The Leap-frog Effect in the Context of Ontario’s Greenbelt: An Analysis of Farmland Loss in the Unprotected Countryside

by

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A Thesis presented to The University of Guelph

In partial fulfilment of requirements for the degree of Master of Science in Rural Planning and Development

Guelph, Ontario, Canada

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ABSTRACT

THE LEAP-FROG EFFECT IN THE CONTEXT OF ONTARIO’S GREENBELT: AN ANALYSIS OF FARMLAND LOSS IN THE UNPROTECTED COUNTRYSIDE

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In December of 2004, the Ontario government introduced the Greenbelt Plan, protecting approximately 1 million acres of prime agricultural land in the Greater Golden Horseshoe. However, not all prime agricultural land in this region received Greenbelt protection. Concerns have been raised over potential increases in farmland loss in the unprotected countryside north of the Greenbelt, due to the leap-frog effect. This thesis examines official plan amendment data in the unprotected countryside to evaluate the presence of a leap-frog effect and determine how the conversion of prime agricultural land in the unprotected countryside has changed since the implementation of the Greenbelt Plan. Results show that the Greenbelt Plan has not spurred a typical leap-frog effect in the northern unprotected countryside but may have caused increased losses of prime agricultural land in the Whitebelt region of the Greater Toronto Area.
ACKNOWLEDGEMENTS

First and foremost, I would like to extend my deepest thanks and gratitude to my advisor, Wayne Caldwell. I am continually grateful to have had the opportunity to learn from you and to be inspired by your passion for rural communities. Words cannot express how much I have appreciated your time, support and guidance over the past two years.

I would also like to thank my advisory committee member, John Smithers, for his support, confidence and trust as I embarked on the journey that is a thesis. Your guidance and insight have been immensely appreciated.

To my parents, thank you for choosing to raise your children on the farm. You introduced me to the agricultural world and have instilled a sense of passion and pride in farming and rural communities, without which I would never have had the inspiration to pursue rural planning. Thank you for encouraging and trusting me to further my education and for all of your continual love and support.

Thank you also to my partner Brett for the words of encouragement and never-failing faith. You continue to help me envision and reach my goals and overcome any traces of doubt, for which I will always be grateful. Thank you also for reminding me to take breaks, reset and refresh when needed.

I would also like to thank the Ontario Ministry of Agriculture, Food and Rural Affairs, for their support through the OMAFRA-University of Guelph Highly Qualified Personnel (HQP) Scholarship. My thanks is extended to John Turvey and all of the staff in the OMAFRA Land Use Planning Unit for the wonderful learning opportunity provided through the HQP placement.
TABLE OF CONTENTS

Abstract .............................................................................................................................................. ii
Acknowledgements .......................................................................................................................... iii
Table of Contents ............................................................................................................................. iv
List of Tables ....................................................................................................................................... vii
List of Figures ..................................................................................................................................... viii
List of Appendices .......................................................................................................................... ix

1 Introduction ...................................................................................................................................... 1
  1.1 Introduction ................................................................................................................................. 1
  1.2 Problem Statement ...................................................................................................................... 3
  1.3 Research Purpose and Objectives ............................................................................................... 5
  1.4 Significance of Research ........................................................................................................... 6
  1.5 Thesis Organization and Structure ............................................................................................ 7

2 Literature Review .......................................................................................................................... 9
  2.1 Introduction ................................................................................................................................. 9
    2.1.1 History of agriculture and development in the Greater Golden Horseshoe .......... 10
  2.2 Methods of farmland preservation ............................................................................................ 13
    2.2.1 Urban containment policies ............................................................................................... 13
    2.2.2 Purchase of development rights: United States ............................................................... 20
    2.2.3 Land trusts and conservation easements ......................................................................... 23
    2.2.4 Agricultural Land Reserve: British Columbia ................................................................. 26
  2.3 Political evolution of farmland preservation methods in Ontario ......................................... 30
<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.4</td>
<td>Ontario’s Greenbelt Plan</td>
<td>35</td>
</tr>
<tr>
<td>2.4.1</td>
<td>Perspectives on the Greenbelt Plan from the agricultural community</td>
<td>38</td>
</tr>
<tr>
<td>2.4.2</td>
<td>Unintended consequences of Greenbelt legislation</td>
<td>41</td>
</tr>
<tr>
<td>2.4.3</td>
<td>The Leap-frog Effect</td>
<td>43</td>
</tr>
<tr>
<td>2.5</td>
<td>Conclusion</td>
<td>48</td>
</tr>
<tr>
<td>3</td>
<td>Context</td>
<td>50</td>
</tr>
<tr>
<td>3.1</td>
<td>Planning for farmland preservation in the Greater Golden Horseshoe</td>
<td>50</td>
</tr>
<tr>
<td>3.1.1</td>
<td>Provincial Policy Statement</td>
<td>51</td>
</tr>
<tr>
<td>3.1.2</td>
<td>Greenbelt Plan</td>
<td>53</td>
</tr>
<tr>
<td>3.1.3</td>
<td>Growth Plan for the Greater Golden Horseshoe</td>
<td>58</td>
</tr>
<tr>
<td>3.1.4</td>
<td>Official Plans</td>
<td>59</td>
</tr>
<tr>
<td>4</td>
<td>Research Methodology</td>
<td>62</td>
</tr>
<tr>
<td>4.1</td>
<td>Identification and Context of Study Area</td>
<td>62</td>
</tr>
<tr>
<td>4.2</td>
<td>Data Collection</td>
<td>65</td>
</tr>
<tr>
<td>4.2.1</td>
<td>Limitations of Data</td>
<td>69</td>
</tr>
<tr>
<td>4.3</td>
<td>Data Analysis</td>
<td>73</td>
</tr>
<tr>
<td>5</td>
<td>Prime Agricultural Land Loss</td>
<td>79</td>
</tr>
<tr>
<td>5.1</td>
<td>Regional Analysis: Greater Golden Horseshoe</td>
<td>79</td>
</tr>
<tr>
<td>5.1.1</td>
<td>Official plan amendments in the Greater Golden Horseshoe</td>
<td>79</td>
</tr>
<tr>
<td>5.1.2</td>
<td>Official plan amendments by theme</td>
<td>83</td>
</tr>
<tr>
<td>5.1.3</td>
<td>Official plan amendments by secondary development theme</td>
<td>85</td>
</tr>
<tr>
<td>5.2</td>
<td>Sub-Regional Analysis: Unprotected countryside north of the Greenbelt</td>
<td>88</td>
</tr>
<tr>
<td>5.2.1</td>
<td>Official plan amendments in the unprotected countryside north of the Greenbelt</td>
<td>89</td>
</tr>
</tbody>
</table>
5.2.2 Official plan amendments by theme ................................................................. 90
5.2.3 Official plan amendments by secondary development theme ......................... 93
5.3 Locational Analysis: Regions affected by Greenbelt ........................................... 95
  5.3.1 Official plan amendments in the GTA Whitebelt ........................................... 97
  5.3.2 Official plan amendments by theme ............................................................... 102
  5.3.3 Official plan amendments by secondary development theme ....................... 104
6 Discussion and Considerations for Future Research ............................................. 106
7 Conclusion ................................................................................................................. 113
References ..................................................................................................................... 115
Appendix ......................................................................................................................... 122
LIST OF TABLES

Table 1: Status of Municipalities in the Greater Golden Horseshoe in the research......64

Table 2: Primary themes for analysis.................................................................76

Table 3: Secondary development themes for analysis ......................................77

Table 4: Number and size of official plan amendments by application time-frame and location relative to the Greenbelt* .................................................................80

Table 5: Number and size of official plan amendments in the unprotected countryside north of the Greenbelt, by application time-frame*..................................................................................89

Table 6: Prime agricultural land lost north of the Greenbelt as a proportion of all prime agricultural land lost outside of the Greenbelt, 2000-2017* ...............................................................93

Table 7: Number and size of official plan amendments in the unprotected countryside of the Whitebelt, by application time-frame* .................................................................100

Table 8: Prime agricultural land lost within the Whitebelt as a proportion of all prime agricultural land lost outside of the Greenbelt* .................................................................104
LIST OF FIGURES

Figure 1: Greenbelt Plan area, 2017 ................................................................. 55
Figure 2: Plan of the boundary of removals from the Protected Countryside, 2017 ...... 57
Figure 3: Greater Golden Horseshoe .................................................................... 63
Figure 4: Hectares of prime agricultural land outside of the Greenbelt affected by official plan amendments, by theme, 2000-2014 ................................................................. 84
Figure 5: Hectares of prime agricultural land outside of the Greenbelt affected by official plan amendments, by secondary development theme, 2000-2014 ....................... 86
Figure 6: Hectares of prime agricultural land in unprotected countryside north of Greenbelt affected by official plan amendments, by primary theme, 2000-2014 ....... 91
Figure 7: Hectares of prime agricultural land in unprotected countryside north of Greenbelt affected by official plan amendments, by secondary development theme, 2000-2014 ......................................................................................... 94
Figure 8: Difference in area of prime agricultural land outside of the Greenbelt affected by official plan amendments compared to pre-Greenbelt application time-frame ....... 96
Figure 9: Location of Whitebelt lands .................................................................. 99
Figure 10: Proportion of all prime agricultural land outside of the Greenbelt lost within and outside of the Whitebelt, by application time frame.............................................. 102
Figure 11: Hectares of prime agricultural land in the unprotected countryside of the Whitebelt affected by official plan amendments, by theme, 2000-2014 ...................... 103
Figure 12: Hectares of prime agricultural land in the unprotected countryside of the Whitebelt affected by official plan amendments, by secondary development theme, 2000-2014 ......................................................................................... 105
LIST OF APPENDICES

Appendix A: Summary of official plan amendments included in the research ............ 122
Appendix B: Summary of collected official plan amendments excluded from analysis 124
Appendix C: Summary of relevant official plan amendments excluded from analysis . 125
1 Introduction

1.1 Introduction

Despite its vast geography, very little land in Canada is suitable for agricultural production. Of the entire national land base, only five percent of the land is considered to be dependable agricultural land. Dependable agricultural land, also known as prime agricultural land, is defined by class 1, 2 and 3 soils, as identified by the Canada Land Inventory, which have highest capability for agricultural production (Hofmann, Filoso, & Schofield, 2005). Canada’s prime agricultural land is found in all ten of the nation’s provinces. However, the most substantial holders of prime agricultural land are the provinces of Saskatchewan, Alberta and Ontario, which contain 38.6 percent, 21.6 percent and 15.5 percent of all of Canada’s prime agricultural land, respectively (Hofmann et al., 2005).

Of the mere five percent of Canada’s land base that is prime agricultural land, much has already been consumed, built upon for non-agricultural purposes, and now cannot be used for agricultural production. The consumption of dependable agricultural land has raised concern in many provinces, inspiring provincial legislation to be enacted that seeks to preserve this resource. This thesis is focused specifically on the prime agricultural land that exists in the province of Ontario, and the provincial land-use plan, known as the Greenbelt Plan, one of the primary purposes of which is to help preserve prime agricultural land in the region of the province known as the Greater Golden Horseshoe.
Though Ontario ranks third in the total area of prime agricultural soils by province, the province specifically contains over half of the class 1 soils of the entire country (Hofmann et al., 2005). Ontario is also home to specialty crops areas within these prime agricultural lands. These specialty crop areas have particular soil and climatic conditions which enable the production of crops not possible elsewhere in the province. Two specialty crop areas have been provincially identified in Ontario, the Niagara Peninsula specialty crop area, which produces grapes and tender fruit, and the Holland Marsh specialty crop area, which produces a variety of vegetables and muck crops (Ontario Ministry of Municipal Affairs, 2017a). These specialty crop areas, and a vast majority of all of the prime agricultural land in the province of Ontario, are located in the south and central regions of the province. A subset of this area of the province has been defined as the Greater Golden Horseshoe, which while containing much of Ontario’s prime agricultural land, is also one of the fastest growing regions in North America (Ontario Ministry of Municipal Affairs, 2017a).

Historically, the population pressures in the Greater Golden Horseshoe have been a contributor to the conversion of prime agricultural lands in the province for non-agricultural, often development, uses. In recognition of this, the provincial government has introduced several pieces of legislation and corresponding land and growth management plans, including the Greenbelt Plan and the Growth Plan for the Greater Golden Horseshoe, that together seek to preserve what remains of the prime agricultural lands in Ontario. These plans set out policies which dictate where growth
can and cannot occur, working to preserve prime agricultural lands through this process (Newbold & Scott, 2013).

This thesis explores the effect of this provincial legislation, and specifically focuses on areas of prime agricultural lands which are not protected through these enhanced provincial policies.

1.2 Problem Statement

The Greenbelt Plan protected 1.8 million acres of the most vulnerable ecological and agricultural lands within the Greater Golden Horseshoe when the plan was put into effect in late 2004 (Eidelman, 2010). The Greenbelt Plan provided protection of these ecological and agricultural lands, with emphasis on providing protection to lands within the inner ring of the Greater Golden Horseshoe, centered around the urban proximate zones of the growing Toronto area. However, much of the physical area of the outer-ring of the Greater Golden Horseshoe, being further away from the urban regions under the greatest development pressures, was left without Greenbelt protection. The lack of Greenbelt protection in much of the outer-ring has left the prime agricultural lands in this region more susceptible to consumption for development purposes. Despite being further from the most highly urbanized zones, much of the outer-ring of the Greater Golden Horseshoe is within a proximity which enables a commuter lifestyle. Provided with the opportunity to live in the outer-ring of the Greater Golden Horseshoe and commute to employment in the inner-ring, there is concern that the outer-ring municipalities may have experienced a greater loss of prime agricultural land since the
implementation of the Greenbelt Plan, due to a phenomenon named the leap-frog effect. Specifically, there exists anticipation that applications for official plan amendments on prime agricultural lands adjacent to the Greenbelt may have spiked following implementation of the Greenbelt Plan; thereby dramatically increasing the conversion of these prime agricultural lands for alternate purposes after Greenbelt implementation. This expected increase is ultimately an implication of the leap-frog effect, whereby the consumption of prime agricultural land is expected to have “jumped” to the unrestricted areas outside of the Greenbelt Plan thus increasing the loss of these lands. In the Ontario and Greater Golden Horseshoe context, the anticipated increase in prime agricultural land converted to other land uses after implementation of the Greenbelt Plan is expected beyond the northern boundary of the Greenbelt Plan in the outer-ring of the Greater Golden Horseshoe, where more available land with fewer restrictions is available.

Despite much speculation around the existence and implications of the leap-frog effect in the Greater Golden Horseshoe, very little research is available to track this phenomenon, especially as it specifically relates to prime agricultural land. In order to understand development patterns in the Greater Golden Horseshoe, and how the province’s prime agricultural land is being affected by development, it is important to determine if the leap-frog effect is a cause for concern, or if this phenomenon has not yet been realized in the Greater Golden Horseshoe. This thesis aims to determine the existence and extent of the leap-frog effect as it relates to prime agricultural land in the unprotected countryside adjacent to Ontario’s Greenbelt.
1.3 Research Purpose and Objectives

The purpose of this research is to analyze the effect of the implementation of Ontario’s Greenbelt Plan on prime agricultural land in the Greater Golden Horseshoe not protected by the plan’s enhanced development control policies. This research focuses specifically on prime agricultural lands, being lands with class 1 to 3 soils which are the most suitable and productive for agriculture. In this study, the prime agricultural lands which are not within the protection of the Greenbelt are referred to as the unprotected countryside. More specifically, this research aims to determine if any evidence of the leap-frog effect exists in the Greater Golden Horseshoe. The research will explore if and how land-use planning decisions affecting prime agricultural land in the Greater Golden Horseshoe have changed since the implementation of the Greenbelt, focusing explicitly on changes observed in the unprotected countryside outside of the Greenbelt Plan boundaries. This research will analyze the area of prime agricultural land lost outside of the Greenbelt Plan, using a time-frame from 2000 to 2017, thereby capturing land-use planning decisions made on these lands both before and after the implementation of the Greenbelt Plan. By capturing decisions made both before and after the implementation of the Greenbelt Plan, this research will provide insight on whether the implementation of the Greenbelt Plan has contributed to an increase in the area of prime agricultural land lost outside of the Greenbelt Plan boundaries, as compared to the area lost before the implementation of the plan. Thus, this research will also provide evidence of any leap-frog effect after the Greenbelt Plan implementation. This research will also explore if the purposes for the loss of prime
agricultural land outside of the Greenbelt in the unprotected countryside have changed since the Greenbelt Plan was implemented. It is intended that this research will help inform municipal and provincial land-use planning authorities by contributing to the available information on land-use planning, and specifically agricultural land-use planning in Ontario.

The objectives of this research are to:

1. Evaluate the effect of official plan amendments on prime agricultural land in the unprotected countryside of the Greater Golden Horseshoe from 2000 to 2017;
2. Identify the most substantial type of official plan amendments affecting prime agricultural land in the unprotected countryside outside of the Greenbelt Plan boundaries; and
3. Investigate evidence of the leap-frog effect on prime agricultural land in the unprotected countryside of the Greater Golden Horseshoe.

1.4 Significance of Research

The results of this research arise at an opportune time; ecological and agricultural land preservation and community and economic growth continue to be two important and combatting political issues in the province of Ontario, and specifically in the Greater Golden Horseshoe. The results of this research will provide important insights to provincial land-use planning bodies, especially to the Ontario Ministry of Agriculture, Food and Rural Affairs and the Ontario Ministry of Municipal Affairs and
Housing, as they make provincial decisions regarding both agriculture and growth. This research will also contribute to larger research projects at the University of Guelph, focused on agricultural land availability and the consumption of prime agricultural lands across the province of Ontario.

1.5 Thesis Organization and Structure

This thesis is organized in seven chapters. Chapter 1 has provided an introduction to the research, the research objectives and significance of the research. Chapter 2 continues to provide an introduction and background to the research through a literature review. The literature review provides a historical perspective on agriculture, development and farmland preservation policy in Ontario. The literature review also highlights the varying methods of farmland preservation and evaluates some of the strengths and weaknesses of these methods, including Ontario’s Greenbelt. Insight is also provided on existing concerns arising from the implemented Greenbelt Plan.

Chapter 3 of this thesis provides more detail on the land-use planning framework in Ontario and the Greater Golden Horseshoe. Applicable plans and policies are explored in this section to provide context regarding the provincial land-use planning policies in effect at the time of this research.

Chapter 4 focuses on the research methodology employed. This chapter describes how the study area was identified and discusses the methods of data
collection. Limitations of the data are identified in this chapter. As well, Chapter 4 describes the steps and strategies employed for data analysis.

The results of the research analysis are presented in Chapter 5 of the thesis. In this chapter, the analysis is presented using a three-region and three-step approach. Results are presented at a regional scale for the entire unprotected countryside in the Greater Golden Horseshoe, as well as for two refined sub-regions of the Greater Golden Horseshoe, specifically focusing on the unprotected countryside north of the Greenbelt and the unprotected countryside south of the Greenbelt, known as part of the Whitebelt. In each of these geographic scopes, three stages of analysis occur: a summary of farmland loss by official plan amendments is presented first, followed by primary themes of farmland loss and secondary themes of farmland loss in the specified geography.

