



Edited by
Danny Blair
Department of Geography
University of Winnipeg, Winnipeg, Manitoba, Canada

TABLE OF CONTENTS

Preface	ii
Could the Red River Channel have been narrower in the early 19th Century? W.F. Rannie.....	1
Explaining the absence and the characteristics of the migrants: French Canadians in southwestern Saskatchewan at the turn of the 20th Century B. Hamilton	12
Owa: a Dariusleut Hutterite Colony in Japan J.C. Lehr	30
Seasonality of imagery: the impact on object-based classification accuracy of shelterbelts J. Pankiw, J. Piwowar	39
Resource characteristics of the Lesser Prairie-chicken (<i>Tympanuchus pallidicinctus</i>) and its survival on the High Plains of the United States J. Coomansingh.....	49
The rise and fall of Winnipeg's modern project (1958-1972): causes and failures J. Warkentin, M. Vachon	58
An overview of destruction and recovery in the Mt. Mayon volcano region, Bicol, Philippines, resulting from lahars initiated by Supertyphoon Reming G.A.J. Scott	67
Western Australian battlers and coastal squatter settlements: heritage from below versus regulation from above J. Selwood, R. Jones	78

Preface

Prairie Perspectives: Geographical Essays is an annual peer-reviewed publication of the Prairie Division of the Canadian Association of Geographers (PCAG). The scholarly manuscripts included in each volume are a selection of those presented at the PCAG annual meetings, as well as contributions pertaining to the geography of the Western Interior solicited from, or submitted by, members of the Canadian Association of Geographers.

This volume was produced by the Department of Geography of the University of Winnipeg, which held the PCAG's 32nd Annual Meeting at the Russell Inn in Russell, Manitoba, on the weekend of September 18 to 20, 2009.

Thirty-four papers were presented in two concurrent sessions on Saturday morning, with another seven entries in the poster session. Each of the PCAG's member institutions was represented, with presentations from participants from Brandon University and the Universities of Manitoba, North Dakota, Regina, Saskatchewan, and Winnipeg, with an additional presentation from a colleague at Minot State University. As usual, and as is encouraged, many of the presentations were made by undergraduate and graduate students from the PCAG departments; each of the student presenters received a Paul Simpson-Housely/CAG Student Travel Award.

The Saturday afternoon field trip was led by Bill Rannie, John Lehr and Marc Vachon. Sites of interest to both physical and human geographers included the Inglis Grain Elevators National Historic Site, the Shellmouth Dam at Lake of the Prairies, the St. Elijah Romanian Orthodox Church and the John Paulencu Homestead and Museum.

At the Saturday evening banquet, Mr. Richard B. Humphrey was presented with the John Welsted Award for Service to Geography in the Western Interior. Mr. Humphrey received this award in recognition of his many years of teaching geography at Glenlawn Collegiate in Winnipeg. It was noted that over the years many geography majors at the University of Winnipeg studied with Mr. Humphrey at Glenlawn Collegiate, clearly indicating that he is a talented teacher and one who is able to inform and excite high school students about the value of geography as a discipline. We thank and congratulate Richard for his contributions and dedication. The keynote speaker at the banquet was Mr. Jay Anderson, a retired Environment Canada meteorologist and now occasional researcher and instructor at the University of Manitoba. Jay gave a very informative and lively presentation about the meteorology of prairie tornadoes and how to chase them without getting hurt. As is the tradition, Jay, as the keynote speaker, was the judge for the Annual Slide Competition, organized by Brian McGregor. As usual, the rivalries between the PCAG departments were fierce and the photographs were excellent.

Eight of the papers presented at the conference are included in this volume. As is typical for papers presented at a regional geography conference, a wide variety of topics and methods are represented. Drawing on historical documents and his extensive

geomorphic expertise, Bill Rannie presents a detailed discussion of the idea that the channel of the Red River might have been narrower in the early 19th Century and widened by the great floods of 1826, 1852, and 1861. Knowing whether or not this is true is of interest to those evaluating the long-term flood risk in and around Winnipeg. In another paper utilizing historical records, Beckey Hamilton evaluates why it is that relatively few French Canadians migrated to southwestern Saskatchewan in the early 1900s. She uses a systems approach to show that there were a number of institutional and individual forces, among others, influencing the choices made by potential migrants. In a paper discussing the export of a cultural lifestyle from North America to a distant land, John Lehr reports on the origin of the only Hutterite colony in Japan: the Owa Hutterite Colony. He compares the agricultural economy, practices, and prospects of this unique colony to those of the more typical colonies found in North America. Turning to a completely different kind of geography, Joey Pankiw and Joseph Piwowar evaluate the utility of summer versus winter satellite imagery for object-based image classification of shelterbelts in western Saskatchewan. They hypothesized that shelterbelts would be more easily classified using winter imagery, but found instead that the lack of leaves on the trees in the winter negatively affected the classification process. Following this, Johnny Coomansingh reports on the state of the Lesser Prairie-chicken on the High Plains of the United States, arguing that the preservation of this fascinating species requires and deserves more attention from governments, conservation agencies and local communities. Joshua Warkentin and Marc Vachon examine the City of Winnipeg's Metro Plan of 1969 that was meant to transform the city into a 'modern metropolis'. They present a history of mid-century urban planning in Winnipeg and critically evaluate the abandonment and failure of the Plan. Geoffrey Scott describes the destruction and recovery associated with lahars triggered by Super Typhoon Reming in the Philippines in November 2006. His paper is augmented by his personal observations of the situation soon after the event in question and includes many colour photographs. So, too, does the final paper in the issue, in which John Selwood and Roy Jones discuss changes and threats to the long-standing tradition of informal coastal shacks and settlements being used by vacationers in Western Australia.

