



uOttawa

L'Université canadienne
Canada's university

**FACULTÉ DES ÉTUDES SUPÉRIEURES
ET POSTDOCTORALES**



uOttawa

L'Université canadienne
Canada's university

**FACULTY OF GRADUATE AND
POSTDOCTORAL STUDIES**

Genevieve Gilbert

AUTEUR DE LA THÈSE / AUTHOR OF THESIS

M.A. (Geography)

GRADE / DEGREE

Department of Geography

FACULTÉ, ÉCOLE, DÉPARTEMENT / FACULTY, SCHOOL, DEPARTMENT

**Adaptive Capacity, Adaptation Strategies and Migration in the Canadian Prairies during the Dirty
Thirties: Lessons for drought-migration Process Under Future Climate Change**

TITRE DE LA THÈSE / TITLE OF THESIS

R. M^cLeman

DIRECTEUR (DIRECTRICE) DE LA THÈSE / THESIS SUPERVISOR

CO-DIRECTEUR (CO-DIRECTRICE) DE LA THÈSE / THESIS CO-SUPERVISOR

EXAMINATEURS (EXAMINATRICES) DE LA THÈSE / THESIS EXAMINERS

E. Aigthon

A. Gilbert

Gary W. Slater

Le Doyen de la Faculté des études supérieures et postdoctorales / Dean of the Faculty of Graduate and Postdoctoral Studies

Adaptive capacity, adaptation strategies and migration in the
Canadian Prairies during the Dirty Thirties:
Lessons for drought-migration processes under future climate change

Genevieve Gilbert

Thesis submitted to the
Faculty of Graduate and Postdoctoral Studies
In partial fulfillment of the requirements
For the MA degree in geography

Department of Geography
Faculty of Arts
University of Ottawa

©Genevieve Gilbert, Ottawa, Canada, 2009



Library and Archives
Canada

Published Heritage
Branch

395 Wellington Street
Ottawa ON K1A 0N4
Canada

Bibliothèque et
Archives Canada

Direction du
Patrimoine de l'édition

395, rue Wellington
Ottawa ON K1A 0N4
Canada

Your file *Votre référence*
ISBN: 978-0-494-58191-9
Our file *Notre référence*
ISBN: 978-0-494-58191-9

NOTICE:

The author has granted a non-exclusive license allowing Library and Archives Canada to reproduce, publish, archive, preserve, conserve, communicate to the public by telecommunication or on the Internet, loan, distribute and sell theses worldwide, for commercial or non-commercial purposes, in microform, paper, electronic and/or any other formats.

The author retains copyright ownership and moral rights in this thesis. Neither the thesis nor substantial extracts from it may be printed or otherwise reproduced without the author's permission.

AVIS:

L'auteur a accordé une licence non exclusive permettant à la Bibliothèque et Archives Canada de reproduire, publier, archiver, sauvegarder, conserver, transmettre au public par télécommunication ou par l'Internet, prêter, distribuer et vendre des thèses partout dans le monde, à des fins commerciales ou autres, sur support microforme, papier, électronique et/ou autres formats.

L'auteur conserve la propriété du droit d'auteur et des droits moraux qui protègent cette thèse. Ni la thèse ni des extraits substantiels de celle-ci ne doivent être imprimés ou autrement reproduits sans son autorisation.

In compliance with the Canadian Privacy Act some supporting forms may have been removed from this thesis.

While these forms may be included in the document page count, their removal does not represent any loss of content from the thesis.

Conformément à la loi canadienne sur la protection de la vie privée, quelques formulaires secondaires ont été enlevés de cette thèse.

Bien que ces formulaires aient inclus dans la pagination, il n'y aura aucun contenu manquant.

■ ■ ■
Canada

Table of Contents

Acknowledgements	5
Abstract	6
Chapter 1: Introduction	7
Chapter 2: Literature review	11
2.1 Vulnerability and adaptation to climate change	11
2.2 Vulnerability and drought-migration in agricultural regions	14
2.2.1 Vulnerability of agriculture to climate change	15
2.2.2 Agricultural adaptation to climate change	16
2.3 General theories of migration	17
2.3.1 Economic theories of migration	18
2.3.2 New economics of labour migration approach	20
2.3.3 The historical-structural approach	21
2.3.4 Migration systems theory and new interdisciplinary approaches	22
2.4 Migration theory and environmental change	24
2.5 Migration as an adaptation to drought	26
Chapter 3: The Canadian prairies, Alberta and the Dirty Thirties	29
3.1 Geography and climate	29
3.1.1 Geographic zones and soils of the Prairie Provinces	29
3.1.2 Alberta's rivers and agricultural water supply	32
3.1.3. Alberta precipitation and temperature	33
3.2 Historical settlement and land use patterns	37
3.2.1 Pre-European contact in the Prairie Provinces	37
3.2.2 European settlement in the Prairie Provinces	39
3.2.3 European settlement in Hanna and the Peace River District	42
3.3 Drought and population movement in the Prairie Provinces and Alberta	42
3.4 The Special Areas and the Prairie Farm Rehabilitation Administration in Alberta	45
Chapter 4: Methodology	48
4.1 Key questions	49
4.2 Conceptual framework	49
4.3 Selection of case study locations	52
4.4 Data collection and data analysis	54
Chapter 5: Results	62
5.1 Introduction	62
5.2 Factors influencing adaptive capacity	63
5.2.1 Economic capital	65
5.2.1.1 Household wealth	65
5.2.1.2 Size and quality of land holding	69

5.2.2 Human capital	73
5.2.2.1 Subsistence skills/self sufficiency	74
5.2.2.2 Gender roles	77
5.2.2.3 Previous farming and trades experience	79
5.2.3 Social capital	81
5.2.3.1 Geographically local social networks	81
5.2.3.2 Geographically distant social networks	85
5.2.3.3 Population change and societal well-being	86
5.2.4 Perception, awareness of risk, hindsight	88
5.2.4.1 Hope vs. lack of perseverance	89
5.3 Adaptation strategies	92
5.3.1 Changes in farm production practices	94
5.3.1.1 Changes in farming methods	94
5.3.1.2 Mixed farming	97
5.3.1.3 Expanded land holdings under lease agreements	100
5.3.1.4 Adaption to water shortage	101
5.3.1.5 Changes in feed methods	103
5.3.1.6 Increased reliance on wild game	104
5.3.2 Adjustment to farm-level financial management	105
5.3.2.1 Barter	105
5.3.2.2 Off-farm employment	106
5.3.2.3 Sale of assets	108
5.3.3 Institutional adaptations	109
5.3.3.1 Government assistance	110
5.3.3.2 The Special Areas	113
5.3.3.3 Free freight to northern Alberta	114
5.3.3.4 Propaganda and cheap land in Peace River	116
5.4 Summary	117
Chapter 6: The movement of people from CD5 to Peace River in the 1930s	121
6.1 Introduction	121
6.2 The migration decision-making process	122
6.3 The sale of assets, departure and the economic costs	124
6.4 Challenges in settlement and adaptation to the Peace River Country	126
6.5 Perceived benefits of migration	129
Chapter 7: Discussion and conclusion	132
7.1 Introduction	132
7.2 Future vulnerability to climate change in the Prairie Provinces	135
7.3 Socio-economic changes over time	138
7.4 Lessons for future climate change in rural Alberta	142
7.4.1 Lesson #1: Capital endowments matter to rural household adaptive capacity	143
7.4.2 Lesson #2: Migration is a potentially successful adaptation strategy	145

7.4.3 Lesson #3: Institutions can increase household adaptive capacity and promote migration	147
7.5 Contribution to migration theory	149
7.6 Methodological challenges	152
7.7 Conclusion	155
Sources Cited	157
Appendix A: List of Interview questions	169
Appendix B: Data Analysis Tables	170

List of Figures and Tables

Figure 1: Palliser Triangle and the Dry Belt: Prairie Ecoregions and Soil Zones	30
Figure 2: Map of Field Study Locations, Hanna in CD5 and the Peace River Country	32
Figure 3: January Daily Mean Temperature: 1961 to 2000	34
Figure 4: July Daily Mean Temperature: 1961 to 2000	35
Figure 5: Total Annual Precipitation: 1961-2000	36
Figure 6: Approximate Tribal Distributions	38
Figure 7: Area Sown to Wheat, Oats, Barley, Rye and Flaxseed and in Summer Fallow in the Prairie Provinces 1934-45	41
Figure 8: Population of CD 1, 3 and 5 and Total Population of Alberta, 1926-1941	43
Figure 9: Special Areas of Alberta 1938	47
Figure 10: Conceptual Model of Vulnerability and Adaptation to Climate Change	50
Figure 11: Climatic Patterns and Population Change during the Study Period	53
Table 1: Interviewee Characteristics	57
Table 2: Summary of Factors Influencing Capacity of Migrants and Non-Migrants from CD5, Alberta in the 1930s	64
Table 3: Summary of Adaptation Strategies Employed by CD5 Residents during the 1930s	93
Table 4: Key Socio-Economic Indicators for Agricultural in Alberta, 1936 and 2006	139

Acknowledgements

Writing this dissertation involved significant work and dedication but I could not have done it without the assistance of many people. First and foremost I wish to express my genuine gratitude to my supervisor, Dr. Robert McLeman, who supported me every step of the way. Always generous with his time, attentive to my concerns and thorough with his feedback, Dr. Robert McLeman was an exceptional supervisor. I am also sincerely grateful to the Social Sciences and Humanities Research Council and the Ontario Graduate Scholarship whose financial assistance made this research possible. And I cannot forget the incredible kindness and goodwill extended to me throughout the duration of my fieldwork by academics, librarians, community members and interviewees. In particular, I wish to thank Ngaio Hotte, Angela Keibel, Jaime Campbell, George Patterson, Marie and William Dafoe, Nicolas Nadeau, Karen Burgess, Adele Rymhs, Simon Evans and David Leonard. Last, but not least, I wish to thank my parents, whose love, encouragement and support have been a constant in my life.

Abstract

This research examines the emergence of migration as a household adaptation strategy to drought in Alberta in the 1930s. Existing research on human migration in response to natural hazards tends to be limited in terms of empirical examples, particularly migration in response to climate stresses. The purpose of this study is to examine the detailed factors that influenced adaptive capacity and adaptation strategies of residents in south-eastern Alberta during the 1930s and to examine migration as one form of adaptation to drought. Data collection involved 37 in-depth semi-structured interviews in south-eastern Alberta and north-western Alberta, a literature review and archival data analysis. This study can help inform our understanding of future household vulnerability to drought in rural Alberta and migration as a potential adaptation strategy to climate change.

Résumé

Cette recherche examine l'émergence de la migration comme stratégie d'adaptation à la sécheresse durant les années 30 dans les ménages en Alberta. La recherche existante sur la migration en réponse aux phénomènes naturels est limitée en ce qui a trait aux exemples empiriques, tout particulièrement pour la migration en réaction aux stress climatiques. Le but de cette étude est d'examiner les facteurs particuliers qui influencèrent la capacité d'adaptation et les stratégies adaptatives au sud-est de l'Alberta durant les années 30 et d'examiner la migration comme stratégie d'adaptation face à la sécheresse. La collect de données a consisté en 37 entrevues semi-structurées dans le sud-est et le nord-ouest de l'Alberta, une revue de la littérature et une analyse de données archivées. Cette étude peut aider notre compréhension de la vulnérabilité des ménages en Alberta rurale à la sécheresse et de la migration comme stratégie d'adaptation potentielle face aux changements climatique.

Chapter 1: Introduction

This research examines migration as a household adaptation strategy to drought in Alberta during the 1930s. There is considerable research that reviews general concepts and makes broad-based predictions about environmental refugees and human migration in response to natural hazards. Increasingly, scholars are interested in migration stimulated by climate change due to the potential for widespread human displacement, civil unrest and violent conflict (Magadza, 2000; Myers, 2002; McLeman, 2006). However, most studies of this nature predict societal response to future climate change based on information from general circulation models and deductive reasoning (Hugo, 1996; MacKellar et al., 1998; Magadza, 2000; Hay and Beniston 2001; Myers, 2002). There remains limited empirical research which explores actual migration as an adaptation to climate stresses or explains broad relationships between climate and human migration (Massey et al., 1994; McLeman and Smit, 2006a). The purpose of this empirical study is to examine the factors that influenced adaptive capacity and adaptation strategies of residents in south-eastern Alberta during the 1930s and to explore migration as one form of adaptation to drought in order to better understand the relationship between climate change and human migration.

Researchers have long recognized the value of studying historical climatic change in order to better understand future climate change impacts on human societies and possible adaptation strategies (e.g. Glantz, 1991; Rosenzweig and Hillel, 1993; Kates, 2000; McLeman, 2006). Given that climate models predict increasing drought and water shortages for the Canadian prairies (Schindler and Donahue, 2006; Sauchyn and Kulshreshtha, 2008), lessons from migration in response to drought during the drought of the 1930s can help inform our understanding of future vulnerability to drought and migration as a potential adaptation strategy.

This study builds on previous research which examines the vulnerability of agricultural systems to climatic change (e.g. Smit and Skinner, 2002; McLeman and Smit, 2006a; Meze-Hausken, 2007; Reid et al., 2007) and offers new insight into the role of human migration as an adaptation strategy.

This study examines the following key questions: What factors influenced the adaptive capacity of households to cope with drought? Were there differences in the adaptive capacity of migrants and non-migrants? What adaptation strategies were employed to cope with drought and economic hardship? What factors facilitated or constrained various adaptations strategies? Do participants consider migration to have been a successful adaptation strategy to drought? What lessons can we draw from this case study that may be relevant to building adaptive capacity of rural residents who face similar conditions of climatic and economic stress in the future?

The following chapter, Chapter 2, provides the research context for this study. It explores five key topic that are relevant to this research: vulnerability and adaptation to climate change, vulnerability and drought-migration in agricultural regions, general theories of migration, migration theory and environmental change, and migration as an adaptation to drought.

This chapter identifies key scholars within these academic circles and explains how this study fits into existing literature.

Chapter 3 offers background information on this case study. It includes information on the geography and climate of the Canadian prairies and south-eastern Alberta, the history of land settlement, and the subsequent out-migration of many residents from southern Alberta. This chapter also discusses the institutional response to drought and water scarcity which involved the creation of the Special Areas by the Province of Alberta and the establishment of the Prairie Farm Rehabilitation Administration by the Government of Canada.

Chapter 4 outlines the key questions, conceptual framework, selection of case study locations, and data collection and data analysis. Using information from a pre-existing GIS model of historical climatological data and census data developed at the University of Ottawa by McLeman et al (submitted, 2008), I identified a region located in south-eastern Alberta where extreme drought conditions coincided with significant depopulation and chose this region (Census Division (CD) 5, 1926 boundaries¹) as my first study location. Based on secondary literature and interviewee data, I identified the Peace River district as the destination for many migrants and chose this as my second study location. A vulnerability-based approach (Smit and Wandel, 2006) guided the methods, data analysis and data interpretation of this study. Data collection involved a literature review, the collection of secondary and archival data, and 37 semi-structured interviews with residents who recalled conditions of adaptation to drought during the 1930s and migration from south-eastern Alberta to the Peace River district.

Chapter 5 and 6 report on the findings from interviewee data, triangulated with information from secondary and archival sources. Chapter 5 focuses on the determinants of adaptive capacity, including the differences between migrants and non-migrants, and the various adaptation strategies employed by migrants prior to migration and by non-migrants. Chapter 6 details the migration process and chronicles the experiences of those who left the dried-out areas of southern Alberta during the dirty thirties noting the many challenges and obstacles faced along the way.

Chapter 7, Discussion and Conclusion, explains the value of historical analogies, discusses the vulnerability of Alberta to future climate change and notes the significant changes

¹ Unless stated otherwise, all references to census divisions are 1926 boundaries which were the same throughout the 1930s but have since changed.

to the socio-economic conditions of rural Alberta since the 1930s. In light of future vulnerabilities and socio-economic changes, three valuable lessons from this study are offered that remain relevant today. Finally, migration theory is revisited to compare and contrast the relative strength of various theories based on the findings.

Chapter 2: Literature Review

2. Literature review

There are a number of important research fields which contribute to the study of drought-migration undertaken in this research project. These include vulnerability and adaptation to climate change, vulnerability and drought-migration in agricultural regions, general theories of migration, migration theory and environmental change, and migration as an adaptation to drought.

2.1 Vulnerability and adaptation to climate change

Vulnerability research has its roots in a number of different research fields, including entitlement failure theory, natural hazards research, human ecology (Adger, 2006), national security and environmental change (Ford and Smit, 2004). Researchers studying vulnerability to climate change generally agree on a systems vulnerability analysis, yet they employ a number of different conceptions of vulnerability to climate change due to different epistemological approaches and different objectives. The Intergovernmental Panel on Climate Change (IPCC) defines vulnerability as “the degree to which a system is susceptible to, and unable to cope, with adverse effects of climate change, including climate variability and extremes” (IPCC, 2007).

Literature on vulnerability in the field of climate change research tends to conceptualize vulnerability as a function of the exposure of a system to climate change impacts and the adaptive capacity of a system to cope with that exposure (Smit and Pilifosova, 2003; Smit and Wandel, 2006). Smit and Pilifosova (2003) develop a model to conceptualize the vulnerability of

a community as a function of exposure to climate change impacts and adaptive capacity to cope with that exposure:

$$V_{ist} = f(E_{ist}, A_{ist}) \quad (1)$$

Where V_{ist} represents the vulnerability of community i to stimulus s in time t ; E_{ist} represents the exposure of community i to stimulus s in time t ; and A_{ist} represents the adaptive capacity of community i to cope with stimulus s in time t . The functional relationship between exposure and adaptive capacity varies from context to context, but it is generally agreed that vulnerability has a positive relationship to exposure and a negative relationship to adaptive capacity (Ford and Smit, 2004).

Exposure reflects both the nature of environmental change and the nature of the community. For example, a community's exposure to an adverse environmental change, such as drought, reflects the nature of the drought (degree, duration, extent, etc.) and the nature of the community (settlement location, livelihoods, land use, etc) (Smit and Wandel, 2006). An exposure can include adverse climatic and non-climatic stimuli, such as changing political, economic, institutional and biophysical conditions (Belliveau et al., 2006). These exposures interact with each other at various scales.

Adaptive capacity, also understood as resilience, is the ability of individuals to cope with exposures by adapting to the impacts of climate change (Smit and Pilifosova 2003; Smit and Wandel, 2006). Adger (2006) defines resilience as "the magnitude of disturbance that can be absorbed before a system changes to a radically different state." Adaptive capacity is influenced by a multitude of interdependent factors such as access to information, technological resources, institutions, infrastructure, and economic, human and social capital (Yohe and Tol, 2002; McLeman and Smit 2006a; Belliveau et al., 2006; Reid et al., 2007). Economic capital

represents the availability of financial resources and assets (McLeman, 2006); human capital refers to the skills, education, knowledge and experience of people (Yohe and Tol, 2002; Reid et al., 2007); and social capital is understood to be the informal social networks within a community, based on trust, reciprocity and exchange (Adger, 2003; Reid et al., 2007). Adaptive capacity is also shaped by macro-structures including social, cultural political and economic processes which operate at various scales (Yohe and Tol, 2002; Smit and Wandel, 2006). When communities are less resilient, significant upheaval may occur and may lead to the disintegration of capital endowments and the absence of viable livelihood options (Adger, 2006). However, adaptation strategies can increase resilience and thus decrease vulnerability (Smit and Wandel, 2006).

Adaptation in response to climate change is defined by Smit and Wandel (2006, pg. 282) as “a process, action or outcome in a system (household, community, group, sector, region, country) in order for the system to better cope with, manage or adjust to some changing condition, stress, hazard, risk or opportunity.” Scholars frequently distinguish different types of adaptation based on a range of criteria, such as the degree of institutional involvement, the duration of the adaptation strategy, the scale of operation, and whether the adaptation is anticipatory or reactive, autonomous or planned (Smit et al., 2000; Smit and Skinner, 2002). Scholars frequently attempt to characterize adaptation strategies in specific studies as successful or not (e.g. Gregory 1989; Adger, 1999; Meze-Hausken, 2000). In order to assess the relative success of adaptation strategies, Adger et al. (2005) develop a normative evaluative criteria based on the level of effectiveness, efficiency, equity and legitimacy.

Vulnerability is dynamic, changing over time, from place to place, and from system to system (McLeman and Smit, 2006a; Adger, 2006; Smit and Wandel, 2006). Vulnerability to

climate change can be increased by non-climatic factors such as poverty, unequal access to resources, food insecurity and the incidence of disease (IPCC, 2007). The vulnerability and adaptive capacity of a system to climate change can be analyzed across a wide range of scales, from the individual or household scale, to the community, or even to the entire globe (Smit and Wandel, 2006). Most communities can cope with a certain range of climatic variability, which is known as the “coping range”. However, when climatic conditions deviate from the norm and exceed the coping range, the adaptive capacity of individuals and communities can be exceeded (Smit and Wandel, 2006).

Central to studies of vulnerability and adaptation are issues of equity. Those most vulnerable tend to be individuals and households at the low end of the socio-economic spectrum, both in developed and developing countries (Hunter, 2005). Furthermore, adaptation strategies tend to reduce the vulnerability of those best able to take advantage of such strategies, rather than the most marginalized members of society (Adger, 2006). The importance of assessing vulnerability and strengthening adaptive capacity is highlighted in the latest IPCC assessment report (IPCC, 2007). The report states that while some adaptation strategies are occurring, they remain limited in scope. The urgency for widespread adaptation strategies is increasing and may be the only viable response for some climate change impacts (IPCC, 2007). However, the costs of and barriers to many adaptation strategies are not well-understood, in part because they are very context-specific.

2.2 Vulnerability and drought-migration in agricultural regions

Droughts can be major natural disasters, having enormous ecological, social and economic impacts and are predicted to increase in many regions of the world as a result of climate change

(IPCC, 2007). This section outlines the literature on agricultural vulnerability to climate change with a focus on vulnerability to drought, agricultural adaptation to climate change, and migration as one type of adaptation in drought-prone regions.

2.2.1 Vulnerability of agriculture to climate change

Agriculture is widely recognized in both scientific and policy communities as a sector that is particularly vulnerable to climate change (Bradshaw et al. 2004; Hay and Beniston, 2001). Many agricultural systems are already experiencing increasing vulnerability due to climate change impacts (Chiotti, 1998; Belliveau et al., 2006), and Canadian prairie agriculture, in particular, is experiencing significant climate change impacts, including lower streamflow levels and increasing aridity (Sauchyn, 2007; Sauchyn and Kulshreshtha, 2008). Agricultural systems are not only sensitive to average temperature increases, but also climatic variability and extreme weather events which are predicted to increase in frequency and intensity due to climate change (Easterling et al., 2000; McCarthy et al., 2001). Farmers can reduce their vulnerability to climate change by seizing opportunities and adapting to adverse conditions, however, the process of agricultural adaptation remains equivocal and ill-defined (Belliveau et al., 2006). This is because farmers operate within a system highly mediated by interdependent factors, including variable political, economic, institutional and biophysical conditions (Brklachich et al., 1997; Wandel and Smit, 2000). These factors interact to influence farmers' decision-making and their choice of adaptations strategies. Vulnerability of the Prairie Provinces to future climate change is discussed in detail in Chapter 7, section 7.2.

2.2.2 Agricultural adaptation to climate change

Canadian agricultural adaptation to changing environmental conditions involves a continuous series of adjustments over time in response to a range of factors (Wall, et al., 2007). Adaptation options for producers vary depending on the context, including location, farm-type, and general socio-economic conditions (Wall et al., 2007). Agricultural adaptation is commonly understood as adjustments in either natural or human systems in response to climatic conditions or risks in order to reduce the vulnerability of agricultural systems (Smit et al., 1999). The study of Canadian agricultural adaptation to climate change has been informed by a number of different research fields, which include the natural hazards field, rural and agricultural change and climate change research (Bryant et al., 2000). A wide variety of agricultural adaptations have been discussed in the literature. These can occur at different but interrelated scales (Smit and Skinner, 2002). Smit and Skinner (2002) developed a typology of farm-level adaptations to climate change which consist of four general categories: technological developments, government programs, farmers' operational practices and farm-level financial management.

Technology and institutional support for agriculture are commonly viewed as means to increase adaptive capacity for farmers (e.g. Smit and Skinner, 2002; Motha and Baier, 2005). Technological developments include the development of new crop varieties, weather and climate information systems and irrigation (Smit and Skinner, 2002). Adaptations undertaken by governments often involve conscious public policies and programs to reduce farmer vulnerability. These can include crop insurance programs, funding for technology, established income stabilization, *ad hoc* compensation and government resource management programs (Smit and Skinner, 2002). Institutional responses to climate change such as drought can also

include the implementation of water conservation measures, water pricing and water metering, or restricted population levels in particularly arid regions (Schindler and Donahue, 2006).

Smit and Skinner (2002) conceptualize farm-level adaptations strategies in terms of farm production practices and farm financial management. Farm production practices include changing land use and topography or changing the timing of planting, input use and harvesting, while farm financial management includes the use of crop insurance or participation in income stabilization programs. Researchers are increasingly interested in the role of human agency in agricultural adaptation to climate change and the role of farmer decision-making to reduce vulnerability (e.g. Smithers and Smit, 1997; Bryant et al., 2000; Reid et al., 2007). Studies have shown that there is a wide variety of farmer response to a certain stimuli, often even within the same geographic region (Bryant et al., 2000). Using Smit and Skinner's (2002) typology, migration is an adaptation within farm production practice, and is just one type of farm-level adaptation strategy, among many, to cope with drought conditions in arid regions.

2.3 General theories of migration

There are a number of general theories that help explain human migration. The neo-classical economic model of migration views migration in terms of economic rationality, where individuals migrate for better employment opportunities and higher income levels (Massey et al., 1994; Castles and Miller, 2003). The new economics of labour migration approach assumes that many more factors than differential income must be considered in order to understand migration processes. These additional factors include the chance of secure employment, availability of investment capital, and the need to manage risk over long periods (Stark and Taylor, 1991; Castles and Miller, 2003). An alternative approach to the neo-classical economic model of

migration was developed during the 1970s and came to be known as the historical-structural approach (Castles and Miller, 2003). Rooted in Marxist political economy and world systems theory, structural explanations of migration conceptualize population movements within the unequal global distribution of economic and political power. Critiques of both the neo-classical economic model of migration and the historical-structural approach have worked to develop a new approach, known as migration systems theory, which attempts to include numerous explanations for migration from a wide range of disciplines. These general categories of migration theory are each now described in greater detail.

2.3.1 Economic theories of migration

The neo-classical economic model of migration assumes that individuals migrate based on economic rationality in order to gain better employment opportunities or earn higher wages (Massey et al., 1994; Castles and Miller, 2003). Writing on the determinants of migration in the 19th century, Ravestein argued that of the many factors which contribute to migration, such as oppressive laws, heavy taxation or an unattractive climate, none is as strong as “the desire inherent in most men to ‘better’ themselves in material respects” (Ravestein, 1889, pg. 286).

The approach conceptualizes migration as a “natural” response to interregional differences in social and economic opportunities. The disequilibrium in demand for labour and wages results in migration of workers from regions of low-wages to regions of high-wages (Harris and Todaro, 1970), while capital moves in the opposite direction (Massey et al., 1994). It is believed that in the long run, migration flows would equalize these economic disparities (Castles and Miller, 2003). Similarly these theories suggest that people move from densely populated areas to sparsely populated areas (Castles and Miller, 2003). State policies which influence migration are

viewed as aberrations which disrupt the ‘normal’ functioning of the market (Castles and Miller, 2003).

Extensions to the neo-classical approach explain human migration in terms of “push” and “pull” factors where conditions at an existing place of residence may motivate an individual to leave, while conditions at a destination may attract a potential migrant (Lee, 1966). Push factors include demographic pressures, political instability, lack of economic opportunities, and more recently, environmental change (Lonergan, 1998), while pull factors include demand for labour, availability of land, good economic opportunities and political freedoms (Castles and Miller, 2003).

The neo-classical economic theory of migration has been criticized for being individualistic and ahistorical (Castles and Miller, 2003). Critics have argued we cannot treat migrants as individual market-players who have full information about their choices and make “rational” decisions based on this information. Research from many different disciplines shows that migrants’ behavior is strongly influenced by historical experiences as well as family and community dynamics (Portes and Böröcz, 1989). However, the greatest criticism comes from the numerous empirical studies which dispute the basic assumptions of this theory. While empirical evidence does support the argument that transnational migration is sensitive to differences in wages between countries of origin and destination, studies show that these factors cannot alone explain migration (Massey et al., 1994). It is rarely the poorest people from the least developed countries who migrate to the most developed countries (Castles and Miller, 2003). Similarly, the argument that people move from regions of high population density to regions of low population density is contrary to much empirical evidence. For example, a

number of countries with high rates of immigration, such as the Netherlands and Germany, also have high population densities (Castles and Miller, 2003).

It has been argued that push-pull theories of migration cannot explain why migrants tend to choose one destination over another (Castles and Miller, 2003). Furthermore, empirical evidence suggests that government policy plays a fundamental role in initiating, shaping and controlling movements, and must be taken into consideration when examining migration processes (Castles and Miller, 2003). For these reasons, the neo-classical economic model of migration is viewed by many as simplistic and incapable of predicting future migration processes (Boyd, 1989; Sassen, 1998).

2.3.2 New economics of labour migration approach

The new economics of labour migration approach emerged in the 1980s in response to a number of the criticisms of economic theories outlined above (Taylor, 1987; Stark and Taylor, 1991).

Unlike the neo-classical economic model of migration, this theory does not assume that global financial markets are complete and well-functioning. Instead, it recognizes that markets for capital, futures, and insurance may be absent, imperfect, or inaccessible (Massey et al., 1994).

The new economics of labour migration approach, first developed in the context of developing countries, suggests that many more factors than differential income between two countries must be considered in order to understand migration processes. These additional factors include the chance of secure employment, availability of investment capital, and the need to manage risk over long periods (Castles and Miller, 2003).

Using this approach, migration can be considered a household survival strategy and a means of spreading risk (Stark and Taylor, 1991). It is not the *individual* who decides to migrate

in order to maximize his or her utility. Rather, it is the family or household that decides to migrate in order to maximize its collective utility. Migration is a strategy that can diversify family income and therefore reduce risk. For example, a family may decide to send one family member to an urban centre in order to find work and send remittances home (Adger, 1999). This idea of income transfers was not considered in the traditional neoclassical model (Massey et al. 1994). The new economics of labour migration approach also posits that households migrate not only to improve absolute income, but to improve income in relation to other community members in order to ameliorate their relative deprivation (Stark and Taylor, 1991; Massey et al., 1994). Massey et al. (1994) argue that this theory has less relevance for developed countries because of institutional structures, such as crop insurance or unemployment insurance, which were created for the purpose of minimizing household risk.

2.3.3 The historical-structural approach

An alternative approach to the neo-classical economic model of migration was developed in the 1970s and came to be known as the historical-structural approach. This approach critiques the neo-classical economic perspective for putting too much emphasis on the free choice and agency of the individual, while neglecting macro-structural forces which influence and restrict individual choices (Lonergan, 1998). Informed by Marxist political economy and world systems theory, structural explanations of migration conceptualize population movements within the unequal global distribution of economic and political power. As capitalism extends outward from core nations in Europe and North America into developing countries, noncapitalist modes of social and economic organization are disrupted, resulting in large numbers of displaced people who are more likely to migrate (Massey, 1988). The process of economic globalization creates both large

numbers of mobile workers in developing countries, and simultaneously links them to labour market demands in developed countries (Massey et al., 1994). It is believed that migration perpetuates uneven development in the world, enabling developed countries to further exploit the resources and labour of poor countries, making rich countries richer and poor countries poorer (Sassen, 1988). Unlike the neo-classical economic model of migration which views human movement as a “natural” process, the structuralist approach views human movement as a response to unnatural imbalances in power and opportunities.

However, the historical-structural approach is criticized by many migration scholars who argued that the capital and interests of developed countries receive too much emphasis and that the approach cannot fully explain the complexities of migration processes (Castles and Miller, 2003). While the neo-classical economic model of migration downplayed the role of the state and historical processes, the historical-structural approach often saw the interests of capital as all-determining and paid inadequate attention to individual and collective human agency (Castles and Miller, 2003).

2.3.4 Migration systems theory and new interdisciplinary approaches

Critiques of both the neo-classical economic model of migration and the historical-structural approach have worked to develop a new approach, known as migration systems theory which attempts to include numerous explanations for migration from a wide range of disciplines. The migration systems approach studies processes and linkages at both the place of departure and place of destination of migrants. These processes include various factors at a range of scales, such as ‘state-to-state relations and comparisons, mass culture connections and family and social networks’ (Fawcett and Arnold, 1987 pg. 456-7). This theory suggests that linkages, such as

trade relations, political ties, or cultural ties between sending and receiving regions play an important role in migratory processes (Castles and Miller, 2003). For example, migration from Mexico to the United States is understood within the context of southwestward expansion of the United States in the nineteenth century and the deliberate recruitment of Mexican labourers by American employers in the twentieth century (Portes and Rumbaut, 1996). Migration scholars who are proponents of the migration systems theory have also suggested the idea of cumulative causation, which refers to the tendency of migration to perpetuate itself overtime, regardless of the factors which contributed to the initial migration. Due to acquired knowledge, values, beliefs and motivations, people who migrate once are likely to do so again (Massey et al., 1994).

The migration systems theory understands migration processes as the result of interacting macro- and micro-structures. Macro-structures involve large-scale institutional factors, such as the political economy of the world market, or interstate relationships, while micro-structures involve the networks, social behavior, practices and beliefs of migrants (Castles and Miller, 2003). For example, Lutz and Scherbov (2000) found that social networks and personal relationships play a critical role in determining where people move. Some authors call this type of analysis the network theory (e.g. Massey et al., 1994). Other studies examine the role of information and human capital, such as knowledge, capabilities for organizing travel, finding work and adapting to a new environment (Castles and Miller, 2003). Increasing attention has also been focused on 'meso-structures' which include individuals, groups or institutions that mediate between migrants and political or economic institutions. Meso-structures can include recruitment organizations, smugglers and other intermediaries (Castles and Miller, 2003).

Despite the development and evolution of these three different approaches to migration, Massey et al. (1994) argue that North American migration studies lack a commonly accepted

theoretical framework. Massey et al. (1994, pg. 700-1) state, “Social scientists do not approach the study of immigration from a shared paradigm, but from a variety of competing theoretical viewpoints fragmented across disciplines, regions, and ideologies. As a result, research on the subject tends to be narrow, inefficient, and characterized by duplication, miscommunication, reinvention, and bickering about fundamentals. Only when researchers accept common theories, concepts, tools, and standards will knowledge begin to accumulate.” Massey et al. (1994) argue that each of the theories presented here have received at least some empirical support, and while there is clearly more evidence to support some theories than others, none can be fully rejected.

2.4 Migration theory and environmental change

While there is increasing interest in the relationship between migration and environment (e.g. Graves, 1980; Hay and Beniston, 2001; Hunter et al., 2003), the traditional literature on migration has largely ignored this relationship (Lonergan, 1998). A few classical migration frameworks take into consideration environmental factors (e.g. Lee, 1966; Wolpert, 1966; Speare, 1974; DeJong and Fawcett, 1981) but these theories generally do not involve empirical research. A decade ago, the National Research Council’s Committee on the Human Dimensions of Global Change (1999, pg. 57) stated, “There is very little empirical documentation of the relationship between migration and environment.” More recently, Hay and Beniston (2001) stated, “The topic of migration and environmental change is of growing importance but is still in the initial stages of analysis.”

