"TOO SMALL TO FARM, TOO LARGE TO MOW": EX-URBAN FORM AND PLANNING POLICIES IN THE RURAL MUNICIPALITY OF SPRINGFIELD

BY

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A Thesis
Submitted to the Faculty of Graduate Studies
In Partial Fulfilment of the Requirements for the Degree of

MASTER OF ARTS

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Abstract

The purpose of this study is an examination of land use change and the issues surrounding effective land use planning in the Rural Municipality (RM) of Springfield, Manitoba, Canada. The study examines rural residential development from 1966 to 1999 and the age distribution of agricultural operators, the RM council's development plan, and potential solutions that might enable efficient use of land while allowing new but cost-efficient development, protection of the agricultural land base, and retention of the rural character of the municipality. Landscape and demographic characteristics of the RM are analyzed, and it is determined that the RM has experienced a shift in land use from agricultural to rural residential, most evident in the northern and north-western portions of the municipality, which is also the area most likely to experience the greatest pressure for further change.

Given these findings the RM's proposed development plan should be designed so as to be more protective of agricultural land and open space. However, the plan will ultimately be unable to achieve many of its goals and objectives because of the way it ineffectively addresses the relationships between various characteristics of the local landscape. A variety of mechanisms exist which could be used to ensure the protection of rural character, agricultural land, and open space, and while the use of no one of these mechanisms will solve all of the challenges faced in policy development, one or a combination of them would help to relieve some of the pressure for problematic land use change.

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Dr. Ian Wight of the Department of City Planning (UofM), was the third integral person to the completion of this thesis. While it may not be an outstanding piece of scholarly work, this was not due to a lack of effort or knowledge on the part of Dr. Wight, who was in large part responsible for the form and quality of the document as it stands. All shortcomings of this thesis are mine alone, many due to an inability (for a variety of reasons) to incorporate all of the suggestions provided by Dr. Wight and the other members of my committee. Further, I would also like to thank Mr. Peter Williams of DataLink Mapping Technologies who provided me with the technology and assistance required for the analysis of the landscape and demographic characteristics of the Rural Municipality of Springfield.

In addition, I must acknowledge the help provided by Mr. Eric Towler, Chief Administrative Officer for the Rural Municipality of Springfield, in allowing me access to the municipality's archived building permit files, which formed the foundation of my study. Finally I would like to thank Andi and Norm for providing me with the necessities of life (such as food, drink, recreation, entertainment and high-speed internet access – in no particular order (for the most part – I saved the most necessary for last)) during my work on what had become known (to me) as 'Greg's Bane' or 'Greg's Folly,' depending on my mood.

"Even a blind pig finds an acorn once in a while."

Hunter S. Thompson

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Woe unto them that join house to house, that lay field to field, 'til there be no place, where they be alone in the midst of the earth.

– Isaiah (5:8)

CHAPTER 1: Introduction

Overview

This thesis is a study of the shift from agricultural to rural residential land-use in the Rural Municipality (RM) of Springfield. This change in land use is important for two fundamental reasons. First, and arguably foremost, is the loss of land that is or could be used for food production. Once agricultural land becomes used for urban forms of activity, it is difficult or impossible to use it for food production again. Second, the expansion of urban land uses outwards from a city's boundary is often inefficient, usually taking up more space than is desired for effective land management. There are a variety of problems created by this inefficiency, such as the potential for conflict between new and existing land uses, as well as an increase in the costs associated with living and farming in these areas. The inefficient expansion of urban activity can even create an additional burden for the region at large, as the provincial government must often subsidize the construction of local infrastructure (particularly roads and water service) when the demand for them increases beyond the ability of the local government to provide. As well, the reasons that people choose to live in rural areas eventually disappear as more land is given over to residential development and the rural characteristics of the area are lost. What was once predominantly rural open space becomes a patchwork of houses on lots larger that would usually be available in the city.

Many, or all, of these problems can be avoided or at least mitigated with effective planning. To plan effectively, the local situation needs to be examined to determine the form development should take so as to be acceptable to the various groups involved, to minimize the effects of ex-urban development upon agricultural operators, to maximize the amount of open space available, and to increase and preserve recreational opportunities. In short, agricultural land could be protected while allowing farmers to retire or stop farming, and pleasing, spatially efficient forms of urban development could be established that allow 'urban' people to live in rural areas without changing the overall rural character of the area or adding onerously to the costs of living in the area. This concept of 'effective planning' is addressed in this thesis through the examination of both historical land use change in the RM of Springfield and the RM's proposed development plan as it relates to future planned land use change.

Purpose

As the purpose of this study is the examination of the process of land use change and the issues surrounding effective planning in the RM of Springfield, the study involves:

1. An examination of the growth of rural residential development from 1966 to 1999 and the potential impact current levels of rural residential development will have on the future of farming within the municipality. These potential affects will be estimated by a correlation of the density of existing rural residential development with the areas that have the largest numbers of farmers close to retirement.
2. An examination of the RM council's development plan in order to determine the direction development is 'planned' to take in the future, given the pressures for urban forms of development.

3. An examination of potential solutions that might enable efficient use of land while allowing new but cost-efficient development, protecting the agricultural land base, and maintaining the rural character of the municipality.

This study focuses on the RM of Springfield because it shares a border with the City of Winnipeg, is a primarily agricultural area with a large amount of good-quality agricultural land, has been experiencing an increasing amount of rural residential activity, and has recently completed a review of its development plan. As such, this RM provides an excellent opportunity to examine local land use change and the issues outlined above, thereby providing a context for a discussion of appropriate and sound development informed by in-depth geographical analysis.

Data and Sources

The information collected for the examination of rural residential development and its actual and potential impact upon the municipality is divided into two categories: maps and attribute data.

Maps

The maps consist of a parcel map, an enumeration area map, a soil classification map, a map of land use designations and an IRS (Indian Remote Sensing) satellite image of the municipality and the surrounding area. The parcel map of the rural municipality (provided by DataLink Mapping Technologies on behalf of the RM of Springfield) delineates the land survey sections within Springfield, the subdivision of land within the sections, and the road system. The enumeration area map was created by the author based upon the boundaries defined by Statistics Canada (for the 1996 census); it is used to

define areas within which the ages of agricultural operators are grouped. The soil classification map (provided by the Manitoba Land Resource Group) shows the distribution of CLI soil classifications within the municipality and the map of land use designations (also provided by DataLink Mapping Technologies on behalf of the RM of Springfield) shows the areal designations as set out by the Rural Municipality of Springfield's Development Plan. Finally, the IRS image (acquired in 1999 and provided by Manitoba Intergovernmental Affairs) provides a picture of the landscape at the time of the study.

Attribute Data

The attribute data consist of the municipality's residential building permits between 1966 and 1999 (provided by the RM of Springfield), and the number of farm operators within each of the nineteen enumeration areas within the municipality (provided by Statistics Canada).

Importance of Residential Building Permits

Local land ownership is an important factor when examining land use change because changes in ownership are often indicative of pressure for change in the current forms of land use and is the first step toward functional change. Shifts in land ownership precede shifts in land use which create a momentum towards further change from the preceding function of the landscape (Bryant, 1982). In this case, shifts in land ownership and functional use of the landscape are shown by examining the number of new houses built in Springfield between 1966 and 1999.

Residential building permits are chosen as the benchmark indicators of change for this study because they identify physical changes on the landscape. Other studies (MacLean, 1985; Medd, 1978; Municipal Planning Branch, 1979) have used approved subdivision applications which show how owners have divided their land. While they are indicative of the proposed direction of future land use, subdivision plans often do not result in an immediate change in land use. Subdivided land will retain its original use or remain unused for long periods of time, particularly if no-one else desires use of this land. Having said this, approved subdivisions can be useful when looking at 'intent', as they indicate how land-owners wish to alter the use of their land.

Importance of the Age of Farm Operators

A second important factor to consider when examining change in land ownership is the age of agricultural operators, as a major impetus for change in ownership is farm operator retirement. By comparing the age of farm operators with the density of rural residential development, a view of the potential pressure for change can be developed, based upon the premise that as farm operators get older they will either sell the land they own or stop renting the land they use. As it is expected that existing residential development will attract more residential development, the owners of agricultural land will face pressure to change the function of the landscape from both outside and from within the agricultural community.

Analysis

Using the data described above, the analysis of change in land use is accomplished with the following steps.

1) To provide the context for the discussion of land use change, a view of the proposed future use of soil resources is developed through an overlay of the soil classifications map with the land use designations map.
2) A general view of the level of residential development in 1999 is achieved by overlaying the parcel subdivision levels on top of the soil classifications map.
3) The development of residential density is shown through a time-series of residential development, created by overlaying residential building permits from 1966-1975, 1966-1985, 1966-1995, and 1966-1999 over top of the soil classifications map.
4) A comparison of the suggested future use of land as proposed by the RM council is then compared with existing dwelling information by placing the location of dwellings on top of the land use designations map. The resulting map entitled Rural Municipality of Springfield Land Use Designations and Dwellings as of 1999, indicates the pressure of residential development on existing agricultural operations.
5) The future form of use of land proposed by the municipal council is compared with land owner desires by overlaying the parcel map onto the land use designations map. The high degree of subdivision illustrated by this map entitled Rural Municipality of Springfield Land Use Designations and Subdivisions as of 1999, is indicative of a desire for the land to be sold for other non-agricultural activities
6) Areas that will likely be facing the highest external (that is to say from non-farm operators) pressure for change are determined with the correlation of residential density and the age of agricultural operators by overlaying current residential development and the age of farm operators on top of the soil classification map and the enumeration area map.
7) The dwelling locations are then replaced by subdivisions by overlaying the parcel map and the age of farm operators on top of the soil classification map and the enumeration area map in order to try to determine the areas facing the most pressure from farm operators themselves.

8) The previous map is compared to the map entitled Rural Municipality of Springfield Land Use Designations, Dwellings and Subdivisions as of 1999, which illustrates the location of existing residences in relation to subdivisions to show how much subdivided land already had residential development by 1999.
9) Finally, a preliminary build-out analysis is performed by locating vacant 2 to 5 acre parcels, identifying them along with dwellings existing in 1999. These existing and potential dwellings are placed first on top of the IRS satellite image and then on top of the land use designation map to suggest where future development could occur based upon both the location of dwellings and vacant parcels as of 1999, and to indicate the areas where residential development is permitted by proposed land use policies.

Springfield's Development Plan

To place the information derived from the steps outlined above into the more general context of effective planning, Springfield's most recent proposed development plan is examined. Under the Manitoba Planning Act of 1975, greater local autonomy was granted by allowing individual municipalities or collections of municipalities within a planning district to develop planning goals through a development plan. A development plan is a document that contains objectives and policies that are meant to guide future development in the area to which they pertain. It should address all aspects of and factors affecting land-use change, from patterns of land use to the attraction of desired economic activity. Ideally the objectives contained in the development plan will be met with the help of policy guidelines implemented through such development control mechanisms as zoning regulations, by-laws, subdivision control, and public works. As such, for a development plan to be effective, policy statements must be reflective of overall objectives and development control mechanisms must be established.

In its current state, the RM of Springfield's Development Plan will ultimately be unable to achieve many of its goals and objectives because of the way it ineffectively addresses the relationships between various characteristics of the local landscape and the potential impacts they may have on one-another. This is due to a lack of knowledge about the local landscape, a lack of design standards for development, the 'encouragement' rather than 'requirement' of a variety of potentially effective policies, and the use of some policies in forms that actually encourage ex-urban sprawl. These problems are examined and discussed along with alternate methods that could assist Springfield's development planning in meeting stated goals and objectives. Such alternate methods include emphasising the creation of more compact development through a more effective use of development control mechanisms, along with the introduction of new mechanisms such as land trusts, open space preservation design requirements, and the development of standards that new development proposals would have to meet. The related discussion demonstrates how these mechanisms would help to preserve agricultural land and open space, as well as encourage efficient development, allowing current residents to maintain their desired ways of life, and to protect the rural character of the municipality for future residents.

Thesis Organisation

Following this introductory chapter, the study begins by providing the regional context, with a physical and demographic description of the study area. This chapter also contains a description of the data used, along with the processes of data collection and analysis. Next, Chapter 3 contains a review of the literature pertaining to post-industrial settlement patterns, the issues and problems associated with ex-urban sprawl, agricultural land

availability in Canada and the growth of ex-urban development on farm land. Chapter 3 also contains a history of zoning ordinance, a discussion of planning in Manitoba, and a discussion of the importance of land ownership as an indicator of land use change. This is followed by Chapter 4 which describes each step of the analysis, followed by a discussion of the results. This is followed by an explanation as to why the findings are not as clear-cut as expected, with respect to the identification of areas most likely to be affected by pressure for change, and the chapter ends with a partial build-out analysis identifying potential locations of future development. Chapter 5 contains an analysis of the RM of Springfield's proposed development plan, and discusses the plan's shortcomings based upon the three general categories of 'non-prevention or encouragement of sprawl', 'lack of design guidelines or standards', and 'weak language'. Based upon the previous discussion, Chapter 6 provides examples of the mechanisms through which farmland and open space could be protected, and the natural character of rural areas preserved, while at the same time allowing efficient, low-impact development. Finally, Chapter 7 contains the conclusion, comprised of a summary of the research processes employed, study findings and suggested development alternatives, along with a discussion of the possible shortcomings of this study and suggestions for further study.

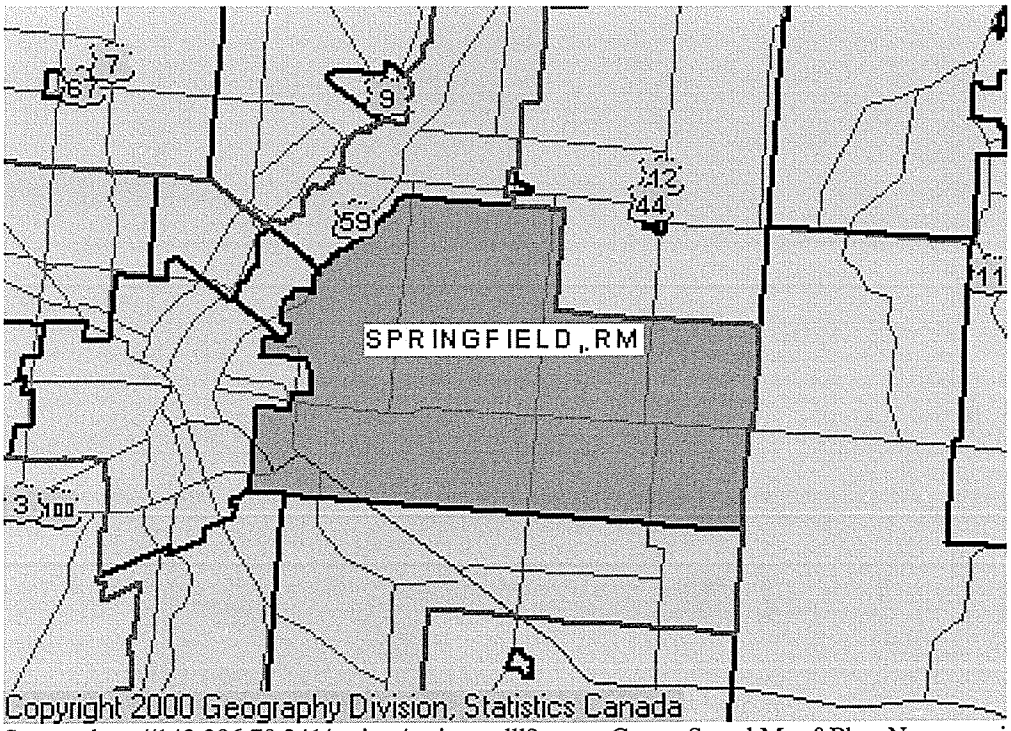
CHAPTER 2: The Study Area

Physical Characteristics

The Study Area Boundaries

The Rural Municipality of Springfield is located immediately east of the City of Winnipeg (see Figure 1). Comprised of 11.5 townships (110,348 ha), it extends east of Winnipeg for a distance of 48 km, where it borders the RM of Reynolds. In addition to Winnipeg, the western boundary is also shared with the rural municipalities of East St. Paul and St. Clements, while its northern boundary is shared with the RMs of St. Clements and Brokenhead. Springfield's southern boundary is shared by the RMs of Tache and Ritchot.

Figure 1. The Rural Municipality of Springfield and Neighbours



Source: http://142.206.70.241/scripts/esrimap.dll?name+CensusSearchMap&PlaceName=springfield &lang=0&theme=csd&code=4612047&cmd=move&resolution=800c600 Retrieved 08 March, 2002.

Physiography

Located entirely within the Manitoba Plain, the lowest level the Canadian Interior Plains lying to the south and west of the Canadian Shield, the Rural Municipality of Springfield can be divided into two distinct landscapes, the Red River Valley and the South-eastern Plain. In general, the terrain slopes northwest down to an elevation of 232 metres above sea level from an elevation of 264 metres above sea level in the southeast corner. The one exception is the upland of glaciofluvial outwash and glacial till known as Birds Hill, which rises abruptly to elevations greater than 255 metres above sea level in the north-western part of the municipality. The difference between the two landscapes is that the Red River Valley, in the western part of the municipality, is predominantly level while the South-eastern Plain in the eastern section of the municipality is slightly ridged (Land Resource Group (Manitoba), 1999).

Variation in relief is primarily under 3 metres, with slopes less than 2 percent. For the most part this produces low surface gradients of about 0.7 m/km (3.8 ft/mi) and results in poorly developed surface drainage and soils classified as imperfectly to poorly drained. 'Poorly drained' means that moisture in the soil is removed so slowly that the water table remains at or on the surface for most of the time when the soil is not frozen (Land Resource Group (Manitoba), 1999). The existence of such soils forewarns potential problems for a variety of activities. In addition, there is very poorly drained organic terrain in the eastern part of the municipality which, along with high groundwater levels throughout most of the municipality, exacerbates the problem of excess water in the soil. The removal of excess water on agricultural land is assisted by a network of man-made

drains, without which surface water would naturally drain to the northwest and north, via Cooks Creek and the Brokenhead River respectively (Land Resource Group (Manitoba), 1999).

Water Supply

While an abundance of water on the surface of Springfield's landscape can be an impediment to some forms of human activity, there are fewer problems obtaining water for domestic and agricultural requirements as it is readily available from groundwater supplies. These supplies would also provide for even moderate industrial and commercial needs, according to a report on groundwater resources for Springfield (Rutulis, 1990). At the time of this report, it was determined that groundwater resources would allow for some new development, however a numerical estimate was not provided.

The groundwater is available from three sources within the municipality. The primary aquifer, within carbonate bedrock consisting of limestone and dolostone, underlies the western and central parts of the municipality (Rutulis, 1990). The main sources of water in the eastern part of the municipality are sand and gravel aquifers overlying the carbonate aquifers. Sand and gravel overlay aquifers such as these are also common in the Birds Hill area. The central and eastern parts of the municipality can also access groundwater from a sandstone aquifer that underlies the carbonate rock aquifer (Rutulis, 1990). The sandstone aquifer contains both fresh and saltwater, with the boundary between the two running roughly diagonally across the municipality from the south west to the north east. As such, the sandstone aquifer is salty in the western and northern parts of Springfield (Rutulis, 1990) and is not a viable source of water.

According to Rutulis, most of the groundwater in the municipality is of good to excellent quality, which means that it has a total dissolved solids content of 1000 mg/L or less and a hardness level of 500 mg/L or less (Rutulis, 1990). However, the aquifers in the area around, and to the west and southwest of Dugald, all have poor to very poor quality water (with an amount of dissolved solids greater than 2001mg/L and a level of hardness greater than 1000 mg/L) (Rutulis, 1990).

Soil

Deposited during the time of glacial Lake Agassiz, the soil materials in the Red River Valley are comprised primarily of deep, clayey lacustrine sediments, which are defined as fine earth containing 35% or more clay by weight and less than 35% by volume of particles between 2mm and 25 cm in size (Hopkins, St. Jaques, & Mills, 1993; Land Resource Group (Manitoba), 1999). The South-eastern Plain landscape is characterised by shallow layers of thin, sandy to coarse-loamy soils on top of stony loam till (Land Resource Group (Manitoba), 1999). This means that soils comprised of fine earth (containing particle sizes ranging between 0.5 and 2 mm in diameter but less than 35% by volume of particles between 2mm and 25 cm in diameter) to soils with a particle size that is comprised of 15% or more – by weight – of fine sand (0.25 to 0.1 mm in diameter) or coarser particles (including particles up to 7.5 cm, and less than 18% clay), overlay soil comprised of a combination of the grade sizes of sand (0.05 to 2 mm), silt (0.002 to 0.05 mm) and clay (less than 0.002 mm) where no one size is more prevalent than the other, and with rock fragments greater than 25 cm in diameter (Hopkins et al., 1993).

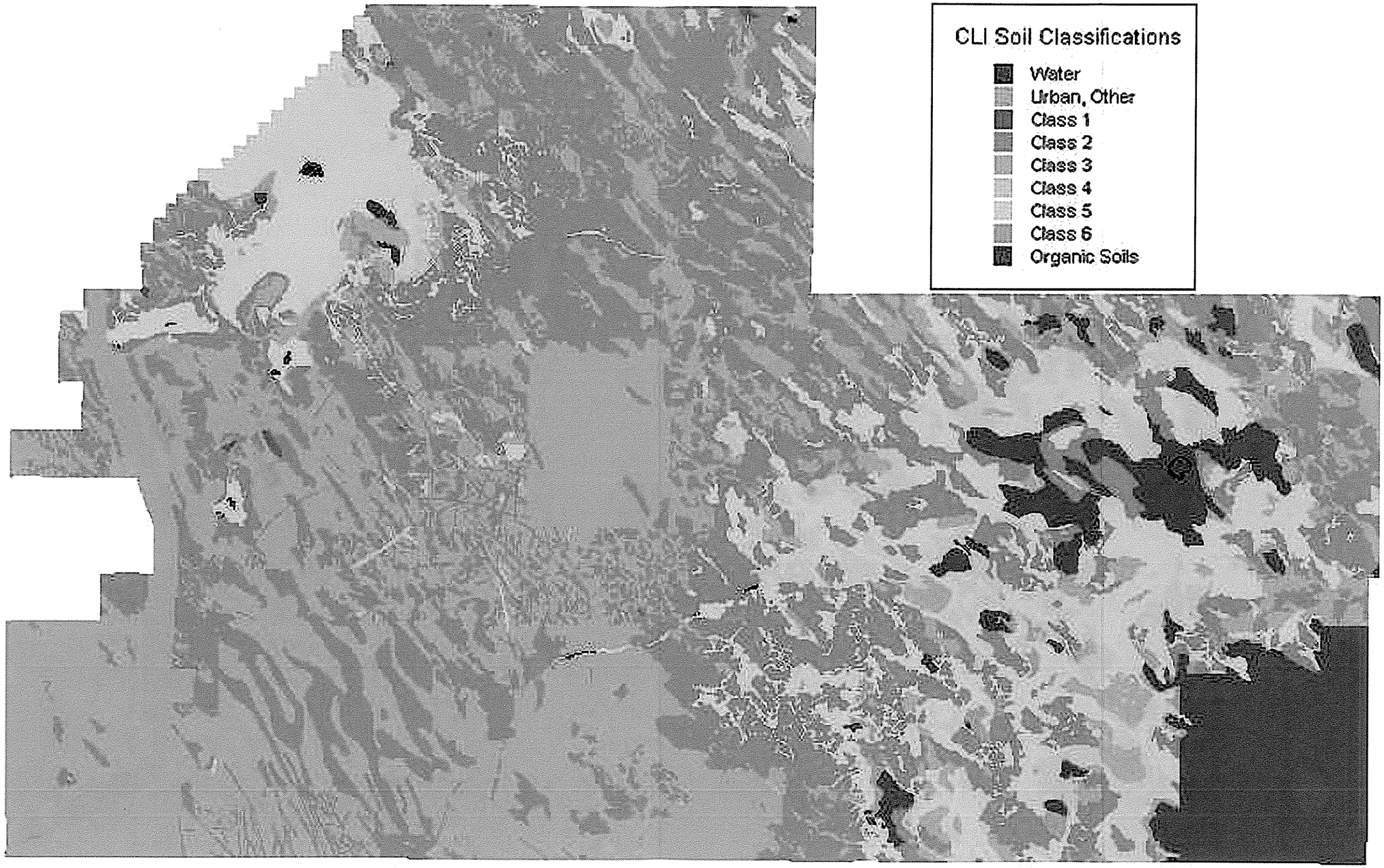
In addition, local areas of gravelly sand outwash and beach deposits occur frequently, particularly around the Birds Hill area, along with extensive organic deposits along the eastern edge of the municipality (Land Resource Group (Manitoba), 1999). These organic deposits are soils that are saturated for most of the year and contain 30% or more of organic matter to either a depth of at least 60 cm if the surface layer consists dominantly of fibric moss, a depth of at least 40 cm if comprised of other or mixed kinds of organic material, or bedrock if contact occurs at a minimum depth of 10 cm (Hopkins et al., 1993).

Discussing the quality of soil with respect to dryland agriculture is made easier through the use of the Canada Land Inventory System (CLIS). This system was developed as a method to determine the capability of soil for dryland agriculture in a given area. This determination is based upon an evaluation of soil characteristics in the context of landscape and climatic conditions that create limitations and affect the soil's suitability for agricultural use. Classes for capability or general suitability are defined by the grouping of mineral soils which are then further broken into subclasses which describe the types of limitation or properties that have an affect on dryland agriculture (Hopkins et al., 1993). These classifications define risks to regional productive capacity depending upon the type of soil, and suggest the way these soils respond to different types of management. The system has seven capability classifications, with soil types grouped together based upon similar relative degrees of potential for agricultural use, or hazard for use, as suggested by the subclass limitation(s) (Hopkins et al., 1993).

Each soil classification or 'class' is indicative of the general suitability of that class for agriculture. Classes 1-3 are generally capable of the sustained production of common field crops and represent prime agricultural land. Class 4 characterises soils which are marginal for sustained arable cultivation, while land designated as Class 5 is capable of perennial forages and improved permanent pasture. Land where improvement is not feasible but which is still capable of producing native forages and pasture is defined as Class 6, and Class 7 land is considered unsuitable for dryland agriculture or pasture (Hopkins et al., 1993).

In Springfield, 69% of the land is designated as being prime agricultural (Classes 1-3) (see Figure 2. Rural Municipality of Springfield CLI Soil Classifications). According to the RM of Springfield Soils and Terrain Bulletin (Land Resource Group (Manitoba), 1999), while less than 1% of the soils fall into Class 1, 36% of the soils are Class 2. Class 1 soils have no important limitations for crop use. They are deep and occur on level or gently sloping topography. Having a moderate water holding capacity, they are well to imperfectly drained (the latter meaning that the soil remains wet for a significant portion of the growing season for several possible reasons) and have a moderate water holding capacity and significant natural supply of plant nutrients. Finally, good tilth (which is the range to which the physical structure of the soil can affect tillage, its fitness as a seedbed, and how easily seeds can emerge from it and roots penetrate it) and fertility are easily maintained in soils in this class, and as a result they range from moderately high to high in productivity for a significant variety of cereal and special crops (Hopkins et al., 1993).

Figure 2. Rural Municipality of Springfield CLI Soil Classifications



Not to scale.

While more restrictive than those of Class 1, the limitations to soils in Class 2 are not severe and are mitigated through the use of good soil management and cropping practices without significant difficulty. However, they do have moderate limitations that reduce the choice of crops that can be used or that require moderate conservation practices to make up for them. Either naturally well supplied with plant nutrients or highly responsive to the application of fertilizer, the soils in this class are moderately to highly productive for a reasonably wide range of crops (Hopkins et al., 1993).

Thirty-three percent of the soils in Springfield fall into Class 3 (Land Resource Group (Manitoba), 1999), which means that they have limitations that are more severe than those of previous classes and conservation practices are more difficult to use and sustain, resulting in a decrease in the variety of crops that can be grown in these soils. In addition to conservation practices and a constrained choice of crops, the limitations also affect the timing and ease of tillage, planting and harvesting (Hopkins et al., 1993). These limitations include one or a combination of the following:

- climate, where growing seasons may be shorter, temperatures may be lower and levels of precipitation may be more variable than what is required to allow the production of crops on the same land in subsequent years without a serious risk of partial or total crop failure,
- tendency for erosion,
- structure, which affects the movement of water, air and plants through the soil and is determined by the geometric structure or shape of the primary soil particles,
- permeability, or the ease with which moisture and air can penetrate the soil profile to greater depths,
- low fertility,

- topography, where the landscape tends to be uneven as opposed to level,
- moisture, too much, too little or too slow in releasing it to plants,
- stoniness, and
- the depth of the soil profile to consolidated bedrock.

Nevertheless, these soils have a fairly to moderately high productive capacity for a reasonably wide range of field crops if good management practices are used (Hopkins et al., 1993).

Soils rated Class 4 make up 4% of the soils in the municipality (Land Resource Group (Manitoba), 1999). The limitations of this class of soils can result in a further reduction in the choice of crops that can be grown, the requirement of special conservation practices, or both. This means that they are really only suited for a few crops; otherwise the yield for a wider range of crops would likely be low or the risk of crop failure would be high. The limitations to this class are climate, an accumulation of undesirable soil characteristics, low fertility, moisture, structure or permeability, salinity, erosion, topography, stoniness, and the depth of soil to bedrock. These limitations can have a serious affect on the timing and ease of tillage, planting and harvesting and hinder or reduce the effectiveness of soil conservation practices, thereby limiting the soil's productivity to low to medium for a narrow range of crops. Even so, it is possible to reach higher levels of productivity with specially adapted crops (Hopkins et al., 1993).

Comprising 15% of the soils in the municipality (Land Resource Group (Manitoba), 1999), Class 5 soils have such serious limitations (which can be due to physical

characteristics of the soil itself or climatic or landscape characteristics) that they are not capable of the sustained production of annual field crops. There are some soils in this class that could be used for cultivated field crops, though only with the use of unusually intensive management practices. Conversely, there are special crops that require more inhospitable soil conditions than common crops, and some of the soils in this class provide those conditions. Nevertheless, the most common use for the soils in this class is for perennial forage crops (either native or tame), and they may be improved (cleared of bush, cultivated, seeded, fertilized and moisture levels controlled) with the use of farm equipment for the production these crops (Hopkins et al., 1993).

Finally, just under 2% of the municipality (Land Resource Group (Manitoba), 1999) contains Class 6 soils, which are only capable of the production of perennial forage crops. They have some natural capacity for sustained grazing by farm animals but also such serious limitations that the use of improvement practices is unfeasible. Examples of these limitations include soil limitations, such as the physical nature of the soil making it unresponsive to improvement practices or preventing the outright use of farm equipment, or climatic or other limitations, such as an inadequate supply of water for farm animals (Hopkins et al., 1993).

As noted earlier, the quality of soils can be further characterised by looking at their associated soil capability subclasses, which identify soil properties or landscape conditions that may have an adverse affect on the soils to which they are attributed

(Hopkins et al., 1993). There are fourteen subclasses (as noted in (Hopkins et al., 1993)) in the CLIS, the following three of which are particularly relevant to this discussion.

By looking at the soil capability subclasses of the soils in the RM of Springfield, it has been determined that 27.9%, 27.4%, 8.1% and 1.6% of the soils in the RM are rated as Classes 2, 3, 5 and 6 (respectively) with the subclass of 'W' or 'wetness' (Land Resource Group (Manitoba), 1999). In this subclass of soils, agricultural use is limited because of too much moisture. The moisture is usually the result of one or a combination of the following: inadequate soil drainage, a high water table, or seepage or runoff from surrounding areas (Hopkins et al., 1993). Precipitation may add to the problem but is usually not a cause in itself.

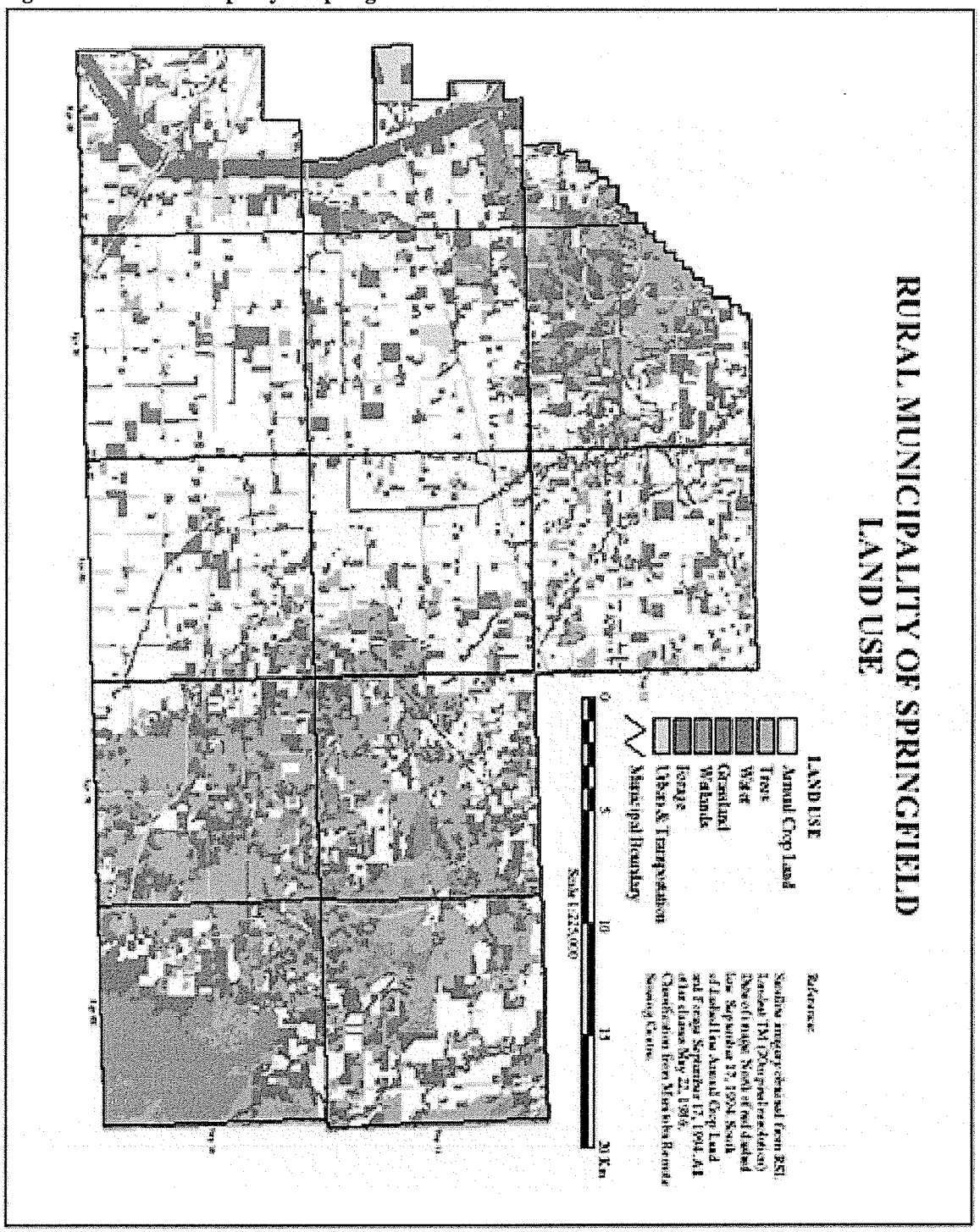
Another 5.9% of the soils are Class 2 with the subclass of 'WP' (Land Resource Group (Manitoba), 1999), meaning that they suffer from the same limitations as a subclass of 'W' but have the added limitation of an excessive level of 'stoniness', indicated by 'P'. Stony soils are usually less productive than their non-stony counterparts, and soils in this subclass contain them in sufficient quantity so as to have a substantially adverse affect on tillage, planting and harvesting (Hopkins et al., 1993).

