section (160 acres). If the developer wished to subdivide additional lots, that number would be dependent on the quantity and quality of natural land on the remainder of the section that would be protected from future development. In Figure 3, a traditional development is shown in the first panel. In the second, in return for protection of the pond, forest and creek, the developer was given one additional lot. The developer will realise a greater value for three lots, than two, and in addition, the lots may be worth more to certain purchasers who can buy knowing that the natural landscape that motivated them to buy it in the first place, will be protected in perpetuity

3.3.1.1.2 Cluster Developments

The idea behind cluster developments or open space zoning is to cluster new development on one portion of a property, while leaving a large tract of environmentally sensitive or scenic land on the remainder of the parcel. See Figure 4. This lowers the impact of the development on the natural landscape and minimises the cost of providing services to new homes since they are closer together than in a traditional development. An attractive feature of cluster developments from a developer's point of view is that the number of houses in the development remains the same. Lots can be of any size depending on the limitations of soil, and other traditional factors.

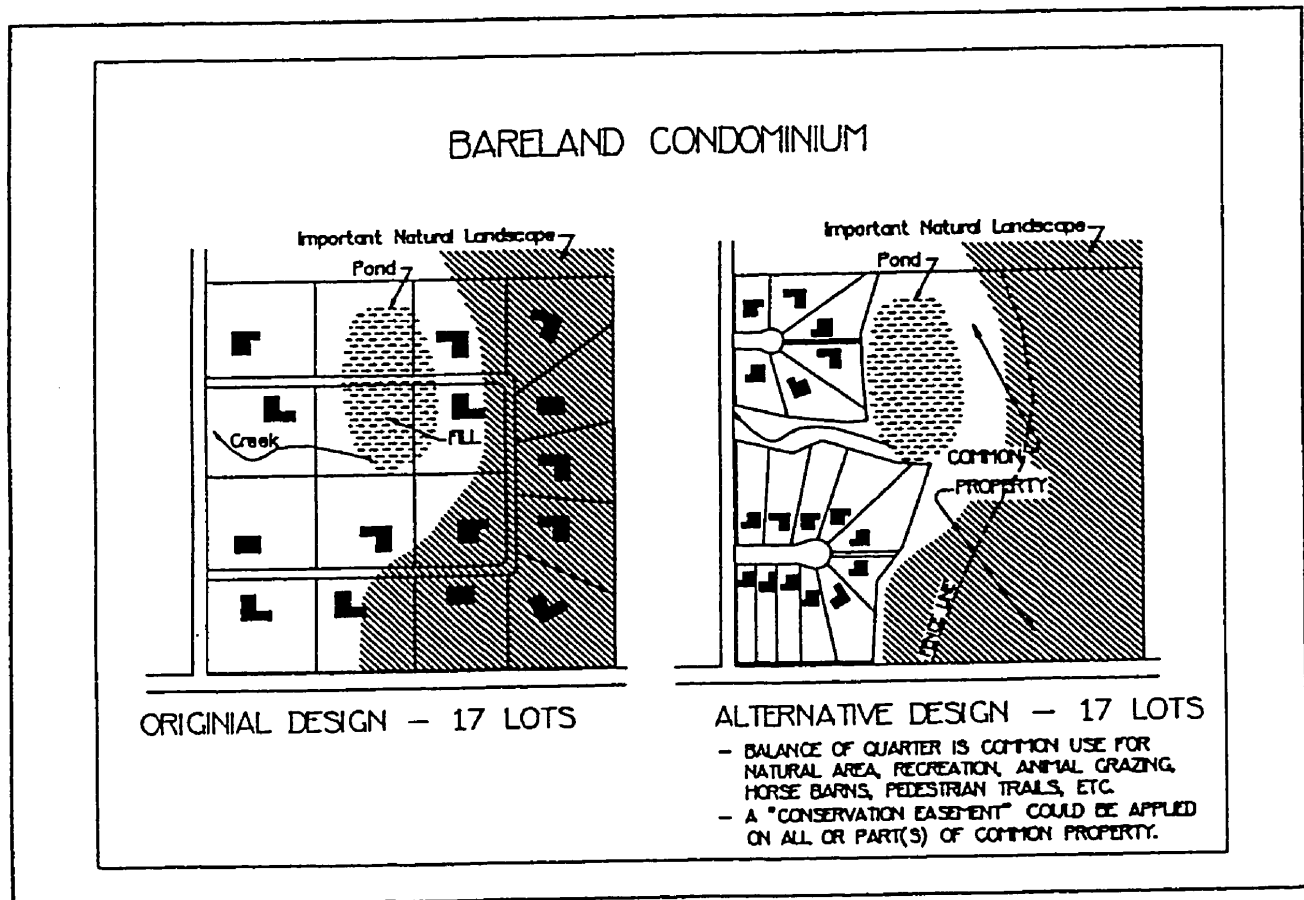
This technique strikes a balance between preservation and growth. New development, not the local government, pays for the protection of open space, since the cost of preserving the land is included in the selling price of the residential lots. In addition, the technique often makes a subdivision more profitable. By clustering homes slightly closer together, the developer spends less money on infrastructure improvements, such as roads and drainage. By preserving open space, the developer makes the subdivision more attractive to prospective purchasers, who realise that many of the natural features that attracted them to the country in the first place will be protected. The open space can either be owned by the municipality, a conservation

Figure 4 Cluster Design



From: Strathcona County

Figure 5: Example of a Bareland Condominium.



organisation, or in common, by the residents through a homeowner's association.

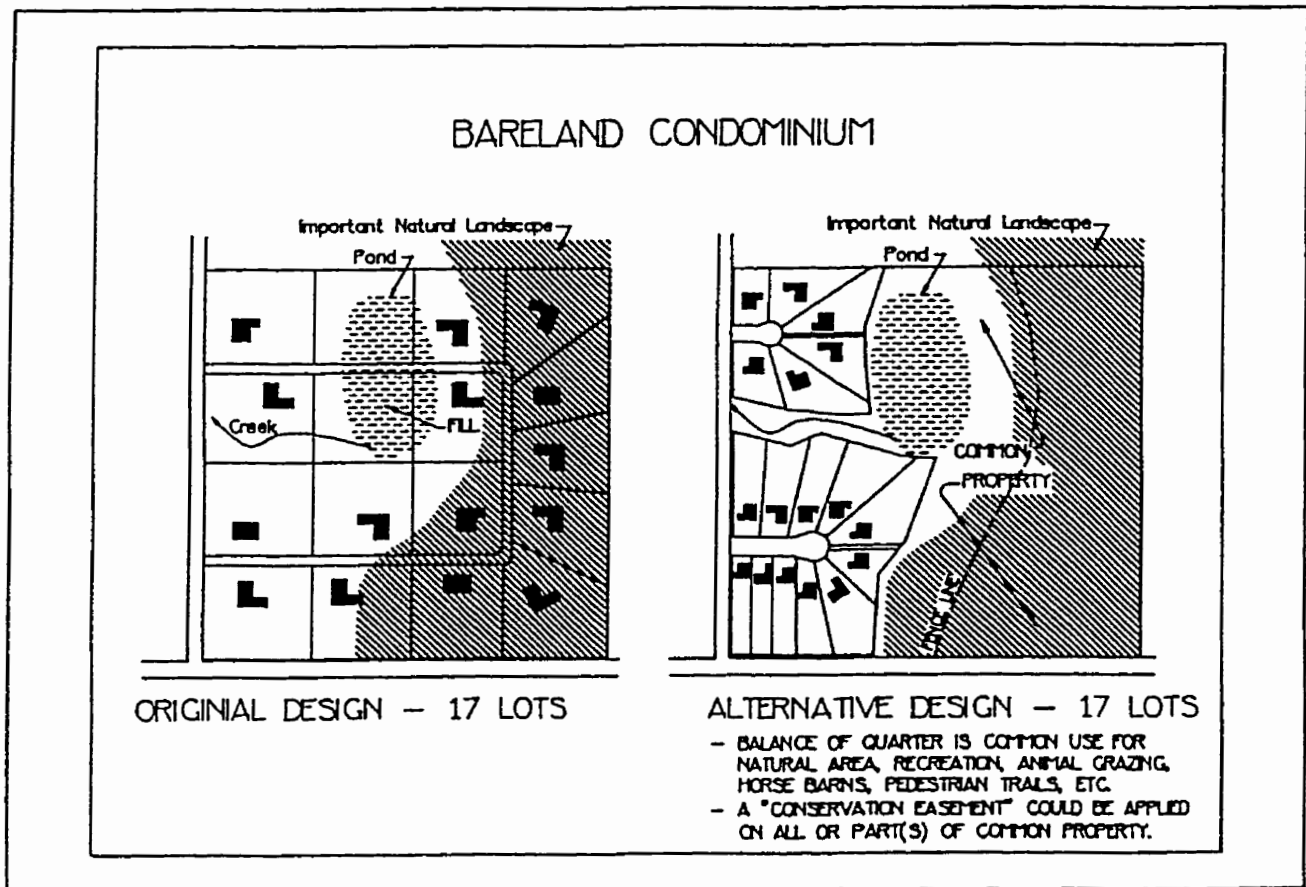
There are a few disadvantages to clustering developments. Because houses are closer together, restrictions may need to be placed on the use of wells and septic fields. If wells and fields cannot be avoided, lots should be large enough to accommodate both according to local soil conditions to ensure adequate percolation from the fields and recharge of the wells. Without having a conservation easement in place, the developer can at a later date apply to the municipality to develop the open space.

3.3.1.1.3 Bareland Condominium

In a bareland condominium arrangement (BLC), landowners own a common interest in a parcel of land. Residual land that is considered an important natural feature could be treated sensitively by the condominium association, either the municipality or the homeowners have not acquired it within a conservation easement or as part of the by-laws of the condominium association (see Figure 5). The assumption is that communal land left in a near-natural or natural state will be more likely to be increasingly valued over time by condominium association members as an aesthetic feature and a secure buffer to future developments.

As of October 1997, Strathcona County had signed nine conservation easement agreements and was negotiating five more. Officials at Strathcona County indicated that they were not aware that these encumbrances limited either the selling price or the actual sale of the properties (Girvan, 1997, pers. comm.). Thus far, conservation easement agreements appear to have achieved their goal. The county was able to increase development and gain additional tax revenue as a result, while preserving both the aesthetic and natural rural environment, as well as the ecosystem structures and intact landscapes that are necessary to preserve biodiversity.

Figure 5: Example of a Bareland Condominium.



Strathcona County believes that conservation easements are the best tool for ecological planning for several reasons:

Development pressures will continue – Accommodating higher development densities in return for long term certainty of protection of important natural landscapes is a strategy that attempts to integrate the environmental concerns and the economics of land development. Important natural features thus acquire a positive cash value for landowners rather than being viewed as an impediment to development.

Net public costs – Residential development comes with a net cost to the municipalities and the environment. The county is able to subsidise these development costs since the supporting provincial/federal grants for roads and other infrastructure are in the process of being reduced, eliminated or privatised.

Protection rules viewed as unfair -- Owners of developable parcels of land perceive that selective environmental protection measures such as subdivision restrictions, "for the greater public interest" are conceived and applied in an uneven and unfair manner. In their view, the greater public has a role to play in sharing the costs of protecting biodiversity and landscapes on private land. This criticism goes to the foundation of municipal land use policy. The community, through its elected officials and land use policies essentially defines the community relationship between public and private stewardship responsibilities.

Public versus private stewardship -- Municipalities in particular and governments in general are less willing and able to acquire and manage public land. Costs and conflicts associated with maintaining land can be more effectively promoted as sustainable habitat if land remains in private ownership under an effective conservation easement.

Conservation easement: the first step -- in order for more innovative planning techniques to be applicable as county policy, a legislative tool was needed to provide more certainty of protection and flexibility of application than currently afforded through restrictive covenants or zoning. The door is then opened for its creative use by municipalities and other land use authorities as an incentive for alternative subdivision and development practices.

Landscape ecological planning comprises the principles of landscape ecology and integrates them into the planning process to form an ecological framework for ecologically sustainable development. Key attributes in a planning strategy for the

conservation of biodiversity are the spatial arrangement of landscape elements over a region combined with the needs of human ecology.

Landscapes and regions are at the optimal spatial scales for planning for biodiversity conservation and preservation. The aggregate-with-outliers principle put forward by Forman, appears to be the best ecological arrangement for landscapes that contains a human population. Land uses are clustered, yet smaller patches and corridors of vegetation are interspersed through developed areas providing conduits for both the movement of people and animals as well as nutrients. Corridors demarcate cultural and natural boundaries as well as serving as recreational zones.

3.4 Chapter summary

Forman's model, while providing benefits for both biodiversity and humans, has not been introduced to the general public. There is no information available about the public's acceptance of landscape ecological planning as depicted in the model, nor how to overcome any barriers to implement such a plan. Likewise, Forman offers no control mechanisms as part of his model. Several such mechanisms have the potential to support landscape ecological planning and these, too, need to be assessed in the context of public acceptance. Strathcona County, Alberta has demonstrated that these mechanisms or controls can be effective in supporting a landscape-based conservation plan.

Although this model and controls appears simple, in reality, the application of this approach requires a complete rethinking of planning and the policies attached to it. The next chapter will explore some of the complexities of implementing the model in an exurban municipality by identifying barriers to this approach. It will also uncover areas of agreement where it may be possible to build and further advance the principles of landscape ecological planning to protect biodiversity.

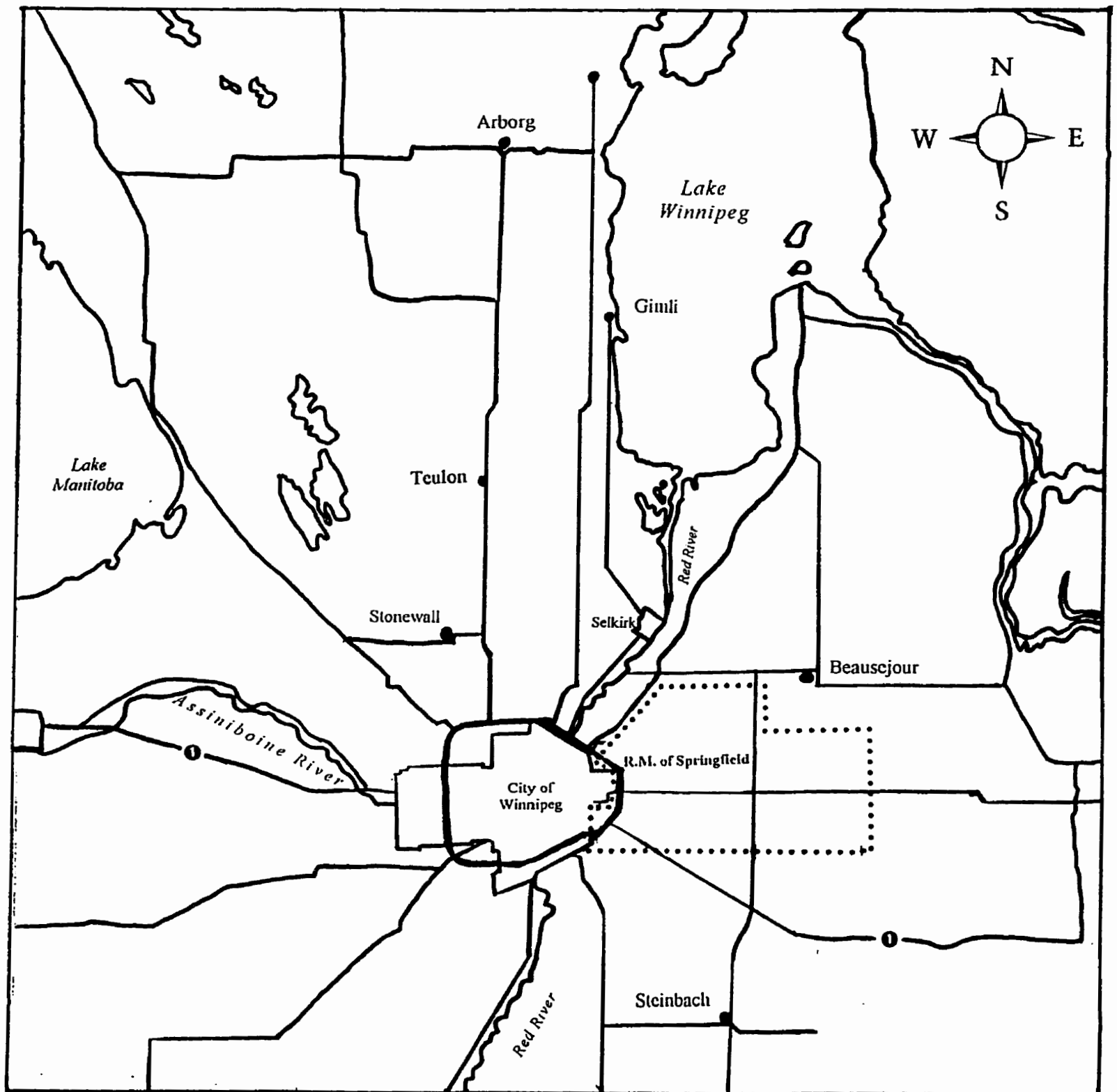
Chapter 4: Methods: The RM of Springfield Case Study

4.1 Introduction

This section of the report will provide background about the study area. It will, as well, describe the methods used to uncover barriers to land use planning and land use controls that can be used to support land use planning. The section starts with an introduction to the physical and cultural aspects of the study area. The subsequent section presents the data sources used in the questionnaire survey and describes the interviews with community leaders and decision-makers.

4.2 The Study Area

The rural municipality of Springfield is located on the eastern rural fringe of the City of Winnipeg (Figure 6). It is comprised of 1058 square kilometres of land (398 sections), and is home to a population of 11,102 citizens (Statistic Canada, 1991 Census). The majority of the land is dominated by agricultural uses, while the balance is woodland and wetlands with scattered pockets of habitation throughout. There are two major centres of new urban-style development, the villages of Oakbank and Dugald. The two smaller communities of Anola and Hazelridge (Figure 7) provide basic services to a mainly agricultural population, although rural residential developments close to these centres are increasing. Springfield's close proximity to the city of Winnipeg affords its residents the opportunity to live in either a small town setting or in a rural environment while, at the same time, being able to take advantage of the amenities of urban life in near-by Winnipeg. The rural setting of the municipality is largely untouched by commercial or industrial development, but there is growing pressure from urbanites from Winnipeg to relocate to this municipality, consequently, the pressure for additional residential development is increasing.