Traditional literature on migration theory and environmental change tends to view reasons for migration as either “push” or “pull” factors (Moore and Smith, 1995). Adverse environmental change is seen as a “push” factor which prompts out-migration (Moore and Smith,

1995; Curran, 2002). The majority of migration in response to environmental change occurs as internal migration, where people are displaced within national boundaries (Hugo, 1996; Hay and Beniston, 2001; Hunter et al., 2003). Socio-economic status can have different effects on the decision to migrate, depending on the context. For example, in developing countries, poor individuals and households exposed to detrimental environmental change may be unable to migrate because of limited resources (e.g. Chan, 1995). However, in developed countries wealthy individuals and households may decide to remain in hazardous areas and rebuild in the face of disaster because they have the resources to do so (e.g. Morrow-Jones and Morrow-Jones, 1991). The analytical theory of environmental change as a “push” factor does not explain why and how some people decide to migrate while others do not. In attempting to explain these differences, important developments in theories of migration and environmental change have incorporated concepts of social networks and social capital (Curran, 2002).

Many authors also acknowledge the role migration plays in further contributing to environmental change and the resulting economic, political and environmental impacts of population displacement (e.g. Hugo, 1996; Hay and Beniston, 2001). Hugo (1996) calls this a “complex two-way relationship involving environmental change as both a cause and consequence of migration.” Researchers have incorporated these feedback effects into their models of migration in response to environmental change (e.g. Richmond, 1993; McLeman and Smit, 2006a).

Some argue it is impossible to isolate environmental factors from the social, economic, political and institutional structures of which they are a part (McGregor, 1994; Lonergan, 1998; Bilsborrow and Carr, 2000). These authors believe we cannot draw a linear, deterministic relationship between environmental change and human migration but that we can understand the

environment as one contributor among many to population movement. While there are a number of migration frameworks that offer potential for incorporating the role of environmental factors, it is argued that the literature is far from having a well-developed theoretical or conceptual framework for understanding the relationship between human migration and environmental change (Hay and Beniston, 2001).

This review suggests that a number of migration frameworks offer potential for including environmental change as a critical factor in the decision to migrate. It is undisputed that there is indeed a relationship between migration and environmental change. However, the literature to date is far from having a well-developed theoretical or conceptual framework for understanding the complexities of this relationship (Hay and Beniston, 2001). Bridging theories of environmental migration in response to environmental change with theories of vulnerability to climate change provides insight into this complex relationship.

2.5 Migration as an adaptation to drought

Research suggests that migration in response to drought is dynamic and complex given that the decision to migrate is seldom made in response to one stimulus alone (McLeman and Smit, 2006a). A number of researchers conceptualize migration along a continuum, where those displaced by land degradation, characterized by slow onset, have a certain degree of choice in their decision to migrate, while those displaced by extreme drought, characterized by rapid onset, are more constrained in their choice to migrate and can be classified as refugees (Hugo, 1996; Meze-Hausken 2000; Bates, 2002). Where drought is severe and occurs rapidly, migration is often the last strategy employed in a desperate attempt to survive. However, droughts are typically characterized by slow-onset changes in climatic and environmental conditions.

Migration in response to drought usually involves deliberate decision-making whereby the migrant assesses the relative costs and benefits of migration – a decision conditioned by a host of other factors, such as perception and personal characteristics (Meze-Hausken, 2000).

A number of authors argue that drought can stimulate migration in both developing (e.g. Findley, 1994; Jiang et al., 2005) and developed countries (e.g. Gutmann, 2000; McLeman and Smit, 2006a). In studies of drought-migrants in Africa, research indicates that in some cases migrants return home after a number of years, and in other cases, male migrants will return seasonally to assist with farm work (Findley, 1994). Still others engage in long-distance migration where migrants move permanently to a foreign country in order to send remittances home, allowing family members who stay to cope with drought conditions (Findley, 1994; Ezra and Kiros, 2001). Because of the considerable costs and barriers to long-distance migration, internal, short-distance migration is the most likely response to drought for people living in arid regions of Africa (Findley, 1994; Hampshire and Randall, 1999; Roncoli et al., 2001). Similar circular, short-distance migration strategies in response to drought have been documented in South Asia and China (Croll and Ping, 1997; Deshingkar and Start, 2003).

A number of studies examining drought-migration in the developed world have focused on the exodus of farmers from the Great Plains of the US during the 1930s (e.g. Gutmann et al., 1998; McLeman and Smit, 2006a). Gutmann et al.'s (1998) study of the US Great Plains demonstrates that counties with greater drought in the 1930s had greater net out-migration than counties with fewer droughts. Similarly, in their analysis of migration patterns in Eastern Oklahoma during the 1930s, McLeman and Smit (2006a) argue that drought, which resulted in widespread crop failure in 1934 and 1936, influenced the decision of farmers to migrate.

However, some scholars believe there is no direct cause-effect relationship between drought and

migration. In her study of dryland areas in Ethiopia, Meze-Hausken (2000) argues that migration should be considered a second order climate impact, which has its roots in processes that directly affect migration, such as agricultural yield, water supply and pest infestation. She shows that vulnerability to drought is complex and does not necessarily make someone a potential climate migrant. This is because people living on marginal lands have the ability to develop alternative adaptation strategies in order to cope with drought and extreme climatic events. The literature on drought-migration suggests that the process is not fully understood. Given the potential for increased drought tendencies in the Canadian prairies, a historical examination of drought migration during the 1930s can provide insight into current and future drought-migration processes.

Chapter 3: The Canadian Prairies, Alberta and the Dirty Thirties

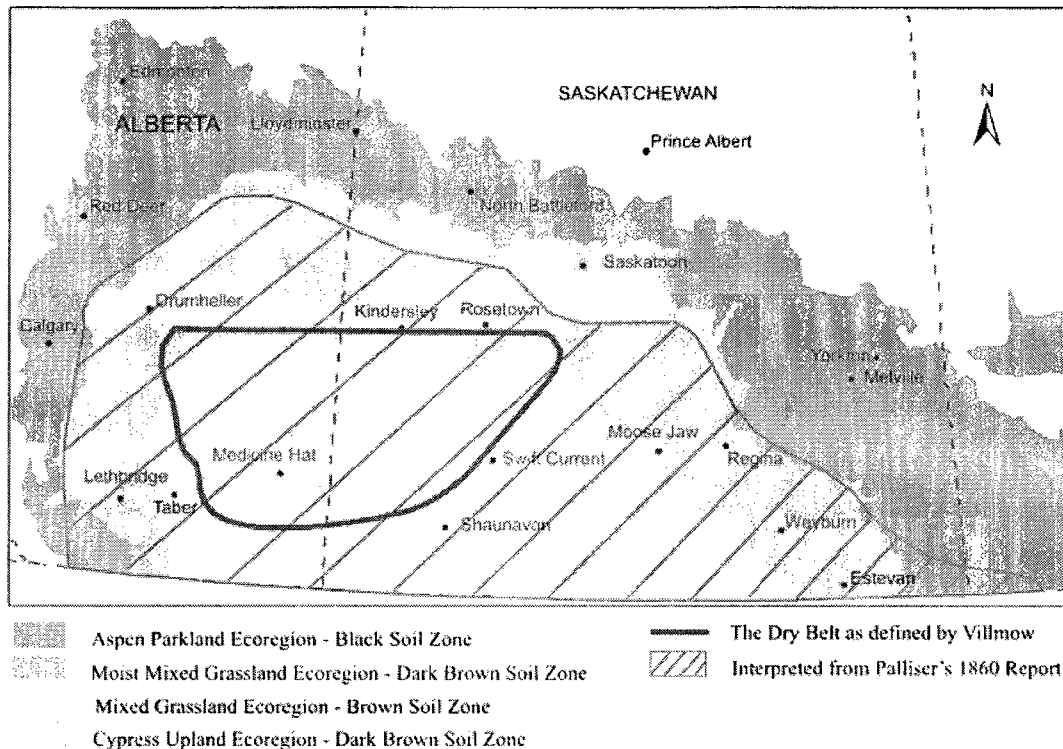
3.1 Geography and climate

3.1.1 Geographic zones and soils of the Prairie Provinces

The Prairie Provinces of Canada – Manitoba, Saskatchewan and Alberta – encompass three broad geographic zones: the grasslands, aspen parkland, and boreal forest (Mitchell and Prepas, 1990; Carter, 1999). The boreal forest geographic zone is the largest of the three zones, but the grasslands zone is most often associated with the Prairie Provinces because this has been the region of largest land settlement over the last 100 years (Carter, 1999). The grasslands are characterized by flat, treeless plains with many small lakes that dot the surface, formed from the depressions and blocked waterways that remained after glacial retreat approximately 12,000 years ago (Mitchell and Prepas, 1990). This ecozone is part of the North American Great Plains, which covers the widest latitude of all ecozones on the continent, stretching from Canada's Prairie Provinces, through 18 US states and 3 Mexican States (Gauthier and Wiken, 2003). However, this region has been so radically transformed by cultivation (Gauthier and Wiken, 2003) that some argue the term 'grasslands' is no longer appropriate (Carter, 1999). The aspen parkland is a region of slightly rolling grasslands with alternating groves of trees, including aspen, bur oak and maple. Biologists believe that the buffalo, which once roamed the grasslands and parkland, played an important role in sustaining these zones (Carter, 1999). While the buffalo was the dominant animal in these two regions, other species included wildfowl, deer, elk antelope, fox, coyote, prairie dogs and other ground squirrels. The boreal forest zone of the Prairie Provinces is part of a contiguous band that stretches across North America, from Alaska and the Rocky Mountains to the Maritimes. This zone is characterized by stands of coniferous

trees, mainly pine, spruce, fir, and tamarack, numerous lakes and rivers, and a complex of wetlands. The game in this region includes moose, caribous, black bear, elk and hare.

Figure 1: Palliser Triangle and the Dry Belt: Prairie Ecoregions and Soil Zones



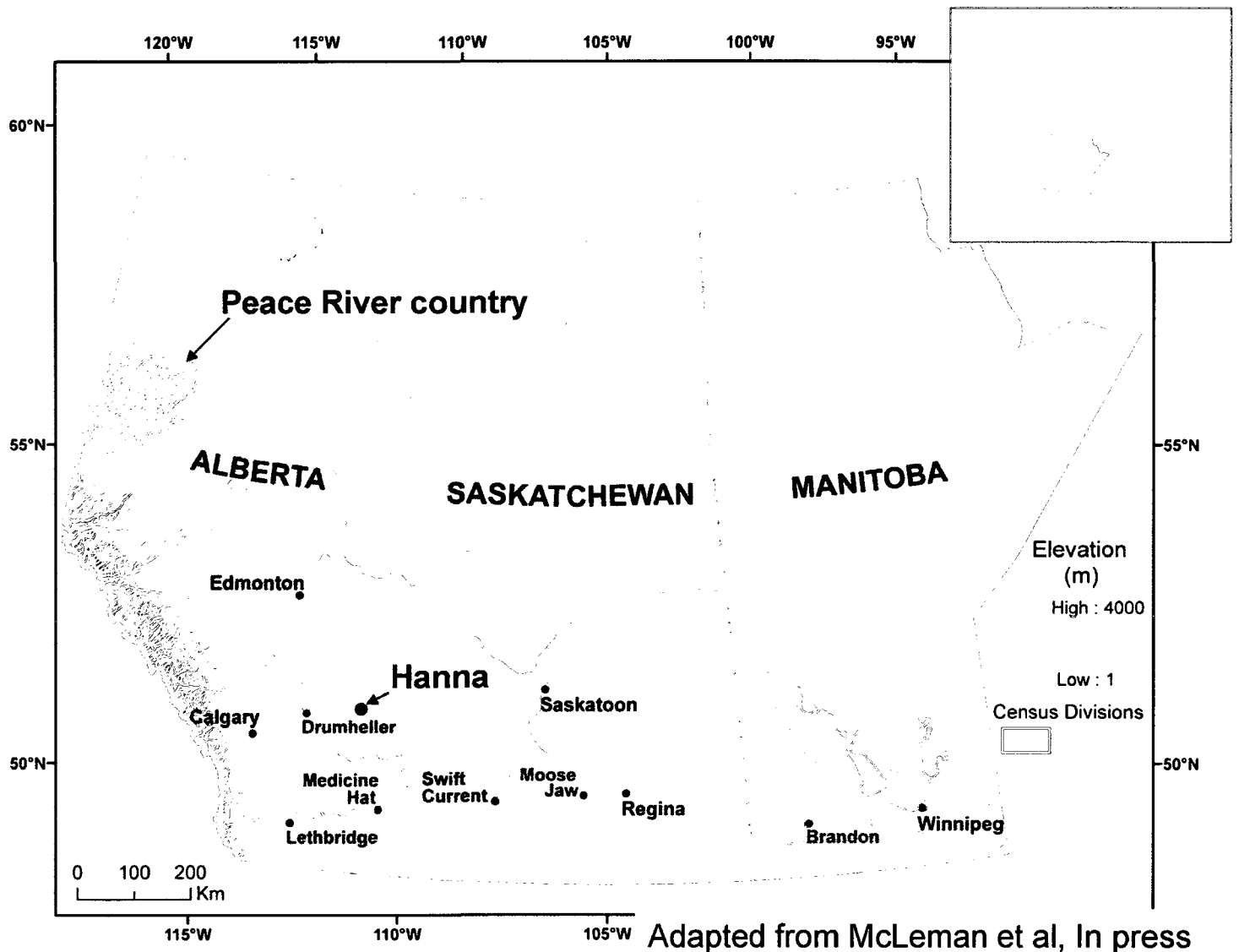
(Marchildon et al., 2007)

Figure 1 illustrates the further subdivision of the grasslands and parkland geographic zones into four ecoregions for the southern half of Alberta and Saskatchewan. The various soil types are influenced by climate, vegetation, parent material, topography and time (Government of Alberta, 2003a). The Mixed Grassland is characterized by predominantly Brown Chernozemic soils, the Moist Mixed Grassland by Dark Brown Chernozems, and the Fescue Grassland and Aspen Parkland by Black Chernozems. At higher latitudes, Luvisols, which develop under the influence of forest vegetation, dominate the Boreal Transition ecoregion (Government of Alberta, 2003a). Figure 1 shows that the Dry Belt is located in the Mixed Grassland, a region

with chernozemic and solonetzic soils which are characterized by a light texture and low water retention potential and are highly sensitive to erosion and drought (Marchildon et al., 2007). Under native prairie grass, erosion is limited; however, cultivation of this region contributes to significant soil loss and soil degradation (Marchildon et al., 2007).

This study involves two principal field locations for in-depth interviews with migrants and non-migrants who were alive during the 1930s. One field location is situated in the Mixed Grassland Ecoregion of Alberta, which includes the community of Hanna. The other field location is situated in northern Alberta, in the transition zone between parkland and boreal forest, which includes the communities of Edmonton, Stony Plain, Grande Prairie, Peace River and Grimshaw. The Peace River country encompasses over 300,000 square kilometres of land in north-western Alberta and north-eastern British Columbia. It is drained by the Peace River and its tributaries and is rich in resources, such as timber, wildlife and coal (Hursey, 1996). For this reason, the emphasis of this chapter is placed on Alberta with special consideration to these two regions, but as one of the three Canadian Prairie Provinces, some discussion also includes the Canadian Prairies more generally (see Figure 2).

Figure 2: Map of Field study Locations, Hanna in CD5 and the Peace River Country



Adapted from McLeman et al, In press

3.1.2 Alberta's rivers and agricultural water supply

Four major rivers originating in the Rocky Mountains drain Alberta. The rivers include the Peace River and the Athabasca River which drain the northern half of the province and which join to form the Slave River, the North Saskatchewan River which flows through Alberta's

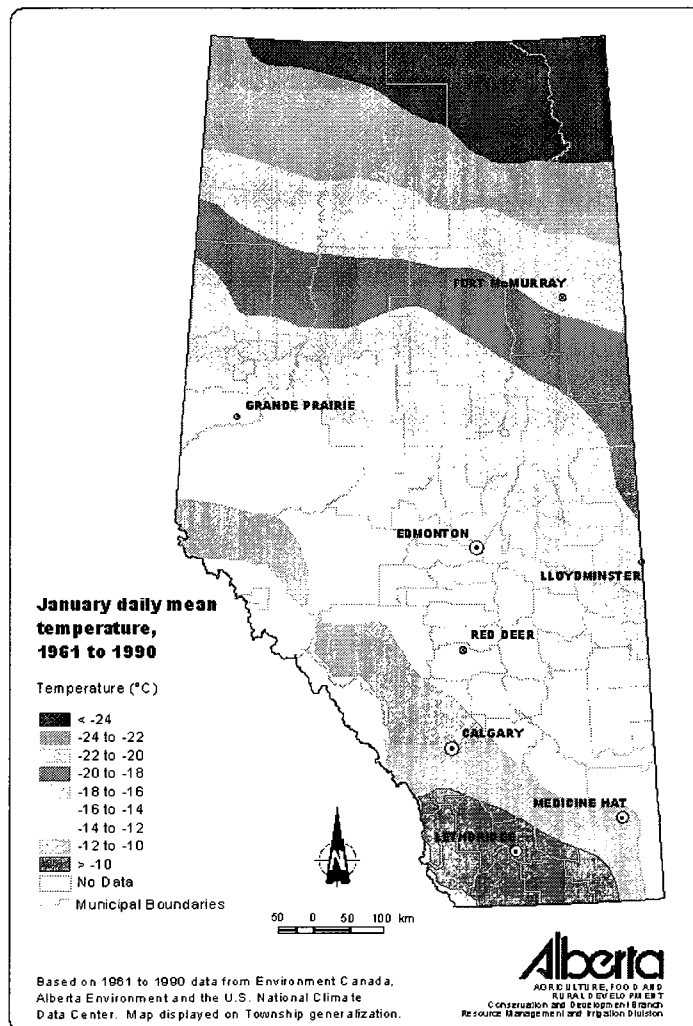
foothills and parkland, and the South Saskatchewan River which flows through Alberta's arid prairie (Mitchell and Prepas, 1990). The water from these river basins drains into creeks, streams and lakes. Unlike many farmers in the US Great Plains who rely on the Ogallala Aquifer for water, farmers in the Canadian Prairies rely principally on surface water (Environment Canada, 1993). This consists mainly of dams and dugouts that are replenished from snowmelt during the spring and streamflow, most of which originates in the glaciers of the Rocky Mountains (Gan, 2000). However, these mountain water supplies are diminishing rapidly as the glaciers retreat. Already, the glaciers in the headwaters of the North Saskatchewan, South Saskatchewan and Athabasca rivers have receded by approximately 25% and their masses continue to shrink (Schindler and Donahue, 2006). It has been argued that the combination of climate warming, increasing human demand for fresh water and the decline in water quality will lead to an unprecedented water crisis in the Prairie Provinces (Schindler and Donahue, 2006).

3.1.3. Alberta precipitation and temperature

Record-keeping of air temperature and precipitation levels in Alberta began in the late 19th century and have continued to date. In the winter, average temperatures are highly influenced by the north-south latitudinal effect. Winter temperatures are coldest at higher latitudes and warmest at lower latitudes, with temperatures below -24°C in the far north and temperatures exceeding -10°C in the foothills (Government of Alberta, 2003b) (see Figure 3). There is also considerable variability in daily temperatures, particularly when winter Chinooks pass over southern Alberta raising temperatures by up to 30°C over a short period of time. In the summer, average temperatures are highly influenced by the effect of east-west elevation and cloud cover gradient. Summer temperatures are coldest in western regions of higher elevation, sometimes

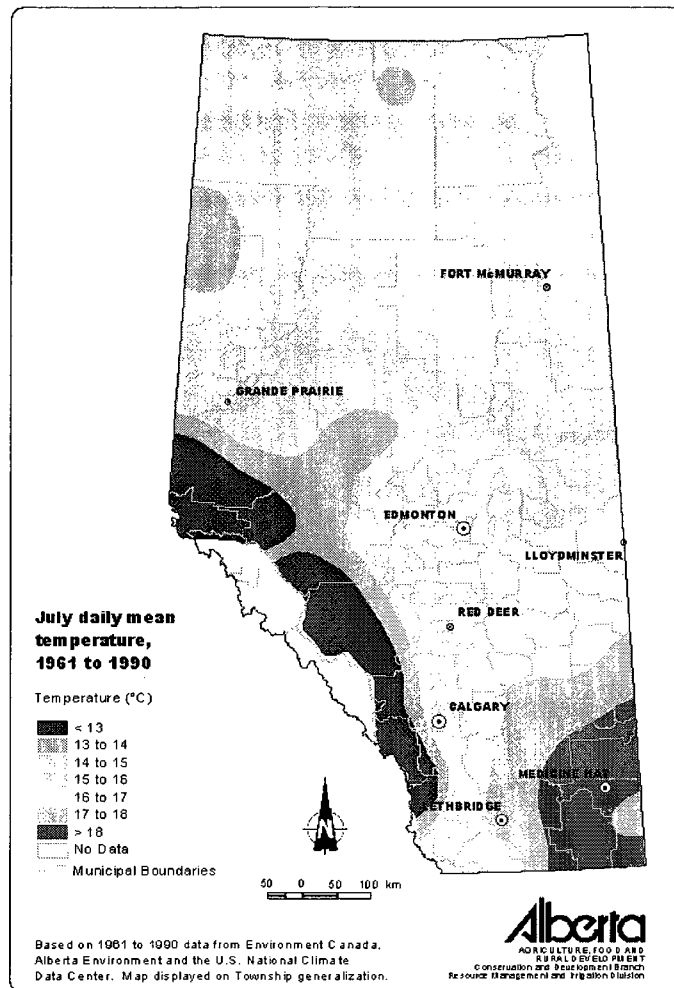
below -13°C, and warmest in eastern regions of lower elevation, exceeding 18°C (Government of Alberta, 2003c) (see Figure 4). As a result, southeastern Alberta experiences the highest average July temperatures. Air temperatures are also influenced by surface moisture conditions, and are higher when the surface is drier.

Figure 3: January Daily Mean Temperature: 1961 to 2000



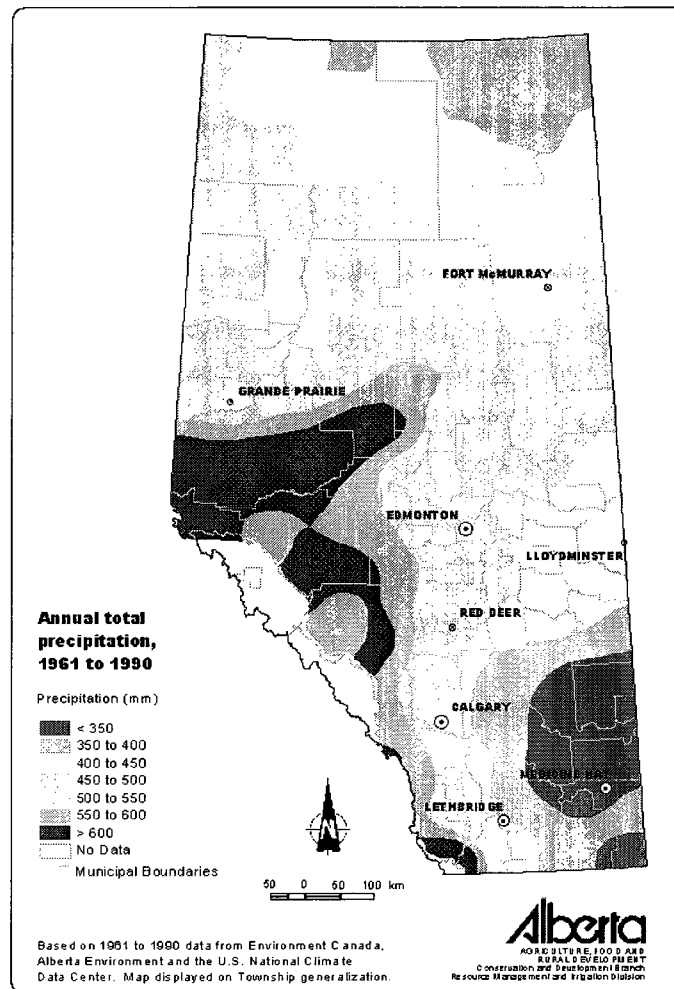
(Government of Alberta, 2003b)

Figure 4: July Daily Mean Temperature: 1961 to 2000



(Government of Alberta, 2000c)

Figure 5: Total Annual Precipitation: 1961-2000



(Government of Alberta, 2003d)

Alberta receives less than 500 mm of total annual precipitation on average, which includes rain, snow and other forms of moisture such as hail, with notable spatial variability across the provinces (Environment Canada, 2006). Precipitation varies from a low of approximately 350 mm in the southeast to more than 600 mm in the Rocky Mountains, increasing with elevation (Government of Alberta, 2003d) (see Figure 5). Precipitation is at a

maximum in late spring or summer when a thermal low is present over the region and is at a minimum during the month of February.

While this climate may be perceived as “normal” for many residents of Alberta and the Canadian Prairie Provinces generally, paleo-climatic data, including tree rings and salinity sensitive diatoms, show otherwise (Schindler and Donahue, 2006). Numerous studies demonstrate that the North American prairies were much drier and experienced more severe droughts over the past 500-1000 than in the 20th century. Despite the numerous droughts experienced in the 20th century, precipitation levels during this century were in fact above the long-term average (Sauchyn and Beaudoin, 1988; Schindler and Donahue, 2006; Cook et al., 2007). Recent studies also demonstrate that various sites in the prairies have undergone a warming of 1-4 degrees C in the past 80-118 years, with most of the temperature increase occurring since 1970, and have experienced a decline of 14-24% in total annual precipitation (Schindler and Donahue, 2006). Additional warming by several degrees by the latter part of the 21st century and increased levels of evapotranspiration, leading to severe drought, are forecast under most climate change projections (Schindler and Donahue, 2006).

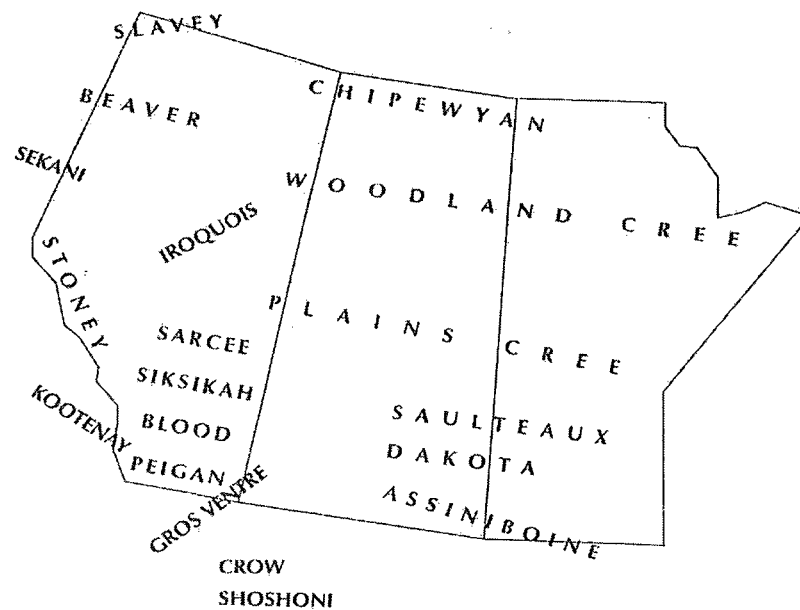
3.2 Historical settlement and land use patterns

3.2.1 Pre-European contact in the Prairie Provinces

Prior to European settlement, Aboriginal people of the Assiniboine, Cree, the Blackfoot (which include the Blood, Siksika, and Peigan), Gros Ventre, Kutenai, Shoshoni, Crow, and the Sarcee tribes occupied regions on the northern stretches of the Great Plains which were to later become the Prairie Provinces (Carter, 1999). The woodlands of the northern Prairie Provinces were occupied by the Chipewyan, whose territory stretched north to the tundra, and the western

regions of the Prairie Provinces were occupied by the Slaves, the Beaver, and the Sekani (MacGregor, 1972). Figure 6 outlines the broad regions occupied by various tribes prior to and upon contact with Europeans; however, it is difficult to know with certainty which peoples lived where prior to European arrival (Carter, 1999). After European arrival, the Shoshoni and Crow migrated south into what is now the United States, and the Kutenai migrated to the west side of the Rockies into what is now British Columbia.

Figure 6: Approximate Tribal Distributions



(Ward, 1995)

Aboriginals in this region engaged in a mobile and flexible way of life by traveling on foot, which often paralleled the movement of the buffalo, but which also reflected the location of sasaktoon berries, the prairie turnip and other fruits and tubers (Carter, 1999). Associated with this seasonal migration was migration in response to variable climatic or adverse environmental change. This gave them greater flexibility to migrate in response to drought than the European

settlers who later inhabited the region and were firmly tied to a specific homestead or settlement (Sauchyn and Beaudoin, 1988).

3.2.2 European settlement in the Prairie Provinces

The first permanent settlements were established in the 1880s after the Canadian government introduced legislation enabling individuals and companies to lease large tracts of land for a 21-year period, which, in concert with a flood of risk capital to the west, promoted rapid expansion of the ranching industry (Evans, 2000). The settlement by ranchers was also promoted by the growing demand for meat from rapidly growing urban populations in the northeastern United States and northwestern Europe and the ability to feed this demand with transportation links provided by the railways and cross-Atlantic steamships (Evans, 1987). These initial settlers felt they had found excellent conditions for raising beef cattle which soon replaced the indigenous buffalo (Gorman, 1988).

John Palliser had inspected the Northwest Territories during the late 1850s on behalf of the Canadian Government to determine its potential for agriculture (MacGregor, 1972). He examined an arid region now known as Palliser's Triangle, which encompasses the Mixed Grass Prairie Ecoregion and the Canadian Dry Belt, located in southeastern Alberta and southwestern Saskatchewan (see Figure 1), and concluded that the land was unfit for human settlement on account of its barren soil and arid climate. It was within Palliser's Triangle that some of the driest conditions and highest rates of out-migration occurred during the 1930s (McLeman et al., submitted 2008).

Despite Palliser's warnings, the Government of Canada, fearing the Americans would attempt to annex the Canadian prairies, was eager to settle the west with farmers who would

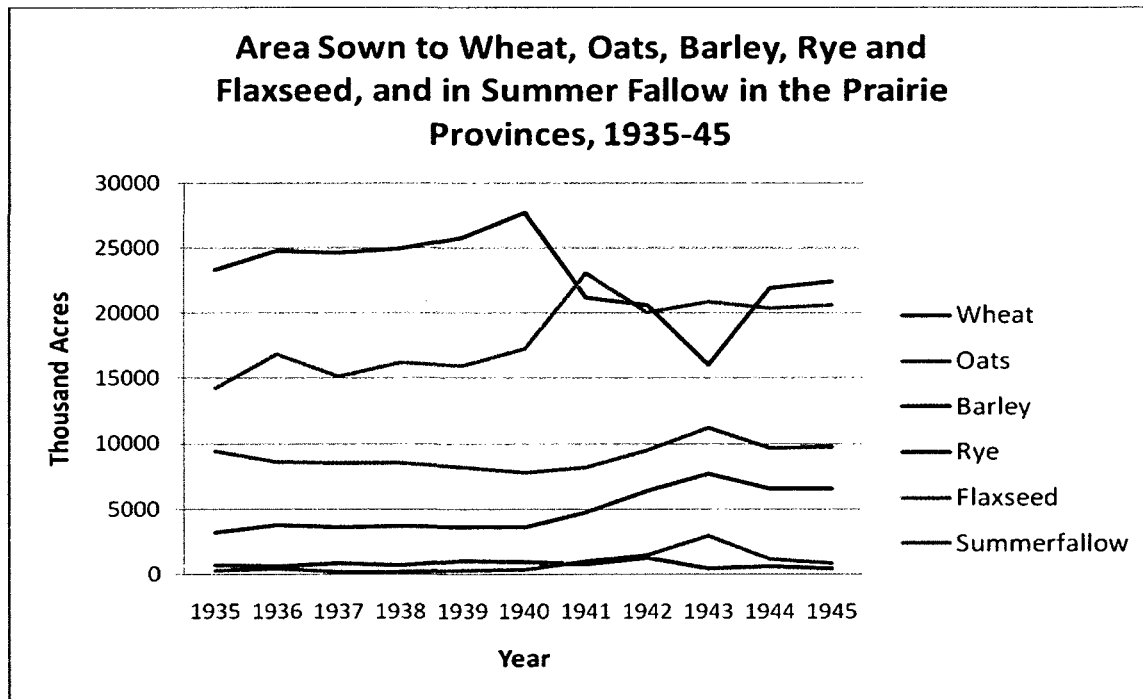
provide an economic stimulus to the nation. With the work of the CPR and John Macoun, a botanist from Albert University, the image of the west as an inhospitable desert was gradually dismantled, and was replaced with an image of the west as the Promised Land, flowing with milk and honey (Jones, 1987). Cattle ranching began a steady decline as immigrants streamed in to establish their homesteads.

In 1872, the Government of Canada passed a charter for the Northwest Territories known as the Dominion Lands Act (MacGregor, 1972). Under this legislation, anyone could file a claim on 160 acres of land for \$10 and could acquire title to the land once he met the requirements of a three-year residence clause, cultivating at least 15 acres of land, and erecting a home (MacGregor, 1972). In 1909, the region was officially opened for homesteading, and thus began the widespread conversion of Mixed Grass Prairie to farmland. The speed of settlement was truly remarkable. Many of the early settlers on the Canadian prairies were immigrants from Scandinavia, the Ukraine and other countries in central and northern Europe, often fleeing unbearable political turmoil or desperate economic conditions, and in search of a better life. However, homesteading proved very difficult for these early immigrants and two out of every five homestead applications in the Prairie Provinces were cancelled between 1871 and 1930 (Waiser, 2007).

During this time, the majority of Canadian farmers living in the Prairie Provinces planted wheat as their principle cash crop (see figure 7). Canadian wheat production increased dramatically during the early decades of the twentieth century and became Canada's top export, feeding European demand during World War I (Britnell and Fowke, 1962). For the Canadian economy and national identity, wheat was King (Owram, 2007). The average land holding size was 160 acres of land, also known as a quarter section of land, based on the method of land

subdivision into six-square-mile townships of thirty six equal sections (Britnell and Fowke, 1962).

Figure 7: Area Sown to Wheat, Oats, Barley, Rye and Flaxseed and in Summer Fallow in the Prairie Provinces 1934-45



(Dominion Bureau of Statistics, 1959).

The success of these early agriculturalists and the bumper harvests of 1905 and 1915 coincided with favourable climatic conditions, promoting agricultural expansion, a rise in commodity prices, and population increase (Sauchyn and Beaudoin, 1998). However, levels of precipitation during the boom years were generally above the long-term average annual precipitation, and did not reflect the norm. Indeed, after 1917 the climate resumed its characteristic variability and by the second half of the 1920s, precipitation levels fell and temperatures increased.

3.2.3 European settlement in Hanna and the Peace River District

Established in 1912, Hanna is the service centre for residents in CD5 and is relatively large in comparison to nearby communities and hamlets, offering a range of facilities and services. The size of Hanna, and its ability to survive and remain a thriving community after the 1930s is related to the fact that it is a Canadian National Railways division point (Burnet, 1979). Settlers to this region were predominantly German-Russian, many of whom remained in the area.