The inclusion of colour in *Prairie Perspectives* is an innovation introduced with this volume, made possible by the decision to exclusively publish the series online. That is, after many years of discussion, the PCAG has decided that access to the series and the excellent research it presents will be enhanced by making it widely and freely accessible on the PCAG website. Furthermore, without the costs associated with printing, the series is now able to include longer papers and a wider variety of user-friendly and enhanced tables, figures and supplementary materials. We are excited about this new format and we look forward to seeing how younger and older scholars alike will take advantage of the possibilities it presents. Thanks are due

to Weldon Hiebert for designing and implementing the new format.

Many people contributed to the success of the meeting in Russell. The faculty and staff of the Department of Geography at the University of Winnipeg worked as a team to put it all together, but special thanks are owed to Weldon Hiebert, Marc Vachon, John Lehr, Bill Rannie, Patricia Fitzpatrick, Brad Russell, and Brian McGregor. We also thank our undergraduate students for their assistance with the conference and for demonstrating that it is possible to have a proper balance between scholarship and fun.

Finally, the editorial process for this particular volume was long but the editor thanks the authors for their patience and the reviewers for their quick turnarounds. The editor is especially grateful for the assistance provided by Weldon Hiebert, John Lehr, Bill Rannie and Marc Vachon.

Danny Blair
Department of Geography
University of Winnipeg

Could the Red River Channel have been narrower in the early 19th Century?

W.F. Rannie

University of Winnipeg, Winnipeg, Manitoba, Canada
b.rannie@uwinnipeg.ca

Abstract

Several historical documents state unambiguously that the Red River widened its channel after the major floods of the 19th Century (1826, 1852, 1861). Arguments to support and contradict these assertions are presented. Despite its meandering nature, the Red River is not a normal alluvial river; surveyed profiles indicate that the modern channel has been stable for more than a century. The main potential mechanism for the historical widening would have been bank failure which is a common phenomenon along the river, particularly following the floods of 1950, 1997, and summer, 2005. Failure has multiple causes but most studies implicate changes in groundwater pore pressure in relation to river water level as a critical destabilizing factor and long-term drawdown of the Upper Carbonate Aquifer as a stabilizing element. It is argued that the general groundwater environment of the early to mid-19th Century would have been favorable for a higher incidence of bank failure but the evidence for its occurrence is slender. The possibility of widening remains unresolved but should be borne in mind in future studies of the hydraulics of the historic floods.

Keywords: Red River, riverbank stability, channel widening

Introduction

During archival research into the flood history of the Red River, the writer encountered two accounts which claimed that the Red River channel had widened following each of the great 19th Century floods (1826, 1852, 1861). These quotations were included in the flood history report (Rannie 1998) with the comment that if they were valid, they would raise questions about the hydraulics of the great floods. The comments were noted by KGS Group (2001) during studies of Winnipeg flood protection; KGS Group found two more accounts (Carson et al. 2002) and others have subsequently come to light.

The accounts are provocative and deserve more attention than they have received. This paper will not resolve the matter but has three objectives. The first is straightforward and modest: to gather the quotations into a single source to assist future researchers. Secondly, the paper will attempt to evaluate the reliability of the accounts and their sources. Finally, the geomorphic circumstances under which such 19th Century widening might have occurred will be explored.

The Anecdotal Accounts

The first claim of channel widening comes from David Anderson, Bishop of Rupertsland, who experienced the 1852 flood. In his *Notes*, written during and shortly after the flood, he commented

The height [of the floodwaters in 1852] on the whole is certainly not so great as in the former [1826] flood, perhaps by 18 inches, but *as the river channel is deeper and broader*, and the creeks much enlarged, there may be an equal volume of water... [emphasis added]. (Anderson 1852)

Following the recession of the 1861 flood, the Nor'Wester Newspaper in the Red River Settlement expressed optimism that channel widening would reduce the threat of future floods.