Because of the deep, clayey lacustrine sediments primarily in the Red River Valley, approximately 65% of the soils in the municipality are affected in some way by excess water, with a portion of them also having enough stones so as to create an impediment to production. In contrast, 4.2% of soils rated as Class 4 and 7.2% of those rated as Class 5

are affected by the subclass of 'moisture limitation', designated by 'M'. The characteristics of soils in this subclass limit the amount of moisture available to crops planted in it, usually due to a low water-retaining capacity. These occur primarily in the Southeastern Plain with its soil profiles comprised of 'looser', more coarse-grained soils. This means that while approximately 90.5 % of the municipality's area is suitable for some form of agricultural activity – and often crop production – the majority of its soils have moderate to moderately severe limitations for arable agriculture and require management practices to remain viable.

With the overall good agricultural productivity of the land in the RM of Springfield in mind, a view as to how the land within the municipality is used is given by LANDSAT satellite imagery (see Figure 3. Rural Municipality of Springfield Land Use). Collected in 1994, it shows that at the time about 51% of the land area was under annual crop cultivation, 3.2% was forage, 19.2% was grassland, 17.8% had thick tree cover, while 3.9% was being used for urban purposes. Based on this information it is reasonable to assume that, generally, the soil resource is being used to its best ability. However, while the amount of land classified as being used for urban activity seems small, the following two points must be considered. First, LANDSAT image resolution is 30 meters by 30 meters, making it hard to distinguish between activities that use smaller amounts of land. Second, rural residences are often comprised of relatively large areas of land and once a number of them exist in the same region, a considerable amount of land may be lost to agriculture and yet not be so displayed on a land-use map derived from LANDSAT imagery.

Figure 3. Rural Municipality of Springfield Land Use



Source: Land Resource Group Manitoba (1999)

Human Characteristics

General Characteristics

The generally favourable characteristics of the landscape encouraged European settlement of the area in 1869 when the Dominion of Canada bought the land from the Hudson's Bay Company. This was followed by surveying and the issue of the first land grants in 1872, and the official formation of the municipality in 1873 (Rural Municipality of Springfield, 1998). As with most of the rest of the Canadian Prairies, the area underwent rapid agricultural development because of its good-quality agricultural land and, until the mid-1960s, most of the municipality's growth was related almost entirely to the agricultural industry. As transportation links to the City of Winnipeg improved, the 1970s and '80s saw an increase in urban activity (primarily residential) as people moved out of Winnipeg and into the surrounding countryside in order to live a 'rural lifestyle'. The expansion of residential development saw the area around Bird's Hill Provincial Park experience an increase in both part-time farming and rural residential development, and the unincorporated urban centres of Dugald and Oakbank develop into bedroom communities (Rural Municipality of Springfield, 1998).

Including Dugald and Oakbank, the municipality has 3 primary unincorporated urban centres. The largest of these is Oakbank with a population of approximately 2,400, followed by Dugald at about 380, and approximately 250 people in Anola, further to the east. Oakbank, having experienced steady growth in the two preceding decades to the point of nearly doubling in size, is expected to see the majority of urban settlement in the future. To meet this potential demand, preliminary subdivision plans have been

developed that would create approximately 250 new homes if implemented. Additionally, there are another eight smaller unincorporated urban centres, which are the hamlets of Cooks Creek, Hazelridge, Glass, Vivian, Ostenfeld, Prairie Grove, Pine Ridge and Navin (Rural Municipality of Springfield, 1998) (see Figure 4. The Rural Municipality of Springfield).

Commercial activity is present to a varying degree in all urban centres, with the majority being located in Oakbank, however some commercial enterprise can also be found along the TransCanada Highway and along Provincial Trunk Highways 12 and 15. Industrial activity is greatest in an area known as the North Transcona Industrial District, which is bounded by Gunn, Springfield and Plessis Roads along with PTH 101 (Rural Municipality of Springfield, 1998).

Population

The population of the municipality has been constantly growing since 1956 (Medd, 1978; Rural Municipality of Springfield, 1998) (see Table.1 Population From Census Years 1956 to 1996). As of 1996 Springfield had a total population of 12,162 – a 9.5% increase over the five year period since the 1991 Census, when the population was 11,102. As the total land area contained in the rural municipality is 1,058.66 km^2, the community has a population density of 11.49 people per square kilometre (Statistics Canada, 1996).

While the population is fairly evenly distributed in the three twenty-year age groupings under sixty years of age, when the population is divided between those under forty-five and those forty-five years of age and older, there is a marked difference with 8400 people

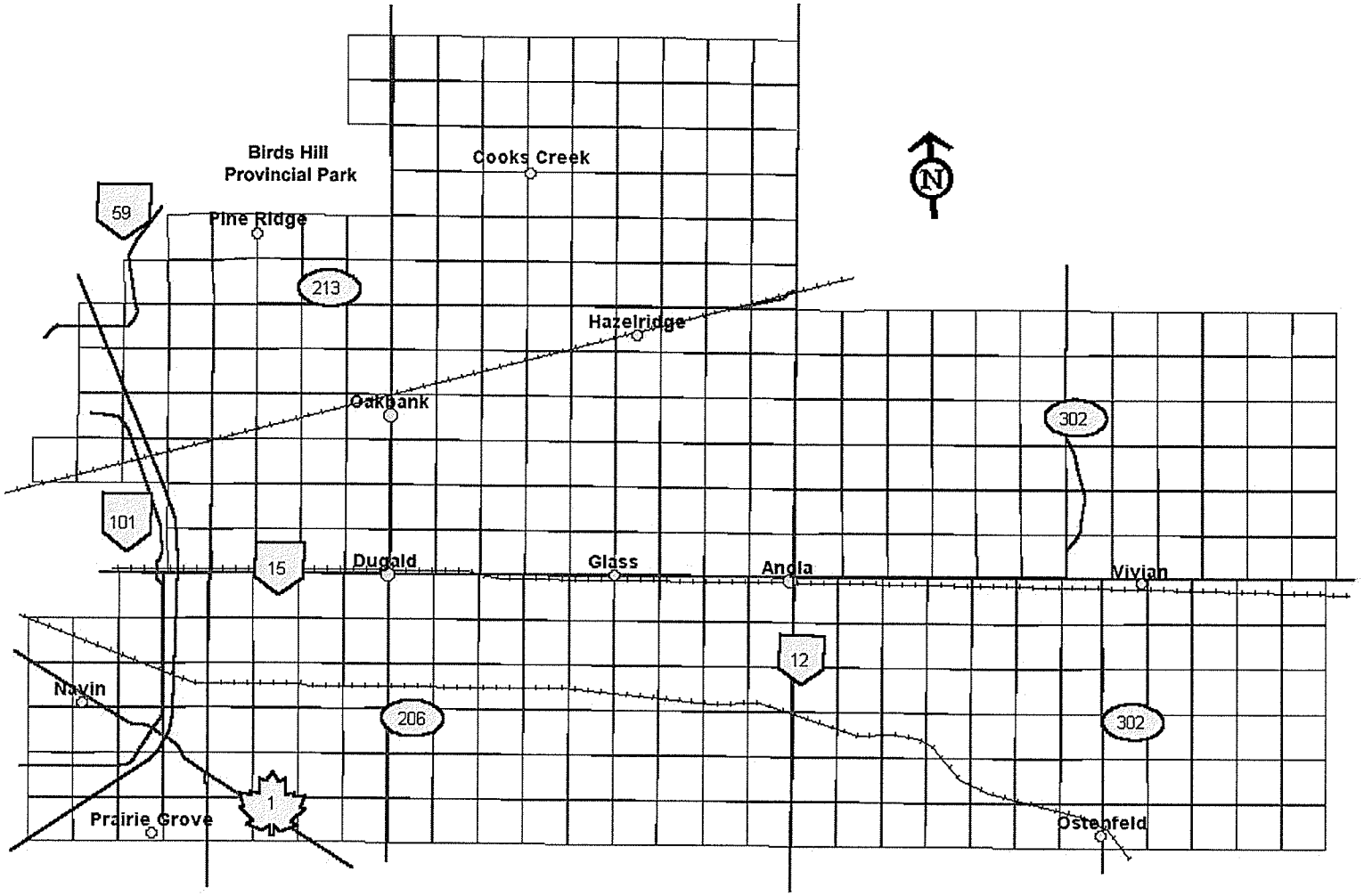


Figure 4. The Rural Municipality of Springfield

Table 1. Population From Census Years 1956 to 1996

Year	Population
1956	5,120
1961	5,608
1966	5,670
1971	5,955
1976	6,944
1981	8,986
1986	9,836
1991	11,102
1996	12,162

Data sources: Medd (1978) and the RM of Springfield (1998).

under the age of forty-five and 3750 people older. The dominant age groups are 35-44 years of age with 2375 people, 5-14 with 2085, 45-54 with 1775, and 1520 people between 25-34 (Statistics Canada, 1996). Adding the populations from the age groups of 15-19 (970) and 20-24 (615) to the group of people 14 years of age and younger, gives a total number of 3665 children likely living at their parent's home.

Some insight as to how mobile the population is, can be gained from studies undertaken by Statistics Canada. In a study examining rural youth migration between 1971 and 1996, it was determined that there had been a net migration of rural youth out of rural and small town areas in each province (Tremblay, 2001). Further, a study of rural youth migration patterns found that while rural areas do not experience a net loss of individuals in all ages, provinces with relatively low incomes, such as Manitoba, have experienced net losses in their rural youth population aged 15-29 during the 1991-1996 period (Dubuy, Mayer, & Morissette, 2000).

At the same time, other studies from Statistics Canada (Beshiri & Bollman, 2001; Mendelson & Bollman, 1998) found growth in rural areas (particularly in rural areas adjacent to a metropolitan centre such as Winnipeg (Beshiri & Bollman, 2001)). Given the fluctuating profits associated with many field crops, and the studies showing youth migration out of rural areas, it is reasonable to assume that agriculture – and particularly crop production – is not an attractive area of employment, and that the growth in small towns and rural areas is due to an influx of older rural residents, and not to young people becoming employed in the agricultural industry.

According to 1996 Census data, there were 6,900 people over the age of 15 in the labour force. Of those people, only about 685, or 10%, of them were farm operators (Statistics Canada, 2001), while approximately 4400 of them commuted to work outside of Springfield (the majority of these, 4270, to Winnipeg, while the remaining 125 or so worked in other Capital Region municipalities) (Statistics Canada, 1996).

An examination of the age range of farm operators shows the majority of them are forty years of age and older. As such it is apparent that the RM of Springfield has an aging farm population (see Table 2. Age Groupings of Farm Operators). Out of the total of 685, about 240 farm operators (over one third) will likely be retiring or looking to decrease their involvement in agricultural activities by the year 2012. As the census was taken in 1996, this means that even those operators who were only fifty-five years old at the time will be in their seventies. Within the next twenty years (and by 2022), 430 or nearly two thirds of the agricultural operators will likely be retiring or looking to decrease the size of

their holdings. Without a significant interest on the part of existing younger farm operators in increasing their holdings, and/or a significant number of new agricultural operators starting up, there will be a large demand by existing older agricultural operators for the ability to dispose of their property in ways that will be most profitable to them.

Table 2. Age Groupings of Farm Operators

Age	Population
> 35	95
35-44	165
45-54	190
55-64	125
65 +	115

Data source: Statistics Canada (2001).

Originally prized for its agricultural land, the main attraction of the RM of Springfield is now as a rural living area, that is within commuting distance to the City of Winnipeg. While not exceptional, the majority of the soils within the municipality are more than suitable for arable crop production and a variety of other agricultural activities. Yet the average age of farmers is increasing, and with it, the demand for the land to change ownership. Farmers often look for others to purchase their land, and in this municipality, the majority of the demand for land is as the site for new rural residential development.

Data

The following section explains how the factors described above are examined through the use of the data used in this study.

Building Permits

An important question for this study is to determine what affects the aforementioned population characteristics are having upon the way the landscape is used. When, as in the case of Springfield, there is an increasing general population, an aging population of agricultural operators, and an increasing demand for rural residential development, likely locations for these developments would be on land formerly used for agricultural purposes. The problem noted earlier with respect to the LANDSAT imagery is illustrative of the general problem of accurately determining the amount of land lost to agricultural activities. To overcome these problems, building permits will be used as the primary indicator of change.

As noted in the previous chapter (and discussed more fully in the following chapter), land ownership can be indicative of whether there might be change in the way the landscape is used. There is therefore a need to decide on the method to determine what changes in ownership and use are taking place. There are two general ways of looking at the way land is currently being used, or will be used in the future: 1) approved subdivision applications, and 2) building permits. A subdivision is the division of a single parcel of land into two or more parcels. In most cases land owners must apply for permission to subdivide their land. Due to concern over the loss of farmland, the 1976 Planning Act required all applications for land subdivision to be reviewed and registered. Under the previous Planning Act, subdivisions could be approved by local authorities without review (MacLean, 1985). The increased importance of the subdivision process, post-1976, facilitated later studies examining land ownership and use.

Decision-makers within the provincial government felt that the loss of agricultural land could be monitored by examining approved subdivision applications. MacLean (1985) states that a computerized method of cataloguing subdivisions, implemented by the Department of Agriculture in 1982, allowed very accurate determinations of agricultural land loss because the information entered for each subdivision contained factors such as geographic location, CLI rating, previous and proposed land use, and number of lots. Nevertheless, the problem of 'intention' and the actualisation of that intention is introduced by a study in which it was recognized that 1,600 hectares of rural land was subdivided for *future* residential use (Friesen, 1985; MacLean, 1985).

A study of agricultural land subdivision between 1976 and 1984 reveals a fairly consistent rate of subdivision from 1976 to 1980 (MacLean, 1985). However, if the area of land subdivided per year in the RM of Springfield is compared with the number of building permits issued by the municipality, and if it is assumed that the houses built in those years were built on the land subdivided, each residence would have been built on approximately 1 acre for 1976 and 1977, and then on about half and acre for 1978 and 1979, and again on approximately 1 acre for 1980 (see Table 3. Area Subdivided and Building Permits Issued From 1976 to 1980). This is unlikely as the subdivision policies section of the Provincial Land Use Policies under the Planning Act recommends that rural residential lots should be a minimum of two acres in size in order to accommodate on-site sewage disposal (Manitoba Intergovernmental Affairs, 1997). As such, it is likely that some of these residences – perhaps the majority – were being built upon land

subdivided in previous years. This illustrates the problem of the type of information that can be derived from a reliance on data on approved subdivisions.

Table 3. Area Subdivided and Building Permits Issued From 1976 to 1980

Year	Area Subdivided (in hectares)	Resident Permits (approximate)
1976	98	225
1977	104	260
1978	24	140
1979	15	75
1980	23	55

Source: MacLean (1985).

The variability in the timeframe associated with the subdivision of land and its actual use is further illustrated in a study of rural residential development in the Winnipeg region, undertaken by the provincial government and published in 1990. In this study an analysis of the supply of lots available for residential development was performed, in part by comparing the amount of land subdivided and the number of residences built between the years of 1976 and 1989. The study found that there was an eight year supply of rural residential lots in the Winnipeg region if the supply of rural residential lots available in 1989 was divided by a demand of 431 lots per year (Urban Affairs, 1990). However, the potential supply of rural residential lots could be increased to 34 years if the 14,656 potential two acre lots designated in the development plans, planning schemes, and zoning by-laws that existed at the time were used as the number for the supply (Urban Affairs, 1990). Again, the proposed use and the actual use can obviously be quite different when (and if) development finally takes place.

In a discussion of the methodology used for a study of the ways land use policies could affect rural residential development, it is noted that residential lots created by subdivision tend to remain vacant (Medd, 1978). In fact, a previous study of land division in Manitoba had found that approximately half of all of the lots subdivided remained vacant for a minimum of five years (Municipal Planning Branch, 1975). The use records of land sales as an alternative way to determine the extent of residential development was also considered, however it was noted that land is sold for a variety of reasons, and as such, could not be an efficient means of determining the extent of residential activity (Medd, 1978). In order to acquire a more precise approximation of building activity, a decision to use the records of building permits issued for residential purposes was made (Medd, 1978).

Clearly, the value of using approved subdivision applications as an indicator of land use change is questionable, as the length of time between when a change in land use is proposed by lot division, and when that change actually occurs, is difficult to determine and can be affected by a variety of factors. Examples of these include the demand for land, and the way in which it will be used. It follows that a more reliable indicator of change is the number of building permits issued each year for residential development. As it is unlikely that either the land upon which a residence is being built is owned by someone other than the would-be owner of the residence, or that a residence will not be built once a permit has been issued, it is fairly safe to assume that the land upon which the residence will be built has changed both in ownership and use, and will be taken out of agricultural production.

Once the decision was made to use residential building permits as the indicator of land use change, an electronic database of the permits for the RM of Springfield was required. This database was created using the application FileMaker Pro, and the completed database file was imported into MapInfo, the GIS software used for this study's analysis. All of the original permits are on individual sheets in a binder for each year, and each permit was examined to determine whether or not it was for a residence before being entered into the database. For the years between 1971 and 1991, permits were divided into two separate binders, one for the municipality and another for the part of the municipality that fell within what was called the Additional Zone (there were no records for this zone from 1966 to 1970). Under the Metro Development Plan, established in 1966, the provincial government delegated planning authority to the City of Winnipeg for the land within its corporate boundary as well as land within the entire RM of East St. Paul and parts of the RMs of Taché and Springfield. The City of Winnipeg Act (established in 1971) was amended in 1991 to dissolve the zone and delegate planning authority to the pertinent municipalities or planning districts. As such, for the twenty-five year period between 1966 and 1991, part of the building permit records for the RM of Springfield were generated by the City of Winnipeg.

The following information was compiled from the building permits for the municipality.

- *Permit Number:* The number given to each building permit made up of the year the permit was issued and the total number of permits issued for that year (e.g. 99-1, 99-2, 99-3…).

- *Roll Number:* The provincial government assigns each parcel of land a discrete number with which it is identified for tax and administration purposes. A roll number on a building permit would enable the association of a residence with the parcel having the same number. It turned out that just under half of the permits did not have a roll number listed.
- *Fee:* The amount paid for the permit. If necessary, this information could help in determining whether or not the permit was issued for renovation or construction.
- *Lot/Block/Plan:* A form of legal description denoting the location of a parcel of land. Prior to the Dominion Land Survey (see below), parcels of land were defined by the boundaries of the individual owner's lot, its relationship to the surrounding lots in a block, and its relationship to a plan of survey. After the Dominion Land Survey, these designations were incorporated into the newly established township system. Some plans of survey still designate a lot/block/plan.
- *Section/Township/Range:* A form of legal description used in the Dominion Land Survey system wherein land was mapped on a grid system into numbered townships of 36 square miles each. The townships are located on range lines counted from meridians. Each township is divided into 36 one square mile sections, and each section is further divided into quarters (that have 2640 feet to each side). As such the location of an attribute in SW-22-11-5-E means that it would be located in the southwest quarter of section 22 in Township 11 range line 5 east of a principle meridian.
- *Zoning:* The development zone designated for that area (e.g. 'commercial', 'residential', 'agricultural', etc.)
- *Frontage:* The distance between the building and the road.
- *Acreage:* The amount of land comprising the parcel.
- *Class:* Whether a building is 'new', 'temporary' or (being) 'demolished'.
- *Cost:* The value of the building. This was also helpful in determining the building's type (for instance whether it was a domicile, renovation of a domicile, barn, garage or shed) and class.
- *Date:* The date the permit was issued.
- *Comment:* Used for the inclusion of extra, potentially useful information.

Basic problems involved in the collection of this information related to changes in the information required for the permit forms over the years, failure to properly or completely fill out the forms, and at times, even difficulty in reading what was written on the forms. These problems primarily resulted in an inability to locate many residences more accurately than within a quarter-section, although it was occasionally difficult to determine the type of structure permitted. There were also problems with some building permits that were issued by the City of Winnipeg for the Additional Zone, which suffered from the same sort of problems listed above, but also had a tendency to site new residences by address (e.g. 235 PTH 15), rather than legal description (e.g. lot/block/plan or section/township/range).

Other problems with the creation of this data-set included the unreliability in the issue of demolition permits and difficulty in determining whether or not a house trailer was to be permanent or temporary. Demolition permits and permits for temporary residences were not used in the analysis of residences; however, it is likely that some houses were demolished without permits, or some temporary trailers became permanent, and vice versa. As such, the exact number of residences located and removed over the study period have not been determined.

Farm Operator Age

In order to estimate the potential for future land use change, the following age groups of existing farm operators were obtained: less than 35, 35-44, 45-54, 55-64, and 65 and over. The age groupings were obtained from the 1996 Census of Agriculture taken by Statistics Canada. The smallest standard geographic area for which census data are

reported are enumeration areas, of which there are nineteen in the RM of Springfield. While all census data is usually aggregated to a much larger region when released to the public, the Agriculture Division of Statistics Canada agreed to perform a special extraction to the enumeration area level for this study. The information on each age of the six age groups within each enumeration area was aggregated to zero or five to help preserve confidentiality.

Maps

Three of the maps used for this study came from two different sources, while one was created for this study. The parcel map and the land use designation map were both provided by DataLink Mapping Technologies on behalf of the RM of Springfield. The parcel map shows how the land has been subdivided within the RM as of the summer of 1999. For this study, it is used to examine current land division and to place the location of residences to within their proper quarter section at least. Along with the road network, the scale of information displayed ranges from sections, quarter sections and individual parcels. Because this information is in digital form and is used within a geographic information system, a variety of attribute information is associated with each of the individual parcels. This includes the owner's name, the address, the parcel's roll number, a legal description, the dimensions of the property, the types of building (if any) located on it, and the development zone (as designated by the municipality) within which it is located.

As noted previously, approved subdivision applications are not reliable indicators of physical change on the landscape. However, the parcel map, which is created using lot

boundaries determined by approved subdivisions, is indicative of a land-owner's desired land use. For instance, a farm operator may wish to decrease his or her land holdings for a variety of reasons. Subdividing a large holding into two or more smaller, but still large holdings (e.g. 40 acres), there is still a possibility of the land being used for agriculture by another operator. Conversely, if a series of smaller lots are created (e.g. 2 to 5 acres) it is quite likely that the land-owner would like to see residential development on those lots, as they can not be used for much else in a rural area. As such, the parcel map is an important aspect in an examination of potential change.

The land use designation map was created for the municipality to assist in the planning decision-making process. It is primarily useful as a quick indicator of the type of use a particular area within the municipality is 'zoned' for (and which can therefore take place), but it can also be used for a variety of analyses including: the determination of existing non-conforming use in a particular area, or throughout the municipality; the determination of the amount of land available for a particular type of use; and to examine the suitability of the physical characteristics of land for the proposed use. In this study, it is used to compare residential development and parcel subdivision with proposed land use, and to determine the suitability of proposed land uses with the physical characteristics of the landscape.

The latter determination is achieved through the use of the soil classification map, provided by the Manitoba Land Resource Group (which is jointly operated by Manitoba Agriculture and Agriculture Canada). This map shows the Canadian Land Inventory

classifications for the soils in the RM of Springfield, and is used to show the quality of soil associated with non-agricultural uses.

The final map is the enumeration area map. Created by tracing the section boundaries of the parcels maps based upon the Statistics Canada enumeration area boundaries, it is used to show the areal boundaries for the various groups of agricultural operators. In addition to these maps, the IRS satellite image – used for the build-out map – has a pixel resolution of 5 metres (i.e. each pixel covers five square metres of the earth's surface) and has been geometrically corrected so that it has a 'true north' orientation. The imagery, which is grey-scale and 'photograph-like' was acquired for, and provided by, Manitoba Intergovernmental Affairs in 1999 and provides the viewer with a picture of what the landscape looked like at the time of the study.

Summary

The RM of Springfield, located immediately east of the City of Winnipeg, has a soil profile that is generally good for agricultural purposes, but physiographic relief that contributes to moisture retention in the soil and which can limit the productivity in areas. Nevertheless, the use of soil conservation measures enables arable crop producers to attaub a good level of productivity. A much greater problem for the agricultural community within the municipality is the encroachment of urban activity, primarily in the form of rural non-farm residential development. Land use conflicts and an outwardly migrating youth population make it hard for existing agricultural operators to pass their land off to their children, or to sell it to others interested in farming. As such, there is

pressure for a shift in land use, from both farmers themselves as well as from people wishing to buy land for rural residences.

The best way of establishing a physical change in the way the landscape was used, entailed tracking the development of rural residences throughout the municipality. This is accomplished by an inventory of the residential building permits issued in the RM of Springfield from 1966 to 1999. Residential development is plotted with the help of a parcel map, which shows how the land has been divided, via MapInfo, a GIS application. Future pressure for continued shift in land use is examined using the ages of agricultural operators in the nineteen enumeration areas within the RM. Other maps used in the analysis of these issues include the RM of Springfield's Development Plan land use designation map and the soil capability map for the municipality.

While an increasingly popular use for rural land, the movement of urban people into predominantly rural areas is often highly problematic, in addition to the fact that the land experiencing this shift in use is removed from food production. Also, the same factors that limit soil capability for agriculture, can have an adverse affect on urban forms of development. The issues surrounding the controversy of ex-urban settlement in agricultural areas are examined in more detail in the following chapter.

CHAPTER 3: How Land Use Patterns Evolved, Why Open Space is Important, and Attempts to Control Development

Settlement in the Post-Industrial Society

Origins of the Suburbs

In 20th century North America, decisions regarding land use were fundamentally defined by the amount of space available, Ford's industrial process and the automobile. Gasoline consumption in the U.S. and many Canadian cities is at least four times higher than that in European cities and over ten times greater than in Hong Kong, Singapore and Tokyo. This can be explained in part by a difference in efficiency and compactness of land-use patterns, as those that are more compact and efficient use land more intensively (with more people, industry and commerce per unit area) and are more oriented towards public transport and/or walking and bicycling (Roseland, 1998).

When using wealth as a determining factor, wealthy Europeans tend to live in the city centre, while those of more modest means live further out. While this pattern was similar across North American around the turn of the century, a reversal could be seen in the 1920s (Harris, 2000). With the amount of non-urban space in North America, it was easy for cities to expand outward once the impetus and means were present. The impetus was the assembly-line production system which consolidated all of the facets of production in one place. This was accomplished by combining activities and functions in areas that could accommodate them (and which were cheaper), outside of the central business district (CBD). On the other hand, the means were provided by personally-owned automobiles which gave the workforce the ability (both physically and financially) to live

in areas separated from their places of employment. Together these factors helped generate suburban growth and the decentralization of the urban population which meant the decline of inner-city populations as manufacturing activities moved to greenfield sites (Golledge & Stimson, 1997).

While the automobile facilitated settlement in areas at some distance from places of employment, settlement patterns evolved out of the multitude of decisions made at a variety of scales, from individual and household levels to those made up of businesses and all levels of governments. As such, settlement patterns need to be looked at within the context of larger societal change (Bryant & Coppack, 1991). There has been a shift from an industrial society to a post-industrial society, characterised by a shortening of product cycles, the growth and development of a variety of service sectors which, along with manufacturing processes themselves, are more information and capital intensive, and less energy and labour intensive. As well, there is an obvious increase in importance of knowledge as capital, accompanied by an increasingly open economic system, advances in communication technology, and an increasing variety of consumer 'needs' (Bryant & Coppack, 1991; Golledge & Stimson, 1997).

These broad shifts or changes can be seen as functioning through 'systems of exchange' which exist at and between various levels of geographic scale. Globalisation and internationalisation have had a powerful effect on the nature of production, as well as flows of capital, trade and passenger travel (Golledge & Stimson, 1997). That being exchanged consists of ideas and information as well as physical or monetary commodities

and services. The interactions of the systems of exchange are quite variable. An individual firm can be part of regional, national, and international systems of production and consumption, individually, or at the same time. Systems of exchange can also be quite local, such as farm produce being sold at a farmer's market, or more regional, as exemplified by the commuting flow that ties suburban or ex-urban residences with employment in the built-up core of the city (Bryant & Coppack, 1991). As such, these flows of goods, information, money, capital, and ideas are the basis of the interactions that link the multi-scaled decision-making units together. Broad societal trends transmit their influence three-dimensionally through the different systems of exchange to produce changes in settlement structure (Bryant & Coppack, 1991; Bryant & Johnston, 1992).

Post-industrial society has influenced changes in settlement structure through the improvement of transportations systems, changes in the nature of communication and production technology, and the development of new 'needs'(Bryant & Coppack, 1991). The improvements to transportation, communication and production systems allow for a greater connection of economic activity and the integration of the national urban system, while the new 'needs' are a product of a greater emphasis placed on the somewhat nebulous concept of 'quality of life.' A greater quality of life can be brought about with increased amounts of disposable income which, while not entirely necessary, would certainly enhance the ease with which one could improve personal health and fitness, increase levels of education, and increase the quantity – and quality – of the enjoyment of tourist experiences and the natural environment through outdoor recreational activities (Bryant & Coppack, 1991; Golledge & Stimson, 1997). The affects of these new needs

can be seen in a variety of ways, not the least of which is the increasing number of people seeking residence outside the built-up core of the city if not outside the city itself. As well, there has been an increase in the number and availability (through organised trips and tours) of outdoor recreational activities such as sports, parks, horse-riding, and amusement parks throughout 'the city's countryside'. The search for new experiences also includes rural excursions for small-town shopping and the opportunity to personally collect produce through the pick-your-own farm produce outlets (Bryant & Coppack, 1991). The satisfaction of these 'needs' are one example of an indicator of the fact that suburbanisation has become the dominant process of growth (Golledge & Stimson, 1997).

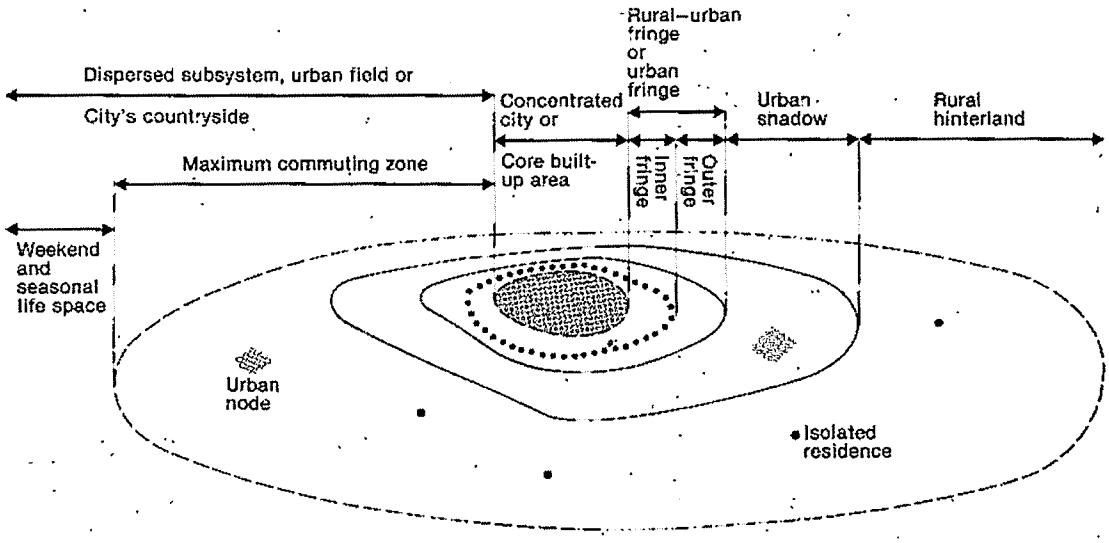
Defining Regions of Land Use

The outward expansion of cities contains four general zones (see Figure 5. The City's Form). First, the *suburban* zone contains a continuously built-up area of primarily newer houses, surrounding the older parts of the city. Second, the *urban fringe* adjoins the built-up city and contains residences along with commercial, industrial and other types of buildings creating an area with both rural and urban land use activities. This zone more intensively invades the rural countryside, in contrast with the primarily rural third zone known as the *urban shadow.* Generally speaking, the urban fringe contains a population density and activities which are semi-urban and become more urban over time, while the urban shadow is primarily rural, both in population density and land use activities, and yet is where the first noticeable signs of urbanisation occur. The fourth zone is known as the *commuting* zone or the 'workshed' and is the total area, including both the urban fringe and urban shadow, from which people commute to employment in the core built-

up area. Another concept germane to this topic is that of the *regional city.* It is defined as the entire activity space of a large city, encompassing the urban fringe, urban shadow, and commuting zone (including small urban areas such as villages and towns) as well as the core city itself (Bryant & Coppack, 1991; Russwurm, 1975).