First settled by fur traders who arrived by canoe, The Peace River Country was historically isolated from urban centres such as Edmonton by hills, forests and muskeg and remained relatively isolated even after other areas in Canada were developed. The first homesteaders began settling the region in the early 1900s, but it was not until the construction of the Edson, Dunvegan and British Columbia Railway (ED&BC), which reached Peace River in 1916, that the first large wave of settlement occurred. These early settlers, who came mostly from eastern Canada, the US and Great Britain, relied on crop farming and cattle raising, as well as alternative activities, such as lumbering, fishing, trapping and mining in order to survive. The second large wave of settlement occurred in the 1930s, when many farm families from southern Alberta and Saskatchewan moved north (Hursey, 1996).

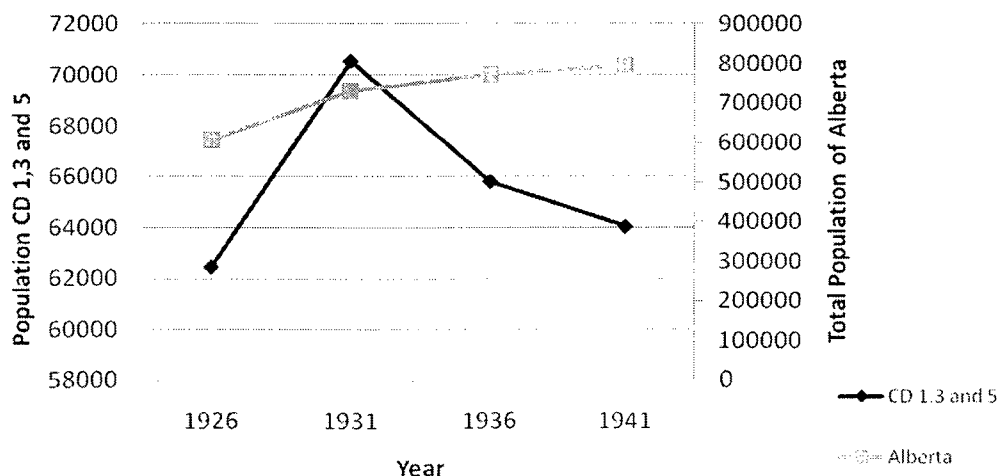
3.3 Drought and population movement in the Prairie Provinces and Alberta

Severe drought conditions of the 1930s in the Prairie Provinces occurred at the same time international demand for wheat collapsed, commodity prices fell into a downward spiral and unemployment rose. While all farmers in Canada suffered from the economic depression and low commodity prices, farmers in the Prairie Provinces suffered the most devastating social and economic consequences due to the concomitant climatic change (Britnell and Fowke, 1962).

The consecutive droughts in the Prairie Provinces throughout the decade affected over 7.3 million hectares of agricultural land and contributed to the out-migration of 250,000 people from the most arid regions (Gan, 2000). Popular writers have typically described this out-migration as a response to multiple adverse environmental and economic changes, primarily drought and economic depression (Gray, 1966; Berton, 1990). Some scholars, however, underscore the importance of drought as a critical factor that prompted migration (e.g. Jones, 1987). In an analogous study of migration from the US Dust Bowl during the 1930s, McLeman et al. (2008) suggest that drought-migration during that period can be studied as a means of interpreting the process by which rural populations adapt to climatic and non-climatic stresses and opportunities more generally.

As a whole, the three provinces boasted a rural population of more than 1.3 million in 1926 and more than 1.5 million in 1936. While the overall rural population increased, these figures hide the large numbers of intra-regional migration of farmers from drought-stricken areas. Rates of out-migration in south-eastern Alberta ranged from 40 percent to as high as 80 percent in some districts (Gorman, 1988). The *Census of the Prairie Provinces* (1946) shows that between 1926 and 1941, Alberta's Dry Belt (roughly CD 1, 3 and 5) -peaked in 1931 with a population of 70,566 and declined to 64,039 by 1941 (Figure 8).

Figure 8: Population of CD 1, 3 and 5 and Total Population of Alberta, 1926-1941



There was a significant movement of people from the driest areas of the province to a variety of destinations both within and outside of Alberta (Britnell and Fowke, 1962). Within the Province, some families moved to urban centres and doubled up with friends or relatives to save money (Gray 1966), but a more significant population movement was from the drought-prone regions toward the park belt which encompasses Peace River country. Still others left the province entirely, migrating to British Columbia, Ontario, Quebec or the United States (Britnell and Fowke, 1962). For those who did not go to the Peace River country anecdotal reports suggest the choice of destination may not have been easy. One man recalled flipping a coin to decide whether he would move to Victoria, BC or to Toronto, Ontario (Williams, 1981).

In 1931, the Province of Alberta, the federal government, and the railways joined to share the cost of a resettlement plan for destitute farmers, transferring them from the dried out regions of Alberta to the northern districts, such as Peace River, where there is higher precipitation (Wetherell and Kmet, 2000). During this time, the Alberta government promoted the Peace River country as the new land of opportunity where good quality farmland was still available (Broadfoot, 1978). However, impoverished migrants faced a different reality upon arrival, with most of the good land containing rich black soils already taken, leaving them with marginal, poor quality land (Hursey, 1996). The allocation of marginal farm land to drought migrants was to create ongoing problems and demands for welfare (Wetherell and Kmet, 2000). Many migrants also took advantage of the free freight to move to land in the Red Deer and Edmonton districts (Wetherell and Kmet, 2000).

Migration was not a perfect adaptation strategy. Before leaving, migrants often held auction sales, selling their limited assets in order to earn some cash for their travels (Gray 1966; Broadfoot 1978). Those who moved to northern Alberta faced significant challenges because

many arrived with limited financial capital and found that they had exhausted their savings before getting their land into production (Friesen, 1984; Wetherell and Kmet, 2000). In addition to the lack of money, migrants arrived with limited resources, such as livestock feed, or seed, and thus became stuck in a cycle of poverty (Wetherell and Kmet, 2000). They also faced the prospect of farming in an unfamiliar ecozone and had limited social support. As the out-migration from drier parts of the Prairies continued, many once lively towns and thriving communities became ghost-towns and disappeared from the map.

3.4 The Special Areas and the Prairie Farm Rehabilitation Administration in Alberta

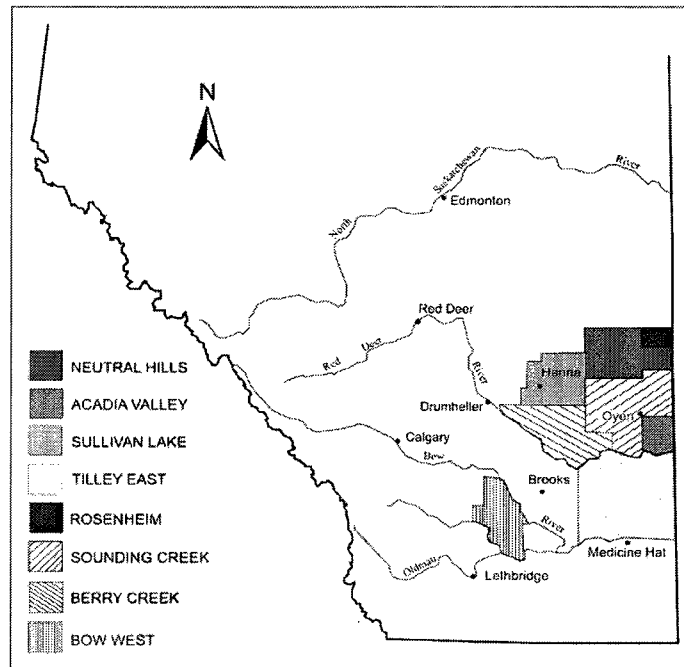
All levels of government were initially reluctant to provide relief or rehabilitation to the drought-stricken farmers of Alberta (Britnell and Fowke, 1962). However, by the mid 1930s, as the crisis became more acute, the federal and the provincial governments responded with specific institutional measures to rehabilitate the drought-prone land and to assist both those who wished to leave and those who wished to stay (Gorman, 1988). The Federal government established the Prairie Farm Rehabilitation Administration (PFRA) in 1935, and the Alberta government established a unique administration structure known as the Special Areas in the region most devastated by drought throughout the 1930s (Figure 9). Both institutions, which function to this day, represent important institutional responses to drought in western Canada and perform similar activities. These activities include the building of dams and dugouts to store water, developing community pastures, actively re-grassing large areas of land, encouraging new farming methods such as strip farming and trash farming, and promoting resettlement (Britnell and Fowke, 1962; Jones, 1987). However, Alberta was less inclined to cooperate with the PFRA than Saskatchewan because the Province of Alberta had developed its own administration to deal

with the crisis (Marchildon et al., 2007) and because Premier William Aberhart was not interested in handing any land back to the federal government after the province had recently obtained control over its land and resources (MacDonald, 2000). For this reason, discussion focuses on the Special Areas in Alberta during the 1930s.

Upon creation, the Special Areas covered an area of more than 7.8 million acres of barren prairie in south-eastern Alberta which included CD5 (Masson and LeSage, 1994), one of the two field locations for this thesis (see Figure 2). After numerous studies, the Tilley East Special Area Act came into effect in 1927 and became the model for an expanded region of 7,000,000 acres in south-eastern Alberta that required massive rehabilitation and restoration (Gorman, 1988). Tilley East and the Berry Creek areas were the first two special areas to be created. These led to the creation of the Sullivan Lake, Neutral Hills, and Sounding Creek areas in 1935 and Bow West area in 1937. In 1938, all the Special Areas were brought under a single law, the *Special Areas Act*, and under a single authority, a three-member board appointed by the provincial government.

Once Alberta gained control of its land in 1930, the Alberta government quickly abolished the homesteading system and replaced it with a lease system (Wetherell and Kmet, 2000). The government froze the sale of 1.5 million acres of Crown land and seized 2 million acres under the Tax Recovery Act – much of which represented abandoned homesteads by drought-stricken farmers (Masson and LeSage, 1994). This land was then made available through inexpensive lease agreements to non-migrants for grazing or grain growing under strict land use regulations.

Figure 9: Special Areas of Alberta 1938



(Marchildon et al., 2007)

Existing settlers were favoured and were given preferential access to land leases on properties abandoned by neighbours. As a result, the establishment of the Special Areas changed both the form of land tenure and the agricultural economy by significantly increasing the size of landholdings (Burnet, 1979) and inducing a major change from wheat farming to livestock operations (Longman, 1932). The Special Areas Board was also given the responsibility for operating schools and hospitals, and maintaining roads and community pastures, thus performing functions similar to any municipal council (Masson and LeSage, 1994). Marchildon et al. (2007) suggest the establishment of the Special Areas was crucial to increasing the adaptive capacity of drought-stricken farmers, and may have averted even greater levels of hardship, farm abandonment and hunger. The following chapter details the methodology for this study.

Chapter 4: Methodology

This study was designed to examine the relationship between drought and human migration during the 1930s in the Canadian Prairies in order to learn lessons from the past that can potentially be applied to future occurrences of drought and economic hardship. It examines the determinants of adaptive capacity for non-migrants and migrants, the various adaptive strategies employed to cope with drought, and the personal experiences of migrants who moved from drought-prone regions of southern Alberta to the Peace River district in northwestern Alberta. This study builds on previous research which examines the vulnerability of agricultural systems to climatic change (e.g. Smit and Skinner, 2002; Reid et al., 2006; McLeman and Smit, 2006a; Meze-Hausken, 2007) and offers new insight into the role of human migration as an adaptation strategy.

This chapter outlines the key questions, conceptual framework, selection of case study locations, and data collection and data analysis. The methodology was created following a review of relevant literature to guide the development of the research questions and the general methodological approach (e.g. Jones, 1987; Smit and Wandel, 2006; Marchildon et al., 2007). Apart from two interviews conducted with the offspring of people who had migrated, all primary data were collected via interviews with people who had first-hand experience of adaption to drought in the 1930s and the migration process. Secondary and archival data, such as local histories and government documents were also analyzed to compare, substantiate, and provide context for the primary information obtained from interviews. From this information, I drew conclusions and offered lessons based on the findings. Further details now follow.

4.1 Key questions

This study examines a number of key questions: What factors influenced the adaptive capacity of households to cope with drought? Were there differences in the adaptive capacity of migrants and non-migrants? What adaptation strategies were employed to cope with drought and economic hardship? What factors facilitated or constrained various adaptations strategies? Do participants consider migration to have been a successful adaptation strategy to drought? What lessons can we draw from this case study that may be relevant to building adaptive capacity of rural residents who face similar conditions of climatic and economic stress in the future?

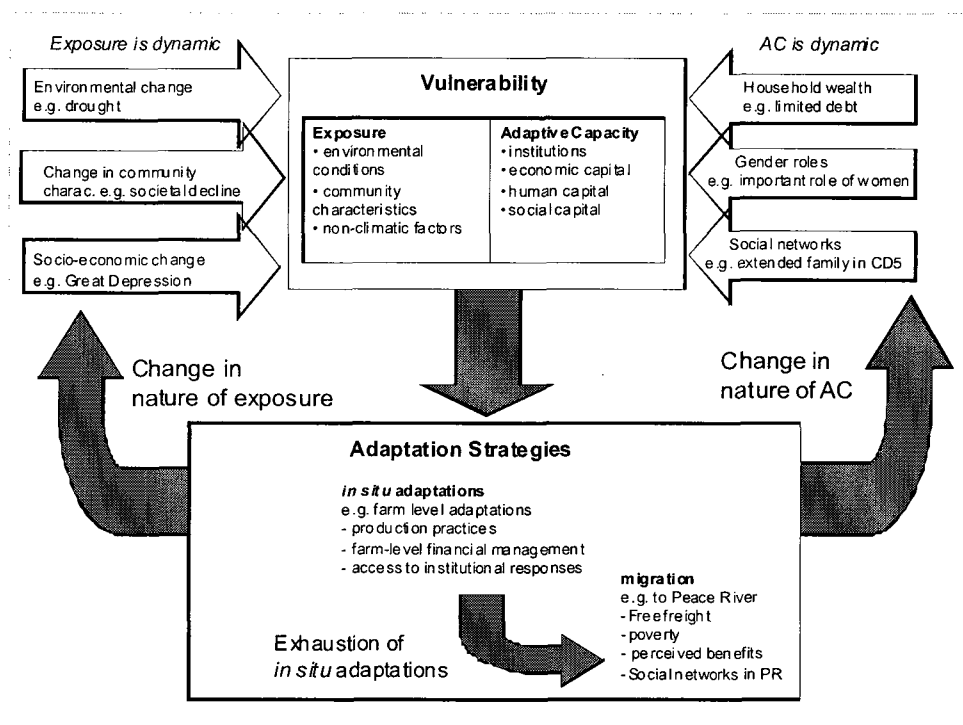
4.2 Conceptual framework

The IPCC defines vulnerability as “the degree to which a system is susceptible to, and unable to cope, with adverse effects of climate change, including climate variability and extremes” (IPCC, 2007). As discussed in Chapter 2, vulnerability is often conceptualized as a function of exposure to climate change impacts and the adaptive capacity to cope with that exposure (Smit and Pilifosova, 2003; Smit and Wandel, 2006).

Figure 10 illustrates the key components of vulnerability, adaptation strategies with reflect the level of vulnerability, and migration as one form of adaptation. Vulnerability is shown to be a function of both exposure and adaptive capacity. The three arrows on each side pointing to exposure and adaptive capacity represent examples of changing factors, both climatic and non-climatic, that result in changes to both exposure and adaptive capacity. This suggests that both exposure and adaptive capacity are dynamic over time. Adaptation strategies reflect the level of vulnerability and can be either *in situ* adaptations or can involve human migration.

The adaptation options presented in this figure represent just a few examples of many potential adaptation options that may alleviate adverse climate change impacts. All adaptation strategies alter the nature of exposure and adaptive capacity, which in turn alters the level of vulnerability. With successful adaptation strategies, vulnerability can be reduced. This diagram shows the feedback loops associated with these concepts.

Figure 10: Conceptual Model of Vulnerability and Adaptation to Climate Change



There are various approaches to studying the vulnerability of systems to climatic change due to different epistemological approaches, often categorized as ‘top-down’ and ‘bottom-up’ approaches. This project utilizes a ‘bottom-up’ approach, also described as the ‘vulnerability approach’.

A top-down approach to studying vulnerability can involve a number of methods, but typically does not involve an empirical examination of actual processes of adaptive capacity or adaptation (Smit and Wandel, 2006). As such, adaptation is assumed rather than documented. Methods for assessing vulnerability may involve the prediction of future climate change impacts at broad scales based on climate models, or the identification of possible future adaptation strategies by a researcher based on observations, analysis, modelling and key informants (Smit and Wandel, 2006).

The bottom-up approach, increasingly employed in the field of climate change adaptation, uses first-hand information from decision-makers on the nature of exposure to climatic and non-climatic stress, adaptive capacities and actual adaptation strategies employed to cope with adverse changes in the climate (Kelly and Adger, 2000; Ford and Smit, 2004; Reid et al., 2006; Smit and Wandel, 2006). This approach enables community stakeholders to identify multiple stimuli to which they are exposed, both climatic and non-climatic, that can range from adverse economic, social, environmental and political conditions (Smit and Wandel, 2006). Research methods include semi-structured interviews, participant observation and focus groups, as well as data collection from literature and other sources of information. The benefit of this approach is the ability to document actual exposures, adaptive capacities and adaptation strategies and identify various barriers or constraints to individual choices. In so doing, this approach has the potential to identify means of decreasing exposures, increasing adaptive capacities and incorporating adaptation strategies into existing structures and institutions (Smit and Wandel, 2006).

The vulnerability approach guided the interview questions, data analysis and data interpretation for this study. There are a variety of factors which influence the ability of farmers

and households to adapt to the changing climatic and non-climatic exposures. I did not presume that certain variables, such as household wealth or strong social networks, represented critical determinants of adaptive capacity for Canadians who inhabited the prairies during the 1930s, but I sought to identify possible determinants by asking the participants themselves. Thus, informants were asked to identify variables that increased or decreased their adaptive capacity, adaptive strategies employed, barriers to adaptation, and personal experiences with migration.

4.3 Selection of case study locations

I selected locations for my case study by using information from a pre-existing GIS model developed at the University of Ottawa in the LAGGIS lab by McLeman et al. (submitted, 2008) that is capable of detecting 'hotspots' where high levels of out-migration coincided with severe drought. This model combines digitized census data and modeled historical climate data at a 10 km² grid scale to generate maps illustrating hotspots where climatic conditions may have had the effect of stimulating out-migration from the period 1926-1936. These data are examined at the census district scale. Census district boundaries generally follow county boundaries for the Prairie Provinces, a scale identified by a number of authors as appropriate for studying the relationship between population and environmental change on the Great Plains (Gutmann, 2000; Polsky and Easterling, 2001).

McLeman et al. (submitted, 2008) identify five 1926 census divisions with negative population change of more than 10% during the time period 1931-36 which coincide with high temperatures and low precipitation. The census district numbers identified are CD5 in Alberta, CD7, CD3 and CD1 in Saskatchewan, and CD4 in Manitoba and are located in areas across south-central Saskatchewan and southeastern Alberta (See Figure 11).

Figure 11: Climatic Patterns and Population Change during the Study Period

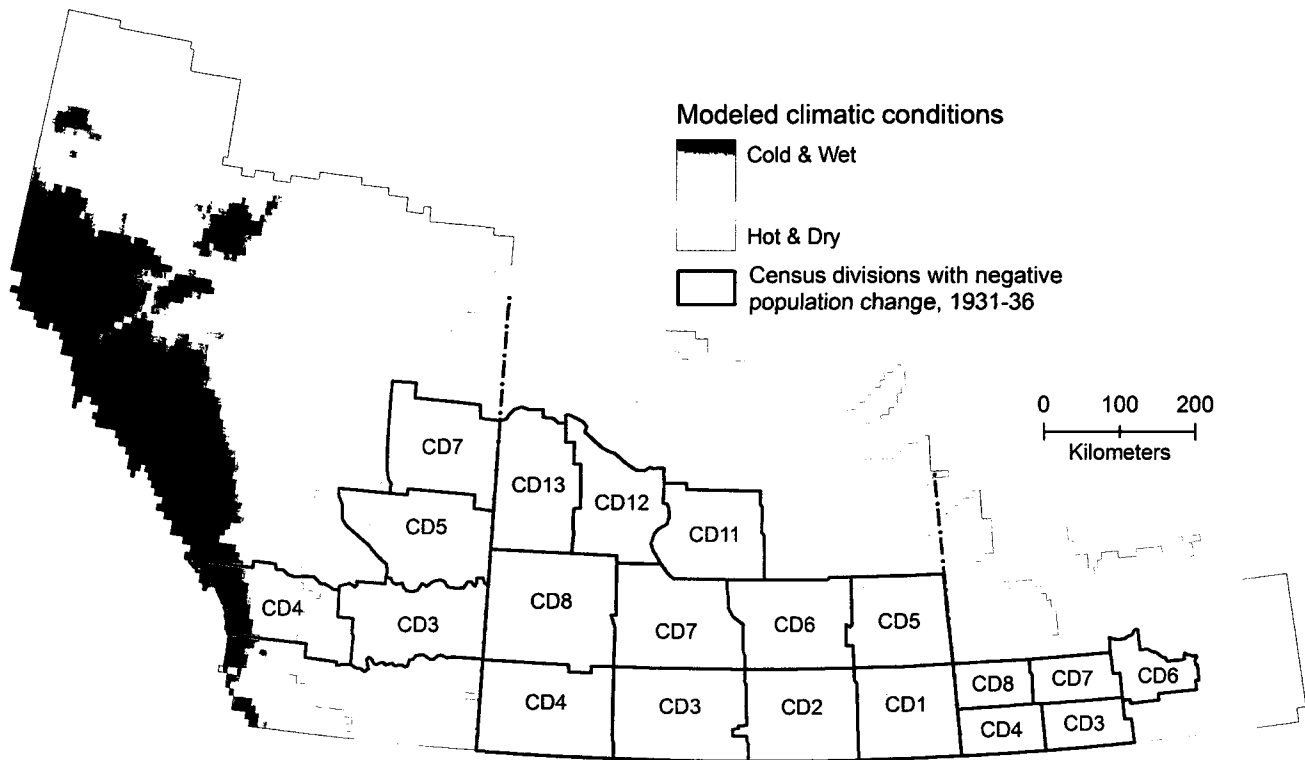


Image displays census divisions that experienced population decline between 1931-1936. These are displayed over a map that displays summer maximum temperatures and precipitation patterns over the period 1926-1936. Climatic variables are displayed at a resolution of 10km^2 grid cells. Each grid cell is ranked according to (1) average maximum temperatures in July and August (2) monthly precipitation May-June) and (3) winter precipitation (December-April). These variables were described by the authors to be critical determinants of wheat yields in the study region. Red areas are the hottest and driest during the study period, blue cells the coolest and wettest during critical periods (McLeman et al., submitted, 2008).

McLeman et al. (submitted, 2008) note that there is significant visual correlation between areas that experienced severe drought and areas that experienced significant population loss.

Secondary readings support the relationship shown in the model and suggest that many people migrated from CD5 to the Peace River country in the 1930s in response to drought conditions (Gray, 1966; Jones, 1987; Wetherell and Kmet, 2000). McLeman et al (submitted, 2008) show

that CD5 suffered a population decline of more than 15% between 1931 and 1936. However, out-migration from this region began much earlier, starting in the 1920s and continuing throughout the 1930s. In 1921, the population of CD 5 reached its peak at 31,220, in 1936, it was 21,359 (Jones, 1980) and by 1941 was only 18,926 (Burnet, 1979). On this basis I selected CD5 as my starting point for my field research and conducted interviews in the community of Hanna and surrounding hamlets. I chose the Peace River District as my final point for field research and conducted interviews in Edmonton, Stony Plain, Grande Prairie, Peace River and Grimshaw (see Figure 2).

4.4 Data collection and data analysis

This study involved a literature review, the collection of primary data from interviewees, and the collection of secondary and archival data. The emphasis of data collection was on gathering first-hand information from people who were alive during the 1930s and who recalled their observations or experiences of adaptation to drought and the drought-migration process. However, the use of these three types of information helped to triangulate interview data in order to gain mutual confirmation of information and validate findings (Mitchell, 1986; Sohler, 1988; Leedy, 1993). The use of more than one form of data collection to identify consistent findings increases the objectivity of the results, thereby minimizing personal biases that might stem from a single methodology (Frankfort-Nachmias, 2000).

The research process began with an exhaustive review of relevant literature to this study, including sources from academic journal articles and books. Initially, a detailed list of relevant topics was developed. After further research and consultation with my thesis supervisor, pertinent research fields were refined and narrowed to five key themes: vulnerability and

adaptation to climate change, vulnerability and drought-migration in agricultural regions, general theories of migration, migration theory and environmental change, and migration as an adaptation to drought. Keywords used to locate materials included: drought, migration, population, vulnerability and climate change. Hard copies of sources were organized and catalogued according to their key themes. This process helped me to identify the most important references and scholars on particular topics. After completing the search, I assessed the information to identify key research gaps and show how this study fits within the research of others. The literature review was written according to the key themes identified above in order to provide a backdrop for my research and to highlight its potential contribution to knowledge.

The second step of the research process involved the design and execution of interviews to collect primary data on my research topic. Interviews were designed to document the processes and factors which influenced adaptive capacity and adaptation strategies, with attention given to migration as an adaptation strategy. Before I started interviewing, I created an interview guide which consisted of four sections: family history and farm characteristics during the 1930s (determinants of adaptive capacity), climatic and non-climatic hardships during the 1930s (exposures), coping mechanisms (adaptation strategies), and stories or experiences of migration (Appendix A).

Section one sought to identify key forces that may have contributed to the interviewee's adaptive capacity during the 1930 and to create a rapport between the interviewer and interviewee. Interviewees were asked about the nature of their farm operation during the 1930s such as size of farm, technological equipment, number and types of livestock, etc. Questions in this section also included discussions on perceived risks, personal skills, experience and education, and social ties. Section two sought to identify critical exposures and their relative

significance to increasing the interviewee's vulnerability. This section included questions on technological, economic, biophysical, socio-cultural and institutional exposures which were generally exogenous to the farm unit. Note that these questions were designed such that the interviewee was not guided toward describing particular types of exposures, but allowed him/her to identify those exposures he/she felt were most critical. Section three sought to identify important adaptation strategies across a range of scales and various barriers to adaptation strategies. Finally, the fourth section asked interviewees about their specific experiences with migration in order to understand migration as one type of adaptation to climatic change. Based on the interview guide, interviews were semi-structured, consisting of a series of open-ended questions, delivered in an established order. A total of 37 semi-structured, in-depth interviews were conducted in order to gain an understanding of the complex processes that influence adaptive capacity and adaptation strategies, including migration. Of these respondents, 22 were non-migrants, located in various communities or rural regions of CD5. Of the remaining respondents, 13 were migrants and 2 were children of migrants, still living in the Peace River region. Participants were selected using a purposive snowball sampling approach. Most typically, recruitment was undertaken with the assistance of a long-time resident in the community employed at the local history museum.

Interviews were generally conducted in the interviewee's residence, which included original homesteads, urban homes, and retirement homes. Interviews usually lasted two hours in duration, but ranged from one to four hours. Recording equipment was not used during the interviews. Rather, hand-written notes were taken due to the advanced age of the interviewees and their associated comfort levels. These notes were transcribed onto a computer immediately following the interview. Detailed field notes were taken throughout the research process which

included information on the location and time of each interview, characteristics of the interviewee, contact details, characteristics of the interview setting, participant behaviour prior to, during and after the interview and follow-up contacts with the participants.

Table 1: Respondent Characteristics

Total number of respondents	37
Number of Males	17
Number of females	20
Number of non-migrants	22
Number of migrants	13
Number of children of migrants	2
Youngest respondent*	77
Oldest respondent	99
Average age	87
Number of respondents currently living towns or cities (typically retirement homes, residential homes, apartments or condos)	34
Number of respondents currently living on family farm	3

*Does not include children of migrants

Table 1 shows that respondents ranged in age from 77 to 99. During the period in question, some were young children, others were adults with their own families, but most were in their early to mid-teens. The vast majority of respondents are no longer farming or living on the family farm because of their advanced age and because of the socio-economic changes that have occurred in Canadian agriculture whereby industrial agriculture has largely replaced small-scale family farming. Of the total respondents, 34 have moved to urban centres into retirement homes, residential homes, apartments or condos. Only three respondents continue to live on their original family farms.

No one I approached to interview refused to participate. Some participants displayed initial hesitation due to their concern over perceived inability to recall detailed information, but

most typically enjoyed the experience and were eager to have a captive listener. Many respondents offered intimate disclosures, such as feelings of sadness over the loss of a spouse or child which fostered trust between me and the respondent.

Information from interviews was subsequently categorized into key themes in an excel spreadsheet, based on the interview guide structure, accompanied by illustrative quotes from the interviewees. The master table involved organization of the data into exposures: technological, economic, biophysical, socio-cultural and institutional, as identified by Smit et al. (2006), adaptive capacity: attributes of farm, experience, perception, assets, technology, and social capital, adapted from Yohe and Tol (2002), Smit and Pilifosova (2003), Belliveau et al. (2006), Reid et al. (2007), and adaptation strategies: technological developments, government programs, farmers' operational practices and farm-level financial management, a categorization developed by Smit and Skinner (2002) (Appendix B). Additional excel spreadsheets were created to organize the critical factors that either facilitated migration (Appendix B) or enabled people to stay in CD5 (Appendix B). Within the excel spreadsheets, migrants were distinguished from non-migrants by colour-coding migrants red and non-migrants green. Factors identified by interviewees as critical factors in either facilitating migration or enabling people to stay in CD5 were colour-coded red and green respectively. Attention was given to ensure consistent categorization of data which enabled effective data analysis.

Upon writing the results from this study, I revised the organizational structure to minimize redundancy and focus on the key questions identified earlier. It was not necessary to maintain a separate section for "exposures" since every interviewee stated categorically that drought was the primary reason for migration and given that most residents were exposed to similar conditions of climatic and economic stress. The results were reorganized into the two

broad categories: adaptive capacity and adaptation strategies. As discussed in Chapter 2, “adaptive capacity” refers to the ability of a system (in this case households) to adapt to the impacts of climate change (Smit and Pilifosova, 2003; Smit and Wandel, 2006) and “adaptation strategies” refers to the specific adjustments in a system that enable it to better cope with exposures (Smit and Wandel, 2006). Based on information obtained from interviewees, the section on adaptive capacity was sub-organized according three forms of capital endowments: economic capital, human capital and social capital. The section on adaptation strategies was sub-organized according to a revised version of Smit and Skinner’s (2002) typology of agricultural adaptation strategies: i) changes in farm production practices; ii) adjustment to farm-level financial management; and iii) institutional adaptations

Secondary and archival data were collected from books, memoirs, government documents and local history books for communities in CD5 and in Peace River. After initial analysis of the interviewee data and the identification of key themes based on the categories discussed above, matching themes within the secondary and archival data were identified and compared to the interviewee data. For example, the size and quality of landholdings, a recurring theme identified by interviewees, was categorized under economic capital in the final analysis and was substantiated with relevant archival data. The creation of tables to organize secondary and archival data was not necessary because the critical components and structure had already been identified from the interviewee data. Rather, secondary and archival data were inserted into the draft text of the interview results where it was deemed appropriate. The process of comparing archival data to interviewee data was iterative and ongoing from the initial analysis to the final editions of the results. Information from secondary sources helped provide additional background and context to the information gained from the interviews.

After the organization of primary interview data based on the initial categories, I began the process of data analysis and interpretation. Firstly, I noted segments of information identified by respondents as critical to adaptive capacity and adaptation. I also noted additional segments of information that I deemed important based on the combination of interviewee data and secondary data. Within these segments of information critical to adaptive capacity and adaptation, I looked for key themes and patterns. In particular, I looked for general similarities and differences between migrants and non-migrants. Several important patterns began to emerge. For example, upon initial examination of the data tables, I noted that local social networks within CD5 were typically reported as strong by non-migrants, but typically reported as weak by migrants. Where I had data from multiple informants, archival sources and secondary sources converging, I took such information as being evidence for important influences of adaptive capacity and adaptation strategies. A significant amount of information received was not reported. In some cases, I was given information by informants that was not substantiated by statements from other informants or from archival and secondary data. While the information may have been truthful, I was unable to triangulate it or gauge its validity and therefore did not report such information.

The results from this analysis are reported in Chapter 5, which details the adaptive capacity and adaptation strategies of residents in CD5 during the 1930s, and Chapter 6, which documents the migration process. Chapter 5 was first written based on the initial data organization of exposures, adaptive capacity and adaptations strategies as discussed above. However, upon reflection and further consultation with the literature, I decided to recast these codes, abandoning the section on exposures and removing redundancy between adaptive capacity and adaptation strategies. The data were linked to the overarching concepts of adaptive capacity

and adaptation in order to move from data analysis to data synthesis. According to Ragin (1994, pg. 55) data synthesis involves “putting pieces together and making sense of them.” Thus, the final stage of reporting results involved understanding the relationship between the various segments of information and viewing them as a coherent whole.

Chapter 6 was written as a narrative of the migration process and is sensitive to the respondents’ stories. Like Chapter 5, Chapter 6 was based on the data tables, but also involved more frequent references to the original transcripts, and has a decidedly different tone. The analysis and interpretation for this chapter was much more fluid and iterative than Chapter 5, as I attempted to develop the story of migration which has a beginning, middle and end. The following chapter details the key findings from this study.

Chapter 5: Results

5.1 Introduction

In this chapter relevant information obtained from interviews is reported and supported with information from secondary literature and archival data. It is organized according to the basic structure of adaptive capacity and adaptation strategies, consistent with the vulnerability approach to climate change impact research described in Chapter 2. The information collected is further organized according to categories described in the methodology chapter of this document (Chapter 4). Each category/sub-category begins with a brief discussion of the secondary literature and archival data to provide general descriptions of conditions for rural residents in south-eastern Alberta, and then proceeds to detail information gained from interviewees that describe the specific experiences of residents of the Hanna region (CD 5) and of those who migrated from that region to the Peace River Country in north-western Alberta. The results provide insights into the similarities and differences in adaptive capacity of non-migrants and migrants, and point to various factors that facilitated or constrained certain adaptation strategies. As detailed in Chapter 2, the factors that underlay adaptive capacity and the adaptation processes and strategies that emerge when exposed to climatic stress are complex and interrelated (Yohe and Tol, 2002; Smit and Wandel, 2006). The categories used in this chapter and the information they contain may, as a result, overlap to a certain extent, but attention has been given to ensure as much as possible that there is a consistent organization of information and minimal redundancy.

5.2 Factors influencing adaptive capacity

This section discusses the various factors identified by interviewees that influenced the adaptive capacity of residents of south-eastern Alberta generally, and more specifically, residents of CD5, during the 1930s to cope with a combination of adverse exposures, including drought, dust storms and economic decline. In Chapter 2 “adaptive capacity” was described as being the ability of individuals to cope with exposures and is shaped by macro-structures, including social, cultural political and economic processes which operate at various scales (Yohe and Tol, 2002; Smit and Wandel, 2006). Some determinants of adaptive capacity typically operate on micro-scales and others typically operate on macro-scales, but many represent an interaction of scales. For example, social networks are a product of both local social capital, such as willingness to share labour and resources, and macro-level institutional forces, such as land settlement policies. Local adaptive capacity is often conditioned by community adaptive capacity, which in turn is conditioned by regional adaptive capacity (Smit and Wandel, 2006). Furthermore, many of the determinants of adaptive capacity discussed here are interdependent. For example, economic well-being may be increased by strong social networks in the local community.