**Figure 6 The Rural Municipality of Springfield:
Regional Context**

Study Area

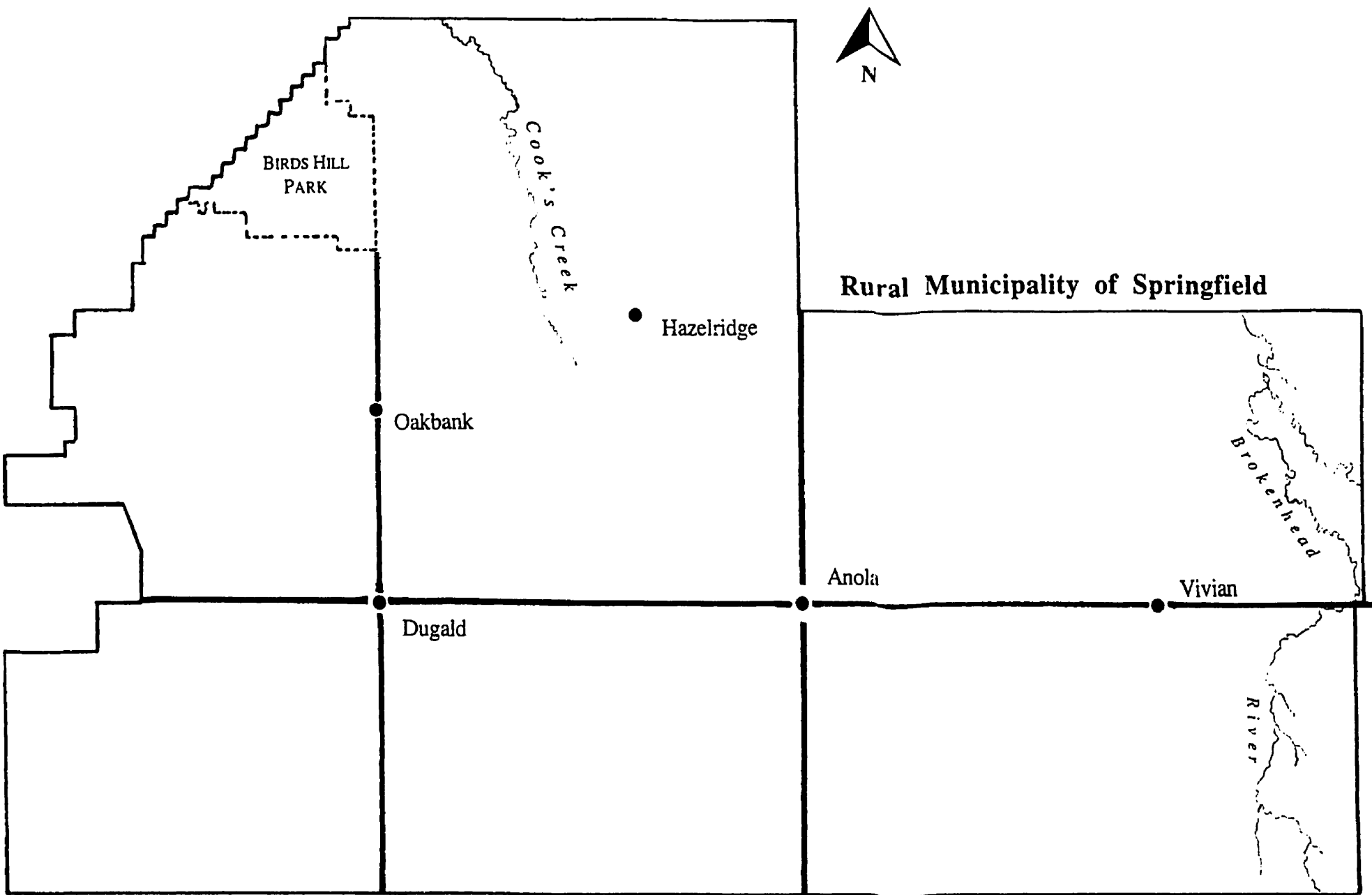


Figure 7

THE STUDY AREA IN DETAIL

4.2.1. Natural History

The rural municipality's physical character, like most regions in southern Manitoba, is a product of the most recent Pleistocene glaciation and the lacustrine deposits of glacial Lake Agassiz. The most ancient rock formations in the municipality consist of the bedrock layer of dolomitic limestone and dolomite. This forms the foundation for the more recent surficial geology overlaying the bedrock. The wave action of the glacial lake brought accumulations of gravel and sand into the region. When the glaciers retreated, the reduced strength of the waves allowed the sedimentation process to increase and as a result, thick layers of fine silt and clay were deposited on the lake bed. The municipality as a result has a quantity of gravel pits, beach ridges, and an accumulation of boulders. The resultant topography provides a diversity of abiotic substrates for the development of a variety of ecosystem complexes and habitats.

The landscape is crossed by many streams and creeks, most notably Cooks Creek and the Brokenhead River. For the most part, however, the land is a flat plain and the subtle changes in elevation result in poor drainage and a high water table. The once numerous wetlands that resulted from this terrain, have now all but disappeared, largely as a consequence of human settlement and agriculture, although some peat and tamarack bogs still can be found in the easternmost area of the municipality.

4.2.2 Land Cover

The RM of Springfield is located in the transition zone between the tall grass prairie and the boreal forest ecosystems. This transition zone, or ecotone, is known as the aspen parkland. In Canada, this ecotone extends along the Alberta foothills and continues across Saskatchewan to the south-eastern side of the Lake Agassiz basin in Manitoba. Springfield is situated on the eastern edge of this zone. As one travels from west to east, the transition from tall grass prairie, now largely under cultivation, to aspen parkland to boreal forest, on the eastern edge, is quite distinct. This

transformation effectively splits the municipality into two areas, the central and western area characterised by flat croplands, including forage and fallow and the more undulating and biologically rich, wooded uplands.

Highway # 12 effectively splits the landcover of the municipality in two. The agricultural backbone of Springfield extends from Winnipeg's city limits on the west to Highway #12 near the centre of the municipality. East of this highway, in the uplands area towards Anola, aspen parkland, bog and marsh dominate the landscape with tamarack shifting to pine forests farther east to the Canadian Shield. The aspen parkland ecotone in the Prairie Provinces harbours some of the major wetlands in western Canada.

4.2.3 Cultural Geography since European Settlement

European settlement began in Springfield before Confederation (University of Manitoba, Faculty of Architecture 1994). During this period, most of the land was owned by the Hudson's Bay Company and was used primarily for fur trapping. After Confederation, the land within the rural municipality was subdivided into one-mile square sections to facilitate the influx of European immigrants onto the prairies. From 1867 to 1900, the government allotted land to homesteaders and soldiers who wanted to farm the rich prairie soil east of Winnipeg. These section-lines were a perfect template for transportation networks. So, this arbitrary land division and resultant grid of roads was imposed on the natural landscape without regard for the natural patterns of vegetation on the land mosaic. As the area became more populated, more roads were built and the land mosaic was transformed from a curvilinear collection of vegetation patches and clusters to the more linear and angular checkerboard or quilt-like pattern of today. It is from this superimposition of human structure on the natural lands that many of the rural and exurban planning problems seem to result. Today this grid pattern remains, and forms the rudimentary template for most rural and exurban planning regardless of the consequences to landscape patterns and biodiversity.

Agriculture has been the dominant social and economic feature of the municipality since settlement. However, the increasing exurban sprawl threatens to change the agrarian character of the region. The communities of Oakbank and Dugald continue to grow and have become suburban in form and population (Maclean, 1998). The less inhabited areas of Anola, and to a lesser degree, Hazelridge have also experienced significant demand for rural residential development in the last 10 years largely because their wooded natural environments are appealing to exurbanites (BC Report, 1979). The entire municipality has experienced a 13% increase in population since 1986 (Statistics Canada, 1991 Census).

The municipality is effectively divided both physically and culturally. The western part of the region is dominated by agriculture and those who have long derived their livelihoods from the land. In recent years there has been an influx of new residents to the area who have for the most part settled in the communities of Oakbank and Dugald. This division of physical characteristics along with the changing demographics make land use planning in Springfield complex and volatile (Maclean, 1998)

4.3 Study Methodology

Community acceptance of landscape ecological planning can be based on many elements. These can include attitudes about conservation, attitudes about planning, and knowledge of other associated community issues. Because of the many factors that are associated with the acceptance of both conservation initiatives and planning schemes as has been addressed in the preceding chapter, the methodology used for this study was largely qualitative, using open ended questions that allowed respondents to voice the opinions they felt most important. Other questions were closed-ended to allow for a grounding of the analysis to the literature and to give the study focus. As well, the study population was small ($n = 27$) and this size precluded accurate inferential statistical analysis. Because the groups to be studied were not chosen at random, but rather purposely because of their role in the community, a

qualitative approach was most appropriate. Qualitative methods analysis follows the approach of Miles and Huberman (1996).

4.3.1 Survey Population

The survey population consisted of 27 individuals belonging to three organisations that have varying degrees of influence and authority in community decision making in the study area. These organisations were chosen because each has a different degree of authority and/or influence on conservation initiatives and land use planning policies. Each group has a mandate for resource conservation, limited development, or acting on behalf of the public good. The first group, the formal decision makers, consisted of members of the municipal council, who are elected by citizens at large to act in the best interests of the public, the citizens of Springfield. The next group, which has less overall power in making land use decisions, but none the less wields considerable influence in the development process was the Cooks Creek Conservation District (CCCD). Finally, the group with the least “official” power, but considerable community influence at the grassroots level and a self-proclaimed environmental interest in conservation of the natural environment, was the Concerned Citizens of Springfield, a citizens’ lobby group advocating limiting development. These three groups cover a continuum in community politics and decision making. The continuum runs from formal power and decision making authority, influence and moderate power to no formal power but considerable community influence.

The Municipal Council (MC) is mandated through the Manitoba Municipal Act to conduct the affairs of the municipality, including land use planning, zoning and the development and implementation of development policies and plans. Council members are elected by the citizens of the municipality. Because of the authority this group has in shaping land use policies and its decision making power, it was believed that this group would be able to offer solid opinions on the suitability of landscape ecological planning.

The CCCD is a municipal/provincial authority established in 1979 that has a mandate to manage and conserve the natural resources of the area. To the CCCD, conservation is “managing and using the District’s natural resources in such a way that they are passed on to future generations in the same or better condition than they are in today.” (CCCD, 1989). Although it accomplishes this goal through programs and education rather than by regulation or enforcement, the CCCD acts as an information resource for Council. Most of the projects the CCCD undertakes relate to drainage issues. However, protection of natural areas and wildlife habitat was among the projects that were identified in the district’s 1991 Management Plan. It was therefore believed that this group would have a wide knowledge of conservation issues. The District has 2 full-time paid staff who were also invited to participate.

The third group of respondents were members of a residents’ group (RG), the Concerned Citizens of Springfield. This group consists of 12 individuals who are opposed to additional residential development in their vicinity and opposed to all unplanned residential development in Springfield. They state that they are opposed to additional development because of the environmental impacts associated with it. The majority of residents in this group live in the area close to Oakbank, adjacent to Birds Hill Park. Although their influence does not extend throughout the municipality, they have considerable sway in their neighbourhood.

4.3.2 Field survey

The interviews with these key groups were designed to reveal opinions about land use planning and conservation as well as the notion of landscape ecological planning and the supporting control. It was also designed to reveal whether there were any differences or similarities between these groups. It was thought that groups with more concern for environmental conservation, such as the Cooks Creek Conservation District and the Residents' Group, would be most amenable to landscape ecological planning. The first section of the interview asked respondents to offer their thoughts and opinions related to general land use planning in Springfield and asked about their knowledge of certain conservation oriented themes. In the second part of the

interview, respondents were given a 20 minute presentation describing landscape ecological planning and land use controls that could be used to uphold the principles of landscape ecological planning in a rural setting. This presentation consisted of visual aids depicting Forman's Model, as well as drawings of the land use controls. Each picture was accompanied by a short explanation of the feature. Feedback about landscape ecological planning and its related concepts was requested at the end of this presentation.

For the individual interviews, councillors were given a brief overview of the project and its objectives. They were also asked if the interviews could be tape-recorded to ensure accuracy of the data. They were then asked questions from the first part of the interview schedule. Their responses were both tape-recorded and then transcribed by the author, or if permission was not received to tape the conversation, the researcher recorded their responses. Upon completion of the first section of questions, the respondent was then shown a visual presentation of landscape ecological planning including Forman's model and the supporting land use control mechanisms. The presentation consisted of the respondent listening to a scripted explanation of the concept of landscape ecological planning along with viewing diagrams that graphically represented these concepts. The text was scripted to insure that the information being presented to each respondent was consistent through out all the interviews. When the presentation was completed, the respondents were then asked for their feedback on the merits of the landscape ecological planning model and the control tools.

The process was much the same for the collection of data during the various groups' meetings. The project and objectives were explained, and the first part of the interview schedule was administered. In these cases, each group member was given a sheet of the questions and they were asked to write in their responses. Once this first section was completed, they were shown a computerised presentation of Forman's Model and land use controls, displayed by a data projector from a laptop computer. The presentation was identical to the paper one given to councillors. Upon completion

of the presentation, the respondents were then asked for their feedback about the concept of landscape ecological planning as well as their opinions about the merits of each of the four land use control mechanisms.

The interview schedule consisted of 47 questions in three parts, designed to uncover information about the respondents' views on a several issues as well as basic demographic information. The questions included both open-ended and closed-ended questions. The questions were developed by the author and were based on the research themes discussed in the literature review as well as on planning issues existing in the municipality. Municipal councillors' interview schedule contained one additional question asking them to describe the land use decision-making process at the council level.

The first section was designed to obtain information about the respondents' views about municipal affairs, including the current planning process, and their opinions about the natural environment, conservation and biodiversity. The first groups of questions asked about respondents' views about the municipality's responsibilities regarding land use planning, whether the respondents' felt that these responsibilities had been lived up to and whether the council should consult with other professionals when making land use decisions, and who these should be.

The next set of questions asked respondents' about their opinions on the condition of the natural environment in the municipality, the future of the natural environment, their knowledge of conservation activities, their beliefs about nature, wildlife and conservation, and about their knowledge of biodiversity. It also asked open ended questions related to how they as individuals might solve any problems, which had been elicited in the first section.

The second part of the interview schedule elicited feedback about Forman's Model of landscape ecological planning and land use control mechanisms that could be used to support landscape ecological planning. The respondents were asked to rate

the model and five possible land use control mechanisms that have been used successfully elsewhere in Canada. They were also asked for the reasons for their opinions. Respondents were also asked to rank both themselves and the decision makers (Councillors) on how open they were to innovation. The section concluded with questions related to the overall satisfaction with the development process in Springfield.

The third section asked respondents for basic demographic information, such as age range, gender, where they lived, and how they rated themselves on their knowledge of municipal and environmental issues.

4.3.3 Administration of the Interviews

Once the groups had been identified, permission to interview the membership was sought. Initial phone calls were made to the heads of the three groups explaining the project and asking if they would participate. The municipal council requested an initial briefing at a council meeting before they would consider participation. A short description of the project was presented at a council meeting on July 12, 1997. After the presentation all councillors indicated that they would participate, and would give the project official approval. Other group heads were explained the project and were informed of the groups to be included, likewise all agreed that their groups would participate. It was explained that although each group had given permission to be included in the project, each individual member of the group could decide to refuse to participate.

Follow-up phone calls were made approximately two weeks after the initial approval. At this time, dates were set for the administration of the interviews. Municipal councillors requested that because of time constraints during council meetings, interviews be done individually and in private, rather than during a council meeting. The other groups offered to provide time for the interviews during their regularly scheduled meetings. Data were collected through in-person interviews with

councillors at their homes or in coffee shops. In the case of the CCCD and Residents' Group, in-person presentations were made to the entire group at their regularly scheduled meetings, and the list of questions was distributed prior to the presentation. Upon the completion of the presentation, respondents were asked to fill in the questionnaire form. This was then handed in after completion of the questions. The interviews and presentations were conducted during the period between March 23, 1998 and May 20, 1998. The average length of the individual interviews and group presentations was 70 minutes. The creator of the model was not identified.

Approval to conduct this research was given by the University of Manitoba's Faculty of Arts Ethics Review Committee based on the content of the questionnaire, which is included in Appendix B. Consent by the individual respondents was requested by way of a Letter of Informed Consent, which was signed by both the researcher and the respondent. Copies of the Letter of Informed Consent are also included in Appendix D. Those whose interviews were taped also signed a permission form to do so.

4.3.5. Response rates

Of the eight decision makers on Council, five agreed to participate in the interviews for a response rate of 62.5%. One refused to participate, one could not be contacted and the other participated as a member of one of the other groups. Two respondents were female and 3 were male. The age breakdown of respondents from this group is as follows: 36-45 years, one respondent; 46-55 years, one respondent; over 56 years, three respondents. Several councillors described themselves as primarily farmers.

Of the 10 Board members and staff of the CCCD present at the meeting, all 10 agreed to participate. Four respondents refused to answer one specific question. Two questionnaires were only partially answered. Nine respondents were male and one

was female. The age break down of respondents in this group is as follows: 36-45 years, two respondents; 46-55 years, three respondents; over 56 years, four respondents. One chose not to reveal their age range. Several members of the board also described themselves as farmers.

Of the 12 individuals present at the CCS meeting, all agreed to participate for a response rate of 100%. Eleven answered all the questions for a completing rate of 91.6%. Nine respondents were male and 3 were female. The age break down of respondents in this group is as follows: 36-45 years, eight respondents; 46-55 years, four respondents; over 56 years, none. Many members indicated that they are relative newcomers to the municipality.

4.4 Summary

This chapter has described the physical and cultural features of the study area. It has described the research methods as well as the sources of data. The study area is physically and culturally divided. Agriculture dominates the western half of the municipality, while woodland and forest dominate the eastern half. Culturally, the municipality is comprised of residents who derive their incomes from agriculture, and exurbanites, who fled the nearby city of Winnipeg for a “rural lifestyle” but who are still dependent on Winnipeg for employment. Regarding planning, historical decisions such as planning townships in a grid pattern, are still the basis for the majority of land use planning decisions today.

There is a continuum of decision makers and opinion leaders in the municipality that reflects the social dichotomy. It is from this continuum that the data sources were derived. It is believed that because of both the similarities and differences in the groups selected to participate, the analysis will yield areas that can be considered barriers to landscape ecological planning. There may also be areas of opinion that the groups share, and these areas that they have in common may be areas of opportunity where the seeds of a landscape based planning approach can be planted.

A total of 27 respondents, from three distinct groups, were surveyed for this research. They were asked a series of 47 questions that were divided into 3 parts, questions requesting demographic information; questions asking about opinions about land use, the environment and the current political regime in Springfield; and finally questions requesting feedback on Forman's model of land use planning and the land use controls that support it. Data gathered from this survey are indented to identify the barriers to landscape ecological planning using Forman's model.

Chapter 5: Results

The results are divided into three parts. The first part deals with the characteristics of the entire sample and the groups. In the second part, responses about the study area planning-context are discussed. These include responses to questions soliciting opinions about municipal governance, conservation issues and biodiversity. In the final part respondents' opinions about landscape ecological planning are presented.

5.1 Characteristics of the Entire Sample and Individual Groups

This section describes each group in terms of the demographic and other characteristics and then compares the groups to the entire sample. Demographic information from the questionnaire included questions about the age range of respondents, and the location of their residence.

5.1.1 Age

In terms of age, the Municipal Council group included the oldest members, the Conservation District had the next oldest, while the Residents' Group had the youngest members. Table 1 illustrates these differences.

Table 1 *Age Ranges of Sample and Groups (%)*

Age Range (years)	Municipal Council n= 5 %		Conservation District n=10 %		Residents' Group n=12 %		Entire Sample Totals n=27 %	
< 25	0	0	0		0	0	0	0
26-35	0	0	0		0	0	0	0
36-45	1	20	2	20	8	66	11	40
46-55	1	20	3	30	4	33	8	29
>56	3	60	4	40	0	0	7	26
No response	0	0	1	10	0	0	1	10

5.1.2 Residential Location

Data related to residential location reveal that respondents from the Municipal Council and the Conservation District live in different locations scattered throughout the study area, while respondents from the Residents' Group are clustered in one part of the study area. For the Municipal Council and the Conservation District groups this dispersal is inevitable – the study area (municipality) is divided into wards in the case of council, and sub-districts in the case of the Conservation District. Therefore, there is representation from each sub area in the municipality by a Conservation District or Municipal Council member. In the Residents' Group, however, five respondents report living on the same section (15-12-5E), four reported living on the adjacent section (9-12-5E), one reports living on another adjacent section (11-12-5E), and two respondents did not answer the question. In the case of the Residents' Group, because of the clustered nature of their residential location, members may be acting on and responding to issues that affect only their immediate neighbourhood. See Figure 8.

5.1.3 Knowledge of Municipal and Environmental Issues

The next set of questions consisted of a self assessment of how knowledgeable they thought they were about both municipal and environmental issues in the study area. Other questions included in this section are related to respondents' opinions about the flexibility of their peers and themselves to new ideas related to land use. Interesting relationships begin to emerge when this data is analysed together with other responses from the survey.