Moving outwards from the city is a decreasing intensity of land use along with a decreasing value in land prices and a decrease in the permanence of the environmental change resulting

Figure 5. The City's Form



Source: Bryant, Russwurm, and McLellan (1982).

from that activity. As a city grows, it primarily grows outwards (as opposed to increasing the intensity of land use within its perimeter) and invades land with the least intense activity which is often agriculture. This process is primarily financial in nature, as the activity with the higher rate of return can buy-out the activity with a lower rate of return. For example, a group of individual residences can be bought in order to construct an office building in their place. In turn, agricultural land can be purchased in order to build

residences. This growth incorporates or replaces the current land use, often resulting in conflicts between those engaged in both the new land use activities and those already in place (Russwurm, 1975).

The Cosmology of the Urban Universe

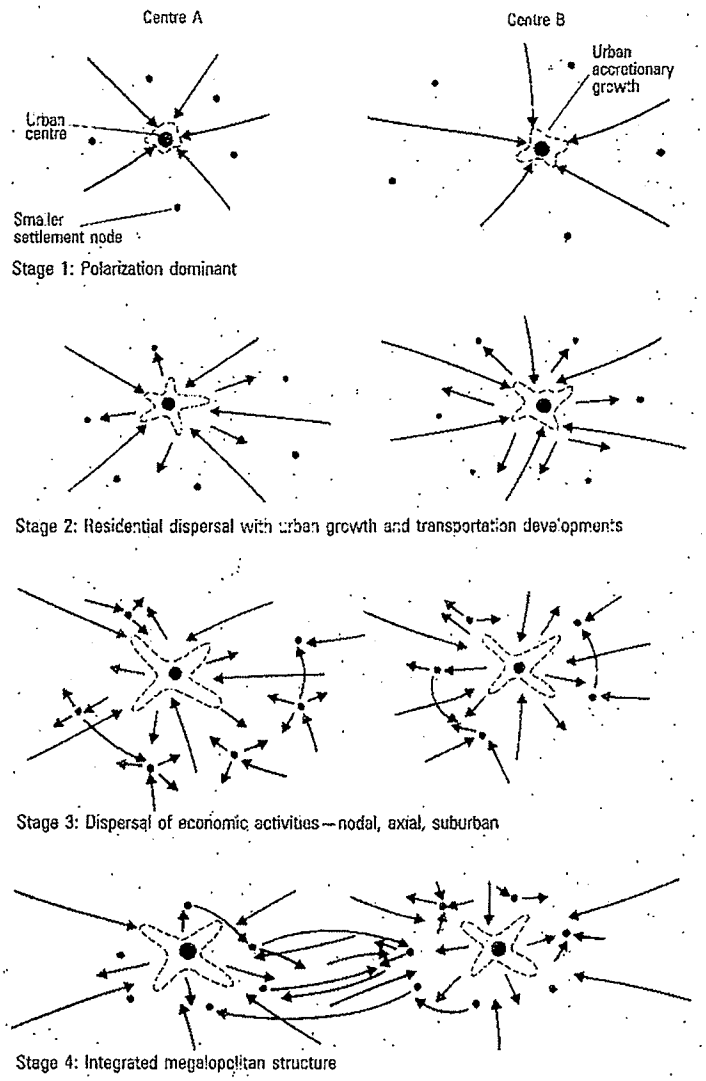
Again the concept of scale comes into play as, at a national level in Canada, the trend in settlement and commercial activity is towards urban growth. However, at regional metropolitan levels the trend is growth in suburban, fringe, and shadow areas, and an outward spread of the urban landscape. While different regions exhibit variations in population change and in the patterns of urbanization, we nevertheless see, at a broad, national scale, an 'implosion' of population; people concentrating in urban centres or urban-centred regions. Conversely, at a more local scale we see an 'explosion' of an population into suburban and rural areas (Bryant & Lemire, 1993; Keddie & Joseph, 1991a, 1991b; Lands Directorate, 1985, 1987; Mendelson & Bollman, 1998; Statistics Canada, 2000). The influence of changes in societal attitudes and inclinations as well as the inter-relationships between broad patterns of inter-regional urbanization and intra-regional distributive change can be seen as the physical forces at work within a *galactic metropolis.* The phrase, coined by Peirce Lewis (1995), refers to the shift of urban patterns from a concentrated, central urban core to a more diffuse pattern of population densities and commercial zones. Like a galaxy of stars and planets, nodes of residences and commercial enterprise develop around one another, held together by a 'gravitational' attraction of mutual need. These concentrations of activity exist as points in space with areas of lower density between them and are a reflection of the inter-relationships

between broad patterns of inter-regional urbanisation and intra-regional change. The patterns (see Figure 6. Evolution of the Urban-Centred Region) they create are illustrated in a four-stage historical model of settlement evolution in urban-centred regions (Bryant & Coppack, 1991; Bryant & Lemire, 1993; Bryant, Russwurm, & McLellan, 1982).

In the first stage of the model, populations and economic activity are concentrated in the larger urban nodes. Originally, these centres were in the midst of agricultural activity and grew because of complex shifts in economic and social systems such as the accumulation of both ancillary and unrelated industries along with the mechanization of agriculture and the resulting displacement of labour or even the draw of the 'bright lights' of the city with people looking for higher-paying industrial or urban jobs. Improvements in transportation and communication that come with such concentrations allow for further use of the city by rural populations because of the ease in moving people and goods (Bryant & Coppack, 1991).

Residential enclaves develop around the periphery of the city, as suburban growth occurs due to the attraction of nearby urban opportunities. Industrial and commercial activities establish in and around these new aggregations of population, as the 'dispersing matter' begins to coalesce into new nodes, or 'constellations'. While the city boundary is still well-defined by the edge of the built-up area and its corresponding political delineation, its influence is felt much further afield (Bryant & Coppack, 1991). The new commercial activities around the city's edge provide employment and other commercial

Figure 6. Evolution of the Urban-Centred Region



Source: Bryant (1992).

opportunities to an increasingly mobile rural population, tying the surrounding rural area even closer to the city core and representing the early stages of 'regional city' development (Stage 2 of Figure 2) (Bryant & Coppack, 1991).

The third stage of the model shows a maturation of the settlement form as industrial, commercial and residential nodes. This new dispersed mass of people and commercial activity collect as points in space, and increase in density. These urban activities are drawn out in this way due to the pull of cheaper land and building prices and rent, along

with differences in taxes and living environment. The increasing population bases further act as a draw of economic activity, once densities reach threshold market sizes (Bryant & Coppack, 1991; Bryant & Lemire, 1993; Bryant et al., 1982).

The fourth stage is one not all urban regions can be expected to reach and is best exemplified in Canada by the collection of overlapping urban fields (the area beyond the edge of the built-up city) in the 'Golden Horseshoe' area of Ontario. Here, several urban nodes exist in close proximity and feel the 'gravitational' attraction of intra-regional forces (from economic, to more subjective forces or influences, such as what constitutes the 'ideal' place to live) which continue to redistribute population and activity (Bryant & Lemire, 1993). Clear structural distinctions between one urban area and another, and even between 'urban' and 'rural,' have become difficult to determine as the patterns of population, social and economic interaction have pulled urban activity around an increasingly wide area. Even so, there is a continued centralizing pull from the built-up area centred on Toronto, fuelled by the concentration of employment and economic activity as well as the development industry and local planning policies, along with the continued public investment in the public transportation system and highways (Bryant & Coppack, 1991). It is unlikely that urban regions such as Regina, Saskatoon, Winnipeg, and Saint John's, for instance, will ever develop to even the third stage in form because of the lack of an elaborate urban system, and comparative isolation from other large urban cores. In these cases, the low initial density of urban centres, and low regional growth pressures, inhibit the degree of expansion of population and economic activity to

the extent required for a mature 'Stage 3' or even infant 'Stage 4' (Bryant & Lemire, 1993; Bryant et al., 1982)

Problems Related to Urban Sprawl:

The outer edge of the city is often where inefficient and conflicting land uses are found as no, or ineffective, planning can result in scattered, conflicting, and disorderly activities. These activities will not only interfere with future planning but frequently take over high-quality agricultural land and open space (area that is left in a natural or at least undeveloped state) when the use of land less suited to agricultural uses would be preferred. Urban sprawl is the unplanned extension of low-density land use activity into rural areas, often occurring along main traffic corridors. As its name implies, there is little control of land subdivision, resulting in the inefficient use of available space and the physical environment. Individual residences or groups of residential developments are spread out and interspersed with incompatible land use activities (Russwurm, 1975).

In the 1980s nearly 60% of net growth in Canada's census metropolitan areas (CMAs) (a CMA is Statistics Canada term for a very large urban area and the urban and rural areas adjacent to it, and has a core population of at least 100,000 (Statistics Canada, 1999)) and almost 50% of the country's overall net growth was located in the CMAs' fringes, which account for an increasingly larger share of CMA population (Bryant & Lemire, 1993). A study examining rural residential development, undertaken by Manitoba's provincial government speaks of the issues facing the populations in these fringe areas by identifying two main types of problems: those relating to resource management (loss of agricultural land, conflicts with agricultural activities, waste disposal, drainage and flood

control, ground water pollution, loss of aggregate resources and degradation of recreation resources); and those relating to settlement (future city growth, protection of highways, cost/revenue ratio of rural residential development) (Urban Affairs, 1990). These problems can be discussed under the headings of *premature development, irregular development, cost of services, impact on existing communities, land speculation* and *environmental concerns.* The following discussion closely follows Russwurm's (1975) presentation of the affects of urban sprawl.

Premature development can be defined as the development of subdivisions before the construction of infrastructure (paved roads, sewer and water lines), or the preparation of an amount of land in excess of what is needed to fill demand. Both result in the misuse of land as, in the first case, urban services are not available and, in the second, more land is cleared than is necessary and thereby made unavailable for other uses. As well, public utilities (e.g. Manitoba Telephone System and Manitoba Hydro) must build plants with the capacity to provide service for the entire development. In this case, current residents must bear the costs of the service, including the costs of servicing those lots which have still to be developed or occupied (Russwurm, 1975; Urban Affairs, 1990).

Irregular development results from the development of land that is not adjacent to the built-up city for a use that is incongruent with existing land use. This sort of development does not follow the principle that necessary outward growth should occur as a continuous outward addition to the built-up city, on land suitable for the desired type of development.

Inflated *costs of services* are often a direct result of irregular development. As urban growth extends outwards, so must urban infrastructure. Infrastructural provision is most efficient if it is a compact extension of existing infrastructure as the costs of services such as watermains, roads, sewers, and hydro and gas lines are basically in proportion to their length: the shorter the average frontage length per user means that more residences are served per unit of length and the lower the cost of the service will be per residence. In some cases, particularly water and sewers, population density is often too low for 'group' or 'community' service to be provided, and each individual residence needs a well and some sort of septic system. When this sort of development occurs close to the city it often takes up land which may be required for future urban expansion. Conversely, it may trigger unnecessary expansion of the city's edge by creating development pressure outside of the urban boundary. Either way, to (re)develop the land for any urban use would likely require careful reorganisation and landscape modification to preserve the existing rural residences, or a wholesale and expensive clearing of the existing landscape, including residential developments (Urban Affairs, 1990).

The *impact on existing communities* inappropriate development has is directly related to the previous problems. Existing communities have evolved particular forms of infrastructure suited to their needs, and adapted to fit their surrounding land uses. Unilateral and inconsistent development places undue strain on the systems in place. For instance, roads, schools and emergency services may need to be upgraded, resulting in an increase in taxes. As well, different land uses may conflict resulting in complaints from

new rural residents unhappy with the noise, smell, and dirt produced by agricultural operations, and farm owners facing decreased revenue from an increase in property tax, resulting from the higher property assessments triggered by increased rural residential development in the area.

Land speculation is the holding of land for a period of time with the expectation that its value will increase, even without any modification. In order for such speculation to be successful, the land's value must increase at a more rapid rate than the holding costs per annum. As mentioned above, the 'value' of less intensively used land is lower. As such, there is considerable appreciative potential for rural areas adjacent to growing urban centres, because this land can be sold for a much higher price to developers with urban land uses in mind (Russwurm, 1975).

There are three main problems that result from this sort of speculation. First, it unnecessarily drives up the price of land, increasing the cost of residential land for the average citizen. This is particularly so if the land changes hands several times. The second problem is the limiting factors placed on land use by speculation. The first of these is a result of the land is sitting idle, waiting for a particular urban use. It is to be sold for urban use because these command the highest prices, therefore it is too expensive for any other use. Finally, because the foundation of speculation is 'optimism', there is often a greater supply of land than there is a demand for it. As a result, there is a gratuitous area of land sitting idle . The third problem resulting from land speculation is its hindrance of sound planning. Continuous, orderly development cannot be

accomplished with speculators holding onto land in order to derive a larger profit in the future. The potentially resulting irregular development, due to this hoarding of land or the expectation of higher demands than are needed, increases the cost both of future development and of the current supply of services. Another possibility is that the speculator may simply wish to develop the land for a use which is not recommended by the principles of sound planning.

As suggested earlier, there are a variety of *environmental concerns* brought-about by urban forms of development in rural areas. A significant problem that people living in the bed of glacial Lake Agassiz must consider is the periodic flooding of the Red, Assiniboine, Seine and La Salle Rivers, along with a variety of smaller water-ways within the region. The flood in the spring of 1997 is an impressive example of this problem, and showed to great effect the extent of the human suffering, property damage, and public expenditure in disaster relief and flood protection resulting from the restriction of the natural capacity of the flood-plain to deal with increased amounts of water associated with more intensive development. Rural drainage systems designed to meet agricultural standards, and which only accommodate excessive run-off from rainfall and not spring flooding, are often the only pre-existing flood protection afforded to rural residential development. In addition, the situation is compounded by the increased runoff resulting from a loss of the land's natural water-retentive capabilities by intensive development, leaving few solutions to the problem (Urban Affairs, 1990).

As well, the twin resources of water and sand-gravel, both of which are often found within the regional city, are affected by and play a role in the creation of development-

related problems. Potable water for both the built-up city and for residences within the surrounding rural area are acquired from either local aquifers or exposed bodies of water. As such, the placement of residential and non-residential activities alike can have a great affect on these important resources. People living outside of the city can see their water tables drop due to demand from the built-up city, or their water become contaminated as a result of some urban activity. Rural residential development itself has often been the cause of groundwater pollution in three ways. First, the improper construction or operation of private sewage systems could directly contaminate near surface aquifers. The frequent failure of these systems causes wastewater to pond and runoff into natural and constructed drains and waterways resulting in pollution, drainage and groundwater contamination problems. This is a particular problem for the municipalities around the city of Winnipeg because of the clay-based soils of the region which restrict the downward movement of effluent, causing surface overflow. Second, the drawing down of a freshwater aquifer can allow the intrusion of saline water from a bordering saline aquifer; and third, the drawing down of a freshwater aquifer can allow contamination from polluted surface water. When the available potable water supplies become unusable, freshwater must be provided by other more expensive means such as private hauling, cisterns or municipal-piped systems. (Russwurm, 1975; Urban Affairs, 1990).

While problems relating to residential development are significant, other land-use activities established to supply urban demands often use larger amounts of land. Industrial land-use activities are problematic because they can require large amounts of land and/or annoy neighbours with noise, odours, dust and smoke. While these activities

are necessary, the problem – from a planning aspect, is where to put them so as to allow them to operate successfully while not adversely affecting existing or future activities. A good example of a necessary but problematic industrial activity relates to the need for sand-gravel. Because this resource is the foundation of the construction industry as well as many types of landscape modification, and because of its bulky nature, sand-gravel collection sites tend to be close to the built-up city. The noise and dust created by these operations can be an annoyance to any other activity nearby, and the operation significantly – and detrimentally – modifies the landscape on which it takes place. As such sand and gravel operations are a significant planning problem even after they move to another area.

Nevertheless, the regional city is affected by commercial land-use activities in a more direct way than industrial activities. With the latter the concerns are primarily related to planning; however, commercial activities outside of the city core often have a direct affect on those within the core. Large shopping centres are usually located in the suburbs or the urban fringe, to take advantage of both urban and rural populations as well as lower priced land. As such they can have a great affect on the viability of existing commercial ventures, particularly in the centre of the city.

Commercial and industrial types of developments also tend to attract residential development and can eventually become part of the built-up city, regardless of the affect such ad hoc development may have on the efficiency of use of the landscape. Small businesses also open in the urban fringe, in order to fill available commercial niches.

Examples of these types of businesses include service stations, banks, and convenience stores. They tend to cluster in small shopping centres, strip malls or isolated corner locations; while motels, gas stations, and restaurants grow along urban fringe highways. Ultimately, all of these types of commercial development may not fit into future forms of development, and may lead to areas of wasted land as the businesses may become no-longer viable. In addition, as with improperly planned residential space, the space such commercial developments occupy may have to be modified at considerable expense.

Even 'rural space' itself has become a resource due to the increase in the variety of consumer 'needs'. So strong is this 'need' that people move their residences outside of the built-up city for the same reasons they drive out on the weekends or holidays; namely to enjoy the open space, clean air and recreational opportunities. These factors demand planning and management on a regional scale in order to maximise the utility of the landscape.

Ultimately all of these types of activities can put pressure on agricultural land resources. Speculation can lead to tracts of land sitting idle; high land prices discourage both farmers from expanding their operations and discourage people interested in farming from buying land. Furthermore, agricultural land is more frequently rented-out, which can lead to its intensive use with little concern for the maintenance of soil fertility. As residential areas spread outwards, existing rural residents face higher taxes as the value of land increases and the cost of services rise due to the increase in demand. While many are concerned with the amount of agricultural land being lost to urban activities, this

conversion is often exaggerated and the more important issue is the use of high-quality agricultural land, when poorer land could be used instead (Russwurm, 1975).

Land Use Change

The Importance of Agriculture and Open Space Lands

Urban centres require agricultural food production methods. The high population density of people involved in non-food producing activities demands that food producers use a method that provides a significant surplus of foodstuffs. Agriculture produces more food per hectare than other methods of food production and it is these amounts which allow the development of surplus food. These surpluses allow for the specialisation of labour as fewer people need to be involved in the production of food. In many societies, and western ones in particular, cities developed in the midst of agricultural land. As populations grew, Europeans sought new lands to exploit for primary resources, and eventually established themselves in North America in major settlements in the most environmentally-hospitable regions. Not surprisingly, the environments of these regions were also suitable for agricultural production and, even today, the most densely populated regions of Canada are those most suited to agricultural production. Similar situations exist in a variety of countries including the United States, Great Britain, France, Australia and New Zealand (Bryant & Johnston, 1992).

The problem is that while the production of food for most people in western societies consists of warming up whatever was brought home from the local grocery store, the surpluses produced by agricultural operations are still required and indeed are the

foundation upon which these nations exist. Not surprisingly, many of these nations have already been expressing concerns over the loss of agricultural productive capacity, due to the expansion of ex-urban land use, and have begun to develop and implement a variety of farmland conservation programmes. These concerns, even while coming at a time when agricultural overproduction creates its own problems, are nonetheless valid as famine and malnourishment are still major issues in many non-western countries, and evidence linking the continual development of increases in efficiency and production in agricultural practises to the deterioration in the productive capacity of agricultural land is growing (Bryant & Johnston, 1992). Compounded by the loss of land, agricultural operators are affected by the improvements in systems of transportation, communication and production due to increased competition and a drive to lower the cost of production while increasing profits. An important means of maintaining competitiveness is the ability to diversify and produce products of greater value. Currently the trend in the agricultural sector is a decrease in the number of agricultural operators and an increase in the size of operations, along with an increased importance on livestock production (Bowlby, 2002). Increased ex-urban development limits the ability of farm operators to respond to changes in the agricultural sector, decreasing their viability and thereby the number of agricultural operations.

It is also necessary to recognize the importance of open space lands, even if they are not under agricultural production. While the definition of open space is broad – everything from rural forest, fields, wetlands, lakes, streams and even vacant urban land, its importance is just as broad (Mantell, Harper, & Propst, 1990). With respect to

agriculture, open space lands provide economic resources as they are useful for crop production and livestock grazing , as well as forestry. Similarly, undisturbed wetlands are vital for fish and game-bird stocks, and help maintain water quality. Tourists are attracted to open space lands, as well (Mantell et al., 1990). Open space lands also provide direct health and safety benefits through the recharge of groundwater aquifers. By leaving watersheds undisturbed (or disturbed as little as possible), the quality of public drinking water supplies is protected. Further, the conservation of unstable hillsides and floodplains prevents injury and property damage. Open space lands also provide recreational opportunities as they are comprised of parks and preserves, as well as archaeological, historical and cultural sites. They are urban greenbelts, greenways and trails, along with shoreline access to lakes and rivers. Open space lands preserve ecological resources as they are comprised of wilderness areas that are animal and plant habitat, as well as unique and threatened species and ecosystems. As such, they are often scientific reserves (Mantell et al., 1990). Finally, open space lands define the aesthetic qualities of an area and help to create community identity. Pastoral and open landscapes create scenic vistas and parkways which separate and maintain the distinct identity of communities by becoming part of a community's cultural landscape (Mantell et al., 1990).

Urbanization in Canada

It follows that the fundamental concern over the 'urbanization' of rural land is actually a concern over the loss of renewable resources and open space. Once urban activity has been established, it is very unlikely that the land it occupied will ever be returned to the production of such primary resources as agriculture or forestry. According to the Canadian Land Inventory (CLI), 45.9 million ha of the 250 million ha surveyed for

renewable resource use are Classes 1-3, which have soils with a high capability for sustained cultivation of field crops. Of the 45.9 million ha of land highly suited to crop production, 4.2 million ha are Class 1, or those best suited for this sort of activity. While the distribution of prime agricultural land is variable across the country, approximately 2.1 million ha, or half of all the Class 1 land in Canada is found in the southern portion of Ontario, along with a large portion of the country's population (Lands Directorate, 1985). Concern over change in land-use prompted the Lands Directorate of Environment Canada to establish the Canada Land Use Monitoring Program (CLUMP) in 1978. One of its mandates was to monitor the conversion of land around 70 Urban-Centred Regions (UCRs) across the country (of which there are 7 in British Columbia, 5 in Alberta, 4 in Saskatchewan, 2 in Manitoba, 26 in Ontario, 19 in Quebec, and a total of 7 in the Atlantic provinces(Lands Directorate, 1985)). An examination of the conversion of rural land for urban use in the period between 1976 and 1981 shows that of a total amount of 98,976 ha converted, 50% or 49,593 ha were prime agricultural land (CLI Classes 1-3) (Lands Directorate, 1985). As suggested by the fact that the largest concentration of the country's population occurs in and around the country's largest concentration of top-quality agricultural land, a fundamental part of the problem is proximity of urban concentration and prime farm-land. According to the 1985 report, more than 55% of Canada's best agricultural land lies within a 160 km radius of a Census Metropolitan Area (Lands Directorate, 1985).

With such proximity, urban growth is bound to impinge upon this land base. An important measurement used in the report examines the number of hectares of rural land

converted per increase of 1,000 people. The greater the number of hectares converted, the lower the population density. According to the 1985 report, the maritime provinces had the lowest population densities ranging from 1,657 – 1,193ha/1,000 population growth, followed by Manitoba and Quebec with 791 ha and 334 ha respectively. Ontario and Alberta had the lowest rates of conversion with the former at 80 ha and the latter at only 46 ha per increase of 1,000 (Lands Directorate, 1985). These numbers allude to a general inverse relationship between the size of the UCR and the amount of land converted. The largest UCR's, those with populations greater than 500,000, have a lower conversion rate than those with smaller populations. UCR's with a population of 500,000 or greater have a population density of 19 persons/ha and were responsible for 72% of the total population increase but only converted 37% of the 98,976 ha of rural land. Their total area only increased by 7% or 61 ha for each increase of 1,000 people (Lands Directorate, 1985). Conversely, the UCR's with the smallest populations, 25,000 to 50,000 people, claimed an average of 341 ha of rural land for each increase of 1,000 people. These UCR's were responsible for 24% of the converted land and had a density of only 8 people per ha (Lands Directorate, 1985).

While it is easy to accept that much of Canada's prime agricultural land is under constant pressure from expanding urban centres it is also easy to see that there is still a large quantity of agriculturally productive land available, according to the CLI. The problem is the CLI for agricultural productivity is based on soil quality and does not account for climatic variation. For a more accurate evaluation of environmental suitability, the CLUMP used both an agroclimatic resource index (ACRI) as well as the CLI. The ACRI

contains measurements of the length of the frost-free period as well as the general amount of available moisture and heat energy, the combinations of which are reflected in a scale of 0.0 (least suitable) to 3.0 (most suitable) (Lands Directorate, 1985). The least suitable lands of 1.0 and less are found in Canada's northern areas while the most suitable values of 3.0 are found in southwestern Ontario (Lands Directorate, 1985).

Sixty-one percent of Canada's prime agricultural land is in the two provinces of Alberta and Saskatchewan which only have aggregate values of 1.5 and 1.4 respectively. Ontario and Quebec, with aggregate values of 2.4 and 2.0 respectively contain most of the farmland with ACRI values of 2.0 or higher. However, less than 15% of all of the country's farmland has values of 2.0 or above, once again showing the positive correlation between population and prime agricultural land. Most of the 50% of the CLI Class 1-3 lands converted between 1976 and 1981 had ACRI values of 2.0 (Lands Directorate, 1985). In order to replace this highly productive agricultural land, farm operations would have to double the necessary area to approximately 106,834 ha of land with CLI Classes 1-3 in areas with only an ACRI value of 1.0 (Lands Directorate, 1985). These replacement lands exist along present agricultural areas with CLI Classes of 1-3 although there are only three areas which offer any long-term potential, according to the Lands Directorate (Lands Directorate, 1985). The opening of these lands for agricultural production comes at a substantially higher cost: the land would have to be developed for agriculture; the number of crops that can be grown is decreased with the more restrictive climatic conditions; and the energy requirements and transportation costs per unit of food

produced would be increased because of the distance from a more suitable climate and the current agricultural infrastructure (Lands Directorate, 1985).

Land-use in the Prairies

During the same study period of 1976-1981, the UCR's of Calgary, Edmonton, Regina, Saskatoon, and Winnipeg converted 14,109 ha of land from rural to urban uses (Lands Directorate, 1987). Change taking place in Canada's prairies predominantly occurs in the Prairie grasslands region where the five regional cities of Calgary, Edmonton, Regina, Saskatoon and Winnipeg are located. This region occupies approximately 522,000 km^2 or 27% of the area of the three prairie provinces. Suiting the environment, the traditional industry and main geographic feature of this region has been agriculture, with 87% of the surface area being farmland, as of 1986 (Patterson, 1993). A notable trend has been the intensification of agricultural production. There was close to a 22% increase in the proportion of the region devoted to cropland between 1971 and 1986, while the proportion of improved pasture increased by almost 5% in the same period. There was an inverse relationship between these improvements and the proportion of land devoted to summer fallow and woodland, which decreased by almost 22% and 63% respectively in the same period. It should be noted that woodland only made up 0.5% of the total area within the grasslands region in 1971, and is an important ecological entity, retaining moisture and providing habitat for a variety of indigenous animal populations (Lands Directorate, 1987; Patterson, 1993).

As of 1993, four million people – more than 85% of the population of Alberta, Saskatchewan and Manitoba and almost 15% of Canada's population – lived in the

grasslands region with 2.7 million or 66% of these people living in the five prairie CMAs. The area occupied by the five CMAs takes up about 5% of the grasslands region and encompasses most of the area upon which the five regional cities are located. As such, this region is both one of Canada's most urbanised as well as one of its least populated. At the same time when comparing these five prairie CMAs to those elsewhere in Canada, there is generally a smaller proportion of total CMA population living within urban fringe areas in the prairies (Patterson, 1993).

These generally smaller fringe populations are due to provincial policies relating to the incorporation of rural land within city boundaries for future urban development. The City of Winnipeg is the most notable example of this as it has incorporated enough farmland within its boundaries to provide space for twenty-five years of urban development (growth), with the amalgamation of 14 of the 16 municipalities in the CMA into Metro Winnipeg in 1961, and then the creation of the single municipality of Unicity ten years later. In cases such as this, rural residential development has occurred within central city boundaries illustrating that the rural/urban fringe is not necessarily defined by municipal boundaries and that measures of the amount of fringe development may be misleading when measured from these boundaries (Patterson, 1993).

This annexation of land for future development within central city limits along with a general propensity for the construction of single-family dwellings has contributed to the low population density of CMA's in the prairie region. This is of significance as these urban areas are located on dependable agricultural land (defined by Statistics Canada as

being CLI classes 1-3 because the soils in these classes have fair to high capability for the production of a variety of crops and are considered suitable for long-term use (Statistics Canada, 2000)) and it was this type of land which accounted for 68% or 9,587 ha of rural land converted to urban use in the prairies between 1976 and 1981 (Lands Directorate, 1987). As such, the demand for urban development of rural land has removed good quality land from the agricultural inventory for a considerable time. A shift to a post-industrial society has initially enabled this type of conversion, and fostered an environment in which urban workers desire rural homes. This leads to the question of how this sort of development and land conversion could be allowed to take place.

Land Use and Development Control

Zoning Ordinance History

According to Gerckens (1994), the earliest modern application of land use zoning in the United States was in San Francisco in 1867. The purpose was to protect the environment (both physical and social) of the existing residences from obnoxious land uses. Since both residences and businesses had the legal right to exist, the reasonable government response to a situation where one legal activity would place impositions on the other was the physical separation of the incompatible activities. The next stage in the evolution of zoning ordinances was the New York Zoning Code of 1916, which was America's first 'comprehensive zoning code (Gerckens, 1994). It relied on a 'pyramidal' approach to permitted uses with the residential zone on top, followed by the commercial zone and then the industrial zone. In the first zone, only residences were permitted while the

second zone allowed both commercial uses and residences. The industrial zone allowed the previous two uses to coexist with industrial uses, making it a catch-all area where virtually all urban activities were permitted, and which therefore was essentially 'un-zoned' (Gerckens, 1994).

This hierarchical system was often used by other municipalities throughout the US, and because of this and the ability to mix uses in the last two zones, the separation and isolation of land uses in most early American zoning was not absolute (Gerckens, 1994). Nevertheless, land use exclusion was frequently justified on the basis of municipal economics and the efficient provision of municipal services with the rationale that like uses require like service needs (Gerckens, 1994). In the Supreme Court case *Village of Euclid v. Ambler Realty Co.*, 272 U.S. 365 (1926), the Village of Euclid's zoning ordinance was upheld and the term 'Euclidean zoning' has become a widely recognized term that refers to the division of a municipality into uniform districts in order to consistently regulate density, bulk and land use in any number of districts. This locational framework is based upon the presumption that land uses should be strictly separated and densities should be as low as possible (Wickersham, 2001). As mass ownership of the automobile increased, so did the zones, as increased mobility allowed the uses to become spread over wider areas. In the prosperity after the Second World War, the 'purity' of zones based on the concept of 'not in my backyard' became the foundational concept of zoning codes, which sought to segregate and isolate all forms of problems, from race relationships, to illness, to illegal behaviour and even undesired contact with persons of lower income (exclusionary zoning). This increased exclusion of uses from zones was

combined with an inclination towards low development density and resulted in sprawling cities comprised of large, developmentally-uniform and life-style conforming zones (Gerckens, 1994).

Based on the same fundamental reason of excluding incompatible uses, and with the intent of controlling growth, current zoning practices are still contributing to low-density development and the inefficient sprawl of urban land uses across the landscape. This is primarily because zoning and subdivision design standards normally do not require developers to provide anything more than the design of house lots and streets (Arendt, 1992). As such, all portions of available land within the development parcel are converted to part of the house lot or streets, with nothing left over for open space (Arendt, 1992).

While it is obvious that some uses would be best kept away from others (such as residences and industrial activities that are particularly obnoxious in some way), many different land uses and activities can be combined with other uses to increase the efficient use of space. As such, it is the overly aggressive attempt to separate uses with conflicting characteristics that has resulted in the decline of liveable, walk-able communities (Arendt, 1994). The uncritical use of conventional suburban zoning and subdivision regulations is creating expanses of standardised, sprawling development that is without the ambience, character and vitality of traditional communities. This is because the characteristics of traditional communities are based upon layout, design, structure, use

mixes and densities which are now outlawed under many existing land use regulations (Arendt, 1994).

The discussion of the RM of Springfield's proposed development plan in Chapter 5 shows that instead of protecting a community from unwanted growth and change, conventional zoning regulations often encourage these effects, and with them a diminished 'sense of place' for the residents (Arendt, 1994). Single use areas such as commercial strips along highways, and large residential subdivisions in agricultural areas, limit the amount of time people will spend in a particular area to the time it takes for a specific activity – such as working, shopping or sleeping (Arendt, 1994). A sense of place and community is difficult to develop when there is no one place an individual needs to be, or rather, when the individual needs to be in a variety of different places, which is the end result of the diffuse spread of a community's attributes over a much larger area than historically was the case.

Sprawl occurring within the outer edges of the regional city is more insidious because its lower density masks its long-term impacts (Arendt, 1994). Low density development of this sort occurs for a variety of reasons, not the least of which are municipal zoning regulations requiring large-lots, and laws exempting large lots from review procedures. Examples of these include Section 1115 of the Public Health Law of New York State which does not require Health Department approval for subdivisions of five acres or greater (Arendt, 1994), as well as the subdivision policies section of the Manitoba Provincial Land Use Policies which includes the statement that rural residential lots

should be at least two acres in size so as to accommodate environmentally-sound sewage disposal (Manitoba Intergovernmental Affairs, 1997). While the purpose of this is laudable – the protection of aquifers and surface water, the prevention of soil salinization, nuisance and health problems as well as the minimization of the demand for urban sized lots and services in rural areas (Manitoba Intergovernmental Affairs, 1997) – the end result is anything but compact development, along with the low density spread of ex-urban development (not to mention facilitation of the use of an inappropriate form of on-site sewage disposal). While the Provincial Land Use Policies are only guidelines and not requirements, many local planning authorities follow these guidelines in general and this policy in particular. In addition, various local planning authorities throughout Manitoba have different lot size limits that exempt the subdivision from requiring approval by a regulatory body. The following section provides a more detailed discussion of the planning process within Manitoba in general and the area around the City of Winnipeg in particular.