The critical determinants of adaptive capacity discussed here are: economic capital, human capital, social capital, and perception. Table 2 provides a summary of the broad findings on the similarities and differences between migrants and non-migrants according to their variable adaptive capacity. The results suggest that migrants generally tended to have weaknesses in one or more of the factors underlying adaptive capacity vis-à-vis non-migrants. While weaknesses in adaptive capacity did not necessarily “cause” migration to occur, it will be shown that a weakness in even one aspect of adaptive capacity could influence a household decision to

migrate. It is important to note that individual households faced their own unique combination of characteristics, and the interaction of factors in any given situation could result in some factors being more important than others.

Table 2: Summary of Factors Influencing Capacity of Migrants and Non-Migrants from CD5, Alberta in the 1930s

Factor	Adaptive capacity	Migrant	Non-migrant
Economic capital	Household wealth	-poverty -indebtedness -larger families, fewer resources	-poverty/potentially greater wealth -limited debt -smaller families, more resources
	Size and quality of land holding	-original quarter-section -poor soil quality -limited access to water	-original quarter-section -adequate soil quality -limited access to water
Human Capital	Subsistence skills/self-sufficiency	-decreased self-sufficiency	-adequate self-sufficiency
	Gender roles	-loss of spouse, failure to marry (e.g. bachelors)	-contribution from both man and woman
	Experience in dryland farming	-limited experience (e.g. Europeans)	-adequate experience (e.g. settlers from US Midwest)
	Experience in a trade	-Migrants to communities may have experience in a trade, migrants to Peace River often do not	-lack of experience in trade constrained option of migration to communities/urban centres.
Social Capital	Geographically local social networks	-Weak social networks in CD5 -Isolation and loneliness -limited extended family in region	-Strong social networks in CD5 -sharing of resources -extended family in region
	Geographically distant social networks	-strong social networks with migrants or people in destination region.	-weak long-distant social networks.
	Population change and societal well-being	-out-migration from region -societal decline	-limited out-migration from region -healthy societal well-being
Perception, awareness of risk, hindsight	Hope vs. Lack of perseverance	-lack of perseverance	-maintained hope

5.2.1 Economic capital

Economic factors that were reported to influence adaptive capacity include household wealth and the size and quality of landholding. These economic factors, experienced at the household level, are heavily conditioned by macro-economic and ecological processes, including global economic collapse, a decline in commodity prices and widespread crop failure (Yohe and Tol, 2002).

Discussion here includes financial capital, resources and assets.

5.2.1.1 Household wealth

Household wealth influenced adaptive capacity of residents in south-eastern Alberta during the 1930s and was determined, in part, by three important factors: relative wealth at the time of settlement, the degree of indebtedness and family size. Average household wealth of all prairie farmers plummeted during the 1930s as they confronted the combined forces of drought and economic depression. Farmers faced the high cost of farm machinery, high freight rates, high interest rates, limited credit, high taxes and low commodity prices (Eggleston, 1992). With virtually no money, many farmers relied on milk and potatoes as their staple diet and wore gunny sacks as dresses (Burnet, 1979). Housing conditions deteriorated because maintenance and repairs became unaffordable (Burnet, 1979). Land values fell precipitously, from \$12.89 per acre in 1915-1919 to \$7.51 in 1925-1929 in the Hanna region (Stewart and Porter, 1942).

One contributing factor to the variation in economic wealth among farmers in Western Canada during this time was the relative amount of resources they brought with them at the time of immigration and settlement. Local histories indicate that immigrant groups arrived with significant variations in financial resources. Settlers from Europe typically had few possessions, while those from the United States and Eastern Canada often brought entire railway cars of

effects with them. Some wealthier immigrants even brought horses or oxen with them (James, 1978). While these differences in wealth were mediated over time by the individual success of family farms, they played a role in the adaptive capacity of families once drought and depression struck (Waiser, 2007). For example, William Hoffman (1978), who migrated to the Hanna region from Illinois in 1901 explains that he brought a boxcar with livestock and farm machinery - resources which helped him establish his homestead without incurring debt.

A second contributing factor to variation in wealth among farmers in south-eastern Alberta was the degree of indebtedness during the 1930s. There had been a general mood of optimism and euphoria after a number of bumper crops in the 1910s. In 1916 high quality hard wheat was selling at \$1.35 cents/bushel and there was so much grain that local facilities were overwhelmed (Gorman, 1988). Farmers, encouraged by government policy, abundant precipitation, high yields and soaring commodity prices thought the good times would last and decided to purchase cars, farm machinery, livestock and land at premium prices – much of it on credit. The 1920s witnessed a relative abundance of credit as doctors, lawyer, bankers and merchants continued to extend credit to farmers based on the assumption that wheat prices would rise (McGinnis, 1980). However, after the stock market crash of 1929, credit availability was significantly curtailed (Regehr, 1983). As a result, by the 1930s, many farmers were burdened with unbearable debt loads and unable to obtain further credit.

Debt soon became unbearable for many farmers who simply could not afford to pay it back. Farmers who faced the seizure of their land and assets due to unpaid bills and taxes found it nearly impossible to stay (Jones, 1987). Land was lost to economic foreclosures and families fled in the middle of the night out of shame and humiliation (Jones, 1987). Some families serviced their loans with crop payments. But when crops started to fail, this method of payment

became impossible. Those unable to make improvements on their land also lost it to the government, banks, mortgage companies and insurance companies. Jones (1987, pg. 154) tells the story of Joe Miller, a homesteader who worked sixteen hours a day on his farm, but could not make enough money to repay all his loans. One day, with an order from the bank and implement dealer, the sheriff approached him and explained that all his stock would be seized. The following day, Joe along with his wife and children, decided to abandon their farm. He was just one among many farmers who had their assets seized by creditors seeking payment. Thousands of Albertans were forced off their land after failing to pay their property taxes, and remaining farmers were left with virtually no income (Masson and LeSage, 1994).

Respondents addressed the critical role debt and economic foreclosures played in precipitating out-migration from CD5. Respondent 1, a non-migrant from Hanna, explained, “A lot of farmers borrowed, and then those guys claimed it back again. I guess those who owned all their land were able to stay more than those who were in debt. But farmers bought more land than the original quarter section on loan, and when the 1930s came, they went capoot.”

Respondent 2, a migrant who moved from Gleichen to Calgary in 1929, said, “That’s why you needed crops so badly – to pay your credit on land.” More and more farmers lost their land to foreclosures as the value of their land declined and dragged them into negative equity.

Respondent 2 explained that his father had purchased a quarter section of land on credit from the CPR at a cost of \$55 and had paid the value of the farm in interest payments, but still owed the principle. When the land was re-evaluated, it was determined that it was worth only \$8.

Generally, more migrants reported that their fathers carried debt during the 1930s than non-migrants. Respondent 3, a migrant from Patricia to Grande Prairie in 1928, said, “Dad couldn’t make the crop payments, so he lost the farm and just walked away from it.” Respondent

4, a non-migrant who lived on a farm near Hanna during the 1930s, explained that her family's survival was dependent on a kind creditor in town who himself could afford to be accommodating during the tight financial times. She said, "Dad carried debt throughout the decade and finally paid the loan back in the 1940s. The loan was from a good fellow in town who was a businessman. He would say to my dad, 'I know you're trying. Just keep on trying.'"

A third contributing factor to the variation in economic wealth among farmers in south-eastern Alberta during the 1930s was family size. This was a time when generally, large families meant more hands to help out with farm work, increasing the viability of the farm unit. But with the combined forces of drought and economic depression, families with a large number of children typically had decreased adaptive capacity due to the economic burden children posed (Burnet, 1979).

Respondents discussed the role that large families played in decreasing the adaptive capacity of residents in CD5 during the 1930s. Respondent 5, a non-migrant who farmed near Sunnynook during the 1930s, explained, "More children makes it more difficult economically. The Olivers, a family on a neighbouring section, had 8-10 kids and they left in the 1930s to move to Caroline." More children meant less resources and less food for each person. Respondent 6, whose family farmed a few miles from Hanna during the 1930s, said, "I remember one family with nine children and they didn't have anything. They ate all their chickens. Their pigs looked like young colts. They just used everything up." Respondent 7, who came from a family with 11 children and migrated from Patricia to Brownvale in the Peace River County in 1931, said, "We had a big family. Someone with two kids could have coped better. This was something that differentiated our family from families who stayed. I often wonder how my mom made it with eleven children." Migrants tended to report larger family sizes than non-migrants.

Both poverty and adequate economic wealth were identified as critical factors that influenced the decision to stay or migrate. A number of interviewees noted that the lack of money forced many people to stay who would have otherwise left, had they had the resources and somewhere to go. Others identified poverty as the critical reason for migration. Respondent 8, a migrant from Compeer Alberta to Brownvale in the Peace River Country in 1934, said, “Dad couldn’t afford to stay.” Respondent 9, whose family moved into Hanna in 1937, said, “Mom and dad would have stuck it out if they could. But we had nothing at all.” It was also noted that adequate economic wealth enabled those who chose to stay to do so. Respondent 5, a non-migrant who says his family did very well during this time, explained, “During the depression, machinists went broke, so if you had money, you could buy machinery for only a few dollars. My father had lots of machinery.” Land and machinery were important factors that increased adaptive capacity. These two factors increased the ability of a farmer to diversify his farm, which further increased his adaptive capacity. These findings indicate that there is not a direct link between economic well-being and the decision to stay or to migrate. However, broadly speaking, poverty and indebtedness was more commonly reported to decrease the adaptive capacity of rural residents in CD5 during the 1930s and influence migration if migration was possible.

5.2.1.2 Size and quality of land holding

The size of land holdings, soil quality and access to water influenced the adaptive capacity of residents in south-eastern Alberta during the 1930s. Even without a prolonged drought and economic depression, it has been suggested that settlement policy in the Canadian Prairie Provinces based on the quarter-section homestead overpopulated marginal lands to an

unsustainable level (Britnell and Fowke, 1962; Gorman, 1988; Eggleston, 1992). The policy of placing a settler on every quarter section of land, established under Clifford Sifton, Canada's Minister of Interior from 1896 to 1905 (Gorman, 1988) ensured the family farm was uneconomical (Burnet, 1979) and the land was populated to an unsustainable level (Britnell and Fowke, 1962; Gorman, 1988). Jones (1987, pg. 21) refers to the settlement policy of Sifton, and his successor, Frank Oliver, as a "monumental blunder" because the arid region consisting of CD5 simply could not support the excess population (Eggleston, 1992).

According to respondents, overpopulation in CD5 was a crucial contributor to the out-migration during the 1930s and was viewed by non-migrants as a catastrophe. Respondent 10, a non-migrant who farmed a few kilometres north of Oyen during the 1930s, said, "It was a disaster. This land couldn't support all the people who had originally settled here." Many respondents addressed the fact that the original quarter-section was simply too small to make a viable living. Respondent 11, a non-migrant who farmed a few kilometres south of Hanna during the 1930s, said, "People left the land because they couldn't make a living on a quarter-section."

In addition to the inadequate size of land holdings, farmers living in south-eastern Alberta faced variable soil quality which influenced their decision to stay or migrate during the 1930s. During the early 1900s, many farms were acquired through what was called 'blind filing.' The farmer would file on a quarter section of land at a land office in town, pay the \$10 fee, and then be assigned the piece of land before seeing it. There was no pre-testing of the land before settlement, so farmers took the chance of potentially good land quality or potentially poor land quality (Gorman, 1988). According to local histories, more often than not, those who filed blind often found the land of poor quality. James (1978, pg. 17), the editor of Hanna's local history

book, states, “One man discovered that he had chosen land in a dried-up lake bottom. The more prudent looked over the land first, then filed their claims.” Some settlers chose their land with the assistance of a local agent, but many, who had no assistance, made a poor selection because of inexperience and the belief that any piece of land was suitable farmland (Waiser, 2007).

There is great variation in soil types and quality from place to place within the drybelt (Burnet, 1979; Gorman, 1988; Waiser, 2007). Land within CD5 is within the brown-soil belt which is made up of mostly chernozemic and solonetzic soils. These soils are of lighter texture and have low rates of water retention, making them vulnerable to drought and erosion (Burnet, 1979; Marchildon et al., 2007). The land experiences rapid degradation upon cultivation and periods of prolonged drought. There is also variability in precipitation, temporally and spatially. The Neutral Hill north of Consort, Hand Hills southwest of Hanna, and the Rolling Hills south of Iddesleigh received more precipitation and retained moisture better than the flatlands during the 1930s (Gorman, 1988). As a result of such variation in soil quality some farmers had better land than others.

Non-migrants noted the importance of soil quality when asked about remaining in CD5 during the 1930s. Respondent 12, who lived with her family on a farm near Endiang during the 1930s, said, “My father bought the land in 1910. He came out here and got a quarter section for \$10. He didn’t pick the land – some of it was good, but some wasn’t so good.” Respondent 5 said, “My dad wanted flat land to plough so that’s why he chose this piece of land. But some people had poor soil while others had good soil. Some didn’t know better.” Interviewee statements also reflected the high degree of soil quality variation and the out-migration of residents in regions suffering from poor soil quality. Respondent 13, a non-migrant who farmed land near Scapa in the 1930s, said, “There were regional differences in soil quality. Right around

our region no one left, but people near Chinook and Cessford left. It was flatter there and the land wasn't as good. We had heavier soil." According to respondents, these variations in soil quality were critical in the decision to migrate. Those who had poorer soil quality had reduced adaptive capacity and were more inclined to migrate north than those who had better soil quality and greater adaptive capacity.

Just as soil quality varied greatly in south-eastern Alberta, so too did water availability. Access to adequate supplies of water was crucial to the survival of families who remained in the Dust Bowl. For this reason, Jones (1987, pg. 57) refers to the search for water in the dry lands during the settlement years as the "fundamental pursuit." All farmers hauled water for cooking and drinking, except during the winter when snow could be melted (Jones, 1987). Some hauled water from their wells, while others hauled water from sloughs if it was not too brackish. Many farmer residents traveled for the better part of a day to haul a barrel of water (Waiser, 2007).

Most farmers dug wells on their land, but this was often a dangerous and disappointing enterprise (Waiser, 2007). While some had to dig only 8 ft before hitting potable water, others dug over 200 ft only to hit water that was alkali and unfit for human and animal consumption (Jones, 1987). Much of the water in Hanna and the surrounding region was alkali and thus unpalatable (Burnet 1979). But first-hand accounts of pioneers suggest that in some cases even alkali water was consumed. McRae (1978a, pg. 599) says, "No two farms seemed to have water that tasted the same. One got used to one's own well water even if it was loaded with iron and soda and alkali and could hardly drink any other kind." Digging wells proved fatal at times when noxious gases were released. One account describes the death of a man named Henry as he was lowered into a well by his wife, the author's grandmother: "Henry was curious to see what had happened in the well, and had Grandma lower him down the hole. He stood on a small

platform suspended by a rope over the tripod rig and hooked to a horse. He could smell some type of gas which must have been escaping from the crack. He called to Grandma and she drove the horse ahead to pull him up from the well. She had raised him to within fifteen feet of the top when he collapsed and fell off the platform” (Boucher, 1985). The foul-smelling, poisonous gas that Boucher (1985) writes of is known as damp gas and was responsible for the fatalities of many settlers who attempted to dig wells on their land (Jones, 1987).

Access to water was addressed by almost every respondent as being crucial to survival in CD5. While some non-migrants said their well never went dry, other non-migrants recalled all the wells, creeks, and sloughs in the region going dry. Many non-migrants also recalled having sloughs nearby which they used for irrigating the garden. Sometimes survival meant relying entirely on one water source – the well would go dry but the slough wouldn’t, or visa versa. But other times, one water source was insufficient. While it is difficult to discern whether there were significant differences in water availability between migrants and non-migrants, almost all respondents cited drought as the primary reason for migration. Many migrants also underscored the fact that their fathers chose certain sections of land in the Peace River Country specifically based on water availability. Respondent 14, a daughter of a migrant who moved from Burdett to Nampa in the Peace River Country in 1926, said, “Upon migration, dad made sure that the farm was beside a river and he picked it out precisely for that reason. When they came up here they claimed on a homestead, but dad bought that second farm for water.”

5.2.2 Human capital

This section addresses the various factors that influenced human capital which include subsistence/self-sufficiency, gender roles and previous farming and trades experience. As

discussed in Chapter 2, human capital refers to the skills, education, knowledge and experience of people (Yohe and Tol, 2002; Reid et al., 2007).

5.2.2.1 Subsistence skills/self sufficiency

Self-sufficiency increased the adaptive capacity of residents in south-eastern Alberta and was crucial to enabling many to remain on the land. Settlers had learned to become virtually self-sufficient during the early years of homesteading because it often took several years before crops provided adequate income (Waiser, 2007). When crop failure and economic hardship struck simultaneously in the 1930s, settlers resorted once again to increased self-sufficiency for survival. Women played an indispensable role in increasing the self-sufficiency of the family farm through their ability to “make do” with few resources and meagre earnings (Strong-Boag, 1992). Most farmers living on the prairies during the 1930s engaged in similar activities and lifestyles –they sold butter and cream in town, kept 5-10 cows, a few pigs and some other livestock (Burnet, 1979). Three critical activities that increased self-sufficiency were the vegetable garden, canning and ad hoc medical practices.

All homesteaders during this time learned to plant and tend to vegetable gardens which provided a significant amount of their food throughout the year. This included potatoes, turnips, carrots and beets – all of which were canned to last the entire winter. When the garden did not grow due to drought, dust storms and grasshopper infestations, coping capacity was decreased and finding food became a daily challenge (Burnet, 1979). As a result, the loss of the vegetable garden was a crucial contributor to family’s decision to migrate. In the biography of her grandmother, Boucher (1985) explains that her grandmother moved from southern Alberta to the Peace River Country after two years of crop failure and the inadequacy of the vegetable garden.

The vegetable garden was discussed by almost all respondents as a significant factor in adaptive capacity and was identified by a number of respondents as critical to survival. Most migrants and non-migrants relied on their family vegetable garden for the majority of their food supplies. Unlike urbanites in Edmonton or Calgary, Hanna residents often had plots of land large enough to grow a family vegetable garden. “The vegetable garden is what kept us alive,” said Respondent 15, a resident of Hanna during the 1930s. A common statement among respondents was that farmers and those who lived in small towns were better able to cope with the combined forces of drought and economic depression than those who lived in cities because they were able to grow their own food during the difficult economic times.

In addition to the importance of the vegetable garden to self-sustenance, respondents addressed the importance of canning for survival in CD5. Canning enabled farmers to store food for the entire season. Many said that virtually everything was canned, including vegetables, berries and meat. Canning meat, which had been butchered in the winter, preserved it for consumption throughout the summer. Respondent 16, who farmed a few kilometres north of Oyen during the 1930s, said, “We canned in the summer for the winter and we canned in the winter for the summer. Life was about canning.” These results indicate that those with greater experience, knowledge and ability to become self-sufficient had greater adaptive capacity and were more capable of remaining on the land than those who displayed limited self-sufficiency.

Families living on the prairies during the 1930s experienced inadequate health care which adversely affected their coping capacity. Illness, injury or death of a father was economically and emotionally disastrous for a mother with children (Strong-Boag, 1992). For this reason, illness was a matter of survival not only for the parent who was ill, but also for the entire family. With no doctors nearby, most farm families learned basic medical treatment and engaged in ad

hoc medical practices. For example, women quickly learned out of necessity how to deliver babies and would act as midwives for other women in the region (Waiser, 2007). But when complications arose during childbirth, mothers and their babies often died.

Respondents addressed the criticality of health for family survival in CD5. Respondent 17 said, “If you had a medical problem, then that meant you probably wouldn’t have food on the table.” The death or illness of a parent often meant young children were required to take on adult responsibilities. Respondents explained that, given the inadequate institutional health care, farmers quickly developed impromptu medical and veterinary care. Respondent 6 was delivered by her neighbour when she was born. “My mother was given alcohol as a painkiller during the delivery,” she said. “The first and only time she was drunk!” In addition to learning basic medical practices respondents discussed ad-hoc veterinary care. Respondent 13 said, “One time our horse cut its stomach and all the guts and organs were falling out, so dad had to stitch it all up.”

Numerous accounts in Hanna’s local history book underscore the importance of self-sufficiency for survival. For example, Small (1978, pg. 669) states, “By 1933 we were well into the Depression and during the next three years prices for farm commodities reached rock bottom. How did we survive? We had our own beef and pork, cured our own bacon and canned our beef for summer. We had a garden, and canned saskatoons for winter fruit. We had chickens and eggs, ground our wheat for cereal, and took wheat to the Hanna Flour Mill where we traded it for flour, shorts and bran. We never went hungry.”

Respondent comments support the importance of self-sufficiency to staying on the land in the face of an environmental calamity and economic hardship. Respondent 5, a non-migrant said, “We survived [when so many others left] by being self-sufficient.” Respondents recalled the

resourcefulness of their parents, such as making clothes from flour sacks, grinding one's own flour, canning and drying fruits, vegetables and meat, picking berries and making jams. Quite often, the skills required for self-sufficiency and survival were acquired with alacrity by women who previously had no such abilities. Respondent 18, a non-migrant who farmed near Sunnynook during the 1930s, said, "Everything was new to my mother. She was from the city and didn't know much about farming. I always wonder how she did it. She had to learn everything. She had to learn how to make bread. She would take flour sacks and make us curtains, skirts and underpants. They weren't very comfortable, but we wore them." Clothing and other goods were recycled and reused with virtually nothing thrown away. Respondent 12 said, "If we had enough money, mom would buy material to sew us clothes. We always passed on our clothes to the younger children and wore hand-me downs ourselves."

5.2.2.2 Gender roles

Critical roles were played by both men and women in augmenting the adaptive capacity of families who chose to stay in south-eastern Alberta during the 1930s. Between 1901 and 1920, approximately two thirds of the 900,000 settlers who moved to the prairies were bachelors (Gorman, 1988). Gorman (1988) calls their efforts at homemaking "tragic" and "often laughable." The difficulties faced by men living alone to farm the land and fulfill domestic activities meant they often did not eat well, sometimes contributing to physical and mental illness (Burnet, 1979). Many bachelors decided to migrate because remaining on the land and gaining title to the quarter section, without the assistance of a spouse and the support of a family, proved too difficult (Waiser, 2007).

These challenges were soon recognized by the federal government which began a propaganda campaign designed to lure young, single women to the West with promises of opportunity. Women played a critical role to the family's survival. In fact, Waiser (2007, pg. 164) states, "Women were probably more important than any other factor to a homesteader's survival." Women were often responsible for tending the vegetable garden, picking berries, and making cream and butter, while men generally worked in the field. Men rarely engaged in women's work. However, women frequently engaged in men's work, working alongside their husbands in the fields, tending animals, and running machinery (Silverman, 1984). This was expected in addition to their traditional duties in the home which included child rearing. Thus, women "hailed a double load" on the homestead (Waiser, 2007). When drought struck and families experienced crop failure, the contributions of women helped maintain self-sufficiency and contributed to risk reduction, enabling families to stay on the land (Strong-Boag, 1992; Carter, 1999).

Despite their important work, women did not engage in an egalitarian relationship with men. As Langford (2000, pg. 170) states, "It seemed that women were indispensable to successful settlement yet treated as dispensable." Silverman (1984) explains that marriage was not about love or emotional satisfaction; rather it was about a working partnership, whose primary purpose was survival, productivity and reproduction. It was the combined efforts of men and women which enabled families to cope during the difficult times. As a result, the loss of a spouse could prove devastating to the family unit.

Many respondents addressed the vital roles of both men and women to sustaining non-migrants in CD5. According to respondents, bachelors had a difficult time because they often lacked the necessary domestic skills, such as cooking and canning, while men who had wives

fared better. Interviewees recalled the harsh challenges and incessant work women endured. As the drought intensified, a number of respondents recalled that their mothers worked both in the field and in the home. Women helped at haying time, rode the horses, milked the cows, fed the pigs and hauled the water. But at the end of every discussion, respondents underscored the fact that women spent most of their time rearing children at a time when birth control was unavailable and resources were scarce.

The critical role both men and women played for mutual survival promoted arranged marriages in CD5 during the 1930s for those who had lost a spouse. Respondent 11 said, “In those days, men couldn't get along without women because women did all the housework, but women also couldn't work in the fields like men did. Because of this dependency on each other, there were arranged marriages.” The role of both men and women was critical to adaptive capacity. The loss of a spouse or the failure to marry decreased one's adaptive capacity and increased the likelihood of migration.

5.2.2.3 Previous farming and trades experience

Previous experience farming or in a trade influenced the adaptive capacity of farmers in south-eastern Alberta. Many farmers lured to the West during the early 1900s had limited dryland farming experience and knowledge of coping strategies. It is argued that among the early settlers, those who fared best were migrants from the American Midwest who had experience in dryland farming (Gorman, 1988; Waiser, 2007). These settlers often arrived in Canada with equipment, household effects, machinery, animals, and critical skills for survival on the Canadian prairies (Waiser, 2007). Europeans, on the other hand, had limited experience in dryland farming, and as a result, had decreased adaptive capacity (Gorman, 1988; Waiser, 2007). In Hanna's local

history book, McRae (1978b, pg. 594) states, “There were those who knew nothing about farming; those who were lumped together as ‘green Englishmen’, though in fact they might have been of almost any nationality. They were the butt of endless jokes about harnessing the horses with the collars upside down, fetching the left-handed monkey wrench or greasing the wheels on the harrow. My father was one of these, green as the prairie grass in June.”

Respondents addressed the crucial role that farming experience played in the adaptive capacity of farm families living in CD5 during this time. Many non-migrants explained that their parents had limited farming experience before homesteading on the prairies, but also acknowledged that those with insufficient farming experience had a tougher time. Respondent 2 told the story of a bachelor who had had no farming experience. “He was from New York City and couldn’t handle machinery. He couldn’t drive his horses, he couldn’t start a tractor – he used to come out and get my brother all the time to help him. He’d get stuck. He had a grinder in the centre of the yard and he’d herd a cow around and around the grinder. He left the region before we did because he wasn’t too successful. He went to Vista, California and became a fruit farmer. He was very successful there.” Thus, sufficient farming experience better enabled farmers to stay on the land while insufficient farming experience ensured decreased adaptive capacity and increased the likelihood of migration.

In addition to previous farming experience, previous trades experience influenced the adaptive capacity of residents in CD5 during the 1930s. Those who migrated to Peace River to continue farming did not require experience in a trade or formal education. But those who migrated to Hanna to engage in alternative livelihoods invariably required experience in a trade. Respondent 2 explained that his parents moved into Hanna and opened up a boarding house with limited success. However, it was their entrepreneurial skills that made the move possible. He

said, “A number of other families also moved to Hanna – if they could find a job.” Respondent 9 explained that his family was able to move to Hanna only because of his father’s previous experience in butchering. After moving to town, the family opened a butcher shop. Therefore, migration to town was contingent on experience in alternative livelihoods as well as the ability to find work, while migration to Peace River was not.

5.2.3 Social capital

This section deals with three factors that influenced social capital: geographically local social networks, geographically distant social networks, and population change and societal well-being. Social capital refers to the many informal social networks between members of a community and the ability to work towards collective objectives, based on trust, reciprocity and exchange (Adger, 2003; Reid et al., 2007).

5.2.3.1 Geographically local social networks

Strong social networks within south-eastern Alberta during the Depression proved crucial to increasing the adaptive capacity of rural residents and their ability to remain on the land. The strength and endurance of many relationships among farmers was based on the simple fact that they were dependent on one another for survival (Waiser, 2007). James Gray, a reporter for *The Free Press*, travelling across southern Saskatchewan – a region that experienced analogous economic and climatic conditions to south-eastern Alberta - met a family in 1936 living in the Dust Bowl and spoke with the wife. He says (1966, pg. 178) “I asked her why they hadn’t joined the trek to the north in 1934, when a quarter of the farmers in the Dust Bowl further west had moved out. Her answer came quickly, as proof that it was a familiar subject. They were among

friends they had known for most of their lives, and there were ties of families and friends that kept them from breaking the circle.” These sentiments are supported by accounts in Hanna’s local history. Temple (1978, pg. 356) writes, “The Great Depression and the drought hit at the same time. As I look back on those years I can’t agree entirely that they were totally “Ten Lost Years.” The caring and sharing established friendships which have lasted over half a century. Children who grew up in that decade acquired a unique sense of values, stability and tolerance.” As discussed by interviewees, strong social networks often involved extended family in the region, frequent socializing, and the sharing of resources. Weak social networks, however, increased the sense of isolation and loneliness, decreasing adaptive capacity and influencing migration.

Many non-migrants said their parents chose not to move because of their established neighbours, extended family in the region and strong social networks. Extended family in the region was a significant tie to the land for residents of CD5. Almost all non-migrants recalled having parents, in-laws and siblings close by. Respondent 12, a non-migrant, said “I didn’t want to go because I didn’t want to leave my neighbours and all our family. I had my mom, my brothers and sisters and my in-laws here.” The establishment of a nuclear family also tied many women to the prairies who would have otherwise returned to their native country in Europe. Respondent 19, a non-migrant who lived in Chinook during the 1930s, said, “Mom was always so homesick and probably would have gone back home if she hadn’t had us kids.”

Non-migrants often recalled socializing with neighbours, participating in working bees at threshing time, and general assistance and support for one another during the difficult times. They often emphasized the role of community activities and tight-knit social structures to their general well-being. Non-migrants recalled the picnics, baseball, basketball and hockey teams,

and Saturday night dances at the local schoolhouse. Respondent 4 said “Every Friday night we’d go to the dance at the schoolhouse. There would be a midnight lunch. Everyone would bring sandwiches, cookies and cakes. They also served coffee. We would dance until two in the morning.” Most recalled attending church every Sunday and the long trek to school every day.

Strong social networks fostered the sharing of resources, which was noted by some respondents as the difference between life and death. Respondent 20 said, “One day a neighbour boy and I went over to bring a nearby couple coal because we knew they didn’t have very much, and they had chopped up all their chairs for the fire. If we hadn’t brought them coal they might have frozen to death.” Even rural residents who were forced to migrate and barely had enough food for themselves would share with others. Respondent 6, a migrant from a farm near Hanna into the community of Hanna in 1934, but whose parents and siblings remained on the farm, said, “There were many poor people travelling through the region and dad would give them something to eat and a place to sleep. He probably never even knew their names.” She later said, “One day dad came across a lady who was crying and was carrying a baby who was crying. Dad asked her what was wrong and she said her husband had gone to town, and all she’d had to eat for a week was potatoes and salt. Dad said we cannot let people starve, so he would invite people over to give them whatever we could – skim milk or a few eggs.” Thus, sharing among non-migrants increased their coping capacity and ability to stay on the land.

On the other hand, isolation and weak social networks within south-eastern Alberta decreased the adaptive capacity of farm families. Early settlers often experienced incredible isolation and loneliness on the barren prairies (Silverman, 1984; Waiser, 2007). Inadequate infrastructure such as roads and railways and the lack of widespread technology to facilitate communication, such as the telephone, increased the sense of isolation. An important

contribution to this isolation was the Dominion Lands policy which divided land into townships, sections and quarter-sections (Gray 1975; Waiser, 2007). The government decided to offer free homesteads on even-numbered sections, but reserved most odd-numbered sections as railway lands, a policy which effectively dispersed and isolated the pioneer farmer (Waiser, 2007).

Women were often more isolated than men because they remained on the homestead, working tirelessly in the little shacks and surrounding yard while men engaged more often with neighbours in the course of their work (Silverman, 1984; Waiser, 2007). As a result, women often lacked companionship with other women. In some rural regions, women only had the opportunity to visit relatives, and in other regions, women simply did not have the time to visit at all due to the demands of their work (Silverman, 1984). Hanna's local history confirms that women often faced greater hardships and isolation than men: "The men who worked with English speaking neighbours, and the children who attended school soon learned the new tongue; the women did not have the same opportunity. They remained on the farm, bearing and raising their children far from churches, schools and medical facilities. The women who had come from the cities were especially aware of the isolation; many declared they would have gone back, if there had been any way they could have done so" (James, 1978, pg. 17).

While not discussed by any respondents, secondary sources and archival data discuss "prairie madness", a mental disease attributed to the isolation and harsh living conditions on the prairies (Burnet, 1979). These sources also suggest inordinately high numbers of suicides among farmers during this time, attributed to the extreme anxiety over financial affairs (Burnet, 1979; Gorman, 1988). Newspapers from the time reported such incidents:

Deceased who was highly respected, and who had countless friends throughout the

Richdale district, had been worrying over the crop failure which he sustained last season

and the terrible deed which culminated in his death is attributed to a fit of despondency over financial matters (Hanna Herald, 1929).

A number of migrants recalled limited socializing with neighbours and no extended family in the region during the 1930s. They attributed migration to weak social networks and intense isolation. Respondent 21 explained, “One of the stipulations of proving up required that a settler remain on the land for 6 months of the year. Well that was too much for many people who couldn’t bear the isolation.” Respondent 2 said, “My wife’s family decided to migrate because there was nothing there. Even if they did have a crop, it was 30 miles to the railroad.” Respondent 22, a migrant who moved from Gravelbourg, Saskatchewan to Berwoyn, Alberta in 1929 in response to severe drought conditions, said she did not recall her family visiting with neighbours because “mom was too busy with housework and looking after the kids.” Respondent 16, a migrant, said the lack of relatives nearby was very difficult for her mother: “My mom had no family in the prairies and couldn’t stand the isolation.”

These findings suggest that strong geographically local social networks were crucial to increasing the adaptive capacity of residents in CD5, enabling them to stay on the land during the 1930s. However, weak geographically local social networks heightened the sense of isolation and decreased the adaptive capacity of residents in CD5, making them more willing to migrate.

5.2.3.2 Geographically distant social networks

The decision of a close friend or relative to migrate increased the probability of migration out of CD5 for a farm family. Some respondents explained that their parents decided to look for land in the North after a brother or an uncle had already migrated. Respondent 8 explained that her uncle migrated after her family had settled in the Peace River Country. A few years later, the rest of

her father's brothers moved to the region as well. Families often migrated together from southern Alberta to Peace River and settled in a similar region.

Associated with social ties to other migrants, is social ties to the destination. This not only encouraged families to migrate, but assisted the migration process and the new settlement upon migration. Respondent 16's family moved to British Columbia because her mother's family lived there. Immediate family in the destination proved a significant migration pull and was cited by nearly every migrant. Respondent 14, the daughter of a migrant, explained her parents' decision to migrate, "Dad felt tied to the land and didn't want to leave. But mom wanted to leave. Mom's family was up here and she said she couldn't bear to stand another summer of hearing the wind blow. My sister-in-law also came up to the Peace River country." Non-migrants, on the other hand, did not report any long-distance social networks. The existence of pre-established social networks with people in Peace River appears to have influenced the migration decision of those who left CD5.

5.2.3.3 Population change and societal well-being

The out-migration from south-eastern Alberta during the 1930s decreased the adaptive capacity of remaining residents, prior to the establishment of the Special Areas, and influenced further out-migration (Burnet, 1979; Gorman, 1988). As neighbours left, it became increasingly difficult for remaining settlers to socialize or engage in rural organizations, thus crippling rural social life (Burnet, 1979). The out-migration of many farmers from south-eastern Alberta ultimately spelled the end of the homestead community. Rural depopulation contributed to the decline in the rural village, which was the community service centre (Owram, 2007). Even by 1930, many towns across southern Alberta had become ghost villages (Burnet, 1979; Owram,

2007). Significant depopulation decreased the tax base of the province and municipalities making it more difficult for governments to provide necessary services (Gorman, 1988). As municipal revenues fell, telephone lines collapsed, roads deteriorated and farm buildings fell into a state of disrepair (Britnell and Fowke, 1962). Many schools closed due to insufficient pupils and the lack of financial resources (Longman, 1931). Widespread school closures forced the amalgamation of districts to ensure some schools remained open (Gorman, 1988). Those families who remained on the land were forced to send their children, usually by horse, to a school farther away.