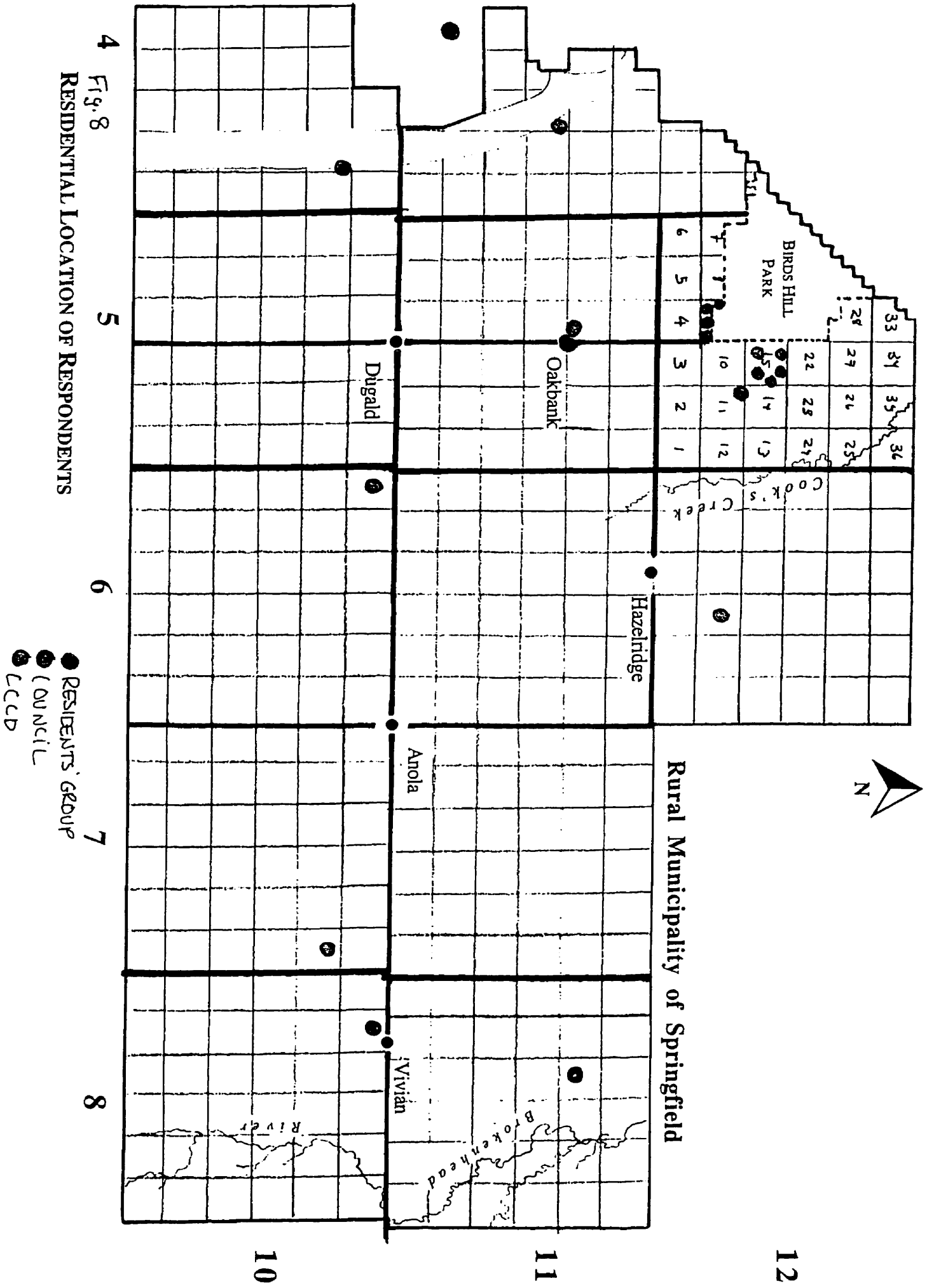


Fig. 8
RESIDENTIAL LOCATION OF RESPONDENTS

Respondents were asked to rate themselves on their knowledge of both municipal and environmental issues in the study area. A scale of very knowledgeable, somewhat knowledgeable, not knowledgeable or don't know was used. Table 2 below summarises these responses

Table 2 *Respondents' self-ranking of their knowledge about municipal issues in Springfield*

Rating	Municipal Council		CCCD		Residents' Group	
	n=5	%	n=10	%	n=12	%
Very knowledgeable	3	60	2	20	1	8.3
Somewhat knowledgeable	2	40	5	50	11	91.6
Not knowledgeable	0	0	2	20	0	0
Don't know	0	0	1	10	0	0

As one would expect, the majority of Municipal Council respondents ranked themselves very knowledgeable about municipal issues in Springfield. What is surprising is the percentage that ranked themselves only somewhat knowledgeable (40%). Likewise for the CCCD respondents, the majority (50%) ranked themselves as somewhat knowledgeable. Of the Residents' Group, 91.6% of the respondents indicated that they felt they were at least somewhat knowledgeable about municipal issues in the study area.

Table 3 shows how the groups ranked themselves in terms of their knowledge of environmental issues in the study area.

Table 3 *Respondents self-ranking of their knowledge about environmental issues in Springfield*

Rating	Municipal Council		CCCD		Residents' Group	
	n=5	%	n=10	%	n=12	%
Very knowledgeable	3	60	1	10	3	25
Somewhat knowledgeable	2	40	6	60	9	75
Not knowledgeable	0	0	1	10	0	0
Don't know	0	0	2	20	0	0

Of interest here are the responses from the Conservation District respondents. Only 10% feel that they are very knowledgeable about environmental issues in the municipality. Of the respondents from the Residents' Group, which supports an environmental mandate, the majority (75%) rate themselves as only somewhat knowledgeable about environmental issues. Although, at public hearings about environmental issues, citizens complain that councillors know very little about the environment, the majority of councillors rank themselves higher on this scale, than both the self ranking of the respondents of Conservation District and the self-proclaimed environmentally oriented Residents' Group.

Respondents in all groups were asked how amenable or reluctant they felt Municipal Councillors were to new ideas related to land use. They were then asked the same question of themselves. The results are summarised below in Table 4.

Table 4 *How amenable/reluctant do respondents feel councillors (colleagues on Council) are towards the acceptance of new ideas related to land use*

	Municipal Council	CCCD	Residents' Group
Very amenable to new ideas	2	2	0
Somewhat amenable to new ideas	0	4	0
Neutral to new ideas	0	2	0
Somewhat reluctant to consider new ideas	2	0	3
Very reluctant to consider new ideas	0	0	8
Declined to answer	1	2	1

Councillors generally thought their colleagues were either very amenable to new ideas or somewhat reluctant to consider new ideas. All members of the Residents' Group, however, felt that councillors were somewhat to very reluctant to consider new ideas. The CCCD felt that councillors were generally neutral to very amenable to new ideas related to land use planning. The next question asked how amenable/reluctant individuals felt they were to new ideas related to land use planning. These are summarised below in Table 5.

Table 5 *How amenable/reluctant respondents are towards the acceptance of new ideas related to land use?*

	Municipal Council	CCCD	Residents' Group
Very amenable to new ideas	3	4	5
Somewhat amenable to new ideas	1	3	5
Neutral to new ideas	0	2	0
Somewhat reluctant to consider new ideas	1	0	2
Very reluctant to consider new ideas	0	0	0
Declined to answer	0	1	0

Figure 9a: How amenable/reliant respondents feel their councillors or colleagues are towards the acceptance of new ideas related to land use (number of responses)

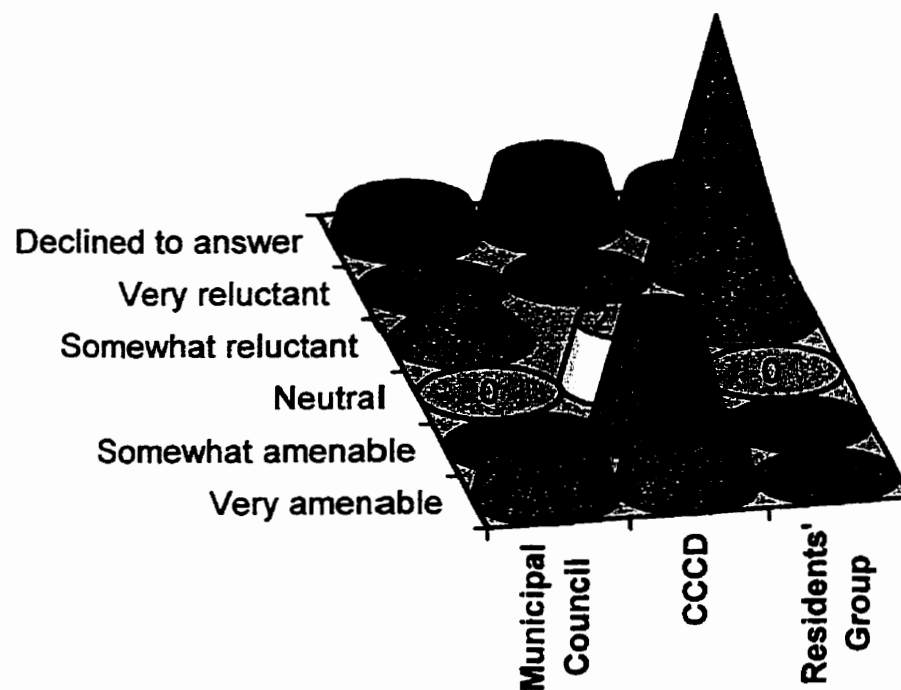
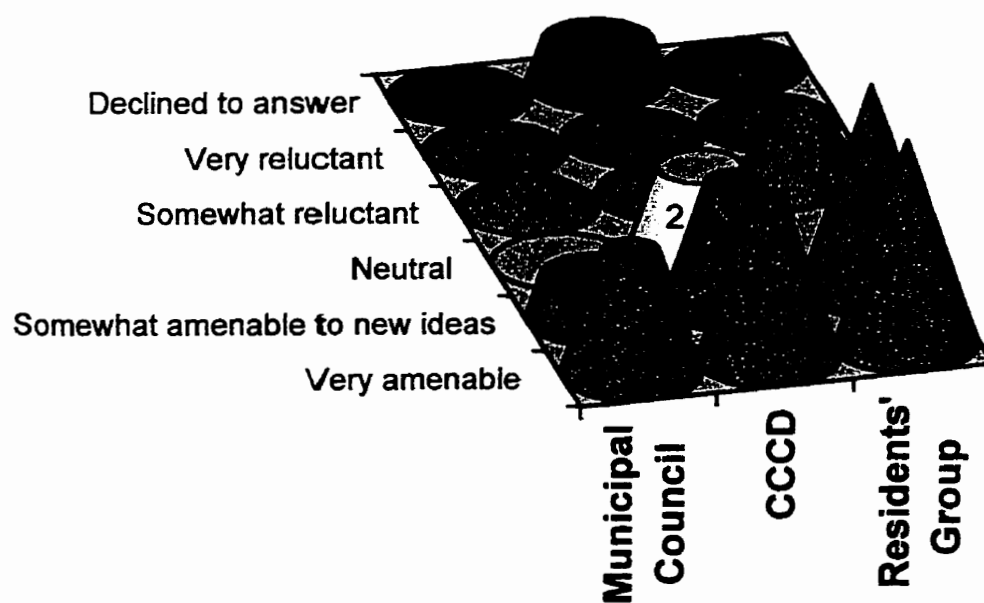


Figure 9b: How amenable/reliant respondents feel they are towards new ideas related to land use (number of responses)



From the graphs on the preceding page, it is clear that individual Councillors rate themselves more amenable to new ideas than their associates on Council. CCCD respondents appear to believe that the Councillors are generally fairly amenable to new ideas and at the same time, CCCD respondents consider themselves relatively more amenable to new ideas than reluctant. The Residents' Group appears to have the most pessimistic view of the council's flexibility, while ranking themselves as generally more amenable to new ideas than those on Council.

5.2 Responses to the Planning Context

The next set of questions was designed to uncover respondents' opinions, knowledge of and degree of satisfaction about municipal planning, municipal governance, conservation and biodiversity. The previous review of the literature suggests that conflicts in these areas can become barriers to new planning initiatives. The questions in this section were included to uncover any of these "pre-existing barriers" to land use planning and conservation in the study area.

The first open-ended question asked respondents what they believed were the main land use policy responsibilities of the Municipal Council. In Table 6, the most frequent response is given first and the second most frequent is next. The actual number of responses are shown in parentheses following the response. This question uncovers the policies that are expected by each of the groups.

Table 6 *Summary of the RM's main responsibilities in terms of land use policy (# of reponses)*

Municipal Council	CCCD	Residents' Group
<u>Control</u> land use (protect agricultural land, avoid land use conflicts, use land wisely) (4) <u>Accommodate</u> wishes of ratepayers without harming others (2)	<u>Preserve</u> agricultural land (4) <u>Protect</u> natural areas and habitats (3)	<u>Pay attention</u> to citizens' concerns and opinions (8) 2) <u>Maintain</u> environmental quality by avoiding poor planning (6)

The responses indicate that there is little real difference between the formal decision-makers' understood responsibilities and the expectations of the others. Councillors believe they are responsible for implementing policies to control land use to use land wisely and avoid conflicts with both land developers and residents. They also indicate it is a responsibility to try to accommodate the wishes of the residents with as much compromise as is required. Residents believe council should pay attention to their concerns and to plan carefully to protect the environment. All three groups indicated, in some way, that land use planning should be used to protect the best use of land, whether for agriculture, for habitat or for other environmental reasons. In addition, the Municipal Council groups and the Residents' Group saw the value in listening to residents' concerns to minimise conflicts and harm.

The next question asked respondents whether or not they thought the Municipal Council had lived up to these responsibilities. In other words, had the expectations of all concerned been met? The results of this question and the previous one provide some indication of whether or not individuals feel there is a basis for change in land use planning practices. The results are summarised in Table 7.

Table 7 *Numbers of respondents who feel that the Municipality has lived up to its main responsibilities relatd to land use policy*

	<i>YES</i>	<i>NO</i>
Residents' Group	0	12
CCCD	4	6
Council	3	2
TOTAL	7	20

Clearly, all groups had some concern that the Municipal Council had not lived up the expectations of each of the groups, as far as land use policy is concerned. However, not surprisingly, analysis within each group reveals that the level of dissatisfaction is stronger amongst the Residents' Group and weakest with the Councillors.

The next question asked respondents to list some of the reasons for their opinions regarding their satisfaction with the way in which the Municipal Council had lived up to its expectations. Since the Residents' Group was unanimous in its belief that Council had not lived up to their responsibilities. The residents' group felt that there was little regard for citizens' opinions and that the land use decision making process was both ad hoc and undemocratic. Other comments from the Residents' Group included "that Council was not acting in the interests of the majority" (this "majority" was not explained). "Too many rural residential developments", "Council doesn't care about the environment", they (Council) have "no idea about stewardship", "inadequate public participation", and "poor enforcement of existing by-laws."

Of those from the CCCD that felt that council had not lived up to its responsibilities, the majority cited the haphazard way in which land is subdivided for rural residential developments and inconsistencies in the application of planning policy. This, they stated, resulted in developments being located in unsuitable areas. The theme of haphazard development or "ad hoc" development recurs frequently in the comments of all respondents. Additional comments were "permits are issued in different ways for different people", "too many residences in low, flood prone areas",

and that subdivisions were mismanaged as far back as 30 years ago, and that this is one reason for the problems that exist today.

Those respondents from the Municipal Council that felt they had not lived up to their responsibilities cited the “cumbersome process”, too much “politics” and the fact that the “system was far from perfect”. Those who thought that the council had lived up to its responsibilities indicated that they had taken action appropriate to the policies but that there would always be some people who are dissatisfied with those decisions. Other comments included references to poor land use practices in the past.

Of those respondents from the CCCD that believed that Council had lived up to its responsibilities, one respondent cited that “various public meetings had been held”. The others who reported “yes” to this question gave no reasons for their belief.

One aspect of planning that has become increasingly important is the consultation process that takes place as a part of the policy development process. The next question asked respondents whether or not council should consult other professionals when making decisions related to land use planning and policy.

Figure 10 indicates that respondents' in the Residents' Group overwhelming thought that the municipal council should consult other professionals when making land use decisions. CCCD respondents were more inclined to think that Councillors did not need to consult others, while the Councillors themselves were the most likely to feel that they did not have to consult others. It would appear that as the formal power and authority of the group increases, the less likely that group is to feel that they should consult others.

Respondents were then asked which professionals they thought should be consulted by Council for additional technical expertise when making land use decisions. Seven choices were supplied with one being “others”. These responses are summarised in Table 8.

Table 8 *List of professionals respondents feel should be consulted by Municipal Councillors for additional technical information about land use (%)*

	Municipal Council n=5	Cook's Creek Conservation District n=10	Residents' Group n=12
Government departments	60	50	83
Professional planners	20	50	91
Local community groups	20	70	91
Environmental organisations	40	30	83
Conservation District	60	70	75
University experts	20	0	58
others	Recreational orgs., local people, property owners	0	School division, health authority

Clearly, the Residents' Group believed that there was a benefit in consulting with professionals from many fields, while Councillors felt less inclined to see the benefits in such consultation. The Residents' Group respondents felt most strongly about including professional planners and local community groups (91% each). Councillors felt that the most valuable outside sources of technical information were other provincial government departments and the least popular source for technical information were the professional planners (20%). Respondents from the CCCD also felt that government departments were good sources of technical information, and they felt strongly (70%) that local community groups should be consulted. Several respondents listed other sources of technical information that should also be consulted,

these included recreational organisations, “local people”, property owners, school divisions, and the health authorities. One respondent from the Municipal Council indicated that local community consultation occurs regularly, in the form of delegations to Council on specific issues.

Respondents were asked in the next question, what actions Council should take to minimise damage to the natural environment from residential developments, if it were determined that damage would occur. Table 9 displays the range of responses varied between all three groups. the respondents’ comments.

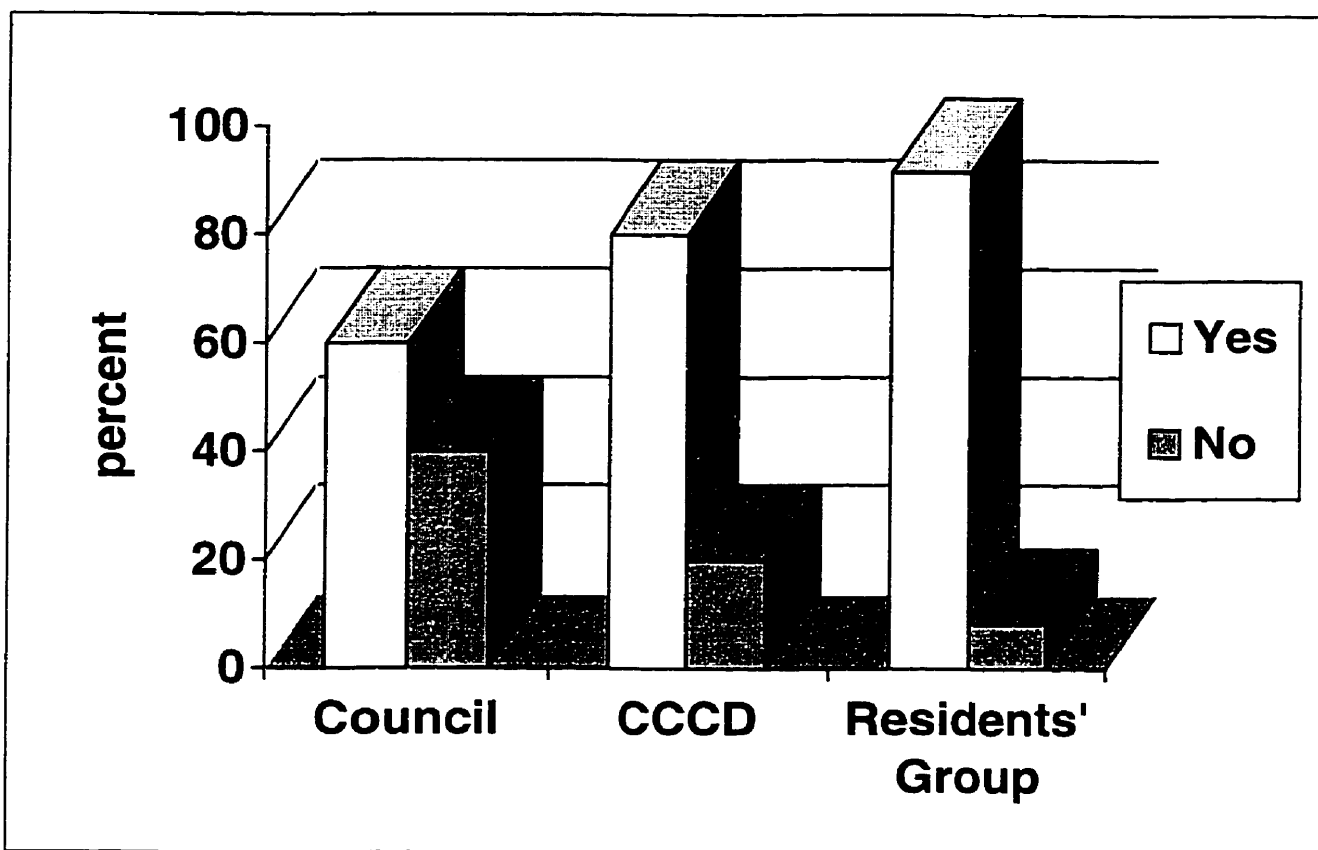
Table 9 *Actions Council should take to minimise damage to local environment*

Municipal Council	CCCD	Residents' Group
enter into a development agreement with developer, which specifies what can and can't be done to minimise damage (2) 40%	“refuse the application”	Limit or stop the development (8) 66%
“Council does not have the final say, so not much can be done”	“not much that can be done”	Consult with technical experts and mitigate damage (7) 58%
“forbid it”	“limit or stop the development”	Follow an environmental development plan (3) 25%
“Council can deny an application on the basis that is environmentally damaging”	“careful consultation before issuing permits”	“Enforce existing by-laws”
“Council can control where the developments go”	“get as much information as possible, and then collectively decide”	
“Developments usually do not destroy all the habitat”	“conduct environmental studies”	

From this table, certain themes appear. Most Municipal Council respondents feel that they have the power to control development to mitigate or minimise environmental damage through either refusing the development, or through restrictive development agreements. However, some respondents from this group feel that they do not have as much control and do not have the authority to deny an application. CCCD

respondents generally feel a consultative approach should be used, complete with information gathering and various environmental studies. However, they too, indicate that Council should limit or stop developments if necessary. The Residents' Group was fairly cohesive in its opinion that developments be stopped. Eight (66%) respondents indicated that developments should be stopped or limited, while 7 (58%), indicated that consultation with technical experts should be undertaken to find a solution that would mitigate the damage.