Planning in the Winnipeg Region

The jurisdictional areas in which planning decisions are made in the area around Winnipeg are comprised of 12 municipalities: the City of Winnipeg, and the Rural Municipalities of Cartier, St. François Xavier, Rosser, West St. Paul, East St. Paul, St. Andrews, St. Clements, Springfield, Taché, Ritchot, and Macdonald. There are also three planning districts within this area: Macdonald-Ritchot, Selkirk and Area (made up of St. Andrews, St. Clements, West St. Paul and the urban centres within them), and South Interlake (comprised of Rockwood, Rosser and the urban centres within them)). The provincial department of Intergovernmental Affairs is the department which oversees

planning within the province. Manitoba's provincial government delegates planning authority to the City of Winnipeg for the lands within its corporate boundaries under the *City of Winnipeg Act* (which, in January of 1972, established Winnipeg as a city in much the form that it exists now, in order to more equally distribute the benefits of planning and development (Ward, 1977)). This act requires that the City create and maintain a development plan with which to govern land development within its jurisdiction. Both the development plan and any amendments need to be approved by the Minister of Intergovernmental Affairs (formerly Urban Affairs (Urban Affairs, 1990)).

The development of land within rural municipalities is circumscribed by the provincial government's *Planning Act,* originally in effect since 1916 but revised in 1975. It was revised in order to eliminate constraints and difficulties which developed as the population of Manitoba grew and, with it, land-use activities and their required administration. Established in the revised planning act were a Provincial Land Use Committee, an Interdepartmental Land Use Planning Board, and the Planning Districts mentioned above, which were allowed subdivision control but which had to petition the committee for permission to set up Special Planning Areas (Ward, 1977).

The Provincial Land Use Committee established province-wide land use policies and, while municipalities and planning districts were allowed to create their own development plans, the committee remained the final arbiter of these plans (Urban Affairs, 1990; Ward, 1977). The committee was advised and assisted by the Interdepartmental Land Use Planning Board, which was the land use planning coordinator within the provincial

government. Currently, province-wide land use policies are set by Manitoba Intergovernmental Affairs, and the Municipal Board (established by the Provincial government) is the arbiter of land use planning related disagreements. Planning districts, comprised of two or more municipalities, were established in areas that wanted them, and they are governed by councillors appointed from the district's member municipalities.

The Planning Act allows Districts and municipalities to adopt their own development plans or basic planning statements, subject to the government's approval. Along with the adoption of such a plan, zoning by-laws must also be assumed; however, as long as they, or any amendments, conform to the plan they do not require provincial approval (Urban Affairs, 1990). Districts also have the ability to approve proposals for subdivisions within their own jurisdictions (Ward, 1977). On the other hand, the province has control over the establishment of Special Planning Areas and can suspend any municipal planning controls already in place. Along with the establishment of such areas, the provincial government can also make changes in zoning and development plans which would allow control of these areas to revert back to the district or municipality level (Ward, 1977).

The Planning Act was revised in 1980 to include *13 Provincial Land Use Policies* to aid the province's guidance of sub-regional development issues. When a municipality does not have an approved plan, the policies assist in the review of subdivision applications along with the review of Plans, Plan amendments and planning scheme amendments (which are not generally allowed to conflict with Provincial Land use Policies) (Urban Affairs, 1990). While there are obviously a series of checks and balances in place, they

are only effective in so far as the local bodies adhere to them, or the Province monitors the changes to make sure that they comply with provincial policies. Ultimately, as changes in zoning by-laws may be made without provincial approval, municipalities are allowed to operate on an 'honour-system' and may change bylaws to allow any sort of development as dictated by such factors as political pressure or favouritism, thereby opening avenues for unsustainable development.

History of Planning in the RM of Springfield

The review process for the current development plan began in the fall of 1996. There had been a number of attempts to review and modify the 1980 development plan (developed for the municipality by the provincial department of Municipal Affairs) prior to 1996, However, these were mainly through amendments to the 1980 plan, and were rejected by members of the community. The review process for the current document was initially undertaken by the elected municipal officials and the consulting firm of David Lettner and Associates[GK64] (E. Towler, personal communication, 5 August, 2002). Starting with three public open houses, the review committee solicited input from community members regarding their opinions of what they liked and disliked about the community and their ideas regarding the directions the community should move in the future. Based upon this information and research conducted by the consulting firm, a background report and draft development plan were produced (E. Towler, personal communication, 5 August, 2002).

This draft development plan was also rejected by members of the community as being too general and flexible. Following this, a the consulting firm RuraLand Consulting Ltd. was

hired and produced the proposed development plan that was submitted for provincial approval in 1999 (E. Towler, personal communication, 5 August, 2002). The staff of the Provincial department of Intergovernmental Affairs had a number of objections to aspects of the proposed plan and outlined twenty recommendations for consideration by the Municipality's Council and the Municipal Board. In the course of the hearings, the municipality accepted ten of the recommendations, the Provincial Government withdrew one of them, and the remaining nine were addressed by the Municipal Board which recommended five changes be made to the proposed development plan (Municipal Board of Manitoba, 2000). The Municipal Council of Springfield made the required changes to the development plan which subsequently came into effect on 25 December, 2001.

Even so, both the Municipal Board and the Department of Intergovernmental Affairs consider the document an "'interim'" policy plan as they have both recognized a need for additional data collection and research in a variety of areas. It was recognized that definite answers to particular questions, especially those regarding environmental issues, are not always available. Specific examples, such as water quality, the condition of septic tanks and fields, the nature of livestock operations and the condition of aquifers within the municipality, were identified as significant factors to be considered in the development of planning policy, and the decision-making process is compromised because of a lack of adequate and current information on these and other factors (Municipal Board of Manitoba, 2000). As such, the issues raised by the Department of Intergovernmental Affairs and those examined by the Municipal Board were related

chiefly to technical issues, until such time that the municipality has the chance to develop more effective policies based upon a better data inventory.

Land Ownership as Indicator of Land-use Change

According to Bryant (1982), land ownership structure and the real-estate market are basic dynamic features of the urban landscape, and shifts in these attributes are indicators of change in the landscape. These shifts and movements call attention to the pressures for change in the functional orientation of the land and can represent both the desires and expectations of those involved with respect to the future of land use and function in a particular area, as well as the first steps toward the actualisation of planned (by individuals or private or public bodies) functional change. Shifts in land ownership precede shifts in land use, which create a momentum for further change from the preceding function of the landscape (Bryant, 1982).

These factors were explored in a 1990 study by the Department of Urban Affairs in which the location of residential development in the Winnipeg region was examined. The study report states that 61% of all the rural residential development within Winnipeg that occurred between 1976 and 1988 was located in two areas; South Headingly and St. Vital Perimeter South. Outside of Winnipeg, approximately 80% of this type of development occurred in the Selkirk corridor (comprised of the rural municipalities of West St. Paul, East St. Paul, St. Andrews and St. Clement) and the Rural Municipality of Springfield for a total annual average of 452 building permits and an average of 84 per municipality. The remaining 110 annual permits (18 per municipality) are divided among the municipalities of Taché, Ritchot, Macdonald, Cartier, St. François-Xavier, and Rosser (Urban Affairs,

1990). Accordingly, those municipalities within the Selkirk corridor, along with the RM of Taché, showed the greatest proportional losses of farmland (Patterson, 1993).

The municipalities listed above, along with the R.M. of Headingly, make up Manitoba's Capital Region. Lately, there has been significant concern over the way land and resources are being used within the region. Even though Winnipeg's population has seen little change since 1991, the population of the Capital Region has continued to grow and there is a significant amount (net approximately 21,000 people) of commuter traffic from the Capital Region into Winnipeg. With Winnipeg's civic government and its business community both looking for immigrants to fill current and potential job openings, it is likely that the demand for rural residences will continue, if not increase (Capital Region Review Panel, 1999). As pressure for a conversion of agricultural land and open space to urban uses, particularly residential development, increases, so too will the pressure on existing agricultural operations. The only controls over the way in which the function of the landscape will change are the establishment and enforcement of land use policies and zoning by-laws or, ultimately, 'consumer' demand (that is, land will not be converted if no-one is interested in living on it).

Summary

Canada, along with many other western countries, faces the loss of prime agricultural land due to the expansion of urban activity. A considerable portion of Canada's best agricultural land has been lost due to the emergence of the regional, or dispersed, city-form, and residential activity in particular. As most agricultural communities began on the best agricultural land, and as major cities were developed in the core of these

communities, the outward spread of urban activity – originally instigated by the consolidation of industrial processes and the wide-spread availability of the automobile, then fuelled by the evolution of the post-industrial society – has claimed the most productive land, forcing agricultural activity to move to less productive land or to cease altogether in some areas.

While the local or regional details may differ, nationally the trend is towards urbanisation. For a while, there was some debate as to whether or not a rural population turnaround existed, with urban people moving back into the countryside. However, the scale at which the data was collected, along with how it was analysed, was misleading. What in fact was happening was that smaller-urban centres in rural areas were growing as were the number of and size of bedroom communities. People were moving back into the countryside to live, but they still worked in the city. As the population and number of commercial enterprises within Canada's major urban centres grew, the urban centres grew outward – sometimes to justifiably accommodate the increases, other times in an inefficient spread.

This shift in land-use to a new, urban activity creates the impetus for further change in that direction. This is because urban development attracts like-development and tends to discourage agricultural land-use. As noted earlier, commercial and industrial development often move out to suburban or semi-rural areas because of cheaper land-prices and taxes. The same is true for residential development although a further impetus is the desire for a 'better quality of life', often seen as access to greater open space and

'fresh' air. Urban activities tend to draw each other into the same area. For instance, once a certain population density is reached convenience stores, restaurants, or banks may move in to take advantage of the population. Similarly, when commercial or industrial development opens up, it can act as an attraction for residential development because of the convenience close proximity offers as well as the 'improved' quality of life for some by living outside of the built-up city. At the same time, urban development discourages agricultural production by decreasing net profits for farmers and introducing incompatible activity. Net profits are reduced because of increases in land-values and the resulting higher taxes that this 'improved' sort of development introduces. As well, taxes and the cost of services are increased as infrastructural improvements must be undertaken to meet the needs of the new development.

The new development often turns out to be incompatible, as those engaged in urban activities in rural areas are not prepared to put up with the dirt, smell and sounds produced by agricultural activity. The combined pressure of unhappy neighbours and reduced profits can make farming an unattractive enterprise, particularly when there is a much greater profit to be made by selling the land. Not surprisingly, those prepared to pay the most for the land are those wishing to engage in some form of urban activity in the city's countryside. As such, the shift from agricultural land-use to that of rural residential development – either grouped or individual residences scattered throughout the municipality – is an important type of change taking place in Manitoba's Capital Region, signalling the advent of serious problems if unplanned, uncoordinated development is allowed.

In order to control development, land use zoning by-laws were created. The purpose of these was to separate incompatible uses and thereby prevent one type of land use or development from being negatively affected by another. Nevertheless problems have developed because of these separations. In particular, many of the amenities found in traditional communities are no longer available in new or expanding communities because the density levels and mixed uses seen in older communities are no longer allowed by these ordinances. The frequent result of this is a diffuse spread of development across the landscape that inefficiently uses space, requires more travelling with a vehicle and degrades a sense of 'community'. Nevertheless, development guidelines and oversight are still required and in Manitoba there are two levels of planning policy development. At the provincial level of government, land use guidelines were developed, which provide a framework for the development plans established by planning authorities at a local level. While the provincial government over-sees municipal planning, municipal governments and planning districts develop the actual planning policy for their jurisdictions. The effectiveness of the planning process in the RM of Springfield is addressed through an examination of the level of residential development within the municipality.

CHAPTER 4: An Analysis of the Pattern of Rural Residential Development in the RM of Springfield

Introduction

Currently, the RM of Springfield's landscape is primarily comprised of agricultural land and open space. However, it does have a high degree of land fragmentation and a significant amount of rural residential development. Proximity to the City of Winnipeg has made Springfield a 'bedroom community', with a total population of 12,162 in 1996 (Statistics Canada, 1996). Of those 12,162 people, approximately 6,900 were part of the workforce, with roughly 4,270 people commuting to work in Winnipeg and about another 125 people working in other rural municipalities around Winnipeg. Only about 685 (or roughly 10%) of them were farm operators (Statistics Canada, 2001). As such, with the likely continuation of both overall population growth and continued out-migration of young people in the RM, there will be continued pressure for change in land use from agricultural to rural residential.

The purpose of this chapter is to examine the form of residential development in 1999 and the ways in which this development could affect agricultural operations in the municipality. The chapter begins by outlining the data used to determine the pattern of residential development between 1966 and 1999. This is followed by a discussion of the results of this examination of historic patterns of residential development. Based upon these historic patterns, and the pattern of land subdivision in 1999, the areas most likely to experience considerable pressure for future change are examined.

Data

Description and Process

As discussed previously, 'maps' and 'attribute data' characterise the information collected for the examination of rural residential development and its potential impact upon the municipality. The attribute data consist of residential building permits between 1966 and 1999 (provided by the RM of Springfield) and the number of farm operators within each of the nineteen enumeration areas within the municipality (provided by Statistics Canada (2001)).

While other studies (MacLean, 1985; Medd, 1978; Municipal Planning Branch, 1979) have used approved subdivision applications (which illustrate how owners have divided their land) to show how land use has changed, it has been determined that such conceptual land divisions are not reliably indicative of change. One of the most accurate ways of determining a change in ownership is by the construction of dwellings, which by the fact that they exist in large numbers in a rural area makes them indicative of a change in land use. As such, this study identifies shifts in land ownership and functional use of the landscape by examining the number of new houses built in Springfield between 1966 and 1999 along with the location of dwellings (as of 1999) on the various maps.

The location of residences as of 1966 was accomplished by subtracting the residences identified by building permits between 1966 and 1999 from the residences that are identified by the RM of Springfield's parcel map. It is assumed that the residences in the municipality not accounted for by the building permits were likely built before 1966. It is

possible to use the parcel map as a final source of residence locations because the RM was in the process of creating an electronic system of administration at the time of this study. The RM had the parcel map was developed for the system in order to keep track of property ownership, land use delineation, and a variety of administrative functions. As such, each parcel on the map had a variety of attributes associated with it, including whether or not there was a residence. Further examination of the potential for change in land ownership, and ultimately land use, is accomplished by using age groupings of agricultural operators as indicators of change. By comparing the age of farm operators with the density of rural residential development, a view of the potential pressure for change can be developed.

While residential building permits were used for this study because they identify actual, physical changes on the landscape, approved subdivision applications are indicative of the proposed direction of future land use. Even though subdivision plans may not immediately result in a change in land use, they do provide insight into how the land owner would like to see his or her land used, at least to some extent. For instance, if a series of lots that are 5 acres or less were subdivided out of a quarter section, it is likely that the intent is to sell them for residential use as they are too small to be of interest to a farm operator. As such, the way land is subdivided speaks to the potential for land use change.

Analysis

Context

Using the data described above, analyses are performed of the change in land use and the relationships between intended land uses, agricultural soil capability and the form of urban development on the current landscape. To provide a current context for the discussion of land use change, a view of the proposed future use of soil resources was developed by an overlaying the soil classification map (see Figure 2) with the map entitled Rural Municipality of Springfield Land Use Designations (see Figure 7) to produce the map entitled Rural Municipality of Springfield CLI Soil Classification and Land Use Designations (see Figure 8).

The land use designation 'Agricultural Preserve Area' covers most of the municipality, and much of the soils with the highest capability classes. A major exception is the area designated 'Rural and Agricultural Area 1', in the north-west section of the municipality (around Birds Hill Provincial Park). While this area also has a significant amount of Class 2 and 3 soils, it was one of the areas to attract settlement early in the study period (as will be illustrated). A second major exception is the area designated 'Rural and Agricultural Area 2', around Anola, and covering much of the central and south-central portions of the eastern half of the municipality. In this case, the quality of soils ranges from Classes 2 to 6, with much of them falling into Class 4. As such, this area is only marginally productive for crop cultivation, with most of it suited for pasture.

Figure 7. Rural Municipality of Springfield Land Use Designations

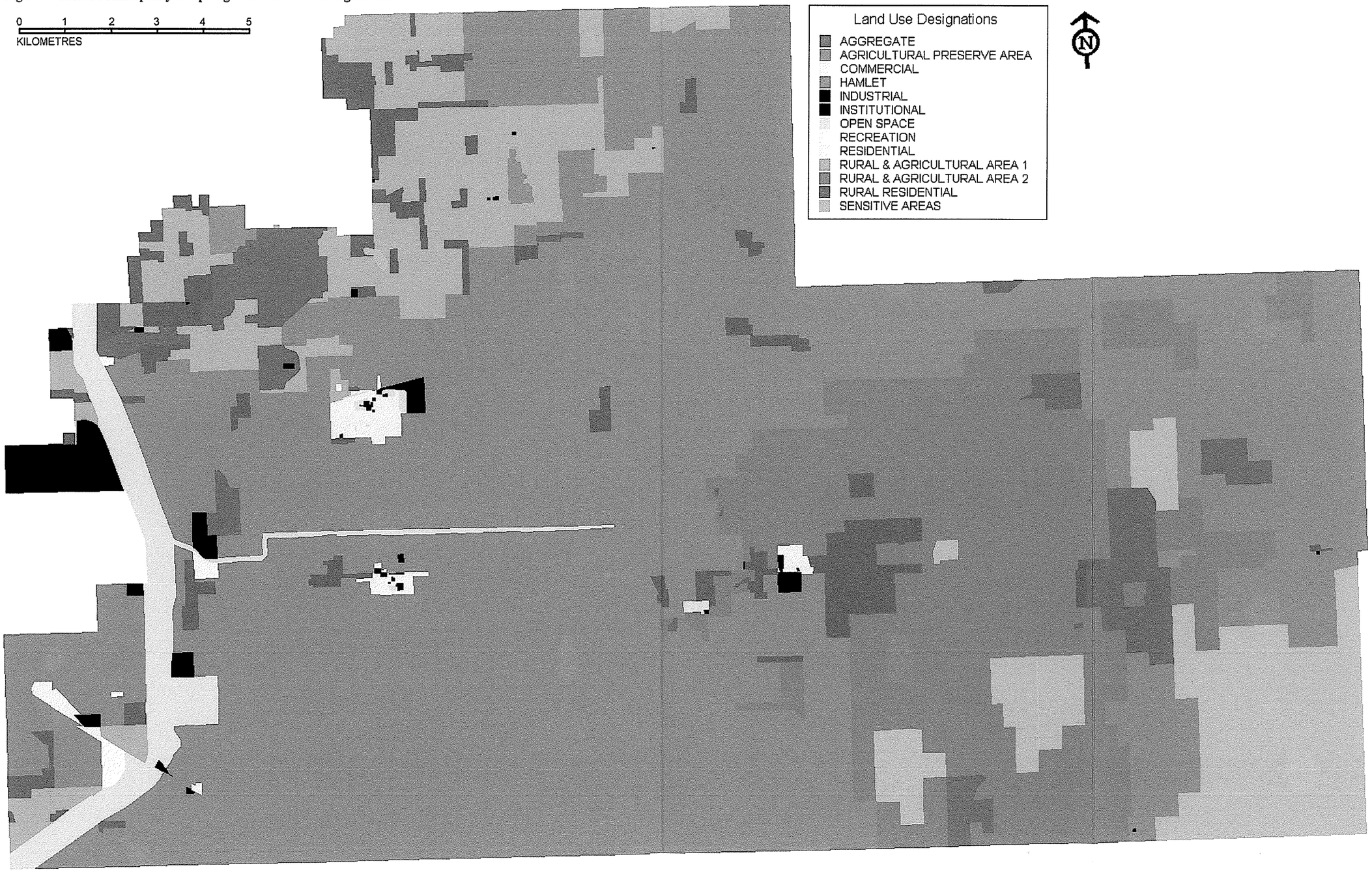
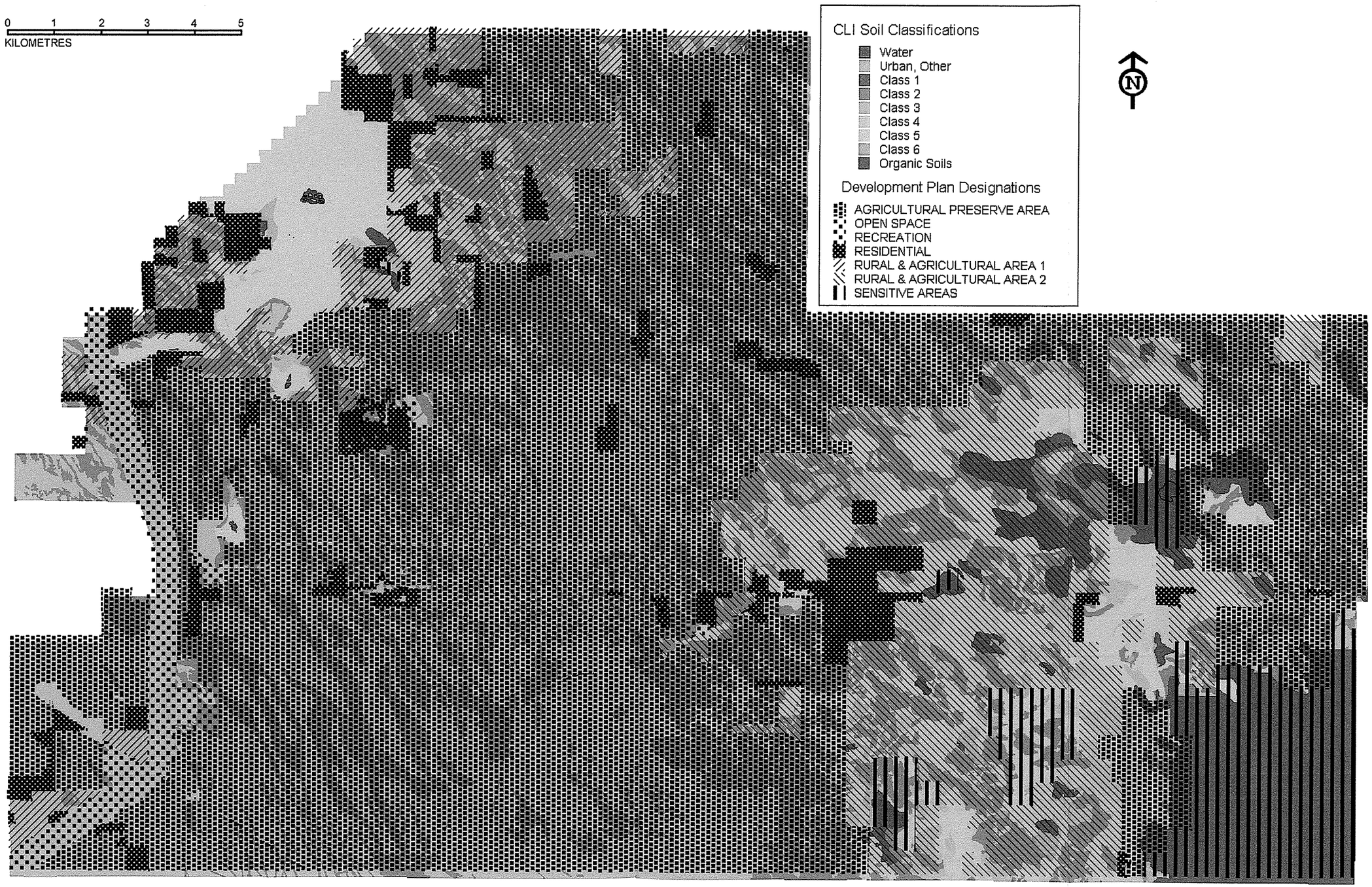


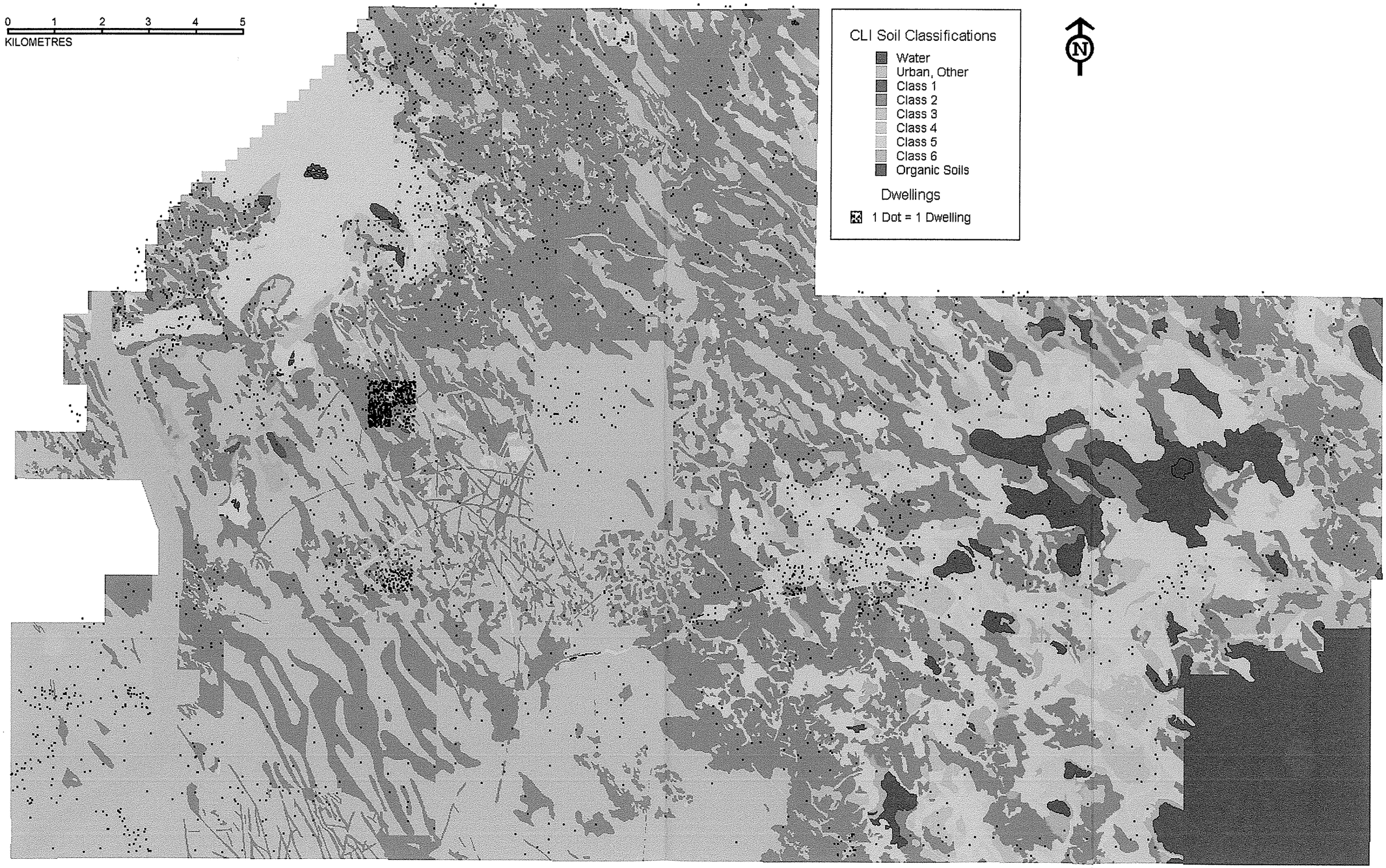
Figure 8. Rural Municipality of Springfield CLI Soil Classification and Land Use Designations



Of these land use designations, 'Agricultural Preserve Area' is the most restrictive towards residential development insofar as the only permitted uses (ostensibly) in this designation are those supportive of the agricultural industry (Rural Municipality of Springfield, 1998). Similarly, according to the proposed development plan, land with the designation of 'Rural and Agricultural Area 1' will be restricted to activities compatible with hobby/part-time farming. The major difference is that large-lot residential development is also a permitted use in this designated area (Rural Municipality of Springfield, 1998). A greater number of uses are permitted in the areas designated 'Rural and Agricultural Area 2', including rural residential development. Nevertheless, based upon the areas covered by these designations in the map Rural Municipality of Springfield CLI Soil Classification and Land Use Designations (Figure 8), it appears as though much of the best agricultural land in the municipality is protected from non-farm residential development.

The problem of determining the affect to which the building of a residence will have on the ability of a farmer to continue farming is addressed by looking at the density of residential development. Possible reasons for a new residence having no affect on an agricultural practice in a given area could be that it is constructed to replace an existing one, or its purpose is to provide housing for agricultural workers employed in a particular area. However, the extent to which residential development occurs throughout the municipality in 1999 is illustrated by overlaying the dwellings as of 1999 over top of the Soil Classification map (Figure 9. Rural Municipality of Springfield CLI Soil Classifications and Dwelling Locations 1999). In this map residential development

Figure 9. Rural Municipality of Springfield CLI Soil Classifications and Dwelling Locations 1999

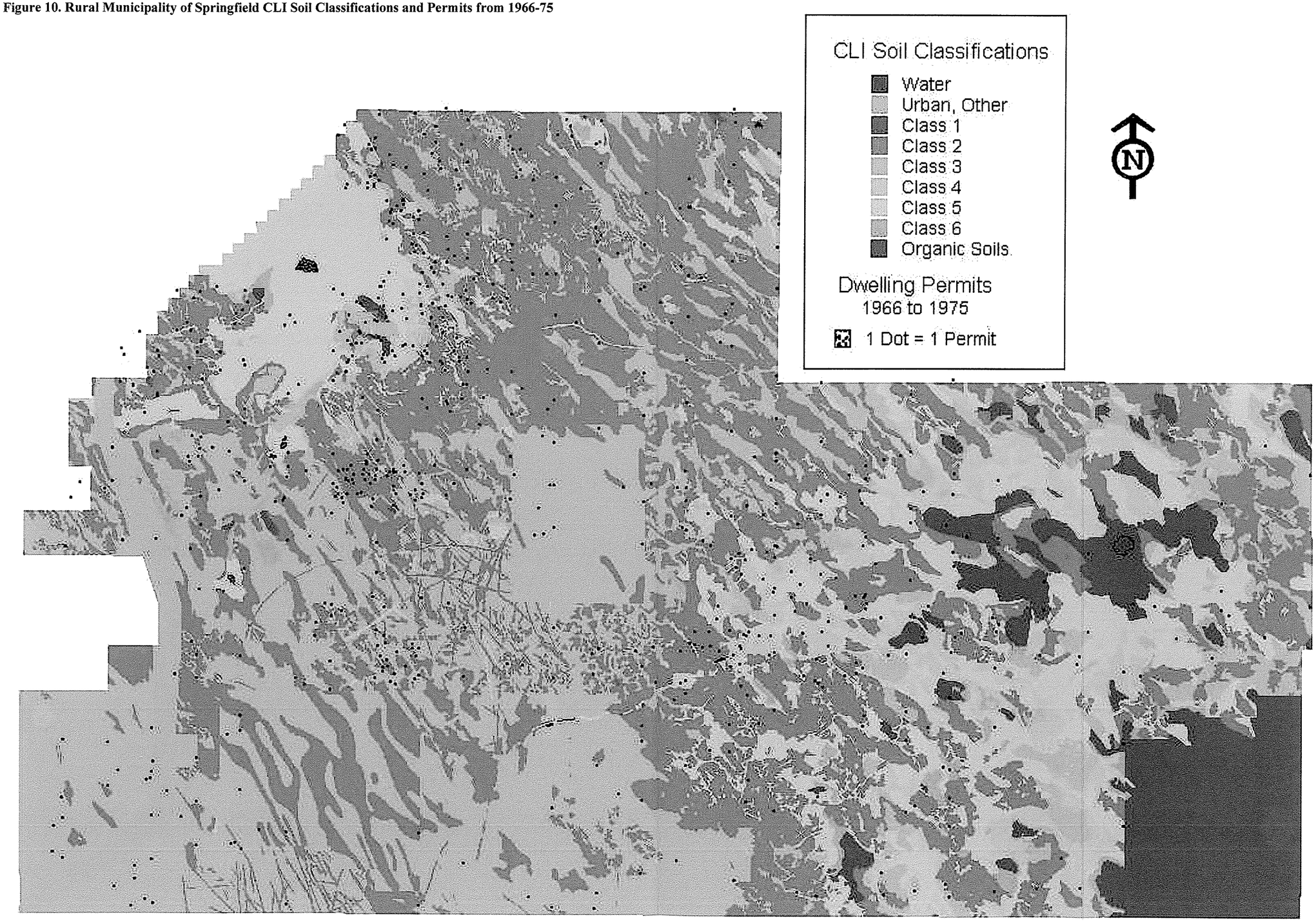


outside of Oakbank (the rectangular cluster in the west-central section of the map) is densest in the north-western section of the municipality, and particularly around Birds Hill Provincial Park, with much of it on Class 2 soils. The second area of greatest density is relatively clustered in the area around Anola, slightly south and east of the centre of the municipality. Here, the soils range from Class 2 to Class 5, and tend to be prone to wetness. Even so, it is clear that there is a high degree of residential development throughout the municipality, with much of it occurring on Class 2 and 3 soils in areas designated as 'Agricultural Preserve Area'.

Pattern of Residential Development

The development of the pattern of residences as of 1999 is shown through a time-series of residential development, created by overlaying residential building permits from the periods of 1966-1975, 1966-1985, 1966-1995, and 1966-1999 over top of the Soil Classification map (Rural Municipality of Springfield CLI Soil Classifications and Permits from 1966-75, 1966-85, 1966-96, and 1966-99, Figures 10, 11, 12, and 13 respectively). As can be seen in the map entitled Rural Municipality of Springfield CLI Soil Classifications and Permits from 1966-75 (Figure 10), the pattern of residential development, while more diffuse, was similar in location to what it was in 1999, with slight clustering occurring in Oakbank, the north-west section of the municipality (with much of it fairly close to Birds Hill Provincial Park), and the general area around Anola. However, the degree to which the people living in those residences were involved in agricultural or agricultural support services would have been much higher in the late 1960s.