Chapter 6 presents a more detailed discussion of the results shared in the previous chapter. This chapter focuses on insights that can be obtained from the analysis, and what impacts these insights may have on land-use planning in the province. This chapter also identifies possibilities for future research to support the insights shared.

This thesis concludes with Chapter 7, which presents and summarizes the results of the research.
2 Literature Review

2.1 Introduction

This literature review is intended to provide a background on the consumption of farmland, methods of farmland preservation and the unintended consequences of implemented farmland preservation policies. Specifically, this review delivers historical information that establishes a basis for exploring the leap-frog effect, the focus of this research. This review focuses specifically on the Ontario context, providing examples from other geographies in areas where Ontario-specific literature is unavailable.

This literature review is organized in four sections. The first section explores traditional settlement and development patterns in Ontario, and how these forms of development have led to urban sprawl and consumption of prime agricultural land within the province. The second section explores various methods that have been proposed and implemented in preserving farmland, including examples from countries across the world. Following this, the third section recognizes the political history of farmland preservation in Ontario. Various historical plans, policies and initiatives are tracked, up to the mechanisms currently in place. The current mechanism employed in Ontario, the Greenbelt Plan, is described in further detail in the fourth section. The fourth section of this literature reviews also introduces and focuses on evidence of the leap-frog effect in a greenbelt context.
2.1.1 History of agriculture and development in the Greater Golden Horseshoe

Agriculture is inextricably connected to the history and evolution of Ontario. In the early days of colonial settlement, agriculture was the predominant way of life (Randall, 1985). In fact, agriculture and the associated land needed to produce agricultural commodities was used to attract immigrants into the newly established colony. Upper Canada, which consisted of a band of land located on the northern edges of the Great Lakes in what is now Ontario, would grant land to new immigrants at minimal costs, in return asking for an oath to the King (Randall, 1985).

The strip of land in Upper Canada located along the north shore of Lake Ontario became one of the longest settled parts of Canada, beginning in the late 1700s (Eyles, Meriano, & Chow-Fraser, 2013). After the American War of Independence, displaced residents of the United States flocked to the northern shores of Lake Ontario. The incentives for immigrants, combined with the new arrival of displaced Americans bolstered population growth in this south-central region of the province, with the population reaching 100,000 by 1815 (Eyles at al., 2013; Randall, 1985).

This settled land was, and continues to be, attractive for agricultural purposes. It contains some of the most productive agricultural soil in Canada, and is located near major waterways, an important mode of transportation at the time of settlement in the province (Hofmann, 2001). In fact, this area contains most of the prime agricultural land, which is the land being most suitable for agricultural production, of the entire province, and constitutes a significant proportion of all of the prime agricultural land in Canada
(Hofmann, 2001). By the mid 19\textsuperscript{th}-century, the land known as Upper Canada was an open farming landscape; farming was seen as the frontier for progress (Wood, 2000). Typically, the farming landscape consisted of long narrow lots, or square surveys, consisting of 100 acres (Wood, 2000). Initially, the farms were located in separated communities, however as the population grew, doubling to reach 200,000 by the 1820s, these communities were connected by rough road networks into a larger agricultural landscape fabric (Wood, 2000; Randall, 1985).

The production of wheat became a large economic stimulus for the growing towns and cities, eventually contributing to the passage of the railway through the area. Ontario was an important contributor to the international trade of grain crops (Wood, 2000). The introduction of the railway was important for agriculture, but also marked the beginning of a new manufacturing era. In the late 19\textsuperscript{th} and early 20\textsuperscript{th} centuries, a marked change was seen in the agricultural labour force and population (Randall, 1985). By 1881, 50 percent of the workforce in Hamilton area, nearby to Toronto and within what was called the Upper Canada area, was industrial focused, rather than directly involved in agriculture, which had traditionally been the main form of both economic and social life (Randall, 1985). This shift was also reflected in the spatial patterns of population concentration and expansion; in 1871, 78 percent of the population lived in rural areas, however less than 100 years later, by 1941, this proportion had decreased to 57 percent (Randall, 1985). Toronto especially was a rapidly growing urban area; by 1884 it was considered an established metropolis, home to more than 86,000 and growing (Freeman, 2010).
Urban growth in and extending from the Toronto area, which had once been largely agricultural, was especially predominant in the years after World War II (Eyles et al., 2013; Joseph & Smit, 1985). The cultural adoption of the automobile and development of provincial highways reduced the need to live in the city; urban sprawl outwards from the well-established Toronto centre began and continued rapidly at this point (Eyles et al., 2013; Randall, 1985). What were once small rural communities became the ‘city’s countryside’; an open system of natural, economic and cultural value surrounding urban centres often desired for recreational and residential uses (Bryant, Russwurm, & McLellan, 1982; Joseph & Smit, 1985). In the south-central part of Ontario, the population more than doubled from 1951 to 1981, growing from 2.5 million to 5.5 million (Randall, 1985). To accommodate this new population growth, new residential development occurred in the form of sprawl, consuming more than 18 percent of the Class 1 soils in the province (Hofmann, 2001).

This historical perspective provides evidence of a settlement pattern that is certainly not unique to Ontario but presents challenges in farmland preservation. Traditionally, flourishing cities, such as the City of Toronto, were established because of their strong historical agricultural presence (Hofmann, 2001). Before advanced transportation and refrigeration technologies, communities needed to locate close to where food was grown (Nelson, 1990). However, as these communities continued to grow, the development needed to support their increasing populations caused the agricultural land on which their land was traditionally produced to be consumed for other purposes, such as housing and infrastructure. Such is the case, as has been described
here, for south-central Ontario, and the highly urbanizing region surrounding Toronto and the greater area.

2.2 Methods of farmland preservation

There are many methods which can be used to preserve farmland. Various land-use planning controls, such as urban growth boundaries and greenbelts, as well as agricultural land reserves, purchase of development rights and conservation agreements have all been used for this intended goal. These methods of farmland preservation are explored in detail in this section, using examples and evidence from North America and around the world.

2.2.1 Urban containment policies

Urban containment policies are one of the most common land-use planning tools used to preserve agricultural land. An urban containment policy generally acts to meet a variety of goals related to containing growth. Often these goals include revitalizing downtown cores, establishing lower costs of growth, and preserving farmland (Woo & Guldmann, 2014). Some urban containment policies also include regulations and incentives to improve densities and curb decentralization (Hortas-Rico, 2015).

It is generally accepted in both the literature and in practice that there are three types of urban containment policies: urban growth boundaries, urban service boundaries and greenbelts (Han et al., 2017). An urban growth boundary creates a border around a municipality, on which one side urban development is permitted, while
on the other side of the boundary specific measures and policies are in place to ensure preservation of the rural and agricultural environment (Woo & Guldmann, 2014). Urban service boundaries are similar to urban growth boundaries in that a boundary is set around a municipality, however on the non-urban side of the boundary, the only measure usually taken to prevent development is that urban services are not available in that area (Woo & Guldmann, 2014). Contrary to the other urban containment policies, which delineate a border line to separate urban and rural lands, the third type policy, greenbelts, function by identifying a physical area of space protected from development (Bengston & Youn, 2006; Han et al., 2017). Urban service boundaries are the weaker of the three urban containment policies (Woo & Guldmann, 2014). Given the strength and use of urban growth boundaries and greenbelts, these specific types of urban containment policies will be explored in further depth, citing examples from North America and beyond.

2.2.1.1 Urban growth boundary: Example from Oregon, United States

An urban growth boundary is a legally enforceable boundary, separating developable land from rural, agricultural and forested lands, helping to limit urban sprawl and keep cities compact (Abbott & Margheim, 2008; Marin, 2007). To encourage and direct development to within the urban growth boundary, fees, zoning and incentives are used by municipal governments. By directing growth to a specific, more compact area, urban growth boundaries are intended to encourage higher densities and provide for more efficient land use and delivery of public services (Marin, 2007). Three components of management are used to implement urban growth boundaries which
meet the intentions described: phasing development within the urban growth boundary, restricting development outside of the boundary, and allowing flexibility in the boundary lines (Jun, 2004).

Though the intended purpose of urban growth boundaries is clear and seemingly straightforward in the manner of implementation, their overall effectiveness, combined with several less desired spin-off effects of their implementation, have been criticized. As noted above, urban growth boundaries, while clearly demarcated at any one point in time, also enable flexibility in their implementation. Cities may, and often do exercise the option to add lands to within the urban growth boundary, thus consuming what were once protected rural and agricultural lands for development and limiting their ability to preserve these lands (Abbott & Margheim, 2008). However, from an alternative perspective, by limiting the land available for development, urban growth boundaries have also been cited as a cause of increasing land and housing costs within the boundary. In a similar criticism, urban growth boundaries have been said to be inequitable, as properties outside of the urban growth boundary cannot command the higher prices of those within, and property owners are burdened with limited property rights (Abbott & Margheim, 2008; Marin, 2007). An additional weakness of urban growth boundaries is that though they aim to direct growth to within the boundary and halt growth outside, some studies have found that the presence of an urban growth boundary merely diverted growth to different area not affected by the boundary, in a manner similar to that of a leap-frog effect (Jun, 2004).
One of the most commonly cited examples of an urban growth boundary in the literature exists in Portland, Oregon. While commonly referenced however, it was not the first urban growth boundary to be implemented in the United States (Jun, 2004). The first urban growth boundary was established in 1958 in Lexington, Kentucky. Oregon was however, one of the first to implement a state-wide mandate requiring urban growth boundaries around metropolitan areas; the first piece of legislation was passed in 1973, and the urban growth boundary for Portland was implemented by 1980 (Jun, 2004). The Portland urban growth boundary protects agricultural and natural lands by directing development to urban lands within the 24 cities and more than 236,000 acres within its bounds (Eagle, Eagle, Stobbe, & Van Kooten, 2015; Jun, 2004).

The planning framework for urban growth boundaries in Oregon was established to meet one of the goals of the state, urbanization (Abbott & Margheim, 2008). The purpose of urbanization in Oregon is to “provide for an orderly and efficient transition from rural to urban land use.” Urban growth boundaries in Oregon are also intended to separate rural land and land uses from urban areas (Abbott & Margheim, 2008). A key strength of the urban growth boundary framework in Oregon is that it works in conjunction with an additional piece of legislation to preserve agricultural lands and land uses (Jun, 2004; Marin, 2007). Through Senate Bill 101, municipalities were required to designate exclusive farm use zones. All land outside of established urban growth boundaries which had not been specifically exempt was to be designated under an exclusive farm use zone (Marin, 2007). This was done with the intention of preserving agriculture land and agricultural uses. Bill 101 also helped to ensure viability of
agriculture by prohibiting local governments from passing laws that limited and restricted agricultural operations (Marin, 2007).

Another strength of the urban growth boundary framework in Oregon is that it enables rural reserves to be established (Sullivan, 2015). Rural reserves are swaths of land outside of the urban boundary that may be designated and protected from addition to the urban growth boundary for a 50-year period (Sullivan, 2015).

Drawbacks of Oregon's urban growth boundary system parallel those of urban growth boundaries in general. The flexibility of the boundaries enable farmland to be consumed for urban purposes through urban reserves and adjustment of the boundary (Abbott & Margheim, 2008; Sullivan, 2015). Urban reserves are identified outside of an urban growth boundary, which are lands that may be added to within the boundary in the future (Sullivan, 2015). Designated urban reserves must demonstrate that there are no alternatives within reason to accommodate future growth, indicating the need for the urban reserve land (Sullivan, 2015). As municipalities must maintain a 20-year supply of developable land, these urban reserves are continually added to the urban growth boundary as existing land supply shrinks (Abbott & Margheim, 2008). In Portland, more than 20,000 acres of land was added into the urban growth boundary between 2002 and 2005 (Abbott & Margheim, 2008). In addition, in Portland it was found that the boundary had little effect on increasing new residential development within the boundary, but did significantly effect new growth in other locales not included in the urban growth boundary (Jun, 2004).
2.2.1.2 Greenbelts

Greenbelts are the strictest form of urban containment policies (Bengston & Youn, 2006; Vyn, 2012). A greenbelt is a continuous area of protected land which may be implemented for a variety of purposes including preventing sprawl, preserving land, protecting environmental features or providing recreational opportunities (Ali, 2008; Carter-Whitney, 2008; Daniels, 2010). Greenbelts typically take the form of a ring or band surrounding an urban area, however the size and form of greenbelts vary greatly (Ali, 2008). Land within a greenbelt is typically used for farming, recreation, greenspace and forestry, with some limited rural residential uses (Daniels, 2010). In some instances, the establishments of greenbelts may involve public acquisition of land and landowner compensation, while in other cases, such as in Ontario, private property is strictly regulated (Bengston & Youn, 2006; Vyn, 2012). The purpose of a greenbelt, and specifically the objective of preserving agricultural land within a greenbelt, is met through strict regulation of greenbelt lands (Bengston & Youn, 2006).

Greenbelts have been implemented in countries around the world, with varying success (Carter-Whitney, 2008). The first greenbelt policies were implemented in Britain, and are now present in England, Germany, Netherlands, Denmark, South Korea and China (Ali, 2008; Carter-Whitney, 2008; Han et al., 2017; Yang & Jinxing, 2007). In each of these regions, challenges and successes of the greenbelt program have been experienced. A common challenge cited in the implementation of a greenbelt is the appreciation effect which a greenbelt, similar to urban growth boundaries, has on land and residential prices in existing urban areas by restricting developable land (Ali, 2008;
Han et al., 2017). In this manner, greenbelts have also been said to create winners and losers in the land market, and concerns have been raised over the fairness of greenbelt policies (Ali, 2008).

These effects combined lead to a drawback of greenbelt policies, as it specifically relates to farmland preservation. As developable land is restricted, prices within inner-city areas rise and businesses and developments may be pushed to develop on areas of agricultural land beyond the greenbelt, where more land is available and fewer restrictions are in place (Ali, 2008; Bengston & Youn, 2006; Pond, 2009a). In this manner, though land is protected within a greenbelt, farmland outside of the greenbelt could be consumed at a greater rate. This issue, coined the leap-frog effect, is discussed in detail in a later section of this literature review. Another drawback of greenbelt policy is that being tied to political institutions, they may be modified or revoked at political will, undermining the permanency of the protection of farmland within its boundaries. Though historically greenbelt boundaries have been firm in most cases, land is often held in speculation by private land owners as they expect the greenbelt boundaries to adjust to development pressures (Ali, 2008).

Despite the negative consequences and concerns with greenbelt policies, studies have shown that greenbelts typically achieve success in preserving agricultural land within their boundaries (Ali, 2008; Han & Go, 2018). However, acting on their own greenbelts may preserve agricultural land, but they cannot ensure that agricultural production on the land is preserved; additional programs and policies are needed to support the agricultural industry on the protected lands (Carter-Whitney, 2008;
Macdonald & Keil, 2012). In the United Kingdom, several programs have been implemented which work alongside the implemented greenbelt to assist farmers (Carter-Whitney, 2008). These programs include support for farmers’ markets, connection to local consumers and funding for the environmental and conservation work undertaken by farmers on behalf of the public. Working in conjunction, greenbelts and agricultural programs can preserve agricultural land and ensure the continued viability of agricultural operations in the area (Carter-Whitney, 2008).

2.2.2 Purchase of development rights: United States

The purchase of development rights is a common farmland preservation tool used most predominantly in the United States. This method of farmland preservation began to gain ground in the United States in the late 1970s, as concerns over sprawl and farmland conversion mounted (Liu & Lynch, 2011). The purchase of development rights is one of the strongest farmland preservation methods available but is only applicable in regions where the transfer of development rights is permitted by law (Hilts, Wilton, & Caldwell, 2017). In the United States, the purchase of development rights is permitted, as landowners own and can sell their development rights (Gorsuch & Scott, 2010).

A purchase of development rights program works by removing the option to develop on the subject piece of land. Typically, cash payments or tax benefits are presented to the property owner in exchange for a long-term conservation easement on the property which restricts development on the property (Daniels, 1991; Liu & Lynch,
The property owner retains ownership of the property, and with the exception of prohibiting development, all land rights are retained (Schilling et al., 2014). In the United States, purchase of development rights programs exist at both the state and local-level, and public funds are allocated to the programs to support their efforts (Liu & Lynch, 2011).

The strength of purchase of development rights programs lies in the permanency of the land protection. Contrary to other farmland preservation methods, including land-use planning and zoning efforts, the legal easement agreement provides for more permanent protection (Daniels, 1991; Schilling et al., 2014). Attractive as a land preservation method from a conservation perspective, this method is also desirable to the public land owners. The money received by the land owner through the conservation agreement acts as a strong financial incentive for participation in the program and can be used to advance the agricultural operation or for personal use (Daniels, 1991; Schilling et al., 2014). In addition, small farms protected under a purchase of development rights program were found to earn more per-acre than their non-protected counterparts, as evidenced in a 2014 study conducted in New Jersey. The additional profit may be used by the farm to expand or modernize, further supporting the viability of the individual farm and local farm industry (Schilling et al., 2014). In addition to the benefits to the current property owner, these programs may benefit future land owners; Schilling et al., (2014) note that easement-protection of land could decrease the sale price of the land by eliminating development pressure and competition. However, studies evaluating the effect of preservation on farmland prices
offer little statistical evidence of a substantial decrease in farm sale price (Nickerson & Lynch, 2001).

Despite being one of the strongest methods of farmland preservation, the purchase of development rights is also one of the most expensive tools that can be used to preserve farmland (Schilling et al., 2014). In the United States, approximately $5.47 billion has been spent to preserve over 2.2 million acres of farmland through purchase of development right programs operated by state and local-level authorities (Liu & Lynch, 2011). However, a historical calculation estimated the total cost of protecting all farmland in the United States at risk of development at a figure of $130 billion (Schilling et al., 2014). Due to the high cost of implementing purchase of development rights programs, less land and smaller parcels of land may be conserved overall as compared to other farmland preservation mechanisms. In addition to the cost, the voluntary nature of these programs results in a less effective method of preserving large continuous blocks of land, when compared to land-use and zoning policies (Daniels, 1991; Schilling et al., 2014). Land owners may choose to participate or not participate in the program, which can undermine the ability to preserve large areas of land in a continuous swath (Daniels, 1991). Another noted drawback of purchase of development rights programs is one that is evident in many farmland preservation programs; though the farmland is protected and preserved, there is no condition that the land be actively used for agriculture (Schilling et al., 2014).

The effectiveness of purchase of development rights programs in the United States in particular has been debated in the literature. While some studies have argued
that purchase of development right programs have not impacted the loss of farmland, others have found that the existence of purchase of development rights programs reduced farmland loss compared to areas with no program in effect (Liu & Lynch, 2011). Liu and Lynch (2011) found that purchase of development rights programs decreased the rate of farmland loss by 40 to 55 percent, in a study focused on the Mid-Atlantic area of the United States.