People socialized less when they knew hostesses might be unable to feed them. Men and women stayed at home more due to lack of adequate clothing. Religious activities also ceased, as churches closed and more people chose not to attend, due to lack of appropriate clothing or finances for church contributions (Burnet, 1979). Local histories from CD5 confirm that remaining on the land after significant out-migration was extremely difficult. For example, Garalneau and Scott (1978) state, "In 1931 many neighbours moved away, leaving a sparsely populated area. Al Desilets chose to stay; it took great faith to remain behind."

Respondents recalled memories of initial societal decline as fewer and fewer classmates showed up at school. Declining enrolment would lead to school closure. Respondent 5 explained that when the local schoolhouse nearby closed, his elder siblings rode with him to a school a few kilometres away in the town of Sunnynook. But this school only went to grade ten, so he moved to Hanna and lived in dormitories in order to complete grade 11 and 12. Respondents went on to discuss widespread societal collapse. Respondent 7 said, "We were born in Patricia but there's nothing there now. The only thing they have there now is a hotel. I remember when there were three stores, a big school, a pool room, four grain elevators." Respondent 19 said, "The town

just fell apart. Chinook used to be a lively town. They had a drug store and a shoe store, lots of restaurants. At one time Chinook had three lumbermills, but during the Depression two closed. One thing led to another and all the businesses just left. Now there is hardly anything left in Chinook and it makes me really sad.” Respondents attributed the success of Hanna to its role as a railroad divisional point. The railroad increased the number of goods and services available to residents in the Hanna region.

Non-migrants typically reported limited out-migration from their region, while migrants typically reported significant out-migration from their region. Respondent 15, a non-migrant, said, “The region was so heavily populated, and most of the farmers in our area stayed. That helped my parents stay.” Respondent 5, the only non-migrant who did report significant out-migration from his region said, “In the 1930s, 37 families had been on this land – that’s when it was fully settled. They all left.” He noted the difficulty of staying as neighbours left. Migrants, on the other hand, reported significant levels of out-migration from their region prior to migration. Respondent 23, a migrant from Coronation to Wanham in 1932, said, “Everyone else left before us. We were the last ones out of there.” This suggests that initial out-migration from a region decreased the adaptive capacity of remaining settlers and precipitated further out-migration, while limited out-migration from a region encouraged families to stay on the land.

5.2.4 Perception, awareness of risk, hindsight

The following discussion reports on how perception influenced the adaptive capacity of residents in CD5 during the 1930s. Perception is inherently interconnected to levels of economic capital, human capital and social capital. For example, recent studies show that people with higher levels of social capital are typically more optimistic and empowered in responding to climate change

than those with lower levels of social capital (Sauchyn and Kulshrestha, 2008). Perception of risk influences how an individual responds to that risk, including the choice of various adaptation strategies, and is determined by a variety of factors including knowledge and awareness (Slovic, 2000; Grothmann and Patt, 2005; Reid et al., 2007).

5.2.4.1 Hope vs. lack of perseverance

Hope and optimism appear to have increased the ability of residents in south-eastern Alberta to stay on the land during the 1930s. Many settlers who had been lured to the west by the promise of free land brought with them incredible hope and optimism for a better future in Canada. Once they arrived, the new settlers used all their energy to improve the land and meet the requirements for acquisition of land title. Many maintained the belief that good times were just around the corner, even as the drought of the 1930s struck because leaving the farm represented abandoning a lifelong dream. As a result, the hope of riches and a bumper crop helped to keep people from leaving the region (Burnet, 1979). In 1938, a district agriculturalist who was trying to persuade farmers to leave the dried-out areas said his greatest fear was that it would rain. If it did, he believed it would take another decade to convince farmers they ought to leave (Burnet, 1979). Stories from Oyen's local history book support the argument that enduring hope enabled families to remain in CD5 during the 1930s. A pioneer wife's poem attributes the ability to stay to perseverance:

We felt the stinging storms
Of wind and rain and sleet;
The sun became our enemy
In times of drought and heat.

But perseverance was the backbone
Of the settlers of early years.
We tamed the wild and rolling plains,
We, the dauntless pioneers (Standing, 1978).

Historical accounts also discuss the deep despair experienced by many at this time. Annie Edwards (1966, pg. 99) recalls the intense heat and drifting soil from 1916 to 1923: “These long, hard years absorbed all the pioneer spirit from most of us. I can still see my mother out beside the house leaning against the siding, which was rough for want of paint, and looking out across the sand-covered stubble, weeping in desperation.” Secondary sources tend to reflect the “rationality” of the decision by many farmers to migrate. Gorman (1988) says, “Even in 1924, it was more puzzling to determine why anyone remained than to understand why the vast majority left.”

A common statement among both migrants and non-migrants was that those who stayed survived on hope and positive thinking. The Canadian Prairies was the land of ‘Next Year Country’ they explained. Respondent 15, a non-migrant, said, “Farmers are a queer bunch. They live for hope. Hope reins eternal. That's what kept us going. It was positive thinking.” Respondent 13, a non-migrant, said, “My parents would always say that it would be better the next year. They never agued and if they were ever depressed, they never showed it.” Respondent 20 said, “People just believed that it would get better.” Non-migrants repeatedly attributed their ability to stay on the land to their incredibly positive outlook.

Despite this incredible optimism, a number of non-migrants also remembered the deep despair and desperation. Respondent 6 explained that it was the birth of her first son that provided the hope her mother needed to get through the drought years. She said, “Mom got very upset with the drought. That winter my first son was born and I was sick so mom took me home for a while. In later years she said, ‘That child saved my life. Before that I felt there was nothing to live for.’” While hope enabled some families to remain on the land for a time, it appears that hope alone was unable to sustain families in the face of increasing adversity. Migrants, who also reported having an enormous repository of hope, explained that a critical threshold was reached, beyond which their optimism was exhausted and they could not longer remain in the Dust Bowl.

Some non-migrants ridiculed those who chose to migrate, accusing them of personal weakness and lack of perseverance. Respondent 24, a non-migrant, said, “The main reason people left was because they didn’t have the perseverance. It was all about your attitude. If you didn’t have water, well go to the neighbours to get water or dig a deeper well. Those who left were chicken. People made fun of them. Why would they leave? What were they going to find that was better? It was scorned upon. Those who maintained are better people. We know how to cope. We persevered.” Not one migrant shared this view of the migration process.

Migrants tended to view migration as a necessary response to an environmental and economic catastrophe. All migrants felt it was a positive decision to move and few expressed a desire to return to southern Alberta. Respondent 22 said, “Mom and dad never wanted to go back – to that dust-filled place.” Respondent 23 said, “You couldn’t have paid my folks to go back. It was too dry and there was nobody left there.” Respondent 2 scoffed that he wouldn’t have given a nickel for the whole countryside. While hope may have played an important role in sustaining some families, others faced such hardship that no amount of hope could have

sustained them. Regardless of the role hope played in real terms to increase the adaptive capacity of remaining settlers, this discussion illustrates the contrast in perception between migrants and non-migrants.

5.3 Adaptation strategies

This section reports on the specific adaptation strategies identified by interviewees and organizes information according to a typology of agricultural adaptation developed by Smit and Skinner (2002). Smit and Skinner (2002) identify four main categories of agricultural adaptation strategies: i) changes in farm production practices ii) adjustment to farm-level financial management iii) accessing government programs, and iv) implementation of technological developments. The following discussion omits the category of technological developments due to the fact that it was not identified by interviewees as being a relevant means of adaptation. This section broadens the definition of government programs to include institutional adaptations in order to capture the range of government responses and actions that were identified by respondents as being important aspects of adaptation in the study period. Table 3 summarizes the various adaptation strategies employed by residents in CD5 during the 1930s and barriers to employing them.

Table 3: Summary of Adaptation Strategies Employed by CD5 Residents during the 1930s

Category of Adaptation	Adaptation Strategy	Barriers
Changes in farm production practices	-Changes in farming methods	-Role of agricultural experts who promoted inappropriate farming methods. -Mental commitments to early farming methods and social pressure -Financial constraints -Resistance to new technology
	-Mixed farming	-Inadequate size of land holdings -Financial constraints
	-Expanded land holdings under lease agreements	- Inadequate size of land holdings -Insufficient equipment -Limited labour
	-Adaptation to water shortages	-Extreme water shortage, limited alternative supplies -Limited social capital
	-Changes in feed methods	-None identified
	-Increased reliance on wild game	-None identified
Adjustment to farm-level financial management	-Barter	-None identified
	-Off-farm employment	-Lack of education or training -Widespread unemployment and lack of available jobs
	-Sale of assets	-Low prices paid for assets
Institutional adaptations	-Government assistance	-Refusal to accept government assistance out of pride
	-Special Areas and free freight to northern Alberta	-None identified
	-Propaganda and cheap land in Peace River	-None identified

5.3.1 Changes in farm production practices

This section discusses a number of changes to farm production practices employed by farmers in CD5 during the 1930s to cope with drought and economic decline. These include changes in farming methods, a switch to mixed farming, expanded land holdings under lease agreements, strategies to cope with water shortages, changes in feed methods and increased reliance on wild game. Changes to farm production practices involve farm-level decisions with respect to farm production, land use, land topography, irrigation and the timing of operations (Smit and Skinner, 2003).

5.3.1.1 Changes in farming methods

The poor farming techniques employed during the 1930s, which had been promoted by dryland farming experts, were key contributors to the widespread soil degradation, soil erosion and soil drifting (Jones, 1985). The CPR and the federal government bombarded farmers with information and pamphlets giving them “proper advice” on farming techniques (Jones, 1985; Gorman, 1988). Perhaps the most influential and well-known dry-land farming expert was W.C. Palmer who published the “Ten Commandments of the Dry Farmer”, urging farmers to plow deep, keep the surface soil loose in order to allow water to percolate, and summer fallow to retain moisture (Palmer, 1912). The practice of deep cultivation left the soil devoid of fiber and structural resistance, making it prone to drifting, particularly on summer fallowed fields (Britnell and Fowke, 1962). But to the agricultural experts, more important than the amount of precipitation for a successful yield, was dryland farming techniques. When farmers experienced crop failure in 1917 and 1918, agricultural experts blamed farmers for failing to follow their dryland farming instructions carefully (Jones, 1987).

A few farmers were examining new methods at the time, such as using a cultivator, rather than a plow, sowing no more than 8 centimetres, sowing directly into stubble, or engaging in strip farming (Gorman, 1988; Macpherson and Thompson, 1992). Albertan farmers during the 1930s employed a header stack-barge, a device invented to adapt wheat harvesting machinery to the particular arid climate and farming conditions of the Canadian prairies (Isern, 1987). Conventional harvesting implements, such as binders and combines were no longer effective when crops were short and thin, but a homemade header stack-barge could collect the short straw and concentrate them in stacks for threshing. Farmers also modified their binders to harvest the short crop by removing the knotter and replacing it with a hopper, which caught the grain from the binder canvas and dumped it into piles on the field. This was known colloquially as the “poverty box”. This was a thrifty, adaptation, initiated by farmers themselves that enabled them to avoid purchasing new expensive machinery. Isern (1987) refers to the poverty box as a “folk technology” – an innovative, local adaptation developed in response to extreme climatic and economic hardship.

However, throughout the 1930s, the majority of farmers continued to engage in poor tillage practices that pulverized the soil while they watched their fields blow away (Gorman, 1988). Gorman (1988) argues that early mental commitments to certain farming techniques were difficult to change. Financial constraints also posed a barrier to significant changes in farming methods. Those who lacked tractors or advanced farm equipment could not even think of purchasing such items when they were focused on subsistence survival. And those who were sufficiently wealthy to own a tractor at the onset of the 1930s found they were not protected by plummeting commodity prices and widespread drought (Owram, 2007). Without money to purchase fuel for cars and tractors, farmers became reliant on horses for all their power

(MacGregor, 1972). It was only after a significant amount of out-migration, and upon the establishment of the Special Areas and the PFRA, that farm-level operational practices changed radically.

Despite the philosophy of the day, some respondents noted that their fathers did experiment with various techniques in their attempts to reduce soil drifting. Respondent 9, a migrant, said, “Dad tried to keep the stubble in because he realized this held the soil down.” Others recalled their families using “poverty boxes”. More often, respondents addressed the barriers to changes in farming methods. They spoke of the social pressure to engage in the prescribed farming methods which represented a barrier to change. They recalled being scorned upon by their neighbours if they failed to follow the prescribed farming techniques. For example, trash cover was considered a sign of poor farming. Respondent 2, a migrant, said, “In the early days we thought it was a good idea to burn the stubble, but in reality that was the worst thing to do. You have to turn the stubble into the ground to prevent soil drift.” Respondent 20 said, “We didn’t leave stubble in in those days because we thought everything should be blackened – if it wasn’t, other farmers would tell you you were a bad farmer. But when the winds came, the soil just blew away.” According to Respondent 21, many farmers in CD5 were encouraged to use the Graham Holm Plow during the 1930s which pulverized the land and made it vulnerable to erosion. It wasn’t until the 1940s that farmers discontinued the use of this plow and came to understand the widespread land degradation it caused.

The commitment to poor farming practices was combined with a resistance to new technology that further precluded a change in farming methods. Respondent 4 explained her father’s resistance to driving a car or operating new farm equipment: “My dad never drove the car – it was my brother. My dad didn’t want to get behind the wheel. Same with the tractor.”

Tractors were beneficial to farmers because they enabled farmers to devote most of their land to crops instead of using a significant portion of land to grow feed for livestock. But even those farmers who willingly embraced technology and had purchased farm equipment during the late 1920s found that the economic crisis and the lack of fuel prevented their operation. As a result, most tractors sat idle in farmyards throughout the decade. Respondents also addressed the barrier of limited financial resources. Respondent 21 said, “In the 1930s, people simply couldn’t afford to buy new machinery.” These barriers meant that short-term, tactical responses were within closer reach to Albertan dryland farmers in the 1930s than long-term strategic responses which required more planning, knowledge and resources.

5.3.1.2 Mixed farming

Most farmers, having been encouraged by the government to farm as much wheat as possible during a time of buoyant wheat prices, became entirely economically dependent on wheat. While livestock contributed to 70% of farm income at the turn of the century, it contributed to only 25% of farm income by 1925 (Gorman, 1988). Cattle herds required large tracts of land and dependable sources of water – requirements that could not be met by farmers living on a quarter section or a half section of land. However, the high dependency on wheat made farmers vulnerable to crop failure and low commodity prices. Diversification as a solution to cope with the drought was noted as early as 1921 by the CPR’s General Superintendent of Lands (1921) and can be understood as a means of increasing the coping capacity of farmers who chose to stay in CD5. By 1931, a number of government reports recognized the importance of encouraging a change in farm methods to diversified crops, and a combination of crop and ranching (Longman, 1932). For example, the planting of rye was promoted by agricultural experts as a management

solution to the dust storms and crop failure because it anchored the soil and reduced its vulnerability to drifting (Jones, 1987). Indeed, many farmers attempted to diversify into crops such as barley, rye peas, buckwheat, flax, sweet clover, millet and adaptable grasses and hay crops (Gorman, 1988). By the late 1930s, the government assisted with widespread diversification into livestock operations, which reduced the exposure of remaining CD5 residents to drought (Marchildon et al., 2007; Owsram, 2007).

Respondents who reported having engaged in mixed farming during the 1930s were invariably better able to cope than respondents who reported being entirely economically dependent on wheat during the 1930s. Respondent 5, a non-migrant, explained that his family farmed wheat but also owned over 200 horses during the 1930s. The horses would be sold at four years of age to a horse buyer who then sent them to Lower Canada. Some respondents also reported diversifying their practices into other crops. Respondent 23, whose family eventually migrated in response to the drought, recalled growing more rye in their final years on the prairies.

While respondents did not report immediate diversification into other animals, such as cattle, sheep, pigs and poultry, some respondents, including both migrants and non-migrants, noted that in later years, they switched into cattle or sheep in an attempt to cope with the drought conditions. The main reasons given for switching to sheep during the 1930s was because sheep survived on Russian thistle, could withstand very dry conditions and cold winter temperatures, and also provided meat and wool. Respondent 4, a CD5 resident whose family diversified into sheep, explained, “Sheep were good animals to have during the drought because they would eat anything. We would take them on other people’s land to feed and they would eat all the weeds. This benefitted the farmers because it was less work for them to take all the weeds out – they

wouldn't have to disk." However, respondents noted that sheep also require a significant amount of labour because they are vulnerable to coyotes and limited milk supplies from the mother. For this reason, respondent 4 explained that, after diversifying into sheep, her family later decided to switch into cattle which are less labour-intensive.

A requisite for moving into both sheep and cattle is access to large amounts of land. Respondents explained that for many families, switching into cattle was only possible after many others in the region had already left and the remaining farmers could acquire more land. Respondent 15 lamented that his family did not switch into sheep or cattle, but recognized that the key barrier was insufficient pasture for the cows and lack of sufficient feed. Too many cattle were a liability if a farmer had insufficient feed. Low prices for cattle, deteriorating conditions of the range, limited water supplies, and the high price of winter feed precluded this switch for many as it was seen as an unwise financial move (Jones, 1985). In addition to these costs, farmers faced the economic costs of the mixed farming, which involved the construction of new buildings, fences and corals (Jones, 1985). Indeed, while a few respondents reported switching into sheep or cattle as a farm-level adaptation, many others reported selling their cattle. This discussion indicates that diversification as a form of farm-level adaptation requires significant amounts of financial capital, human resources and access to land. The costs of diversification into different crops and livestock operations can often be prohibitive without significant government assistance. In this case, increased institutional assistance for livestock diversification at the end of the 1930s proved crucial to increasing the adaptive capacity of those families who were still on the land.

5.3.1.3 Expanded land holdings under lease agreements

The out-migration of many from CD5 provided the adaptation strategy of expanded land holdings after the establishment of the Special Areas. In 1932, O.S. Longman, an employee of Alberta's Department of Agriculture, wrote a report which proved pivotal to the establishment of the Special Areas and the rehabilitation of the region. In this report, Longman offered numerous recommendations on the exodus of farmers, the rehabilitation of the land, and the reorganization of the farm-ranch unit. Longman (1932) states, "In order that the farm-ranch unit method of operating may prove attractive to the resident farmer, such lease land must be available at a rental charge in keeping with its productive powers; taxes must be reduced to a minimum as well as cover other overhead charges." He went on to state that "the first consideration in the allotment of lands be given to the present residents who desire to remain within the area, and can make satisfactory use of such land." Many of Longman's recommendations were heeded. With the establishment of the Special Areas over the 1930s, lands abandoned by settlers were seized by the province and offered to long-time farmers under affordable lease agreements (Gorman, 1988). Many abandoned fenceless homesteads were also converted into community pastures which benefited remaining farmers (Eggleston, 1992). In addition, out-migration gradually eased economic stress of remaining settlers as taxes fell due to decreased demand for community services, and as overhead costs decreased (Eggleston, 1992).

Many interviewees, both migrants and non-migrants, noted that out-migration provided a beneficial adaptation strategy for those who stayed and that the farmers who stayed and "stuck it out" are now very wealthy. Respondent 15, a non-migrant who lived on a farm 10 kilometres south of Hanna during the 1930s said, "People who stayed gathered the land and used it for raising cattle. They became very wealthy." Respondent 5, another non-migrant who lived a few

kilometres east of Sunnynook his entire life explained his own family's acquisition of land after the out-migration of the 1930s. "My father benefited when people left because he was able to buy up all the cheap lots," he said. Respondent 5's father had bought 320 acres of land in the early 1900s and during the 1940s his family acquired over 20,000 acres. That non-migrants benefited economically from the mass-out-migration of other farmers from the region was largely the consequence of concerted institutional efforts to address the critical problems of drought and land degradation.

However, not everyone could take advantage of cheap land. Those who lacked the equipment to farm additional land did not acquire large tracts because they did not have the means or ability to farm it. Respondent 10, a non-migrant, explained, "Even if you had lots of land, you might not have the equipment to farm it all, so you just took what you could handle." Some migrants who left during the 1930s in search of land elsewhere discussed the acquisition of land in CD5 as a lost opportunity which they recognized only in hindsight. Respondent 16, a migrant whose family had moved from a farm near Oyen, Alberta to British Columbia during the 1930s said, "Dad had an afterthought: the ones who stayed did better than the ones who left."

5.3.1.4 Adaption to water shortage

As the drought intensified, many farmers found their wells go dry. In East Tilley, 90 percent of the wells were inadequate for stock watering and barely adequate for domestic needs (Gorman, 1988). Homesteaders would dig numerous wells on their land in a desperate search for water. A family that could not obtain sufficient potable water from its well was forced to find other water sources, sometimes hauling water for the better part of a day (Waiser, 2007). In response to the limited supplies of water, the reuse and conservation of water became a fine art for people living

in the Dust Bowl during this time. Dish water was reused as laundry water and was then poured on the vegetable garden (Gray, 1966). The lack of water also led to despair, desperation, and suicide in some cases. In Hanna's local history book, McRae (1978a, pg. 598) states, "A book could be written about wells in the early days, or about the lack of them. We can all recall tales of people who, discouraged and fed up with the hard unrewarding life, jumped into wells and ended their troubles."

A number of techniques were employed by both migrants and non-migrants in the attempt to cope with dwindling water supplies. The first and foremost strategy was water conservation and the reuse of water. Many respondents said they would never throw water out. It was recycled for domestic uses and then finally fed to the cattle or used to irrigate the vegetable garden. Migrants noted some interesting strategies their families employed before leaving. Respondent 23 said that his family moved their vegetable garden to be directly under the well so that a little water was poured on the vegetables while they were watering the cattle. Respondents also recalled digging deeper and more numerous wells, and constructing dams and dugouts in an attempt to cope with limited water supplies.

Many respondents recalled having to haul water from a neighbour's well or slough. Respondent 4, a non-migrant, said, "Our well did not dry up, but the lake on our property dried up. That's when we started hauling water from the neighbour's spring. Dad bought a water tank at an auction one year and we'd haul water from the neighbour's spring two miles away. Dad would haul water every day - except Saturdays and Sundays. In return for the water we would give the neighbour vegetables and meat. This spring kept us going. The well wouldn't have been enough." As evidenced from this quote, strong social networks and barter were crucial for access to water.

Hauling water was a back-breaking activity that ensured the water was used for only the most critical uses: domestic consumption and drinking water for cattle. Respondent 21, a non-migrant, noted, “Horses were your only power, so you had to have enough water for horses.” Those who hauled water any significant distance rarely used it as irrigation for their vegetable gardens. A number of non-migrants recalled having insufficient water to irrigate their vegetable garden which decreased the family’s adaptive capacity.

Access to water was so important that some people took extreme measures to find water. Respondent 25 recalled that as a child, he would climb down into a coal mine that was crumbling and had been closed for a number of years to collect water and bring it home for the family. He said, “When dad was mining coal, he found a stream of water and dug a well in the mine. In the late thirties the mine was closed. Dad didn’t know this because he didn’t get out much, but my brother and I were so desperate for water that we would climb down into the mine, as the roof was crumbling in, to collect water and bring it home. But as soon as my dad found out we were doing that, he was furious and that was the end of it.”

5.3.1.5 Changes in feed methods

When faced with limited feed for cattle due to crop failure, many farmers on the Canadian Prairies resorted to feeding Russian thistle, also known as tumbleweed when mature plants blow in the wind, to their livestock. Russian thistle is able to survive in arid conditions and became emergency forage for starving cattle in drought-stricken areas of the Canadian prairies during the 1930s (Babb, et al., 2007). While it might have kept them from starving for a short period of time, Russian thistle is a weed which lacks nutritional value and is therefore not a long-term sustainable adaptation strategy (Fowler, et al., 1992). In his story for Hanna’s local history book,

Fred Engel (1978, pg. 147) explains that he helped his neighbour, Walter Carlson, to separate the weeds from the wheat after harvesting with a poverty box. “We got about three or four rack loads of weeds for each rack load of wheat,” he said. “For my pay Walter gave me all of the weeds, which was all I had to feed my milk cows.”

Many migrants and non-migrants employed changes to their feed methods when they could not grow sufficient oats and barley for their cattle. The most common example discussed by respondents was the use of Russian thistle as feed for cattle. Respondent 15 recalled, “Normally the cattle wouldn’t eat the Russian thistle, but if you cut it and stacked it, then it would soften and you could feed it to them. They would have starved to death if we hadn’t done that.” Others discussed the reuse of egg shells and milk as feed for chickens and pigs. Respondent 13 recalled grinding chicken eggs and feeding it back to the chickens and turkeys as a source of calcium. Respondent 24, a non-migrant, said, “Pigs lived on the milk from the cows and grain grindings. We made every bit do.” Adequate feed was critical for the survival of the farm family because cattle and animals sustained the family with meat, eggs, cheese and milk. Therefore, when farmers experienced crop failure and low commodity prices, they ensured the stocks were adequately fed before any crops were sold.

5.3.1.6 Increased reliance on wild game

Accounts from Hanna’s local history indicate that farmers during this time became more reliant on wild game, such as rabbit, prairie chicken and some antelope. However, most antelope had been driven out of the region with the rapid settlement of the region and only gradually returned after a significant amount of out-migration. Farmers would hunt ducks and other water fowl in the sloughs that dot the region before they went dry (Robertson, 1974). Farmers also became

reliant on rabbits (Dragon, 1974; Robertson 1974). Taphorn (1974) recalls, “There was fried rabbit, stewed rabbit, rabbit ground into hamburger, smoked rabbit and rabbit everywhere, winter or summer.”

Two respondents recalled their increased reliance on wild game prior to migration. Respondent 23 explained that before moving from the drought-prone region of Alberta to the Peace River Country, “We survived on meat. We’d go out 40 miles to hunt jack rabbits and prairie chicken. We never ate gophers. We ate wild geese that migrated in. They used to be in the millions. The sky would be black. And we’d can ’em up! One time I shot a sandhill crane and mom said, ‘We can’t eat that!’, but I convinced her to cook it up and it tasted like a rubber boot.” Respondent 9, another migrant, who discussed the very desperate conditions he experienced as a child recalled eating weasels prior to migration. Increased reliance on wild game can be understood as a short-term, tactical adaptation strategy that was employed by farmers on the brink of starvation or migration. Other non-migrants who had increased coping capacity discussed hunting coyotes and badgers to sell fur to the Hudson’s Bay Company, but did not report relying on wild game for food.

5.3.2 Adjustment to farm-level financial management

Farm-level financial adjustments in CD5 during the 1930s included increased reliance on barter, off-farm employment and the sale of assets.

5.3.2.1 Barter

Barter, which became fundamental to the continued functioning of the Alberta economy, was a crucial adaptation strategy employed by all farmers and non-farmers in the Canadian Prairies

during the 1930s due to the lack of money (Byfield, 1998). In rural south-eastern Alberta, farmers were trading wheat for almost anything they could get. Even as early as the 1920s, companies were accepting wheat for bill payments, including Alberta Government Telephones (later Telus) (Byfield, 1998). Local businesses would often accept payment in the form of chickens, eggs or potatoes (Gray, 1966). Local histories explain that the one important item which could not be bartered was gas (Matlock, 1978), which is why so many cars and tractors sat idle in the yard throughout the dirty thirties.

Respondents recalled bringing meat to town in order to pay a bill, or being paid for off-farm work with goods and livestock. Respondent 19 said, “You had no money. You wouldn’t ever see a woman carrying a purse. We would say, ‘We’re not poor, we just don’t have any money.’ You just prayed you wouldn’t need money for anything.” Respondents also underscored the importance of bartering on credit which enabled them to obtain necessary goods from a local merchant in town and later repay the merchant with their crop at harvest time. Respondent 20, a non-migrant, said, “There was a good store nearby – the owners, Mr and Mrs Lunn would give us flour in return for wheat after the harvest months later. We might have starved without them.” These types of financial transactions, often dependent on trust and good will, were necessary for the survival of many farmers and were crucial to increasing the adaptive capacity of all rural residents.

5.3.2.2 Off-farm employment

Off-farm employment which supplements the family farm income can be an important adaptation strategy for farmers facing difficult financial situations due to crop failure and depressed commodity prices. Small (1978, pg. 669), an author in Hanna’s local history book,

states, “On July 26, 1927, a hailstorm pounded our crop right into the ground. It also ruined the prairie for haying. It was not big hail, about pea size, but it was hard and so thick that you could shovel it up on the north side of the barn the next morning. Now what could we do? No feed and no money to buy it. We sold the cattle and I went out harvesting and threshing. Hilda [my wife] went to Calgary and found work with a family in Three Hills.” Some farmers worked off the farm, seasonally, employed with the railways in the summer, or logging in the winter. However, summer employment was risky because it meant farmers were away from their land when labour was needed most (Waiser, 2007). Children also engaged in off-farm labour, however sources suggest that those parents who encouraged their children to find off-farm employment often felt there was no future in dryland farming and were more inclined to migrate (Burnet, 1979). The income provided by off-farm labour sometimes represented the difference between success and failure (Waiser, 2007).

Respondents reported children, more often than adults, being sent out to work during the drought years of the 1930s. Children could be paid far less than adults even if they were capable of performing an equal measure of labour. Respondent 6 recalled that as a young woman, she was sent by her parents to Hanna in order to find employment and soon found work as a nurse at the hospital. Her father did not require her to send remittances, but many other young women she worked with were required to send money home. “Some kids started working in town as young as eight,” she said. “If the families were big they had to send their kids out.” Boys were generally sent to work as farm labourers, machinists, or road workers. Respondent 26 recalled the back pain he suffered the rest of his life from the back-breaking work he engaged in during the depression years as a young man. Remittances from children could help families stay on the

land temporarily. However, many families dependent on the remittances of children for their financial income and ultimate survival were invariably forced to migrate.

Most migrants and non-migrants reported their fathers working solely on the farm and not engaging in off-farm employment. While some may have sought off-farm labour, a critical barrier was simply the lack of jobs during the depression years. As the Depression worsened, off-farm employment became very scarce and more difficult to find (Strong-Boag, 1992).

Respondent 1 said, “Today all farmers have second jobs, but in the 1930s, there were no second jobs to be had.”

5.3.2.3 Sale of assets

The sale of assets is an important adaptation strategy as a means of obtaining financial capital which can be used to purchase necessities for survival. Many farmers sold half-starved cattle during the 1930s as a last resort survival strategy, but for marginal prices (MacEwan, 1990). Prior to migration, farm families typically held auction sales, where they would sell virtually anything they could, including household equipment, farm animals, and assorted junk (Gray 1966). The sale of assets in auction sales is recorded in many stories from Hanna’s local history book. Cecil Brunner Schultz (1978) states “In 1938 my dad decided he had had enough, and we made preparations to move to B.C. We had a farm sale and after the bills were paid we had two hundred dollars left. We had sold cows, horses, machinery and some household effects.” The selling of assets as a coping mechanism was not exclusive to farmers. Many destitute families in large cities sold virtually all their pawnable valuables before applying for relief (Gray, 1966). Gray (1966, pg. 32) states, “Homes all over town were ransacked for odds and ends of clothing and household goods that could be sold.” However, for farmers living in south-eastern Alberta,

this form of adaptation was often the last adaptation strategy employed before migration and was not a sustainable adaptation which enabled farmers to stay on the land. It is, therefore, a short-term, tactical adaptation strategy employed as a final desperate attempt to gain financial capital which was ultimately used to move north and start over.

Migrants recalled selling their starving cattle for virtually nothing after a number of cows had already died due to crop failure. Respondent 2, a migrant said, “We sold all the cattle. They would have starved that winter, so we sold them all and left.” Some farmers sold what they could and managed to transport near starving horses by rail to Peace River. Respondent 27 recalled a man whose “horses were so thin they had to hook them together so they could lean on each other. He shipped them up with the free freight.” A number of migrants also recalled the large auction sales they held before migrating. “We sold everything to our neighbours,” Respondent 9 said. “The only thing we brought was our dog.” Sometimes, the financial capital gained from the sale of assets was used to start new financial ventures upon migration. Respondent 9 explained that his father used the money from their auction sale to buy a butcher shop in town. Respondent 2 explained that his family traded their Chev Sedan for the down payment on a house in Calgary.

5.3.3 Institutional adaptations

The following section discusses the various institutional adaptations that assisted both migrants and non-migrants to cope with the adverse impacts of drought and economic depression.

According to Smit and Skinner’s (2002) typology of agricultural adaptation, the category “government programs” includes agricultural subsidy and support, private insurance and resource management programs that encourage or discourage changes to farming methods, land use and water use. Here, it is worth broadening this definition to include the various institutional

adaptations, including government programs, policies and other responses that influenced individual farmers' adaptation strategies. This section focuses on government assistance, the establishment of the Special Areas, free freight to northern Alberta, and propaganda and cheap land in Peace River.

5.3.3.1 Government assistance

The combined crises of drought and economic depression encouraged the federal and provincial governments to assume much more active roles in the economic and development policies of the Prairie Provinces. Emergency assistance from the federal government began in 1930 and was continued and expanded upon in subsequent years. In 1931 the federal government implemented the Unemployment and Farm Relief Bill and provided \$35 million for relief (McGinnis, 1980). By 1924, the province of Alberta had provided \$7 million in relief (Jones, 1985). However, relief programs proved economically taxing to the Alberta government and caused many municipalities to go bankrupt (Jones, 1987). The out-migration of farmers further crippled municipalities because they quickly lost their tax base. As a result, they were unable to provide basic services and infrastructure requirements. Recognizing that Alberta was teetering on the edge of bankruptcy, Prime Minister Mackenzie King established the Royal Commission on Dominion-Provincial Relations to address the imbalance between federal and provincial responsibilities and their respective fiscal capacities (Ferguson and Wardaugh, 2005). According to Berton (1990), the central problem was that Canada's constitution divided responsibility among different levels of government in such a way that impoverished Albertans could not count on help from anyone.

Federal and provincial relief was grudgingly provided to prairie residents, but Prime Minister R.B. Bennett viewed anyone who applied for relief a failure to society, as did many residents themselves (Berton, 1990). Vegetables, such as potatoes, carrots, beets and turnips were made available to farm families living in CD5 in the early 1930s (Gorman, 1988). Facing near starvation, relief supplies from government agencies and churches were the only available foods for a number of families on the prairies during this time (Burnet, 1979). Farmers also received oats from the Special Areas as feed for cattle. In the early 1920s, the Alberta government provided over \$300,000 for feed and seed, transported hay into the dried out regions and transported livestock out (Jones, 1987).

In some regions of CD5, up to 100 percent of the population was receiving government relief (Burnet, 1979). Despite the humiliation associated with relief, it proved crucial to the survival of many prairie residents during this time, enabling them to stay on the land. Indeed, scholarship indicates that the main objective of these early relief programs was for this precise purpose - to keep farmers on the land who would have otherwise left (Jones, 1987; Marchildon et al., 2007). This objective was born from the concern that should large numbers of destitute farmers drift into the cities where residents already faced high levels of unemployment, violence and civil unrest would erupt (Marchildon and Black, 2006; Neatby, 1950). There was already social unrest in cities due to the fear among the employed that those on relief would look for jobs (Gray, 1966). Increased competition from the movement of rural farmers to town in search of work would only heighten such fear and unrest.

However, relief was often insufficient and the distribution was poorly organized (Burnet, 1979). Rehill (1978), an author in Hanna's local history book, recalls waiting in long lines for feed, often to find out that there wasn't enough to go around. Furthermore, this relief was not

free. In return for groceries, feed, seed and hay, the Alberta government took liens on the crops until the amount was repaid (Jones, 1987). Men were also required to do roadwork in order to pay back the relief they had received (Ripley and Hilyer, 1978). This work, sometimes referred to as “boondoggles”, or “make-work” projects, was essentially a waste of time but was devised to ensure that government assistance was worked off (Gray, 1966).