Figure 10. Rural Municipality of Springfield CLI Soil Classifications and Permits from 1966-75

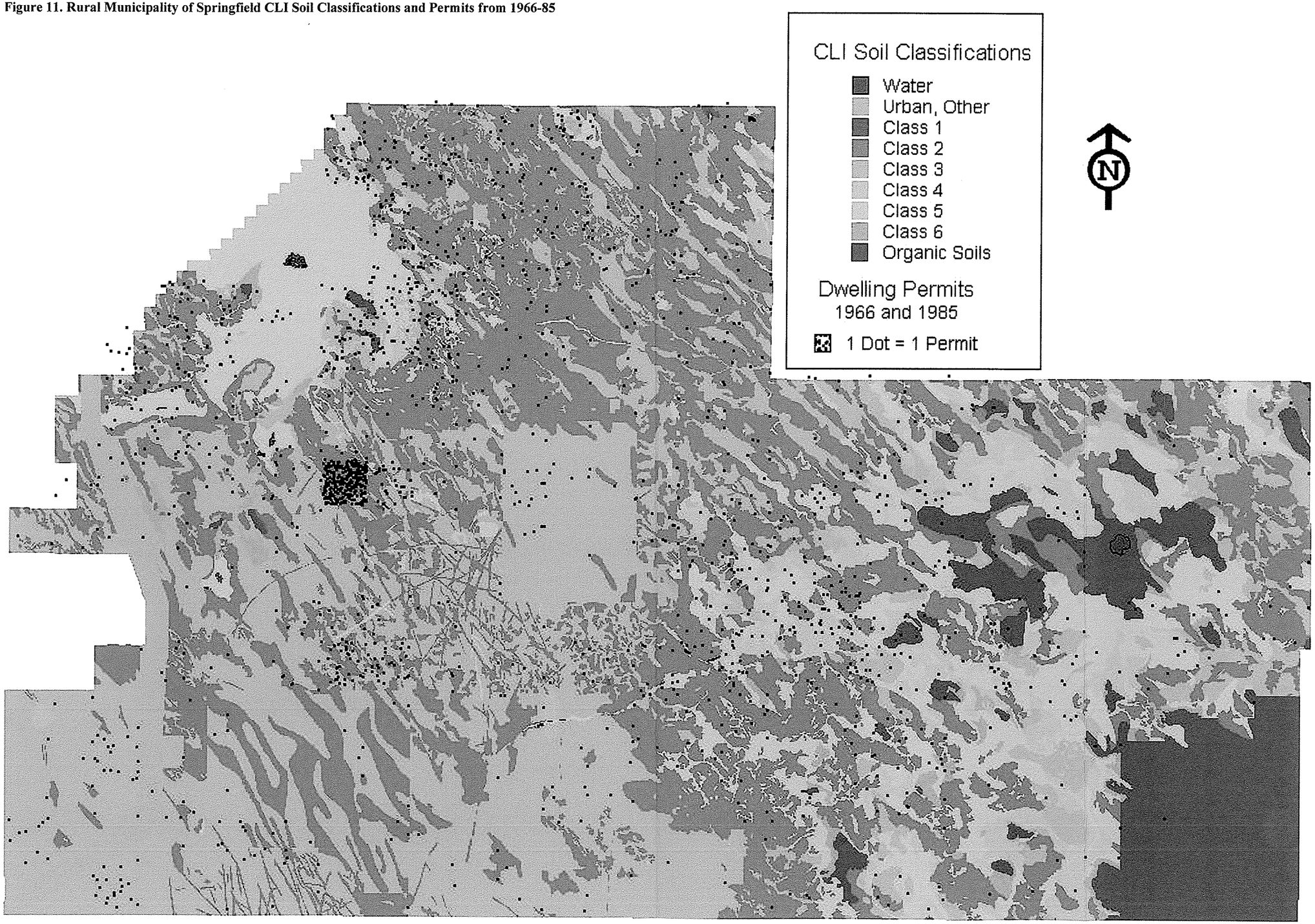


Not to scale.

The pattern of residential development remained diffuse throughout the rest of the timeline, with no area, other than Oakbank, developing a increase in density over another at a discernible rate. It is, however, interesting to note that residential development had spread across the northern-most edge of the municipality by 1985 (see Figure 11. Rural Municipality of Springfield CLI Soil Classifications and Permits from 1966-85). As is illustrated by the map, this area is comprised primarily of Class 2 soils. What is not shown by the soils map is the topographic change and density of woodland also characteristic of that area. These development patterns suggest a preference for locations with features such as woodland and variable topography. This suggestion is supported by studies examining the rationale behind ex-urban residences that show the attractiveness of the landscape as an important factor in site determination (Ben-Ron et al., 1974; Paterson Planning and Research Ltd., 1973). As such the proposed development plan should be designed so as to preserve landscape attributes in existing areas with rural residential development and to foster use of local landscape form as a design element in new developments. Chapter 5 contains a discussion of how well this is accomplished.

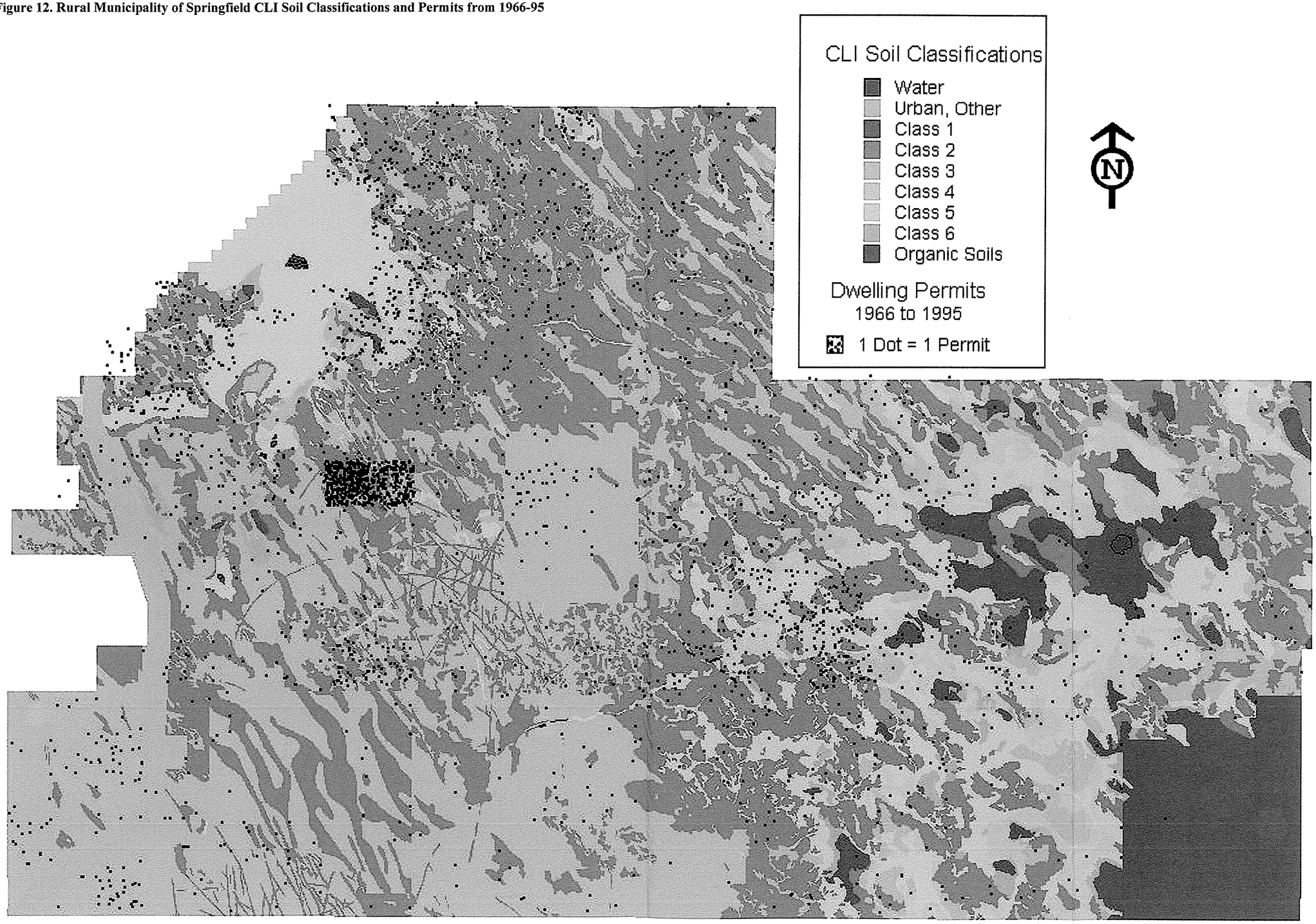
Rural residential development had also spread fairly significantly into areas with some of the best soils in the municipality by 1985 (see Figure 11. Rural Municipality of Springfield CLI Soil Classifications and Permits from 1966-85). As such this type of development had established itself throughout much of the best agricultural land in the municipality by the mid 1980s. Because of this, the municipality's planning process is

Figure 11. Rural Municipality of Springfield CLI Soil Classifications and Permits from 1966-85



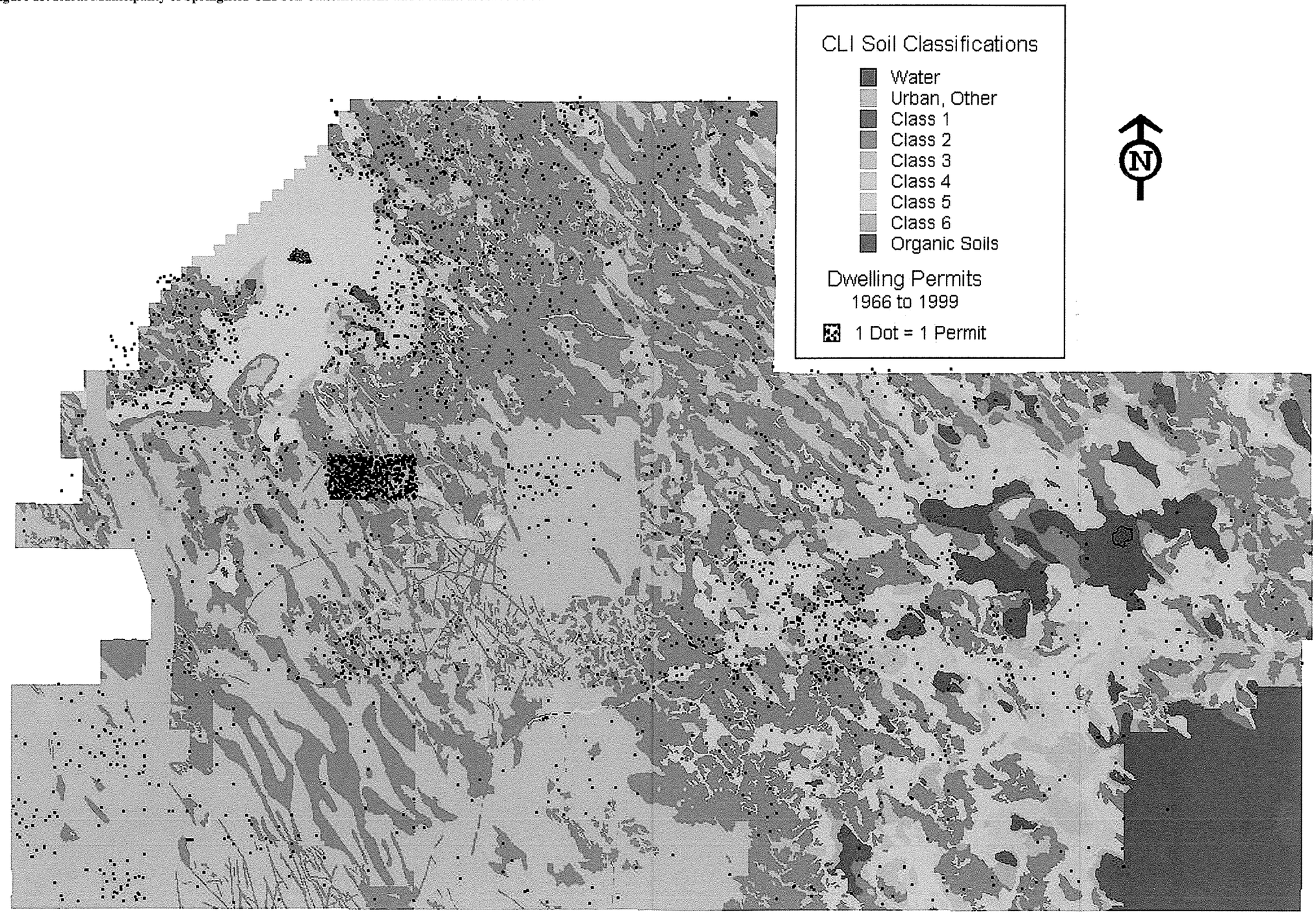
Not to scale.

Figure 12. Rural Municipality of Springfield CLI Soil Classifications and Permits from 1966-95



Not to scale.

Figure 13. Rural Municipality of Springfield CLI Soil Classifications and Permits from 1966-99



Not to scale.

made more complicated by the added burden of having to account for the fragmented land patterns and incompatible forms of land use (primarily rural residential and agricultural) resulting from development over the past thirty-plus years.

The problems created by these historic patterns of rural residential development for current planning policy are further illustrated through a comparison of the suggested future use of land, as proposed by the municipal council, with the dwellings in 1999, and then land owner desires by overlying the dwelling and parcel information on top of the land use designation map. The first map, Rural Municipality of Springfield Land Use Designations and Dwellings 1999 (see Figure 14), shows a significant number of dwellings throughout the area designated as 'Agricultural Preserve Area', but particularly in northern and central sections of that land use designation area.

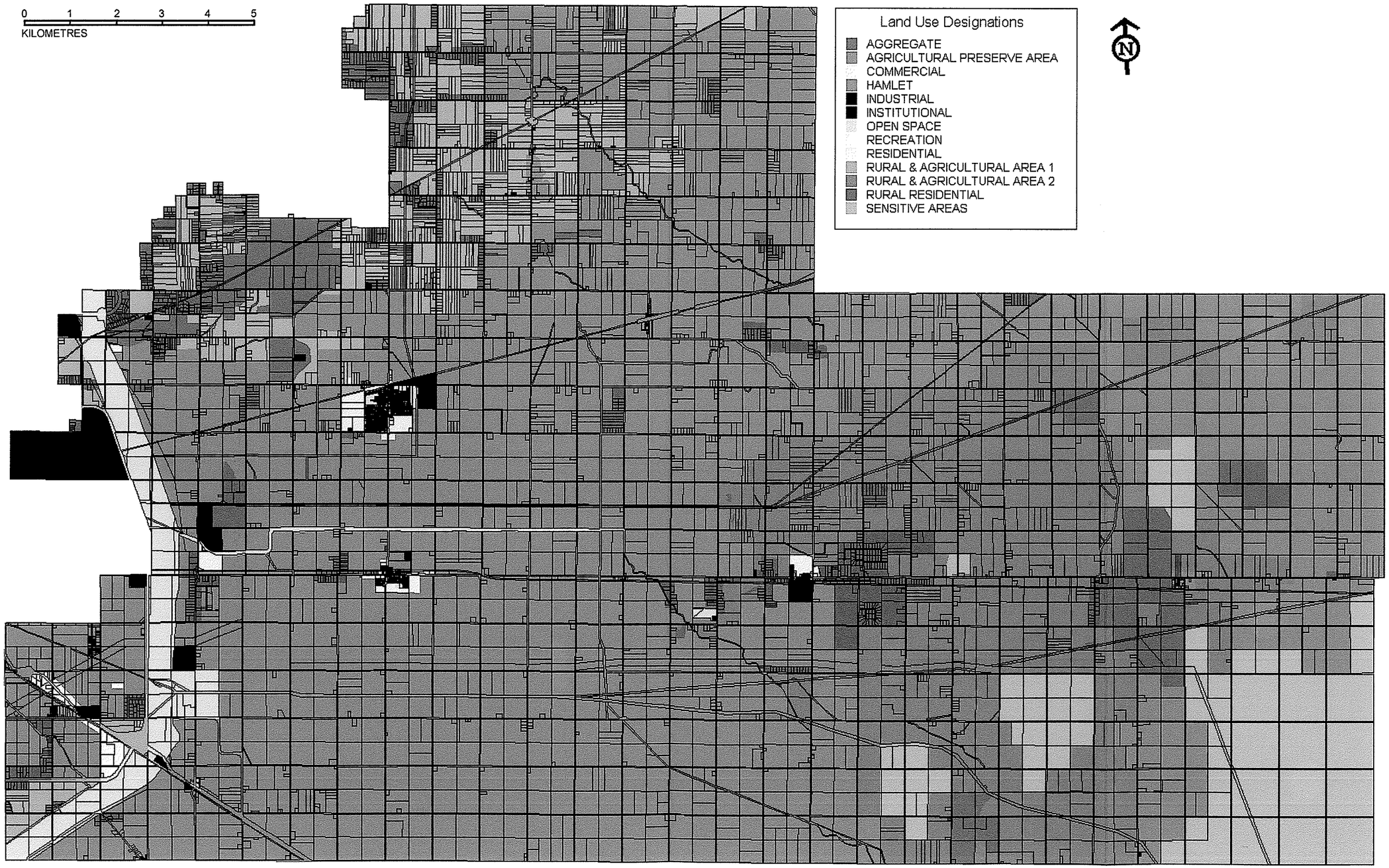
Residential Development and Land Use Policy

The problems created by the existence of this pattern of residences is compounded by the pattern of land subdivision as is shown in the map entitled Rural Municipality of Springfield Land Use Designations and Parcel Subdivisions 1999 (see Figure 15). The number of dwellings in all three of the agricultural land use designations is representative of an external pressure for a change in land use away from agriculture, due to the pressures that residential and other urban forms of development place on agricultural areas (such as demand for more services and increased land values, both of which contribute to higher property taxes that in turn cut into farm operation profits). In this case, while there are many large parcels on the land designated 'Agricultural

Figure 14. Rural Municipality of Springfield Land Use Designations and Dwellings 1999

Not to scale.

Figure 15. Rural Municipality of Springfield Land Use Designations and Parcel Subdivisions 1999



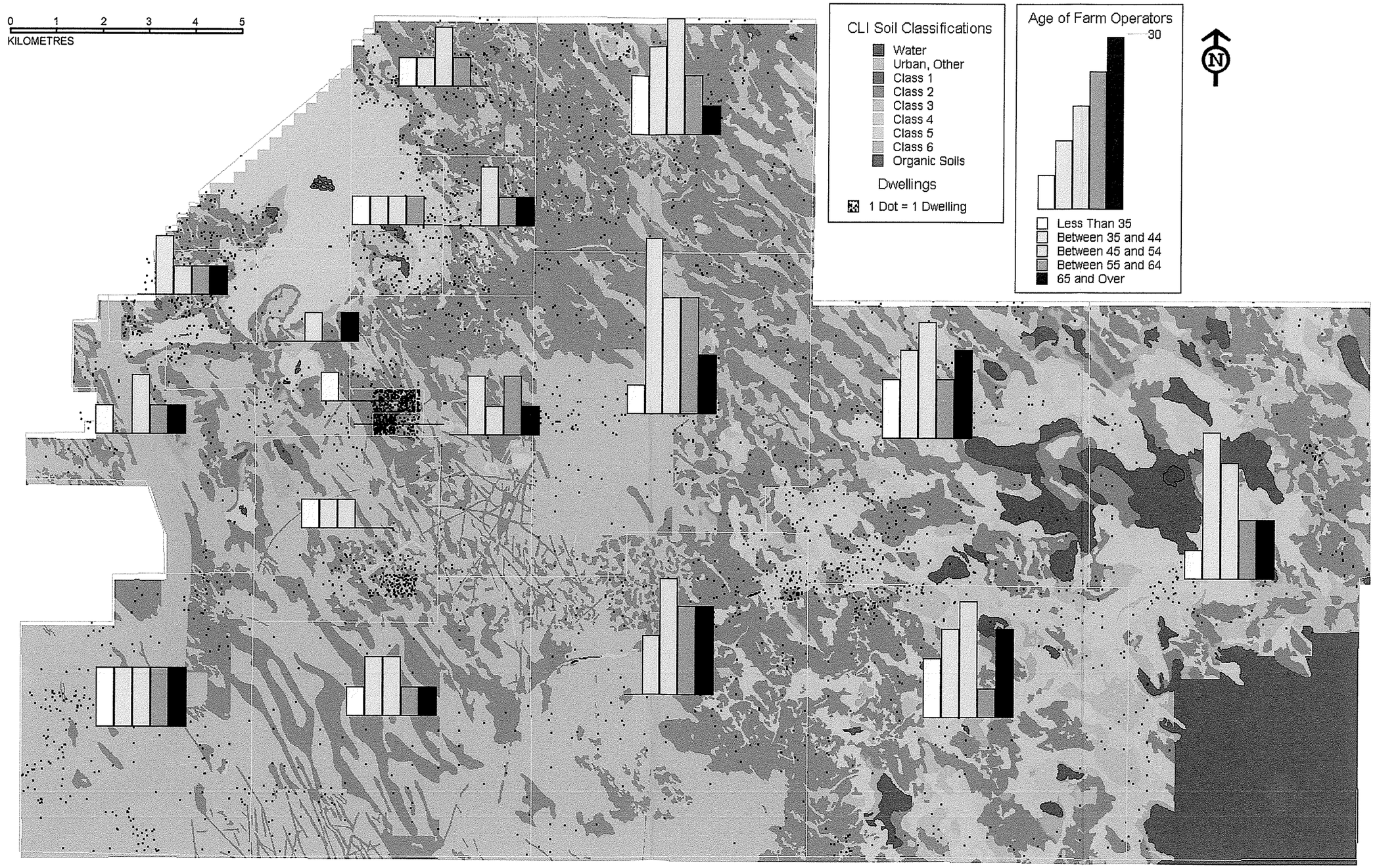
Preserve Area', there still exists a pressure for more residential development, manifest in the amount of subdivision throughout the municipality. It is particularly evident where there are smaller, open parcels near clusters of existing dwellings. These groups of dwellings and vacant smaller lots are common throughout the northern half and the western edge of the municipality . The significant number of dwellings and high degree of subdivision, is illustrative of the pressure for other non-agricultural activities from both in and outside of the community of farm operators.

Pressure on Agricultural Operators

The determination of areas that will likely be facing the highest pressure for change was taken a step further by examining the relationships between the age groups of agricultural operators (per enumeration area) and residential development, and the level of subdivision as of 1999. The age of agricultural operators and dwelling density was correlated by overlaying the age of farm operators and the level of residential development in 1999 on top of the soil classification map to create a map entitled Rural Municipality of Springfield CLI Soil Classifications, Farm Operators, and Dwellings 1999 (see Figure 16). In this map, the nineteen enumeration areas within the RM of Springfield are defined by the grey lines. Unfortunately the results were not as definitive as was hoped, due to the fact that the enumeration areas with the highest density of dwellings and subdivisions had either smaller age ranges of farmers or had larger numbers of farmers aged 54 or less.

Nevertheless, the areas likely to experience the most pressure for change due to residential development are those EAs in the north-west section of the municipality

Figure 16. Rural Municipality of Springfield CLI Soil Classifications, Farm Operators, and Dwellings 1999

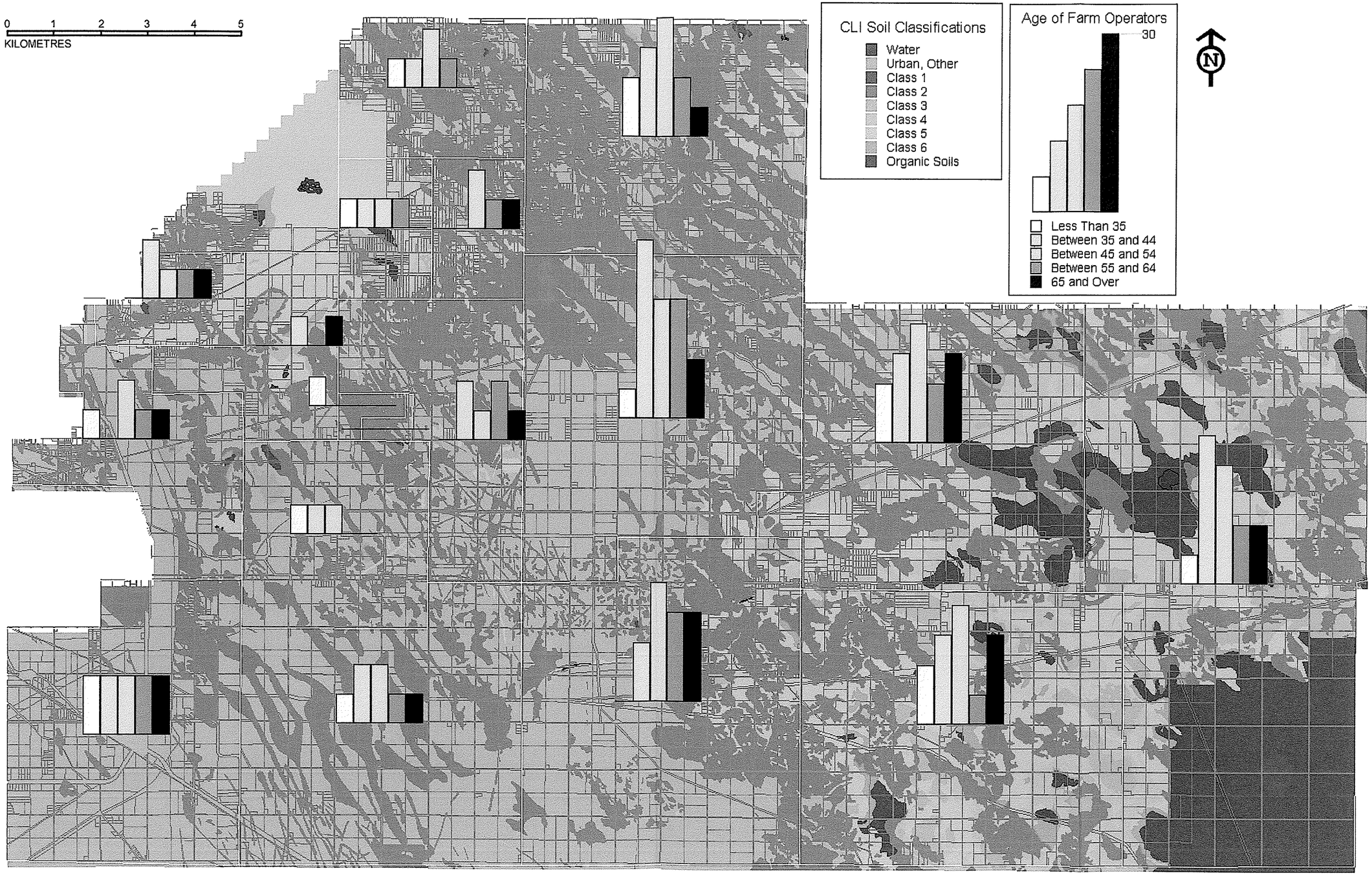


around Birds Hill Provincial Park, and particularly the second EA due east of the park. Here, even though the number of farm operators aged 55 and over is lower, the overall number of farmers per EA is also lower than in many other EAs within the municipality. At the same time, there is a higher density of rural residences. The second EA due east of the park is the major exception, in that the numbers of farm operators 54 and younger and those 55 and older are roughly equal. Additionally, the proposed development plan designates this area as 'Rural and Agricultural Area 1', wherein large-lot residential development is permitted (Rural Municipality of Springfield, 1998).

The next most likely area is the EA immediately east of the three northern-most EAs that border Birds Hill Provincial Park. Once again, while the number of agricultural operators under 55 is much higher than those 55 and over, there is also a significant amount of existing residential development. Even though this area is designated as 'Agricultural Preserve Area', the level of residential development would constrain the operation of many farms. This is significant because the latest Statistics Canada (2002) data shows that the number of farm operators is dropping, while the size (in acres) of farm operations is growing. This raises the question of how the farm operators themselves feel their land needs to be used, or how they would like to see it used.

To determine this, the age groupings of farm operators by EA and the parcel map were overlaid on top of the map of soil classifications to produce the map entitled Rural Municipality of Springfield CLI Soil Classifications, Farm Operators, and Parcel Subdivisions 1999 (see Figure 17). On this map, EA boundaries are off-white in colour

Figure 17. Rural Municipality of Springfield CLI Soil Classifications, Farm Operators, and Parcel Subdivisions 1999

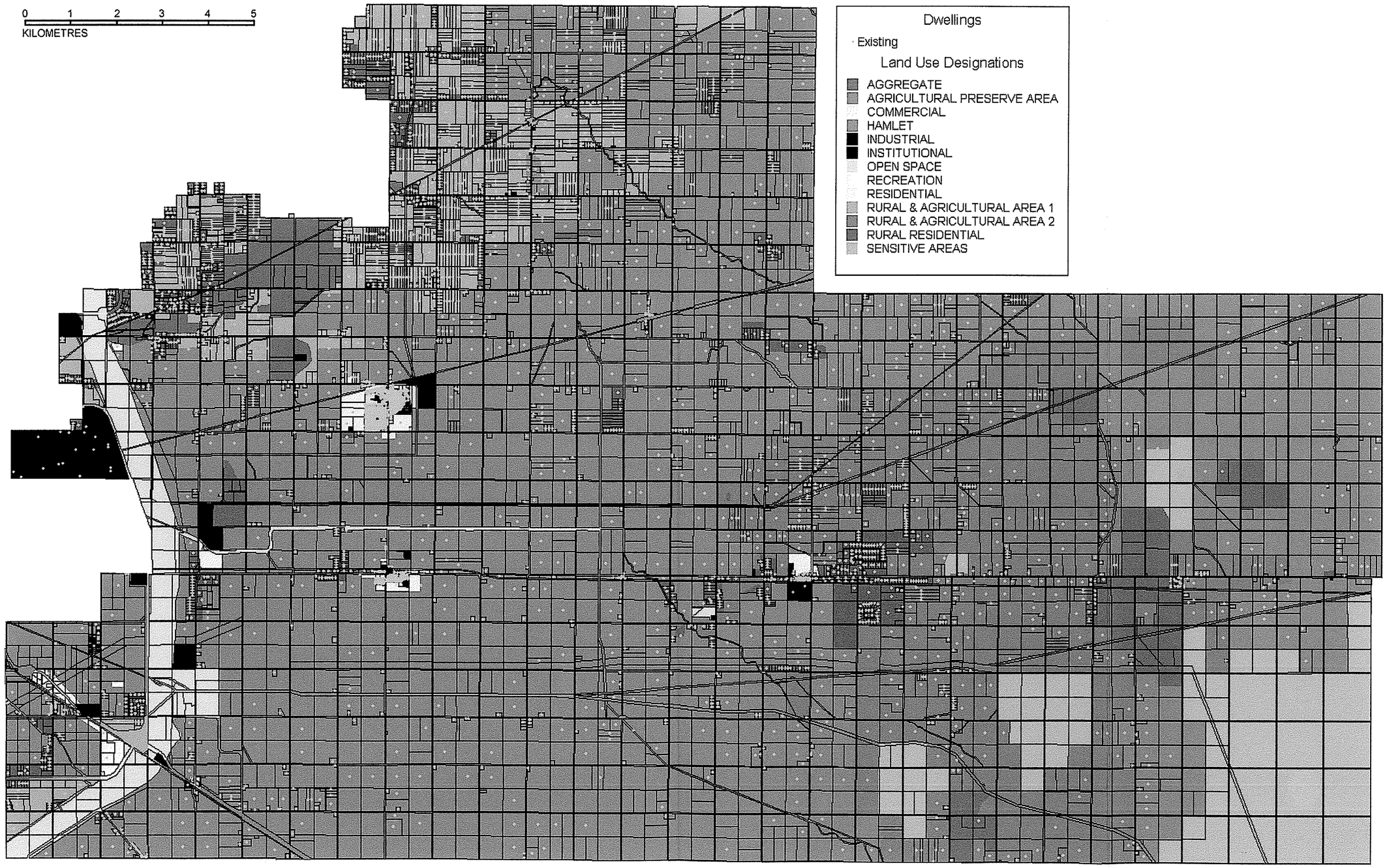


and once again, the greatest pressure for land change, as suggested by the degree of subdivision, is seen in the EAs around Birds Hill Provincial Park. The small number of farmers is offset this time by the level of subdivision within these EAs. Also similar to the previous map is the likely pressure faced by the EA immediately east of the northernmost EAs that border Birds Hill Provincial Park. In both situations the levels of subdivision would suggest strong intentions for change in land use, given the current trend of farm operators and farm sizes.

However, in looking at the number of subdivisions with dwellings on the map entitled Rural Municipality of Springfield Land Use Designations, Dwellings, and Parcel Subdivisions 1999 (see Figure 18) it is clear that much of the subdivided land in the EAs around Birds Hill Provincial Park already has dwellings. As such, the intention of the farm operators towards their land as they retire is more difficult to discern in this area. Nevertheless, this map shows that the EA to the east of those bordering Birds Hill Provincial Park has more subdivisions without dwellings. It also has more smaller subdivisions than other areas with the designation of 'Agricultural Preserve Area', suggesting that more farm operators would like to retire on the profits from the sale of their farm land for rural residential development.

Additionally, the amount of subdivision and residential development illustrated in the previous three maps would suggest that farmers in the northern areas of the municipality and even some areas with the designation of 'Agricultural Preserve Area,' are severely restricted in their ability to expand. As such, they face the likely possibility of being

Figure 18. Rural Municipality of Springfield Land Use Designations, Dwellings, and Parcel Subdivisions 1999



edged out by an inability to follow the trend for that sector, and expand the size of their farms.

Potential for Residential Development

Using the IRS satellite image as the base map, the parcel map (coloured yellow) and the dwellings existing in 1999 (identified as blue points) were overlaid. At this point, each empty parcel that was five acres or less in size was located and identified as a red point, to produce the map entitled Rural Municipality of Springfield IRS Build-out Map (see Figure 19). The term 'build-out' refers to a mapping exercise that is used to visualise the form that development in an area may take in the future based upon a variety of variables, not the least of which is current or proposed zoning. While this is far from a complete build-out analysis (which is discusses in detail in Chapter 6), it begins to show that more residential development could occur throughout the municipality, based upon vacant rural residence-sized lots (as suggested by the Government of Manitoba's Provincial Land Use Policies) and Springfield's proposed development plan. The IRS image was substituted with the map of land use designations to create the map entitled Rural Municipality of Springfield Land Use Designation Build-out Map (see Figure 20), which shows that there are a number of inappropriate lot sizes within the 'Agricultural Preserve Area' that could see the placement of rural residences.