2.2.3 Land trusts and conservation easements

The use of a land-trust is another one of the options available for farmland preservation, which acts in a similar mechanism to the purchase of development rights. However, a land trust can operate in areas where development rights do not lie with the property owner, as is the case in Canada (Gorsuch & Scott, 2010). This section will provide a brief overview of the function of land trusts, as an alternative to the purchase of development rights.

A land trust is a private, non-profit organization devoted to the preservation of land. Land trusts act in a variety of ways to preserve landscapes of varying functions, including environmental, agricultural and community-oriented areas. Land trusts coordinate and assemble land through donation and purchase for a mandated purpose, and hold this land in trust (Hamilton, 2005). The mandate of a farmland trust in particular involves the preservation of agricultural land and the associated heritage and ecological assets of the property (Gorsuch & Scott, 2010). Farmland trusts may also engage in research, education and extension activities (Gorsuch & Scott, 2010).
In addition to the donation of lands to a farmland trust, and purchases of land by the trust, these bodies may act in additional ways to ensure agricultural land is conserved. Farmland trusts may work with land owners to apply conservation agreements, covenants or easements, to the property (Gorsuch & Scott, 2010). The application of conservation agreements is one of the most prominent functions and methods in which a farmland trust preserves land, and keeps ownership of the property with the land owner (Hamilton, 2005). The conservation agreement includes requirements and restrictions for what may occur on the property (Gorsuch & Scott, 2010; Krueger, 2016). In essence, the conservation agreements implemented by farmland trusts set use restrictions on the property, often prohibiting any non-farm development (Krueger, 2016).

One of the benefits of a farmland trust is that these bodies can work with the local community to empower and protect farmland, and can tailor efforts to meet local concerns (Gorsuch & Scott, 2010). In addition, similar to the purchase of development rights, farmland trusts can offer financial incentives to encourage property owners to donate their land or apply conservation agreements (Krueger, 2016; Yuan, Boyle, You, & Fuller, 2012). However, the incentives offered by farmland trusts are typically not as strong as those offered through purchase of development rights, in areas where that is an available option (Krueger, 2016). Landowners who have donated or implemented a conservation agreement on their land typically receive benefits through the form of tax deductions, made available through charitable tax receipts issued by the land trust (Hamilton, 2005; Krueger, 2016).
Similar to the purchase of development rights, farmland trusts, through conservation agreements, provide a more permanent layer of farmland preservation that is not subject to influence by political priorities and policies (Gorsuch & Scott, 2010). The permanency of the conservation agreement allows landowners to protect their land for future generations, and land trusts often help land owners in this type of succession planning (Gorsuch & Scott, 2010). In addition to aiding in succession planning, farm trusts working at the local level can also help new farmers enter the industry, by linking the farmers with available land for lease (Gorsuch & Scott, 2010; Hamilton, 2005). In this way, farmland trusts not only work to preserve farmland, but also help to preserve the viability and continuity of agriculture in the area.

The largest drawback of farmland trusts is the limited financial support; as a private, non-profit organization, farmland trusts are often limited to fundraising efforts to cover the costs of obtaining farmland and establishing legal agreements, as well as covering the general operating cost of the trust (Gorsuch & Scott, 2010). This is a significant difference from the purchase of development rights programs in which public funding supports the program (Liu & Lynch, 2011). Farmland trusts may lease purchased and donated lands to help generate funds for the trust, however the public willingness to lease trust lands depends highly on the restrictions of land use, size of available parcel and type of agricultural operation (Hamilton, 2005).

There are several land trusts operating throughout Canada, including the Ontario Farmland Trust. The Ontario Farmland Trust was incorporated in 2004, and strives to preserve farmland through the use of easements, while also generally contributing to
societal knowledge and awareness of farmland preservation through research and education efforts (Caldwell & Hilts, 2005).

2.2.4 Agricultural Land Reserve: British Columbia

Another common method of farmland preservation is use of an agricultural land reserve, which is similar to a greenbelt. An agricultural land reserve is intended to protect a specific region of agricultural land (Hilts et al., 2017). Preservation of land in an agricultural land reserve is often done through restrictive zoning, as in the case in British Columbia, which provides one of the best and most commonly cited examples of agricultural land reserves (Curran, 2007; Eagle et al., 2015; Hilts et al., 2017).

In British Columbia, less than five percent of the total provincial land base is considered suitable for agricultural purposes, while less than one percent is made up of prime agricultural land (Curran, 2007; Eagle et al., 2015). As in Ontario, historical development patterns in British Columbia led to the establishment of the province’s largest cities in areas with prime agricultural land. As these cities expanded, including Victoria and Kelowna, increasing pressure was placed on the already limited prime agricultural land supply in the province (Curran, 2007; Eagle et al., 2015).

In response to increasing urbanization and development pressures on prime agricultural lands, the agricultural land reserve in British Columbia was implemented through the Land Commission Act in 1973 (Eagle et al., 2015). While preserving agricultural land was the primary purpose of the land reserve, consideration to local food supply was also considered as a factor in establishing the reserve (Curran, 2007).
Prior to the passing of the *Land Commission Act*, the province implemented agricultural land zoning at a large scale, which identified agricultural land within the province and subsequently zoned these lands for agricultural purposes (Eagle et al., 2015). At the conclusion of land identification and zoning, all of the parcels of land in the province which were in an agricultural zone and were larger than two acres were included in the agricultural land reserve (Eagle et al., 2015). As a result, more than 4.7 million hectares of land were protected under the agricultural land reserve, equal to approximately five percent of the provincial land base (Curran, 2007; Katz, 2009).

The reserve works to preserve agricultural land by restricting development and subdivision of the land governed in its zone (Eagle et al., 2015). At the time the agricultural land reserve was implemented, an Agricultural Land Commission was also established to regulate the reserve and ensure no development proceeded (Katz, 2009).

The Agricultural Land Commission acts to achieve three goals: encourage preservation of agricultural land, encourage active farming on agricultural land and work with municipalities to encourage land preservation and the implementation of agriculture-focused policies in their plans, by-laws and governing documents (Green, 2006; Katz, 2009). Specific to preserving agricultural land, the Agricultural Land Commission achieves this goal by acting as an approval authority on all applications which seek to exclude or include agricultural land from the reserve, or which seek to establish non-farm uses on the agricultural zoned land (Androkovich, 2013; Eagle et al., 2015; Katz, 2009). However, in this function, an inherent weakness of the land reserve system as a method to preserve agricultural land is revealed. The agricultural land
reserve does not permanently preserve agriculturally zoned land, and agricultural land can be removed from its protection to satisfy community needs, given no other available alternatives (Eagle et al., 2015; Green, 2006). If an application is made to include, exclude or modify permissions on land within the agricultural land reserve, after processing at the municipal level, the application is sent to the Agricultural Land Commission for a decision, which may supersede any decision made at the municipal level (Katz, 2009). Decisions of the Agricultural Land Commission may also be overruled by the provincial Cabinet, if the application is found to satisfy provincial interests (Androkovich, 2013). However, recent changes to legislation have required that agricultural considerations must be given the highest priority over any economic, environmental, cultural, heritage or social effects in any evaluations by the Cabinet, in efforts to ensure preservation of the reserve (Androkovich, 2013).

Despite a stringent application process focused on preserving the land base, historically many decisions to exclude agricultural land from the reserve have been approved (Curran, 2007; Green, 2006). In a period from 2002 to 2005, more than 70 percent of applications proposing the removal of land from the reserve were approved by the commission, and since 2002 the amount of land which was been approved for removal from the reserve has increased (Curran, 2007; Green, 2006). While the removal of agricultural land from the reserve has occurred, the area of the reserve has remained relatively constant by adding land to counteract what was removed. However, prime agriculture land removed from the reserve is generally replaced with lower quality land (Green, 2006). Most of the land excluded from the agricultural land reserve has
historically been in the lower portion of the province, where prime agricultural land predominates, while additions to the reserve have been in the north of the province, and consist of lesser quality agricultural lands (Curran, 2007). While this has maintained the area of the reserve, it has decreased the quality of lands within the reserve; losses of prime agricultural land are approximately 2.8 times greater than gains of prime agricultural land in the reserve (Curran, 2007).

Another concern with the agricultural land reserve method, similar to concerns with land-use planning methods, is that land owners are not compensated for any changes in property value (Hanna, 1997; Katz, 2009). This challenges the equity and fairness of the method, as property rights are strictly restricted without compensation (Hanna, 1997). Such was the case in British Columbia, where lands within the agricultural reserve were not expropriated from owners, and as such no compensation was provided (Katz, 2009). However, in British Columbia, the agricultural zoned lands which constitute the reserve received a 50 percent reduction in school taxes and preferential tax rates in an effort to partially recompense losses (Hanna, 1997; Katz, 2009).

Critics of the agricultural land reserve model also cite the reserve as a contributing factor to housing unaffordability by restricting land available for development (Katz, 2009). In addition, the agricultural land reserve has been questioned as to its effectiveness in promoting smart growth tactics, including high density living and adoption of public transit. While population density has increased in
the British Columbia, the proportion of those who rely on personal vehicle transportation to get to work remains high, and commuting congestion remains a concern (Katz, 2009).

Recognizing concerns with the agricultural land reserve method of preserving agricultural land, this method does maintain key strengths. One of the strengths of this method, specific to the British Columbia example, relates to the application process involved to remove agricultural land from the reserve. The application is a legal process with high costs and outcomes that are not guaranteed (Eagle et al., 2015). Applicants must demonstrate that there will be no harm to local agriculture through approval of the application (Eagle et al., 2015). The effort, time and uncertain outcome of the application may deter applicants from seeking to consume agricultural land from the reserve, thus preserving this land in the process. Though, as described above, farmland is lost from the agricultural land reserve, overall the British Columbia model appears successful; rates of farmland loss in the province decreased to 500 hectares per year in 2006 from 6,000 hectares per year prior to the establishment of the reserve in the 1970s. (Eagle et al., 2015).

2.3 Political evolution of farmland preservation methods in Ontario

As described the preceding sections, development on prime agricultural land in Ontario has been a result of traditional settlement patterns. While there are many options available for the preservation of farmland, some of the most commonly used methods of farmland preservation and protection are tied to political will and public
support. This section explores how provincial politics and public concern have evolved and influenced farmland preservation in Ontario.

While the consumption of agricultural land for urban and residential uses in the province may have originally proceeded unchecked, concerns over the loss of agricultural land began to arise in the mid-1950s, along the same time as the booms in population growth in south-central Ontario. One of the first papers to document a concern over farmland loss was authored by Ralph Krueger in 1959. This paper described the conflicting issues over the preservation of farmland, with specific regard for tender fruit lands in the Niagara Region which faced pressure for urban development (Piro, 1989). The value of the lands in Niagara as a contributor to the agricultural industry and economy provided the basis for the preservation of these lands and the restriction of development (Piro, 1989).

Since the earliest concerns over farmland preservation arose, quantitative measures of farmland loss in Ontario have not been well documented in the literature. However qualitative concerns over farmland loss and availability are reflected in political histories of the province. Several years after the Krueger 1959 report, a political plan to enforce growth management regimes and preserve greenspaces, including farmland, was delivered by the Progressive Conservative (PC) party (Eidelman, 2010). Less than ten years later, two new government policies were introduced. In 1966, the Urban Development in Rural Areas policy was implemented by the province, which was delivered as a response to the increasing loss of prime agricultural land (Joseph & Smit, 1985). This policy aimed to restrict residential development in rural areas (Joseph &
Smit, 1985). In 1968, the provincial government, led by John Robarts, developed the Toronto-Centered Region Concept Plan, which included a parkway belt meant to preserve the division between urban and rural areas. Ultimately, however, the Toronto-Centered Region Concept Plan was forgotten, and despite the Urban Development in Rural Areas policy, the loss of prime agricultural land in the province continued (Eidelman, 2010).

The lack of farmland preservation mechanisms and permitted wide-spread sprawl was evident across the urbanizing region of the Greater Toronto Area and beyond in the late 1970s. It was at this time, in 1978, that the first provincially mandated policies, known as the Foodland Guidelines, were put into place to specifically preserve farmland (Bourne, Bunce, Taylor, Luka, & Maurer, 2004). These guidelines required municipalities to identify and protect prime agricultural lands through municipal policies and procedures and are seen as one of the most important steps of historical provincial action in preserving prime agricultural lands (Bourne et al., 2004).

While the province was beginning to take action on the loss of prime agricultural lands through the Foodland Guidelines, the loss of these lands was not the only concern for the public and policy makers. The destruction and loss of environmental lands specifically was also a large concern at this time and arguably received more public attention and resultant policy action. Public concern over the loss of environmental lands and features led to the creation of the earliest government land-use planning initiatives, which went beyond the Foodland Guidelines by introducing provincially mandated land-use designations for the protection of environmentally
sensitive areas (Whitelaw, Eagles, Gibson, & Seasons, 2008). In 1962, mineral aggregate operations were blasting on the Niagara Escarpment. Their operations left visible evidence, which spurred public concerns and campaigns to preserve the landform, measuring over 183,000 hectares in total area (Whitelaw et al., 2008). In 1973, in response to the concerns, the Niagara Escarpment Planning and Development Act was passed by the provincial government (Moss & Milne, 1998). Under this Act, the Niagara Escarpment Commission (NEC) was established, and brought forward a proposed plan for protection of the escarpment in 1979. After six years, the plan was finally approved in 1985 (Moss & Milne, 1998; Whitelaw et al., 2008). As approved, the Niagara Escarpment Plan introduced seven land use designations that worked together to restrict development on the landform; coincidentally protecting some prime agricultural lands but largely working to preserve its environmental assets as its primary intent (Whitelaw et al., 2008).

In the late 1990’s, public concern also sparked the development of a second government land-use planning initiative tied once again to the protection of environmental features and lands specifically, the Oak Ridges Moraine Conservation Plan (Leffers, 2018). At this time, large subdivision developments in south-central Ontario were proposed on the Oak Ridges Moraine (Leffers, 2018). The Oak Ridges Moraine holds strong environmental value; it contains important hydrologic resources, including aquifers, headwaters, fish habitat, kettle lakes, bogs and wetlands (Logan & Wekerle, 2008). Recognizing the value of the moraine, environmental groups strongly opposed the proposed developments, and placed pressure on the Ontario government
to implement controls on these developments. In response to this pressure, and in efforts to maintain public support, the provincial government introduced legislation in 2001, known as the Oak Ridges Moraine Protection Act, which formed the basis for the Oak Ridges Moraine Conservation Plan (Leffers, 2018; Logan & Wekerle, 2008). The Oak Ridges Moraine Conservation Plan was adopted in 2002 and introduced four land-use designations with associated policies intended to preserve the moraine. However, the Oak Ridges Moraine Conservation Plan, was and continues to be largely focused on environmental features; only 30 percent of land is designated ‘Countryside Area’ under the Plan, representing agricultural lands (Webber & Hanna, 2014).

While the Niagara Escarpment Plan and Oak Ridges Moraine Conservation Plan primarily focused on the preservation of their ecological resources, sprawl on prime agricultural land within the province remained a concern. As with these two plans, public pressure was placed on the government to redirect growth away from prime agricultural lands, thus preserving farmland. Vision reports were created by individual working groups in Toronto in the 1990s with the goal of preserving the countryside, and in particular, agricultural and green lands (Bourne et al., 2004). At the turn of the 20th century, the Greater Toronto Services Board introduced the GTA Countryside Strategy which had a goal of preserving a permanent countryside in the Greater Toronto Area. However, with eight percent of Ontario’s GDP arising from land development and construction around this time, the consumption of agricultural land continued (Eidelman, 2010).
It wasn’t until the end of 2003 that the province took action in introducing a land-use planning mechanism to preserve prime agricultural lands, stepping beyond the previously set Foodland Guidelines, and aligning more closely with the Niagara Escarpment Plan and the Oak Ridges Moraine Conservation Plan (Pond, 2009a). In 2003, under the direction of the Liberal government, the province implemented a zoning order that restricted new uses of land in and around the Greater Toronto Area (Deaton & Vyn, 2014). The initial lands that the zoning applied to then became the Greenbelt Protection Act area in 2004, which ultimately formed the foundation of the Greenbelt Act and Greenbelt Plan in 2005 (Deaton & Vyn, 2014). At the same time, the province also made changes to the Provincial Policy Statement; in March of 2005 these revisions were enacted (Caldwell & Hilts, 2005). The revisions required that all municipal planning must be consistent with provincial policy. Specifically, in relation to the preservation of farmland, three new policies were adopted. These changes introduced policies relating to lot creation and settlement area boundary expansions on prime agricultural lands, and in addition established policies requiring that prime agricultural areas would be protected long-term for use in agriculture (Caldwell & Hilts, 2005).

2.4 Ontario’s Greenbelt Plan

The Ontario Greenbelt Plan serves as the primary provincial policy instrument for preserving prime agricultural land within the designated Greenbelt region. Preservation of farmland within the Greenbelt boundaries is supported by stronger policies than elsewhere in the province, given the heightened restrictions on land-use planning
decisions and development on prime agricultural land within the Greenbelt. The Greenbelt Plan works in concert with several other provincial plans, including the Oak Ridges Moraine Conservation Plan, the Niagara Escarpment Plan, the Growth Plan for the Greater Golden Horseshoe, and the Provincial Policy Statement to achieve objectives related to farmland and greenspace preservation, and also largely to achieve goals related to managing growth.

As one key function of the Ontario Greenbelt is the control of urban growth, the Ontario Greenbelt is not what some may consider to be a traditional Greenbelt (Pond, 2009a). Functioning to control growth, the Ontario Greenbelt can be considered to be a type of urban growth boundary (Dawkins & Nelson, 2002). The designated boundaries of the Ontario Greenbelt Plan were set in 2005, under direction of the Greenbelt Act. In the designated boundaries, the Greenbelt Act required that all planning decisions made under the Planning Act and the Condominium Act must conform with the Greenbelt Plan (Ontario Ministry of Municipal Affairs and Housing, 2005a).

The boundaries of the Greenbelt Plan cover roughly 1.8 million acres in the Greater Toronto Area and beyond (Eidelman, 2010). The Greenbelt Plan includes lands previously designated within the Oak Ridges Moraine and the Niagara Escarpment, stretching 325 kilometers around Lake Ontario from Northumberland County to Niagara Region (Pond, 2009b).

Approximately 800,000 acres within the Greenbelt Plan boundaries are ecological lands that were previously protected under the Oak Ridges Moraine
Conservation Plan and the Niagara Escarpment Plan. The remaining approximately 1 million acres were newly protected under the 2005 implementation of the Greenbelt Plan and were mostly included under a Protected Countryside designation in the Plan (Pond, 2009b). It is the Protected Countryside designation that works to preserve agricultural lands within the Greenbelt by outlining provisions and restrictions for the varying sub-designations of lands within the Protected Countryside. Lands within the Protected Countryside designation consist of approximately 11 percent specialty crop area, 57 percent prime agricultural land, 17 percent rural land and 15 percent settlement areas (Pond, 2009b). Specialty crop areas are those designated by the province that have the capacity and investment in the industry and associated infrastructure to produce specialty crops such as tender fruits and muck soil crops (Ontario Ministry of Municipal Affairs, 2017a). Specialty crop lands are concentrated in the Greenbelt Plan boundaries in Niagara, where many tender fruits are produced, and in Simcoe and York Regions, which are home to the Holland Marsh. Prime agricultural lands are those with soils with high capability for agriculture, typically made up of Canada Land Inventory Class 1, 2 and 3 lands (Ontario Ministry of Municipal Affairs, 2017a). Settlement areas are comprised of areas with built-up development, typically cities, towns, villages and hamlets. In the Protected Countryside designation, rural lands make up the rest of the lands which are not specialty crop, prime agricultural or settlement areas (Ontario Ministry of Municipal Affairs, 2017a).