Figure 10: *Percentage of respondents who feel that Council should consult other professionals for advice when making land use decisions*



While the mandates of these three groups are all somewhat different, they all appear to agree that there may be circumstances in which development applications should be denied and other circumstances where mitigation may be more appropriate. However, it is not clear if Council has enough information available to it to determine what those circumstances may be. A subsequent question deals with the issue of the amount of technical information that is available to Councillors when they make land use decisions.

The next set of questions asked about the respondents' opinions regarding the current condition of the non-agricultural environment of the municipality. These responses were intended to reveal respondents' general perspective about the natural environment and its condition. The first of these question asked about the condition of the natural environment compared to 10 years ago on a five-point scale. The responses are summarised in Table 10.

Table 10 *Respondents rate the condition of Springfield's non-agricultural environment compared to 10 years ago*

Ranking	Municipal Council % of respondents	CCCD % of respondents	Residents' Group % of respondents
Much better than 10 years ago	0	10	0
Better than 10 years ago	20	0	0
Neither better or worse	60	20	0
Worse than 10 years ago	0	20	66
Much worse than 10 years ago	0	20	33
Don't know	20	20	0

Once again, the data show a distinct division between the Residents' Group perspective and that of the official decision-makers. It appears to be a case of whether one sees the "glass as being half full or half empty". When asked the reasons for these

beliefs, members of the Residents' Group described the increasing exurban population and its negative impact on water supply, traffic, natural areas and the lack of enforcement of by-laws designed to limit development to environmentally suitable areas. The Municipal Council group felt that the environment was in better condition because of the increased level of awareness of environmental issues, the increased co-operation between various groups and the fact that they felt that more information about environmental issues was available.

The second question concerning the condition of the natural environment asked respondents what they felt the condition of the non-agricultural areas of Springfield would be better or worse in 10 years from now. Table 11 summarises the responses.

Table 11 *Percentage of respondents who feel that the condition of Springfield's non agricultural environment will be better or worse in 10 years from now*

	Municipal Council (%)	CCCD (%)	Residents' Group (%)
Better	60	40	0
Worse	40	30	91
No change	0	20	0
Other*	0	0	8

*this was not an official choice in the questionnaire, however the respondents felt that with proper planning, it could easily be better, but without this it would be worse

Once again, there appears to be a dichotomy of views regarding the future of the non-agricultural environment in the Municipality in Springfield. The Residents' Group clearly feels that the environment will be in worse condition in 10 years from now, but the Municipal Council is considerably more optimistic, with 60% feeling that the environment will be in better condition. CCCD respondents are marginally less optimistic than the Councillors but more than the Residents' Group. Reasons for an improved environment included “abandoned wells are being capped”, “improved farming practices”, “more information available” and more environmental groups

working to improve the environment. Reasons for a poorer environment 10 years from now include an increase in hog barns, horses, and population.

This dichotomous pattern may result because those making the decisions feel that they are making the correct decisions as far as the environment is concerned while the other groups have less confidence in the decision-making authorities. Clearly, in terms of decision-making, the Municipal Council appears to be operating from a different set of assumptions than the other groups.

The next series of questions was designed to find out if there were any inherent barriers regarding habitat conservation among the different groups. The respondents' were asked if they had heard of "habitat conservation" and what they thought it was. Most of the respondents in all three groups had heard of habitat conservation. (Table 12).

Table 12 *Percentages of respondents who are aware of the term "habitat conservation"*

	Municipal Council (%)	CCCD (%)	Residents' Group (%)
YES	100	70	83
NO	0	30	16

Municipal Council respondents had all heard of the term habitat conservation, but what is surprising is that 30% of CCCD respondents and 16% of the Residents' Group respondents had not heard of it. It is surprising because both these groups have either an official mandate to protect habitat, in the case of CCCD, or a stated concern for the environment, in the case of the Residents' Group. This finding has far reaching implications for this study, for as Syme (1993) concluded, knowledge of an environmental issue leads to increased likelihood of positive behaviour towards that issue. While it is encouraging that the formal decision-makers are aware of the

concept, it is disturbing that there are those in the conservation and environmental fields have members that are unaware.

There were varying degrees of sophistication in the answers regarding the purpose of habitat conservation but most were fairly simplistic. This finding is not surprising in light of the research conducted by Beleden and Russonello (1995) which found that the public's concern with habitat related issues is "paper-thin" and superficial. Responses in all groups ranged from "preserving ecosystems", "the balance of nature" to simply "protecting birds". All respondents who indicated that they had heard of habitat conservation had some idea of what its purpose is.

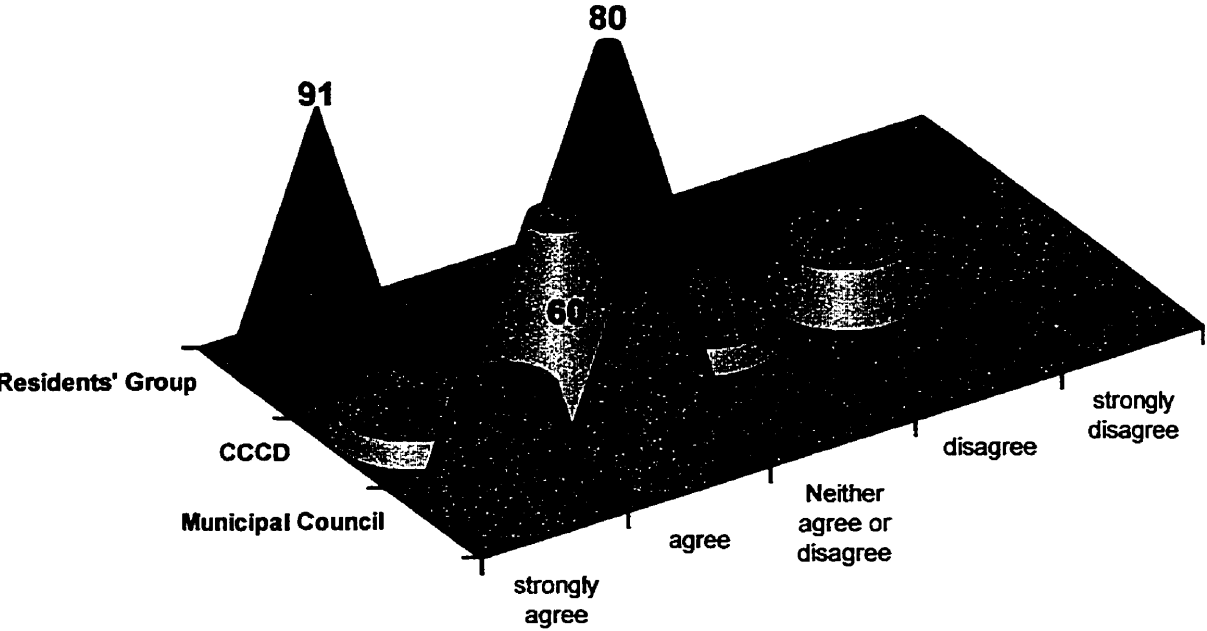
Along similar lines, was the next question, which asked respondents if they believed that maintaining healthy wildlife populations was necessary to insure a healthy environment. Responses were given on a 5-point scale. In each of the groups, the majority of respondents either agreed or agreed strongly. (Table 13 and the Graph in Figure 11). Two respondents from the CCCD disagreed, citing the over-population of some species that were damaging to humans, such as geese, and beavers. Beleden and Russonello (1995) obtained similar results in their survey. They discovered that different value systems characterise some animals as pests and thus make the value of preserving habitats for all species unattractive. Other respondents who agreed indicated that wildlife populations must be controlled to ensure a healthy environment, but they recognised their presence was still valuable nonetheless. The extent of the general agreement is evident here.

Table 13 *Percentage of respondents who feel that healthy wildlife populations are needed to insure a healthy environment*

	Municipal Council		Cook's Creek Conservation District		Residents' Group	
	n=5	%	n=10	%	n=12	%
Strongly agree	2	40	1	10	11	91
Agree	3	60	6	60	0	0
Neither	0	0	1	10	1	8
Disagree	0	0	2	20	0	0
Strongly disagree	0	0	0	0	0	0

Council's reasons for their agreement included "wildlife is necessary, but must be controlled or harvested", "we must think about the needs of future generations". Respondents from the Municipal Council most often cited utilitarian reasons for maintaining healthy wildlife populations. For example, "wildlife was necessary to feed people", "it is there to be used" and new "cures" can be found from nature. However, one respondent referred to the intricacies of the balance of nature and even though the mechanism of this "balance" was not clear, the role of all species was definitely important in the big picture. Many respondents of the Residents' group cited ethical and philosophical reasons for maintaining healthy wildlife populations. Their reasons included "we are guests not masters of the landscape...", "wildlife can be indicators of other things, like a canary in a coal mine", "healthy wildlife populations are crucial to a properly balanced ecosystem", "poor conditions for wildlife can mean poor conditions for humans, such as bad water," (mentioned three times). As well, four mentioned that they believed wildlife was a part of the "rural character" or "rural lifestyle" of the area. The CCCD respondents made reference to wildlife as indicators of environmental degradation. Generally, the responses from this group were less detailed and less sophisticated than those of the Residents' Group. Often, the terms were vague. For example, "they (wildlife) are a part of the community", "it is an

Figure 11: Percentages of respondents who feel that healthy wildlife populations are needed to insure a healthy environment



essential part of the environment”, “too (sic) much problems with wildlife in populated areas”.

Respondents' were asked, in the next question, if conserving *all* types of native plant and animal life were important for a healthy environment. Table 14 shows these results. The Graph in Figure 12 compares the opinions about wildlife and all life-forms.

Table 14 *Percentage of respondents who feel that conserving all types of native plants and animal life is important for a healthy environment*

	Municipal Council		CCCD		Residents' Group	
	n=5	%	n=10	%	n=12	%
Strongly agree	2	40	1	10	9	75
Agree	3	60	5	50	0	0
Neither	0	0	2	20	1	8.3
Disagree	0	0	0	0	1	8.3
Strongly disagree	0	0	0	0	0	0
No answer	0	0	2	20	1	8.3

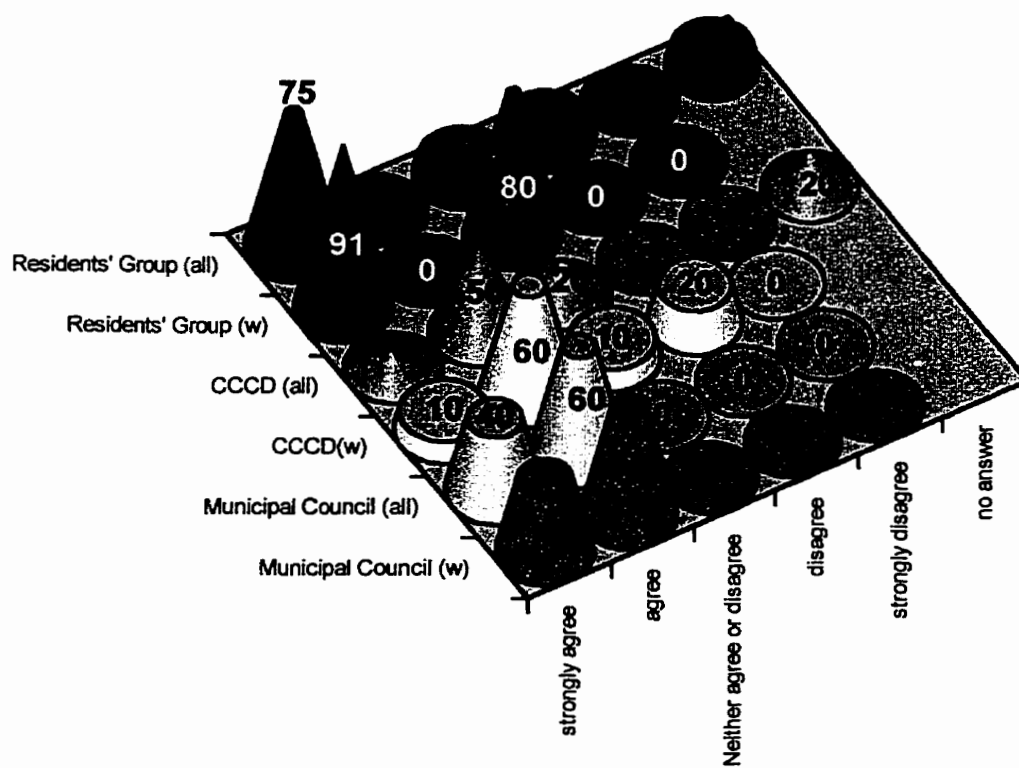
From Figure 12, it appears that there is overall agreement in all three groups that wildlife as well as all native plant and animal species have important roles in the larger environmental picture. However, the CCCD and the Residents' Group seem to make distinctions between the importance of conserving wildlife and conserving all native species, while the Municipal Council respondents do not.

Respondents of the Municipal Council strongly agreed or agreed with both questions in the equal proportions. Forty percent *agreed strongly* that both wildlife consevation and conservation of native species were important for human life, while 60% *agreed* for both wildlife and all native species. This suggests that among these respondents, there is no difference in their perceptions about the importance of

Figure 12: *Comparison between each groups' opinion about conservation of wildlife and conservation of all life-forms*

all = all species

w = wildlife



conservation wildlife and other native species. However, in the other two groups, there appear to be such distinctions.

Among the CCCD respondents, 10 % agreed strongly to the question regarding wildlife, and 60% agreed. Ten percent neither agreed nor disagreed, and 20% disagreed. For the question related to all types of native species, 10% agreed strongly, 50% agreed, no one disagreed. Two respondents did not answer the question. It seems that some distinction is being made between wildlife and other species, in which wildlife may be perceived as having negative impacts on the environment, while native plants and animals have no such negative perceptions.

Similarly, among respondents from the Residents' Group, there is a clear split on the question of wildlife with 91% agreeing strongly and 8% neither agreeing nor disagreeing. However on the question about all native species, there is less unity. Seventy-five percent strongly agreed, 8.5% neither agreed nor disagreed, 8.3% disagreed, and 8.3% did not answer the question. In this case, respondents appear to feel that some native species may be less important or have negative impacts on the overall environment. This is the opposite of the CCCD response.

The next series of questions aimed to take the concept of habitat conservation and extend it to the more complex concept of biodiversity conservation. As has been outlined in the literature review, biodiversity is a complex concept and it is unlikely that activities related to its conservation and preservation will be undertaken if the concepts are unknown or not understood. In this set of questions, the respondents were asked if they had heard of biodiversity conservation, if so, had they done any additional research or reading about it, and finally, if they were familiar with the ways in which biodiversity could be affected by human activities. The final question in the series asked whether or not respondents' agreed or disagreed with the statement "Humans are dependent of other forms of life for their health and well-being". The responses are summarised in Table 15.

Table 15 *Percentage of respondents who have heard of the term "biodiversity conservation"*

	Municipal Council	CCCD	Residents' Group
YES	40%	30%	75%
NO	60%	70%	25%

Once again there is a distinct dichotomy between the responses of the Residents' Group and the Municipal Council. More respondents from the Municipal Council had NOT heard of the term (60%), while more of the Residents' Group HAD heard of it (75%). What is more interesting, however is that a majority (70%) of respondents from the Conservation District officials had not heard of biodiversity conservation before. At first it was theorised that this may be a function of the term rather than the concept. However when analysed in conjunction with the other data, it appears that both the term and concept may be unfamiliar to some members of this group. These results are not surprising though. In Witter's state wide survey conducted in Missouri, USA, in 1994, only 30% of the respondents indicated that they "understand what the term biodiversity means" (Witter, 1995). However, these were members of the general public, and not individuals charged with the responsibility to conserve resources. This finding points out how obscure the concept of biodiversity is.

Of the 2 respondents of the Municipal Council who indicated that they had heard of biodiversity conservation, both said that they had done research or other reading about it. Of the 3 respondents of the CCCD who indicated that they had heard of biodiversity conservation, one (33%) said that they had done research or other reading about it. And of the 9 respondents of the Residents' Group, 8 (88%) indicated that they had read or researched the subject. It may be concluded that the concept of biodiversity is so complex that one needs to "study" it before one has a good understanding of it.

Respondents from the Municipal Council, who had heard of biodiversity, when asked if they were aware of the ways in which biodiversity could be affected by human activities, all responded yes. All the respondents of both the Residents' Group and the CCCD that indicated they had heard of biodiversity also reported that they were aware of ways in which biodiversity could be affected by human impacts.

The next question asked whether or not they agreed with the statement that humans are dependent on other forms of life for their health and well being and reasons for their answer. Respondents could either agree or disagree. All respondents from the both the Municipal Council and the Residents' Group indicated they agreed. One respondent from the CCCD disagreed and 2 did not answer the question. Reasons for agreement were similar between all groups. There were no reasons given by the respondents who disagreed.

When compared to the responses to question 16 (*Do you agree that conserving all types of native plants and animals is important for a healthy environment?*) there is little difference. From the Municipal Council, 100% either strongly agreed or agreed with question 16. For this question 100% agreed. For the respondents of the Residents' Group 75% strongly agreed with question 16, 0% agreed and 8.3% disagreed. For this question 100% said they agreed. For the CCCD respondents 60% either agreed strongly or agreed with question 16, while 20% indicated they neither agreed nor disagreed and another 20% did not answer. For this question, 70% agreed and 10% disagreed. The differences in these responses could be a factor of the wording of the questions. Question 16 asked about all native plants and animals being important for insuring a healthy environment, while the current question asked about human dependency on other forms of life. Clearly, respondents may be making some distinction between wildlife, agricultural animals, crops, and other types of biota.

However, the responses to this set of questions and questions about habitat and wildlife, indicates that among these three groups, there appears to be a strong

agreement in principle for habitat conservation and a potential basis for biodiversity conservation. More respondents agree or agree strongly than disagree or disagree strongly that conservation activities are required. However, as Witter (1995), and Carr (1972) discovered, strong support and sympathy for conservation measures are common when the issues are discussed in general terms. When specific issues and implementation of policies begin, disagreement begins and support often “evaporates”.

The next series of 12 questions discussed the respondents’ ideas about land use and land use planning. At this point in the process, respondents were given a definition of biodiversity so that even those who had not heard of the term before, could participate in the survey.

The first question asked about conservation actions the respondents might recommend to Council, if they, the respondents were the councillors. In the case of present Councillors, the question was “If it were within your power as a Councillor, what activities would you undertake to improve habitat and to protect biodiversity, while still allowing the municipality to grow and prosper?” It was hoped that this question would offer respondents a chance to propose some creative alternatives to the present situation. Table 16 displays these results.

Table 16 *Conservation activities recommended to Council to improve habitat and protect biodiversity*

Municipal Council	CCCD	Residents' Group
<u>Control development</u> without harming peoples' livelihoods	Implement "right to farm" regulations	<u>Limit rural residential development</u> to areas where it is not detrimental to the environment, including residents. <u>Prohibit lots less than 5A</u>
<i>Discuss land use policy with other groups and government</i>	<u>Control rural residential development</u> , implement better land use policies	We are prosperous already. Growth is not the same as prosperity
Recognise which areas are significant, create buffers around them.	<u>Decrease development in natural areas</u>	<i>Listen to citizens, seek informed opinion</i> , create policies that enhance the natural environment
EDUCATE PEOPLE ABOUT THE IMPORTANCE OF NATURAL LANDSCAPES	Plan!	Sustainable development plan, with enforcement. <i>Development approvals subject to approval from a technical advisory group.</i>
Protect the bogs , "animal life" there must be protected	RM should own land for wildlife habitat through out the whole RM	Protect present wooded areas , EDUCATE AS TO THE VALUE OF "NON-PRODUCTIVE" LAND
Protect what we have now , and replace what we have lost		Adopt a plan that considers protecting biodiversity as its main objective
Keep environment as natural as possible , and minimise human impacts		<u>Stop major subdivisions.</u> <u>Prohibit internal roads in the sections</u>
		Protect water resources. Promote private conservation areas

There are clearly many ideas for improving the natural environment in the study area as evidenced by the data in this table. There are no distinct separations in ideas between the three different groups, however, the Residents' Group does offer several very specific suggestions, while the other 2 groups suggest mainly broad ranging, and general activities. But, from this display, some themes begin to emerge.

These themes are summarised in Table 17. The other specific suggestions are presented below.