A number of respondents noted the critical role relief played to their survival and ability to remain in CD5 during the 1930s. Many recalled receiving food, such as apples, cheese and salty cod, as well as feed for livestock, which increased the chance of keeping their farm animals alive, and in turn provided food and meagre income to farm families. Respondent 10, a farmer who stayed, said, “We depended on the grain they shipped in. Otherwise we wouldn’t have survived.”

The stigma associated with receiving relief was also addressed by many respondents. Some respondents expressed the alternative opinion that relief was not critical to survival during this time and that no one should be dependent on the government. Respondent 4, a non-migrant, argued that it was only lazy farmers who required relief because they “couldn’t be bothered with gardening and would rather loaf.” Many of these deep-seated sentiments towards government assistance have remained with survivors of the Depression to this day. Respondent 6 spoke with contempt about the attitude of people today “who expect the government to do everything for them.” Respondent 28, the daughter of a migrant who moved from Patricia to Brownvale in the Peace River Country in 1931, said her grandfather hunted all the time so that “he wouldn’t have to go on the dole.” She explained that he continued to work as a janitor well into his 60s because he refused to accept old age security from the government. He would say, “You just don’t take handouts.”

Some non-migrants proudly proclaimed that their families had refused relief, despite the desperate times. Some migrants even said their families had been too proud to accept government assistance. Respondent 23, a migrant who moved from Coronation to Wanham with his family in 1932, told a particularly harrowing experience of hardship, drought and migration and then said, “We wouldn’t ask for government help. No way.” It is impossible to determine whether migrants who refused government assistance could have stayed on their farm had they willingly accepted it, but government assistance would have increased their adaptive capacity. This discussion suggests that government assistance worked to increase the adaptive capacity of remaining settlers and helped them to stay on the land, despite the opinion of some to the contrary.

5.3.3.2 The Special Areas

The establishment of the Special Areas was a long-term institutional form of adaptation to drought which worked to both encourage out-migration of residents who chose to leave in order to prevent over-population, and encourage sustainable land-management practices of the residents who chose to stay. The Special Areas had an explicit aim of preventing over-population and assisting the adaptation of both migrants and non-migrants (Burnet, 1979). The provincial government recognized that there were some families who would wish to stay and some families would wish to leave. O.S. Longman’s (1932) report on Berry Creek stated, “To bring about an adjustment of farm operations . . . , a reduction in population in certain districts is desirable. To this end it would appear advisable that the present policy of free transportation be continued.” As discussed in Chapter 3, the Special Areas also made available large tracts of land at inexpensive lease rates to existing settlers, promoted improved farming methods and

methods of water conservation (Gorman, 1988). Thus, the establishment of the Special Areas was crucial to increasing the adaptive capacity of both those who chose to stay, and facilitating the adaptation strategy of migration for those who chose to migrate. The Special Areas Board continues to remain responsible for reducing the vulnerability of residents to drought.

Most respondents made reference to the general household history that the Special Areas enabled their family to cope during the 1930s. Non-migrants noted the many benefits they received from the Special Areas, including the acquisition of lease land, the construction of dams and dugouts, the encouragement to diversify into cattle, and the provision of cheaper feed. Respondent 4 explained that upon creation of the Special Areas, her father and four other men in region, including his uncle and cousin, communally used the lease land made available to them and all benefitted from a dugout that was constructed on it. Others recalled being encouraged to diversify their farms into cattle. However, respondents typically offered sparse information on how the Special Areas impacted their specific families' experience. This is in part because during the 1930s, respondents were young and not personally involved with the institution.

5.3.3.3 Free freight to northern Alberta

In 1931 an arrangement was established between the two major railways, the CNR and the CPR, and the federal government and the provincial government, to provide transportation to northern Alberta for desperate farmers wishing to migrate (Wetherell and Kmet, 2000). It is the most obvious form of government assistance that actively encouraged migration out of the driest parts of Alberta during the 1930s. Under this agreement, 1,305 families were moved from southern Alberta to northern Alberta. However, many more moved on their own, with automobiles or wagons loaded with household effects and a few farm animals (Gorman, 1988). This was

because the free freight was offered only from the Special Areas which were expanding throughout the decade. Thus, while drought conditions existed across southern Alberta during this period, only those from areas recently incorporated into the Special Areas could benefit from this transportation policy (Britnell and Fowke, 1962). Others did not take advantage of free freight if they chose destinations outside of Alberta not covered by this policy, such as B.C. or Ontario (Britnell and Fowke, 1962).

Many of the farmers who did migrate via free freight moved to the Peace River district as well as the Red Deer and Edmonton districts (Wetherell and Kmet, 2000). Because of their extreme poverty, most of these families simply could not have migrated without the free freight (Gorman, 1988). Archival data point to the fact that the provincial government recognized the lack of financial resources as a significant barrier to migration. In his report on Berry Creek in 1932, O.S. Longman states, “. . . many settlers residing within the area are anxious to move elsewhere but have not the financial resources to procure transportation and acquire a new location” (Longman, 1932).

Many respondents addressed the critical role free freight played in facilitating migration. But they also discussed its limitations. Free freight was offered only for household effects and livestock. One adult was allowed to accompany the livestock in the box cars, but the rest of the family was required to pay their own passenger freight – a cost which some large families could not afford to pay. Interviewees explained that this led to extreme and nearly fatal measures taken by families who felt they had no choice but to migrate. For example, additional children were often hidden in boxcars. Respondent 14 said, “You were only allowed one person in the box cars with the machinery, but dad had two sons and couldn’t afford to pay for passenger freight, so they hid in the cars and jumped out before the rail got to Peace River, just barely

missing the canyon.” Respondent 23 explained that when he was 14 he lied to authorities telling them he was 18 in order to ride in the boxcar. “I was also hiding people in the car,” he said. “Policemen would come and ask if anyone was hiding and I’d say, ‘Nope!’” Therefore, free freight to northern Alberta provided an opportunity and a way out for families that had limited adaptive capacity to remain in CD5.

5.3.3.4 Propaganda and cheap land in Peace River

Cheap land in Peace River and Athabasca was a significant draw for many families struggling to cope in southern Alberta during the 1930s. Much of southern Alberta had already been fully settled. Land ownership in Peace River was particularly desirable for those who rented land from the railway company (Wetherell and Kmet, 2000). Advertising and favourable press publicity played a significant role in promoting this migration (Zaslow, 1976). After high yields in 1927 and 1928, Premier Brownlee proclaimed the Peace River “would provide farm homes for a million people in less than a decade” and that its production would be greater than “all Western Canada at the present time” (Wetherell and Kmet, 2000). Just as mass promotion across Europe prompted the waves of immigrants to settle the prairies during the early 1900s, promotion of Peace River encouraged many of these same families to move once again. Zaslow (1976) states, “The tide of settlement also underwent a dramatic upturn, and scenes reminiscent of the great western Canadian land rushes of the pre-war years were re-enacted.”

However, despite the great optimism for expansion, by the late 1920s most available homestead land south of the Peace River was of marginal quality, located in heavily wooded regions (Wetherell and Kmet, 2000). As a result, most settlement of migrants from south-eastern Alberta occurred on scattered clearings, located on the margins of existing settlements. Due to

the limited availability of homestead land south of the Peace River, many migrants settled north of the river on dispersed land served only by roads and trails, such as the Fort St. John and Battle River districts (Wetherell and Kmet, 2000).

Respondents addressed the importance of propaganda and the lure of cheap, abundant land to their family's decision to migrate. Respondent 7, a migrant from Patricia to the Peace River district, recalled, "We moved partly because all the land on the prairies was taken. And there were many notices for the Peace River Country advertised all over. We could take up a homestead here for only ten dollars." Respondent 26, a migrant, recalled, "When we were living in Manitoba, we were just working for another farmer. Dad didn't own land there. And he wanted a better life and land of his own. Peace River was going around the country down there. Notices were in the paper and at the office in town. You could file on a homestead. So dad made an application down there to get a homestead up here." Thus, the institutional role played by the Alberta government to promote Peace River a new land of opportunity encouraged migration to this region.

5.4 Summary

This chapter has identified a number of key determinants of adaptive capacity and the various adaptation strategies employed by residents in south-eastern Alberta, and more specifically CD5, during the 1930s. While the forces influencing adaptive capacity were unique to each family, it appears that migrants generally had weaker adaptive capacity in comparison to non-migrants. Migrants often had less economic capital, social capital and human capital, leaving them with fewer strategies that would enable them to remain on the land in the face of an environmental catastrophe. It is difficult to offer a generalized conclusion on the relative importance of each of

the various determinants of adaptive capacity for all CD5 residents during the 1930s. The importance of various underlying forces that determined adaptive capacity, and in turn, influenced the decision to migrate, differed for each family. For example, some interviewees noted weak social networks as crucial to their family's decision to migrate, while other interviewees described severe poverty and lack of economic capital as having been key to their family's decision to migrate. It would generally appear that access to economic capital, human capital and social capital were of greater influence in relative terms than was perception, notwithstanding that this latter factor was often mentioned as being influential.

The adaptation strategies identified included both short-term tactical adaptations (such as increased reliance on wild game, or the use of a poverty box) and long-term strategic adaptations (such as expanded landholdings). In general, long-term adaptations for both migrants and non-migrants were often possible only because of crucial institutional responses, such as the establishment of the Special Areas and the PFRA. These institutions proved invaluable to assisting residents overcome various barriers to adaptation. However, before residents could take full advantage of these institutional responses, they typically resorted to various short-term, tactical adaptations. These types of adaptation strategies, which helped the family remain on the land only temporarily, were often employed by migrants prior to migration. This indicates that most families chose migration as an adaptation strategy of last resort, after all other less disruptive adaptation strategies were exhausted.

These findings suggest that the forces and processes underlying the determinants of adaptive capacity can enable or constrain potential adaptation strategies at the household level. While most families faced similar exposures, they exhibited varying levels of adaptive capacity. As a result, not everyone was able to take advantage of all potentially available adaptation

strategies. The most significant barriers to adaptation described by interviewees were: a lack of adequate financial capital and assets (weak economic capital), limited experience in a trade combined with widespread unemployment (weak human capital), and dogmatic societal attitudes (which could weaken social capital).

The lack of adequate financial capital, assets and land precluded a number of adaptation strategies, including changes to farm methods, acquisition of lease land after population decline, a move into mixed farming and human migration. In addition to the barriers of adaptation strategies which helped farmers stay on the land, poverty constrained the ability of farmers who did not take advantage of free freight, to migrate.

A second significant barrier to various adaptation strategies was the lack of experience in a trade, combined with widespread unemployment across Canada. This posed a barrier to potentially undertaking rural-urban migration and to finding off-farm employment. Those who lacked training or experience in a business venture also found their options for migration constrained (see also Burnet, 1979; Thompson, 1998).

A third significant barrier to various adaptations strategies was dogmatic societal attitudes. This precluded important changes in farming methods and reduced the willingness to accept government assistance. Many interviewees described how the societal mentality towards “proper” farming techniques, promoted both by agricultural experts and fellow neighbours, ensured farmers continued to practice farming methods, such as summer fallowing, which contributed to soil erosion, land degradation and dust storms. It was only after a significant amount of out-migration and the establishment of the Special Areas and the PFRA that farm-level operational practices changed significantly. Interviewees who suffered extreme poverty and hardship also reported a frequent unwillingness to accept government assistance because of

social pressures, an adaptation strategy that would have almost certainly improved household wellbeing. These early mentalities proved extremely difficult to change, resulting in a weakened household wellbeing of many residents in CD5 (Gorman, 1988). The next chapter examines migration as an adaptation strategy in greater detail, offering a glimpse into the experiences of those who left the Dust Bowl of south-eastern Alberta during a time of immense hardship, to head north in an attempt to start over in a new environment.

Chapter 6: The Movement of People from CD5 to Peace River in the 1930s

6.1 Introduction

The previous chapter suggests that migration from the drought-prone regions of southern Alberta represented an adaptation strategy of last resort, after other available adaptation strategies were exhausted. Many migrants themselves recognized this, scrawling PEACE RIVER OR BUST along their cars and wagons (Wetherell and Kmet, 2000). As discussed in Chapter 3, migrants from CD5 and other drought-stricken areas of south-eastern Alberta moved to a variety of destinations, including northern Alberta, BC, Ontario, Quebec and the United States. This chapter focuses on the migration to the Peace River region of northern Alberta and is based primarily on information gained from interviewees who experienced this migration process. It describes the migration decision-making process, the economic costs of migration, the challenges of adaptation and settlement in Peace River, and the perceived benefits of migration. The stories of migrants draw upon the benefit of hindsight to understand the relative costs and benefits of migration as an adaptation to drought and the challenges migrants faced in adapting to a new environment.

As discussed in chapter 5, free freight was offered to farmers willing to relocate from CD5 and other drought-stricken areas starting in 1931 and continued throughout the decade. Families were given two free cars on the train – one for their household effects, and another for their livestock. The provincial government further assisted migrants by establishing immigration halls in major urban centres in northern Alberta. Volunteers would meet migrants at the train station and direct them to immigration halls (Diemert, 1978), made available to families for a week or two until their cattle and household effects arrived by train (Kramps, 1978). Some

authors in local histories from Peace River describe the relief they felt at stepping off the train and having access to comfortable living quarters which included furniture, a kitchen, table, chairs and bedrooms with cots and blankets (Diemert, 1978). But they soon continued on to their final destination where they were often required to homestead all over again.

Thousands more families moved north on their own, without government assistance (Jones, 1987). These farmers packed up their meagre belongings on a hay rack, wagon, or - if they were lucky - an old automobile, and began the long, arduous journey north, camping along the road and stopping to let their horses graze when they reached a patch of grass (Gray, 1966). This trip could take over a month if one was traveling on his own from CD5, Alberta (Giesbrecht, 1978). In addition to the migration of entire farm families, many bachelors migrated alone to northern Alberta (Wetherell and Kmet, 2000). I was unable to identify the exact number of migrants who moved on their own from CD5 to Peace River, for records of this level of specificity do not appear to have been kept. As a result of the wave of migration from across southern Alberta and Saskatchewan to northern Alberta, the population of the Peace River district more than doubled between 1926 and 1931, rising from 22,591 to 50,777 (Zaslow, 1976). Peace River had become known as the 'last, Best West' (Thompson, 1988).

6.2 The migration decision-making process

Many migrants clearly recalled detailed stories of their family's decision to leave south-eastern Alberta during the 1930s - an indication of the indelible impression this experience had on them, even after many decades, and evidence that migrating during times of drought was no trivial undertaking. Respondents recalled their parents debating the idea of migrating north, weighing the pros and cons. Fathers of families that ultimately decided to migrate and of those that did not

often travelled north to Peace River to inspect the land before making a final decision. Some who investigated northern Alberta found it very favourable on account of the precipitation and “lushness.” Respondent 3, a migrant, said, “First dad came up to investigate in 1927. He talked to two or three realtors and came back very thrilled about the country.” Others, however, opted to stay in CD5, after an initial inspection, feeling that the family’s well-being would not be improved upon migration. Respondent 15, a non-migrant, said, “My dad had a 1928 Chev Truck and he took 15-20 men up north who were all looking for a better place to live. All the guys went to Peace River. But every single one came back because they thought that no place is as good as home.” A common explanation among non-migrants for the choice to stay after this inspection was that Peace River had too much brush and was too muddy and wet. Respondent 9 said, “Dad looked around before they moved. Him and a neighbour went north to Camrose and Stettler, but they figured that it wasn't any better there than it was here. I don't think he ever considered going as far north as Peace River because it was brush up there. He thought the deer flies would eat up the horses.”

Migrants often found the migration-decision making process emotionally devastating. There was a deep sense of loss and despair as families left the land they had infused with so much hope and hard work. Many farmers had worked more than 15 years on their farm, only to find that all their effort and careful planning had been useless (Jones, 1987). They also left social networks and communities, established over many years through good will, cooperation and reciprocity. Respondents spoke of tearful farewells and deep sorrow as they said goodbye to fellow farmers in the Hanna region who they would probably never see again. Respondent 16 recalled, “I remember as we drove away from the homestead, dad was so upset that he wouldn't talk until we got to Drumheller.” Respondent 8 said, “I remember mom sitting in the chair and

crying. She had left such a nice house in the prairies and she had no family of hers with her. It must have been scary.” For most, the decision to migrate was not an option they embraced immediately, for it represented a wrenching change in the family’s existence and a period of intense sadness.

6.3 The sale of assets, departure and the economic costs

Migrants reported selling their assets and machinery at an auction before heading north, but non-migrants suggest that many others, unable to sell much in the dire economic climate, literally walked away from their homes and belongings. Respondent 16 said, “We were forced to sell most equipment. When we left in 1937, Dad had to get rid of all the machinery. We gave our furniture to a cousin in the region who stayed. Dad gave our homestead to my cousin Frank.” Respondent 9 said, “We lost the land. It was mortgaged, so it went to the mortgage company. We sold all of our belongings. In the summer of 1937, we decided to move because everything was burnt up. We sold everything to the neighbours - had a big auction sale. The only thing we brought was our dog.”

Many non-migrants recalled migrants leaving in the middle of the night without a goodbye, out of shame and humiliation. Respondent 29, a non-migrant who lived a few kilometres north of Hanna during the 1930s, said, “There was a really nice house in town which housed the post office. The family obviously had quite a bit of money. They were also farmers. But they left everything – just walked away leaving their dishes on the table. There are also stories of people leaving unopened letters and mail on the table and just leaving everything behind.” Sometimes houses would sit empty for years before other farmers in the region

eventually helped themselves to the goods that were left behind. Other times houses were demolished immediately to make use of the lumber.

After the heartbreaking departure from south-eastern Alberta, families were to face significant hardships en route. If they chose to migrate without government assistance they were at the mercy of rainstorms, windstorms and weak horses, traversing poor and often muddy roads. Broadfoot (1975, pg. 46) quotes a migrant: "If you wanted to be charitable, you could call them roads. You see, they froze in winter, but in summer, muskeg. . . There were no other wagons on the trail and it got so we didn't know if we were on the right road." Roads north of Athabasca were not gravelled, so rain in the summer made it nearly impossible to traverse due to the mud. Sometimes they would become just two deep ruts. Local history books indicate that 1935 was a particularly wet year, with roads and bridges washed out, making travelling very dangerous (Kramps, 1978). One woman recalls the journey: "The last nine miles in the wagon was indescribably awful. Up hill and down dale, over logs, through bits of muskeg. I hoped I would never have to travel it again" (Wilson, 1978). But those who took advantage of the free freight also faced difficulties en route. According to Respondent 3, livestock were not allowed to unload until they reached Peace River. She recalled her father being very concerned about the health of his livestock: "Dad was worried about the horses' legs because they couldn't move around at all." Passengers sometimes had to camp out beside the railroad track for days at a time due to delays.

Migrants from south-eastern Alberta, most of whom were already in abject poverty, incurred significant economic costs in the process. Many had literally walked away from their farms, abandoning the houses, belongings and farm land. Upon arriving in Peace River, they found that most of the good land with rich black soils was already taken, and without money to

purchase the little remaining good land, they were left to farm dispersed regions with marginal soil quality (Hursey, 1996; Wetherell and Kmet, 2000). The majority of drought-migrants arrived with virtually no financial capital and found their savings exhausted before they could get their land into production (Wetherell and Kmet, 2000). Respondent 7, a migrant, explained that his family had prepared and organized canned foods for the first winter after migrating to Peace River. But the second year proved extremely difficult as the family was unable to grow a sufficient amount of food in the new climate which was wetter and colder. Accounts from local histories describe the extremely difficult conditions migrants faced in the first few years due to lack of an established vegetable garden, not knowing where the good berry patches were, and limited feed for stock. But, as Wilson (1978) states, “Each year was a little better than the last as we got more land broken, more vegetables, lots of fruit and I suppose better able to cope with conditions as we found them.”

6.4 Challenges in settlement and adaptation to the Peace River Country

Families faced a harsh struggle for survival in a new climate with little infrastructure and limited social support. It was a colder, wetter climate with significant vegetation, or “brush” that required clearing. Often excessive amounts of rain made roads and fields muddy making both transportation and farming difficult. Farmers who reported leaving southern Alberta on account of the drought were soon faced with too much precipitation after moving to Peace River. Respondent 23 said, “We got ready to put the crop in, but it was soon under water – it was the opposite way!” Respondent 30, a migrant who moved from Champion to the Peace River District in 1930, said, “We landed on the 24th of May, 1930. It was raining when we got here and it rained all the way through June. Everything was wet. There was too much water so we

didn't get a crop in. Sometimes we barely had enough to eat. For three years it was really bad because there was too much rain. The potatoes rotted so all we ate for a whole winter was turnips. For those years we relied on turnips and carrots. Dad considered going back down south to the prairies on account of all the rain, but we didn't have the money." Respondent 14 said, "It seemed like it rained all the time when they came up here – you have to be careful what you wish for. They essentially walked into mud." The Peace River Country also had a shorter growing season which influenced the work schedule of the farmer. After moving north, farmers had to work much longer days in order to complete the necessary work in time. Respondent 14 explained: "They had to rush up here. Dad [who migrated from southern Alberta] wanted to finish work by 6 pm, but my husband worked till midnight."

Peace River was a heavily vegetated region and migrants from southern Alberta faced the incredible challenge of clearing the land by hand, building a home and sowing their crop. Respondent 3 said, "There was so much brush here. Clearing the heavy brush was difficult. We had to cut down the trees, dig the roots, burn it and break up the land." Mosquitoes and deer flies posed additional challenges to which migrants were unaccustomed. One migrant recalled making smudges for the livestock to keep the mosquitoes off. Migrants also recalled the difficulty of livestock to adapt to the new environment. Respondent 22 explained that the horses would always escape and run south while Respondent 21, a non-migrant, explained that one family returned to the prairies because their horses could not survive in Peace River.

In addition to climatic challenges, migrants also faced the challenge of homesteading all over again in a new environment. After the struggle to homestead on the prairies, those who left were forced to start all over again from scratch. They had recently experienced the trials of settling a region with few amenities. When settlers had first arrived on the Canadian Prairies,

they were met with virtually no services of any kind – no schools, hospitals, health services, roads, mail services or even municipal governments (Gorman, 1988). However, after a number of years and continued demand from settlers, roads, telephones, schools, churches and other social services began to be provided (Gorman, 1988). Interviewees explained that many did not want to endure these hardships again in a region still in the early stages of settlement.

Respondent 31 said, “People, particularly women, did not want to go through the homesteading process again. In many cases, women wanted to stay, but the men thought they could make a better living by moving north.” Migrants had to learn to build their own log cabins which served as family homes for the next two decades and supplemented their meagre incomes by engaging in seasonal off-farm labour at lumber camps during the winter months (Bekkeheim, 1978). These endeavours proved extremely challenging for farmers from the flat and treeless prairies.

Respondent 14 said, “Dad, from the prairies, knew nothing about log houses.” Many recalled the poorly constructed train infrastructure. Respondent 27 said, “The trains were called Edmonton-Dunvegan-BC (or EDBC) and we would call them Even Dangerous and Badly Constructed.”

Women were also faced with similar conditions of isolation and loneliness upon migrating to a region with limited development (Esak, 1978). Esak (1978) states, “The sense of isolation, at first, was almost overwhelming – each family tucked away in its own little pocket of bush!”

Given the nature of this study, only migrants who stayed in Peace River were interviewed. However, due to these various challenges, not everyone stayed. Occasionally drought-migrants would move south again, but few ever returned to CD5 (Jones, 1987; Wetherell and Kmet, 2000). Non-migrants recalled no cases of anyone returning to CD5.

6.5 Perceived benefits of migration

Generally non-migrants believed that those who migrated were not any better off after the move. Respondent 18 said, “Many who went north were harder off. My aunt went north and she was never happy.” Respondent 15 said, “Both my uncles moved to Peace River. They left almost all their belongings and remained poor and hardworking.” Respondent 29 said, “It wasn’t really rosier in the North. The ones who stuck it out did better in the end.” This was undoubtedly true for the first few years after migration. Respondent 8 compared what her family had on the prairies to her new home in Peace River: “We had a beautiful home on the prairies, but when we moved, we moved into a little log house with low ceilings and little windows.” However, all migrants reported successful establishment after the initial years of hardship in their new home. Respondent 7 explained that migration was indeed economically beneficial because in contrast to southern Alberta during the 1930s, there was work in the Peace River Country. He said, “You could work in the sawmills, in the bush, or hunting wild game. Here there was always work.” Despite the many challenges of migration, every migrant stated emphatically that their family never regretted the move. They felt migration was a good decision and expressed no desire to ever return to southern Alberta. Most explained that the foremost reason for such sentiments was the abundant precipitation in Peace River in contrast to the lack of precipitation in southern Alberta. Respondent 23 exclaimed, “We had rain! It’s nicer to start working if you know you’re going to grow something.” Respondent 14 said, “Up here you could guarantee rain sometimes, but not down there.” Respondent 22 said, “Despite the hardships, Mom and Dad never wanted to go back – not to that dust-filled place. We never regretted moving here.” Respondent 23 said, “You couldn’t have paid my folks to go back. It was too dry. There was nobody left there. When we pulled out, you could drive to Hanna and not see a soul.” Respondent 7 said, “It is the best

place here. They still get dry years down there.” Many expressed gratitude for abundant precipitation in their new home and also rejoiced in the fact there were no grasshoppers or gophers in the Peace River Country. Respondent 32, an interviewee from Peace River said, “People were coming up from the Dust Bowl. And they’d say ‘Oh how nice and green it is up here!’ I don’t know their names. They came up too fast. But boy oh boy were there a lot of people coming in in the 1930s. Wherever there was land to take, they took it. They just came in like birds and landed.”

In addition to sufficient precipitation, migrants noted that a key benefit of moving to Peace River were the greater options for self-sufficiency. The different climate ensured an abundance of wood and wild game, which were critical given the dire economic conditions (England, 1936). While farmers on the prairies recalled difficulties finding sufficient amounts of coal during the winter, farmers in Peace River always had an adequate supply of firewood. Farmers could build their own houses from timber they felled themselves instead of having to purchase wood from a lumber company as was required in the prairies. Peace River also had plentiful wild game which supplied poor families with sufficient quantities of meat year round and brought in additional income from selling fur. Migrants recalled hunting moose and rabbits for food, and hunting coyotes, foxes, weasels, mink and squirrels for hides. For many, moose meat – from dried moose meat to moose meat sandwiches - became part of their daily diet.

Migration of farmers from the dried out regions of Alberta to Peace River represents a somewhat unique case where drought-migrants were willingly accepted and incorporated into their new society. Unlike other cases of drought-migration, such as the migration of farmers from southern Saskatchewan to northern Saskatchewan (Wetherell and Kmet, 2000), or the migration of farmers from Oklahoma to California during this same time period (McLeman,

2006), newcomers to Peace River were not met with animosity or resentment (Wetherell and Kmet, 2000). This was partly due to the fact that Peace River remained relatively undeveloped at the time of their arrival, and as a result, existing settlers faced many of the same challenges as newcomers (Wetherell and Kmet, 2000). Furthermore, settlement of drought-migrants occurred on relatively dispersed parcels of land which ensured societal tension was minimal. They soon integrated into the society of the Peace River Country and contributed, along with existing settlers and other immigrants, to the social and economic well-being of northern Alberta. Over time, non-migrants and migrants to Peace River slowly fell out of touch. Non-migrants generally did not know what became of those families who left. Their stories were left untold in the local history books of the Hanna region. Many said, “I often wonder what became of them. They just left and we don’t know their stories.”

This chapter has shown that, for many former residents of CD5, migration was a logical and beneficial adaptation strategy that increased their household well-being in the long-term. Unquestionably, the emotional, social and economic costs associated with migration were high. Migrants also faced significant challenges en route and upon arrival as they struggled to adapt to a new environment with limited social support. Nonetheless, over time, many families who had migrated north during the 1930s, established successful farms in Peace River and contributed to thriving communities. The stories of these migrants suggest that migration was neither a sign of laziness nor lack of perseverance – as indicated by some non-migrants. More importantly, migration was not a failure to adapt. Rather, migration was an important adaptation strategy to an environmental calamity, which ultimately contributed to the rehabilitation of drought-prone regions in southern Alberta.

Chapter 7: Discussion and Conclusion

7.1 Introduction

Given that anthropogenic climate change is largely irreversible over the next 1,000 years, even if greenhouse gas emissions were to cease immediately, successful adaptation strategies will become increasingly necessary for human survival (Smithers and Smit, 1997; Adger et al., 2005; Smit and Wandel, 2006; Solomon, et al. 2009). Successful adaptation strategies require adequate levels of adaptive capacity. As discussed in Chapter 2, there are numerous determinants of adaptive capacity based on various characteristics of the system, sector and location (Yohe and Tol, 2002). These determinants can include the availability of technology, the role of critical institutions, financial markets, access to tools and resources, public perception, and the level of human capital and social capital (Belliveau et al., 2006; Yohe and Tol, 2002; Reid et al., 2007). The importance of adaptation as a necessary response to climate change is recognized internationally. The IPCC's 2007 synthesis report of the Fourth Assessment Report states that "recent studies reaffirm the TAR [Third Assessment Report] finding that adaptation will be vital and beneficial" (Bernstein et al., 2007). Canada, along with many other countries, has acknowledged the urgency of adaptation and has committed to exploring various adaptation strategies (Natural Resources Canada, 2009).

Historical analogies of human adaptation to climate change offer invaluable tools to help us understand future vulnerability and adaptation to climate change (Glanz, 1991; Rosenzweig and Hillel, 1993; Meze-Hausken, 2000; McLeman and Smit 2006a). For example, findings from McLeman's (2006) study of drought-migration from Oklahoma to California during the 1930s can be used to anticipate future population movements in response to climate change. Similarly, Meze-Hausken's (2000) study of historical drought-induced migration in

northern Ethiopia can be used to understand potential migrant behaviour in the near future. These studies show that lessons from historical experience can help us understand the complexity of migration in response to drought conditions, and the various factors that influence adaptive capacity and adaptation strategies.

Glantz (1991) notes that a key limitation of using historical analogies in climate change impact analyses is the dynamism of vulnerability and adaptation: a community exposed to the same climatic stimuli at a different point in time may adopt very different adaptation strategies. However, the value of this analogy lies in the ability to help us understand the relationship between adaptive capacity and adaptation, the various forces that drive or constrain certain adaptation strategies, and the role of human migration as an important adaptation strategy. According to Glantz (1991), analogies can be used “to provide a glimpse of some aspects of societal responses to climate change at the regional level.” This study continues in a similar vein, using the analogy of drought-migration in Alberta during the 1930s, to better understand the relationship between adaptive capacity and adaptation, the various forces that drive or constrain adaptation strategies, and the role of human migration as an important adaptation strategy. The stories and experiences of those who survived the dirty thirties provide insight into current and future adaptation as Canada faces the threat of simultaneous economic and climatic stress once again. The use of this analogy takes into consideration the significant socio-economic changes that have occurred in western Canada since the 1930s.

As Canada is dragged down by the deepening US recession, many commentators are drawing comparisons between today’s economic crisis and the economic circumstances faced during the Great Depression (e.g. Fox, 2008; Zuckerman, 2008; Kealey, 2009). In her January

2009 speech from the throne, Michaëlle Jean, Canada's Governor General, first reminded us of the struggles Canadians faced during the Great Depression and then stated, "Today we meet at a time of unprecedented economic uncertainty" (National Post, 2009). US president Barack Obama has repeatedly stated that the US, Canada's largest trading partner, is now in the worst financial crisis since the Great Depression (Holland, 2008). Economist Harry S. Dent argues that US President Barack Obama's costly stimulus package will do little to avert a second Great Depression as financial markets continue to decline throughout 2009 (Dent, 2009). Due to the global financial crisis that started in the US, Canada lost more jobs in January, 2009, than in any other month on record in over 30 years, and countries world-wide are experiencing increasing unemployment (Grant, 2009). Some economists predict the worst is yet to come as the world faces a global recession that could potentially last as long as a decade (Gee, 2008; Fox, 2008).

Along with almost all sectors of the Canadian economy, agriculture is also suffering (Cline, 2008). Canadian farmers experienced record high commodity prices in 2008, easing some of the economic difficulties they faced throughout the 1990s, but economic difficulties are returning. Farmers will soon face increasingly tight credit, high interest rates, and steep production costs as the price of oil goes back up (Akin, 2009). Indeed, Canadian agriculture shed more jobs than any other sector of the economy over the past year (Akin, 2009). Canadian livestock producers, in particular, are facing challenging times as they struggle with low prices and rising costs (Canadian Press, 2009). Recognizing the economic squeeze faced by the Canadian agricultural industry, the federal government recently pledged \$1.5 billion to farmers (Egan, 2009). However, this bailout does not represent long-term support, and may not be enough to relieve current and future economic pain. Furthermore, recent economic data suggest that Western Canada – BC and Alberta in particular, are being hit hard by the economic decline

(McLeod et al., 2009). As we once again enter a period of prolonged economic uncertainty, it is worth recalling that within living memory, many Albertans, lived in abject poverty and faced conditions of semi-starvation, malnutrition and mental instability (Burnet, 1979). This is not to suggest that similar hardships are imminent, but rather to remind readers that in recent history, Canadians exhibited high levels of vulnerability during times of economic and climatic stress.

7.2 Future vulnerability to climate change in the Prairie Provinces

In addition to a worsening economy, the Prairie Provinces, and in particular southern Alberta, face the prospect of increasing vulnerability to climate change due to higher temperatures, melting glaciers, decreased stream and river flows, more frequent drought, and increased frequency of extreme weather events (Schindler, 2001; Sauchyn and Kulshreshtha, 2008). As discussed in Chapter 3, recent studies suggest that many parts of the Canadian Prairies experienced, on average, significantly more precipitation in the 20th century than during the past millennium, which was characterized by extreme aridity and recurring droughts (Sauchyn and Beaudoin, 1988; Schindler and Donahue, 2006). The knowledge that the climate of the 20th century in western Canada was somewhat of an anomaly, combined with recent scientific data on current and future climate change impacts, are cause for concern as western provinces once again face severe water shortages and other climatic risks associated with climate change.

Many regions in the Prairie Provinces, including southern Alberta, have undergone warming of 1-4 degrees C in the past 80-118 years, with most of the temperature increase occurring since 1970, and have experienced a decline of 14-24% in total annual precipitation (Schindler and Donahue, 2006). It is projected that temperatures will continue to rise, leading to an increase of several degrees by the end of the 21st century (Schindler and Donahue, 2006).

Rising temperatures will pose significant challenges to agricultural producers in the Prairie Provinces. Agriculture in the prairies relies heavily on surface water from streams and rivers (Gan, 2000). Higher temperatures and increased rates of evapotranspiration will reduce streamflow, causing some first-order streams to become ephemeral (Schindler, 2001). Spring snowmelt currently contributes to 30% of the Prairies' precipitation and is also a critical source of water for agriculture (Gan, 2000). Higher temperatures and decreased annual precipitation will lead to less winter snow fall and the early onset of spring snowmelt, triggering heavier winter floods and leading to less streamflow during the summer months (Gan, 2000).

Most usable water in Alberta originates in the glaciers of the Rocky Mountains. As discussed in Chapter 3, snowpack and glaciers in the Rocky Mountains feed all the major rivers that flow across the Canadian prairies and maintain groundwater supplies (Schindler and Donahue, 2006). However, glaciers of the Rocky Mountains are melting at an alarming rate. For example, many of the large glaciers feeding the headwaters of the Saskatchewan and Athabasca Rivers have already shrunk by approximately 25% (Schindler and Donahue, 2006). As a result, stream flow is reduced and arid regions of southern Alberta are becoming increasingly vulnerable to water deficit (Schindler, 2001). Due to ongoing glacial decline, one day the major rivers that now cross the Prairie Provinces will cease to exist (Schindler and Donahue, 2006).