Each designation of lands within the Protected Countryside in the Greenbelt has specific policies in place that support the preservation of farmland. These policies work
in conjunction with those outlined in the plans above, identifying where growth should and should not occur, supporting stronger density targets outlined in the Growth Plan for the Greater Golden Horseshoe, and preserving valuable agricultural and ecological lands (Akimowicz, Cummings, & Landman, 2016; Ontario Ministry of Municipal Affairs, 2017a). The specifics of these policies are discussed in detail in Chapter 3. In a broad sense, the Greenbelt Plan protects prime agricultural land within the Protected Countryside by prohibiting redesignation of or expansion of settlement areas onto prime agricultural and specialty crops lands. (Ontario Ministry of Municipal Affairs, 2017a; Pond, 2009a).

2.4.1 Perspectives on the Greenbelt Plan from the agricultural community

By eliminating the opportunity to convert specialty crop and prime agricultural lands to other uses, development may not occur on these lands within the Greenbelt. This creates an environment supportive of farmland preservation, however implementation of the Greenbelt Plan was met with differing perspectives from the farming community (Pond, 2009a). As one of the largest stakeholder groups directly affected by Greenbelt policies, the perspectives of the agricultural community are important to consider in any discussion surrounding the Greenbelt, especially in this research which directly relates to the prime agricultural lands on which they produce their livelihoods (Macdonald & Keil, 2012).

One of the criticisms of the Greenbelt Plan arising from the farming community was the lack of compensation for lost property value. By eliminating the opportunity for
development on agricultural lands, the Greenbelt also eliminated the opportunity for farmers to sell to developers and receive large financial benefits. Farmers within the Greenbelt were denied this opportunistic value and received no compensation during the implementation of the Greenbelt (Pond, 2009a). For some, this meant coming up with a new retirement plan, as the sale of land for those farms for potential development within the Greenbelt was no longer a viable option (Pond, 2009a). However, for those farms on the external boundary of the Greenbelt Plan, inflated prices were being paid for available farmland as land was banked by speculators for future development (Macpherson et al., 2013). A critical example of this is provided by Hilts, Smith and Watkins (2008) who note that a 40-hectare farm was sold for $1.75 million after learning it was just beyond the Greenbelt borders, and another three years later, the former owner received another $1.75 million payment, valuing the 40 hectare parcel at well over $3-million (Hilts et al., 2008). Thus, the Greenbelt Plan has been criticized by the agricultural community for unfairly affecting agricultural property values without potential compensation to land owners.

In addition to the inability to sell for development, and the lack of compensation that corresponds with that option, farmers’ collectively also criticized the plan for increasing the difficulty in selling the property for any purpose (Caldwell & Procter, 2013). Farmers have noted that in some cases, the farm property is too close to a developed area to be desirable to other farmers, in light of the issues faced by agricultural operations near an urban centre, as discussed further in the next section of this literature review. In other cases, farmers noted urbanites looking for country estate
dwellings were also not interested. As such, with challenges selling to farmers, urbanites and developers, sale of the farm could prove increasingly difficult (Caldwell & Procter, 2013).

The farming community was also concerned that the Greenbelt Plan represented an incomplete approach to planning for the viability of agriculture in the region and did not address the long-term economic sustainability of agriculture in the region (Caldwell & Procter, 2013; Macdonald & Keil, 2012). After facing dramatic economic events in the years leading up to the implementation of the Greenbelt, including rising input costs, increasing global competition, and loss of income resulting from impacts on the beef sector from an instance of bovine spongiform encephalopathy (mad cow disease), farmers’ concerns about farm finances were at a much-heightened state. As was observed at the time, the introduction of the Greenbelt Plan assured only the protection of agricultural land, not the protection of individual farm enterprises and the economic vitality of local agriculture (Bunce & Maurer, 2005; Caldwell & Procter, 2013; Macdonald & Keil, 2012). Government support, in the form of public promotion of agriculture, safety net programs and agricultural and rural infrastructure were identified as key elements that would help preserve viable agriculture in the area, that needed to work with Greenbelt protection of the land base, instead of only providing protection of agriculture through preservation of the land (Macdonald & Keil, 2012). Another concern presented from the perspective of farmers was that the Greenbelt Plan added an additional layer of regulation which increased the costs and time required to complete planning applications, and that the Greenbelt Plan was also inconsistently interpreted and
implemented across municipalities and government agencies (Caldwell & Procter, 2013).

Despite the concerns and criticisms presented by the agricultural community, additional farmer perspectives shared positive impacts and expectations of Greenbelt Plan implementation. Although frustrations related to property values and compensation were expressed, many farmers interviewed by Caldwell and Procter (2013) spoke to their desire to have agricultural land protected and valued the Greenbelt Plan for that purpose. In another study, though very few farmers spoke in support of farmland preservation policies in general, the need to protect farmland was still expressed, specifically highlighting the irreplaceable value of prime agricultural land (Bunce & Maurer, 2005).

2.4.2 Unintended consequences of Greenbelt legislation

Despite the best intentions of the Greenbelt policies to preserve farmland and farm viability, the literature suggests there have been unintended consequences of the policy. Several studies looked at the unintended consequences of the Greenbelt Plan, which affect land both within and outside of the Greenbelt Plan borders. These consequences include a decrease in agricultural viability and investment within the Greenbelt borders (Akimowicz et al., 2016; Inwood & Sharp, 2012; Li, Vyn, & McEwan, 2016), and a speculated increase in the conversion of prime agricultural land for development outside of the Greenbelt borders (Macpherson et al., 2013; Pond, 2009a).
The Greenbelt Plan, by protecting and preserving agricultural land within its borders, created the potential for rural-urban interfaces, an area of mixed-land uses with an irregular, potentially abrupt transition, from agricultural to non-agricultural land use (Inwood & Sharp, 2012). In the Ontario Greenbelt, agricultural lands exist in close proximity to urban areas (Caldwell & Procter, 2013). As a result of this rural-urban interface, the agricultural community is faced with many challenges that may affect the overall viability of agriculture within the Greenbelt, contrary to the original purpose of the plan (Cummings, Megens, & Murray, 2010; Inwood & Sharp, 2012). Though present in the Greenbelt, the urban-rural conflict is an issue not specific to this area, and affects farmers operating nearby most urban areas (Caldwell & Procter, 2013). One of the mostly commonly discussed challenges as it relates to agriculture proximal to a rural-urban interface is the potential for conflicts with non-farm neighbours; farms within the Greenbelt often face hostility towards their normal farm practices from the encroaching urban population (Akimowicz et al., 2016; Caldwell & Procter, 2013; Inwood & Sharp, 2012). Often these challenges take the form of complaints of odour and noise arising from normal farm practices, especially in livestock operations (Akimowicz et al., 2016; Inwood & Sharp, 2012). Increased traffic and the inability to move equipment is also a concern for agricultural operators in rural-urban areas, however in an effort to avoid traffic by moving equipment late at night, some Greenbelt farmers have received complaints about noise at night (Akimowicz et al., 2016). Agricultural operators have also reported conflicts with the urban population in regards to trespassing, theft and
vandalism on the agricultural property (Akimowicz et al., 2016; Caldwell & Procter, 2013; Inwood & Sharp, 2012).

In addition to conflicts with neighbours affecting the desire to farm and the viability of agricultural operations within the Greenbelt, there is generally a lower prevalence of agricultural operations, especially livestock operations, in rural-urban interface areas, including those areas within the Greenbelt (Akimowicz et al., 2016; Cummings et al., 2010). As the number of agricultural operations in these areas decrease, the agricultural support sector, which provides services and information to active farmers, becomes increasingly scarce (Akimowicz et al., 2016). Fewer suppliers, processors and markets are available to agricultural operations nearby urban centres (Akimowicz et al., 2016; Inwood & Sharp, 2012). Though the loss of these services may have occurred prior to the implementation of the Greenbelt, the effect of their loss remains with the farms protected by the Greenbelt (Li et al., 2016). As a result of decreasing agricultural services, combined with increasing conflicts with the urban population in the rural-urban interface, the viability of agriculture in the Greenbelt may be decreased. This is reflected in research by Li et al., (2016) which found that levels of farm investment within the Protected Countryside of the Greenbelt were lower than farms outside of the Greenbelt bounds.

2.4.3 The Leap-frog Effect

Another potential consequence of the Greenbelt Plan affects the prime agricultural land outside of its protection, rather than within. This perceived
consequence is known as the leap-frog effect. The leap-frog effect causes development to “jump” to the outer edge of a Greenbelt where there are fewer restrictions and requirements of developers (Pond, 2009a). As a result of this effect, more prime agricultural land outside of the Greenbelt may be consumed for development as compared to the area consumed prior to the implementation of the Greenbelt. In Ontario, the leap-frog effect has been predicted to affect municipalities beyond the northern boundaries of the Greenbelt, in the outer-ring of the Greater Golden Horseshoe (Macpherson et al., 2013). The leap-frog effect has been suggested to cause development of bedroom or satellite communities and decentralization, shifting development and consumption of land from urban to rural areas (Newbold & Scott, 2013; Vyn, 2012).

Newbold and Scott (2013), provided insight on the effect of Ontario’s Greenbelt and the potential for the leap frog effect. Their research suggested that the Greenbelt Plan may not be achieving its goal of intensification within its border, but rather in an unintended fashion, encouraging growth outside of its borders through leap-frogging development. There has been much recent growth in areas beyond the Greenbelt, encouraged by the new housing opportunities provided by developers seeking business in areas with fewer restrictions, including the unprotected countryside beyond the northern edge of the Greenbelt (Newbold & Scott, 2013). Municipalities such as Wellington, Dufferin and Simcoe Counties, have an abundance of unprotected countryside containing large swaths of prime agricultural land north of the Greenbelt and did not receive protection in 2004 (Newbold & Scott, 2013; Pond, 2009a). These
municipalities also tend to have lower housing prices, but still remain in a commuting
distance to job markets that make the area attractive to working professionals (Newbold & Scott, 2013). As such, it is predicted that municipalities such as these, with
unprotected countryside in the outer-ring of the Greater Golden Horseshoe, are
inevitably subject to the leap-frog effect and strong development pressures (Pond, 2009a).

Speculation of the leap-frog effect has also been explored by Deaton and Vyn (2014), who described the phenomenon in relation to farmland prices within and outside of the Greenbelt. Their study found that prices for farmland outside of the Greenbelt appreciated at a greater rate than farmland within the Greenbelt (Deaton & Vyn, 2014). As farmers face declining incomes, those that can sell to developers are likely to participate in the land market, and thus the leap-frogging effect is promoted both by a desire by farmers to sell high-value land outside of the Greenbelt, and by the limited income of new farmers to pay the appreciated value that developers can afford (Bourne et al., 2004; Krushelnicki & Bell, 1989). Vyn (2012) also contributes to speculation of leap-frog development by highlighting the non-continuous sprawl of urban centres and satellite communities. In this research, Simcoe County is highlighted specifically as an area vulnerable to leap-frog development, along with Brant County where development applications are noted to have increased substantially (Vyn, 2012).

Despite the suspected existence of the leap-frog effect as a result of Greenbelt implementation in Ontario, proving evidence is still limited. Newbold and Scott (2013) provide anecdotal evidence that the leap-frog effect may exist, thus propelling farmland
loss, in the regions on the external periphery of the Greenbelt, by analyzing the number of commuters crossing the Greenbelt boundaries. In 2001, 103,585 commuters crossed the Greenbelt for employment, while this number increased to 111,535 in 2006 (Newbold & Scott, 2013). While more recent commuter estimates are not available, continued growth beyond the Greenbelt provides reasonable grounds to assume this trend has persisted, and the volume of commuters is expected to have increased.

2.4.3.1 International evidence of leap-frogging in a Greenbelt context

While information in Ontario is scarce, leap-frog effects have also been analyzed in cities around the world that have similar Greenbelt systems. Many international greenbelts have also seen evidence to support the theory of a leap-frog effect spurred by greenbelt implementation (Amati & Yokohari, 2006; Jun & Hur, 2001).

In Seoul, South Korea, a greenbelt was first introduced in 1971. The goal of implementing the greenbelt was to prevent the sprawl of urbanizing areas while protecting natural and recreational areas (Jun & Hur, 2001). The greenbelt was put in effect as a development control zone; strong land controls and restrictions were put into place within the greenbelt, mitigating development within its boundaries. However, as the population of Seoul continued to grow, existing housing infrastructure could not support the increase in population. This resulted in a housing rent increase of 3.2 percent from 1980 to 1990, while the consumer price index increased by only 1.9 percent during the same period (Jun & Hur, 2001). The increase in population and rising housing costs created pressure for new housing developments and five new towns were
planned and constructed outside of the greenbelt boundaries from 1989 to 1995, under a policy coined “new town development”. In this sense, Seoul’s greenbelt and new town policies were contradictory to each other. Though the greenbelt aimed to prevent urban sprawl, it forced new town development to leap-frog over its boundaries, and has been cited as a reason for extending urban sprawl and commuting times (Jun & Hur, 2001).

In the United Kingdom, similar criticisms of the greenbelt as they relate to housing and leap-frog development have also been expressed in relation to the experience in the Greater London planning area. The first greenbelt system in London was introduced in 1909, intended to fulfill a similar purpose to the Ontario greenbelt; it was intended to preserve agricultural land (Amati & Yokohari, 2006). Over the course of several years, the greenbelt system in London evolved and grew to meet changing priorities, however by 1934 the implementation of a London greenbelt in the face of high development pressure had become a national concern (Amati & Yokohari, 2006). In 1935, 4,560 hectares of land were established as a greenbelt around London. This was expanded to 28,600 hectares by 1939 as urban uses continued to consume agricultural and green lands (Amati & Yokohari, 2006). Though the greenbelt remains largely undeveloped, concerns have been raised that question the greenbelt as contributing to housing shortages and non-compact cities. Proponents argue that the greenbelt has caused development to leap-frog further into rural areas, causing increased car use and longer car journeys (Amati & Yokohari, 2006).

In the face of rapidly growing populations, a greenbelt may not be enough to control growth (Yang & Jinxing, 2007). Instead of promoting increased densities and
compact form, a greenbelt may instead lead to leap-frog development further away from larger cities, as has been suggested in Seoul and London (Amati & Yokohari, 2006; Jun & Hur, 2001). The greenbelt in Ontario is associated with the Greater Golden Horseshoe region, which is one of fastest growing regions in North America (Ontario Ministry of Municipal Affairs, 2017a). As such, it is possible that with an exploding population in the area, the Ontario greenbelt may have, or will, promote leap-frog development on prime agricultural land beyond its borders.

2.5 Conclusion

While many options exist for the preservation of farmland, the literature provides evidence that regardless of the option employed, all farmland preservation regimes experience mixed degrees success. Public support, financial backing and contesting priorities all play a role in determining the overall success of farmland preservation in a given region. The literature also provides several indications of unintended consequences that may hinder the primary intention of farmland preservation policies. Commonly referenced, and cited in examples around the world, is the phenomenon known as the leap-frog effect, which propels development across the boundaries of protected farmland to unprotected areas of farmland.

This research will focus on one specific farmland preservation mechanism, the greenbelt, and evaluate the presence of the leap-frog effect in an Ontario context. The evidence presented in the review of the literatures suggests that it may be possible that the greenbelt implemented in Ontario has initiated leap-frog development into the
unprotected countryside beyond its boundaries, thereby causing a greater consumption of farmland in the unprotected area. This research aims to determine if quantifiable evidence exists that the Ontario Greenbelt has contributed to leap-frog development on prime agricultural lands in communities within the Greater Golden Horseshoe which contain unprotected countryside.
3 Context

3.1 Planning for farmland preservation in the Greater Golden Horseshoe

Land-use planning in Ontario is governed by a hierarchy of planning regulations and documents that dictate the goals, policies and rules by which land-use planning processes must occur. At the top of the planning hierarchy is the Planning Act, which identifies how land-use decisions may be made, and by whom, as well as identifying land-use policies of provincial interest (Ontario Ministry of Municipal Affairs, 2018). Succeeding and providing more detailed policies to the Planning Act is the Provincial Policy Statement, which provides policy direction related to topics of provincial interest that apply across the province. In the Greater Golden Horseshoe, there are an additional four provincial plans which guide growth and land use in the region. These plans are the Growth Plan for the Greater Golden Horseshoe, the Greenbelt Plan, the Oak Ridges Moraine Conservation Plan, and the Niagara Escarpment Plan. The policies and guidance provided in the Provincial Policy Statement and the provincial plans are implemented through regional and local official plans, which must be consistent with the policy directions provided at a provincial level.

The Planning Act specifies the “protection of the agricultural resources of the Province” as a matter of provincial interest (Planning Act, 1990). To align with the Planning Act, the Provincial Policy Statement, provincial plans, and regional official
plans also provide reference to agriculture and the preservation of farmland. The most important planning documents for farmland preservation in the Greater Golden Horseshoe are the Provincial Policy Statement, the Greenbelt Plan, the Growth Plan and the regional official plans.

3.1.1 Provincial Policy Statement

The Provincial Policy Statement has historically been an evolving document, issued three times to update and provide more detail on policies of provincial interest. The first version of the Provincial Policy Statement was issued in May of 1996 and amended in 1997 (Ontario Ministry of Municipal Affairs and Housing, 2005b). The Provincial Policy Statement applies to all land in the province, including the unprotected countryside in the Greater Golden Horseshoe.

The first version of the Provincial Policy Statement was a concise document, containing five agricultural policies, two of particular significance from a farmland preservation perspective. Policy 2.1.1 of the 1996 Provincial Policy Statement dictated that “prime agricultural areas will be protected for agriculture,” (Ontario Ministry of Municipal Affairs and Housing, 1996). However, as per policy 2.1.3, prime agricultural areas may also be used for urban and rural settlement area expansions, provided it can be demonstrated that there is a need for the land and there are “no reasonable alternative locations that avoid prime agricultural areas,” (Ontario Ministry of Municipal Affairs and Housing, 1996).
An updated version of the Provincial Policy Statement was issued in 2005, and replaced the 1996 document (Ontario Ministry of Municipal Affairs and Housing, 2005b). The updated version of the Provincial Policy Statement provided several revisions that impacted the perspective and mechanisms by which farmland was protected in Ontario, in conjunction with other legislative changes, including the introduction of the Greenbelt Plan, discussed below (Caldwell & Hilts, 2005). One of the significant changes included a revision to Policy 2.1.1., now Policy 2.3.1 in the 2005 Provincial Policy Statement, which as revised read “Prime agricultural areas shall be protected for long-term use in agriculture,” (Ontario Ministry of Municipal Affairs and Housing, 2005b). The 2005 version of the Provincial Policy Statement also introduced the concept of specialty crop areas, mandating planning authorities to designate these areas, and giving them the highest priority for protection. Policy 2.3.5.1 also specified, that should prime agricultural land be used for settlement areas and settlement area expansions, the land may not comprise a specialty crop area (Ontario Ministry of Municipal Affairs and Housing, 2005b).