- Promote private conservation areas
- Prohibit internal roads
- Municipality should purchase conservation lands
- Develop a Sustainable development Plan
- Identify ecological areas and create buffer zones around them
- Implement better land use policies
- Right-to-farm legislation

None of these suggestions are contradictory. Any or all of them could form the basis for an ecologically-based land use plan. No one group seems to have exclusive opinions on what can or should be done to improve the natural environment. The themes are fairly well distributed between each group. “Control” made up 14% of the Municipal Council responses, 33% of the CCCD responses, and 21% of Residents' Group responses. “Consultation” was evenly divided in the Municipal Council group and the Residents' Group with 14% of the responses. “Education” made up 14% of Municipal Council responses and only 7% of the Residents' Group responses. “Protection” accounted for 42% of the Municipal Council responses and 21% of the Residents' Group answers.

Table 17 *Planning activity themes identified from survey*

CONSULTATION	EDUCATION	CONTROL	PROTECT
<i>Discuss land use policy with other groups and government</i>	EDUCATE PEOPLE ABOUT THE IMPORTANCE OF NATURAL LANDSCAPES	<u>Control development</u> without harming peoples' livelihoods	Protect water resources
<i>Listen to citizens, seek informed opinion</i>	EDUCATE AS TO THE VALUE OF "NON-PRODUCTIVE" LAND	<u>Prevent development</u> that changes habitat	Keep environment as natural as possible
<i>Development approvals subject to approval from a technical advisory group</i>		<u>Prohibit internal roads in the sections</u>	protect biodiversity
			Protect the bogs
		<u>Stop major subdivisions.</u> <u>Prohibit internal roads in the sections</u>	Protect what we have now,
		<u>Limit rural residential development</u>	Protect present wooded areas,

The next question was linked to the previous one, in that it asked respondents what factors would prevent them from undertaking the activities they had just proposed. Table 18 displays these responses.

Table 18 *Factors preventing recommended conservation activities?*

Municipal Council	CCCD	Residents' Group
Public opinion	MONEY and people	Pressure from developers.
<u>Concerns of colleagues on Council</u>	COST	Archaic world view
Interest groups who see things differently	Some ratepayers	Nothing
ECONOMICS	Past land use policy	<i>Votes</i>
COST FACTOR	Pressure from developers to subdivide	Pressure from groups that are interested in destroying biodiversity for the sake of profit.
Government agencies	Lack of long term planning	If Council was committed to sustainable development, nothing would prevent this from happening
Appeal board	Haphazard building of utilities	Catering to developers
Selfishness	FUNDING	Power of money
People who own land think they can do whatever they want with it		Developers and property owners who are "cashing in"
Politics		ignorance
Crown land is often protected but government is selling it to private interest who often want to develop it		<u>Other councillors</u>
		Pressure from developers
		Land developers
		<u>Votes of other councillors</u>
		Pressure to allow unplanned rural residential development

There were not as many clearly differentiated themes identified in the analysis of this question as the distribution of results from this question is quite different from the previous one. “Pressure” of several kinds is the dominant theme but it can be broken down into components. Clearly the Residents' Group feels that pressure *from developers* is a great barrier to conservation planning. The Municipal Council indirectly expresses pressure but not explicitly from developers. Respondents in this group make reference to “public opinion” and “interest groups”. Since the question related to factors that would stop one from implementing conservation oriented activities, it may be assumed that these references point to groups or opinions that are against conservation activities. However, it is too large a leap to assume they mean “developers”.

The theme of “pressure from developers” was mentioned 7 times by the Residents' Group along with related themes of greed and money. However it is not clear if these relate to the perceived greed of Council, or to others, such as the developers, who are profiting from development. Pressure from developers is therefore classed as one theme and the other pressures of “money” and “votes” another.

“Money” was also mentioned by the Municipal Council and the CCCD, however this was in the context of “funding” to implement plans or “economics” rather than “profit”. Respondents from the Municipal Council also indicated that the “concerns of colleagues on Council” would be a factor preventing them from undertaking conservation activities. This was also mentioned twice in the Residents' Group. “Votes” was also mentioned by the Residents' Group.

The next question asked respondents if they felt that the Municipal Council had a responsibility to protect the environment, wildlife and biodiversity. The responses are summarised in Table 19.

Table 19 *Percentage of respondents who believe the municipal council has a responsibility to protect the environment, wildlife and biodiversity?*

	Municipal Council			Cook's Creek Conservation District			Residents' Group		
	Yes	No	NA	Yes	No	NA	Yes	No	NA
environment	100	0	0	100	0	0	100	0	0
wildlife	100	0	0	100	0	0	100	0	0
biodiversity	80	20	0	70	0	30	91.6	0	8.3

The majority of respondents from all three groups feel that the municipal government has a responsibility to protect the environment and wildlife. However they are not so clearly supportive when it comes to biodiversity. Although only one (20%) respondent from the Municipal Council indicated that the Municipal Council had no responsibility for protecting biodiversity, other respondents simply declined to answer the question. This may indicate that respondents are unclear of the meaning and importance of biodiversity or unclear on the role of the municipal government in initiating or developing conservation activities.

Respondents were then asked if they thought it was possible to protect biodiversity by regulating or controlling land use. Eleven (91%) of those in the Residents' Group indicated yes, while 1 (8.3%) indicated "don't know". Of the respondents of the Municipal Council, 4 (80%) indicated "yes", while 1 (20%) indicated "no". finally of the respondents in the Cooks Creek Conservation District 7 respondents (70%) indicated "yes", one (10%) indicated "no", and two (20%) gave no answer. This indicates a fundamental agreement among all groups that controlling land use is a possible solution to protecting biodiversity.

A similar question asked if biodiversity *should* be protected by controlling land use. A clear majority of respondents in the Residents' Group indicated that

biodiversity should be protected by controlling land use (91.6%), while one respondent indicated they did not know. All the respondents in the Municipal Council indicated that biodiversity should be protected by controlling land use, while 70% of the respondents from the Cooks Creek Conservation District indicated “yes”, biodiversity should be protected by controlling land use. One respondent indicated “no” and two (20%) did not answer the question.

The next part of this question offered respondents the opportunity to offer other suggestions as to how biodiversity could be protected. None of the respondents in any of the groups made any suggestions.

The next question asked whether or not the groups thought Council had enough technical information to make sound land use decisions. The Residents' Group overwhelmingly thought that Council did not have enough technical information when making land use decisions, with 83.33 percent of respondents indicating "no; the respondent who indicated “yes” thought that while they had the information, they didn't use it or didn't understand it. The CCCD respondents thought that Council did not have enough, but to a lesser degree (62.5% indicating "no"). It is not surprising, following this trend, that Councillors were more inclined to think that they had enough information when making land use decisions (60% "no" and 40% indicating "yes"). Interestingly, some of the respondents from the Municipal Council who indicated they did not know about biodiversity also indicated that they had enough technical information about making land use decisions.

These results can be compared to the results of question 6, which asked if Councillors should consult with other professionals for advice when making land use decisions. Table 20 compares this data.

Table 20 *Percentage of respondents who believe that Council has enough technical information about the impacts of development on biodiversity and habitats when they make land use decisions vs Percentage of respondents who believe Council should consult with other professionals for advice when making land use decisions*

	Municipal Council		C C C D		Residents' Group	
	Enough info.	consult	Enough info.	Consult	Enough info.	consult
yes	40%	60%	30%	80%	8%	91%
no	60%	40%	50%	20%	83%	8%
No answer	0	0	20%	0	8%	0

The final set of questions in this section was designed to bring the previous concepts of biodiversity and habitat loss together. The first question presented the statement “Some scientists claim that the aspen/prairies parkland ecosystem that is found in the eastern part of the RM is almost as endangered as the tropical rainforest. They say that only 18% of the pre-settlement aspen forest, and less than 1% of the tall grass prairie remains.” Respondents were then asked if they believed this to be true. Answers could be “yes”, “no” or “don’t know”.

Of the respondents in the Residents' Group, 7 or 58% said “yes”, none indicated “no”, and 5, or 41.6% indicated “don’t know”. Of the respondents from the Municipal Council, two or 40% indicated “yes”, and 3 or 60% indicated they didn’t know. Of the Cooks Creek Conservation District respondents, two, or 20% indicated “yes”, and 8, (80%) indicated “don’t know”.

The second part of this question asked those who indicated “yes”, if they thought that this loss might be bad for biodiversity. Respondents were given a scale of five choices, agree strongly, agree, have no particular view, disagree and disagree strongly. Among the respondents’ from the Residents' Group, 10 (83%) agreed strongly, one (8.3%) agreed and one (8.3) did not answer. From the respondents of the

Municipal Council 2 (40%) agreed strongly, one (20%) agreed and two did not answer. Of the Cooks Creek Conservation District respondents, four (40%) agreed, 2 (20%) had no particular view and 4 (40%) did not answer.

The final part of the question asked respondents why they answered as they did. Those in the Residents' Group offered reasons. They ranged from comments about the interconnectedness of nature, lack of adequate studies, biodiversity not understood by the public, and one respondent indicated that once an ecosystem was lost it could never be regained. Respondents from the Municipal Council and Cooks Creek Conservation District offered no reasons for their answers.

From this set of responses it appears that indeed the concepts of habitat loss and its relationship to biodiversity is complex. Respondents may have agreed to the statement based on the general thrust of the questionnaire, however because of the number of non-responses as well as the lack of explanation for their agreement, it could indicate that either understanding or belief or both are marginal.

5.3 Responses related to Landscape Ecological Planning

In this section, respondents were asked a series of questions for their opinions about the aggregate-with-outliers land use planning model developed by Richard Forman. Feedback was requested on several different components of this model. The first area solicited respondents' opinions about the model itself. The next set of questions asked about the specific land use controls that were explained to them in the presentation. The results are discussed in the following sections. Table 21 summarises the results, and Figure 13 graphs the responses.

5.3.1 Opinion about landscape ecological planning based on Forman's Model

This question asked respondents if they thought the aggregate-with-outliers model had merit or not. They were then asked why it had merit or not. Respondents

from the Municipal Council generally felt positive about the model had merit with 80% indicating it had merit. Comments from this group included the opinion that the concept was excellent, but that farmers would have difficulty with it because their farming methods require large expanses of clear fields with no “interruptions” such as stands of trees. Another respondent indicated that while the concept was very good it may be difficult to do in practice. “Education of residents and developers” was cited by two respondents who felt that without such information, the concept would not work.

Members of the CCCD similarly thought the model had merit. Nine respondents (90%) indicated it had merit and one did not answer. The only comment offered was that this concept had the potential to reduce the cost of services.

The respondents from the Residents' Group were equally enthusiastic about the concept. Ten (83%) indicated that they thought the model had merit, one (8.3%) indicated that they thought it had no merit and one did not answer. Comments from this group were more revealing than those of the other groups. One respondent indicated that they would not tolerate *any* development no matter how it was configured. Another stated that it had merit because it maintained more of the natural environment. Yet another indicated that anytime development was undertaken in a controlled manner, it was good. Others revealed that they especially liked the idea of corridors.

5.3.2 Opinions about the Land Use Controls

The next four questions asked about the merit of land use controls. The first asked about clustering, the next about bonusing the third, about bare land condominiums, and the final one asked about conservation easements. Specifically, the questions asked whether or not respondents thought these land use controls had merit or not, and why.

The first question asked if clustering had merit or not, and why. Members of the Municipal Council were unanimous in their belief that this land use control had merit (100%). One respondent indicated that this was the “perfect option”. Another worried that while it had merit it would be difficult to do, and another said that it had merit, but there had to be fewer lots, rather than more. One respondent stated that this had been tried before but that the public did not trust it. They also indicated that it was hard to change the “straight-line” pattern of development that people are used to.

Eighty percent of the respondents from the CCCD believed that concept of clustering had merit, and 10% (1 respondent) thought that it had no merit. The negative comment stated that there was no room for natural vegetation and that the concept was good for developers because there would be an increase in the number of lots but a decrease in green space. (In actuality, this is the opposite of what the concept does. It appears that this respondent did not fully understand the presentation.) Other comments were that it was a good idea because more people could live on less land.

Respondents from the Residents' Group were less enthusiastic about this land use control than those from the other groups. Only 41% thought that it had merit while 50% thought it had no merit. One respondent did not answer the question. Comments against the concept included concerns that the area would be too crowded, (although the size of the lots can be as large as necessary), it looked “too suburban”, “good for inner city only” and that there should not be any roads constructed beyond the existing “grid road” system. Comments favouring the concept stated that this concept decreases the likelihood of sporadic and unplanned development, and that it maintains more of the natural environment.

The next question asked respondents whether or not bonusing had merit or not, and why. Respondents from the Municipal Council generally thought the idea was viable, with 80% indicating it had merit. Only one respondent (10%) indicated it had no merit. Positive comments included that fact that there had to be some incentive for

developers to adopt new thinking and that bonusing could be such as incentive. One expressed concern that people have to want this. Before they agree to it.

The concept of bonusing did not appear to motivate members of the CCCD. While 3 (30%) indicated it had merit, 70% did not answer this question. It is not clear whether those respondents who did not answer were also potential land developers who were thinking about subdividing their land. No reasons were given by any respondents for their opinion.

Once again, members of the Residents' Group did not feel that this land use control was beneficial. Only 4 (33%) thought that this control had merit, while 7 (66%) felt that it had no merit. One respondent did not answer the question. Negative comments indicated that respondents thought it was a “buy off” in that it encouraged development. Others indicated that it made habitat too vulnerable to exploitation, increased density creates more pollution. Positive comments were that it takes account of the “natural pattern of nature on the lots”, and that it preserves habitat that otherwise would be developed.

The final question related to land use controls asked about “bare land condominiums” (BLC). Respondents were again asked if they thought this control had merit or not, and why. Members of the municipal council overwhelmingly agreed that this had merit, with 100% agreeing. Some said that it was an “excellent option”, for conservation especially for those residents with horses.

Of the respondents from the CCCD, 6 (60%) thought that bareland condominium had merit, 20% felt it had no merit and 20% did not answer the question. Comments for this group expressed concern that there would be too much disagreement between neighbours. Others thought that it had merit because landowners can have green space and natural areas, and at the same time be responsible for the costs of maintaining it in its natural state.

Most (eight) respondents from the Residents' Group felt that the BLC had merit, with 66% agreeing. Four (33%) felt that it had no merit. Those who felt it had merit indicated that they liked the potential for large areas of green space, protection of natural environment. Their issues included concern about the size of the lots. Those who felt that it had no merit cited people would be living too close together, and that BLC forced an extreme concentration of people in one area.

The final question in the series asked about conservation easements. Again, respondents were asked if it had merit or not and why. Members of the Municipal Council once again, were unanimous in their agreement that this control had merit (100%). Some had concerns about its “validity with each subsequent change in ownership”. Others said it had merit “depending on the particular location”. One respondent indicated that it was the “weakest of all the options”. Another indicated that it was only as good as the laws of the day, and that these could always be changed at some time in the future.

Sixty-six percent of the respondents from the CCCD indicated that they felt conservation easements had merit, 20% felt that they did not, and 20% did not answer the question. None of the respondents provided reasons or comments.

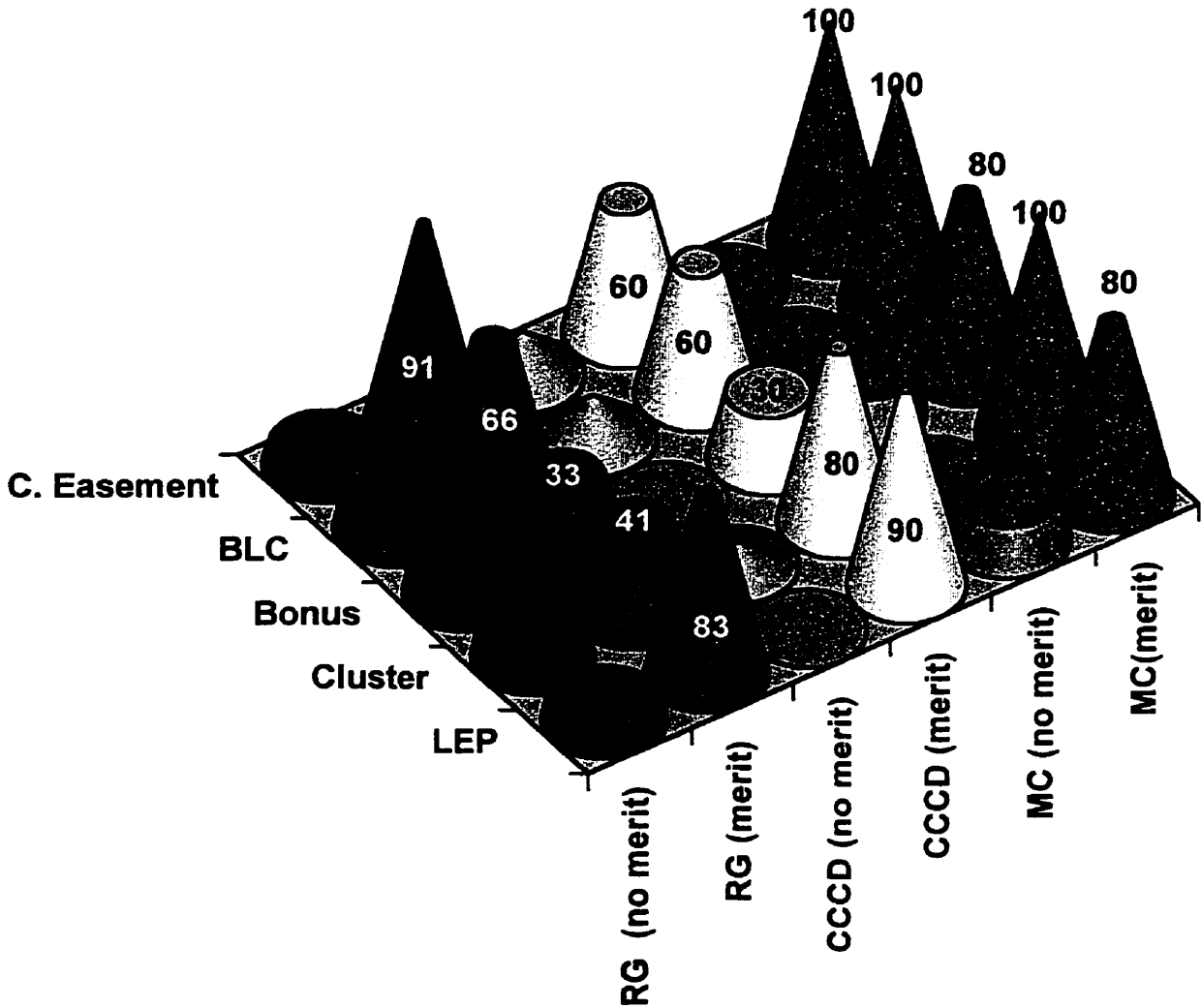
Respondents from the Residents' Group preferred conservation easements over all the other options, with 91% believing it had merit and none believing it had no merit. One respondent did not answer the question. Reasons for their approval included “more land freed from development”, absolutely essential to do this”, “it is practical” and some indicated they thought it was “a guarantee of protection”. One respondent felt that it did not provide enough protection since laws could change with a new government.

Table 21 *Summary of responses to land use control questions*

	Municipal Council %		Cooks Creek Conservation District %		Residents' Group %	
	Merit	No Merit	Merit	No Merit	Merit	No Merit
LEP	80	20	90		83	8.3
Clustering	100		80	10	41	50
Bonusing	80	20	30	0	33	66
BLC	100		60	20	66	33
Conservation Easement	100		60	20	91	8.3

As can be seen from this Table, there is strong support for the concept of landscape ecological planning as depicted in the model. Overall, more than 80% of all respondents in all groups supported it. The concept of clustering, however, is not as well accepted by all the groups. The Municipal Council feels strongly that clustering has merit but it is less favoured by the Residents' Group, with only 41% of those respondents feeling that it has merit. Bonusing is again favoured by the Municipal Council but only 30% of Cooks Creek Conservation District respondents felt it had merit along with only 33% of respondents in the Residents' Group. Bare land condominiums were strongly supported by the Municipal Council but less so by the Cooks Creek Conservation District, with only 60% of those respondents indicating it had merit. Similarly, only 66% of the Residents' Group respondents felt that BLC had merit. Finally, conservation easements were universally thought to have merit among respondents from the Municipal Council, and almost as popular with the Residents' Group whose respondents indicated 91% in favour. However, of the Cooks Creek Conservation District respondents only 60% thought that conservation easements had merit.

Figure 13: Summary of responses to landscape ecological planning (Forman's Model) and land use controls (percent of responses)



The final set of questions about landscape ecological planning asked respondents about what they felt would be the greatest barrier (besides the cost) to implementing an ecologically based land use plan based on the model they had just been presented with. They were then asked how they thought this barrier might be overcome.