While relatively few in number, it should be noted that the lot sizes examined were those five acres or less, and there are a variety of larger parcels that by themselves would be too small for agricultural purposes. Based upon the policies in the proposed development plan, it is possible that many of these lots could be purchased for

Figure 19. Rural Municipality of Springfield IRS Build-out Map

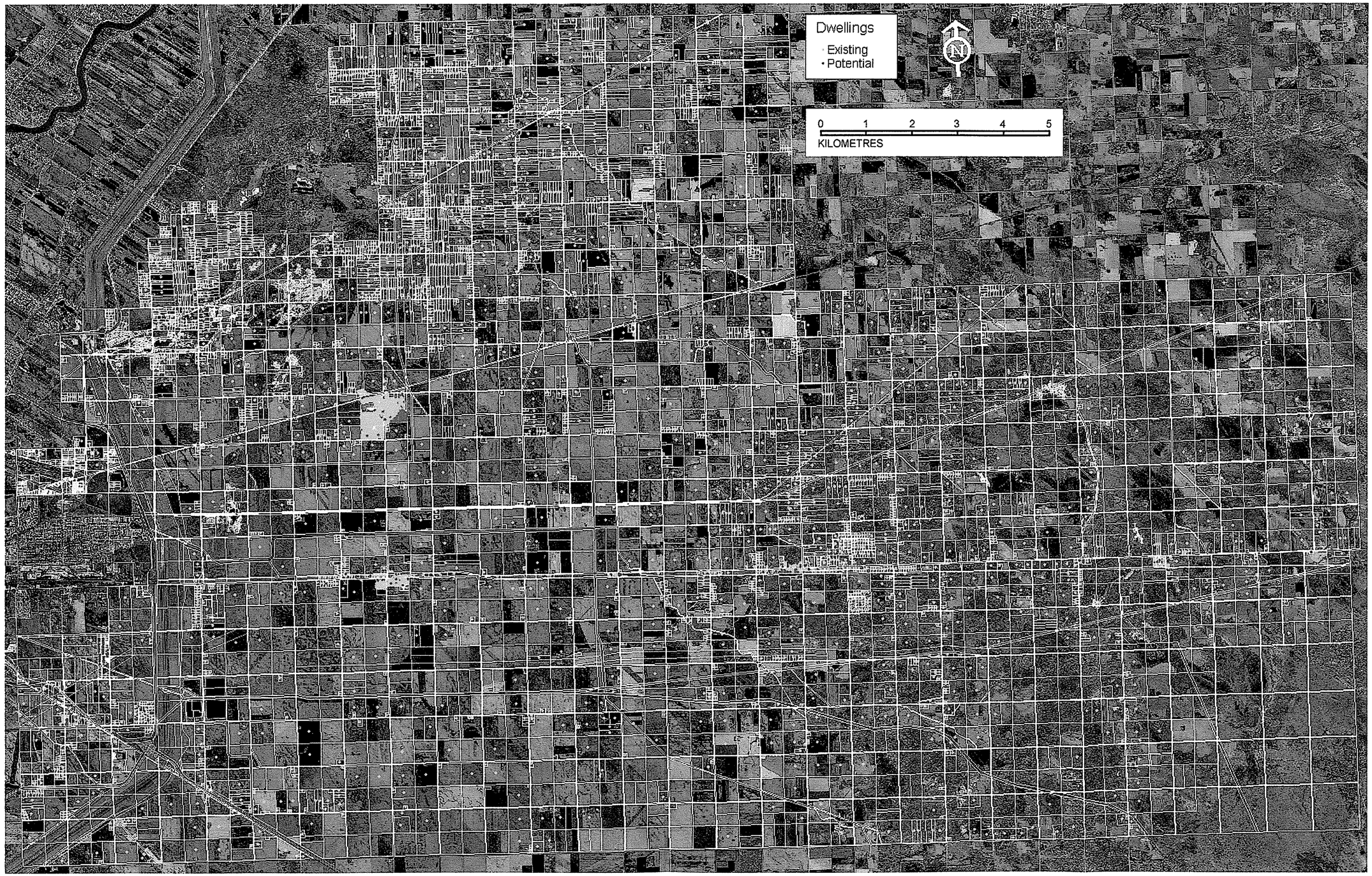
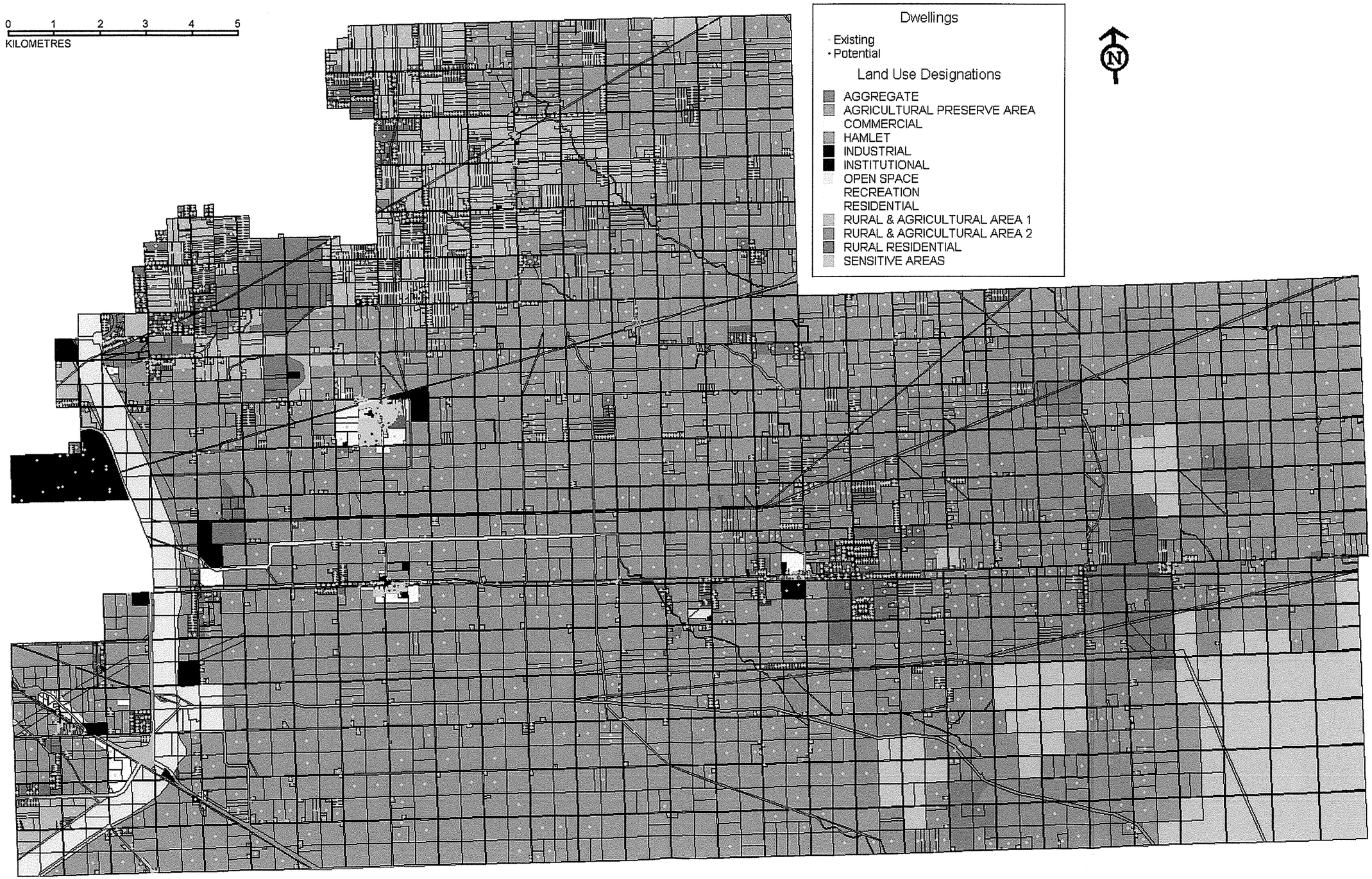


Figure 20. Rural Municipality of Springfield Land Use Designation Build-out Map



the placement of rural residences. The result of this would be both physical and perceptual constraints on existing farm operators, the former in the shape of further restriction of a farm-land owner's ability to expand his or her operation, and the latter being an increase in the general costs (especially taxes) of living and working in the area, as well as the potential for complaints from rural residents about the dirt, noise and/or smells associated with an agricultural operation. As such it is likely that for many agricultural operations to survive, additional farm protection mechanisms need to be implemented. These would need to be part of the municipality's development plan and zoning by-law, and the following chapter examines how effectively the proposed development plan can deal with the issues associated with the protection of farmland and open space.

Summary

With a high population of ex-urban residents and the residential development that houses them, along with a significant amount of land fragmentation and undeveloped lot subdivisions, the RM of Springfield has seen a shift in land use from agricultural to rural residential in the period between 1966 and 1999. Using the building permits issued between 1966 and 1999, the RM of Springfield's parcel map from 1999, a CLI soils classification map, and the proposed development plan's land use designation map, it is determined that: a) while fairly common throughout the municipality, the greatest number of residences is located generally in the northern part of the municipality, and more specifically in the most northern and north-western portions of the municipality, and b) the current pattern of residential development and land subdivision places pressure on

farm operators which the development plan needs to address in order to prevent the gradual constriction of the area within which farm operations could comfortably exist.

To determine the areas most likely to see the greatest pressure for a change in land use, the age groupings of farm operators per enumeration area is combined with the dwellings as of 1999, the RM of Springfield's parcel map from 1999, and the CLI soils classification map. The two maps (one using farm operator groups, dwellings, and soil classifications and the other using parcels instead of dwellings) show that the greatest pressure for change is likely in the northern-most portion of the municipality, immediately east of the area adjacent to Birds Hill Provincial Park. While the findings are not as clear-cut as was hoped, due to a greater range in ages of agricultural operators than was expected, and the number of smaller lots that had already had dwellings on them, this area could possibly see the greatest increase in residential development due to the ability (albeit limited) of farm operators to subdivide existing houselots for new residences.

The possible form future development could take is examined through the generation of two partial build-out maps. Vacant 2 to 5 acre parcels are identified with a red point on the IRS satellite image and the map entitled Rural Municipality of Springfield Land Use Designations (see Figure 7), showing the amount of area readily available to rural residential development. Based upon the ability of a farmer to subdivide houselots, the actual area potentially affected by rural residential development is much larger. Given these findings, and the fact that the development patterns suggest a preference for locations with features such as woodland and variable topography, the proposed

development plan should be designed so as to protect agricultural land and open space, as well as preserve the aesthetic features in existing areas with rural residential development and to foster their use as a design element in new developments. The following chapter examines Springfield's proposed development plan to determine how well it protects and manages its resources.

CHAPTER 5: Pragmatism, Planning and the Development of Effective Policy

Introduction

As has been demonstrated, rural residential development is fairly extensive in the RM of Springfield. Given the past pattern of settlement and the demands and pressures that have developed (at least in part) because of it, the likely form of future development will be affected by the municipality's development plan. As stated earlier, a development plan is the policy framework from which the municipal zoning by-laws are developed. In this examination of Springfield's development plan, it will be shown that while having a strong foundation with respect to the protection of agricultural land and open space (and ultimately the rural nature of the municipality), the plan appears to fall short of being able to achieve many of its stated objectives.

Pragmatism In Development Plan Creation and Evaluation

In his article entitled "Evaluating Plans Pragmatically", Hoch (2002) argues for planners to have a less *rational* perspective and instead use a more *pragmatic* approach to evaluating development plans. An evaluator taking a rational approach looks for precision, correspondence, principles, and expertise in the examination of a plan. This approach emphasises conceptual coherence and fit. Conversely, the pragmatic approach emphasises relevance, similarity, consensus and stewardship. An examiner taking this perspective looks for purpose and consensus in a plan (Hoch, 2002). Hoch states that he is not arguing against rational analysis, but rather against a "[r]ationality that elevates theory above practical reason" (Hoch, 2002).

This study has tried to take a more pragmatic approach to the evaluation of the RM of Springfield's proposed development plan due to a recognition of the great variety of factors that influence land use and which should influence land use policy-making. As noted earlier, more Canadians are living in urban areas. However, the constitution of urban areas is changing insofar as small towns and bedroom communities in rural areas are growing in size and population even though most of their residents work in the built-up city. This has placed increasing pressure on rural land owners to sell or develop their land for urban uses, especially residential development. At times the pressure is internal, with farm land owners perceiving a need for more income and then selling their land for residential development. Conversely, pressure is often exerted by external forces as the new urban forms of development attract more urban development which creates a positive-feedback cycle of increasing land values (and the associated higher taxes), increasing service provision (such as road improvements or municipal sewage disposal), and increasing pressure from new neighbours not prepared for the noises, smells and dirt associated with agricultural operations and who then complain once they are exposed to them.

In an attempt to avoid such problems, zoning by-laws were created. These legal mechanisms are used with the intent of preventing incompatible land uses from developing next to each other, as well as controlling where different forms of activity are located in general. An additional anticipated benefit of this sort of control is the avoidance or mitigation of excessive costs in the delivery of municipal services. However, due to the ease with which compatible (or desirable mixes of) uses can end up

being separated, *Euclidean zoning* often ends up being too exclusive and segregational, and can therefore be a cause of inefficient and diffuse development patterns. By limiting or disallowing the mix of land uses seen in traditional communities, current suburban and ex-urban development patterns separate the different factors that comprise a livable, walkable community to create car-dependent communities where a large amount of time is spent driving to the places that the residents need to go. Further to this, zoning and subdivision by-laws usually do not require developers to provide more than the design of house lots and streets and, as a result, the entire development parcel is converted to nothing more than house lots and streets. In the case of rural residential development, farmable parcels can be gradually converted to a series of contiguous parcels that are too small to farm and too large to mow, due to minimum lot size requirements. This results in a checker-board pattern of residential development across the landscape which is without the amenities of a traditional community and which decreases the rural character that was the attraction in the first place.

The current pattern of residential development throughout the RM of Springfield likely indicates that (at least to some extent) the municipal decision-makers believed that individual land-owners have a paramount right to decide how their land is used, and that more residential development automatically meant greater net revenues for the municipal government. As has been shown in the previous chapter, residential development is found throughout the municipality, regardless of the quality of soil for crop production or septic field suitability. As such, it seems to have been driven by land-owner desires, and allowed because of the short-term benefits to the land-owner and the municipality. While

it is true that more houses mean more people paying taxes (and higher taxes due to the increase in land value), there are ultimately, if not immediately, increased costs associated with the inefficient provision of services, environmental degradation and a gradual loss of the characteristics that attract urbanites to rural areas. In order to protect the remaining agricultural and open space land from haphazard, land-consumptive development in the future, the municipality requires a plan that accounts for both the various landscape characteristics and its residents' desires regarding the direction and type of future development.

A pragmatic perspective of land use planning policy creation is likely to lead to meaningful change in land use policy, and hopefully land use, in the municipality. In trying to examine the proposed plan pragmatically, it becomes noticeable that the creators of the plan seemed to have approached it from a more rationalist perspective. It is likely that it is from taking this more focused and specific approach as well as having certain, and at times contradictory, goals (such as a desire to allow land owners to use their land in the way that they choose, and a desire for greater tax revenue through increased development, along with a need to comply with the provincial government's land use policy) in mind that the problems with the plan's policies are born. Many of the policies do not significantly account for the variety of views held by the municipality's residents, nor the variety of landscape characteristics within the municipality. At the same time many of the policies are based upon fairly basic Euclidean zoning guidelines which allow certain forms of development to exist in some places (and hoping that it does not occur in others), while at the same time allowing land owners to create rural residential lots where

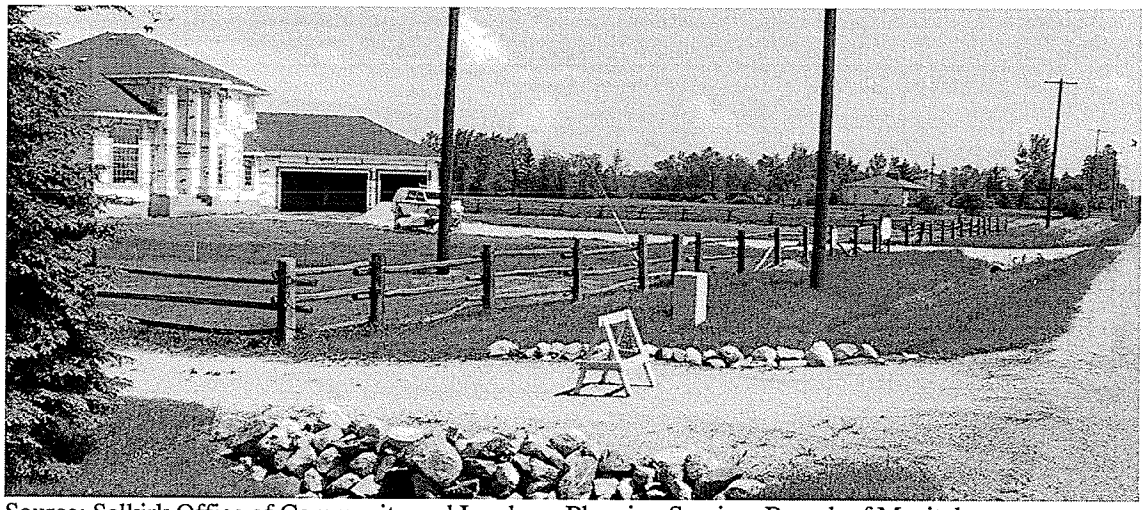
they would otherwise not be allowed. As such, the policies developed for the proposed development plan will not prevent the type of development pattern that has evolved over the past thirty-odd years and is unlikely to make the municipality a better place to live or farm.

An important feature of the landscape is the level of residential development throughout the municipality, which is indicative of an urbanising municipality that becomes developed from the outward spread of urban uses. While the densities of development may not be close to those of designated urban areas, the number of non-farm residents as compared to residents employed in the agricultural industry is significant, and needs to be considered when creating a development plan. This level of urban development is already having at least one affect insofar as there is a concern among land-owners that they should be allowed to subdivide their land (if they need/want to) because their neighbours were allowed to. As such, mechanisms other than the standard separation of uses need to be employed in order to meet the needs of current and in-migrating residents, as well as protect and foster agriculture within the municipality.

RM Of Springfield Proposed Development Plan

While the development plan demonstrates some intent to prevent (or at least minimize) the adverse effects of rural residential development and protect agricultural land, it lacks strong policy mechanisms that will actually accomplish these goals. Instead, some of the policies listed will foster the development of a checker-board pattern of rural residential houselots, and the associated wide-spread, low density development (see Figure 21). This means that there will be an overall loss of agricultural land and open space that will likely

Figure 21. Inappropriate Suburban-Style Subdivision in a Rural Area



Source: Selkirk Office of Community and Land-use Planning Services Branch of Manitoba Intergovernmental Affairs

end up increasing the costs to the residents of the municipality in a variety of ways, not the least of which will be a loss of the rural character of the area, if current rates of development are maintained. Some of the policies will even contribute to potential health and safety problems, as septic fields and groundwater wells combined in areas prone to high levels of water in the soil increases the chances of groundwater contamination due to the failure of the fields under these conditions.

A pragmatic approach to the RM of Springfield's development plan review process would address the process from a more 'regional' perspective. This means that there would have been a better understanding of the current form of the landscape within the municipality (looking at both natural and human-made characteristics), the desires of the variety of residents within the municipality, and the costs of provision of additional services to new development. This would provide the context from which to examine past land use decisions along with the provincial land use policies, and to create zoning by-

laws appropriate to the current municipal situation. In the past, decisions were made that allowed residential development in areas where ground water is easily polluted or where ex-urban development would adversely affect or otherwise limit agricultural activities in the immediate area. Based on zoning policies and a set of provincial land use policies that do not address the conditions in a rural municipality with this level of urbanisation, the proposed development plan will likely not provide much impetus for change.

The 'level of urbanisation' refers to the fact that the clear majority of employed people living in the municipality (approximately 90%) not only work outside of the agricultural sector (Statistics Canada, 1996), but also the municipality (approximately 4400 out of 6900). For effective regional planning to take place, the provincial government needs to recognise the existence of urbanizing municipalities in an emerging dispersed-city form. As the provincial land use policies are a set of guidelines, they have not been strictly or evenly applied in the past, resulting in the City of Winnipeg being surrounded by rural municipalities that are becoming more urban to various degrees. As such, new strategies that can effectively protect agricultural land while accommodating existing and new development need to be identified or developed, and employed in order to ensure future land use will be more efficient. A more pragmatic approach to land use planning would start by establishing clear, consistent goals based upon a landscape inventory and community input.

Better Planning Through Better Mapping: Build-Out Maps

In many cases the end result of conventional zoning on all land environmentally suitable for development will be wall-to-wall subdivisions, periodically interspersed with an

occasional shopping centre, office park or civic facility (Arendt, 1994). Nevertheless, a major problem found by people involved in land use planning is a lack of public interest. Even so, while much of the ex-urban development in rural areas takes place incrementally and, as such, may not be seen as imminent a threat as it often is, planners have found that people living in rural communities relate very directly with the loss of the natural landscape where they live. In addition, when they are shown that alternatives to conventional development design can prevent this without reducing the land-owner's equity, people's interest in improving zoning regulations is aroused (Arendt, 1994).

One of the most understandable, inexpensive and effective tools for envisioning the long-term results of the implementation of existing zoning and subdivision regulations is the 'build-out map' (Arendt, 1994; U.S. Environmental Protection Agency, 2001). These maps illustrate the probable locations of new roads and residential development that could legally be constructed on vacant and buildable land within the district (i.e. a municipality, a section of the municipality, or even large, undeveloped parcels), based upon the development zones and zoning by-laws of that district. An important reason that they are such a valuable tool is that they demonstrate to municipal officials and residents alike just how vulnerable to inefficient development their community is, in spite (or because) of existing zoning (Arendt, 1994; U.S. Environmental Protection Agency, 2001). While the maps showing the current conditions of rural residential development in the RM of Springfield are striking enough, a build-out map would be particularly effective in demonstrating just how bad the problem of residential development could

become and why a well-designed development plan is so important (see Figures 19 and 20).

While there are a variety of ways to conduct a build-out analysis to create the map, there are three basic methods, a *parcel build-out,* a *land use build-out,* and a *site design level build-out* (Amengual, 2001). A *parcel build-out* analysis estimates the number of units that can fit on each individual parcel. Once the size of each parcel is determined, a variety of areal factors such as roads and constraints (which can be anything, either physical or conceptual, that prevents development such as a required buffer or a section of low-lying land prone to flooding) are applied and subtracted from the parcel size. Following this, the number of lots (based upon minimum allowable lot size) that can fit within the buildable area of the parcel is determined (Amengual, 2001).

A *land use build-out* analysis follows the same basic methodology as that of the previous analysis, but is usually done when parcel data are unavailable. The amount of available land in each zoning district is determined by subtracting non-buildable areas (using the same types of constraints as mentioned above) and then dividing by the minimum lot size to determine the number of lots that can be created (Amengual, 2001). While similar to the previous two methods, the *site design level build-out* analysis is much more accurate and much more time consuming because potential site designs are drawn for each vacant parcel, based upon the aforementioned available land reduction process. In addition to showing how much development would likely occur, this method produces an accurate picture of the different types of development that could occur, and where they would

possibly occur (Amengual, 2001). Regardless of the method used, development should not be projected into areas where natural or regulatory constraints would prevent it, and the predicted development should reflect reduced density where the landscape or existing activity would limit new development (Arendt, 1994).

A build-out analysis has two products, maps showing the development patterns that are likely to take place based upon existing zoning by-laws and past demographic information, and information on the amount of development that could occur (such as the number of new buildings and residents, the amount of land consumed, and level to which municipal services will need to be extended) (Arendt, 1994; Theobald). Generally, there are two phases in a build-out analysis, with the first phase depicting changes on a map and the second phase quantifying the impact of those changes (U.S. Environmental Protection Agency, 2001). It should be noted that GIS is a particularly appropriate technology for this type of analysis and the creation of this sort of map (Amengual, 2001; Massachusetts, 2002; Park County Environmental Council, 2001; Theobald, ; U.S. Environmental Protection Agency, 2001). The RM of Springfield has both the technology and the digital data necessary for a build-out analysis. The government of the State of Massachusetts lists zoning districts, location of various land uses, the amount of open space available, and existing subdivisions as critical GIS data inputs (Massachusetts, 2002). In the case of Springfield, 'subdivisions' can be read as 'parcels' because of the level of data available to them. Additional GIS data include digital orthophotography or satellite imagery, well locations, hydrology, hypsography, habitat, and soil information

(Massachusetts, 2002). Most if not all of these data are available to the municipality as well.

Examples of how effective these studies can be are seen in build-out analyses for Central and Western Montgomery County, PA and Paradise Valley, Park County, MT. The first study is comprised of the 26 municipalities within central and western Montgomery County, PA. The major findings of the study show that the area could accommodate a total population of roughly 423,900 people, based upon current zoning ordinances, with most of the population living in low-density suburban-style communities (80% single-family detached houses) with a lot size of about 43,200 square feet (Montgomery County Planning Commission, 1996). Aside from being an inefficient use of land, it could possibly lead to a housing shortage as current employment trends suggest that there as many as 39,000 more jobs than employable local residents which would lead to an increase in commuter traffic (Montgomery County Planning Commission, 1996). Ultimately, the study shows that, based upon current zoning, future development will likely interfere with stated community development objectives such as preserving community character and historic assets; providing efficient, cost-effective municipal services; providing several modes of travel; congestion avoidance; and the provision of a reasonable variety of housing types (Montgomery County Planning Commission, 1996).

The second build-out analysis of Paradise Valley, Park County, Montana is even more telling. Similar in land use to the RM of Springfield, Paradise Valley is primarily rural farmland and woodland, interspersed with farmhouses, a few small communities and an

increasing number of large lot subdivisions (Park County Environmental Council, 2001). Also similar to Springfield, the Park County Comprehensive Plan did not contain mechanisms through which the residents could effectively meet their stated goals of maintaining the mix of small town and rural characteristics of the area, preserving open space and agricultural characteristics, and preserving the rural character of the area (Park County Environmental Council, 2001).

Given local concern over the future of development, the study was undertaken using various data sources such as levels of recent land subdivision, septic tank permit data for the previous thirty years (which was used as the indicator of the construction of a new residence – Springfield has the actual residential building permits), and aerial photographs (Park County Environmental Council, 2001). The build-out maps resulting from the study graphically show the form in which, and the extent to which, land is likely to be consumed – by overlaying current residential development and lot subdivision with projected residential development and lot subdivision, overtop of aerial photographs of the area. Essentially, 2027 will see almost all of the valley consumed by large lot residential development, with only a fraction of the existing farmland and open space remaining (Park County Environmental Council, 2001).

The study then goes on to define the way in which development could occur in such a way as to protect farmland and open space. Two conceptual illustrations of potential development were drawn, one showing how conventional development inefficiently consumes land, pushing out agricultural operations and making publicly accessible open

space private and inaccessible to the general public, while the other depicts the results of land use planning mechanisms that minimize the affects of ex-urban development in rural areas (Park County Environmental Council, 2001) The second drawing illustrates the affects of the redirection of growth, clustering it around the existing urban areas and discouraging it from viable agricultural land, riverfront and wildlife habitat (Park County Environmental Council, 2001). Where ex-urban development does occur, the homes are clustered together while the open space is linked together, protecting view sheds and retaining parcels large enough for agricultural operations to remain viable (Park County Environmental Council, 2001).

The resulting pattern from conventional development planning is a more-or-less continuous pattern of checkerboard subdivisions where the only large areas of open space remaining are privately owned or in areas where development is inhibited by the landscape (Arendt, 1992, 1994). While these maps are only projections of future development, based upon historic conditions, and while the actual direction future development could take would obviously be affected by a variety of social and demographic factors, this form of analysis is an excellent starting point from which to raise the question of the effectiveness of the current development plan and zoning by-laws. The maps raise the question of what it will be like to live, work and farm in the community when increasing densities of development occur, according to the current zoning regulations, and illustrate the importance of the role zoning regulations play in shaping the way land will be used (Arendt, 1994).

Community Visioning And Citizen Participation

With the landscape inventory complete and a view of how future development could occur based upon past patterns of development and population growth, and according to existing zoning by-laws, participants in the planning process will have a clear view of what has happened and what could happen. The next step is to develop a vision of the future based upon the opinions of the residents, as they are intimately familiar with their community with its unique qualities and problems. As such they can be a source of creative ideas to enhance and protect those qualities and deal with the problems (Department of Community Trade and Economic Development (Washington State), 1994). This would seem to be a basic course of action as many of the residents moved to the community because of a desire for a rural lifestyle and as such, would know what they do and do not like. As well, farmland preservation requires the participation of members of the farming 'community', which includes anyone who has a stake in the future of local agriculture (Mantell et al., 1990). Often, land use or development plans and regulations are developed without significant (or any) involvement of the community's residents – some even developed by consultants who reside outside of the community (Department of Community Trade and Economic Development (Washington State), 1994). The RM of Springfield's most recent development plan revue process inititally involved a series of three public meetings, and general background studies undertaken by their hired consultants (E. Towler, personal communication, 5 August, 2002).

Input from residents can be obtained at community workshops designed to encourage the active participation of attending residents, and from a community preference survey (Department of Community Trade and Economic Development (Washington State), 1994). The survey could be comprised of a combination of conceptual and visual (i.e. illustrations of various community scenes – for instance, side-by-side illustrations showing a clustered development buffered by vegetation, next to one showing a cookie-cutter subdivision) questions to which residents would respond based upon personal preference. The results then become part of the definition of a clear vision of the future as determined by the local residents, identifying the future direction of development and what purposes are to be served by the landscape within the community (Department of Community Trade and Economic Development (Washington State), 1994).

Part of this process is accomplished by reaching consensus regarding the qualities (in particular those natural and human-made characteristics of the landscape that create or detract from rural 'character') that are most important and need to be preserved and which should or could change (Department of Community Trade and Economic Development (Washington State), 1994). As noted previously, while the purpose of a development plan is intended to be the articulation of a vision of effective and efficient development, land management, municipal service delivery and community maintenance and enhancement, the actual outcome can be somewhat less. A method that has been widely used to improve both the development and articulation of a vision for a community's future is the development of a Map of Conservation and Development (Arendt, 1994). This type of map could be an important part of the 'visioning' process as

it should be developed from a pragmatic perspective and shaped by the desires of the community's residents. It would also allow the residents to visualise how their community will look once regulations based upon their goals are enacted.

A map of conservation and development identifies all the areas within the community that should remain unbuilt, as well as those where growth should be located, based upon an inventory of their natural and cultural (i.e. municipal services, existing development, and any human-made attributes that could affect, or be affected by, new development) resources (Arendt, 1994, 1998). Once complete, the map would be incorporated as a regulatory feature in the municipality's development plan and zoning by-law. In this way, both land-owners and prospective developers would be aware of the constraints and opportunities that exist within the community, allowing them to take the various relevant factors into account in their personal planning process (Arendt, 1994).

Landscape features to be considered for preservation are both natural and human-made, such as wetlands, floodplains, woodland, prime agricultural land, wildlife habitat, groundwater hazard areas, stream corridors and riparian zones, historic sites and scenic view-sheds (Arendt, 1998). New development should be required, as much as possible, to be located outside of preserved areas, and allowed to be clustered at higher net densities on other parts of the owner's property (Arendt, 1994).

Once complete, the map of conservation and development can be used as a template on which development designs are based. Conservation zoning and conservation subdivision

design are the two regulatory ways in which the map is used as a policy tool (Arendt, 1998). Conservation zoning allows for a greater variety of development choices (as long as they are not incompatible), and prevents all the land in a particular area from turning into streets and house lots (Arendt, 1998). Conservation subdivision design uses the map of conservation and development as a mechanism by which the area to be developed is identified and its shape determined. Protected areas near or within the subdivisions are located, and development is designed away from or around them (Arendt, 1998).

In order for this to work effectively, a by-law listing the specific procedures for the analysis of each subdivision site, along with detailed standards for preparing a development plan for the site (that include the amount of land required to remain unbuilt and directions for demonstrating the way in which the proposed open space relates to the community's map of conservation and development), needs to be passed (Arendt, 1998). The site's proposed development plan would need to have an existing resources and site analysis map as well as a sketch plan. The first identifies land that is undevelopable, as well as the areas that could be built upon but that should remain as open space, while the second shows where and in what form the proposed development will take place. When compared with the first map, the sketch plan will show officials the quality of the development design (i.e. how well land is protected and how efficiently it is being used) and allow them to make more informed decisions regarding its approval (Arendt, 1998).

As such, the use of these two types of maps would allow all members of the community to make more informed decisions regarding the protection of resources and the future

shape of development. These types of maps would be the best way to collect and show information about the community relevant to the planning process. Once complete, the map of conservation and development becomes the foundation upon which the framework of land use policy and zoning by-laws are laid.

Springfield's Policy Examples

There are three general problems which recur throughout the various sections of the RM of Springfield's proposed development plan. These problems reduce the plan's ability to control and guide development in effective and efficient ways. While all of these problems are related, and end up contributing to the same result, they do show different and important aspects of the overall problem: a development plan that will likely not protect agricultural land and open space, nor the overall interests of its residents. First, many of the policies listed will not prevent a checker-board pattern of ex-urban development, but rather will encourage the low-density spread of ex-urban development throughout the municipality. Examples of these include:

> "[Policy 7.3.]2. In evaluating requests to re-designate or re-zone areas for Rural Residential uses the following criteria shall apply: ...
> e) Development is not permitted adjacent to urban centres. ...
> [Policy 7.3.]7. In 'Hamlets' rural residential lots should generally be in the 2 acre size range.
>
> "[Policy 8.3.]4. A limited number of subdivisions may also be created for the following non-farm uses: ...
> b) Retiring farmers, or farmers who have purchased additional farms with existing farmsteads, may subdivide the existing farmstead provided the

subdivision will not restrict the agricultural practices carried out on the balance of the land and the surrounding area." (Rural Municipality of Springfield, 1998)

"[Policy 8.3.]8. In reflecting the dominant agricultural nature of [Agricultural Preserve Areas], the implementing by-law will permit only those uses which are supportive of the agriculture industry. The subsequent zones will be limited to the following: Agricultural General, Agricultural Intensive, Agri-Commercial, Open Space, Municipal Services." (Rural Municipality of Springfield, 1998)

The second problem is that there is a lack of development design guidelines or standards that would shape the way new development occurs, ensuring that it: is more compact; preserves agricultural land or open space; minimises the need for, or cost of, municipal services; or helps to maintain the rural character of the community.