The current version of the Provincial Policy Statement was issued in 2014, replacing the 2005 document, and implemented more stringent policy controls related to farmland preservation. In the 2014 Provincial Policy Statement it is required that planning bodies must designate both prime agricultural areas and specialty crop areas, using provincially developed guidelines (Ontario Ministry of Municipal Affairs and Housing, 2014). The Province also introduced stricter policies for settlement area and settlement area expansions onto prime agricultural areas, mandating that, in addition to
the policies outlined in the 1996 and 2005 documents, identification and expansion of settlement areas may only occur at the time of a comprehensive review (Ontario Ministry of Municipal Affairs and Housing, 2014).

The directions outlined in the Provincial Policy Statement apply across the Province, ensuring a consistent baseline level of farmland preservation is established across all regions. However, when compared to the policies implemented specifically in the Greenbelt Plan area, discussed below, the Provincial Policy Statement policies are considered weaker. Thus, though some protection for prime agricultural lands is provided through the Provincial Policy Statement, in this research lands not protected by the Greenbelt Plan are termed the unprotected countryside.

3.1.2 Greenbelt Plan

The Greenbelt Plan was first introduced in 2005, and took effect retroactively on December 16, 2004 (Ontario Ministry of Municipal Affairs and Housing, 2005a). The plan protects 1.8 million acres of land in regions across the Greater Golden Horseshoe from development by designating areas where growth may not occur and implementing strict policies for the preservation of natural areas, including prime agricultural land (Ontario Ministry of Municipal Affairs and Housing, 2005a; Pond, 2009b). When established, the Greenbelt Plan included previously protected sensitive natural areas, being the Niagara Escarpment and the Oak Ridges Moraine (Newbold & Scott, 2013). In addition to the policies of the Greenbelt Plan, lands in the Niagara Escarpment and Oak Ridges Moraine are each subject to their own provincial plans.
The Niagara Escarpment and Oak Ridges Moraine are captured in the Greenbelt Plan under individual designations. The Greenbelt Plan also introduced a new designation named the Protected Countryside (Ontario Ministry of Municipal Affairs and Housing, 2005a). Lands within the Protected Countryside designation of the Greenbelt Plan may be specialty crop areas, prime agricultural areas, rural areas, towns/villages, hamlets or shoreline areas. However, together specialty crop areas, prime agricultural areas and rural areas make up the Agricultural System of the Greater Golden Horseshoe, which outlines protection for farmlands (Ontario Ministry of Municipal Affairs and Housing, 2005a). Within the Agricultural System of the Greenbelt Plan, specialty crop areas and prime agricultural areas have stricter policies for preservation compared to rural areas, which are considered non-prime agricultural lands and have a lower capability for agriculture (Ontario Ministry of Municipal Affairs and Housing, 2005a). In this research, prime agricultural areas and specialty crop areas, which maintain the highest capability for agriculture and the highest priority for protection were considered. Rural lands were not considered in this research.

The 2005 Greenbelt Plan specified that specialty crop areas shall not be redesignated within municipal official plans, and that settlement area expansions may not occur within specialty crop areas (Ontario Ministry of Municipal Affairs and Housing, 2005a). Prime agricultural areas were also not to be redesignated in municipal official plans, except to bring the official plan into conformity with the Greenbelt Plan, or for settlement area expansions subject to the policies of the Provincial Policy Statement (Ontario Ministry of Municipal Affairs and Housing, 2005a). An exception was provided
through Policy 3.4.4. for settlement area expansion proposals that had been initiated prior to the implementation of the Greenbelt Plan. In these cases, settlement area expansions may be permitted into prime agricultural areas (Ontario Ministry of Municipal Affairs and Housing, 2005a).

Figure 1: Greenbelt Plan area, 2017

(Ontario Ministry of Municipal Affairs and Housing, 2017c)

The Greenbelt Plan was updated in 2017, as part of a review of all four provincial plans which was launched in 2015 by the province (Advisory Panel on the Coordinated Review, 2015). The updated Greenbelt Plan was released in May of 2017, and came into effect on July 1 of the same year (Davies Howe LLP, 2017). The policies of the 2005 Greenbelt Plan were maintained in the updated 2017 Greenbelt Plan, ensuring...
continued preservation of the agricultural land base. However, two new policies relating
to specialty crop areas prime agricultural areas were also introduced. These policies
describe that land use compatibility between agricultural uses and non-agricultural uses
will be achieved by avoiding and mitigating impacts on the Agricultural System (Ontario
Ministry of Municipal Affairs, 2017a). In addition, the new policies emphasize the
importance of maintaining the spatial continuity of the agricultural land base and
avoiding fragmentation of agricultural lands, as well as promoting economic connections
to support the industry (Ontario Ministry of Municipal Affairs, 2017a).

Boundary changes to the Greenbelt Plan also occurred as a result of the review
(Ontario Ministry of Municipal Affairs and Housing, 2017b). Approximately 10,100
hectares of land was added to the Greenbelt Plan under two designations: Urban River
Valley and Protected Countryside. Several removals from the Greenbelt Plan Protected
Countryside also occurred. The majority of these removals consisted of smaller parcels
of land which were concentrated along the southern boundary of the Greenbelt Plan
area (Ontario Ministry of Municipal Affairs and Housing, 2017b). The removal of lands
from the Protected Countryside constituted a loss of approximately 150 hectares;
overall the boundary changes saw a net increase of almost 10,000 hectares into the
Greenbelt Plan (Ontario Ministry of Municipal Affairs and Housing, 2017b).
Overall, the language used in the Greenbelt Plan policies is stronger and stricter than the Provincial Policy Statement, providing greater emphasis on farmland preservation. Through the policies noted above, the Greenbelt Plan preserves the existing prime agricultural and specialty crop land base by prohibiting redesignation of these lands to alternative designations through official plan amendments that would enable non-agricultural uses and development.
3.1.3 Growth Plan for the Greater Golden Horseshoe

The Growth Plan for the Greater Golden Horseshoe was first introduced in 2006 under the province’s Places to Grow initiative (Ontario Ministry of Municipal Affairs, 2017b). The Places to Grow Act, 2005, provides legislation which enables the province to develop plans guiding growth and land use (Ontario Ministry of Municipal Affairs, 2017b).

The 2006 Growth Plan for the Greater Golden Horseshoe provided policy direction which was supportive of increasing densities and limiting sprawl. The Growth Plan directed growth to built-up areas, and restricted settlement area boundary expansions (Ontario Ministry of Public Infrastructure Renewal, 2006). This direction was given through policies which required that growth would be accommodated through intensification, growth would occur in settlement areas, and no new settlement areas would be established (Ontario Ministry of Public Infrastructure Renewal, 2006). The Growth Plan also outlined a specific policy, 2.2.3.1, which required that by 2015, and each year after, at least 40 percent of all new residential development would be within a built-up area (Ontario Ministry of Public Infrastructure Renewal, 2006). Policy 2.2.7.2 also required that for greenfield areas, new development must achieve a minimum density of 50 residents and jobs combined per hectare (Ontario Ministry of Public Infrastructure Renewal, 2006). These intensification-supportive policies, working with the Greenbelt policies, delivered a directive which promoted density and the preservation of natural and agricultural lands.
As with the Greenbelt Plan, the Growth Plan for the Greater Golden Horseshoe was also updated as part of the coordinated provincial plan review (Davies Howe LLP, 2017). As a result of the review, several changes were made to the policies of the Growth Plan for the Greater Golden Horseshoe. The most significant changes to the Growth Plan included the revision of policies outlining minimum intensification and density targets for settlement areas (Davies Howe LLP, 2017). The previous requirement for 40 percent of all new residential development to be within a built up area was increased in the 2017 Growth Plan to 50 percent until 2031 and 60 percent each year after (Ontario Ministry of Municipal Affairs, 2017b). In addition, the greenfield density target was increased to a minimum of 80 combined residents and jobs per hectare (Ontario Ministry of Municipal Affairs, 2017b). Settlement area boundary expansions were also given stricter criteria following the update of the Growth Plan. Specific to agricultural lands, the updated Growth Plan requires an Agricultural Impact Assessment to be conducted where an expansion into prime agricultural lands cannot be avoided and is justified (Ontario Ministry of Municipal Affairs, 2017b). As a result of the update, the policy changes further directed intensification to promote efficient use of resources and limit conversion of natural and agricultural lands.

3.1.4 Official Plans

Official plans are the primary mechanism for implementing provincial policies through municipal planning processes. Section 3 of the Planning Act prescribes requirements for official plans, including required contents and policies, and legislated processes to approve, update and amend official plans (Planning Act, 1990). Section 3
of the Planning Act also prescribes that any municipal planning decisions shall be consistent with the Provincial Policy Statement (Ontario Ministry of Municipal Affairs and Housing, 2014).

Typically, an official plan outlines goals and objectives for a municipality, and policies which are intended to help meet those goals and objectives. An official plan also identifies areas of the municipality which are subject to certain land-use designations. Each land-use designation has its own respective policies to govern permitted uses in the identified area. Land use designations in an official plan may include: residential, commercial, institutional, agricultural and rural, among others. In many cases, official plan designations recognize specialty crop areas and prime agricultural lands in an agricultural designation, while lower capability lands are often categorized under a rural designation, or similar. Official plan designations on specific properties may be amended through an official plan amendment process, which changes the existing designation on the property to a different designation which would permit the intended use desired by the applicant. Official plan amendments may be privately-initiated or initiated by the municipality, but are subject to approval by the municipal council, and in some instances by the Ministry of Municipal Affairs.

Municipal official plans must conform to the policies of the Greenbelt Plan in their planning decisions, and must amend their official plans to conform to the Greenbelt Plan (Ontario Ministry of Municipal Affairs and Housing, 2005a). Municipal official plans must contain policies that are equivalent to, or more stringent than Greenbelt Plan policies, and must conform to these policies in all municipal planning processes (Ontario Ministry
of Municipal Affairs and Housing, 2005a). Thus, prime agricultural lands in municipalities which are within the Greenbelt are not permitted to be re-designated through the official plan amendment process, as this is a specific policy outlined in the Greenbelt Plan (Ontario Ministry of Municipal Affairs and Housing, 2005a).

Prior to 2013, adoption of official plans was not mandated. In 2013, the Ontario government passed Regulation 352/02 which implemented mandatory adoption of official plans for 30 upper-tier and 36 single-tier municipalities in Ontario (Mandatory Adoption of Official Plans, O. Reg. 352/02, s.1.)
4 Research Methodology

4.1 Identification and Context of Study Area

The identification of the study area for this research was driven by the geographic location of the Greenbelt Plan. The Greenbelt Plan is located in south-central Ontario, and protects 1.8 million acres of countryside spanning from Northumberland County in the east to Niagara Region in the west (Pond, 2009b). The Greenbelt Plan covers area in the region known as the Greater Golden Horseshoe (GGH), a metropolitan planning area covering 32,000 square kilometers which includes 21 upper- and single-tier municipalities (Ontario Ministry of Public Infrastructure Renewal, 2006; Pond, 2009b).
The Greater Golden Horseshoe was Canada’s most urbanized region in 2011, home to more than 8.76 million people, and it continues to grow (Newbold & Scott, 2013). From the 2006 to the 2011 census, the Greater Golden Horseshoe added more than half of a million new residents. Given the strong population pressures in the region, the Greater Golden Horseshoe is at greater risk of losing farmland and experiencing sprawl (Newbold & Scott, 2013). This was recognized by the Ontario government, and resulted in the implementation of the Growth Plan for the Greater Golden Horseshoe in 2006, meant to work in conjunction with the Greenbelt Plan to establish where growth can and cannot occur (Newbold & Scott, 2013).
For this study, all upper- and single-tier municipalities within the Greater Golden Horseshoe were considered. Each municipality was evaluated to determine if a substantial amount of prime agricultural land specifically was designated within the municipality’s official plan during the study time frame from 2000 to 2017. Municipalities which contained a substantial amount of prime agricultural land were then included in the research, while others were excluded from the study. Table 1 below provides the status of the municipalities in the Greater Golden Horseshoe in this study.

Table 1: Status of Municipalities in the Greater Golden Horseshoe in the research

<table>
<thead>
<tr>
<th>Municipality</th>
<th>Upper- or Single-Tier</th>
<th>Status</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Toronto</td>
<td>Single</td>
<td>Not Included</td>
<td>Limited presence of prime agricultural land 2000-2017</td>
</tr>
<tr>
<td>Durham Region</td>
<td>Upper</td>
<td>Included</td>
<td>Substantial presence of prime agricultural land 2000-2017</td>
</tr>
<tr>
<td>York Region</td>
<td>Upper</td>
<td>Included</td>
<td>Substantial presence of prime agricultural land 2000-2017</td>
</tr>
<tr>
<td>Peel Region</td>
<td>Upper</td>
<td>Included</td>
<td>Substantial presence of prime agricultural land 2000-2017</td>
</tr>
<tr>
<td>Halton Region</td>
<td>Upper</td>
<td>Included</td>
<td>Substantial presence of prime agricultural land 2000-2017</td>
</tr>
<tr>
<td>City of Hamilton</td>
<td>Single</td>
<td>Not Included</td>
<td>Information not available from municipality</td>
</tr>
<tr>
<td>Northumberland Region</td>
<td>Upper</td>
<td>Included</td>
<td>Substantial presence of prime agricultural land 2000-2017</td>
</tr>
<tr>
<td>City of Peterborough</td>
<td>Single</td>
<td>Not Included</td>
<td>Limited presence of prime agricultural land 2000-2017</td>
</tr>
<tr>
<td>Peterborough County</td>
<td>Upper</td>
<td>Included</td>
<td>Substantial presence of prime agricultural land 2000-2017</td>
</tr>
<tr>
<td>City of Kawartha Lakes</td>
<td>Upper</td>
<td>Included</td>
<td>Substantial presence of prime agricultural land 2000-2017</td>
</tr>
<tr>
<td>Simcoe County</td>
<td>Upper</td>
<td>Included</td>
<td>Substantial presence of prime agricultural land 2000-2017</td>
</tr>
<tr>
<td>City of Barrie</td>
<td>Single</td>
<td>Not Included</td>
<td>Limited presence of prime agricultural land 2000-2017</td>
</tr>
<tr>
<td>City of Orillia</td>
<td>Single</td>
<td>Not Included</td>
<td>Limited presence of prime agricultural land 2000-2017</td>
</tr>
</tbody>
</table>
Dufferin County   | Upper  | Included | Substantial presence of prime agricultural land 2000-2017
Wellington County | Upper  | Included | Substantial presence of prime agricultural land 2000-2017
City of Guelph   | Single | Not Included | Limited presence of prime agricultural land 2000-2017
Waterloo Region  | Upper  | Included | Substantial presence of prime agricultural land 2000-2017
Brant County     | Upper  | Included | Substantial presence of prime agricultural land 2000-2017
City of Brantford| Single | Not Included | Limited presence of prime agricultural land 2000-2017
Haldimand County | Upper  | Included | Substantial presence of prime agricultural land 2000-2017
Niagara Region   | Upper  | Included | Substantial presence of prime agricultural land 2000-2017

4.2 Data Collection

Data for this study was collected from 14 of the 21 single- and upper-tier municipalities in the Greater Golden Horseshoe. As noted in the table above, six municipalities were not included in the research due to a limited or non-existent presence of prime agricultural lands designated in the municipal official plans during the study time frame. These municipalities were the cities of Toronto, Peterborough, Orillia, Barrie, Guelph, Brantford. One additional municipality, the City of Hamilton, was not included in the research. Though the City of Hamilton does contain prime agricultural lands, information for the municipality could not be obtained by the time of this writing.

Data collection began in 2014 as part of a larger research project at the University of Guelph and continued through to 2018. Data for this study were generally obtained from official plan amendment documents, for approved amendments at the lower- and upper-tier level that were applied for between 2000 and 2017. The time
frame from 2000 to 2017 was chosen in order to ensure data were captured from both prior to the implementation of the Greenbelt Plan in late 2004, and after.

Data for this research were collected from official plan amendments. Official plan amendments were used as the method of tracking the conversion of prime agricultural lands to other uses, as these amendments reflect a marked decision to permit the land to be used for an alternative, often development-oriented purpose. Further, official plan amendments provide a consistent methodology of tracking prime agricultural land conversions across the Greater Golden Horseshoe, as they are required by all municipalities to change land-use designations.

The data for this research focuses specifically on official plan amendments which affect prime agricultural lands, including specialty crop areas. Prime agricultural areas were chosen as the focus of this research and data collection, rather than farmland in general, as prime agricultural areas are the most productive for agriculture, and thus are considered the most valuable. Rural lands, though they may be used for agriculture, typically do not have the same production capacity, consist of lower quality soils and thus do not hold as high of a resource value.

The official plan amendments included in this research thus captured lands under a prime agricultural designation, within the Protected Countryside of the Greenbelt and outside of the Greenbelt. This research however did not consider official plan amendments in the areas within the Niagara Escarpment Plan or Oak Ridges Moraine
Conservation Plan, as though these lands are within the Greenbelt, they are typically not subject to the policies for prime agricultural lands of the Protected Countryside.

Data points collected from the official plan amendments included the official plan amendment number, date of application, date of final adoption, purpose, former and new land use designation, area affected by the amendment (hectares), special policy permissions and location. As required, if all necessary information was not available from the official plan amendment directly, the data were obtained from related documents, including planner’s reports, Ontario Municipal Board files and application forms, as well as general correspondence with the planners of the municipality. Interactions with municipal planners occurred to provide clarity and confirm the values obtained for the quantitative analysis; however, it should be specified that these interactions did not represent key information interviews.

Data were collected from the upper- or single-tier municipality for 11 of the municipalities included in the study. However, in Simcoe County, Dufferin County, Peterborough County and Northumberland County, official plan amendment information was obtained either exclusively from the lower-tier municipalities, or in combination with data collected from the upper-tier.

In both Dufferin County and Northumberland County, there was no upper-tier official plan in effect during the 2000 to 2017 time-frame. These two counties were subject to Ontario Regulation 352/02 issued under the Planning Act, which required upper-tier municipalities without an official plan to prepare and adopt one.
Planning, 2016). The first upper-tier official plan for Dufferin County was approved by the Ministry of Municipal Affairs and Housing in 2015 (MMM Group, 2017). In Northumberland County, the upper-tier official plan was approved by the Ontario Municipal Board in November of 2016 (Meridian Planning, 2016). As no upper-tier official plan was in place for these counties during majority of the research time-frame, official plan amendment information was collected from the lower-tier municipalities within each county, each of which did have their own official plan.