Respondents from the Municipal Council listed public reluctance, “cost of infrastructure”, “lack of awareness of environmental issues”, “large corporate developers have no concern for local issues”, “development has to be on “substandard land” where there is bush, not agricultural land”. “Lack of awareness”, and “the need to convince the public that this is a necessary activity” were listed by three respondents. One respondent indicated that citizens “are quick to recognise everything wrong with others, but not about things they, themselves do that can negatively impact others.” Ways to overcome these barriers included education, incentives, programs to encourage the community to undertake innovative developments, have to find ways to overcome peoples’ reluctance to do new things, discourage large developers, and information campaigns.

Only three respondents from the Cooks Creek Conservation District answered this question. They listed as barriers “attitudes of residential developers”, “getting people to agree”, and the fact that “landowners are not used to different ideas and are more comfortable with traditional methods”. These respondents cited “education and more presentations”, “better planning”, and “economic incentives” as ways in which the barriers might be overcome.

Respondents from the Residents' Group offered numerous comments in response to this question. One respondents stated that the natural land is too fragmented over too much of the area to actually implement such as plan. Many others (6) claimed the greatest barrier was the Municipal Council. Responses from these particular respondents included the “antiquated and parochial attitudes of people in charge”, “councillors resistance to change”, “lack of political will”, “outdated

thinking by council”. It is important to note that according to the results this survey summarised in Table 21, the respondents from Municipal Council appear more likely to believe Forman’s model and its accompanying land use controls have merit than the respondents from the Residents’ Group! Not surprisingly, thoughts about how this barrier might be overcome related to education of councillors. Seven respondents cited education as the most important factor.

5.3.3 Opinions about Specific Issues in Springfield

The final 5 questions in the survey asked respondents about several different issues in the municipality. The first two questions asked about their knowledge of a Natural Areas Study, conducted by Manitoba Natural Resources (MNR) in 1996, and what the Municipality should do with the information. The next question asked respondents what they liked most about living in the municipality. The fourth question asked if respondents felt that rural residential development in Springfield has had a negative impact on the natural environment of the area. And the final question solicited from respondents, any comments or other points related to land use and conservation.

All the respondents from the Municipal Council had heard of the MNR study. There were varying explanations of what Council was going to do with the information. One respondent indicated they were waiting for the final report so nothing had been done yet. Another thought it was a very useful resource that would be considered in the planning process.

5.4 Chapter Summary

This chapter has the characteristics of the sample groups, in terms of demographic and other attributes. The interview schedule of 47 questions is outlined and the results of the interviews are explained and displayed. Questions were asked in areas relating to the respondents’ demographic characteristics, their knowledge of

municipal and environmental issues in the study area, the planning context, and about the aggregate-with-outliers model of land use planning controls associated with it. Results of the questions reveal that there are distinct differences in the opinions of the respondents in the three groups in most every area. It also reveals that, among the groups, there is also a basis for agreement in some areas.

There are many issues surrounding planning, conservation and development in the exurban region. This chapter has provided, through the use of a questionnaire, a method to identify some of these barriers and opportunities. This chapter first presents a brief description of the characteristics of the respondent groups and the individual respondents. This is followed by the results of a series of questions related to the local planning context, questions about opinions of a landscape ecological planning model, questions about specific land use controls and finally about specific items related to planning in the study area.

The findings indicate that while there are strong areas of general agreement on broad issues between the groups, there are also many areas of conflict. Some of the areas of agreement may be used as opportunities to further the goals of landscape ecological planning but many of the conflicting areas can be considered barriers. The next chapter, discusses the implications of these results.

Chapter 6 Discussion and Conclusions

Community acceptance of a landscape ecological plan appears to be a complex issue. The results of the survey indicate that clearly there are a number of potential barriers to implementing a landscape ecological plan for rural residential development in the exurban region. Some of these correspond to what others have found and has been outlined in the literature review. Specifically the literature review indicates that lack of knowledge about biodiversity impedes many conservation initiatives; the unique social setting of the exurban region presents unique problems with regard to land use planning and conservation; and finally, the individual's environmental perceptions influence how they will respond to environmental issues in their communities. This section will relate the research of this thesis to what others have found, as well as highlighting other areas that have been uncovered through this study, and that may be considered barriers. As well, it will summarise areas in which there is community agreement and opportunity for progress towards a landscape ecological plan that incorporates the aggregate-with-outliers model.

6.1 Biodiversity and Barriers

Biodiversity is a complex and unfamiliar topic. The literature contains several studies that outline how little is known about it by the general public. Belden and Russonello (1995) found that the public's real concern about habitat loss is "paper thin" and that the initial "lip service" paid to the circle of life quickly disappeared when other issues entered the discussion. In the survey of groups in the Rural Municipality of Springfield, similar results were found. Overall, only 44 % of all respondents had heard of the term biodiversity. Most (75%) of them were from the Residents' Group. Overall, 85 % of all respondents either agreed strongly or agreed that preserving wildlife populations was important for a healthy environment. This dropped to only 74 % when the question included all types of native plants and animals. Respondents cited problems with weeds, geese and deer as being reasons

that they did not agree. When a general ecological planning model was presented to the groups, 95% of all respondents agreed that it had merit. When specific solutions were presented, such as bonusing, only 40 % agreed that it had merit.

Because of the lack of knowledge of biodiversity , Martinez (1995) reported that people will respond in unexpected ways to biodiversity issues. Even though they may support the concept of healthy ecosystems, they may not understand or follow through or support processes that are essential for the maintenance of these systems when it is close to home. In Springfield, the Residents' Group professed a mandate to support conservation of natural and wild areas in the municipality. In the survey 100% of the respondents in this group agreed that humans were dependent on other forms of life and that healthy wildlife populations were necessary for a healthy environment. However, when presented with the ecologically based option of clustering developments and bonusing in exchange for conserving habitat, (options that would further their goals of conservation of natural areas), they disregarded them for reasons that had nothing to do with environmental integrity (66% indicated bonusing had no merit). In addition, some respondents disregarded these options because they did not “believe that ‘internal roads’ should be constructed at all. (Internal roads is the local term for roads that are build inside sections of land, apart from the traditional grid road system). In fact, this position assumes that the grid roads have been, and will be, built in environmentally appropriate areas and the internal roads will not. This assumption is incorrect. Forman (1995) has decried the destruction of nature by the traditional linear planning design. So it seems that lack of sound environmental knowledge is a barrier to landscape ecological planning in the municipality of Springfield.

6.2 Exurban Issues and Barriers

The unique social environment of exurbia complicates conservation and development issues. Spain (1993) states that the social milieu of the exurban region is characterised by two distinct communities, the long-time rural residents and the

exurban newcomers or 'refugees' from the city. Spain also found that newcomers are less likely to embrace on-going development in the community while the long-time residents welcome it. In the Rural Municipality of Springfield, such a split is also evident. Although no formal question related to duration of residence in the study area, many respondents offered this information in the interviews. Four out of five respondents from the Municipal Council indicated that they were long time residents having lived and farmed in the area all their lives. Similarly, eight respondents from the Residents' Group made comments about reasons for moving to the country from their former homes in the city. Members of the Residents' Group are opposed to development especially if it is in their neighborhood as indicated in their literature. Members of the Municipal Council tend to be more open about new developments.

A survey done by the Municipality of Springfield in 1994 indicated that the main concern of residents was to preserve the rural character of the area. However, as Healy and Short (1979) found out, this terminology is a representation of a desire to preserve the past. They indicated that environmental preservation is a manifestation of preserving a simpler way of life often associated with living in the country. Long-time residents however have an economic stake in development, most earn their living within the rural/exurban fringe while the newcomers don't – they commute to the city to jobs there. The potential for conflict results in mistrust and a lack of cooperation. Clearly in this study, there is conflict between the Municipal Council and the Residents' Group. In most responses to questions, the dichotomy of opinion is evident.

6.3 Behaviour and Barriers

In Carr's study of farmers and conservation (1990), farmers were generally found to be sympathetic to conservation when it was discussed in general terms. Carr found that large differences began to appear when specific issues were discussed. Conservationists saw the loss of habitat and species as the issue, while farmers were more concerned with the loss of their freedom and to be able to do whatever they

wanted with their land. In Springfield, this sentiment was expressed by respondents from the Municipal Council. Some respondents felt that if a farmer had paid taxes on his land all his/her life, they should be able to do whatever they wanted to with it. In a comment about the merit of the landscape ecological planning model, one respondents from the Municipal Council indicated that it limits the farmer's ability to farm the land they way they have always done it. The stands of trees will be an annoyance because they will have to manoeuvre their equipment around them, resulting in inefficiencies.

Carr also noted that farmers attitudes about wild plants and animals were contrary to those of conservationists. Farmers tended to view many wild animals as "vermin". Some respondents from the Cooks Creek Conservation District and the Municipal Council had the same opinions. They mentioned too many geese, deer and beavers were present and that they should be "harvested". "Feeding the masses" had to take priority over conservation, according to one respondent.

Carr also surveyed farmers' sources of advice on several environmentally related activities. Most often others in the farming community were consulted, while those in the conservation community were least thought of. This is similar to results from this thesis. When respondents from the Municipal Council and the Cooks Creek Conservation District were asked who Council should consult for technical advice on land use issues, environmental organisations were mentioned by only 30% of Cooks Creek Conservation District respondents and 40% of Municipal Council respondents. Eighty-three percent of respondents in the Residents' Group indicated that environmental organisations should be consulted.

6.4 Other Barriers

Lack of knowledge about biodiversity, complex social factors of the exurban region and individual responses to the environment all complicate planning and conservation initiatives. However in Springfield, there are other barriers as well. The data in this thesis suggest that things are not entirely as they appear on the surface in

this municipality. There are large differences between the responses of the Municipal Council respondents and those of the Residents' Group. The Cooks Creek Conservation District respondents appear to be neutral.

Human nature being what it is, it is not surprising that self-interest appears to be a barrier to landscape ecological planning, as well as mistrust and misunderstanding of those in power. There are probably other factors also. None of these were explored by this thesis but they may provide future research projects.

The most illuminating finding of this research focuses on some of the possible reasons for the large differences between the Municipal Council and the Residents' Group. In terms of community acceptance of landscape ecological planning, the most important difference is in the results of the opinions about landscape ecological planning. While the Residents' Group states that they are concerned for the environment they feel that the Municipal Council is not. They believe the Municipal Council is acting from self interest, ignorance and possibly greed, as data in Table 19 in the previous chapter shows. Still, the respondents from the Municipal Council, however unsophisticated their understanding about environmental issues might be, reported they were willing to explore new methods of planning, to try to implement conservation strategies and to accept new land use controls to support the planning model. The respondents from the Residents' Group on the other hand, while showing support for the general model, felt that two of the specific controls had little merit at all, in contrast with the Municipal Council who overwhelmingly thought they did have merit. There are several possible reasons for this.

One reason could be that because of their self-reported greater understanding of environmental issues, the respondents from the Residents' Group found something environmentally wrong or faulty in the land use controls. This does not appear to be the case. None of the reasons that they offered for believing the controls had no merit were based on real ecological concern. Rather, the reasons had more to do with the lifestyles or perceived changes in lifestyles of the respondents. For example, one

respondent indicated clustering was too much like the suburbs. Another indicated that the density of people would be too high. Another thought that there would be more pollution, but failed to recognise that the size of the lots in the scenario could be of any size, so larger lots would result in less pollution. One respondent indicated this type of design was only good for the inner city. Another thought that it would *reduce* the amount of natural vegetation.

Residential location may be another factor. All the respondents from the Residents' Group live in one of the most densely populated areas of the municipality, the area surrounding Birds Hill Park. They are likely to be more suspicious of any plans for additional development. However, at the beginning of the questionnaire, these respondents were instructed to consider landscape ecological planning for the entire municipality, not just for their neighbourhood. It is possible though, that their emotional attachment to the status quo overrides the ability to extrapolate the merits of the model to other neighbourhoods.

The overall tone, however, of comments made by respondents from the Residents' Group, seem to suggest that they prefer to maintain the status quo. It may be too much to infer that they are willing to sacrifice good ecological planning for their own self interest, but clearly they have presented no ecological grounds for finding no merit in the proposal.

The Municipal Council, while indicating that they believe both the model and the controls have merit, appears to have a perception problem among the respondents of the Residents' Group. Perhaps because of the Municipal Council's feeling that it does not need to consult others (40% reported that they should not have to consult); and because they generally feel that they have lived up to their responsibilities as far as planning is concerned, (60% indicated they had lived up to their responsibilities), they have adopted an attitude that is resented by the Residents' Group. The lack of deep understanding of ecological issues may be a barrier to good communication with

the conservationists in the community. And while they appear to be open to new ideas, it may be that they have not communicated this very well.

As in the case with the respondents from the Residents' Group, respondents from the Municipal Council may also be acting from a base of self interest. The new ideas presented to them in this model, may ultimately help serve their own interests for more development in the municipality. They may have no interest in the ecological benefits of the model, but they can see the merit in promoting it as an environmental solution and thus move the agenda towards more land subdivision.

From this research, it appears that many of the respondents from the Cooks Creek Conservation District are disinterested in, uninformed or simply unmotivated about conservation as evidenced by the numerous questions that went unanswered. As well, fully 70% of the respondents indicated they had not heard of biodiversity and 30% had not heard of habitat conservation. Ironically, 60% of Cooks Creek Conservation District respondents reported that they were dissatisfied with the way in which Council had lived up to its planning responsibilities. Lack of knowledge appears to be a barrier for this groups and so is a lack if interest to improve the situation.

Respondents were directly asked in a series of question what they thought would be the greatest barrier (besides the cost) to landscape ecological planning. Their explicit answers are related to the barriers discussed above. Generally, all respondents cited others' lack of knowledge, and financial issues to be the greatest barriers to landscape ecological planning. This confirms the data that was collected about the "hidden" or implicit barriers.

6.5 Opportunities for landscape ecological planning

Biodiversity is a complex subject. Its preservation entails an understanding of both the concept of biodiversity and the ways in which human activity impact upon it.

In this study, despite the widespread lack of understanding of biodiversity among most respondents, they largely supported the idea of wildlife conservation and habitat preservation. This broadly based support could provide the foundation for an educational program to make residents and decision-makers more aware of biodiversity and its importance. Along the same lines, the one general theme that emerged from this research, that should also be considered an opportunity was the respondents explicit identification that education was a method that could be used to overcome the real and perceived barriers.

6.6 Conclusion

The main aim of this thesis was to identify factors relating to community acceptance of landscape ecological planning as a means to protect biodiversity in the exurban municipality of Springfield, Manitoba. The broad objectives were to identify barriers and opportunities for the application of a land use planning model developed by R. T. T. Forman, to identify land use controls that can support the model, and to identify the degree of community acceptance of these controls. Specifically, the objectives are to:

- 1) identify barriers to landscape ecological planning as a method to preserve biodiversity in exurban rural residential developments
- 2) identify opportunities for landscape ecological planning in exurban rural residential developments
- 3) identify land use controls that support landscape ecological planning
- 4) identify public opinion of the suitability of these controls

These objectives were outlined in Chapter One. A review of biodiversity, its importance and the level of its understanding within the general population followed this. Chapter Three presented the concept of landscape ecological planning and introduced the model developed by Forman. It concluded with a case-study that illustrated the integration of landscape ecology spatial principles into the planning

process. Chapter Four highlighted the study area and the research methods and data sources used in this report. Chapter Five discussed the results of the survey and provided a descriptive analysis of the data. The purpose of the remainder of this chapter is to summarise the findings and to offer recommendations for future research.

6.6.1 The Research Design

The primary research tool for this study was an interview schedule developed to gather qualitative information regarding respondents' opinions about a number of environmental and municipal concerns related to land use planning and habitat conservation.

The interview schedule was divided into two main sections. The first dealt with general issues related to municipal planning and conservation while the second part solicited specific feedback about the suitability of Forman's model in the study area. Within the first section, the survey was divided into three parts: 1) demographic data, 2) open and closed ended questions about respondents' view on certain municipal policies and activities, and 3) respondents' opinions about the natural environment. The second section was divided into two parts. The first asked about the merit of the model and the second part asked about the merit of the land use controls that may be used to sustain the model.

The first section revealed that despite the differences between the three respondent groups, most respondents agreed with the broad concept of habitat and wildlife conservation. It also revealed that there was nonetheless a split in opinion about satisfaction with the planning process and with the decision-makers perceived understanding of the environment.

The second section suggested that concern for the environment in the expression of habitat or biodiversity conservation, may not be the greatest factor in determining the acceptance of this model in the rural municipality of Springfield. It

appears that lifestyle changes, or perceived changes because of increased population density, may be a stronger influence.

Overall, there appear to be many obstacles to landscape ecological planning and few opportunities. Education was mentioned by all groups as one way to begin the task of overcoming these difficulties.

6.6.2 Implications of the Findings

The findings of the study should be treated with caution because of the small size of the study population ($n=27$). The data cannot be generalised beyond the study area. As much as the literature suggests that similar social dynamics are operating in other exurban regions, the results of this study cannot be extrapolated to other areas given the specific political influences in this municipality at this time. However future research should explore the factors affecting the community acceptance of landscape ecological planning in other exurban municipalities in order to uncover the true motives of citizens involved in the planning process.

6.6.3 Recommendations

If biodiversity is to be protected and preserved, traditional land use strategies must be changed. However, land use planning is also necessary to accommodate the needs of humans, who share the landscape with “biodiversity”. Forman has presented a practical model from which to base new and innovative planning schemes while still allowing for human activity. Whether or not these kinds of innovations come to fruition depends on how the public, including the decision-makers, accept them. On what is this acceptance based? More research is needed to better define the barriers to conservation-based land use planning. However, the municipality should begin implementing policies that promote the value of protecting biodiversity. Some of these could include the following:

- 1) Based on the findings of this research, the municipality should develop better communications strategies for the benefit of all its citizens.
- 2) The municipality should begin an educational campaign to make citizens aware of biodiversity and its importance. This should also include suggestions for ways that landowners can become better stewards of their land.
- 3) In the absence of an ecological plan, the municipality should still promote the land use controls described in this thesis. Along with the promotion, though, there needs to be a clear plan on how to communicate the overall value of such controls and any concerns of the citizens must be addressed honestly and openly.
- 4) Begin a community advisory group that can assist with the development of a communications plan. Top down decision-making results in mistrust and a lack of “ownership” among the citizens.

This thesis has attempted to shed some light on the complexities of conserving-biodiversity-through-planning in an exurban region. It has emphasised the identification of barriers to community acceptance of landscape ecological planning as visualised by Forman. While the findings are largely descriptive and exploratory and are derived from a limited base, it uncovers issues that have not heretofore been associated with landscape ecological planning. It also raises a number of questions that illustrate the complexity of the topic and perhaps why little research has been done in this area up till now.

Appendix A Definitions

Definitions

For the purposes of this thesis, the following definitions will be used:

Rural residential development-- small-holding, non-farm, residential development un-associated with existing village settlements (Springfield Development Plan Draft, 1973).

Conservation-- To protect from loss or harm. To *use carefully* or sparingly, avoiding waste: *kept the thermostat lower to conserve energy*. The **controlled use** and systematic protection of natural resources, such as forests, soil, and water. (American Heritage Dictionary, 1992). Note that the association with USE is critical in the definition of conserve.

Preservation-- To keep in perfect or unaltered condition; maintain unchanged. (American Heritage Dictionary, 1992). In this thesis, preservation is used to mean "unchanged" by human activities. It recognises that *natural* evolutionary, ecological processes will change landscapes, ecosystems and biodiversity.

Natural area--an area of land or water which had been unaltered by human activity and retains its pre-settlement flora, fauna, geological or similar features, or which has re-established its natural character, although it need not be completely undisturbed (Nature Conservancy, 1975).

Appendix B Principles of Landscape Ecology

Principles of Landscape Ecology

Historically, as the study of landscape ecology evolved, it became clear that there are only three types of landscape elements. Every point on the land mosaic is either a patch, a corridor or matrix. These elements may be of natural or human origin, and so contribute to the spatial pattern of different ecosystems, community types, successional stages, or land uses. In addition to landscape elements, there are three other underlying concepts worth expanding upon here: fragmentation, the edge effect and grain size. Landscape elements and subsequent concepts are of prime importance to rural planning to protect biodiversity. These ideas are briefly outlined in the following paragraphs.

Landscape Elements

1) Patches

The theory of island biogeography states that the number of species that occur on an island is a function of the island's size and isolation from other islands (MacArthur and Wilson, 1967). Larger islands and islands closer to other islands can support a larger number of species. Each species or organism requires different minimum areas for survival. Each species or organism has a different ability to cross "hostile" habitats surrounding the islands and therefore can require different minimum separation distances necessary to effect colonisation. Patches of habitat are analogous to MacArthur and Wilson's islands. Patches are defined as smaller homogeneous areas within the larger landscape. Just as in island biogeography, patches must be "available" for organisms to use as habitat. There are many ecological advantages of large patches, some advantages of small patches and few, if any for mid-sized patches (Loyn).