Scientists predict that the Prairie Provinces will experience extreme, multi-year droughts as climate change impacts intensify (Gan, 2000; Schindler, 2001). Solomon et al. (2009) project that if CO₂ levels peak between 450 and 600 ppm during the coming century, much of the southwestern North America could experience climatic conditions comparable to the Dust Bowl of the 1930s, this time with the potential to last for centuries. Increased drought tendencies will have significant impacts on crop production and livestock for farmers in the Canadian Prairies.

Increased temperatures and lower precipitation will lead to decreased soil moisture availability, increased wind erosion, the loss of fertile topsoil and the spread of desert-like conditions (Motha and Baier, 2005). These changes will contribute to crop stress, reduced crop yields and decreased quality of forage crops (Reid et al., 2007). Longer growing seasons and higher temperatures will increase the potential for plant diseases and pest infestations and also decrease the effectiveness of herbicides and pesticides, making crops even more vulnerable to pests and diseases (Reid et al, 2007). Increasing summer temperatures may lead to heat stress among cows, decreased milk production, lower rates of weight gain, and increased susceptibility to pests and pathogens (Charron et al. 2003).

Recent droughts have not prompted the same type of out-migration as experienced in the 1930s due to sweeping socio-economic changes, but they continue to pose serious challenges to western provinces. Record drought conditions were experienced in the Canadian Prairies in both 2001 and 2002 following two decades of generally warmer and drier conditions, viewed within the context of anticipated climate change (Bradshaw et al., 2004). The droughts had massive economic, social and environmental impacts, which included a drop in agricultural production of an estimated \$3.6 billion, employment losses exceeding 41,000 jobs and severe wind erosion events and deterioration of grasslands (Sauchyn and Kulshreshtha, 2008). At the same time Alberta faces constrained water supply, the province is also experiencing rapid population growth due to its booming energy and industrial development (Schinder, 2001). Population growth is further increasing the vulnerability of Albertans to drought as water demand soars (Schindler and Donahue, 2006; Sauchyn and Kulshreshtha, 2008) and as competition for water between agricultural and non-agricultural users increases (Motha and Baier, 2005; Schindler and Donahue, 2006; Duckworth, 2009).

Due to concerns about future climate change impacts in the Prairie Provinces, agricultural adaptation to climate change is considered urgent and necessary (Sauchyn and Kulshreshtha, 2008). A number of adaptation strategies have been suggested for farmers facing increased aridity, including improved water management and conservation (Sauchyn and Kulshreshtha, 2008). However, even with appropriate adaptation strategies, the impact of climate change on agriculture may be catastrophic in terms of productivity declines and economic losses, leading to widespread societal disruption (Motha and Baier, 2005).

7.3 Socio-economic changes over time

While Alberta may soon face a confluence of economic and climatic conditions akin to the 1930s, many socio-economic changes have occurred over recent decades that have consequently altered the nature of human exposure to climate-related risks, the sensitivity of the systems, and the capacity to adapt.

The statistics in Table 4 point to a structural transformation from a largely family-based way of life to an agribusiness industry that has occurred over recent decades in Canadian agriculture. During the 1930s, agriculture was the backbone of the Alberta economy but in recent decades, the oil and gas industry has largely replaced the agriculture as the key economic sector. Since the 1930s, farms nation-wide have continued to increase in size and decrease in number as technological developments lead to increased efficiency and reduced labour demands (Bradshaw, 2007; Parton et al. 2007). The number of farms in Canada peaked in 1941 at 732,883 and have declined since as farms undergo continual amalgamation (Bradshaw, 2007). Family farming in rural Alberta is no longer an economically viable way of life as farmers face fierce competition, long hours of work, low commodity prices and rising costs (Boyens, 2001). Apart from agro-

industries, few family farms can survive on the prairies without additional off-farm income, often in the oil and gas industry (Boyens, 2001; Bradshaw, 2007).

Table 4: Key Socio-Economic Indicators for Agricultural in Alberta, 1936 and 2006

Alberta	1936	2006
Total population	772,782	3,290,350
Total rural population	486,335	590,499
Total urban population	286,447	2,699,851
Total farms	100,358	49,431
Average size of farm (acres)	100-200	Greater than 3,520
Land under agricultural production (acres)	40,540,000	52,127,857
CD5 (1936) CD4 (2006)*		
Population of Hanna	1, 405	2,847
Total population	21, 359	10,600
Total rural population	18, 300	7,753
Total urban population	3, 059	2,847
Number of farm operators	4, 317	1,805
Average age of farm operators	37	55
Number of farms	4,317	1, 302
Total agricultural farm land (acres)	3, 010, 868	5,009,680
Total area owned (acres)	1,482,758	2,493,338
Total area rented (acres)	1,528, 110	2,028,027
Total area under wheat production (acres)	635,746	443,400
Total cattle and calves on census day	69,523	350,538

(Alberta Finance and Enterprise, 2008; Census of the Prairie Provinces, 1936; Statistics Canada, 2009) *Note that CD5 in 1926 is roughly equivalent to CD4 in 2006.

Rural communities across the province face continual decline due to rural depopulation, the consolidation of farms, the demise of the railway, and the associated flight of wealth and services (Sauchyn and Kulshreshtha, 2008). There are ongoing closures of schools, banks and post offices along with the cessation of sports teams and community events (Boyens, 2001). It is

not uncommon for kids to travel more than two hours a day to and from school (Boyens, 2001). The loss of key services accelerates rural-urban migration, leading to further societal decline and demographic change (Parton et al., 2007). Young people are choosing to leave farming altogether and remaining cultivators continue to age. Many farmers, facing the difficult economic challenges associated with family farming, are actively discouraging their children from entering the farming business and are instead encouraging them to attend university in urban centres (Boyens, 2001).

While farmers faced significant difficulties during the 1930s, they exhibited high levels of self-sufficiency as discussed in Chapter 5. The farm itself, which provided produce from the cows and chickens, and vegetables from the vegetable garden, often fulfilled the basic necessities for survival. Nearby neighbours, always willing to share and help out, provided additional assistance in coping. However, most rural residents no longer have the skills or resources to be self-sufficient as farmers were during the 1930s. Nor is the social fabric as strong as it once was. Indeed, many interviewees stated they would never wish for another depression today because rural residents would simply be unable to cope.

Assessing this widespread transformation in Canadian agriculture, Boyens (2001, pg. 18) states: “What is happening to Canadian farmers is not a short-term, cyclical crisis caused by low commodity prices. Rather, it is a persistent, systematic problem that combines low prices with high costs. Aggravating that situation is a government that seems to lack agricultural policies beyond its focus on free trade and its appetite for deregulation and cost-cutting. It seems as if the federal government has abandoned farmers.”

Boyens’ (2001) statement reflects the critical influence of agricultural policy on the socio-economic conditions of agriculture in western Canada. Many institutions, agricultural

organizations and public policies were put in place during the 1930s and in the decades that followed in order to help farmers manage risk and reduce their vulnerability to both weather-related disasters and market failures (Culver et al. 2001). These include the Canadian Wheat Board, established in 1935 to guarantee a minimum price to farmers for wheat, the Crow benefit, also known as the Western Grain Transportation Act, which subsidized rail transportation, agricultural income support, crop insurance and others. During the 1980s, the Canadian government provided agricultural subsidies equivalent to the EU and the US (Boyens, 2001). The Special Areas, discussed in Chapters 3 and 5 continues to play an important role in southern Alberta and remains the most important institutional force in land and water management for the province (Marchildon et al., 2007).

However, since the 1980s Canadian agricultural support has fallen as the federal government attempted to reduce the deficit (Boyens, 2001). This has involved significant cuts to government spending, deregulation, the removal of farm subsidies and price controls and the privatization of state industries and utilities (Venema, 2007). Between 1992 and 2002 federal agricultural support fell from \$6.1 billion to \$2.9 billion (Venema, 2007). Funding for subsidized rail transportation, the Crow Benefit, was stripped in 1995 under the Chretien Government and had the effect of devastating farmers' gross income (Boyens, 2001). In addition to reduced agricultural support, the Canadian government has focused on export production for global markets. As early as 1989 the National Farmers Union of Canada stated that Canada no longer had an agricultural policy. Instead it had a "trade policy that masquerades as farm policy" (Venema, 2007). Cuts to agriculture support programs mean it is even more difficult for family farms to survive economically.

As a result of the enormous transformation in Canadian agriculture since the 1930s, the nature of farm-level exposure, sensitivity and adaptive capacity has changed. While scholarship has consistently characterized Canadian agricultural adaptive capacity as high (Gan, 2000; Sauchyn, 2007), there are always climate thresholds beyond which agricultural systems cannot cope. This is in part because many agriculture policies and programs currently in place do not account for future impacts of climate change (Venema, 2007). Indeed, when faced with simultaneous water and economic crises, and the loss of many important coping skills due to socio-economic changes, adaptive capacity could be exceeded.

Agricultural production has decreased in relative terms in comparison to Alberta's GDP but agriculture remains an important industry that continues to support many family farms and rural communities. Indeed, while urban centres have grown in size, in absolute terms, the population of rural Alberta is larger today than it was during the 1930s. Therefore, although there have been many changes in rural Alberta since the 1930s, the rural population remains an important sector of society that must be considered under future climate change scenarios.

7.4 Lessons for future climate change in rural Alberta

This study provides three important lessons that remain relevant today. Firstly, the adaptive capacity of rural households can be identified and understood by considering their access to economic, social and cultural capital. Secondly, migration can be understood as a potentially successful adaptation strategy to drought rather than a failure to adequately adapt. And thirdly, institutions can play a fundamental role in facilitating the long-term adaptation of rural populations, and this case provides suggestions about how we can learn from past missed opportunities.

7.4.1 Lesson #1: Capital endowments matter to rural household adaptive capacity

This study points to differences in capital endowments between migrants and non-migrants that determined levels of adaptive capacity and influenced the decision to migrate, a finding consistent with McLeman and Smit (2006a). As discussed in Chapter 5, migrants typically exhibited less economic, human and social capital vis-à-vis non-migrants. Migrants were sometimes poorer than non-migrants, had larger families and fewer resources, and farmed land with poor soil quality and limited access to water. Some had lower levels of self-sufficiency, lacked a spouse, or had limited experience in dryland farming. Migrants also typically had weak social networks in CD5, experienced feelings of isolation and loneliness, suffered from regional societal decline and had networks with people in the destination region. Non-migrants generally had more economic, human and social capital to cope with severe drought and economic decline without migrating. That those with lower levels of capital endowments and decreased adaptive capacity are more likely to migrate than those with greater capital endowments and increased adaptive capacity is consistent with findings made elsewhere by Meze-Hausken (2000). Differential levels of capital endowments thus appear to influence the choice of migration as an adaptation strategy to drought.

Household capital endowments, including economic, social and human capital, remain vital to the adaptive capacity of residents in rural Alberta and the survival of rural communities today. The loss of these types of capital endowments with the flight of key services and continued depopulation can prove disastrous for communities. For example, Stettler, a community 130 km north-west of Hanna, is desperately struggling to retain its family physicians and is in need of more. Three of Stettler's six doctors are from South Africa - an indication of

the inability to attract Canadian trained doctors to rural communities. Discussions with residents of Stettler during field data collection suggest that many are concerned about the current crisis in health care and what the loss of even one or two doctors could mean for the future of their community. Unfortunately, Stettler's health care crisis is characteristic of rural communities across the province. As discussed above, communities are finding it challenging to retain adequate health care, education and cultural services – all critical components of adequate capital endowments.

However, there are some interesting examples of concerted efforts to revive dying communities. For example, Rosebud, a small community approximately 100Km north-east of Calgary, was described by many in the region of CD5 with whom I spoke as a ghost town during the 1970s. But with the arrival of LaVerne Erickson, a music and art teacher who began a children's summer art camp, the community's social capital gradually grew. Rosebud now features the Rosebud Theatre and the Rosebud School of the Arts, which in turn fostered the development of many other key services, such as cafes, stores and small inns. The critical role of economic, social and human capital to adaptive capacity suggests that community members and political leaders alike can play an intentional role in promoting healthy communities. Political authorities, such as members of the Alberta government, can also play a vital role by recognizing the importance key services to the rural livelihoods when the closure of another school or hospital is under consideration. We cannot recreate the conditions that cultivated strong economic, social and human capital in the past, but we can understand the critical components to find new opportunities to strengthen household capital endowments and thereby strengthen adaptive capacity within the changed socio-economic context of rural communities today.

7.4.2 Lesson #2: Migration is a potentially successful adaptation strategy

This study suggests that migration is typically not the adaptation strategy of first choice when households are confronted with adverse climatic conditions, a finding consistent with Meze-Hausken (2000) and McLeman and Smit (2006a). Migrants from CD5 tended to employ other adaptation strategies before migrating, such as increased water conservation or increased reliance on wild game. As discussed in Chapter 6, migration was a very disruptive process which involved high economic costs, such as the abandonment of land and resources, and high social costs, such as the breaking of social ties in CD5. The costs of migration identified here are consistent with Moore and Smith (1995) and Kates (2000). Thus, it is not surprising that residents of CD5 attempted to employ less disruptive adaptation strategies before finally deciding to leave the region. However, despite the fact that it was often the adaptation strategy of last resort, this study also suggests that we should avoid viewing migration as a failure to adapt.

Various scholars have characterized migration as a failure in adaptation because it is often an indicator of extreme deprivation, hardship, and weakened social resilience (Gregory 1989; Meze-Hausken, 2000). Others have noted that migration in response to climate change can be an indicator of both stability and instability depending on the *type* of migration (Adger, 1999). According to Adger (1999), the migration of one or more family members in order to diversify household income through remittances is understood as a form of spreading risk and increasing adaptive capacity (Adger, 1999), while widespread displacement can entail deleterious socio-economic consequences for both sending and receiving regions. Information gained from this study supports the argument that migration was an indication of the limited capacity of residents to adapt to environmental risks in the source region. But this study also shows that migration

enabled successful adaptation in the destination region and therefore was anything but a failure to adapt.

Migrants reported that migration was a logical and beneficial response to extreme climatic and economic stresses. Adger et al. (2005) develop a normative evaluative criteria for assessing the relative success of adaptation strategies and argue that the important determinants of successful adaptation include effectiveness, efficiency, equity and legitimacy. Migration from CD5 to northern Alberta during the 1930s was an effective adaptation in that it achieved the objective of reducing exposure of both migrants and non-migrants to adverse environmental conditions. Migration was efficient in that the long-term costs and opportunities outweighed the short-term costs for many migrants. And finally, migration proved relatively equitable for both migrants and non-migrants and also gained legitimacy through the involvement of the Special Areas. Therefore, it appears that migration was a successful adaptation strategy that increased the well-being of migrants and non-migrants in the long-run. Non-migrants benefited from population relief and access to larger landholdings through lease agreements. This depopulation was never reversed despite the increased adaptive capacity of the region (Jones, 1987). Scholars are increasingly viewing migration as a potentially successful adaptation strategy to climate change (e.g. Moore and Smith, 1995; McLeman and Smit, 2006a; Reuveny, 2007). With rapid population growth in regions that are projected to suffer severe drought in the near future, academics and policy-makers alike should be more willing to consider migration as one form of adaptation that can prove beneficial for both migrants and non-migrants.

7.4.3 Lesson #3: Institutions can increase household adaptive capacity and promote migration

The study of drought migration from southern Alberta during the 1930s underscores the critical role played by institutions to decreasing the vulnerability of both non-migrants and migrants. The Special Areas helped non-migrants in CD5 cope with drought in the long-term and recover from the widespread environmental degradation of the 1930s. As mentioned in Chapter 5, adaptation strategies promoted by the Special Areas included methods of water conservation and sustainable land management practices. Data gathered from interviewees suggest that many residents simply would not have had the means or wherewithal to employ these adaptation strategies independent of government assistance. Furthermore, as noted in Chapter 5, most long-term adaptations were undertaken only with government assistance. In addition to increasing the adaptive capacity of remaining resident, the Special Areas increased the adaptive capacity of migrants. Poverty-stricken farmers, encouraged to migrate, were offered the opportunity with the provision of free freight to northern Alberta and assistance en route. The Special Areas thus made available a much larger repertoire of adaptation options to residents of CD5, one of which was migration. These findings are consistent with those of Marchildon et al. (2007) who argue that institutional adaptation in southern Alberta during the 1930s proved critical to lowering the vulnerability of migrants and non-migrants.

It is widely acknowledged that the ability of individuals to respond to adverse exposures is ameliorated by the ability of institutions to adequately plan for changing climate conditions and provide appropriate adaptive processes and programs (Adger, 1999; Magadza, 2000). However, a key requirement for such institutional adaptations is a stable governance system with sufficient resources and political will to address serious climatic challenges (Magadza, 2000).

Particularly in light of studies that project mass migrations in response to rising sea levels, floods, droughts and other extreme events related to climate change (e.g. Myers 2002), a stable political system will prove all-important to increasing the coping capacity of both migrants and non-migrants (Meze-Hausken, 2000). As noted by a number of scholars (e.g. Magadza, 2000; McLeman, 2006a), migration in response to climate change will occur with or without institutional assistance, but unassisted migration has the potential to cause societal conflict in receiving areas (Reuveny, 2007). This study shows that proactive adaptive measures supported by government institutions, can ease the economic costs of migration by making available subsidized transportation, and minimize the societal costs upon settlement in a new region by directing migrants to destinations with limited potential for societal conflict.

What do these findings mean for future institutional responses to drought in western Canada? As noted by Brooks and Adger (2005), the ability of institutions to adequately plan and implement adaptation strategies is determined by the capacity to learn from historical experiences and apply these experiences to new circumstances under future climate change. However, evidence suggests that current institutional programs and activities are not presently adapted to the range of climate conditions projected under future climate change scenarios (Sauchyn and Kulshrestha, 2008). It has been many decades since the government provided free transportation to drought-stricken farmers in south-eastern Alberta seeking to migrate. However, this historical case shows that governments can provide a range of diverse adaptation options in response to drought even during times of meagre resources. Many interviewees expressed deep concern over the increasing aridity in recent years and acknowledged that governments must play role in promoting adaptation to water deficit and in reducing the potential for societal conflict between farmers and industry over water use. The Alberta government has

acknowledged the potential water crisis and first released their water strategy called *Water of Life* in 2003 which aims to increase water efficiency by 30% by 2015 (Government of Alberta, 2008). However, the surge in water demand from the oil and gas industry combined with the growing population means that much more is needed to address looming water shortages. Given that severe water scarcity is projected for both urban and rural residents (Schindler and Donahue, 2006), institutions can take a more active role in water conservation, watershed management, regulated water withdrawals, water-pricing for energy production, improved monitoring of water quality and quantity (Griffiths and Wolynillowicz, 2009), further research on climate change impacts, and give more thought to ameliorating population pressures on scarce water resources.

7.5 Contribution to migration theory

While much literature on migration theory is not empirical (Massey et al., 1994), this study contributes important empirical findings to migration theory. The findings in this study support key tenets of various migration theories discussed in Chapter 2. None of these theories alone can fully explain the migration of residents from CD5 to Peace River, but some theories explain the migration process in this study better than others.

The neo-classical economic model of migration views migration as a simple cost-benefit decision of one individual seeking to maximize his or her income. Without a doubt, economic considerations played an important role in the decision of individuals and families to migrate out of CD5 during the 1950s. As outlined in Chapter 5, economic hardship, including high levels of indebtedness, declining commodity prices and failing crops in south-eastern Alberta, combined with the hope of increased economic well-being in northern Alberta, influenced the decision of many to migrate. However, additional tenets of the neo-classical economic model of migration

are not supported empirically by this study. For example, proponents of this theory believe that migrants move from low-wage regions to high-wage regions and seek destinations with the highest net gain. But the destination options among migrants from CD5 were constrained due to lack of funds, widespread unemployment nation-wide, and the availability of land. Furthermore, the neo-classical economic model of migration cannot fully explain the migration of entire families from CD5 to northern Alberta or the historical contributions to such migration, such as the role of land settlement policy. Migration routes were significantly influenced by social networks in certain destinations and government programs which promoted resettlement in northern Alberta. These criticisms of the neo-classical economic model of migration are consistent with Castles and Miller (2003) and Portes and Böröcz (1989). Thus, economic considerations may not always have been the most important factor in determining migration decisions.

As discussed in Chapter 2, the new economics of labour migration approach explains migration as a household survival strategy for spreading risk. Unlike the neo-classical economic model of migration, this theory helps to explain the migration of entire families out of the drought-prone regions of Alberta during the 1930s as an attempt to maximize their collective utility. The new economics of migration theory also explains why some families during this time chose to send one or more children to work in urban centres or on nearby farms in order to send remittances home. While this approach is important and complements the neo-economic model of migration, it fails to fully explain the migration process in this study.

The historical-structural approach helps explain many of the complexities of this migration process and addresses a number of the failings of the economic theories of migration discussed above. Migrants did not have the free choice and agency to move to any destination

they chose. As outlined in this study, macro-structural forces, such as the role of free freight to specific destinations in northern Alberta and the concerted effort of the Special Areas authorities to reduce population levels in south-eastern Alberta, circumscribed individual choices. At the same time, migrants were not robbed of free agency altogether. As noted by Longman (1932) in his report on the drought-prone region of Hanna, there were some people who chose to stay and others who chose to leave.

Migration systems theory offers insight into the role of capital endowments, such as the social capital which involves linkages between the place of departure and the place of destination. This study shows that various forms of household capital endowments can significantly influence the decision to migrate. Migration systems theory also offers the opportunity to analyze migration as the result of interacting scales of influence and agency, from the micro-level of the individual or household, to the macro-level of state policies or international financial markets. This type of analysis helps to explain the interaction of household decision-making and institutional pressures to migrate. Just as many other empirical studies provide most support to the migration systems theory (Castles and Miller, 2003), so too does this study. Nevertheless, important insights are still gained from other theoretical approaches which offer piecemeal explanations into the migration process of residents from CD5 to the Peace River country in the 1930s.

Consistent with scholarship on migration in response to environmental change (e.g. Hay and Beniston, 2001; Myers, 2002; Hunter, 2007), this study suggests that climate change can stimulate migration. As explained in Chapter 4, every respondent unequivocally cited drought as the primary reason for migration. However, while drought may have played a disproportionate role in influencing the migration of families out of CD5 during the 1930s, it does not explain

why some people chose to stay while others chose to leave, the migration process, or the choice of destination. Drought was indeed the underlying motivation for migration, but is not the complete picture. As detailed in this study, adaptive capacity and adaptation strategies can help us understand the nuances of human migration behaviour in response to environmental change. Thus, while we can understand climate change as a trigger for migration, an understanding of adaptive capacity and adaptation strategies can better equip us to understand who will migrate and who will stay and options for increasing the adaptive capacity of both groups.

7.6 Methodological Challenges

Interviewing elderly people presents a number of methodological challenges. Chief among these is the challenge of data validity and data reliability (Jackson et al., 1989; Perry, 1982, Ebrahim, et al, 1987; West et al., 1991; Berney and Blane, 1997). West et al. (1991) identify four main characteristics of elderly people that threaten the validity of data: (1) physical characteristics; (2) cognitive characteristics; (3) affective characteristics and (4) personal characteristics. Physical characteristics include health problems which may affect the ability or participants to communicate, such as pain or seeing and hearing difficulties. Cognitive characteristics refer to, among others, general disorientation and short-term memory deficit. Affective characteristics refer to the ways in which elderly people respond emotionally to questions during an interview, including lack of affect, distress, unhappiness or other feelings. Finally, personal characteristics include a range of personal information, such as ethnic background, education levels, and languages spoken (West et al., 1991). In order to minimize these challenges, I chose not to interview anyone with physical or cognitive difficulties.

Two key recommendations offered by West et al. (1991) to increasing the validity of data obtained from elderly people include recognizing the value of stories and recognizing the value of socializing. All the data gathered from interviewees were based on story-telling, including stories of growing up on the family farm, stories of migration, and stories of resettlement. These stories were often told over a snack or a meal, offered to me by the respondent. In addition, I typically engaged in social activities prior to or after interviews. Those still living on farms took me on a tour of their farms, proudly showing me their vegetable gardens, livestock and land. One elderly man took me to the back of his yard to view an old shack which had been the original farm house his father built in 1910 - the same shack in which the respondent was born. Other respondents offered me gifts, asked me to watch movies with them or arranged for a family member to take me on a tour of the community. Throughout the socializing process I developed personal relationships with the respondents, increasing the likelihood of obtaining accurate and valid information

In addition to the concern of data validity and data reliability when interviewing elderly people, a second key challenge of this study involves the collection of retrospective data over seven decades. Literatures suggests that the accuracy of information tends to falls as the duration of lapsed time increases and as information requested becomes more detailed (Berney and Blane, 1997). When asked about the nature of adaptive capacity and adaptation options, respondents frequently attributed their inability to provide specific details due to their young age during the 1930s and the length of time that has passed since the 1930s. For example, as discussed in Chapter 5, most non-migrants were unable to offer specific information on the programs under the Special Areas, such as water conservation programs or initiatives to promote improved farming methods, that their families benefited from. Nevertheless, almost every non-migrant

identified the Special Areas as an institutional response that was critical to their adaptive capacity – a valuable insight in itself. Similarly, a number of migrants were unable to recall the specific details of the migration process but they were able to explain that their parents specifically chose land in the Peace River Country based on access to water and that their families never regretted the move. The general insights and opinions offered by respondents were perhaps more crucial than the details of the various experiences which could be supplemented with archival data.

The primary method of mitigating challenges associated with retrospective data collection was the use of multiple sources of data, which included archival data and secondary information. In order to ensure additional rigour in the reliability and validity of this research, I searched for any information that was inconsistent, contradictory or questionable and chose not to report this information. However, there was very little information reported by respondents that I identified as potentially erroneous.

Despite the concerns among some respondents over their inability to offer detailed information, I was frequently astounded by the incredible memory many respondents exhibited, including those well into their 90s. Many could recall specific dates of events, climatic conditions, and socio-economic circumstances. As an example of memory recall, here is an excerpt of a transcription from a 99 year old man I met at a retirement home in Edmonton:

I was born in England in 1909. Dad was a butler in England for twenty years and married a maid he worked with who was to become my mother. Together my parents moved to New York. And then back to England where my older brother and sister were born. Dad worked for Sir Daniel Cooper, who was a race horse breeder, in Newmarket. I was born there, but then Cooper died and dad didn't have a job anymore, so it was back to New York. In New York dad saw the CPR ads which lured immigrants to the west. Dad fell for it and thought he'd "make a fortune". But mom didn't like the idea at all. She thought it was too much of a gamble. Mom finally said she would go west on one condition: that the family return to England one more time to say goodbye to all the

relatives. So it was back to England again. We sailed on the famous Lusitania on March 9, 1912. When we returned to New York, we stayed with an aunt and uncle who lived there for one night. On March 16 we left New York and we headed for Montreal. In Montreal got on a settler's car headed for Calgary. The trip took us four days. We arrived in Calgary on the 20th of March where dad went to the CPR to get land. We finally settled in Gleichen, Alberta. . . But then the weather completely changed. It was dry from 1929 to 1936. In 1929 we had no crops and that was the year we left. Drifting Russian thistle would get stuck in the fences, and dust would pile up so high that you could walk right over the fences. I wouldn't have given a nickel for the whole countryside. The dust storms came up as black as the ace of spades from the North West. If you were in the car you had to pull over and wait for the storm to past. When the storms were gone, the houses were full of dust. . . The CPR had sold dad another quarter for \$55 on credit- Dad had the credit from the CPR. When dad left the farm in 1929, he'd already paid the value of the farm, but still owed just as much because of the interest. When we moved, the CPR re-evaluated the land and decided that the cost was \$8. Can you believe it? A drop from \$55 to \$8!?

This research underscores the value of interviewing elderly people and demonstrates that recalled information from over 70 years ago can be obtained with a high degree of accuracy when steps are employed to mitigate methodological challenges. This research also shows that even if some respondents cannot recall specific details of experiences in the past, there is important value to be gained from expressed concerns, opinions or feelings of historical experiences. These findings support the work of others, such as Berney and Blane (1997), who state that high levels of recall ability after numerous decades can be obtained with a useful degree of accuracy.

7.7 Conclusion

This study has documented the adaptive capacity and adaptation strategies employed by residents of Alberta CD 5 and by migrants from CD5 to the Peace River Country during the 1930s when residents faced the harsh confluence of climatic and economic stress. In addition to alternative adaptation strategies that enabled residents to stay in CD5, this study has examined migration as

an adaptation strategy to drought. By interviewing elderly people who still retain knowledge of the factors that influenced migration-decision making, I have identified key differences in adaptive capacity and resultant adaptation strategies of migrants and non-migrants.

The results from this study suggest that migrants tended to have weaknesses in one or more of the key determinants underlying adaptive capacity vis-à-vis non-migrants, which included economic, human and social capital. It appears that weakened adaptive capacity has the potential to influence a household decision to migrate. A number of adaptation strategies, other than migration, were employed by residents of CD5 by non-migrants and by migrants prior to departure. These involved: i) changes in farm production practices, including changes in farming methods, mixed farming, expanded land holdings under lease agreements, adaptation to water shortages, changes in feed methods and increased reliance on wild game; ii) adjustment to farm-level financial management, including barter, off-farm employment and the sale of assets; and iii) institutional adaptations, including government assistance, Special Areas and free freight to northern Alberta, and propaganda and cheap land in Peace River. A number of barriers to adaptation were identified: the lack of adequate financial capital and assets, limited experience in a trade combined with widespread unemployment, and dogmatic societal attitudes.

In addition to these adaptation strategies, this study has documented the migration process of residents from CD5 to the Peace River Country during the 1930s and shows that migration can be considered a successful adaptation strategy to drought. Migration was a logical and beneficial adaptation strategy that increased the long-term household well-being of migrants and non-migrants. There are a number of lessons this study offers in light of projected economic decline and increased water scarcity for rural residents of south-eastern Alberta.

Sources Cited

- Adger, N.: 1999, 'Social vulnerability to climate change and extremes in coastal Vietnam', *World Development* **27**(2), 249-269.
- Adger, N.: 2003, 'Social capital, collective action, and adaptation to climate change', *Economic Geography* **79**(4), 387-404.
- Adger, N.: 2006, 'Vulnerability', *Global Environmental Change* **16**(3), 268-281
- Adger, N.: 2007, 'The shape of things to come?' *The Guardian*. Retrieved March 16, 2008 from <http://www.guardian.co.uk/environment/2007/nov/05/greenlist.comment1>
- Adger, N., Arnell, N.W., and Tompkins, E.L.: 2005, 'Successful adaptation to climate change across scales', *Global Environmental Change* **15**(2), 77-86.
- Akin, D.: 2009, February 9, 'Federal government pressed to help agriculture', *The Calgary Herald*. Retrieved February 16th from <http://www.calgaryherald.com/Business/Federal+government+pressed+help+agriculture/1270949/story.html>
- Babb, S., Babb, D., and Wixson, D.C.: 2007, *On the Dirty Plate Trail: Remembering the Dust Bowl Refugee Camps*, University of Texas Press, Austin.
- Barnett, J.: 2001, 'Security and climate change', *Global Environmental Change* **13**(1), 7-17.
- Barnett, J. and Adger, N.: 2003, 'Climate dangers and atoll countries', *Climatic Change* **61**(3), 321-337.
- Bates, D.C.: 2002, 'Environmental refugees? Classifying human migrations caused by Environmental Change', *Population & Environment* **23**(5), 1573-7810.
- Bekkeheim, T.: 1978, 'Bekkeheim, (Ted) Trygve', in W. Moore and F. Moore (ed.), *Across the Smoky*, Debolt and District Pioneer Museum Society, Debolt, pp. 92.
- Belliveau, S., Smit, B., and Bradshaw, B.: 2006, 'Multiple exposures and dynamic vulnerability: Evidence from the grape industry in the Okanagan Valley, Canada', *Global Environmental Change* **16**(4), 364-378.
- Bernstein, L et al.: 2007, 'Climate change 2007: Synthesis report', *The Intergovernmental Panel on Climate Change*. Retrieved February 14th from http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf
- Berton, P.: 1990, *The Great Depression: 1929-1939*, McClelland & Stewart Inc, Toronto.
- Bilsborrow, R.E. and Carr, D.: 2000, 'Population, agricultural land use, and the environment in developing countries', in D.R. Lee and C. Barrett (eds.), *Tradeoffs or Synergies? Agricultural Intensification, Economic Development and the Environment*, CAB International, Wallingford, UK, pp. 33-56.
- Boucher, A.: 1985, *Biography of Ethel Louisa Marks Botsford Gale*, Valley Printers, Peace River.
- Boyd, M.: 1989, 'Family and personal networks in international migration: recent developments and new agendas,' *International Migration Review* **23**(3), 638-70.
- Boyens, I.: 2001, *Another Season's Promise*, Penguin Books Ltd, Toronto.
- Bradshaw, B.: 2007, 'Climate change adaptation in a wider context: Conceptualizing multiple risks in primary agriculture', in E. Wall, B. Smit and J. Wandel (eds.), *Farming in a Changing Climate*, UBC Press, Vancouver, pp. 103-114.
- Bradshaw, B., Dolan, H. and Smit, B.: 2004, 'Farm-level adaptation to climatic variability and change: crop diversification in the Canadian Prairies', *Climatic Change* **67**(1), 119-141.

- Britnell, G.E. and Fowke, V.C.: 1962, *Canadian Agriculture in War and Peace 1935-50*, Stanford University Press Stanford, California.
- Brklacich, M., McNabb, D., Bryant, C., and Dumanski, J.: 1997, 'Adaptability of agriculture systems to global climate change: a Renfrew County, Ontario, pilot study', in B. Ilbery, Q. Chiotti and T. Rickard (eds.), *Agricultural Restructuring and Sustainability*, CAB International, London.
- Broadfoot, B.: 1978, *La grande depression*, Édition Québec, Ottawa.
- Brooks, N., and Adger, N.: 2005. 'Assessing and enhancing adaptive capacity', in B. Lim and E. Spaner-Siegried (eds.), *Adaptation Policy Frameworks for Climate Change: Developing Strategies, Policies and Measures*, Cambridge University Press for United Nations Development Programme—Global Environment Facility, Cambridge
- Bryant, C.R., Smit, B., Brklacich, M., Johnston, T., Smithers, J., Chiotti, Q. and Singh, B.: 2000, 'Adaptation in Canadian agriculture to climatic variability and change', *Climatic Change* **45**(1), 181–201.
- Burnet, J.: 1979, *Next-Year Country: A Study of Rural Social Organization in Alberta*, University of Toronto Press, Toronto.
- Byfield, T.: 1998, *Alberta in the 20th Century. Fury and Futility: The Onset of the Great Depression 1930-1935*, United Western Communications Ltd, Edmonton.
- Canadian Press.: 2009, February 10, *Economy, Troubled Livestock Sector the Focus as Agriculture Ministers Meet*. Retrieved February 11 from <http://www.google.com/hostednews/canadianpress/article/ALeqM5hwRMK6YITerZ816vIvJnMIoQYOaQ>
- Carter, S.: 1999, *Aboriginal People and Colonizers of Western Canada to 1900*, University of Toronto Press Inc, Toronto.
- Castles, S. and Miller, M.J.: 2003, *The Age of Migration: International Population Movements in the Modern World*, Guilford Press, New York.
- Census of the Prairie Provinces.: 1936, *Canada Dominion Bureau of Statistics*, Printer to the King's Most Excellent Majesty, Ottawa.
- CF.: 1929, Jan 17, *Hanna Herald*.
- Chan, N.W.: 1995, 'Choice and constraints in floodplain occupation: the influence of structural factors on residential location in Peninsular Malaysia', *Disasters* **19**(4), 287-307.
- Charron, D., Waltner-Toews, D., Maarouf, A., and Stalker, M.: 2003, 'A synopsis of the known and potential diseases and parasites of humans and animals associated with climate change in Ontario', in S. Griefenhagen and T. Nolan (eds.), *A Synopsis of the Known and Potential Diseases and Parasites Associated with Climate Change*. Forest Research Information Paper No. 154. Ontario Ministry of Natural Resources, Toronto, pp. 7–89.
- Chiotti, Q.: 1998, 'An assessment of the regional impacts and opportunities from climate change in Canada', *Canadian Geographer* **42**(4), 380–393.
- Cline, H.: 2008, Dec 20, 'Fiscal crisis will impact agriculture', *Western Farm Press* **30**, 27.
- Cook, E, Seager, R., Cane, M., and Stahle, D.: 2007, 'North American drought: Reconstructions, causes and consequences', *Earth-Science Reviews* **81**(1-2), 93-134.
- Croll, E., and Ping, H.: 1997, 'Migration for and against agriculture in eight Chinese villages', *The China Quarterly* **149**, 128-146.
- Culver, D., Niekamp, D., Zafiriou, M.: 2001, 'Canadian agricultural safety net programs and pressures for change', *Canadian Journal of Agricultural Economics* **49**(4), 509-527.