Data regarding official plan amendments were also collected exclusively from lower-tier municipalities in Simcoe County, due to the structure of agricultural land-use designations in the Simcoe County Official Plan. Prior to approval by the Ontario Municipal Board of the new Simcoe County Official Plan in 2016, land-use designations in the Simcoe County Official Plan did not distinguish between prime agricultural areas and rural areas. Rather, the County had a Rural and Agricultural designation at the upper-tier level which transferred the responsibility of identifying prime agricultural areas onto the lower-tier municipalities (County of Simcoe, 2007). As such, official plan amendment data were collected from the lower-tier municipalities in Simcoe County as given the broad upper-tier designation, no county-level official plan amendments would have been required.

In Peterborough County, data were collected as a combination of official plan amendment information from the upper-tier and the lower-tier municipalities. This occurred as an effect of the planning hierarchy in Peterborough County; four of the lower-tier municipalities in Peterborough used the County official plan as their own
official plan, while the other four lower-tier municipalities had free standing official plans (County of Peterborough, 2017). As a result, not all official plan amendment data were readily available at the County and missing files were sought out and affirmed with lower-tier municipalities.

Methods of data collection varied by municipality. In some instances, all official plan amendment information from 2000 to 2017 for the municipality was available electronically, either through the municipal website, or via email correspondence. In other cases, site-visits were arranged to the municipality to collect data from physical files available at the municipal office. Depending on the number of official plan amendments applied for and approved during the time-frame, the timing of the site-visits varied. Lengths of site-visits ranged from one 2-hour visit, to multiple visits of more than 4-hours each.

Data were recorded and organized in a secure Excel file and copies of official plan amendments were secured to provide additional reference if needed for analysis. Once data collection was finalized, a summary was sent to each of the municipalities, providing them the opportunity to review the information and identify any required adjustments.

4.2.1 Limitations of Data

The data as collected from official plan amendment documents and correspondence with municipal planners does provide for some limitations that need to
be recognized. There are two key limitations of obtaining data from official plans amendments: availability and accuracy.

4.2.1.1 Availability

One of the most significant limitations of collecting official plan amendment data is that the availability of the information varies greatly by municipality. This is due to several factors. One of the reasons for limited availability of official plan amendment records was that the municipality had implemented a records retention policy. Records retention policies are often used by municipalities to control the volume of files held on site, and historical records and files are destroyed, based on the date or number of years set in the record retention policy. In this research, some municipalities with record retention policies no longer had physical copies of the official plan amendments relevant to the early period of the study time-frame. In addition, with no digital log or copy of the official plan amendments, there was no information available on these files, and thus they could not be included in the research.

Factors external to the municipality’s control also affected the availability of records. In some instances, natural events including floods had destroyed the only copies of the official plan amendments held in records. Again, as such, there was no other information available on these historical official plan amendments, and they could not be included in the research.
4.2.1.2 Accuracy

Another limitation of utilizing official plan amendment data is ensuring the accuracy of information provided by the municipality in the official plan amendment files. The most important factors of which accuracy was sometimes questioned was the area (hectare value) of prime agricultural lands affected by the amendment, the application date, and the classification of the property into prime agricultural or rural lands.

To ensure the area (hectare) value provided in the official plan amendment documents was accurate in data collection, files with missing information were subject to additional testing. Specifically, using the maps provided in the official plan amendment files, the area affected by the official plan amendment was mapped using online GIS technology. An estimate was provided by mapping the area online, and this estimate was then sent to the municipality for their approval. If a map was not available for the official plan amendment, and additional information on the area value was not available from the municipality, the official plan amendment was removed from the data set.

In a similar manner, official plan amendments for which the application date could not be found were also subject to further inquiry. In the instance that a specific application date for an official plan amendment file was not available from the planning documents, an application time-frame was estimated from the related materials and with the aid of municipal planning staff. The application time-frames used were 2000 to 2004, 2005 to 2009, and 2010 to 2014. These application time-frames thus provided a
consistent five-year time span and represent five years prior to implementation of the Greenbelt (2000-2004), five years after the implementation of the Greenbelt (2005-2009) and six to ten years after the implementation of the Greenbelt (2010-2014). Data for the years 2015-2017 has been included in this research, however given that this subset of data represents a three-year rather than a five-year timeframe, it has been included with subtext within the analysis. Comparison of the 2015-2017 time-frame data to the other three application time-frames is limited and reflects cautiousness. If neither a specific application date or general application time-frame could be obtained, the official plan amendment was removed from the data set.

The third limitation in relation to data accuracy was the classification of the subject lands by the municipality into prime agricultural or rural land-use designations. This was a specific issue in dealing with the lower-tier municipalities in Simcoe and Dufferin Counties, some of which did not identify prime agricultural lands in their official plan until several years into the study time-frame. Official plan amendments which had a generic agricultural or rural designation, but did not specify prime agricultural, were subject to further analysis. Using the available information provided in the official plan documents, these official plan amendments were mapped online using the Ontario Ministry of Agriculture, Food and Rural Affairs GIS tool, the Ag Information Atlas. This tool provides a geographic layer of the Canada Land Inventory soil suitability for agriculture, and outlines each of the different soil classes in an area. Using this layer, it was determined if a strong presence of Class 1, 2 and 3 soils were present in the area of the official plan amendment. The presence of the type of soils, combined with
information from the planning reports, were used in conjunction to determine if the area subject to the official plan amendment should be classified as prime agricultural. If so, the amendment was included in the data set, however this process did result in some official plan amendments being excluded from the study, having been determined to be more suited to a rural designation.

4.2.1.3 Effect of Data Limitations

Considering the processes outlined above, the limitations of the official plan amendment data had an important effect on the number of official plan amendments included in the study. Removing official plan amendment data with questionable accuracy, combined with the limited files available from the municipalities has resulted in a decreased number of official plan amendments being included in the data set. In turn, this has resulted in a decreased hectare value of prime agricultural lands affected by official plans being reported. As a result, the data used in this research likely underestimates the amount of prime agricultural land affected by official plan amendments and should be considered to be a lower-end estimate of actual figures.

4.3 Data Analysis

Several phases of data analysis were required in this research. Two preliminary phases of data categorization were required to further prepare the data for analysis through descriptive statistics. Several phases of analyses using descriptive statistics were also employed, each phase adding an additional level of detail to help identify if
there has been an increase in the amount of prime agricultural land converted through official plan amendments outside of the Greenbelt Plan boundaries since the implementation of the plan.

The first preliminary phase of the data categorization was required to determine the location of the official plan amendments relative to the Greenbelt Plan. Specifically, this preliminary phase was conducted to determine if the official plan amendments collected affected lands within the Protected Countryside designation of the Greenbelt Plan or whether the lands were in the unprotected countryside of the Greater Golden Horseshoe. For some official plan amendments in the study, this information was easily obtained from the official plan amendment and planning documents. However, the location of the area subject to each official plan amendment in this research was affirmed through the use of GIS mapping. The Greenbelt designations GIS mapping layer was obtained from the Province of Ontario’s data catalogue. This mapping layer provides the area of the Greenbelt Plan, and delineates the Niagara Escarpment Plan, Oak Ridges Moraine Conservation Plan, Protected Countryside and Urban River Valley designations. This layer was then imported into Google Earth, where the area affected by each official plan amendment was identified and mapped. By comparing the Greenbelt Plan designation areas, specifically the Protected Countryside designation, and the lands subject to official plan amendments in the data set, the location of the official plan amendment subject lands relative to the Greenbelt Plan Protected Countryside was easily determined. From this comparison, the official plan amendment
was then classified into either a Protected Countryside category, or otherwise an unprotected countryside category, which is the main focus of this research.

In the Greater Golden Horseshoe, unprotected countryside exists in two general locations: beyond the northern outer boundary of the Greenbelt protected area and beyond the southern inner boundary of the Greenbelt protected area. The unprotected countryside north of the Greenbelt in the Greater Golden Horseshoe is very large, while the area south of the Greenbelt, often referred to as the Whitebelt, represents a much smaller proportion of the total unprotected countryside in the Greater Golden Horseshoe. To recognize these two distinct areas of unprotected countryside, official plan amendments which were determined to be within the unprotected countryside were then further analyzed to determine if they occurred within the northern unprotected countryside or the Whitebelt.

Following the determination of the geographic location of the official plan amendments, the data were subject to a second preparatory phase of categorization, which divided the official plan amendments by a primary and secondary theme. The themes used were intended to reflect the purpose of the official plan amendment. Four primary themes were used. These primary themes captured the stated purpose of the official plan amendments: to permit a sport or recreational use (SPORT), a small business on the property (SBIZ), on-farm diversified uses in addition to existing agricultural operations (OFDU) and development on the subject lands (DEV).
For official plan amendments permitting development of the subject lands, a secondary theme was also assigned within the data set. Six secondary themes were used for those official plan amendments which permitted development of prime agricultural lands. These secondary themes captured development for: institutional uses (DEVIS), industrial uses (DEVIN), large-scale settlement area expansions and growth conformity exercises (DEVSA), commercial uses (DEVCL), residential uses (DEVR), and agricultural-related development (DEVAG). Tables 2 and 3 provide summaries of the primary and secondary themes used in the analysis, including examples of the type of official plan amendment included within each primary and secondary theme.

Table 2: Primary themes for analysis

<table>
<thead>
<tr>
<th>Primary theme</th>
<th>Explanation</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPORT</td>
<td>Permits sport and recreational related uses</td>
<td>Golf course; sports field, campground; motor speedway</td>
</tr>
<tr>
<td>SBIZ</td>
<td>Permits small businesses to operate</td>
<td>Contractor’s shop; professional home office; sawmill; small retail business</td>
</tr>
<tr>
<td>OFDU</td>
<td>Permits on-farm diversified uses in addition to existing agricultural operation</td>
<td>Chip truck; agriculture-related retail sales</td>
</tr>
<tr>
<td>DEV</td>
<td>Permits development on the property</td>
<td>Housing; commercial, institutional, and industrial facilities; urban expansions</td>
</tr>
</tbody>
</table>
Table 3: Secondary development themes for analysis

<table>
<thead>
<tr>
<th>Secondary theme</th>
<th>Explanation</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEVIS</td>
<td>Development for institutional purposes</td>
<td>Place of worship; cemetery; private school; retirement home</td>
</tr>
<tr>
<td>DEVIN</td>
<td>Development for industrial purposes</td>
<td>Explosives facility; natural gas production; waste facility; creamery</td>
</tr>
<tr>
<td>DEVSAG</td>
<td>Development of community; includes a mix of purposes</td>
<td>Settlement area boundary expansions; allocations for future growth areas</td>
</tr>
<tr>
<td>DEVCL</td>
<td>Development for commercial purposes</td>
<td>Large-scale landscaping business; RV sales; marine sales and service; wedding facility</td>
</tr>
<tr>
<td>DEVR</td>
<td>Development for residential purposes</td>
<td>Residential lot creation; estate residential; subdivision; condominium</td>
</tr>
<tr>
<td>DEVAG</td>
<td>Development for agriculture-related purposes</td>
<td>Temporary farm dwelling; agricultural society and fairground</td>
</tr>
</tbody>
</table>

Following the categorization of the data by location relative to the Greenbelt, and by theme, detailed analysis on the data set was conducted using descriptive statistics. As described above, this analysis occurred in several phases, each phase with a series of layers to enhance the detail presented in the analysis.

The first phase of the analysis was conducted using a regional approach; the focus in this analysis was on prime agricultural land identified in the unprotected countryside of the Greater Golden Horseshoe region as a whole. Three analyses were performed at this regional level: number and size of amendments, primary themes experienced, and secondary development themes experienced. The second phase of the analysis narrowed the focus to a sub-regional scope, focusing only on those areas predicted to be most vulnerable to the leap-frog effect, north of the Greenbelt border. Following this, a third analysis was conducted on unprotected prime agricultural lands south of the Greenbelt border, in the area which has been referred to as the ‘Whitebelt’. 77
For the second and third analyses scoped to the northern and southern unprotected countryside, the same three analysis which were conducted at the Greater Golden Horseshoe region level were performed to provide comparisons.
5 Prime Agricultural Land Loss

5.1 Regional Analysis: Greater Golden Horseshoe

Analysis of the data began using a wide geographic scope. The first phase of analysis focused on looking at the combined effects in the unprotected countryside of the Greater Golden Horseshoe region as a whole.

5.1.1 Official plan amendments in the Greater Golden Horseshoe

The first layer of data analysis was undertaken to determine the total number of official plan amendments and area (hectares) affected by these amendments in three time-frames, being five years before implementation of the Greenbelt (2000-2004), five years after implementation of the Greenbelt (2005-2009) and six to ten years after implementation of the Greenbelt (2010-2014). These time frames represented the application period for the official plan amendment, which thus represented the policy regime under which the amendment was considered. In the 2000-2004 time-frame, the Greenbelt Plan was not yet in effect, and the Provincial Policy Statement had more relaxed policies as it relates to farmland preservation. Thus, during these five years, prime agricultural land could be re-designated to an alternative designation for an alternative purpose through the official plan amendment process. However, following the implementation of the Greenbelt Plan, in the time periods from 2005-2009 and 2010-2014, the re-designation of prime agricultural land was not permitted in the Greenbelt Plan boundaries. During these time periods, the Provincial Policy Statement
also heightened emphasis on the protection of prime agricultural land; however, re-designation of prime agricultural land in the areas protected solely by the Provincial Policy Statement was still permitted, thus these areas are referred to in this research as the unprotected countryside.

This first analysis was intended to provide a broad overview and initial evidence of whether the number and size of amendments had increased outside of the Greenbelt after 2004, which may lead to initial evidence of the leap-frog effect. These results are summarized in Table 4 below.

Table 4: Number and size of official plan amendments by application time-frame and location relative to the Greenbelt*

<table>
<thead>
<tr>
<th>Application time-frame</th>
<th>Number of amendments within the Greenbelt area</th>
<th>Size of amendments within the Greenbelt area</th>
<th>Number of amendments outside the Greenbelt area</th>
<th>Size of amendments outside the Greenbelt area</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000-2004</td>
<td>13</td>
<td>891 ha</td>
<td>70</td>
<td>3670 ha</td>
</tr>
<tr>
<td>2005-2009</td>
<td>3</td>
<td>316 ha</td>
<td>39</td>
<td>9159 ha</td>
</tr>
<tr>
<td>2010-2014</td>
<td>0</td>
<td>0 ha</td>
<td>32</td>
<td>3969 ha</td>
</tr>
<tr>
<td>2015-2017**</td>
<td>1</td>
<td>0.5 ha</td>
<td>5</td>
<td>113 ha</td>
</tr>
</tbody>
</table>

*Values have been rounded. **2015-2017 data reflects a shorter period of time compared to the other application time-frames and as such analysis is restrained.

Though a broad initial analysis, the table presented above provides interesting insights in regards to how prime agricultural land is being managed in the Greater Golden Horseshoe, especially in relation to the Greenbelt Plan. Though this research is focused on the effects of official plan amendments on prime agricultural lands in the unprotected countryside outside of the Greenbelt, it is important to look at what has occurred within the Greenbelt as well to obtain a more detailed context.
Within the Greenbelt, prior to its implementation (2000-2004), thirteen official plan amendments affecting prime agricultural lands were applied for which affected over 891 hectares of land. In the following five years (2005-2009), despite the fact that the Greenbelt was in force and in effect at this time, there were three official plan amendments which did affect prime agricultural lands.

However, further analysis provides insight on these amendments. Two of the official plan amendments approved within the Greenbelt after it was implemented were for settlement area boundary expansions to accommodate future residential and employment growth. These amendments were initiated at the lower-tier level prior to the effective date of the Greenbelt Plan but were not applied to at the upper-tier level until afterwards, which is the date captured in this study. As per Greenbelt Plan policy 3.4.4.1, these amendments were allowed to move forward. Policy 3.4.4.1 describes that municipal settlement area expansions that were supported by a council resolution and background studies prior to December 16, 2003, may be approved, provided that the settlement area expansion does not extend into the Natural Heritage System or specialty crop areas (Ontario Ministry of Municipal Affairs and Housing, 2005a). The third amendment was a site-specific policy which permitted expansion of a golf facility, which affecting 18 hectares of prime agricultural land.

In the years 2010-2014 no amendments were approved within the Greenbelt. However, in 2015-2017, noting the reduced three-year time-frame, another amendment was permitted. This amendment, affecting 0.5 hectares of prime agricultural land, permitted a site-specific policy for a paramedic station. Given the above noted context
of the two amendments for settlement area boundary expansions approved within the Greenbelt, these two site-specific policies, together affecting 18.5 hectares of prime agricultural lands, are the only amendments considered to have been approved in conflict with the Greenbelt legislation. Largely, the Greenbelt Plan has been effective in stopping the conversion of prime agricultural land within its’ borders since coming into effect.

Analysis of the unprotected countryside outside of the Greenbelt provides an interesting contrast to Greenbelt protected prime agricultural lands and is required to understand any evidence of a leap-frog effect. Outside of the Greenbelt, through the entire study time-frame, there has been a substantially higher number of official plan amendments when compared to area within the Greenbelt boundaries. Even before the Greenbelt was in effect, focusing on the time-frame from 2000-2004, prime agricultural lands outside what became the Greenbelt were subject to over five-times more amendments, which constituted an area of over four-times more, affecting 3,670 hectares. In addition, outside of the Greenbelt, though the number of amendments decreased, the area affected by official plan amendments increased drastically, more than doubling, in the five years after the Greenbelt was implemented (2005-2009), affecting over 9,150 hectares of prime agricultural land. These results indicate that even before the Greenbelt was implemented, the area outside of the Greenbelt boundaries was experiencing greater pressure for official plan amendments. Further, these lands have continued to be under pressure for conversion after the implementation of the Greenbelt, affecting an additional approximately 3,970 hectares of prime agricultural...
areas from 2010-2014, and so far recorded in the following years (2015-2017), 113 hectares.

To sum, this high-level analytical overview provides preliminary insight that the leap-frog effect may be occurring in the study region of the Greater Golden Horseshoe. However, to further provide stronger insight into this plausible concern, further analyses were completed, as described below. The following analyses focused specifically on the unprotected countryside area outside of the Greenbelt and sought to provide more detail on what these official plan amendments were approved for, and if the pattern of official plan amendments changed once the Greenbelt Plan was implemented.