2) Matrix

The matrix is the largest total area of homogeneous character present in the landscape – the dominant element in the landscape characterised by extensive cover, high connectivity, and/or major control over the ecological dynamics of the region. The region is the area composed of landscapes with the same macroclimate and tied together by human activities (Forman, 1995).

3) Corridors

Corridors are patterns of vegetation that connect areas of matrix, or connect patches. Its vegetation is of a type that differs from the adjacent land on both sides. These elements have important functions including acting as 1) conduits allowing for the movement of species and nutrients between patches, 2) barriers that can prevent predation and 3) providing habitat in their own right.

A) Edges and Boundaries

Edge in landscape ecology is defined as the place where divergent plant communities meet, or where successional stages or vegetative conditions within plant communities come together (Thomas et al, 1979). Edges extend well into the interior of the patch forming a type of zone. The overall dimensions of the patch itself determine this precise distance. Edges are active places where interactions between organisms and abiotic factors are concentrated. Boundaries occur where two edges meet. These can be thought of as the location where one might draw a line on a map that would differentiate differing vegetation types. The “edge effect” refers to the high population density and diversity of species in the edge of a patch or other spatial element. Managing the edge effect has been a fundamental principle of wildlife management for many years (Allen, 1962) as it has been observed that many game species are edge adapted. However, recent studies indicate that human created, or

induced edge, has detrimental effects on non-game species as well as causing degradation of floral communities (Noon et al, 1979; Whitcombe et al, 1976)). While the impact of edges and boundaries on other organisms in general is a complex and diverse topic it is, nevertheless, for the purposes of this paper important to know some of the consequences of induced edge on organisms and subsequent impact on biodiversity. The following paragraphs outline some recent observations of induced edge on plants, animals and on the interactions of animals on vegetation.

Noon (1979) discovered that the rare floral species of undisturbed forests are very sensitive to habitat alteration. Hoehne (1981) observed that human disturbance of forest interiors can have pronounced effects on plant species presence and frequency. When forest patches become small, there is an increase in edge area relative to the interior. Edge flora, more tolerant of dry conditions, may replace interior species in these small areas (Ranney et al, 1981). Edge adapted species are mostly widespread and are rarely in danger of extinction. Typically, no rare species are found in edges.

There is evidence that increased induced edge may also affect fauna. Whitcomb et al (1976) indicates that swaths cut through forests for roads, powerlines and even wide trails not only stress the moist habitat of certain species, but can also destabilise entire faunal communities. In such cases overall species richness may increase temporarily with the influx of edge species, but only at the expense of the more rare forest interior species (Figure 6). Edges of corridors are frequently colonised by brood parasites, such as cowbirds, nest predators and non-native nest hole competitors such as starlings. These opportunists are usually abundant in urban and urban-agricultural matrix and easily invade nearby woodlots that exhibit a large amount of introduced edge (Whitcomb et al, 1976). Gates and Gysel (1978 in Noss) documented some other insidious effects of induced edge. In a field-forest edge, they found that the habitat attracted a variety of passerine birds, but the habitat was acting as a "trap". The authors determined that, although the edge contained the structural cues of mixed forest, the birds' usual nesting habitat, pairs nesting near the edge had

smaller clutches and were subject to higher rates of predation and cowbird parasitism than those nesting in either the adjoining habitat interior. This seems to indicate that birds characteristic of interior habitats are unable to maintain their populations in areas where edge is abundant.

Because of the relationship between plants and animals, increasing edge can cause degradation of native plant species due to increased browsing by ungulates. Bratton and White (1980) in Noss reported that manipulation of habitat to support huntable deer populations could result in heavy browsing in adjacent natural and undisturbed areas. Because native plant species are generally more palatable than introduced species the increase in deer browsing can further endanger the native plant populations.

The edge effect is probably one of the most well studied phenomenon in ecology, consequently it is possible to use this information to mitigate the detrimental effects of induced edge some extent. For example the literature indicates that increasing length of boundaries enhances game and other species that prefer edge habitat such as birds of suburban and agricultural landscapes (Whitcombe et al, 1981). So, keeping induced edges as short as possible can reduce this effect. If the edges are kept convoluted rather than straight, fewer animals will move along them and more animals move through them, between habitats (Forman et al, in Forman, 1995) allowing for interpopulation movements and mixing of gene pools (Figure 7). Straight boundaries typically of human design, are biologically impoverished, while boundaries with lobes and coves in a curvilinear pattern exhibit many biologically important functions. Soil erosion along curvilinear edges, for example, is diminished. The greater amount of edge there is compared to the amount of patch interior, has an effect on the type and amount of species that live in the interior. As patches become smaller, the edge-to-interior ratio increases, diminishing habitat for those species that prefer the more homogenous interior areas.

In terms of planning and land use for biodiversity preservation, the impact of edges is crucial. In order to maintain the greatest biodiversity, induced edge should be controlled. As humans carve up land and increase the amount of edge, they eliminate the key values of large patches and put biodiversity at risk. Recognising the spatial attributes of boundaries and edges that promote a diversity of native species in all habitats types should be paramount in rural planning. Creating boundaries and edges that are conducive to species abundance and composition, not just simple species number could be one more tool in a spatially oriented planning regime that supports biodiversity.

B) Fragmentation

Fragmentation is the loss and subdivision of a given patch of habitat. Fragmentation is pervasive at all spatial scales and impacts all organisms (Lord and Norton, 1990). It follows that when particular or combinations of habitats are rare or absent from a landscape, species that depend on them are also rare or absent. Fragmentation of natural landscapes is considered one of the most important factors contributing to the loss of biodiversity (Wilcox and Murphy, 1985). The more highly fragmented a landscape, the fewer large patches there are; the connections between landscapes are usually not as prolific; and species movement is hindered. This less than optimal spatial arrangement has deleterious effects of species survival and thus, biodiversity. Conversely, large, well-connected landscapes support more types of species, and thus greater biodiversity (Fahrig and Merriam, 1985). Hobbs (1993) noted major alterations in hydrologic regimes, mineral nutrient cycles, radiation balance, wind patterns, and soil movement in severely fragmented landscapes. He furthermore concluded that this alteration of ecosystem services also altered species patterns. As will be discussed in a following section, these spatial arrangements may also have explicit benefits to humans, beyond the indirect benefits of more robust ecosystems and greater biodiversity.

C) Grain Size

Grain size refers to the coarseness in texture of an area, as determined by the size of patches that are observed. For example, a grainy photograph appears to be made up of many dots. In a photo with fine grain, the dots are almost undetectable because they are so small compared to the rest of the picture. In landscapes, the texture may be coarse or fine depending on the relative size of the landscape elements in relation to the matrix. This is measured as the average diameter of a patch and the portions of the matrix that are present. A fine-grained landscape has mostly small patches while a coarse grained landscape is composed mainly of large patches.

Grain size is important in landscape ecological planning because animals are sensitive to grain size (1964, Forman, R.T.T. and Godron, M., 1968). For example, deer respond positively to clearings made by farmers, but do not respond to spider holes in the grass or the pattern of regions within a province. They do not perceive very small or very large elements. The woolly mammoth responded to the pattern of wetlands and ridges in its territory, whereas the fleas in its coat responded to the individual hairs and were completely unaware of the regional topography (Forman, 1995). This perception of grain size then, is very important to planning for biodiversity. Animals and humans only respond to a small fraction of the multi-scale heterogeneity present in landscapes. The spatial elements causing these responses determine the direction, route, and rate of movement of organisms within and between landscapes. Planning and management must therefore focus on both the grain of the landscape and the response of its inhabitants.

Appendix C Provincial Planning Overview

1) Provincial Overview

Under the Planning Act, the Province, through the Minister of Rural Development, has planning authority for land use in all municipalities, local government districts, towns and villages outside the City of Winnipeg. This planning authority can be delegated to a municipality if the municipality adopts a development plan. The Planning Act is enabling legislation that sets out the process of creating these Development Plans. The Planning Act sets out what should and shouldn't be included in Development Plans. Development Plans are the documents used to develop long-range policies and frameworks within which to guide municipalities in their land use decisions. Through the Development Plan, a municipality can create policies to:

- Protect the environment

- Provide efficient transportation networks

- Ensure that developments are in appropriate locations

- Co-ordinate timing of developments

- Develop avenues for public recreation

- Guide land subdivisions

- Initiate conservation programs (can be addressed in Development Plans , but most times passed off to the Conservation Districts)

- Guide agricultural land development

- Regulate aggregate developments (gravel pits etc.)

The municipality's Development Plan facilitates these activities through its ability to allow the municipality to pass zoning by-laws with which to enforce the policies. Zoning by-laws are embodied in a document separate from the Development Plan, and it set specific uses and regulations by:

- Dividing land areas into land uses or zones

- Specifying permitted uses

- Establishing set backs and buffers

- Regulating size of buildings

- Regulating open space

- Regulating parking requirements

The Development Plan and subsequent amendments require provincial approval while zoning by-laws do not. Under the Planning Act, no subdivision of land can be approved if it does not conform to the provincial Land Use Policies or an approved Plan, zoning by-law or planning scheme. Clearly, environmental protection of some sort is proscribed by these instruments. However, in reality the responsibility, at the provincial level, of approving developments including the identification of any environmental issues is dependent upon the input of many different provincial departments. For example, a development proposal will be submitted to Manitoba Hydro to insure that power-lines are not affected. It will also be circulated to the Department of Highways to make sure that access to major roads is not problematic. Water Resources will have its input, as will Natural Resources, Environment and all the other departments that may have an interest in the proposed development.

2) A Brief History of Planning in Springfield

Prior to 1976, (when the provincial Planning Act was enacted), in Springfield no approval was required by either the municipality or the province for the subdivision of land. Landowners simply registered their ownership changes, via metes and bounds, with the Land Title Office in Winnipeg. Over the years, many farmers

subdivided their land for residential developments in this manner. Small pockets of scattered residential areas developed throughout the municipality, however many of the subsequent lots remained undeveloped largely because of economics and commuting distances. In the early 1980s, Springfield enacted Development Plan by-law 80-8 to prevent this fragmentation of agricultural land and its conversion to non-agricultural uses. The rural municipality was divided into settlement areas and rural areas. These settlement areas were largely limited to the areas surrounding Oakbank and Dugald. However, the Development Plan still allowed farmers to subdivide their lands for family members who would be assisting with farming operations. These splits often resulted in the creation of several small acreages on one section of land, not spatially related to any other community or settlement. As time went on, the farming family eventually moved elsewhere and the property re-sold to non-farming families. As a result, small, scattered areas of non-agricultural rural residential development have emerged through out the municipality, creating a myriad of land use conflicts. The surrounding woodland areas became more and more fragmented in the process, with smaller land holdings being created and larger areas of natural habitat being diminished. By 1983, 38% of all privately owned land in Springfield was owned by non-farmers (MacLean, 1985). A 1994 study determined that land use fragmentation was high to moderate in the municipality, and that the areas around Birds Hill Park and Anola were the most highly fragmented. It around these areas that the more unique and natural habitats of the municipality can be found.

Until 1990, the City of Winnipeg held authority for the eastern most section of the rural municipality, about 16,500 acres, under the Additional Zone of the City of Winnipeg's Planning Act. This zone was established to accommodate additional land that might be required as the City of Winnipeg expanded beyond its formal limits. This Additional Zone Policy was repealed in 1990, and authority for its planning given back to the municipality of Springfield but no amendments to the Springfield Planning Act have been made to reflect this change.

3) The Current Planning Situation

Thus, in Springfield today, in addition to diverse land uses and land subdivisions that circumvents the development plan, the planning process is further complicated by the fact that authority for planning comes under the control of two jurisdictions and four land use by-law documents instead of the usual one. These are 1) Rural Municipality Development Plan 80-8, 2) Springfield Zoning By-law 88-11, which reflects the policies of Development Plan 80-8, 3) City of Winnipeg Additional Zone Planning Policy (City of Winnipeg Planning Act), and 4) Springfield Planning Scheme 1959 which dictates development control in the Additional Zone.

For the remainder of the rural municipality outside the former Additional Zone, Development Plan 80-8 and Zoning By-law 88-11, is in force. This Plan does not incorporate land use policy designations, but rather encourages development of existing residential lot inventories, thus reducing the conversion of agricultural land to non-farm uses.

In 1990, the City of Winnipeg rescinded its authority of the Additional Zone. At the same time, demand for new rural residential developments in the Springfield grew, and there was increased concern from local residents about potential misuse of the "family subdivision" provision in the Development Plan. As a result, the existing Development Plan is now under review. In 1995, Springfield retained a consultant to revise the Plan, however the subsequent recommendations were met with resistance from local residents and the new proposed plan was rejected. In 1996, the municipality amended Development Plan 80-8 in an attempt to revise it. The resulting amendment also met with resistance and it too was rejected. In 1997, a new consultant was retained, and the entire process started over from the beginning, but with more public input at the outset. The difficulty in achieving consensus for a new Development Plan is testament to the diversity of opinions, interests, agendas and land uses in the municipality. From the lack of a clear and cohesive policy direction, it becomes apparent that in Springfield, private individual economic interests drive the

pattern of development, without any real concern for the interests of the public at large.

However, with the current Development Plan under review, it is an appropriate time to bring discussions of biodiversity to the fore. Although it may seem folly to add one more component to an already contentious issue, it may, in reality, be more expedient to deal with all issues at once, in a unified and cohesive manner, rather than re-visiting biodiversity at some point in the future, when it may be too late.

Appendix D The Survey and Associated Documents

Letter of Informed Consent

As a member of the Municipal Council of Springfield, you have been selected to participate in a research study being conducted through the University of Manitoba. The purpose of this research is to collect information about your opinions about land use, conservation, sustainable development and planning in the rural municipality of Springfield. The objective is to uncover barriers and opportunities for sustainable development in rural areas. It will form a substantial portion of the work required to complete my Master's degree from the University of Manitoba, Department of Geography. Your information is part of a data set comprised of four groups: Councilors, a citizens lobby group, a group of developers and a group of citizens selected at random.

The information that I collect will only be used for academic purposes. Your answers to the questionnaire will be kept anonymous as will any other information you submit. Your responses will be tabulated by group and analyzed both within and among groups. Because there is no way to attribute your comments back to you, there is no risk associated with participating in this study.

Your participation will require answering a series of questions about what you think of land use planning, conservation and biodiversity. You will be presented with a concept called landscape ecological planning and asked about its suitability. At this stage of the research, I am seeking your personal opinions about the subjects rather than what you think the "official" position of Council might be. Accordingly, your answers to all the questions will be anonymous and details which might identify you will be kept confidential. In order to preserve the accuracy of information which I collect from you, I will also request your permission to have our discussion tape recorded. This information, as well, will only be used to verify my notes and will not be released to anyone. Once the report is completed, the tapes will be destroyed. You can refuse to be tape recorded.

Your participation is voluntary. You have the right to withdraw from this study at any time and/or to refrain from answering whatever questions you prefer to omit, without prejudice or consequence. In appreciation for your cooperation and time, you will be acknowledged in the final report. I will also submit a copy of the completed report to the Municipal Council of Springfield.

This study is being conducted with the cooperation of the Municipal Council of Springfield and has been approved by the University of Manitoba Faculty of Arts Ethics Review Committee. Any complaints regarding a procedure

may be reported to the Dean (Research), Faculty of Arts, (474-7321), or to the head of the Geography Department (474-9081), for referral to the Ethics review Committee.

Yes, I understand the information presented herein, and I agree to participate in this research project and to have this interview tape recorded.

Signature Printed name date

Yes I understand the information presented herein, and I agree to participate in this research project but I **do not want** to have this interview tape recorded

Signature Printed name date

Researcher

Alexandra Morrison date

Letter of Informed Consent

March 1998

Dear resident of Springfield,

As a member of a citizens' group, you have been selected to participate in a research study being conducted through the University of Manitoba Department of Geography. The purpose of this research is to collect information about people's opinions about land use, conservation, sustainable development and rural planning in the municipality of Springfield. The objective is to uncover barriers and opportunities for sustainable development in rural areas. It will form a substantial portion of the work required to complete a Master's degree in the department of Geography at U of M. The information collected will be used only for academic purposes. Your responses will be part of a data set comprised of four groups: Springfield councillors, your citizens' group, a group of developers and a group of residents selected at random. Your answers to the questionnaire will be anonymous as will any other information collected from you. Your responses will be tabulated by group and analyzed within your group, as well as compared to the other groups. Because there will be no way to attribute your comments back to you, there are no risks in participating in this study.

Your participation will require answering a series of questions about what you think of land use planning in Springfield, biodiversity and habitat conservation, as well as your thoughts about a concept called landscape ecological planning, which will be presented to you.

Your participation in this research is voluntary. You have the right to withdraw from this study at any time and/or to refrain from answering whatever questions you prefer to omit, without prejudice or consequence. In appreciation for your time, you will be given a copy of the summary report if so requested.

This study is being conducted with the full cooperation of the Municipal Council of Springfield and has been approved by the Faculty of Arts Ethics Review Committee. Any complaints regarding a procedure may be reported to the Dean (Research), Faculty of Arts, (474-7321), or to the Head of the Geography Department (474-9081) for referral to the Ethics Review Committee.

Yes, I understand the information herein and I agree to participate in this research project.

Signature	Printed name	date
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Researcher

Alexandra Morrison	date
--------------------	------

Letter of Informed Consent

May 1998

Dear Conservation District Board and Staff,

As a member of a group that influences conservation in the RM of Springfield, you have been selected to participate in a research study being conducted through the University of Manitoba Department of Geography. The purpose of this research is to collect information about people's opinions about land use, conservation, sustainable development and rural planning in the municipality of Springfield. The objective is to uncover barriers and opportunities for sustainable development in rural areas. It will form a substantial portion of the work required to complete a Master's degree in the department of Geography at U of M. The information collected will be used only for academic purposes. Your responses will be part of a data set comprised of three groups: Springfield councillors, a citizens' group, and the Conservation District Board and staff. Your answers to the questionnaire will be anonymous as will any other information collected from you. Your responses will be tabulated by group and analyzed within your group, as well as compared to the other groups. Because there will be no way to attribute your comments back to you, there are no risks in participating in this study.

Your participation will require answering a series of questions about what you think of land use planning in Springfield, biodiversity and habitat conservation, as well as your thoughts about a concept called landscape ecological planning, which will be presented to you.

Your participation in this research is voluntary. You have the right to withdraw from this study at any time and/or to refrain from answering whatever questions you prefer to omit, without prejudice or consequence. In appreciation for your time, you will be given a copy of the summary report if so requested.

This study is being conducted with the full cooperation of the Municipal Council of Springfield and has been approved by the Faculty of Arts Ethics Review Committee. Any complaints regarding a procedure may be reported to the Dean (Research), Faculty of Arts, (474-7321), or to the Head of the Geography Department (474-9081) for referral to the Ethics Review Committee.

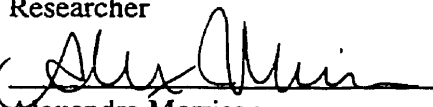
Yes, I understand the information herein and I agree to participate in this research project.

Signature

Printed name

date

Researcher

 May 20/98

Alexandra Morrison

date

University of Manitoba
Department of Geography

Springfield Rural Planning Study

Date: _____

Code: _____

RESIDENT'S INTERVIEW

1. In terms of deciding how land is to be used, i.e.: for residential developments, hog farms, other agricultural purposes, (land use policy), what do you think are the Municipality's responsibilities?

2. Do you feel that the municipality has lived up to these responsibilities? Yes ☐ No ☐

3. Why _____

4. Do you think Council should consult other professionals for advice when making land use decisions?

Yes ☐

No ☐

(IF YES, GO TO 5. IF NO, SKIP TO 6)

5. If so, which of the following should be consulted? (PLEASE CHECK APPROPRIATE SPACE)

- Government departments _____
- Professional planners (Consultants) _____
- Local Community Groups _____
- Environmental Organizations (i.e.: Manitoba Eco-network, Sierra Club) _____
- Conservation District Officials _____
- University experts _____
- Others, please list _____

6. What actions should Council take to minimize damage, if it is determined that a residential development may harm habitat or local plants and animals? _____

7. Thinking about the non-agricultural areas of the municipality, how do you rate the condition of the environment in the RM of Springfield? (PLEASE CHECK APPROPRIATE BOXES)

- ☐much better than 10 years ago
- ☐better than 10 years ago
- ☐neither better nor worse than 10 years ago
- ☐worse than 10 years ago
- ☐much worse than 10 years ago
- ☐don't know

8. Why? _____

9. Will the condition of Springfield's non-agricultural environment be better or worse in 20 years than it is now? (PLEASE CHECK APPROPRIATE BOXES)

- ☐Better
- ☐Worse
- ☐No change

10. Why? _____

11. Over the years, you may have heard about habitat conservation. Yes ☐ No ☐.
(IF NO SKIP TO 134)

12. If yes, what do you believe is the purpose of habitat conservation? _____

13. Some people believe that it is necessary to maintain healthy wildlife populations to insure a healthy environment. Do you agree or disagree with this statement?
(PLEASE CHECK APPROPRIATE BOXES)

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

14. Why? _____

(IF YES, GO TO 15, IF NO SKIP TO 16)

15. would you also agree that conserving all types of native plant and animal life is important for a healthy environment? (PLEASE CHECK APPROPRIATE BOXES)

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

16. A relatively new concept, related to habitat conservation, is the concept of biodiversity conservation. Have you heard this term before?