- Curran, S.: 2002, 'Migration, social capital, and the environment', in L. Wolfgang, A. Prskawetz, and W.C., Sanderson (eds.), *Population and Environment: Methods of Analysis*, Population and Development Review, New York, pp. 89-125.
- DeJong, G.F. and Fawcett, J.: 1981, 'Multidisciplinary frameworks and models of migration decision making', in G.F. De Jong and R.W. Gardner (eds.), *Migration Decision Making Multidisciplinary Approaches to Microlevel Studies in Developed and Developing Countries*, Pergamon Press, New York, pp. 13-58.
- Dent, H.: 2009, *The Great Depression Ahead*, Simon & Schuster Audio, New York
- Deshingkar, P. and Start, D.: 2003, *Seasonal Migration for Livelihoods in India: Coping Accumulation and Exclusion*, Overseas Development Institute, London.
- Diemert, F.: 1978, 'Diemert, Frank', in W. Moore and F. Moore (eds.), *Across the Smoky*, Debolt and District Pioneer Museum Society, Debolt, pp. 182.
- Dragon, G.: 1974, 'Ukrainian family', in H. Robertson (ed.), *Salt of the Earth: The Story of Homesteading in Western Canada*, James Lorimer & Company, Publishers, Toronto, pp. 84.
- Duckworth, B.: 2009, February 12th, 'Demand for water increasing in Alberta', *Western Producer*. Retrieved February 14, 2009 from <http://www.producer.com/free/editorial/news.php?iss=2009-02-12&sec=news&sto=0030>
- Dugmore, A.J., Borthwick, D.M., Church, M.J. Alastair, D., Edwards, K.J. Keller, Christian, K., Mayewski, P., McGovern, T.H., Mairs, K., and Sveinbjarnardottir, G.: 2007, 'The role of climate in settlement and landscape change in the North Atlantic islands: An assessment of cumulative deviations in high-resolution proxy climate records', *Human Ecology* **35**(2), 169-178.
- Easterling, D., Evans, J., Groisman, P., Karl, T., Kunkel, K., and Ambenje, P.: 2000, 'Observed variability and trends in extreme climate events: A brief review', *Bulletin of the American Meteorological Society* **81**, 417-425.
- Edwards, A.: 1966, 'The Edwards Family' in Lomond Book Committee (eds.), *History of Lomond and District*, Southern Printing, Lethbridge, pp. 120.
- Egan, L.: 2009, 'Canada budget pledges C\$1.5 bln to farmers – minister', *Reuters*. Retrieved February 9, 2009 from <http://www.reuters.com/article/marketsNews/idUSN2349955520090123>
- Eggleston, W.: 1992, 'The old homestead: romance and reality', in R.D Francis and H. Palmer (eds.), *The Prairie West: Historical Readings*, University of Alberta Press, Edmonton, pp. 339-351.
- El-Hinnawi, E.: 1985, *Environmental Refugees*, United Nations Environment Programme, Nairobi, Kenya.
- Engel, F.: 1978, 'The Fred Engel Story', in J. James (ed.), *Hanna North*, Robins Southern Printing, Lethbridge, pp. 147-148.
- England, R.: 1936, *The Colonization of Western Canada*, Orchard House, Westminster London.
- Environment Canada: 1993, *Water Works*, Freshwater Series A-4, Ottawa, Ontario.
- Environment Canada: 2006, *Canadian Climate Normals or Averages 1971-2000*. Retrieved April 11, 2008 from http://www.climate.weatheroffice.ec.gc.ca/climate_normals/index_e.html.
- Esak, M.: 1978, 'Woodward, Arlie Andrew', in W. Moore and F. Moore (eds.), *Across the Smoky*, Debolt and District Pioneer Museum Society, Debolt, pp. 207-209.

- Evans, S.: 1987, 'The origin of ranching in western Canada: American diffusion or Victorian transplant?' in L.A. Rosenvall and S.M. Evans (eds.), *Essays on the Historical Geography of the Canadian West: Regional Perspectives on the Settlement Process*, The Department of Geography, the University of Calgary, Calgary, pp. 70-94.
- Evans, S.: 2000, 'Tenderfoot to rider: Learning 'cowboying' on the Canadian ranching frontier during the 1880s', in S. Evans, S. Carter and B. Yeo (eds.), *Cowboys, Ranchers and the Cattle Business*, University of Calgary Press, Calgary, pp. 61-80.
- Ezra, M. and Kiros, G.E.: 2001, 'Rural out-migration in the drought prone areas of Ethiopia: A multilevel analysis', *International Migration Review* **35**(3), 749-771.
- Fawcett, J.T. and Arnold, F.: 1987, 'Explaining diversity: Asian and Pacific immigration systems', in J.T. Fawcett and B.V. Cariño, B.V. (eds.), *Pacific Bridges: The New Immigration from Asia and the Pacific Islands*, Center for Migration Studies, New York, pp. 453-474.
- Ferguson, B. and Wardaugh, R.: 2005 'Impossible conditions of inequality': John W Dafoe, the Rowell-Sirois Commission and the interpretation of Canadian federalism', *Canadian Historical Review* **84**(4), 551-583.
- Findley, S.E.: 1994, 'Does drought increase migration? A study of migration from rural Mali during the 1983-1985 drought', *International Migration Review* **28**(3), 539-553.
- Ford, J.D. and Smit, B.: 2004, 'A framework for assessing the vulnerability of communities in the Canadian Arctic to risks associated with climate change', *Arctic* **57**(4), 389-400.
- Fowler, J.L, Hageman, J.H., Moore, K.J. Suzukida, M., Assadian, H., and Valenzuela, M.: 1992, 'Salinity effects on forage quality of Russian thistle', *Journal of Range Management* **46**(6), 559-563.
- Fox, J.: 2008, December 22, 'Don't say the D word', *Time* **172**(25), 44.
- Frankfort-Nachmias, C.: 2000, *Research Methods in the Social Sciences*, Worth Publishers, New York.
- Friesen, G.: 1984, *The Canadian Prairies: A History*, Toronto, University of Toronto Press.
- Gan, T.Y.: 2000, 'Reducing vulnerability of water resources of Canadian Prairies to potential droughts and possible climatic warming', *Water Resources Management* **14**(2), 111-135.
- Garalneau, R. and Scott, J.: 1978, 'Mr. and Mrs. A. L. Desilets', in J. James (ed.), *Hanna North*, Robins Southern Printing, Ltd, Lethbridge, pp. 176-177
- Gauthier, D.A. and Wiken, E.B.: 2003, 'Monitoring the conservation of grassland habitats, prairie ecozone, Canada', *Environmental Monitoring and Assessment* **88**(1-3), 343-364.
- Gee, M.: 2008, November 21, 'Is Japan's 'lost decade' a window to the future?' *The Globe and Mail*. Retrieved February 9, 2009 from <http://www.theglobeandmail.com/servlet/story/RTGAM.20081121.wrjapan22/BNStory/Front/home>
- General Superintendent of Lands: 1921, Nov 5, 'The Advantage of Mixed Farming', *The Farm and Ranch Review*, Advertisement, p. 4.
- Giesbrecht, D.: 1978, 'Griesbrecht, Martin', in W. Moore and F. Moore (eds.), *Across the Smoky*, Debolt and District Pioneer Museum Society, Debolt, pp. 78-79.
- Glantz, M.H.: 1991, 'The use of analogies in forecasting ecological and societal responses to global warming', *Environment* **33**(5), 10-33.
- Gorman, J.: 1988, *A Land Reclaimed: A Story of the Special Areas in Alberta*, Gorman 7 Gorman Ltd., Hanna.

- Government of Alberta: 2003a, 'Soils and ecoregions in Alberta', *Agroclimatic Atlas of Alberta*. Retrieved January 9th from [http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/sag6303](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/sag6303)
- Government of Alberta: 2003b, 'January daily mean temperature: 1961-2000', *Agroclimatic Atlas of Alberta*. Retrieved January 9th from [http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/sag6437?opendocument](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/sag6437?opendocument)
- Government of Alberta: 2003c, 'July daily mean temperature: 1961-2000'. *Agroclimatic Atlas of Alberta*. Retrieved January 9th from [http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/sag6438?opendocument](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/sag6438?opendocument)
- Government of Alberta: 2003d, 'Total annual precipitation: 1961-2000', *Agroclimatic Atlas of Alberta*. Retrieved January 9th 2009 from [http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/sag6434?opendocument](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/sag6434?opendocument)
- Government of Alberta: 2008, *Water for Life*. Retrieved February 27th, 2009 from <http://environment.gov.ab.ca/info/library/8035.pdf>
- Grant, T.: 2009, February 9, 'One quarter of Canadians fear layoffs', *The Globe and Mail*. Retrieved February 9, 2009 from <http://business.theglobeandmail.com/servlet/story/RTGAM.20090209.wjobworry09/BNStory/robAtWork/home>
- Graves, R.E.: 1980, 'Migration and climate', *Journal of Regional Science* **20**(2), 227-237.
- Gray, J.H.: 1966, *The Winter Years: The Depression on the Prairies*, Hignell Printing Limited, Toronto.
- Gray, J.H. 1975. *The Roar of the Twenties*. Toronto: Macmillan
- Gregory, J.N.: 1989, *American exodus: the Dust Bowl migration and Okie culture in California*, Oxford University Press, New York.
- Griffiths, M. and Woynillowicz, D.: 2009, 'Heating up in Alberta: Climate change, energy development and water', *The Pembina Institute*. Retrieved February 27th from <http://pubs.pembina.org/reports/heating-up-in-alberta-report.pdf>
- Grothmann, T. and Patt, A.: 2005, 'Adaptive capacity and human cognition: the process of individual adaptation to climate change', *Global Environmental Change* **15**(3), 199-213.
- Gutmann, M.P.: 2000, 'Scaling and demographic issues in global change research: the Great Plains, 1880-1990', *Climate Change* **44**(3), 377-391.
- Gutmann, M. P., S. Pullum, G. A. Cunfer, and D. Hagen.: 1998, *Great Plains Population and Environment Database*, Version 1.0. User's Guide, University of Texas Population Research Center, Austin.
- Hampshire, K., and Randall, S.: 1999, 'Seasonal labour migration strategies in the Sahel: Coping with poverty or optimizing security?' *International Journal of Population Geography* **5**(5), 367-385.
- Harris, J.R. and Todaro, M.P.: 1970, 'Migration, unemployment, and development: a two-sector analysis', *American Economic Review* **60**(1), 126-142.
- Haug, G.H., Gunther, D., Peterson, L.C., Sigman, D.M., Hughen, K.A., and Aeschlimann, B.: 2003. 'Climate and the collapse of Maya civilization', *Science* **299**(5613), 1731-1735.
- Hay, J. and Beniston, M.: 2001, 'Environmental change and migration', *Tiempo*. Retrieved March 16, 2008 from <http://www.cru.uea.ac.uk/tiempo/portal/archive/issue42/t42a4.htm>
- Hoffman, W.: 1978, 'William Hoffman story', in J. James (ed.), *Hanna North*, Robins Southern Printing, Ltd., Lethbridge, pp. 173.

- Holland, S.: 2008, October 7, 'Obama: U.S. in worst crisis since Depression', *Reuters*. Retrieved February 6th, 2009 from <http://www.reuters.com/article/governmentFilingsNews/idUSN0749084220081008>
- Homer-Dixon, T.: 1991, 'On the threshold: environmental changes as causes of acute conflict', *International Security* **16**(2), 76-116.
- Hunter, L.M.: 2005, 'Migration and environmental hazards', *Population and Environment* **26**(4), 273-3020.
- Hunter, L.M.: 2007, 'Climate change, rural vulnerabilities, and migration', *Population Reference Bureau*. Retrieved March 16, 2008 from <http://www.prb.org/Articles/2007/ClimateChangeinRuralAreas.aspx>
- Hunter, L., White, M.J., Little, J.S., and Sutton, J.: 2003, 'Environmental hazards, migration and race', *Population and Environment* **25**(1), 23-39.
- Hugo, G.: 1996, 'Environmental concerns and international migration', *International Migration Review* **30**(1), 105-131.
- Hursey, R.: 1996, *A Sense of the Peace: A Historical Overview and Study of Communities and Museums in the Peace River Country*, Prepared for the Spirit of the Peace Association, Peace River.
- IPCC: 2007, 'Summary for policymakers', in M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson (eds.), *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, Cambridge, UK, pp. 7-22.
- Isern, T.D.: 1987, 'The header stack-barge: Folk technology on the North American plains', *The Social Science Journal* **34**(4), 361-373.
- Jacobsen, J.L.: 1989, 'Environmental refugees: Nature's warning system', *POPULI* **16**(1), 29-38.
- James, J.: 1978, 'Introduction', in J. James (ed.), *Hanna North*, Robins Southern Printing, Ltd., Lethbridge, pp. 1-39.
- Jiang, L., Yufen, T., Zhijie, Z., Tianhong, L., and Jianhua, L.: 2005, 'Water resources, exploration and population dynamics in arid areas – the case of the Tarim River Basin in Xinjiang of China', *Population and Environment* **26**(6), 471-503.
- Jones, D.: 1980, 'A strange heartland: the Alberta dry belt and the schools in the Depression', in R.D. Francis, H Ganzevoort, *The Dirty Thirties in Prairie Canada, 11th Western Canada Studies Conference*, Tantalus Research Limited, Vancouver, pp. 89-110.
- Jones, D.: 1985, 'The Canadian prairie dryland disaster and the reshaping of the 'expert' farm wisdom', *Journal of Rural Studies* **1**(2), 135-146.
- Jones, D.: 1987, *Empire of Dust*, University of Alberta Press Edmonton, Alberta.
- Kates, R.W.: 2000, 'Cautionary tales: Adaptation and the global poor', *Climatic Change* **45**(1), 5-17.
- Kealey, T.: 2009, 'A new deal for the White House: Barack Obama will take office in times more closely resembling Depression-era America than any in modern memory', *New Scientist* **201**(3689), 42-44.
- Kelly, P., and Adger, N.: 2000, 'Theory and practice in assessing vulnerability to climate change and facilitating adaptation', *Climatic Change* **47**(4), 325-352.
- Kramps, N.: 1978, 'Taylor, Joe', in W. Moore and F. Moore (eds.), *Across the Smoky*, Debolt and District Pioneer Museum Society, Debolt, pp. 88-90.

- Langford, N.: 2000, 'Childbirth on the Canadian Prairies', in C.A. Cavanaugh and R.R. Warne (eds.), *Telling Tales: Essays in Western Women's History*, UBC Press, Vancouver, pp.170.
- Lee, E.: 1966, 'A theory of migration', *Demography* 3(1), 47-58.
- Leedy, P.D.: 1993, *Practical Research Planning and Design*, Macmillan, New York.
- Loneragan, S.: 1998, 'The role of environmental degradation in population displacement', *Environmental Change and Security Project Report* 4, 5-15
- Longman, O.S.: 1932, April 20th, *Report Berry Creek Area*, Department of Agriculture, Field Crops Commissioner, Edmonton, Alberta.
- Lutz, W. and Scherbov, S.: 2000, 'Quantifying vicious circles dynamics: the PEDDA model for population, environment, development and agriculture in African countries', in E.J. Dockner, R.F. Hartle, M. Luptacik, and G. Sorger (eds.), *Optimization, Dynamics, and Economic Analysis*, Physica-Verlag, Heidelberg, pp. 311-322.
- MacDonald, G.A.: 2000, *Where the Mountains Meet the Prairies*, University of Calgary Press, Calgary.
- MacEwan, G.: 1990, *Grant MacEwan's West*, Western Producer Prairie Books, Saskatoon.
- MacGregor, J.G.: 1972, *History of Alberta*, Hurtig Publishers, Edmonton.
- MacKellar, F. L., Lutz, W., McMichael, A. J., and Suhrke, A.: 1998, 'Population and climate change', in S. Rayner and E. L. Malone (eds.), *Human Choice and Climate Change*, Battelle Press, Columbus, pp. 89-194.
- Macpherson, I. and Thompson, J.H.: 1992, 'The business of agriculture', in R.D. Francis and H. Palmer (eds.), *The Prairie West: Historical Readings*, University of Alberta Press, Edmonton, pp. 475-496.
- Magadza, C.: 2000, 'Climate change impacts and human settlements in Africa: Prospects for adaptation', *Environmental Monitoring and Assessment* 61(1), 193-205.
- Marchildon, G.P., Kulshreshtha, S., Wheaton, E. and Sauchyn, D.: 2007, 'Drought and institutional adaptation in the Great Plains of Alberta and Saskatchewan, 1914-1939', *Natural Hazards* 45(3), 391-411.
- Masson, J.K. and LeSage, E.C.: 1994, *Alberta's Local Governments: Politics and Democracy*, University of Alberta Press, Edmonton.
- Massey, D.S.: 1988, 'Economic development and international migration in comparative perspective', *Population and Development Review* 14(3), 383-414.
- Massey, D.S., Arango, J., Hugo, G., Kouaouci, A., Pellegrino, A., and Taylor, E.: 1994, 'An evaluation of international migration theory: the North American case', *Population and Development Review* 20(4), 699-751.
- Matlock, W.: 1978, 'Matlock, Wade', in W. Moore and F. Moore (eds.), *Across the Smoky*, Debolt and District Pioneer Museum Society, Debolt, pp. 80-82.
- McCarthy, J.J., Canziani, O.F., Leary, N.A., Dokken, D.J., and White, K.S.: 2001, *Climate Change 2001: Impacts, Adaptation, and Vulnerability*, Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge.
- McGinnis, D.P.: 1980, 'The "Keynesian Revolution" in Canada, 1929-1945', in R.D. Francis, H. Ganzevoort, *The Dirty Thirties in Prairie Canada, 11th Western Canada Studies Conference*, Tantalus Research Limited, Vancouver, pp. 45-64.

- McGregor, J.: 1994, 'Climate change and involuntary migration: implications for food security', *Food Policy* **19**(2), 120-132.
- McLeman, R.: 2006, 'Migration out of 1930s rural Eastern Oklahoma: insights for climate change research', *Great Plains Quarterly* **26**(1), 27-40.
- McLeman, R. and Smit, B.: 2006a, 'Migration as an adaptation to climate change', *Climatic Change* **76**(1-2), 31-53.
- McLeman, R. and Smit, B.: 2006b, 'Vulnerability to climate change hazards and risks: crop and flood insurance', *The Canadian Geographer* **50**(2), 217-226.
- McLeman R., Mayo, D., Strebeck, E. and Smit, B.: 2008, 'Drought adaptation in rural eastern Oklahoma in the 1930s: Lessons for climate change adaptation research', *Mitigation and Adaptation Strategies for Global Change* **13**(4), 379-400.
- McLeman, R.: forthcoming, 'Climate change migration, refugee protection and adaptive capacity-building', *McGill International Journal of Sustainable Development Law and Policy*.
- McLeman, R., Herold, S., Reljic, Z., Sawada, M. and McKenney, D.: Submitted, 2008, 'Spatial-modeling of historical 'hotspots' of drought-related human migration in Western Canada', *Global Environmental Change*.
- McLeod, L., Grant, T., and Hyslop, K.: 2009, February 10, 'Western Canada hit hardest by decline', *The Globe and Mail*. Retrieved February 10, 2009 from <http://www.theglobeandmail.com/servlet/story/RTGAM.20090210.reconomy10/BNSStory/crashandrecover/home>
- McRae, P.T.: 1978a, 'Of Wells and Water', in J. James (ed.), *Hanna North*, Robins Southern Printing, Ltd., Lethbridge, pp. 598-600.
- McRae, S.: 1978b, 'The Hugh McRae Family', in J. James (ed.), *Hanna North*, Robins Southern Printing, Ltd., Lethbridge, pp. 594-598.
- Meze-Hausken, E.: 2000, 'Migration caused by climate change: How vulnerable are people in dryland areas?' *Mitigation and Adaptation Strategies for Global Change* **5**(4), 379-406.
- Mitchell, E.S.: 1986, 'Multiple triangulation: a methodology for nursing science', *Advances in Nursing Science* **8**(3), 18-25.
- Mitchell, P. and Prepas, E.E.: 1990, *Atlas of Alberta Lakes*, University of Alberta Publishers, Edmonton.
- Moore, E.J. and Smith, J.W.: 1995, 'Climatic change and migration from Oceania: Implications for Australia, New Zealand and the United States of America', *Population and the Environment* **17**(2), 105-121.
- Morrow-Jones H. A. and Morrow-Jones, C.R.: 1991, 'Mobility due to natural disaster: Theoretical considerations and preliminary analyses', *Disasters* **15**(2), 126-132.
- Motha, R.P. and Baier, W.: 2005, 'Impacts of present and future climate change and climate variability on agriculture in the temperate regions: North America', *Climatic Change* **70**(1-3), 147-164.
- Myers, N.: 2002, 'Environmental refugees', *Philosophical Transactions of the Royal Society of London* **357**(1420), 609-613.
- National Post: 2009, January 26, 'Throne speech: Governor General Michaëlle Jean', *National Post*. Retrieved February 6th 2009 from <http://www.nationalpost.com/news/story.html?id=1219596>

- National Research Council: 1999, *Human Dimensions of Global Environmental Change: Research pathways for the Next Decade*, National Academies Press, Washington DC.
- Natural Resources Canada: 2008, *Adaptation 101*. Retrieved February 14 from http://adaptation.nrcan.gc.ca/101/index_e.php
- Neatby, H.B.: 1950, 'The Saskatchewan relief commission, 1931-1934', *Saskatchewan History* **3**(1), 41-56.
- Orlove, B.: 2005, 'Human adaptation to climate change: a review of three historical cases and some general perspectives', *Environmental Science & Policy* **8**(6), 589-600.
- Owram, D.: 2007, 'Uncertain promise: the prairie farmer and the post-war era', in R. Douglas and C. Kitzen (eds.), *The Prairie as Promised Land*, University of Calgary Press, Calgary, pp. 335-354.
- Palmer, W.C. May 2, 1912. "Ten Commandments of the Dry Farmer." *Carlstadt Progress*.
- Parton, W., Gutmann, M., Ojima, D.: 2007, 'Long-term trends in population, farm income, and crop production in the Great Plains', *BioScience* **57**(9), 737-747.
- Polsky, C. and Easterling, W.E.: 2001, 'Adaptation to climate variability and change in the US Great Plains: A multi-scale analysis of Ricardian climate sensitivities', *Agriculture, Ecosystems & Environment* **85**(1-3), 133-144.
- Portes, A and Barocz, C.: 1989, 'International migration: theoretical perspectives on its determinants and modes of incorporation', *International Migration Review* **23**(2), 606-630.
- Portes, A. and Rumbaut, R.E.: 1996, *Immigrant America: A Portrait*, Second Edition, University of California Press, Berkeley.
- Ravestein, E.G.: 1889, 'The laws of migration', Second Paper, *Journal of the Royal Statistical Society* **52**, 241-289.
- Regehr, T.D.: 1983, 'Bankers and farmers in Western Canada, 1900-1939', in L.H. Thomas and J.E. Foster (eds.), *Developing the West: Essays on Canadian History in Honor of Lewis H. Thomas*, University of Alberta, Edmonton, pp. 303-336.
- Rehill, B.: 1978, 'J.J. Rehill and family', in J. James (ed.), *Hanna North*, Robins Southern Printing, Ltd., Lethbridge, pp. 299-301.
- Reid, S., Smit, B., Caldwell, W. and Belliveau, S.: 2007, 'Vulnerability and adaptation to climate risks in Ontario agriculture', *Mitigation and Adaptation Strategies for Global Change* **12**(4), 609-637.
- Reuveny, R.: 2007, 'Climate change-induced migration and violent conflict', *Political Geography* **26**(6), 656-673.
- Richmond, A.: 1993, *The Environment and Refugees: Theoretical and Policy Issues*, Revised version of a paper presented at the meeting of the International Union for the Scientific Study of Population, Montreal, Quebec.
- Ripley, F.G. and Hilyer, K.G.: 1978, 'The William Glover Family', in J. James (ed.), *Hanna North*, Robins Southern Printing, Ltd., Lethbridge, pp. 302-304.
- Robertson, H.: 1974, *Salt of the Earth: The Story of Homesteading in Western Canada*, James Lorimer & Company, Publishers, Toronto.
- Roncoli, C., Ingram, K., and Kirshen, P.: 2001, 'The costs and risks of coping with drought: Livelihood impacts and farmers' response in Burkina Faso', *Climate Research* **19**, 119.
- Rosenzweig, C. and Hillel, D.: 1993, 'The dust bowl of the 1930s: Analog of greenhouse effect in the Great Plains?' *Journal of Environmental Quality* **22**, 9-22.

- Sauchyn, D.: 2007, 'Climate change impacts on agriculture in the Prairies', in E. Wall, B. Smit and J. Wandel (eds.), *Farming in a Changing Climate*, UBC Press, Vancouver, pp. 67-80.
- Sauchyn, D.J. and Beaudoin, A.B.: 1998, 'Recent environmental change in the Southwestern Canadian Plains', *Canadian Geographer*, **42**(4), pp. 337-153.
- Sauchyn, D. and Kulshreshtha, A.: 2008, 'Prairies', in D.S. Lemmen, F.J. Warren, J. Lacroix and E. Bush (eds.), *From Impacts to Adaptation: Canada in a Changing Climate 2007*, Government of Canada, Ottawa, Ontario, pp. 275-328.
- Sassen, S.: 1988, *The Mobility of Labour and Capital*, Cambridge University Press, Cambridge.
- Schindler, D.W.: 2001, 'The cumulative effects of climate warming and other human stresses on Canadian freshwaters in the new millennium', *Canadian Journal of Fish and Aquatic Science* **58**(1), 18-29.
- Schindler, D.W. and Donahue, W.F.: 2006, 'An impending water crisis in Canada's western prairie provinces', *Proceedings of the National Academy of Sciences* **103**(19), 7210-7216.
- Schultz, C.B.: 1978, 'Steve Brunner Jr. and Family', in J. James (ed.), *Hanna North*, Robins Southern Printing, Ltd., Lethbridge, pp. 228-229.
- Silverman, E.L.: 1984, *The Last Best West: Women on the Alberta Frontier 1880-1930*, Eden Press, Montreal, Quebec.
- Slovic, P.: 2000, *The Perception of Risk*, Earthscan Publications, London.
- Small, E.: 1978, 'Our life on the prairies', in J. James (ed.), *Hanna North*, Robins Southern Printing, Ltd., Lethbridge, pp. 668-670.
- Smit, B., McNabb, D., and Smithers, J.: 1996, 'Agricultural adaptation to climatic variation', *Climatic Change* **33**(1), 7-29.
- Smit, B., Burton, I., Klein, R.J.T. and Street, R.: 1999, 'The science of adaptation: a framework for assessment', *Mitigation and Adaptation Strategies for Global Change* **4**(3-4), 199-213.
- Smit, B., Burton, I., Klein, R., and Wandel, J.: 2000, 'An anatomy of adaptation to climate change and variability', *Climatic Change* **45**(1), 223-251.
- Smit, B. and Skinner, M.: 2002, 'Adaptation options in agriculture to climate change: a typology', *Mitigation and Adaptation Strategies for Global Change* **7**(1), 85-114.
- Smit, B. and Pilifosova, O.: 2003, 'From adaptation to adaptive capacity and vulnerability reduction', in J. Smith, R.T.J. Klein and S. Huq (eds.), *Climate Change, Adaptive Capacity, and Development* Imperial College Press, London, pp. 9-28.
- Smit, B. and Wandel, J.: 2006, 'Adaptation, adaptive capacity and vulnerability', *Global Environmental Change* **16**(3), 282-292.
- Smithers, J., and Smit, B.: 1997, 'Human adaptation to climatic variability and change', *Global Environmental Change* **7**(2), 129-146.
- Sohier, R.: 1988, 'Multiple triangulation and contemporary nursing research', *Western Journal of Nursing Research* **10**(6), 732-742.
- Solomon, S., Plattner, G., Knutti, R. and Friedlingsteim, R.: 2009, 'Irreversible climate change due to carbon dioxide emissions', *Proceedings of the National Academy of Sciences of the United States of America* **106**(6), 1704-1709.
- Speare, A. Jr.: 1974, 'Residential satisfaction as an intervening variable in residential mobility', *Demography* **11**(2), 173-188.

- Standing, H.: 1978, 'Pioneers', in J. James (ed.), *Hanna North*, Robins Southern Printing, Ltd., Lethbridge, pp. 16.
- Statistics Canada: 2009, *2006 Agricultural Community Profiles: Hanna*. Retrieved February 16 2009 from http://www26.statcan.ca:8080/AgrProfiles/cp06/Table1.action?prov=00&search=search&placename=hanna&placestart=0&geog_id=481004004&geog_id_amal=481004004&locode=31510&tab_id=1
- Stark, O. and Taylor, E.: 1991, 'Migration incentives, migration types: The role of relative deprivation', *The Economic Journal* **101**(408), 1163-1178.
- Stewart, A. and Porter, W.D.: 1942, *Land Use Classification in the Special Areas of Alberta*, Dominion Department of Agriculture, Edmonton, pp. 36.
- Strong-Boag, V.: 1992, 'Pulling in double harness or hauling a double load', in R.D. Francis and H. Palmer (eds.), *The Prairie West: Historical Readings*, The University of Alberta Press, Edmonton, pp. 401-423.
- Taphorn, W.: 1974, 'Rabbits', in H. Robertson (ed.), *Salt of the Earth: The Story of Homesteading in Western Canada*, James Lorimer & Company, Publishers, Toronto, pp. 62.
- Taylor, E.J.: 1987, 'Undocumented Mexico-US migration and the returns to households in rural Mexico', *American Journal of Agricultural Economics* **69**(3), 626-638.
- Temple, A.: 1978, 'Jack and Agnes Temple', in J. James (ed.), *Hanna North*, Robins Southern Printing, Ltd., Lethbridge, pp. 355-357.
- Thompson, J.H.: 1998, *Foraging the Prairie West*, Oxford University Press, Toronto.
- Traynor, I.: 2008, 'EU told to prepare for flood of climate change migrants: global warming threatens to severely destabilize the planet, rendering a fifth of its population homeless, top official say', *The Guardian*. Retrieved March 17, 2008 from <http://www.guardian.co.uk/environment/2008/mar/10/climatechange.eu>
- Venema, H.D.: 2007, 'Biophysical and socio-economic stressors for agriculture in the Canadian Prairies', in E. Wall, B. Smit and J. Wandel (eds.), *Farming in a Changing Climate*, UBC Press, Vancouver, pp. 115-126.
- Waiser, B.: 2007, '"Land I can own": Settling in the Promised Land', in R.D. Francis and C. Kitzen (eds.), *The Prairie West as Promised Land*, University of Calgary Press, Calgary.
- Wall, E., Smit, B. and Wandel, J.: 2007, 'Context-based approach', in E. Wall, B. Smit and J. Wandel (eds.), *Farming in a Changing Climate*, UBC Press, Vancouver, pp. 3-12.
- Wandel, J. and Smit, B.: 2000, 'Agricultural risk management in light of climate variability', in H. Millward, K. Beesley, B. Ilbery, and L. Harrington (eds.), *Agricultural and Environmental Sustainability in the New Countryside*, Hignell Printing Limited, Winnipeg, Manitoba.
- Ward, D.: 1995, *The People: A Historical Guide to the First Nations of Alberta, Saskatchewan and Manitoba*, Fifth House Publishers, Saskatoon.
- Wetherell, D.G. and Kmet, I. R.A.: 2000, *Alberta's North: A History, 1890-1950*, University of Alberta Press, Edmonton.
- Williams, R.: 1981, 'Moved to Victoria', in R. Jardine and H. Austen (eds.), *Many Trails Crossed Here: A Story of Oyen Alberta, and the Surrounding Districts*. Eds.. Holmes Printing, Oyen, pp. 8.

- Wilson, E.: 1978, 'Wilson, Fred', in W. Moore and F. Moore (eds.), *Across the Smoky*, Debolt and District Pioneer Museum Society, Debolt, pp. 242-234.
- Wolpert, J.: 1966, 'Migration as an adjustment to environmental stress', *Journal of Social Sciences* **22**(4), 92-102.
- Yardley, W.: 2007, 'Victim of climate change, a town seeks a lifeline', *The New York Times*. Retrieved March 16, 2008 from <http://www.nytimes.com/2007/05/27/us/27newtok.html>
- Yohe, G. and Tol, R.: 2002, 'Indicators for social and economic coping capacity – moving toward a working definition of adaptive capacity', *Global Environmental Change* **12**(1), 25-40.
- Zaslow, M.: 1976, 'The Peace River outlet', in C. Berger and R. Cook (eds.), *The West and the Nation*, McClelland and Stewart Ltd., Toronto, pp. 273-299.
- Zuckerman, M.B.: 2008, 'Avoiding a deep recession', *U.S. News and World Report* **145**(9), 92.

Appendix A: List of Interview Questions

1. Family history and farm characteristics during the 1930s:
 - Tell me about yourself, your childhood, your current situation.
 - Tell me about your experience of the 1930s.
 - Did your family own a farm during the 1930s? What was the size of the farm?
 - What types of farm implements did your family own?
 - What types of livestock and how many livestock did you own?
 - What skills or education did you or other members of your family have?
 - Did your family have previous farming experience?
 - Did you have relatives or neighbours nearby? Did you socialize frequently? What types of activities did you engage in?
2. Climatic and non-climatic hardships during the 1930s
 - What hardships did your family face during this time? Can you describe particular stories or experiences?
 - How did the economic depression affect your family?
 - How did the change in climate affect your family?
 - How did institutional changes affect your family?
3. Coping mechanisms
 - What coping mechanisms did your family employ during this time?
 - Were there any barriers to certain coping mechanisms?
4. Stories or experiences of migration
 - Did you experience migration out of dry areas during the 1930s? When did you migrate? Can you describe this experience? Do you recall the decision-making process?
 - Why did you migrate? What factors enabled you to migrate?
 - What were the relative costs and benefits of migration?
 - Do you recall the stories of others who migrated?