5.1.2 Official plan amendments by theme

The second layer of analysis focused on the Greater Golden Horseshoe area sought to understand the purpose of each official plan amendment affecting prime agricultural lands outside of the Greenbelt Plan area. The purpose of the official plan amendment was classified using four different themes previously noted: to permit sport and recreation facilities (SPORT), to permit small businesses (SBIZ), to permit on-farm diversified uses (OFDU), or to permit large development (DEV). The size of amendments by theme is shown in the chart below. Given the reduced time-frame for 2015-2017, the data provided in the analyses below is only for the comparable time frames of 2000-2004, 2005-2009 and 2010-2014.
Official plan amendments in the unprotected countryside outside of the Greenbelt that were intended to permit development (DEV) emerged as the dominant theme across all three application time-frames. These development-type official plan amendments affected nearly 15,760 hectares of prime agricultural land from 2000 to 2014 through 114 amendment applications. Interestingly, more than half of the prime agricultural land outside of the Greenbelt affected by development-type applications was applied for during the five years after the Greenbelt was implemented (2005-2009). Though the number of development-type amendments decreased from 2000-2004 to 2005-2009, the area affected by these amendments increased more than two-fold after the Greenbelt was implemented, affecting over 8,663 hectares of prime agricultural land. As the area of prime agricultural land affected by official plan amendments for development purposes increased in the unprotected countryside after the Greenbelt was implemented, it can be inferred that any leap-frog loss of prime agricultural land...
that is being experienced is largely due to development purposes. However, official plan amendments outside of the Greenbelt that permitted sport and recreational factors also played a role in the effect on prime agricultural land and followed a similar pattern of that of the development-type applications. Though the number of official plan amendments in the unprotected countryside for sport and recreational purposes decreased after the Greenbelt was implemented, the area of prime agricultural land affected by these amendments remained relatively constant in the five years after the Greenbelt was implemented. Overall, 15 of these amendments subject roughly 1,017 hectares of prime agricultural lands to sport and recreational uses from 2000 to 2014.

The remaining two themes used did not represent a substantial effect on prime agricultural lands, nor did the size or number of these amendments change dramatically after the implementation of the Greenbelt Plan. Official plan amendments for small business purposes and on-farm diversified uses together represented less than one-percent of all the prime agricultural land outside of the Greenbelt subject to amendment.

5.1.3 Official plan amendments by secondary development theme

A third level of analysis was performed to provide detail on the types of development permitted on agricultural lands through official plan amendments outside of the Greenbelt, as development applications contributed most substantially to the loss of prime agricultural lands. All official plan amendments under the primary development theme were further categorized into six secondary themes: institutional (DEVIS), industrial (DEVIN), settlement area expansions and growth (DEVSAG), commercial
(DEVCL), residential (DEVR) and agricultural (DEVAG) development. The area of prime agricultural land redesignated for each of these secondary themes, by application time-frame, is shown in the chart below.

**Figure 5: Hectares of prime agricultural land outside of the Greenbelt affected by official plan amendments, by secondary development theme, 2000-2014**

Of the development-oriented official plan amendments in the unprotected countryside of the Greater Golden Horseshoe, official plan amendments representing settlement area boundary expansions and growth conformity exercises (DEVSAG) had the greatest effect on prime agricultural land. These official plan amendments permit general development of a community, and may permit a variety of uses, including residential, commercial and institutional, rather than specifying only one specific use or type of development. These amendments accounted for approximately 81 percent, 90 percent and 93 percent of the total prime agricultural land redesignated for development.
purposes in the 2000-2004, 2005-2009 and 2010-2014 application time-frames, respectively.

Aligned with the trend observed at the primary theme level, at the secondary theme level, specifically and most prominently with settlement area and growth conformity types of development amendments, there was a substantial increase in the area of prime agricultural land affected when comparing the 2000-2004 and 2005-2009 time-frames. Though the other categories of development did fluctuate throughout the application-time frames, the largest and most pronounced difference was with the settlement area and growth conformity amendments. From 2005 to 2009, the area of prime agricultural land affected by settlement area and growth conformity official plan amendments was more than three times greater than what was observed in the five years previous, before the Greenbelt was implemented, affecting more than 7,765 hectares. The area of prime agricultural land amended to be used for settlement area and growth conformity types of development from 2010 to 2014 was also higher than the 2000 to 2004 time-frame, affecting roughly 1.42 times the area. Observing these results, settlement boundary expansions and growth conformity exercises have had the greatest effect on the leap-frog consumption of prime agricultural lands outside of the Greenbelt, as evidenced by the area of these amendments and the substantial increases of 2005-2009 and 2010-2014, as compared to the years prior to the Greenbelt implementation.
5.2 Sub-Regional Analysis: Unprotected countryside north of the Greenbelt

As previously noted, in the Greater Golden Horseshoe, unprotected countryside exists both north of the Greenbelt boundary and south of the Greenbelt boundary. In the literature, the leap-frog effect was discussed largely in its effect on prime agricultural land north of the Greenbelt, within municipalities in the outer-ring of the Greater Golden Horseshoe (Macpherson et al., 2013; Newbold & Scott, 2013). Unprotected countryside in the area considered north of the Greenbelt exists in all outer-ring municipalities, including Niagara, Haldimand, Brant, Waterloo, Wellington, Dufferin, Simcoe, Kawartha Lakes, Peterborough and Northumberland.

The rationale provided for expected leap-frog development north of the Greenbelt, rather than south, relates to market forces (Newbold & Scott, 2013). It is anticipated that given the reduced greenfield developable area in the Toronto region, and the resulting increased land and housing prices, movement of the population to the unprotected countryside north of the Greenbelt, where land and housing prices are presumably lower, will occur (Newbold & Scott, 2013; Tomalty & Komorowski, 2011). Personal preferences for greater space and access to natural amenities is also cited in the literature as a factor that will motivate development in the unprotected countryside north of the Greenbelt (Newbold & Scott, 2013).

Given the anticipated development pressure on the northern unprotected countryside as alluded to in the literature, a secondary analysis was performed at this
sub-regional level. This analysis focused on the unprotected countryside in the Greater Golden Horseshoe beyond the northern edge of the Greenbelt.

5.2.1 Official plan amendments in the unprotected countryside north of the Greenbelt

Table 5 below summarizes the number of amendments north of the Greenbelt and the area of prime agricultural land affected by these amendments by the application time frame of the amendment.

<table>
<thead>
<tr>
<th>Application time-frame</th>
<th>Number of amendments north of the Greenbelt</th>
<th>Size of amendments north of the Greenbelt</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000-2004</td>
<td>64</td>
<td>2,601 ha</td>
</tr>
<tr>
<td>2005-2009</td>
<td>34</td>
<td>1,432 ha</td>
</tr>
<tr>
<td>2010-2014</td>
<td>25</td>
<td>1,065 ha</td>
</tr>
<tr>
<td>2015-2017**</td>
<td>5</td>
<td>113 ha</td>
</tr>
</tbody>
</table>

*Values have been rounded. **2015-2017 data reflects a shorter period of time compared to the other application time-frames and as such analysis is restrained.

Prior to the implementation of the Greenbelt Plan (2000-2004), in the area north of what would become the Greenbelt boundary, 64 amendments were applied for and later approved, which affected roughly 2,601 hectares of prime agricultural land.

Contrary to expectations, in the years following implementation of the Greenbelt, the number of official plan amendments affecting prime agricultural land decreased, as did the total area of prime agricultural land affected by these amendments.

From 2005 to 2009, 34 official plan amendments which affected prime agricultural land were applied for and later approved. These official plan amendments
affected roughly 1,432 hectares of prime agricultural land. These figures represent a decrease of approximately 47% in the number of official plan amendments and a decrease of approximately 45% in the area of prime agricultural land affected, compared to the five years prior to the implementation of the Greenbelt Plan (2000-2004).

This decreasing trend continues in the years 2010-2014. Both the number of and size of amendments decreased around 25% compared to the five years previously (2005-2009) and decreased roughly 60% when compared to the five years prior to Greenbelt implementation (2000-2004). Further, so far recorded for the following years (2015-2017) the decreasing pattern has continued.

The above analysis thus contradicts expectations provided in the literature, and what was found when looking at the entire unprotected countryside in the Greater Golden Horseshoe, as per the first analysis. Neither the number of official plan amendments nor the area of prime agricultural land affected by official plan amendments increased in the unprotected countryside of the Greater Golden Horseshoe north of the Greenbelt boundary after the Greenbelt was implemented. No evidence of the leap-frog effect affecting prime agricultural lands in these areas was found.

5.2.2 Official plan amendments by theme

Notwithstanding the above analysis, which does not point to increased loss of prime agricultural land north of the Greenbelt as a result of the leap-frog effect, it is still
of interest to analyze the official plan amendments in this region to determine what type of development is most affecting prime agricultural lands in this area.

As with the regional Greater Golden Horseshoe analysis, official plan amendments for the unprotected countryside north of the Greenbelt were captured in four categories: prime agricultural land converted for development (DEV), on-farm diversified uses (OFDU), small businesses (SBIZ) and sport and recreation (SPORT). These amendments are displayed in the chart below.

Figure 6: Hectares of prime agricultural land in unprotected countryside north of Greenbelt affected by official plan amendments, by primary theme, 2000-2014

The results for the unprotected area north of the Greenbelt provide contrast to the earlier analysis for all of the unprotected countryside area outside of the Greenbelt in the entire Greater Golden Horseshoe region. While amendments for development uses still constituted the large majority of official plan amendments affecting prime
amendments for sport and recreation purposes constituted a greater proportion of the total area of prime agricultural land affecting by amendments in this area. In fact, while development amendments accounted for approximately 94 percent of all prime agricultural land affected in the entire unprotected countryside, when looking at the northern unprotected countryside exclusively, these amendments accounted for approximately 81 percent. Amendments for sport and recreational uses accounted for a greater proportion of prime agricultural land affected by official plan amendments in the northern unprotected countryside being roughly 18 percent, compared to 6 percent when looking at the entirety of the unprotected countryside.

Further, it is of interest to determine the area of amendments in the northern unprotected countryside as a proportion of the area affected in the entire unprotected countryside of the Greater Golden Horseshoe. Overall, amendments in the unprotected countryside north of the Greenbelt accounted for only 30.8 percent of all of the area of prime agricultural lands outside of the Greenbelt consumed for development. By theme, amendments in the northern unprotected countryside accounted for only 26.6 percent of the area affected by development amendments. However, the northern unprotected countryside accounted for 100 percent of prime agricultural land outside of the Greenbelt converted for on-farm diversified uses and small business and nearly 92 percent of the area of prime agricultural land redesignated for sport and recreation purposes. These results are summarized in Table 6 below.
Table 6: Prime agricultural land lost north of the Greenbelt as a proportion of all prime agricultural land lost outside of the Greenbelt, 2000-2017*

<table>
<thead>
<tr>
<th></th>
<th>Total prime agricultural land lost outside of Greenbelt</th>
<th>Prime agricultural land lost north of Greenbelt</th>
<th>% Prime agricultural land lost north of Greenbelt</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEV</td>
<td>15,825 ha</td>
<td>4,208 ha</td>
<td>26.6%</td>
</tr>
<tr>
<td>OFDU</td>
<td>0.70 ha</td>
<td>0.69 ha</td>
<td>100%</td>
</tr>
<tr>
<td>SBIZ</td>
<td>69 ha</td>
<td>69 ha</td>
<td>100%</td>
</tr>
<tr>
<td>SPORT</td>
<td>1,017 ha</td>
<td>933 ha</td>
<td>91.7%</td>
</tr>
</tbody>
</table>

*Values have been rounded.

5.2.3 Official plan amendments by secondary development theme

As development amendments still accounted for the most substantial proportion of prime agricultural land affected in the northern unprotected countryside, a secondary analysis focusing specifically on development amendments in the unprotected countryside north of the Greenbelt was completed. As with the earlier analysis, development amendments were further subdivided into six categories: institutional (DEVIS), industrial (DEVIN), settlement area expansions and growth (DEVSAG), commercial (CL), residential (DEVR) and agricultural (DEVAG) related development. The area affected by each type of these amendments is shown in Figure 8.
As could be expected based on the regional analysis of all lands in the Greater Golden Horseshoe outside of the Greenbelt, the largest proportion of development-type amendments specifically in the unprotected countryside north of the Greenbelt were for settlement area expansions and growth conformity exercises. These amendments typically prepare the land affected for a range of land-uses which benefit and expand a community.

Important to note is the contrast between Figure 5, which represents the area affected by secondary development theme in the entire unprotected countryside in the Greater Golden Horseshoe, and Figure 7 above. There is a much greater diversity in the proportions of development type amendments which affect prime agricultural lands. North of the Greenbelt, a greater portion of the area of prime agricultural land affected by development amendments is affected by amendments specifically for institutional,
industrial, commercial, residential and agricultural uses. While settlement area and growth conformity amendments are still responsible for the largest area and proportion of prime agricultural land lost, the area north of the Greenbelt also has several amendments which designate land for more specific purposes.

5.3 Locational Analysis: Regions affected by Greenbelt

As discussed previously, the first level of analysis provided preliminary evidence that an increased amount of prime agricultural land in the unprotected countryside may have been consumed as a result of the leap-frog effect after implementation of the Greenbelt Plan. However, the secondary analysis which focused on the area north of the Greenbelt, which had been suggested in the literature to be at greater risk of the leap-frog effect, found no evidence of this pattern.

Given the contrasting results, analysis was then conducted to determine which particular regions in the Greater Golden Horseshoe were affected by the Greenbelt Plan, specifically experiencing an increase in the loss of unprotected farmland. To reach this objective, a value differential was prepared for each of the municipal counties and regions. This value differential calculated the difference in the hectares of prime agricultural land affected by official plan amendments in the application time-frames from 2005-2009 and from 2010-2014, compared to the five years before the Greenbelt was implemented (2000-2004). These differentials are displayed by municipality visually in the chart below. A positive value differential indicates an increase in the area of prime agricultural land affected by official plan amendments in the 2005-2009 and 2010-2014
application time frames, compared to the 2000-2004 application period. A negative value differential indicates a decrease in the area of prime agricultural land affected by official plan amendments; for clarity however, negative value differentials do not represent an increase in prime agricultural land.

Figure 8: Difference in area of prime agricultural land outside of the Greenbelt affected by official plan amendments compared to pre-Greenbelt application time-frame

The differential calculation produced some interesting results. Contrary to what was suggested in the literature, there was no substantial increase in the area of prime agricultural lands affected in the outer-ring municipalities which have unprotected countryside north of the Greenbelt. This confirms the secondary analysis described previously.

In fact, most counties and regions in the outer-ring of the Greater Golden Horseshoe and on the outside of the northern boundary of the Greenbelt plan saw a decrease in the area of prime agricultural land affected after the Greenbelt Plan was
implemented. The most extensive increases in the area of prime agricultural land affected by official plan amendments, when compared to the 2000-2004 pre-Greenbelt application time-frame, occurred in Durham, Halton, Peel and York Regions. Each of these regions are part of the inner-ring of the Greater Golden Horseshoe and make up a part of the Greater Toronto Area.

In the years from 2005 to 2009, Durham Region experienced a loss of 1,588 hectares of prime agricultural land greater than when compared to the five years previous. Halton and Peel also experienced similar increases in the 2005-2009 time-frame compared to the pre-Greenbelt application period, observing increases in the loss of prime agricultural land of nearly 2,480 and 2,865 hectares, respectively. In York Region, less prime agricultural land was lost in 2005-2009 versus 2000-2004, however there was a difference in excess of 1,400 hectares when comparing prime agricultural land lost in 2010-2014 versus 2000-2004.

Given the results produced in the value differential, a second sub-regional analysis was conducted. This analysis focused on the Greater Toronto Area, including the regions of Durham, Halton, Peel and York. Specifically, this analysis focused on unprotected prime agricultural lands in these regions which are found south of the Greenbelt border, referred to as the Whitebelt and described below.

5.3.1 Official plan amendments in the GTA Whitebelt

The results of the previous analyses contradicted the expected leap-frog effect; there was no considerable increase in the area of prime agricultural land affected by
official plan amendments in the unprotected countryside in the outer-ring of the Greater Golden Horseshoe, beyond the Greenbelt’s northerly bounds. However, the results conclude that within the unprotected countryside that exists within the inner-ring of the Greater Golden Horseshoe, a substantial increase in the loss of prime agricultural land through official plan amendments did occur after the implementation of the Greenbelt. This unprotected countryside in the inner-ring of the Greater Golden Horseshoe constitutes part of what is known as the Whitebelt, located specifically in the Halton, Peel, York and Durham Regions, as well as the City of Hamilton, which was not included in this research (Allen & Campsie, 2013).
Figure 9: Location of Whitebelt lands
(Allen & Campsie, 2013)

The Whitebelt is an unofficial term, referring to the lands between the outer edge of the existing urban settlement areas around the City of Toronto and the inner edge of the Greenbelt Plan (Allen & Campsie, 2013). These lands comprise a landscape similar to that of the Greenbelt, however they are not subject to the protection policies of the Greenbelt Plan. Rather, the lands in the Whitebelt, in regards to farmland protection, are subject to the policies of the Provincial Policy Statement and thus have less restrictions on development. While these lands have less restrictions for development, they may continue to be used for agricultural purposes, as the lands within the Whitebelt often have not yet been specifically designated for growth. (Allen & Campsie, 2013). For the
purposes of this research, any amendments affecting prime agricultural land approved south of the Greenbelt border were considered to be within the Whitebelt.

In the regions of Durham, Halton, Peel and York, amendments which affected prime agricultural lands were mostly within the Greenbelt Plan Protected Countryside area or within the Whitebelt. Two amendments in these regions were not in the Greenbelt Protected Countryside or Whitebelt; these were instead within the Oak Ridges Moraine and represented a conversion of over 2,500 hectares. The amendments in the Oak Ridges Moraine however were not included in this study. Table 7 lists the area of prime agricultural land lost within the Whitebelt in these regions.

Table 7: Number and size of official plan amendments in the unprotected countryside of the Whitebelt, by application time-frame*

<table>
<thead>
<tr>
<th>Application time-frame</th>
<th>Number of amendments in Whitebelt</th>
<th>Size of amendments in Whitebelt</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000-2004</td>
<td>6</td>
<td>1069 ha</td>
</tr>
<tr>
<td>2005-2009</td>
<td>5</td>
<td>7728 ha</td>
</tr>
<tr>
<td>2010-2014</td>
<td>7</td>
<td>2904 ha</td>
</tr>
<tr>
<td>2015-2017*</td>
<td>0</td>
<td>0 ha</td>
</tr>
</tbody>
</table>

*Values have been rounded. **2015-2017 data reflects a shorter period of time compared to the other application time-frames and as such analysis is restrained.

Prime agricultural land loss in the Whitebelt, in total, has affected over 11,700 hectares of land. Prior to the implementation of the Greenbelt, in the Greater Toronto Area, outside of what would become the Greenbelt, just under 1,070 hectares of prime agricultural land were lost within the Whitebelt. This area constitutes less than half (48 percent) of all prime agricultural land lost in the GTA during this time (2000-2004); most prime agricultural land lost in the GTA from 2000-2004 was within the area that would become the Greenbelt. However, after the implementation of the Greenbelt Plan, and
coincidentally the Growth Plan for the Greater Golden Horseshoe, 100 percent of agricultural land lost outside of the Greenbelt in the GTA was within the Whitebelt. The results are not necessarily surprising. In the inner ring of the Greater Golden Horseshoe, and specifically in the regions of Durham, York, Peel and Halton, the Greenbelt covered the entirety of the region that was not designated under the Oak Ridges Moraine, a settlement area or left as the Whitebelt. As such, conversion of prime agricultural lands in the unprotected countryside of these regions after the implementation of the Greenbelt had to take place in the Whitebelt or would otherwise violate provincial policies.