[Policy 7.3.]8. Rural residential planned unit developments may be permitted. ... To ensure the permanence of open space, the Municipality may require developers to:
a) Dedicate land to the Municipality.
b) Prepare a bare land condominium plan showing the open space area.
c) Have the open space owned jointly by all of the residential land owners.
In addition, open space areas in planned unit developments shall be zoned as 'Open Space'." (Rural Municipality of Springfield, 1998)

"[Policy 13.3.]10. Biking and walking paths shall be incorporated into the design of new subdivisions in the urban centres. Paths will be linked to

> other community facilities such as parks, playgrounds and schools whenever possible" (Rural Municipality of Springfield, 1998).

The third problem is the way policies are written insofar as the language contained in the document is such that many of the good policies presented are merely suggestions, with no straight-forward requirement for development to occur in a particular way, or for designs to contain particular attributes. The following policies are prime examples of this:

> "[Policy 5.3.]14. The Municipality encourages the beautification of highly visible areas such as main thoroughfares, entrances to urban centres and civic areas.
> [Policy 5.3.]15. The Municipality encourages attractive buildings, adequate on site parking, landscaping and screened storage areas" (Rural Municipality of Springfield, 1998).

It is likely that these problems are (at least to some extent) the result of a rational approach to the development of land use policies. In general the proposed development plan lacks the mechanisms necessary to effectively protect rural character, agricultural land and open space. Unfortunately, Springfield's proposed development plan does not consistently *require* developers to do much more than provide a design for on-site septic systems, houselots and streets. As well, there needs to be more consideration of the current form of existing land uses in order to better protect agricultural and open space land, as well as maintain the rural character of the municipality. As can be seen in Figures 14 and 15, there is land within the area designated as 'Agricultural Preserve Area' that has considerable amounts of existing rural residences, and a diverse land subdivision

pattern. As such, is particularly susceptible to the subdivision allowed by policy 8.3.4b above, wherein farmers who have purchased additional land with existing farmsteads have the ability to subdivide those farmsteads.

Techniques such as the use of Build-out and Conservation and Development maps, along with a more substantial program to collect public input, would enable the municipality to have a more precise picture of the resources available to it, along with the desires of its current residents. These techniques would also help with the establishment of development design standards and the implementation of open space development design principles. In Springfield's proposed development plan there is great emphasis placed on the separation of uses to protect agricultural land. However, better communities and more farm security could be achieved by allowing mixed uses, as long as they do not adversely affect the community.

With particular respect to the needs of agricultural operators, the ability to run farm-related businesses such as food processing, equipment sales and service, and manure composting, would be of great benefit – and help to prevent the sale of land to developers (Russell, 1996). Even the ability to operate unrelated businesses on farm properties should be considered, as long as they do not adversely affect their neighbours and are small in scale. These sorts of mixed uses could be permitted under careful scrutiny, and would not affect the character of area (Russell, 1996). In urban centres a mixture of uses such as institutional (post office, government buildings), commercial, recreational,

residential and open space is important because it helps to create compact and therefore livable, walkable communities.

Even in rural areas, recreational activities such as walking, biking and skiing are not necessarily incompatible with farming, with Beaudry and LeBarrier Parks being two examples where forested recreation areas (containing picnic sites and the aforementioned trail types) exist in the midst of actively used farmland. Furthermore, people do want to live next to recreational opportunities and areas where the natural landscape has been maintained , as is shown by the concentration of dwellings near Birds Hill Park (see Figure 4). As such, the policies should leave more room for a mixture of residential development with recreational opportunities, and the use of development design standards could ensure that passive recreational opportunities are incorporated as a local amenity in as many locations as possible.

Suggestions for Planning and Policy Development

Principles for the Development of Planning Policy

A good place for planning authorities to begin the development plan review or creation process is by reviewing the seven design principles below. Developed from community surveys and materials prepared for communities in the U.S., they are an integral part of the City of Breaux Bridge's (Louisiana) 'Unified Development Code' (City of Breaux Bridge, 2000). The design principles are as follows:

1. *Impact is more important than use.* Zoning should be flexible and permit a wide variety of uses, subject to performance standards used by the planning authority to

determine whether the use should be allowed by conditional use or variance in a particular location. This is particularly important to a municipality such as Springfield, because the protection of agricultural land and open space requires land-owners to be able to derive income from means other than selling portions of their land for residential development. More flexibility in uses maintains the traditional ability of rural land-owners to choose how they use their land, as long as they do not affect their neighbours or other land uses nearby. Further to this, neighbours should have a significant ability to guide the land uses around them through participating in form and informal hearings, as well as an informal mediation process if required.

2. *Density is more important than lot size.* As most conventional zoning determines the number of lots allowed on a parcel by minimum lot dimension standards, the character of a rural areas is permanently changed by an increase in population and a modification of the landscape due to the creation of suburban-style subdivisions comprised of a checker-board of uniform lots. While areas designated for low levels of development need to maintain low densities, they do not need to have large minimum lot sizes that simply consume land faster than small lots. Again, flexible zoning should be used to separate density from lot size by allowing very small lots as long as overall *density* guidelines are maintained.
3. *Design is more important than density.* A development's design can have a significant impact on the land-owner's 'bottom line' and a community's character. Attractive, well-planned low density developments are often more profitable than high-density conventional subdivisions, while well-planned, high-density developments may fit in better with a small community's character than low-density sprawl development. As such, good design and flexible planning are often more important than density to everyone.
4. *Development should be concentrated in and near existing urban centres, following their traditional pattern and layout.* Significantly higher densities should be allowed within and around these areas, and street and lot layout guidelines should be established to determine how these areas are to develop so as to maintain a rural, small-town feeling and character.

5. *Development should meet design standards that maintain local community character.* The distinctiveness of many rural communities is being lost to a standardized form of development found throughout suburban North America. To prevent or at least minimize this, rural zoning by-laws should contain guidelines and plans for ensuring that new development is compatible and maintains small-town character.
6. *Reviewing boards should have discretion to allow that which fits into the community, to prohibit that which does not, and to condition approvals to make sure that the development is appropriate.* The reviewing board should have the flexibility to work with applicants and neighbours to come up with plans that fit the community instead of having rigid use and bulk requirements. This could be accomplished using clear guidelines as the basis for making well-reasoned decisions (rather than those made to curry favour or votes). The board should also have the authority and resources to make sure that any approved plans are properly implemented.
7. *Small-scale projects need a less complicated review process than large-scale ones.* Complex projects need a complex review, small or simple ones do not. They do, however, need to satisfy the design guidelines established by the community. (All seven principles were provided by the City of Breaux Bridge (2000))

Based upon these guiding principles, a development plan should be able to create mechanisms that more pragmatically address the problems faced by an urbanizing rural municipality. A pragmatic approach does require more work, both in the policy development process and in the administration of those policies, however the solutions they provide will likely be much more effective than applying a standard set of guidelines developed for situations other than that of present-day Springfield.

Model By-laws for the Protection of Agricultural Land, Open Space and Rural Character

While agricultural land and open space lands are fairly easy to define, rural character is not. Yet in order to protect it, the concept needs a definition. The following is a definition used by Jefferson County, WA in their 'Growth Management Act'.

> "Rural character refers to the patterns of land use and development established by a county in the rural element of its comprehensive plan:
> (a) In which open space, the natural landscape, and vegetation predominate over the built environment;
> (b) That foster traditional rural lifestyles, rural-based economies, and opportunities to both live and work in rural areas;
> (c) That provide visual landscapes that are traditionally found in rural areas and communities;
> (d) That are compatible with the use of the land by wildlife and for fish and wildlife habitat;
> (e) That reduce the inappropriate conversion of undeveloped land into sprawling, low-density development;
> (f) That generally do not require the extension of urban governmental services; and
> (g) That are consistent with the protection of natural surface water flows and ground water and surface water recharge and discharge areas."
> (Jefferson County Department of Community Development, 1998)

Once the municipality's vision of the future has been determined, goals and policies that enable the protection of agricultural land, open space and rural character need to be established in the development plan, and backed by clear guidelines in the zoning by-law. The goal in this case is to provide guidelines for development that clearly define the

requirements and standards for a use in a particular area. For instance, to protect agricultural land and open space, permitted uses could include:

> **"Permitted Uses.**
>
> A. The following uses of land are permitted in this district :
>
> 1. All forms of agriculture, horticulture, and animal husbandry, including
> necessary farm structures; ...
> 3. Single-family dwelling units directly associated with farm and forest uses;
> 4. Production nurseries and production greenhouses;
> 5. Wildlife refuges and fish hatcheries;
> 6. Conservation areas; and
> 7. Transmission and distribution lines, and pipelines of public utility companies within existing public rights of way." (Minnesota Environmental Quality Board & Biko Associates Inc., 2000)

While conditional uses could include:

> **"Conditional uses.**
>
> A. The following are conditional uses in the Agriculture and Forest Protection District that require a conditional use permit based upon procedures, factors and conditions set forth in other regulations of Model Community ['Model Community' is used as the name of the community for which the ordinance is developed]:
>
> 1. Single-family dwelling units on non-farm/forest lots, provided that:
> a. The permit application for construction includes a scaled drawing indicating the location of the proposed dwelling relative to the surrounding parcels;

b. The dwelling is sited on that portion of the lot which separates it as
much as possible from adjacent farming and forestry, including minimizing the length of property lines shared by the residential lot and the adjoining farms and forest used for production;
c. The dwelling and its lot are located on the least productive agriculture and forest land wherever practical; and
d. The dwelling is sited on the smallest practical area to satisfy the requirements of this ordinance and on-site sewage disposal requirements.

2. Temporary farm housing, provided that this use:
   a. Takes place on a farm of at least twenty-five acres;
   b. Utilizes mobile homes or manufactured housing;
   c. Is used only to house farm laborers; and
   d. Is removed when farm laborers no longer occupy the housing;
3. Home occupations as defined by Model Community in other ordinances;
4. The conversion of a single-family dwelling to a two-or three family dwelling;
5. Bed and breakfast inns;
6. Family care for fewer than six (6) children or adults;

B. At a minimum, the following standards shall be applied when reviewing
applications for conditional use permits within the Agriculture and Forest Protection District:

1. The proposed use shall be sited upon lands which are less suitable for commercial agriculture and forestry than other agricultural or forestry lands within the district.
2. The proposed use shall be sited on a parcel in a manner which minimizes the amount of productive agricultural and forest land which is

converted to the proposed use.

3. The proposed use shall be located in close proximity to existing buildings whenever possible and appropriate." (Minnesota Environmental Quality Board & Biko Associates Inc., 2000)

Incompatible uses should also be clearly outlined. For instance:

"Incompatible Uses.

Uses not specifically permitted by section XX.03 above are not permitted in the
Agriculture and Forest Protection District. In general, uses and activities that are
not directly related to agriculture or forestry, including, but not limited to the
following, are incompatible with this District, alter the essential character of the
District, and are not permitted:

A. Uses and activities that induce non-farm/forest development;

B. Uses and activities that generate large amounts of traffic;

C. Uses and activities that require substantial parking;

D. Landfills;

E. Golf courses;

F. Airports; and

G. Country clubs." (Minnesota Environmental Quality Board & Biko Associates Inc., 2000)

Finally, design standards are listed:

"**Design standards.**

In general, the use of land and structures within the Agriculture and Forest Protection District shall seek to maximize agriculture and forest productivity. The use of land and structures must also conform to the following design standards that create a minimum level of consistency in lot and parcel configuration:

A. All lots or parcels shall have a minimum width of one hundred (100) feet at the building setback line and sixty (60) feet at the street right-of-way line.

B. All structures located on non-farm/forest lots shall have a minimum front and rear yard of twenty-five (25) feet, and a minimum side yard of ten (10) feet on each side.

C. All structures located on farm or forest parcels shall have a front setback of at least fifty (50) feet from the street right-of-way line.

D. The maximum height of a residential building is thirty-five (35) feet. The maximum height of all other permitted and accessory buildings is seventy-five (75) feet, excluding silos and windmills, which shall, however, be set back a distance at least equal to their height from all property lines.

E. The total impervious coverage, including structures and other impervious surfaces, of a non-farm/forest parcel shall not be more than ten percent (10%).

F. On-site septic systems shall comply with the Model Community septic ordinance and County Health Department requirements.

G. A driveway shall be separated from adjacent driveways on the same side of the road by the following minimum distances:

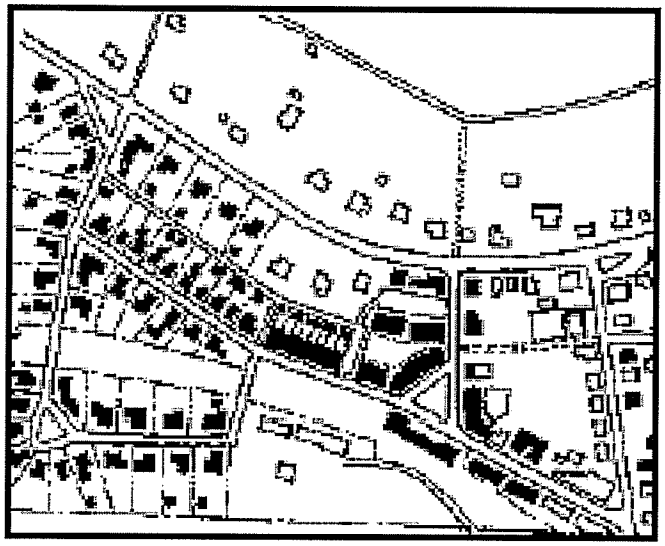
1. Local secondary road: 100 feet
2. County primary/state highway: 125 feet
3. Minimum distance from an intersection: 80 feet" (Minnesota Environmental Quality Board & Biko Associates Inc., 2000)

In these examples, the various types of appropriate and inappropriate developments and land uses are clearly outlined and design standards are listed (both of which remove the need for municipal 'encouragement'). Yet at the same time the ability for a mix of uses is maintained in order to help maintain rural character and ensure the viability of the farms and businesses within an area to help prevent the need for the sale of parcels for residential development. Furthermore, mixed uses and compact development standards should also be applied to urban centres. Not only would this reduce the amount of space used for the same and often increased amounts of development, but this creates the essence of traditional community, where most places one would need to go are within walking distance or slightly farther. Figures 22 and 23 are comparisons of compact and diffuse development.

New development should be near existing urban centres to allow for the extension of a pattern of small lots, mixed-uses, interconnected streets and walkable neighbourhoods (City of Breaux Bridge, 2000). Figures 22 and 23 show the difference between compact, mixed-use development and the diffuse development pattern common to many ex-urban subdivisions in North America. Figure 22 shows a plan of a possible extension that has 100 units for residences and other uses. Covering the same area, Figure 23 shows a standard, suburban-style extension with a mere 25 residential units (City of Breaux Bridge, 2000).

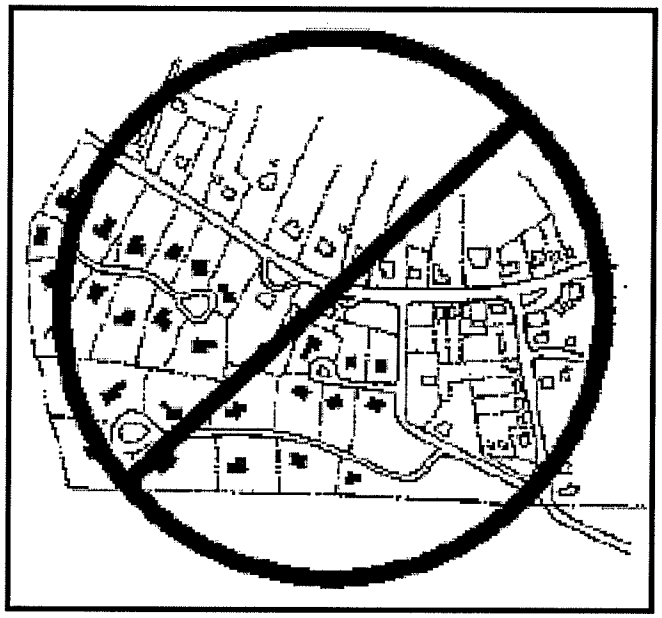
In areas where denser development is allowed (such as urban centres or a clustered development in a highly fragmented rural area), *density transfers* are a useful option to

Figure 22. Compact, Mixed-Use Development



Source: City of Breaux Bridge (2000).

Figure 23. Diffuse Residential Development

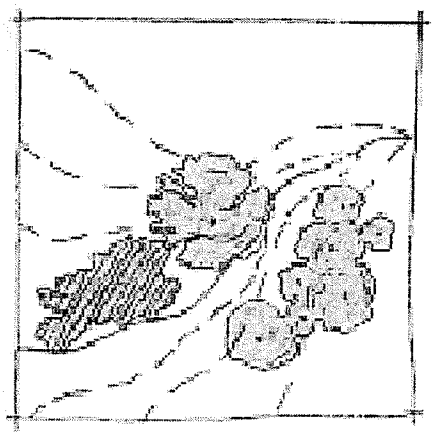


Source: City of Breaux Bridge (2000).

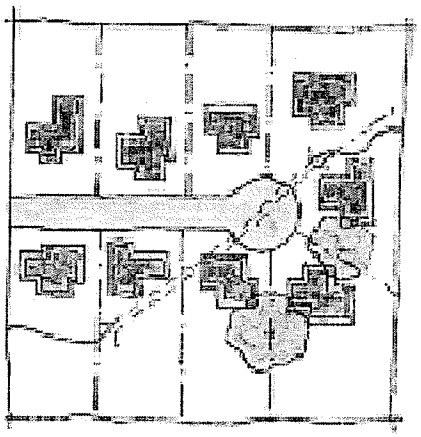
ensure that the landscape is used most efficiently and effectively. With a density transfer system, the property owner has the right to the same number of units and allowable uses, however the units are transferred from more sensitive land (such as high quality

agricultural land, high water content in the soil, or an area prone to flooding) to less sensitive land within the same parcel (see Figure 24) (Envision Utah, 1999). This is also a valuable mechanism in maintaining open space lands, and an ordinance could be

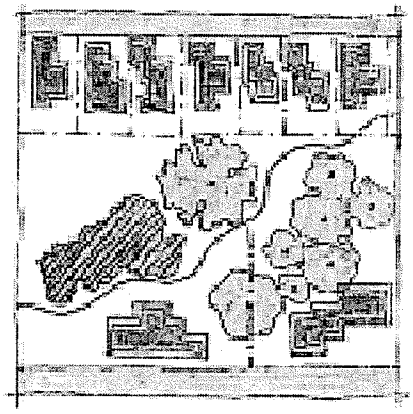
Figure 24. How a Density Transfer Works



Existing site has a significant stand of trees and a pond on a steep hillside.



Minimum lot size regulations encourage development of uniform lots that ignore the natural characteristics of the site.



A density transfer allows a property owner to develop the same number of units on the site while preserving sensitive natural features.

Source: Envision Utah (1999)

structured so as to require development on the area of the parcel with the least open space value.

The guidelines for a density transfer would be part of the by-law that accompanies the development plan, as would a variety of standards and guidelines relating to such factors as location and density of uses, the type of uses allowed and the guidelines under which they are allowed, and the standards they must meet in order to be approved. Landscaping and road requirements, as well as building form, are also prime examples of the sorts of design factors that need to have standards set (in order to ensure the preservation of rural character in particular). Other useful mechanisms would be the adoption of development impact fees and enforcement of threshold standards. Development impact fees help to put the costs of municipal service provision back on the developers and new home buyers, by determining the cost of the provision of new services and charging them to the developer and home buyers before development begins (Fodor, 1999). On the other hand, threshold standards are standards that could be set for new development to meet in order to protect the environmental, economic and social well-being of the community. These standards could be set for almost any aspect of the community such as environmental quality, the provision or maintenance of amenities (such as parkland, open space, and recreational facilities), efficient resource usage, and transportation systems (Fodor, 1999). New developments would have to show how they would meet or surpass these standards before they would be approved (Fodor, 1999).

An important factor in the examples presented above related to the development of planning policy is that 'specificity' does not mean 'limited' or 'limiting'. A development plan that addressed a variety of development locations, mixes and densities with strict and detailed requirements and standards, could in fact be much more flexible than one that simply outlaws uses on the basis that they are deemed incompatible in accordance with some vague concept of separation of uses.

Summary

In the review the RM of Springfield's proposed development plan, it is determined that the plan's development was likely from a basic and conventional perspective. In particular, the policies do not seem to address, or acknowledge, the current form of the landscape within the municipality, and seem to have been developed without a significant amount of resident input. This could readily be addressed through the build-out analysis process and the creation of a map of conservation and development. The map of conservation and development should be formed on the basis of the build-out analysis and the goals and directions gained from full public participation in the planning process.

While many of the proposed development plan's stated objectives – such as the establishment of mixed use areas, the protection of farmland and open space, and protection from both unnecessary increases in service costs and threats to the health and well-being of residents – are praiseworthy, they will likely go unmet without the establishment of clear-cut policy guidelines and standards. A variety of mechanisms exist that would ensure the protection of rural character, agricultural land and open space by

providing greater option to the land-owners while at the same time holding their development to a higher standard.

Without addressing these problems, and if current rates of development are maintained, agricultural land and open space will continue to be lost along the pattern shown in the previous chapter, increasing the costs to the residents of the municipality in a variety of ways, not the least of which is a loss of the rural character of the area.

CHAPTER 6: Maintaining Farmland And Open Space

Introduction

The purpose of this chapter is to present additional mechanisms to address the challenges of agricultural and open space land protection, as well as the protection of the physical, social and economic well-being of the RM of Springfield's residents. Currently, there is a shortage of both time and technical expertise when it comes to municipal land use planning. Development plans and the land use policies they contain would likely be much more effective had their authors knowledge of (and an interest in using) a greater variety of development control mechanisms. As such, this chapter was included to provide at least a few examples of instruments with which to augment municipal development plans.

A fundamental starting point would be the requirement of open space development design through *open space zoning.* Requiring the placement, or *clustering,* of development on a portion of a lot (with another portion of the lot left as agricultural land or open space), this intervention could be applied across the municipality or in particular areas within the municipality. This chapter contains a discussion of the benefits of clustered development, open space zoning, and the means through which open space land is maintaining. A specific advantage with clustered development is the ability to share septic systems, which would be a significant benefit due to the potential health hazards that this aspect of development poses to the municipality, and a number of alternative septic systems are described.

It is recognized that there are a variety of implementation issues related to open space zoning, open space development design, municipal design standards and clustered developments – not the least of which is the fact that they allow comparatively urban forms of development in rural areas. Nevertheless, the fact that the RM of Springfield is effectively an urbanizing rural municipality must be taken into account. As such, new mechanisms need to be examined in order to properly address the issues that currently exist in the municipality.

Finally, land owners, particularly agricultural operators, should be provided with alternatives to selling their land for urban development and a number of these mechanisms are listed and described. By providing land-owners with these options, the pressure to collect the equity from their land through its sale for urban development will be decreased. This in turn, will enable the municipality to undertake a less-biased examination of the landscape, and determine the best form use.

Requiring Open Space Development Design

Experience in the U.S. has shown that simply making open space development design legal (that is to say, allow approaches such as clustered and mixed-use development in places where they were not allowed, regardless of how appropriate they were) does not mean that developers will make use of these principles to create a more compact and efficient land use form. In fact, only about 10 to 15 percent of developers will implement open space concepts into their designs when their use is not mandated (Arendt, 1994). Nevertheless, the general public has a fundamental right to ensure that their community grows in a balanced manner, with developers having no inherent 'right to sprawl' either

constitutionally or legally guaranteed by the Canadian or U.S. governments (Arendt, 1994).

Since there are strict requirements for street construction, buffering, environmental performance and the location of particular uses, it logically follows that something as important as the way land use is designed should also have to meet minimum standards (Arendt, 1994). In fact, minimum standards are set and adhered to whenever a municipality is serious about ensuring that those standards are met(Arendt, 1994). As such, it would not be unreasonable to make compliance with development design standards necessary in order for development to be allowed. Further, in addition to the rural residents who recognize the need for rules and regulations when trying to guide the way land is used, many municipal councillors and employees from a variety of municipalities surrounding the City of Winnipeg would like to see a set of firm land use rules in place.

Based upon the small number of developers voluntarily using open space development design noted above, it is important not to let the developer determine whether open space development design principles are used as, in the majority of cases, land area would be wasted and landscape features (farmland, woodlands, wetlands or marshes, aquifers, riparian or prairie ecosystems, wildlife habitat, and any number of scenic features) would be destroyed, hidden or fragmented (Arendt, 1992). Recent problems in the Winnipeg-Selkirk corridor, such as failing septic fields and the loss of sections of house lots due to erosion along the Red River and Parks Creek, illustrate the problems associated with a

lack of standards. Mandatory open space development design could have prevented a uniform pattern of subdivision and allowed for the siting of the residence to be determined through a site suitability analysis, which would have protected both the homeowners and the local and provincial governments from the costs of urban development on unsuitable sites.

As a result of the common zoning patterns discussed in the previous chapter, large developmentally uniform zones were established. These zones produced widespread conformity in land parcels in post-war North American ex-urbs, with the conventional, 'checker-board' pattern of subdivision becoming the predominant building pattern. Any development that diverges from this standard is seen as odd and out of place, even in rural areas where more traditional forms of development (that lack uniformity in building style, lot size, road width, etc.) are evident (Arendt, 1992).

The alternative to leaving the design principles up to the developer (and to help to prevent conventional patterns of subdivision) is the use of the practical and effective alternative of open space zoning. The basic principle is to group new homes onto one part of the parcel to be developed while keeping the rest of the land as unbuilt, open space (Arendt, 1992) (see Figure 25. Conventional Development and Clustered Development). This allows the equity held by pre-development land-owners to be maintained because the same overall amount of development is currently permitted, the difference being that construction occurs on only a portion (usually half) of the parcel, with the rest of the land being held for agricultural uses or as open space through a conservation easement (which

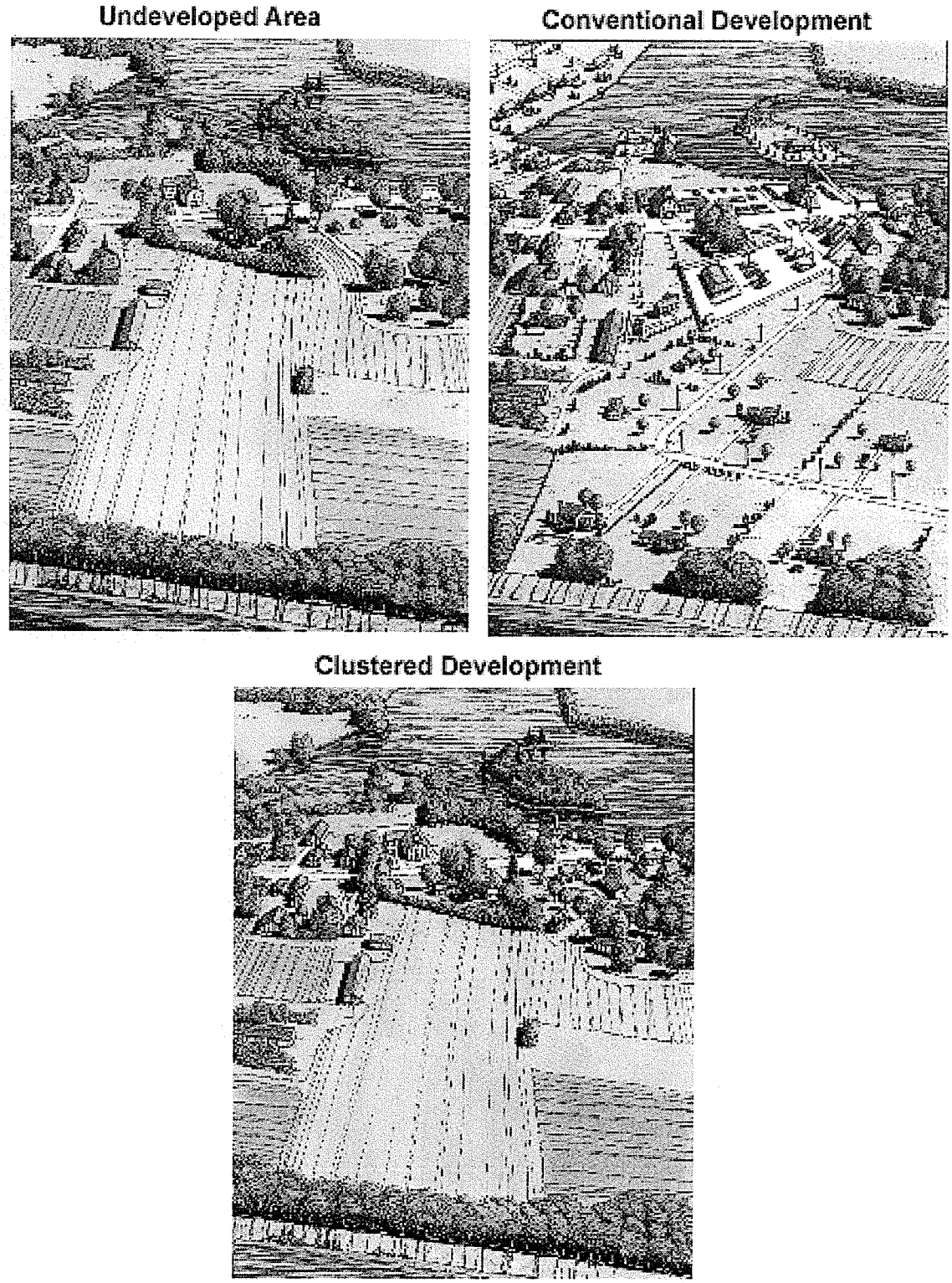
is a deed restriction that prevents land from being used for purposes other than those allowed by the easement; easements are further discussed later in this chapter) (Arendt, 1992).

While Arendt suggests that the best balance between land saved and the levels of comfort and attractiveness of the living environment is most effectively reached by someone with expertise in landscape architecture (Arendt, 1994), the use of electronic data and a GIS can be of great assistance in the determination of the building site or sites on the parcel(s). Through the use of electronic data (such as soil type, slope, hydrology, vegetative pattern) any environmental condition that may be adversely affected by, or itself adversely affect, different land uses can be more easily and accurately determined. This allows the most appropriate locations to be identified for residential (or any type of) development, thereby using the landscape to help process liquid waste and protect water supplies, or even help to protect aspects of the landscape itself.

Open space zoning can be implemented as a blanket mandatory requirement or a partial requirement based upon certain criteria. In the first case, open space development designs would be required for all appropriate development (farming would obviously not be required to meet open space development design standards) in the municipality. The latter alternative has three general forms.

First, open space development could be required in particular zoning districts or when particular resources or activities are present (such as good quality soils or a predominance

Figure 25. Conventional Development and Clustered Development



Source: http://www-unix.oit.umass.edu/~ruralma/Parsons.un.html

of agricultural operations) (Arendt, 1992). Second, the requirement for open space development could be brought forward only when the developer's design plan would destroy or remove a set percentage of resources, allowing for individual determinations (Arendt, 1992). Third a partial form of developer self-determination could be used in which open space development is not officially required, but would involve the punishment or rewarding of developers for their development design choices.

In this third case, developers who choose a more inefficient standard or design could pay a high 'density penalty'. Arendt (1992, 1994) gives the example of Clallam County, Washington, and the County's revision of its zoning from a density of one unit per five acres to a minimum of one unit per thirty acres (Arendt, 1992, 1994). Developers could still obtain the original, smaller density if the house lots did not take up more than fifteen to twenty percent of the parcel. Conversely, developers could be rewarded with 'density bonuses' for land conserving design choices. The reward would consist of the municipality allowing a greater number of smaller house lots when a larger amount of open space is preserved.

An important factor to be considered with the requirement of open space development design is the definition of what constitutes the preservation of farmland and open space. A narrow fringe abutting rear lot lines and/or the parcel's outer perimeter is hardly preserving open space. As such, confusion on the part of the developer can be avoided by specifying requirements for consideration as open space preservation in the by-law. For instance, the requirement could be that roads and lots not cover more than *n* percent of

the parcel, and that at least half of this open space must be designed in such a way that it could be used for agriculture or active recreation (Arendt, 1992).

Developers would be guided in situations such as the one presented above by a set of municipal development design standards. These would consist of minimum requirements that each proposed development would have to meet. Examples of factors the standards would address include the soil type, the type of development occurring in a particular area, the type of sewage system used, the amount of green-space on the lot, the placement of the buildings on the lot, and could even address the way different types of buildings are constructed along with their architectural design. One situation where these standards would apply is residential development adjacent to land used for agricultural production. Here, the two land uses would need to be separated by a buffer, or strip of wooded area approximately 23 to 30.5 (or more) meters wide (Arendt, 1992). If existing woodlands are not available, the planting of a dense buffer of native tree and shrub species would be required in order to meet the conditions of the ordinance (Arendt, 1992). Having such a set of standards would be beneficial to everyone involved as the community will be protected from poor development, developers will have a defined and clear-cut set of standards that would have to be met in order for their proposal to be approved, and municipal officials would not have to deal with (or would have to deal with fewer) proposals for substandard, and unwanted, development.

The question of how these new areas of open space are maintained is answered differently depending upon how a particular area is used. If it is to be used for recreation

(either more formal, such as playing fields for baseball, football or soccer, or more informal such as walking, cycling, and jogging trails), either a homeowners' association (to which all of the new homeowners are contractually obligated to join) could be established (Arendt, 1992) or the municipality could maintain it. In the case of Springfield, because new residential development may be sporadic and diffuse, and the areas undergoing development are either farmland or wooded areas, it would be easy to allow the land to remain as is thereby requiring little or no maintenance.