Yes ☐ No ☐

(IF NO, PLEASE READ THE DEFINITION ATTACHED, THEN SKIP TO 19)

17. Have you done any reading or other research about biodiversity?
Yes ☐ No ☐.

18. Are you aware of the ways in which biodiversity can be affected by human activities? Yes ☐ No ☐

19. Do you agree or disagree with the following statement: Humans are dependent on other life forms for their health and well being.

☐ Agree Why? _____
☐ Disagree Why? _____

20. If you were a councillor, what kinds of activities would you recommend to Council to improve habitat and to protect biodiversity while still allowing this RM to grow and prosper?

21. If you were a councillor, what do you think would prevent you from doing these things? _____

22. Do you think the Municipal Council has a responsibility to protect the environment? Yes ☐ No ☐. Does this include wildlife? Yes ☐ No ☐. Could this responsibility extend to the preservation of biodiversity? Yes ☐ No ☐

23. Do you think is it possible to protect biodiversity by regulating or controlling land use?

Yes ☐ No ☐

24. Should biodiversity be protected by controlling land use? Yes ☐ No ☐

(IF NO GO TO 25, IF YES SKIP TO 267)

25. How should biodiversity be protected? _____

26. Do you think Council has enough technical information about the impacts of development on biodiversity and habitat when they make land use decisions?

Yes ☐ No ☐

27. Some scientists claim that the aspen/prairie ecosystem that is found in the eastern half of this RM is almost as endangered as the tropical rainforest. They say that only 18% of the pre settlement aspen forest and less than 1% of the prairie remains. Do you think that this is true?

Yes ☐ No ☐? Don't know ☐

28. If NO why not? _____
(THEN SKIP TO 31)

29. Do you agree or disagree that this loss may be bad for biodiversity? (PLEASE CHECK APPROPRIATE BOXES)

- ☐ agree strongly
- ☐ agree
- ☐ have no particular view
- ☐ disagree
- ☐ strongly disagree

30. Why? _____

31. In The presentation, you were shown a system of planning that has been implemented elsewhere in Canada. Below you will find the concepts that were described in the presentation. I'd like you to indicate if each of these concepts has merit or not and why. (PLEASE CHECK APPROPRIATE BOXES)

Landscape ecological design (Model) Merit ☐ No Merit

☐ Why? _____

Clustering Merit ☐ No Merit ☐ Why? _____

Bonusing Merit ☐ No Merit ☐ Why? _____

Bare land condominium Merit ☐ No Merit ☐ Why? _____

Conservation easements Merit ☐ No Merit ☐ Why? _____

32. How amenable/reluctant do you feel your councillors are to new ideas related to land use? (PLEASE CHECK APPROPRIATE BOXES)

- ☐ very amenable to new ideas
- ☐ somewhat amenable to new ideas
- ☐ neutral to new ideas
- ☐ somewhat reluctant to consider new ideas
- ☐ very reluctant to consider new ideas

33. How amenable/reluctant are you to new ideas related to land use? (PLEASE CHECK APPROPRIATE BOXES)

- ☐ very amenable to new ideas
- ☐ somewhat amenable to new ideas
- ☐ neutral to new ideas
- ☐ somewhat reluctant to consider new ideas
- ☐ very reluctant to consider new ideas

34. Besides the cost to develop such a plan, what do you feel would be the *greatest* barrier to an ecological approach to land use planning in the RM of Springfield?

35. How might this be overcome? _____

36. Do you know about the Natural Areas Study that was conducted in Springfield in 1996? Yes ☐ No ☐. (IF NO GO TO 38)

:

37. What, if any, activities or actions should the RM be planning with respect to these areas?

38. Thinking about the physical environment, what do you like best about living in the RM of Springfield? Indicate as many as you like.

39. How would you rate your satisfaction with the way in which rural residential development currently takes place in Springfield? (CHECK APPROPRIATE BOXES)

- ☐ very satisfied
- ☐ somewhat satisfied
- ☐ neutral
- ☐ somewhat dissatisfied
- ☐ very dissatisfied

40. Why? _____

41. Do you think that residential development in Springfield, has had a negative impact on the natural environment of the area?

Yes ☐ In what way? _____

No ☐ Why? _____

Don't know ☐

42. Do you have any points or comments that you would like to add about rural planning, biodiversity conservation and land use in our municipality? _____

THE NEXT FEW QUESTIONS WILL BE USED FOR QUALITY CONTROL PURPOSES. AGAIN, YOUR ANSWERS WILL NOT BE DISCLOSED.

43. Please indicate your age range:

< 25 ☐

26-35 ☐

36-45 ☒

46-55 ☐

> 56 ☐

44. Please indicate the section, township and range in which you live _____

45. Generally, how knowledgeable would you say you are about local municipal issues in Springfield?

Very knowledgeable ☐

Somewhat knowledgeable ☒

Not knowledgeable ☐

Don't know ☐

46. Generally, how knowledgeable would you say you are about environmental issues in Springfield?

Very knowledgeable ☐

Somewhat knowledgeable ☐

Not knowledgeable ☐

Don't know ☐

THANK YOU FOR YOUR TIME AND PARTICIPATION IN THIS STUDY

University of Manitoba
Department of Geography

Springfield Rural Planning Study

Date: _____

Code: _____

COUNCILLOR INTERVIEW

1. I'm interested in how land use decisions are made in the RM of Springfield. Can you describe for me this process at the Council level?

2. In terms of land-use policy, what do you think are the Municipality's responsibilities? _____

3. Do you feel that the municipality has lived up to these responsibilities? Yes ☐ No ☐

4. Why _____

5. Does Council consult other professionals for advice when making land use decisions.

Yes ☐

No ☐

(IF YES, GO TO 6. IF NO, SKIP TO 7)

6. If so, which of the following are consulted?? (PLEASE CHECK APPROPRIATE SPACE)

- Government departments _____
- Professional planners (Consultants) _____
- Local Community Groups _____
- Environmental Organizations (ie: Manitoba Eco-network, Sierra Club) _____
- Conservation District Officials _____
- University experts _____
- Others, please list _____

7. What actions can council take to minimize damage, if it is determined that a residential development may harm habitat or local plants and animals?_____

8. Thinking about the non-agricultural areas of the municipality, how do you rate the condition of the environment in the RM of Springfield? (PLEASE CHECK APPROPRIATE BOXES)

- ☐much better than 10 years ago
- ☐better than 10 years ago
- ☐neither better nor worse than 10 years ago
- ☐worse than 10 years ago
- ☐much worse than 10 years ago
- ☐don't know

9. Why?_____

10. Will the condition of Springfield's non-agricultural environment be better or worse in 20 years than it is now? (PLEASE CHECK APPROPRIATE BOXES)

- ☐Better
- ☐Worse
- ☐No change

11. Why?_____

12. Over the years, you may have heard about habitat conservation. Yes ☐ No ☐.

(IF NO SKIP TO 14)

13. If yes, what do you believe is the purpose of habitat conservation?_____

14. Some people believe that it is necessary to maintain healthy wildlife populations to insure a healthy environment. Do you agree or disagree with this statement?
(PLEASE CHECK APPROPRIATE BOXES)

- ☐Strongly agree
- ☐Agree
- ☐Neither agree or disagree
- ☐Disagree
- ☐Strongly disagree

15. Why?_____

(IF YES, GO TO 16, IF NO SKIP TO 17)

16. would you also agree that conserving all types of native plant and animal life is important for a healthy environment? (PLEASE CHECK APPROPRIATE BOXES)

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

17. A relatively new concept, related to habitat conservation, is the concept of biodiversity conservation. Have you heard this term before?

Yes ☐ No ☐

(IF NO, DESCRIBE AND EXPLAIN BIODIVERSITY FROM STANDARD DEFINITION, THEN SKIP TO 20)

18. Have you done any reading or other research about biodiversity?
Yes ☐ No ☐.

19. Are you aware of the ways in which biodiversity can be affected by human activities? Yes ☐ No ☐

20. Do you agree or disagree with the following statement: Humans are dependent on other life forms for their health and well being.

☐ Agree Why? _____
☐ Disagree Why? _____

21. If it were within your power as a councillor, to do something to improve habitat and to protect biodiversity while still allowing this RM to grow and prosper what kinds of activities would you undertake?

22. If it were within your power as a councillor to do something to improve habitat and to protect biodiversity while still allowing this RM to grow and prosper, what would prevent you from doing it? _____

23. Do you think the Municipal Council has a responsibility to protect the environment? Yes ☐ No ☐. Does this include wildlife? Yes ☐ No ☐. Could this responsibility extend to the preservation of biodiversity? Yes ☐ No ☐

24. Do you think is it possible to protect biodiversity by regulating or controlling land use?

Yes ☐ No ☐

25. Should biodiversity be protected by controlling land use? Yes ☐ No ☐

(IF NO GO TO 26, IF YES SKIP TO 27)

26. How should biodiversity be protected? _____

27. Do you think you have enough technical information about the impacts of development on biodiversity and habitat when you make land use decisions?

Yes ☐ No ☐

28. Some scientists claim that the aspen/prairie ecosystem that is found in the eastern half of this RM is almost as endangered as the tropical rainforest. They say that only 18% of the pre settlement aspen forest and less than 1% of the prairie remains. Do you think that this is true?

Yes ☐ No ☐? Don't know ☐

29. If NO why not? _____
(THEN SKIP TO 32)

30. Do you agree or disagree that this loss may be bad for biodiversity? (PLEASE CHECK APPROPRIATE BOXES)

- ☐agree strongly
- ☐agree
- ☐have no particular view
- ☐disagree
- ☐strongly disagree

31. Why? _____

32. If you thought that a land use decision might adversely affect biodiversity, what actions could you take to minimise the damage?

33. I'm going to describe a land use planning system that has been used in other parts of Canada. It is known as landscape *ecological planning*. This system is used to preserve wildlife habitat and biodiversity, but also encourages development.). I'm going to explain a little about each of the components of this system, and give you an example. I'd like you to tell me if you personally think this method of planning has merit or not and why or why not. (PLEASE CHECK APPROPRIATE BOXES)

Conservation easements	Merit ☐ No Merit ☐ Why? _____
Clustering	Merit ☐ No Merit ☐ Why? _____
Bonusing	Merit ☐ No Merit ☐ Why? _____
Bare land condominium	Merit ☐ No Merit ☐ Why? _____
Landscape ecological design (AWO Model)	Merit ☐ No Merit ☐ Why? _____

34. How amenable/reluctant do you feel your colleagues on council are to new ideas related to land use? (PLEASE CHECK APPROPRIATE BOXES)

- ☐very amenable to new ideas
- ☐somewhat amenable to new ideas
- ☐neutral to new ideas
- ☐somewhat reluctant to consider new ideas
- ☐very reluctant to consider new ideas

35. How amenable/reluctant are you to new ideas related to land use? (PLEASE CHECK APPROPRIATE BOXES)

- ☐ very amenable to new ideas
- ☐ somewhat amenable to new ideas
- ☐ neutral to new ideas
- ☐ somewhat reluctant to consider new ideas
- ☐ very reluctant to consider new ideas

36. Besides the cost of developing a landscape ecological plan, what do you feel would be the *greatest* barrier to an ecological approach to land use planning in the RM of Springfield?

37. How might this be overcome? _____

38. Do you know about the Natural Areas Study that was conducted in Springfield in 1996? Yes ☐ No ☐. (IF NO GO TO 41)

:

39. What, if any, activities or actions is the RM planning with respect to these areas?

40. Have you considered them in the planning process? Yes ☐ No ☐ If no, why not? _____

41. Thinking about the physical environment, what do you like best about living in the RM of Springfield? Indicate as many as you like.

42. How would you rate your satisfaction with the way in which rural residential development currently takes place in Springfield? (CHECK APPROPRIATE BOXES)

- ☐ very satisfied
- ☐ somewhat satisfied
- ☐ neutral
- ☐ somewhat dissatisfied
- ☐ very dissatisfied

43. Why? _____

44. Do you believe that rural residential developments have a negative impact on the environment?

Yes ☐, No ☐, Why? _____

Don't know ☐

44. Do you have any points or comments that you would like to add about rural planning, biodiversity conservation and land use in our municipality? _____

THE NEXT FEW QUESTIONS WILL BE USED FOR QUALITY CONTROL PURPOSES. YOUR ANSWERS WILL NOT BE DISCLOSED.

44. Please indicate your age range:

< 25 ☐

26-35 ☐

36-45 ☐

46-55 ☐

> 56 ☐

45. Please indicate the section, township and range in which you live _____

46. Generally, how knowledgeable would you say you are about local municipal issues in Springfield?

Very knowledgeable ☐

Somewhat knowledgeable ☐

Not knowledgeable ☐

Don't know ☐

47. Generally, how knowledgeable would you say you are about environmental issues in Springfield?

Very knowledgeable ☐

Somewhat knowledgeable ☐

Not knowledgeable ☐

Don't know ☐

THANK YOU FOR YOUR TIME AND PARTICIPATION IN THIS STUDY

University of Manitoba
Department of Geography

Springfield Rural Planning Study

Date: _____

Code: _____

CONSERVATION DISTRICT INTERVIEW

1. I'm interested in how land use decisions are made in the RM of Springfield. Can you describe for me this process at the Council level?

2. In terms of land-use policy, what do you think are the Municipality's responsibilities? _____

3. Do you feel that the municipality has lived up to these responsibilities? Yes ☐ No ☐

4. Why _____

5. Does Council consult other professionals for advice when making land use decisions.

Yes ☐

No ☐

(IF YES, GO TO 6. IF NO, SKIP TO 7)

6. If so, which of the following are consulted?? (PLEASE CHECK APPROPRIATE SPACE)

- Government departments _____
- Professional planners (Consultants) _____
- Local Community Groups _____
- Environmental Organizations (ie: Manitoba Eco-network, Sierra Club) _____
- Conservation District Officials _____
- University experts _____
- Others, please list _____

7. What actions can council take to minimize damage, if it is determined that a residential development may harm habitat or local plants and animals? _____

8. Thinking about the non-agricultural areas of the municipality, how do you rate the condition of the environment in the RM of Springfield? (PLEASE CHECK APPROPRIATE BOXES)

- ☐ much better than 10 years ago
- ☐ better than 10 years ago
- ☐ neither better nor worse than 10 years ago
- ☐ worse than 10 years ago
- ☐ much worse than 10 years ago
- ☐ don't know

9. Why? _____

10. Will the condition of Springfield's non-agricultural environment be better or worse in 20 years than it is now? (PLEASE CHECK APPROPRIATE BOXES)

- ☐ Better
- ☐ Worse
- ☐ No change

11. Why? _____

12. Over the years, you may have heard about habitat conservation. Yes ☐ No ☐.

(IF NO SKIP TO 14)

13. If yes, what do you believe is the purpose of habitat conservation? _____

14. Some people believe that it is necessary to maintain healthy wildlife populations to insure a healthy environment. Do you agree or disagree with this statement?
(PLEASE CHECK APPROPRIATE BOXES)

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree or disagree
- ☐ Disagree
- ☐ Strongly disagree

15. Why? _____

(IF YES, GO TO 16, IF NO SKIP TO 17)

16. would you also agree that conserving all types of native plant and animal life is important for a healthy environment? (PLEASE CHECK APPROPRIATE BOXES)

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

17. A relatively new concept, related to habitat conservation, is the concept of biodiversity conservation. Have you heard this term before?

Yes ☐ No ☐

(IF NO, DESCRIBE AND EXPLAIN BIODIVERSITY FROM STANDARD DEFINITION, THEN SKIP TO 20)

18. Have you done any reading or other research about biodiversity?
Yes ☐ No ☐.

19. Are you aware of the ways in which biodiversity can be affected by human activities? Yes ☐ No ☐

20. Do you agree or disagree with the following statement: Humans are dependent on other life forms for their health and well being.

☐ Agree Why? _____
☐ Disagree Why? _____

21. If it were within your power as a councillor, to do something to improve habitat and to protect biodiversity while still allowing this RM to grow and prosper what kinds of activities would you undertake?

22. If it were within your power as a councillor to do something to improve habitat and to protect biodiversity while still allowing this RM to grow and prosper, what would prevent you from doing it? _____

23. Do you think the Municipal Council has a responsibility to protect the environment? Yes ☐ No ☐. Does this include wildlife? Yes ☐ No ☐. Could this responsibility extend to the preservation of biodiversity? Yes ☐ No ☐

24. Do you think is it possible to protect biodiversity by regulating or controlling land use?

Yes ☐ No ☐

25. Should biodiversity be protected by controlling land use? Yes ☐ No ☐

(IF NO GO TO 26, IF YES SKIP TO 27)

26. How should biodiversity be protected? _____

27. Do you think you have enough technical information about the impacts of development on biodiversity and habitat when you make land use decisions?

Yes ☐ No ☐

28. Some scientists claim that the aspen/prairie ecosystem that is found in the eastern half of this RM is almost as endangered as the tropical rainforest. They say that only 18% of the pre settlement aspen forest and less than 1% of the prairie remains. Do you think that this is true?

Yes ☐ No ☐? Don't know ☐

29. If NO why not? _____
(THEN SKIP TO 32)

30. Do you agree or disagree that this loss may be bad for biodiversity? (PLEASE CHECK APPROPRIATE BOXES)

- ☐agree strongly
- ☐agree
- ☐have no particular view
- ☐disagree
- ☐strongly disagree

31. Why? _____

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Conservation easements	Merit ☐ No Merit ☐ Why? _____
Clustering	Merit ☐ No Merit ☐ Why? _____
Bonusing	Merit ☐ No Merit ☐ Why? _____
Bare land condominium	Merit ☐ No Merit ☐ Why? _____
Landscape ecological design (AWO Model)	Merit ☐ No Merit ☐ Why? _____

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- ☐somewhat amenable to new ideas
- ☐neutral to new ideas
- ☐somewhat reluctant to consider new ideas
- ☐very reluctant to consider new ideas

35. How amenable/reluctant are you to new ideas related to land use? (PLEASE CHECK APPROPRIATE BOXES)

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- ☐ neutral to new ideas
- ☐ somewhat reluctant to consider new ideas
- ☐ very reluctant to consider new ideas

36. Besides the cost of developing a landscape ecological plan, what do you feel would be the *greatest* barrier to an ecological approach to land use planning in the RM of Springfield?

37. How might this be overcome? _____

38. Do you know about the Natural Areas Study that was conducted in Springfield in 1996? Yes ☐ No ☐. (IF NO GO TO 41)

:

39. What, if any, activities or actions is the RM planning with respect to these areas?

40. Have you considered them in the planning process? Yes ☐ No ☐ If no, why not? _____

41. Thinking about the physical environment, what do you like best about living in the RM of Springfield? Indicate as many as you like.

42. How would you rate your satisfaction with the way in which rural residential development currently takes place in Springfield? (CHECK APPROPRIATE BOXES)

- ☐ very satisfied
- ☐ somewhat satisfied
- ☐ neutral
- ☐ somewhat dissatisfied
- ☐ very dissatisfied

43. Why? _____

44. Do you believe that rural residential developments have a negative impact on the environment?

Yes ☐, No ☐, Why? _____

Don't know ☐

44. Do you have any points or comments that you would like to add about rural planning, biodiversity conservation and land use in our municipality? _____

THE NEXT FEW QUESTIONS WILL BE USED FOR QUALITY CONTROL PURPOSES. YOUR ANSWERS WILL NOT BE DISCLOSED.

44. Please indicate your age range:

- < 25 ☐
- 26-35 ☐
- 36-45 ☐
- 46-55 ☐
- > 56 ☐

45. Please indicate the section, township and range in which you live _____

46. Generally, how knowledgeable would you say you are about local municipal issues in Springfield?

- Very knowledgeable ☐
- Somewhat knowledgeable ☐
- Not knowledgeable ☐
- Don't know ☐

47. Generally, how knowledgeable would you say you are about environmental issues in Springfield?

- Very knowledgeable ☐
- Somewhat knowledgeable ☐
- Not knowledgeable ☐
- Don't know ☐

THANK YOU FOR YOUR TIME AND PARTICIPATION IN THIS STUDY

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