These conversions of prime agricultural land in the Whitebelt together accounted for over 10,630 hectares of prime agricultural land affected by an official plan amendment in the ten years after the Greenbelt was implemented (2005-2014). These results, interpreted with those presented above, dispute what would be expected from the traditional leap-frog effect. Prime agricultural land lost at the northern edge of the Greenbelt decreased after Greenbelt implementation while agricultural land loss has increased within the inner-ring of the Greater Golden Horseshoe.

The lands lost within the Whitebelt make up a sizable proportion of the total prime agricultural land lost in the unprotected countryside outside of the Greenbelt in the Greater Golden Horseshoe. Prior to the implementation of the Greenbelt Plan and Growth Plan for the Greater Golden Horseshoe, prime agricultural land loss in the Whitebelt was minimal, relative to the total. However, in the following years, the prime agricultural land lost in the Whitebelt represented a considerable portion of the total.
From 2005-2009, prime agricultural land lost in the Whitebelt made up over 84 percent of all prime agricultural land lost outside of the Greenbelt. From 2010-2014, this figure was approximately 73 percent. The proportions of prime agricultural land lost outside of Greenbelt, relative to their location to the Whitebelt, are displayed visually below.

**Figure 10: Proportion of all prime agricultural land outside of the Greenbelt lost within and outside of the Whitebelt, by application time frame**

![Proportion of all prime agricultural land outside of the Greenbelt lost within and outside of the Whitebelt, by application time frame](chart.png)

5.3.2 **Official plan amendments by theme**

As amendments in the GTA and the Whitebelt specifically constitute a substantial proportion of all prime agricultural land lost after the implementation of the Greenbelt Plan, the trends observed at the Greater Golden Horseshoe level in respect to the purpose of the amendments persist. These trends are explored briefly in this section.

As with the initial broad analysis, the official plan amendments in the Whitebelt were explored by their primary purpose: development (DEV), on-farm diversified uses
(OFDU), small business (SBIZ), or sport and recreation (SPORT). These results are displayed in the chart below.

**Figure 11: Hectares of prime agricultural land in the unprotected countryside of the Whitebelt affected by official plan amendments, by theme, 2000-2014**

Aligned with the broad analyses at the Greater Golden Horseshoe level, within the Whitebelt the greatest proportion of prime agricultural land loss after the implementation of the Greenbelt Plan was for development purposes. From 2005-2009, prime agricultural land lost to development within the Whitebelt covered more than 7,727 hectares, a substantial increase when compared to the five years before the Greenbelt Plan was implemented. The following five years (2010-2014), another 2,900 hectares were converted for development. Within the Whitebelt, no agricultural land was lost for small business or on-farm diversified uses. An amendment was approved for sport and recreational purposes within the Whitebelt during the time-frame from 2010-
2014, however this amendment constituted a nominal proportion of agricultural land loss. Development amendments in the Whitebelt accounted for nearly 100 percent of all amendments affecting prime agricultural land in this area.

Table 8: Prime agricultural land lost within the Whitebelt as a proportion of all prime agricultural land lost outside of the Greenbelt*

<table>
<thead>
<tr>
<th></th>
<th>Total prime agricultural land lost outside of Greenbelt</th>
<th>Prime agricultural land lost within Whitebelt</th>
<th>% Prime agricultural land lost within Whitebelt</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEV</td>
<td>15,825 ha</td>
<td>11,617 ha</td>
<td>73.4%</td>
</tr>
<tr>
<td>OFDU</td>
<td>0.69 ha</td>
<td>0 ha</td>
<td>0%</td>
</tr>
<tr>
<td>SBIZ</td>
<td>69 ha</td>
<td>0 ha</td>
<td>0%</td>
</tr>
<tr>
<td>SPORT</td>
<td>1017 ha</td>
<td>84 ha</td>
<td>8.3%</td>
</tr>
</tbody>
</table>

*Values have been rounded.

The table above summarizes the hectares of prime agricultural land lost within the Whitebelt as a proportion of all prime agricultural land lost in the unprotected countryside. The Whitebelt accounted for over 73 percent of all prime agricultural land lost to development purposes. However, the Whitebelt accounted for little, or zero percent of amendments in the unprotected countryside of the Greater Golden Horseshoe for on-farm diversified, small business and sport and recreation uses.

5.3.3 Official plan amendments by secondary development theme

Similar to the analyses for the Greater Golden Horseshoe as a whole, official plan amendments for settlement area and growth conformity types of development constituted the largest proportion of official plan amendments affecting prime agricultural land in the Whitebelt. However, in the Whitebelt, settlement area expansions and growth conformity types of development amendments constituted a larger portion of
all amendments and the diversity of amendments across the Whitebelt was limited.

While amendments for institutional and industrial uses did occur, no amendments specifically for commercial, residential or agricultural uses were found. Instead, settlement area and growth conformity types of development amendments, which are typically larger and encompass multiple land uses, were experienced.

Prior to the implementation of the Greenbelt (2000-2004), settlement area and growth conformity amendments accounted for more than 99 percent of all development-type applications. From 2005-2009 and 2010-2014, these amendments accounted for 100 percent and 98 percent, respectively, of all development-type applications. These applications are represented in the chart below.

**Figure 12: Hectares of prime agricultural land in the unprotected countryside of the Whitebelt affected by official plan amendments, by secondary development theme, 2000-2014**
6 Discussion and Considerations for Future Research

At the outset of this research, three research objectives were identified which the above analyses have intended to achieve. These research objectives were to: evaluate the effect of official plan amendments on prime agricultural land in the unprotected countryside in the Greater Golden Horseshoe; identify the most substantial type of official plan amendments affecting prime agricultural land outside of the Greenbelt Plan boundaries; and investigate evidence of the leap-frog effect on prime agricultural land in the unprotected countryside of the Greater Golden Horseshoe.

Based on the above analyses, it has been determined that official plan amendments have had a substantial effect on the amount of prime agricultural land in the Greater Golden Horseshoe; more than 16,911 hectares of prime agricultural land has been redesignated through official plan amendments in the unprotected countryside of the Greater Golden Horseshoe from 2000 to 2017. As reflected in each of the geographic analyses, for the unprotected countryside in all of the Greater Golden Horseshoe, beyond the northern Greenbelt boundary and within the Whitebelt, official plan amendments which redesignated prime agricultural land for development purposes have historically had the largest effect on the loss of prime agricultural lands. Across the entire unprotected countryside, prime agricultural land redesignated for development purposes accounted for more than 93 percent of all prime agricultural land in the unprotected countryside affected by an official plan amendment. In the northern unprotected countryside this number was slightly decreased, at 81 percent, while in the
Whitebelt region it was significantly higher at 99 percent. Amendments for other purposes, including on-farm diversified uses, small businesses and sport and recreation, accounted for a marginal percentage of all prime agricultural land subject to official plan amendments across the Greater Golden Horseshoe during the 2000 to 2017 time period.

More specifically, settlement area and growth conformity types of development amendments, which occurred to accommodate a variety of development purposes, including a mix of residential, commercial, and institutional uses, rather than one specific use, affected the largest area of prime agricultural land from 2000 to 2017. Nearly 89 percent of all prime agricultural land in the unprotected countryside of the Greater Golden Horseshoe during the study time frame was converted for settlement area expansion and growth conformity exercises. Development amendments which identified a specific purpose, such as institutional, industrial, commercial, residential or agricultural uses, together accounted for less than 12 percent of all prime agricultural land in the unprotected countryside affected by development official plan amendments. When looking specifically at the unprotected countryside north of the Greenbelt, settlement area and growth conformity types of development amendments still affected the greatest proportion of prime agricultural land, however, the proportion was less; these amendments affected 59 percent of the prime agricultural land subject to development related amendments from 2000-2017. A greater diversity in the purpose of development amendments was seen in the northern unprotected countryside. Industrial specific development amendments accounted for 22 percent of all prime agricultural
land affected by development related amendments and residential specific amendments accounted for just over 9 percent, while institutional, commercial and agricultural specific development amendments made up the remaining roughly 9 percent. In the southern unprotected countryside of the Whitebelt, the opposite was true; there was very little diversity in the type of development specific amendments. Settlement area expansions and growth conformity amendments accounted for 99 percent of all development related amendments from 2000 to 2017.

Further, the analyses have shown that the prime agricultural land which did not receive protection under the Greenbelt Plan has historically been under greater pressure than the lands which did eventually receive Greenbelt protection. Before the Greenbelt was implemented (2000-2004), in the area which became the Greenbelt, approximately 891 hectares of prime agricultural land was converted through an official plan amendment to alternate uses. During this same period, nearly 3,700 hectares of prime agricultural land were lost in what became the unprotected countryside. The unprotected countryside has continued to be under pressure; since the implementation of the Greenbelt (2005-2017) more than 13,240 hectares of prime agricultural land has been converted through an official plan amendment to alternate uses.

These results provide interesting insights when reflecting on the past land-use planning decisions and policies implemented by the provincial government. Given the increased pressure that lands outside of the Greenbelt have historically faced and continue to face, it is worth considering whether the boundaries of the Greenbelt were placed in the most effective areas or whether the boundaries should be expanded. In
this light, it is also important to recognize the geographic difference in prime agricultural land lost in the unprotected countryside, which is emphasized in the analysis of the third listed research objective: investigating evidence for the leap-frog effect.

As noted in the analyses, the loss of prime agricultural land in the unprotected countryside has occurred in two geographic locales: north of the Greenbelt boundaries and south of the Greenbelt boundaries, in an area often referred to as the Whitebelt. In several pieces of literature, it was suggested that after the implementation of the Greenbelt Plan, there may be an increase in the loss of prime agricultural land and an increase in development in the unprotected countryside to the north of the Greenbelt, due to the phenomenon known as the leap-frog effect (Macpherson et al., 2013; Newbold & Scott, 2013). However, the analyses provided above have demonstrated that this traditional form of the leap-frog effect has not been proven to exist in the context of prime agricultural land converted through official plan amendments. More than 5,210 hectares of prime agricultural land has been lost in the northern unprotected countryside, however this represents only 30.8 percent of all prime agricultural land lost in the unprotected countryside of the Greater Golden Horseshoe, and the area of prime agricultural land lost in this geography has actually decreased every five years since the implementation of the Greenbelt Plan.

Beyond the southern borders of the Greenbelt, in the Whitebelt area situated between the Greenbelt boundaries the existing settlement areas, the loss of prime agricultural lands has been much higher; more than 11,700 hectares of prime agricultural land has been lost in this area, representing nearly 70 percent of all prime agricultural land.
agricultural land lost in the unprotected countryside. Further, the hectares of prime agricultural land lost in the Whitebelt increased drastically when comparing the pre-Greenbelt (2000-2004) and post Greenbelt (2005-2009) time-frames. Though the hectares of prime agricultural land lost in the Whitebelt decreased in 2010-2014, the area affected still remained high.

All of the above being noted, it could be debated that Greenbelt protection should have been expanded further south given that these lands have historically been and continue to be under the greatest pressure for conversion. However, keeping prime agricultural lands in the Whitebelt has enabled the regions of Durham, York, Halton and Peel, which have faced the highest population pressures, to accommodate growth. The Whitebelt lands, in conjunction with the delivery of the intensification policies of the Growth Plan for the Greater Golden Horseshoe, have encouraged these regions to develop and intensify in the Whitebelt lands. If the Whitebelt lands had not been left available for development, it is more likely that the traditional leap-frog effect would have been experienced and more land would have been lost beyond the northern borders of the Greenbelt.

While the Whitebelt has enabled the GTA regions facing high population and development pressure to accommodate growth by converting prime agricultural lands, this may not be a trend that can continue to sustainably persist. The Neptis Foundation has estimated the inventory of lands in the Whitebelt to be 46,000 hectares (Allen & Campsie, 2013). This estimate however does not specify the land use designation of these lands. Thus, while this study has found that 11,700 hectares of prime agricultural
land in the Whitebelt has already been designated for other uses to accommodate growth, the amount of land in the Whitebelt which has been designated and consumed for growth may be higher; land which was not designated prime agricultural would not have been captured in this study.

It would be of interest for further research to analyze all official plan amendments which have been approved to accommodate growth in the Whitebelt to then conduct a current inventory of land still available for growth in the Whitebelt. By analyzing trends of consumption of lands in the Whitebelt, the projected rate and timeline at which all of the lands within the Whitebelt will be exhausted could then be determined. It is plausible that after the time at which the lands in the Whitebelt are exhausted, that the traditional form of the leap-frog effect may begin to materialize. In addition to determining the consumption of lands within the Whitebelt, further research could replicate the methodology of this study and analyze official plan amendments affecting prime agricultural lands north of the Greenbelt in the next ten to twenty years. The results of this study conducted to cover the next ten to twenty years may identify new land use patterns and provide evidence of the traditional leap frog effect emerging on prime agricultural lands north of the Greenbelt Plan boundaries.

Future research investigating the leap-frog effect may also be conducted using development applications. This research has focused specifically on the potential effect of leap-frogging on prime agricultural lands, thus using official plan amendments and land use designations to determine evidence for this phenomenon. By using official plan amendments, this research has documented the leap-frog effect as it relates to land-use
designations, however it does not capture physical development on the ground. Moreover, the leap-frog effect is not exclusive to prime agricultural lands; there may be lands which were vacant, but under a different land-use designation which received planning approvals for development in the study-time frame. As such, it would be of interest to collect development applications to see if and how physical development patterns have changed in the entire area outside of the Greenbelt Plan.

While there is potential for further research to advance and inform the results presented here, the insights gained remain to be of value for policy makers, specifically provincial land use ministries in Ontario. The insights have identified that the Greenbelt Plan and the Growth Plan for the Greater Golden Horseshoe working together have limited the loss of prime agricultural land within the Greenbelt boundaries while increasing and intensifying growth within the Whitebelt. However, as discussed above, as the Whitebelt lands are exhausted, the traditional leap-frog effect may materialize and prime agricultural lands north of the Greenbelt may be under heightened pressure for conversion and development. These results and insights will be important to reflect upon when considering changes to the policies of the provincial plans and boundaries of the Greenbelt Plan. In years to come, should heightened pressure on the unprotected countryside north of the Greenbelt occur through the leap-frog effect, expansion of the Greenbelt boundaries may be a reasonable option to be considered by these provincial ministries; while this research has shown continued development in the unprotected countryside, it has also affirmed that the Greenbelt Plan has been immensely successful in preserving prime agricultural land within its borders.
7 Conclusion

The conversion of prime agricultural lands in the province of Ontario has been a historical concern. Recent provincial land-use plans, namely the Greenbelt Plan, have enhanced policies for the preservation of prime agricultural lands within its borders. While prime agricultural lands within the Greenbelt Plan area have been well protected, lands outside of the Greenbelt boundaries, protected at a provincial level by only the policies present in the Provincial Policy Statement, have continued to be at risk for conversion and development.

This research tracked official plan amendments in the Greater Golden Horseshoe which redesignated prime agricultural lands to alternative land use designations and uses from 2000 to 2017. The official plan amendments were analyzed to determine their overall effect on prime agricultural lands, the type of purpose for which they were approved, and most importantly, whether the pattern of official plan amendments reflected evidence of the leap-frog effect. The traditional leap-frog effect, as discussed, would result in an increase in the area of prime agricultural land re-designated for development north of the Greenbelt boundaries, as development “jumps” to the area with less prohibitive policies.

Results of this research have shown that substantial amounts of prime agricultural land in the unprotected countryside outside of the Greenbelt continue to be redesignated through official plan amendments, namely for development purposes. However, most of the prime agricultural land in the unprotected countryside affected by
official plan amendments in the study time period from 2000 to 2017 has been within the Whitebelt lands south of the Greenbelt; in comparison, a much smaller amount of prime agricultural land has been lost north of the Greenbelt boundaries. Thus, the traditional-leap frog effect has not yet been evidenced in the context of Ontario’s Greenbelt, specifically as it relates to prime agricultural land. However, as the population of the Greater Golden Horseshoe continues to expand, these lands may be under increased pressure if the Whitebelt lands become exhausted and increased growth cannot be accommodated through intensification and redevelopment.

Thus, though the traditional form of the leap-frog effect has not yet been observed, continued monitoring of prime agricultural lands north of the Greenbelt should be maintained. These lands, though attractive for growth, represent a valuable and limited resource in Ontario, and should be protected to ensure continued viability of the agricultural sector in the province.
REFERENCES


*Mandatory Adoption of Official Plans, O. Reg. 352/02, s.1.*


## APPENDIX

**Appendix A: Summary of official plan amendments included in the research**

<table>
<thead>
<tr>
<th>County / Region</th>
<th>Number of official plan amendments</th>
<th>Area of official plan amendments</th>
<th>Location of official plan amendments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brant</td>
<td>0</td>
<td>0 ha</td>
<td>Greenbelt Protected Countryside</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>40.75 ha</td>
<td>Unprotected countryside (north)</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>0 ha</td>
<td>Unprotected countryside (Whitebelt)</td>
</tr>
<tr>
<td>City of Kawartha Lakes</td>
<td>0</td>
<td>0 ha</td>
<td>Greenbelt protected countryside</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>174.27 ha</td>
<td>Unprotected countryside (north)</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>0 ha</td>
<td>Unprotected countryside (Whitebelt)</td>
</tr>
<tr>
<td>Dufferin</td>
<td>1</td>
<td>18 ha</td>
<td>Greenbelt Protected Countryside</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>150.36 ha</td>
<td>Unprotected countryside (north)</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>0 ha</td>
<td>Unprotected countryside (Whitebelt)</td>
</tr>
<tr>
<td>Durham</td>
<td>4</td>
<td>105.11 ha</td>
<td>Greenbelt Protected Countryside</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>0 ha</td>
<td>Unprotected countryside (north)</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>1588 ha</td>
<td>Unprotected countryside (Whitebelt)</td>
</tr>
<tr>
<td>Haldimand</td>
<td>0</td>
<td>0 ha</td>
<td>Greenbelt Protected Countryside</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>265.61 ha</td>
<td>Unprotected countryside (north)</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>0 ha</td>
<td>Unprotected countryside (Whitebelt)</td>
</tr>
<tr>
<td>Halton</td>
<td>3</td>
<td>96.86 ha</td>
<td>Greenbelt Protected Countryside</td>
</tr>
<tr>
<td></td>
<td>0</td>
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<td>6</td>
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Appendix B: Summary of collected official plan amendments excluded from analysis

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<tr>
<td>- Amendment for aggregate purpose</td>
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<td>- Amendment for surplus farm lot or lot configurations</td>
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<td>- Amendment for gains of agricultural land</td>
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<tr>
<td><strong>Total official plan amendments considered relevant to research</strong></td>
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Appendix C: Summary of relevant official plan amendments excluded from analysis

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<td>Total official plan amendments included in analysis</td>
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