This would require that development design plans for particular parcels be drawn up to take into account the maximum amount of open space development even if the house lots were to be sold and built-upon gradually. The way the open space is to be used would also be determined and if it were to be for recreation, it would be easy to start off with less formal forms of recreation and new owners could be charged a fee by the homeowner's association or the municipality to help pay for the costs of maintenance. Once the area became fully developed and all new owners had made a financial contribution, another decision could be made regarding any modifications to the way the land is used for open space and, if a change was desired, new accommodations for maintenance could be made.

If, on the other hand, the land were to be used for agricultural purposes, the land could be leased to interested agricultural operators by the municipality or the original land-owner could sell the 'development rights' of the property, while continuing to keep the open space for agricultural production. In this latter case, the farmer could use the land

personally and when the decision to retire was made, it could be sold or leased to another interested agricultural operator at a price that reflected the land's agricultural value and not the potential building-lot value (Arendt, 1992). In Manitoba, the Municipal Assessment Act allows for land-owners to apply to have their property assessed on the basis of its use for farming purposes, thereby allowing the land-owner to have their land taxed at a lower rate when it is not used for development purposes (this is further discussed in the section on farmland protection mechanisms).

As suggested by the preceding discussion, open space zoning has a variety of advantages. Aside from helping to maintain a viable agricultural economy for the municipality, it is also easy to administer, does not require large public expenditures (such as the purchase of land by the municipality), development potential is maintained for the developer, the land-owner is not penalised and farmers (or other land owners) are able obtain their rightful equity. It is also extremely effective in protecting a considerable portion of each development tract from being completely covered by roads and house lots (Arendt, 1992). Perhaps the most important argument in favour of open space zoning is the number of economic benefits derived from it.

Aside from not being placed under unreasonable constraints, developers would see a reduction in the cost of roads, since the distance between house lots would be shorter. They would also see a reduction in the cost of water and sewer lines for the same reason, if these costs had to be borne by the developer. The compact layout of development would also benefit utility providers whose costs would be less. Local governments would

not have to purchase land (with the likely accompanying rise in property taxes to enable this) to be held for agriculture or open space (this is further discussed in the section on land conservation trusts and land banks). Neither would they be forced to deal with the administrative complexities of a transfer of development rights. Conversely, local governments would save on the cost of delivery of services such as snow-ploughing, road re-surfacing, as well as sewer and water, if or when they were to become required.

The current land-owner and perspective land-owner gain similar advantages. Land-owners viewing their property as a source of 'old age security' will still be able to retire with the income from their land – only without having to destroy their fields and woodlots. Realtors will be able to use the guarantee of open space remaining open space (providing nearby recreational opportunities and maintaining the rural flavour of the community) as a valuable marketing tool (Arendt, 1992). Finally, because of these decreases in costs, people purchasing homes would likely end up paying less for their new property, and the costs of living in the area are unlikely to increase as abruptly or as much as they could in a community comprised of inefficient development patterns (Arendt, 1992).

As previously mentioned, if a sewer and/or water system were required by the municipality at some point pre- or post-development, the cost of construction would be minimised by the proximity of the house lots. However, in Springfield most of the current residential development relies upon private septic systems and their use is one of the arguments for more diffuse development, in order to provide enough space for each

house to have a septic field. As such, the use of clustered development would seem to be at odds with the municipality's regulations in this area.

Sewage Disposal Systems

However, there exist a variety of efficient alternatives that could help conserve land while providing more environmental protection from sewage contamination. An immediate benefit to open space development design is that there is more land available from which to select the best soils for a leaching field. Conventional subdivision development can limit the location of septic systems to areas where soils can only meet minimum health requirements (Arendt, 1992). The two to five acre lot sizes of rural residential development in Springfield is a means to allow for more suitable soils to be found. Yet clustered development allows for more choice even on smaller lot sizes, and has the added ability to allow for the location of septic fields beyond individual lot lines and onto an easement within the protected open space (Arendt, 1992).

This flexibility is important because, if designed correctly, it bases the layout of lot sites on landscape criteria. Important factors such as slope, depth to bedrock, soil texture and soil type are used when determining the location of house lots and septic fields (Arendt, 1994), allowing for optimal placement and maximum environmental protection. The ability to place the leaching field outside of individual house lots also enables the sharing of a field by the residences in the development. Such a sharing of resources increases cost-effectiveness and can allow for superior functioning of the field itself (Arendt, 1994). These improvements are the result of having a larger area in which to appropriately site a larger, more sophisticated leaching field. Researchers looking at the

effectiveness of sewage treatment methods have evidence showing that the common large rectangular disposal beds do not allow for sufficient exchange of carbon dioxide and atmospheric oxygen in their centres which results in anaerobic conditions that inhibit the treatment process (Arendt, 1994).

Four alternative types of sewage system may be identified: *large soil absorption systems, constructed wetlands, composting toilets,* and *holding tanks. Large soil absorption systems* have been in use for decades, with users including apartment complexes, shopping centres, hospitals, schools and restaurants (Arendt, 1994).This system involves the use of larger areas in which a series of parallel underground beds are laid. Similar to the systems in Springfield, it has two stages, a septic tank into which household waste-water is emptied and in which the first stages of treatment begin, and the underground beds or 'trenches'(Arendt, 1994). The beds require a larger area because they must be far enough apart to allow CO_2 gases to escape and oxygen to penetrate, enabling the aerobic treatment of the waste (Arendt, 1994). The improved functionality of these trench systems comes from their additional absorptive capacity per cubic foot of gravel, as the lower parts of side walls also absorb effluent, so a two-foot wide trench filled with 18 inches of gravel would have an effective absorption area of 3.5 square feet per linear foot (Arendt, 1994).

Alternatives to the trench system include *contour systems,* and *intermittent sand filters.* Contour systems are elongated versions of the trench system that are designed to follow the contours of the landscape (Arendt, 1994). These were originally designed and used in

Canada's maritime provinces, based upon research findings which showed that effluent was not distributed evenly when rectangular absorption areas were located upon sloping land. Instead of travelling vertically down the direction of the ground slope, the filtered effluent had a tendency to travel laterally. It was determined that better treatment could be achieved by having a longer, narrower trench that ran along the slope (Arendt, 1994). While it was originally designed for steeper terrain, applying this design to flatter areas would also increase dilution (Arendt, 1994).

Intermittent sand filters (ISFs) are generally a three stage system comprised of: the septic tank, a large filter bed two to three feet deep with sand, and a disinfectant chamber (which can be optional depending upon local conditions) (Arendt, 1994). Variations of ISFs consist of such forms as exposed, buried, re-circulating or nitrifying (Arendt, 1994). According to the EPA, ISFs are typically filled with sand, however anthracite, mineral tailings, bottom ash and other media have been used. The term 'intermittent' refers to the periodic rather than constant application of effluent from the septic tank to the filter bed, where it percolates through the sand (or other medium) to the bottom of the filter (U.S. Environmental Protection Agency, 1999b).

While the process of percolation allows the sand to filter out particles from the effluent, the more important aspect is that it allows the effluent to come into contact with significant amounts of oxygen, creating an aerobic environment in which the bacteria break down the organic matter in the effluent. Studies comparing the effluent from septic tanks and from ISFs show a distinct improvement in water quality from the ISFs,

including a consistently lower amount of fecal coliforms. However, nitrogen and bacteria were not totally removed (U.S. Environmental Protection Agency, 1999b), so the use of the disinfectant chamber would be advisable in Springfield. Another factor which makes this particular type of system attractive is that it can be modular, with extra beds added if increased system performance were required (U.S. Environmental Protection Agency, 1999b). This would allow the shared septic system to be enlarged as more residences were built.

The main problem common to the systems discussed above is the fact that they are adversely affected by a high water table or high levels of soil moisture, which limits the areas they should be used in Springfield. However, a solution that would make use of the wet soil conditions found throughout the municipality is the use of *constructed wetlands*. Wetlands are defined as land where saturated soil conditions, and the plants that thrive in that condition, are maintained every year (U.S. Environmental Protection Agency, 1993). Examples of naturally occurring wetlands are marshes bogs and swamps, and it was in these ecosystems that significant improvements in water quality had been seen. This led to the design of 'constructed wetlands' in an attempt to replicate this naturally occurring water purification process (U.S. Environmental Protection Agency, 2000). Emergent aquatic vegetation (most of which is seen in natural marshes) is used in both the *free water surface wetland* and the *subsurface flow wetland* – the two basic types of constructed wetland (U.S. Environmental Protection Agency, 1993). The *free water surface wetland* is the less desirable of the two as the water surface is exposed to the atmosphere. There are three distinct disadvantages of this: an increased possibility of

odour; the provision of a breeding ground for mosquitoes; and a decreased exposure of effluent to aerobic conditions (U.S. Environmental Protection Agency, 1993, 2000).

Conversely, the *subsurface flow (SF) wetland* is not affected by these shortcomings. This means that the same amount of effluent can be more effectively treated in a smaller area (U.S. Environmental Protection Agency, 1993, 2000). SF wetlands are usually constructed as one or more shallow basins or channels lined with a barrier to prevent seepage into groundwater aquifers. The basins use twelve or more inches of gravel or crushed rock, usually with some variation in particle size within a single basin, as a medium for the support of vegetation and effluent processing. More recently, the gravel is being topped with layers of loam and mulch to allow for a greater variety of plants to be used (Arendt, 1994; U.S. Environmental Protection Agency, 1993, 2000). Effluent is introduced to the SF wetland through a perforated manifold pipe and once the effluent has percolated through, it enters an outlet manifold for further processing or discharge into the environment (U.S. Environmental Protection Agency, 2000). An important shortfall of this system with respect to Manitoba's climate is the fact that cold temperatures slow down the biological processes in the SF wetland, requiring either a larger area or longer processing (U.S. Environmental Protection Agency, 2000).

Regardless of the type of shared system used, the septic tanks could be owned and maintained by the individual homeowners in the development – or larger, jointly-owned tanks could be used. However, it may be more desirable to have a separate septic tank for each dwelling, in order to decrease the likelihood of a communal problem (Arendt, 1994).

In addition to providing a greater selection of soil conditions from which to choose, clustered development design also provides an opportunity for shared septic systems, in turn enabling a larger financial base with which to purchase a better system. As noted previously, approximately 65% of the soils in the municipality have a high moisture content due to inadequate soil drainage, a high water table, and/or seepage or runoff from surrounding areas. The U.S. Environmental Protection Agency (EPA) points out that for septic tank soil absorption systems to effectively treat wastewater, the soils need to be relatively permeable and should be unsaturated to several feet below the depth of the system (U.S. Environmental Protection Agency, 1999c). This would suggest that the use of septic fields in the RM of Springfield, regardless of (or in spite of) how common they are, is a potentially hazardous activity. A recent commentator (Leo, 2000) has pointed out the danger that residential development, using this mechanism for sewage treatment and disposal, poses to a population that is dependant upon local groundwater sources for their potable water.

Further, the EPA notes that to avoid contamination of drinking water sources (and other problems), these wastewater treatment systems must be located at prescribed distances from wells, surface waters and springs, escarpments, property boundaries and building foundations (U.S. Environmental Protection Agency, 1999c), and it is with these (or similar) criteria in mind that provincial and municipal guidelines call for 2 to 5 acres for each rural residence. However, by taking the perspective of compact and efficient land use, these criteria provide further argument for the use of clustered development designs,

as this would provide a wider variety of soil profiles to choose from, and a potentially more efficient use of the available appropriate soil and landscape conditions

An added benefit of a shared system would be the obligatory agreement on system maintenance. The EPA points out that most individually owned systems are not well-maintained, and that improperly functioning systems are often the cause of the introduction of nitrogen, phosphorus, and organic matter, as well as bacterial and viral pathogens, into the surrounding area and potable water aquifers (U.S. Environmental Protection Agency, 1999c). Arendt (1994) states that with a shared system, homeowners would enter into a mandatory system maintenance contract that contained references to the following:

- *Regular pumping of septic tanks*. The frequency would be determined by the design engineer and based upon the size of the tank and the household.
- *Monthly inspection of absorption areas*. Regardless of the technology used, monthly inspection could be undertaken to detect problems as soon as possible. The amount of effluent pumped into the field could be recorded by meters attached to the individual septic tanks.
- *Frequent testing of system during the first year*. In its first year of operation, the large soil absorption system should be tested every three months for the biochemical oxygen demand, total suspended solids, total ammonium (or Kjeldahl nitrogen), nitrate nitrogen and pH (which is the level of acidity or alkalinity). After the first year, these measurements would be taken once a year, and groundwater checks would be performed semi-annually.
- *The communal system would be owned by a homeowner's association (HOA).* Membership in this association would be mandatory for all of the dwellings connected to it The HOA would have the authority to place liens (with interest

penalties) on the properties of owners who fail to live up to their financial and maintenance obligations. There would be annual dues collected to cover the costs of maintenance and repair of the system, which should be divided into two sub-accounts. These accounts would be a year to year operational cost account to cover such items as pumping and monitoring, and an account to cover long-term capital repairs or replacement (aimed at a highly conservative estimate of replacing the system about every ten years) Even though conventional septic systems are designed to operate indefinitely as long as they are properly maintained, improper maintenance means that they typically have a functioning life of about twenty years (U.S. Environmental Protection Agency, 1999c).

- *Assurance of repair payment.* In the event of the inability of an individual household or even the HOA to undertake needed repairs, the HOA or the municipality (in the unlikely case of the problem being with the HOA) could hire a private contractor to make the repairs and then bill the homeowner or homeowners individually, placing a lien against their home(s) until their repayment is made.

These rules would provide much more protection to the development and the surrounding community than the individually-owned systems currently being used in the municipality. The HOA, similar to a co-op or condominium association, would provide a simple and enforceable means of ensuring regular monitoring, maintenance and eventual repair of a system that will likely be installed more carefully and placed on the most appropriate soils in the most appropriate area of the development (because the development would be designed with the health of the environment and residents in mind) (Arendt, 1994).

While the septic systems discussed to this point provide better alternatives to the current systems used in the RM of Springfield, a much more compact, efficient and less complex

system of waste management would be the use of composting toilets. Sweden was the first country to have commercially available units, where they have been in use for more than 30 years (Oikos Green Building Source, 2001; U.S. Environmental Protection Agency, 1999a). Using little or no water, composting toilets can contain and process excrement, paper, carbon additives and even food waste, producing a stable, soil-like material called 'humus,' just like a yard waste composter. This type of system uses unsaturated conditions (unlike a septic system) to create an aerobic environment in which bacteria and fungi break down the waste material. Under normal operating conditions (that is, a properly working unit that is the correct size for the household in which it is installed) the output of a composting toilet is between ten to thirty percent of the input volume (Oikos Green Building Source, 2001; U.S. Environmental Protection Agency, 1999a).

Composting toilets are good for single residences or even for a multi-unit residential development. They would minimize the amount of area needed for septic disposal and reduce the factors involved in the choice of areas used to process greywater (which is the effluent from sinks, bathtubs, showers, dish and laundry washing machines). When greywater is strained through a filter used to catch any suspended solids or fats, the effluent is not as biologically hazardous, and by using a biological processing method (an SF wetland for instance), it can be released into the surrounding environment without fear of contamination.

Finally, a more basic and familiar system used by residences not connected to municipal sewage systems is the use of a holding tank. This method has two options with the first being the separation of household grey and blackwater, allowing the greywater into a leachate field or other biological processing system and storing the blackwater in a holding tank which would then need to be pumped out regularly. As discussed previously, greywater contains fewer contaminants and as such, is much easier to process requiring less space. The second option is the municipality requiring a single holding tank system for both grey and blackwater which would need to be emptied on a regular basis. A company could be contracted by the municipality to pump the holding tanks of municipal residences and the fees could be collected as part of the yearly taxes. This system would be one of the simplest ways of making sure that the effluent from an individual household does not come in contact with the local environment. It is simple in terms of both engineering and use. In the first case, the size of the tank would be determined by the number of people living in the household, while use would consist of the periodic emptying and maintenance of the tank itself. The main drawback of a system like this is that it is closed, and if it were to see more use than normal (such as houseguests), the tank would likely have to be emptied sooner than would otherwise be required. It should be noted that there are many municipalities that require the use of holding tanks, and which do not allow the use of systems that discharge effluent into the environment. As such, it would not be extreme if the municipality were to require all new buildings with sewage needs, and without a connection to the municipal sewage system, to use a holding tank in order to help protect groundwater resources and community health.

As the current solution to the problem of how to manage household sewage requires a considerable amount of land, the use of clustered development design would not only conserve land for agricultural or open space purposes but would also help to prevent groundwater contamination by enabling the use of more sophisticated methods of effluent processing. Household sewage management aside, open space zoning and the appropriate placement of clustered development (such as in areas that are already highly fragmented, where the new development would act as in-fill) would even provide for increased residential opportunities without impinging upon existing agricultural land and open space. However, in order for effective open space development design to take place, a clear and thorough understanding of the current landscape is required. Through a greater understanding of the amount of development and the type of land in a particular area, better decisions about the use of remaining land could be made.

As was shown in Chapter 4, the RM of Springfield is a municipality that has rural areas where there is a considerable amount of ex-urban development as well as areas where there are large amounts of undisturbed (or at least relatively undisturbed) agricultural land. By applying different policies to these two types of areas, agricultural operations could be protected from ex-urban development. In the case of the former areas, clustered development could be mandatory for any new development proposals, while the latter could benefit considerably from exclusive agricultural zoning. In this case, residential development could be kept to a minimum by only allowing it as a conditional use, and only as a direct part of a farm operation. At the same time, farm operators could be allowed to run a variety of businesses (even ones that are not directly related to farming)

to augment their farm income as long as those businesses did not limit agricultural enterprise in the area. Even so, the protection of agricultural land and open space requires a variety of approaches in order to be fully successful.

Farmland Protection Mechanisms

While a legislative solution that prohibits the sale of land deemed an important agricultural resource could be enacted, there are two important factors to be considered. First there is the political reality, wherein local and provincial politicians would likely be reluctant to alienate an important block of voters. Second, there is the obligation that the rest of society has for helping a group of people who have filled an important role in Canadian society. While the situation in Canada is different to that in the U.S., wherein it is the Crown and not a land-owner who the owns the development rights to a property, there should still be mechanisms in place to compensate agricultural land-owners for those development rights. By fulfilling that societal obligation through the compensation of people who have managed an import resource, at least some (if not much) of the pressure to sell the land for its highest value (that being ex-urban development) will be relieved. In addition to this, farmers with active and on-going operations would benefit from mechanisms that assisted them and protected their ability to farm. Mechanisms such as these would help to make existing farm operations more profitable by reducing potential costs and discouraging activity that would be a nuisance to them. As such, the following sections contain examples of mechanisms that could be used to assist farm operators, and that would help relieve some of the pressure for these operators to sell their land for urban development.

Farm-Use Assessment. Land-owners of land used for agricultural purposes can have their land taxed at a lower rate, saving them money. Section 17 of the provincial "Municipal Assessment Act" enables the registered owner of farm property to have that property assessed on the basis of its use for agricultural purposes rather than having it assessed on the basis of what it could be used for (which usually means its full real estate value, which is usually much higher than what it is worth as agricultural land). This section of "The Municipal Assessment Act" also accounts for agricultural or conservation easements that would decrease the value of land.

Agricultural or Conservation Easements. A conservation easement is a deed restriction voluntarily placed on property by the land-owner, and preventing land from being used for anything other than agricultural operations, open space, wildlife habitat, or heritage preservation. It could even be used to protect ground or surface water resources (Park County Environmental Council, 2001). Currently, the term 'easement' has a much more narrow definition in Manitoba, but the important part of this concept is the restriction on the use of the land, as outlined in the deed of that land, and which is passed along with ownership of that land. As the situation in Springfield is such that agricultural operators often wish to sell their land when they retire, the purchase of conservation easements from the operator would provide both revenue for the land-owner and protection of land for the community. Depending upon the details of the purchase agreement, the land-owner could then, for example, rent the land to operators interested in farming it.

In the U. S. these purchases are made by a government agency or private conservation organization (Farmland Information Centre, 1998). However, there are no programs, either government or private, in Manitoba that pay farm land owners to preserve their land from ex-urban development. As much of the demand for the sale of farmland comes from agricultural operators themselves, looking for equity from property that they no longer wish to use, an important step in protecting agricultural land and open space would be to remove the desire (and the arguable need, in some cases) to sell land for the greatest amount of profit from the land-owner. If funding were available for the compensation of land-owners who agree to place conservation easements on their land, the demand for the ability to sell land for ex-urban development would be decreased.

Land Conservation Trusts and *Land Banks.* These are similar entities in so far as they are designed to serve the same purpose of the preservation of land (either for agriculture, open space or low cost housing). However, the former is a non-governmental organization while the latter is usually established by a local government. Both can be developed through the assistance of a variety of funding organizations (both public and private), and the money can be recouped by renting the land out or selling it with easements attached (Carver & Yahner, 1996; Farmland Information Center, 1998; Peterson, 1996). By purchasing land, the owner makes a profit off of his capital while it becomes protected from ex-urban development. These organizations could also pay a land-owner to place an easement on the property. In order to adequately deal with the problem of the loss of agricultural land and open space, both sides of the issue need to be addressed. This means that methods by which the land is protected must take into account

the needs of the current land-owner. While, in Canada, the owner of land does not own the development rights and the Crown can ultimately decide what sort of development could take place there, it is nevertheless important for the government and the community at large to treat these land-owners fairly. As such, by spending money on protecting land resources, both the land owner and the community at large benefit, and the demand to be able to sell land for residential development is reduced.

Growth Management Laws. Designed to control the timing, phasing and character of ex-urban development, growth management laws (GMLs) regulate the pattern and rate of development within a region, sometimes covering several municipalities (such as a planning district). The policies associated with GMLs, which concentrate new development in designated urban growth areas or boundaries, are set based upon a landscape inventory like that used for a map of conservation and development (Park County Environmental Council, 2001). These policies direct local governments to protect land identified as significant (such as good agricultural land, wildlife habitat, or areas where there is a likelihood of groundwater contamination) and requiring protection (Farmland Information Center, 1998).

Some versions of these laws in the U. S. are similar to the Province of Manitoba's Planning Act, which requires municipalities and planning districts to have a plan of development. However, as we have seen, development plans are not always designed as well as they should be. Because of this, GMLs could be passed to provide a stricter set of guidelines from which municipalities and planning districts would operate. Designated

urban growth areas (based on landscape inventories and site suitability analyses) could be set by the provincial government, preventing local governments from allowing inappropriate forms of development, and *Right-to-Farm Laws*, *Agricultural Protection Zoning* and *Mitigation Ordinances* could become required.

Right-to-Farm Laws. Every state in the U. S. has at least one right-to-farm law, which are used to protect farmers from nuisance lawsuits filed by neighbours and/or protect farmers from anti-nuisance ordinances and unreasonable controls on agricultural operations (Farmland Information Center, 1998; Park County Environmental Council, 2001). These laws are an assertion of the importance of commercial agricultural activity within the state and help to support the economic viability of farming by discouraging neighbouring residents from filing lawsuits against farm operations (Farmland Information Center, 1998). This type of protection could also be implemented at the local level through a zoning ordinance, which could also include the requirement of a notice, appended to the deeds of all properties in agricultural areas, which cautions potential buyers that they would likely experience dust, noise, odours and other inconveniences from nearby agricultural operations (Farmland Information Center, 1998).

Agricultural Protection Zoning. As shown in Springfield's proposed development plan, even though areas were zoned as agricultural preserve areas, they did not enjoy complete protection from inappropriate forms of development. If agricultural protection zoning were to be part of the policies of a GML, standard restrictions could be set, limiting the

flexibility which local planning authorities could have in applying their zoning regulations with respect to the protection of agricultural land.

Mitigation Ordinances. These ordinances require an equal amount of land protected for every acre of farmland converted to other uses. In most cases developers place an agricultural easement in another area (Farmland Information Center, 1998). An alternative to this would be to place the easement on sections of land within and/or around a clustered development.

Summary

Although no one mechanism will solve all of the problems facing farm operators and the municipal government, one or a combination of them would help to relieve some of the pressure to shift land use from agricultural to rural residential. In doing so, it would be easier to implement some of the policy alternatives suggested at the beginning of this chapter. By reducing the desire of land-owners to sell their land for urban uses, some of the resistance to open space development design will also be reduced. Like the farmland protection mechanisms presented here, no one policy alternative will be a solution to all of the problems faced by the municipality, and the most successful approach would involve the use of a variety of the policy alternatives suggested.

The most successful implementation of any of the policies would involve the use of build-out maps and a map of conservation and development as discussed in the previous chapter. This is because the land inventory and analysis techniques that are part of the

creation of these two maps provide the interested parties with a much more detailed collection of landscape information than they would have previously had. At the same time, the visual display of this information would help community members to better understand the form and scope of the problems related to land use issues, as they pertain to the current landscape and zoning by-laws. Once such issues are more widely known and understood, it would likely be easier to make policy changes to address them from both a political and analytical aspect. In the first case, there would likely be more support from the community, making policy changes a much less contentious issue, and in the second case, more information would be available and displayed more effectively. This 'ease of access' to more information would enable members of the community to make better decisions about the protection of resources and the manner of future development.

CHAPTER 7: Conclusion

Purpose

The purpose of this study is to examine the history and process of land use change, particularly from agriculture to rural residential, along with the related issue of effective land use planning in the RM of Springfield, Manitoba. To accomplish the former, rural residential development from 1966 to 1999 is examined. As well, the potential affects current levels of this sort of development could have on the future of farming in the municipality is investigated by correlating residential development with the age groupings of farm operators based on the 19 enumeration areas that comprise the municipality. The latter purpose is accomplished through an examination of the RM's proposed development plan, and the presentation of policy and zoning alternatives intended to help protect rural character, agricultural land and open space, as well as the environmental, economic and social well-being of the community.

Context

Canada, along with many other western countries, experiences the loss of prime agricultural land due to the expansion of urban activity. As most major cities developed out of agricultural communities situated on the best agricultural land, the outward spread of urban activity has crept over the most productive land, forcing agricultural activity to move to less productive land or cease altogether in some areas. However, demographers have noticed a resurgence in the populations of rural areas, suggesting that these areas might not have been as adversely affected by emigration as was believed. Unfortunately although people are moving back into the countryside to live, they still work in the city.

A major problem with ex-urban development in rural areas is that it discourages agricultural production by decreasing net profits for farmers and introducing incompatible activity. Net profits are reduced because land-values increase, resulting in higher taxes on that land as well as increased taxes to cover the cost of increased municipal service provision, undertaken to meet the needs of the new ex-urban development. While the impetus for rural residential development is the desire for a 'better quality of life' (which is primarily seen as access to more recreational amenities along with more open space and 'fresh' air in general), this type of development tends to draw more of the same into the area, thereby creating further impetus for change.

Ex-urban development attracting like-development ends up discouraging agricultural land-use. The resulting land use conflicts, and an outwardly migrating youth population, make it hard for existing agricultural operators to pass their land on to their children, or to sell it to other people interested in farming. When agricultural incomes are down and agricultural land has more value as urban land, many land-owners are tempted to sell part of their holdings to supplement their incomes. As such, there is pressure for a shift in land use from both farmers themselves as well as people wishing to buy land for rural residences.

Analysis and Findings

An examination of previous studies looking at the issue of agricultural land use change determined that the best way of establishing a physical change in the way the landscape was used was to track the construction of rural residences throughout the municipality.

For Springfield, this is accomplished by collecting the residential building permits issued from 1966 to 1999. Many other studies have depended upon approved applications for land subdivision, however they often do not indicate an immediate change in land use. This is because even though land may be subdivided with the intention of selling the smaller lots for residential development, until they are purchased for that purpose they likely remain in use by the original activity. Nevertheless, approved subdivisions applications are good indicators of the intentions or desires of the land-owner, as a series of contiguous, small lots likely means that the owner envisages residential development.

The RM of Springfield has experienced a shift in land use from agricultural to rural residential in the period between 1966 and 1999, as is evident by the amount of existing non-farm residences throughout the municipality. This is correlated by a high population of ex-urban residents as indicated in the 1996 Canada Census data, and is accompanied by a significant amount of land fragmentation and undeveloped lot subdivisions. Using a combination of the building permits issued between 1966 and 1999, the RM of Springfield's parcel map from 1999, a CLI soils classification map, and the proposed development plan's land use designation map, the following determinations are made:

a) even though residential development is fairly common throughout the municipality, the greatest rural 'clustering' of residences is located in the northern part of the municipality in general, and in the most northern and north-western portions of the municipality specifically, and

b) the current pattern of residential development and land subdivision would place pressure on farm operators which the development plan would have to address in order to prevent a gradual decrease of the area within which farm operations could exist.

To determine the current areas most likely to see the greatest pressure for a change in land use, two maps are produced using farm operator age groups and soil classifications. This previous combination was then combined with dwellings and parcel subdivisions to try to identify the areas now under the most pressure for change. These analyses showed that the greatest pressure for change would be in the northern-most portion of the municipality, immediately east of the area adjacent to Birds Hill Provincial Park. Even though the findings are not as clear-cut as was hoped due to a greater range in ages of agricultural operators than was expected, and the number of smaller lots that already had dwellings on them, this identified area could likely see the greatest increase in future residential development as a result of farm operators choosing to subdivide existing houselots for the construction of new residences.

The possible form future of development is examined through the creation of two partial build-out maps. The maps identify vacant 2 to 5 acre parcels with red points on the IRS satellite image of the municipality and the map, Rural Municipality of Springfield Land Use Designations (Figure 7). Even at the minimum parcel sizes allowed in the non-urban areas of the municipality, these maps show a considerable amount of area readily available for rural residential development. Further, with the ability of a farmer to

subdivide houselots, the actual area potentially affected by rural residential development is much larger. Given these findings, along with development patterns that suggest a preference for locations with features such as woodland and variable topography, the proposed development plan should be designed so as to be more protective of agricultural land and open space. Further, it should contain mechanisms that would help to preserve the aesthetic features in existing areas with rural residential development and to foster their use as a design element in new developments.

To assess how well these goals would be accomplished, the RM of Springfield's proposed development plan is reviewed with a pragmatic approach. In doing so, it is determined that it was itself likely developed from a rational perspective, as it lacked a good understanding of the form of the landscape within the municipality and a significant amount of resident consultation did not take place., This lack of understanding of the various factors and influences in the municipality, resulting from a very basic and 'by-the-book' review process, was an impediment to effective policy development. This could readily be addressed through the build-out analysis process, and the development of a map of conservation and development, with the latter formed on the basis of the build-out analysis and the goals and directions gained from full public participation in the planning process.

Though praiseworthy, many of the proposed development plan's stated objectives (such as the establishment of mixed use areas, the protection of farmland and open space, and protection from both unnecessary increases in service costs and threats to the health and

well-being of residents) will likely go unmet without the establishment of clear-cut policy guidelines and standards. There are a variety of mechanisms that exist which could be used to ensure the protection of rural character, agricultural land, and open space, by providing more and better options to the land-owners while at the same time pressing for development to a higher standard. While the use of no one of these mechanisms will solve all of the problems facing farm operators and the municipal government, one or a combination of them would help to relieve some of the pressure for problematic land use change. It is important to recognise the changing character of this (and other similar ones) municipality, from that of a predominantly rural population on a predominantly rural landscape to that same landscape type inhabited by a predominantly urban population. The problems created by this mix of uses and expectations requires new solutions to be implemented in order to protect rural land and lifestyles.

An important way of protecting agricultural land and open space is by reducing the desire of land-owners to increase their income by selling some of their land for urban uses. This could involve a variety of mechanisms, yet the one that stands out is by allowing a mix of uses in rural areas. As long as they do not interfere with neighbours and nearby agricultural activities, a variety of uses should be allowed in order to help land-owners supplement their incomes and thereby decrease the desire to sell land for that purpose. Even so, no one policy alternative presented in this document will be a solution to all of the problems faced by the municipality. As such, the most successful approach would involve the use of a variety of the policy development processes and policy alternatives provided.

Shortfalls and Further Study

An important shortfall in this study is a lack of knowledge regarding which residences belong to farm operators or workers and which are rural residences. This distinction would provide a greater understanding of land ownership and fragmentation and help to identify the potential for pressure for land use change. This information would assist policy-makers in the identification of areas where special land preservation mechanisms should be applied.

A study that would be useful to the RM of Springfield (or any municipality of planning district undertaking a review of its development plan) would be a survey of resident desires regarding the future, and the form the community should take. Such a survey could be used for two purposes, the development of a community 'vision' and/or the creation of development design standards to be used by the municipality in structuring the form development would take. The questionnaire could be general and comprehensive enough to allow for both, or two separate surveys could be undertaken with the questionnaire for each of them structured to collect information for a particular area of interest.

Another study that would be particularly beneficial to the RM of Springfield would be to undertake a full build-out analysis. This would provide the RM council with a much greater understanding of the factors affecting the protection of rural character, agricultural land, and open space as well as the environmental, economic, and social

well-being of the community. They would then be in a much better position to develop land use planning policy for the next review of their development plan. If both this study and a survey of the residents of the municipality were undertaken, the municipality would be able to create of a map of conservation and development, which would be the next important aid in the creation of planning policy for the community.

Two more general, but perhaps more important studies involve an investigation into improving citizens' participation in the planning process, as well as a review of regional planning policy in Manitoba and its formation. In the first case the difficulty in generating citizen participation in something as seemingly vague and unimportant as land use planning is recognised. As the decision to participate is made by the individual, new ways of generating interest in, and an understanding of, the importance of the planning process should be developed. Perhaps the key lies in making the process more visual and therefore easier to understand, and if so, a series of contrasting scenes could be developed and used to facilitate an understanding of the issues being discussed. Further to this, the question of which type of image, generic or ones based upon the areas of relevance, should be used could also be investigated.

The importance of a review of provincial planning policy was referred to in this study as there are other rural areas, particularly within Manitoba's Capital Region, where so many 'urban' residents live. This has fragmented the land base, and made farming a more difficult enterprise than it already is. Because of the form that this mixture of land use types has taken within the region, there is a need to rethink guidelines, such as those

regarding sewer service provision and road standards, to make safer and more traditional communities. Current policies and guidelines, well intentioned as they are, sometimes help to create car-dependent communities where services cost more, amenities are fewer and agricultural operations are no longer viable. New mechanisms need to be introduced to help planners approach planning policy creation more pragmatically, which in turn could help to develop policies that maintain and enhance rural communities which otherwise face the prospect of ex-urbanisation, and becoming neither fully rural nor fully urban.

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