We do not think that the country below Fort Garry will ever be flooded again for experience shows clearly that each successive flood has indicated far less depth on the plains than its

predecessors—a fact fully accounted for by the *rapid widening of the river channel*. There may be the same volume of water in each flood, or very nearly so, and the *ever-increasing width of the river* will explain the disparity of depth on the main land [emphasis added]. (Nor'Wester Newspaper June 1, 1861)

Eleven years later, in 1872, the naturalist John Macoun accompanied Sandford Fleming on an expedition to the prairies. In his 1882 book *Manitoba and The Great Northwest*, he wrote

The Red River channel at Winnipeg is very different now to what it was when the first settlers came in. *The soil is alluvial and the continual action of the water on the banks is having the effect of increasing the width of the water-way. It is said that the lately deceased Mr. McDermot first crossed the stream on a small oak tree that had fallen into the channel. To-day several trees would be necessary to span the river for the width is about three hundred yards on an average* [emphasis added]. (Macoun 1882, p. 489)

Sandford Fleming became the Engineer-In-Chief of the Canadian Pacific Railway. In Macoun's autobiography (published in 1922, two years after his death), while discussing Fleming's opinions on the best location for the railway crossing of the Red River, he specified that the river width had increased by four times.

[Fleming] intended to cross the Red River at Selkirk... I agreed ... that it was dangerous to build the railway bridge on account of the great floods that had taken place there for months in 1825 [it can be assumed he intended 1826] and other years. My later knowledge showed that *Mr. Fleming had not taken into account that the Red River was perhaps four times as wide in 1879 as it was in 1825*. [emphasis added] (Macoun 1922, p. 160-161).

In his earlier book, Macoun had also claimed that the Assiniboine River near the Forks had doubled its width.

Fort Garry is situated a few hundred yards west of the confluence of the Assiniboine and Red Rivers. A bridge has been built across the former at this point. *Common report makes the river nearly double the width now that it was forty or fifty years ago*. [emphasis added] (Macoun 1882, p. 46).

Despite Macoun's assertion, Fleming had in fact been aware of these claims that the channel had widened because his Report of 1879 contained the following statement:

A person arriving in Winnipeg will observe that the banks of the river are of a soft and yielding character, easily acted on by the elements. They are of clay, but the clay is somewhat of the character of quicksand. They are subject to slides and alteration of form. In consequence of the constant changes that take place, *a marked increase in width, between the river banks, has taken place within the past 50 years. Similar changes have oc-*

curred at many places along the course of the river; as far north as St. Andrews. [emphasis added] (Fleming 1879, p. 270).

He went on to emphasize that the widening ended in the Parish of St. Andrews where

... the character of the banks change, they are no longer soft and yielding, on the contrary, they are firm and strong; in more than one locality a ledge of rock presents itself. Generally through the Parish of St. Andrews, and for some distance below Stone Fort, the trench through which the river flows remains contracted, and its appearance indicates that no perceptible change takes place from year to year. Indeed, *it is highly probable that this portion of the river is practically the same, in sectional form, as it was many years ago, and its banks are so firm for many miles, that no material change can be predicted*. [emphasis added] (Fleming 1879, p. 270).

Fleming attributed the extent and duration of the floods upstream to the "limited dimensions of the river channel through the Parish of St. Andrews [which had the effect of] raising and backing of the flood water, until the whole country to the south becomes submerged." (Fleming 1879, p. 270)

Fleming had read Anderson's account of the 1852 flood since he appended extracts, including the statement about channel widening, to his Report. Thus his opinion may simply have been derived from Anderson, although it is a more considered and elaborate statement which added important details about the process and affected reaches. It would certainly have been reinforced by (and possibly based on) the report he received from his District Engineer, James Rowan, dated a month earlier than Fleming's own report. Rowan's report also asserted widening of the river and provided a more extended account of the cause:

[The clay of the river bank] when dry is extremely compact and solid, it has however a great affinity for water, and when brought into conjunction with it, absorbs a large quantity and becomes like bird lime... Owing to the nature of the clay ... it has, when brought into contact with the water, been forced out into the river at low-water level, by the weight of the superincumbent earth, and is carried down to the lake ... The oozing out of this material from under the banks causes them to crack and settle down almost perpendicularly; these cracks sometimes occur as far back as 100 to 300 feet from the outer edge of the bank. By this settling down, the material which otherwise would not be disturbed to any great extent by the current or ice, becomes disintegrated, and is easily carried away by the freshets and ice... *Owing to this cause the river valley is much wider at many places than it was fifty years ago*, but there are numerous points between here and the lake where, from some unexplained cause, this action does not seem to have occurred to any extent [emphasis added]. (Rowan 1879, p. 277).

The final quotation comes from a paper on Red River flooding which S.P. Matheson read to the Manitoba Historical Society in 1932.

I remember also the late Col. [Henry Norlande] Ruttan, for so long our city engineer, when questioned as to his view of the possibility of flood again taking place, remarking that, while the prospects were greatly lessened by the extension of drainage, and *while the rivers, especially the Red River, had greatly widened and also were capable of carrying away rapidly a greater volume of water*, he did not consider that the danger had entirely passed away. He gave as his reasons that, while *doubtless the Red River was much broader all along its course than it once was*, yet he had observed that its mouth where it entered into Lake Winnipeg, had remained the same width and he added that a funnel was only capable of carrying through itself what its small end could convey. [emphasis added] (Matheson 1932).

Assessment of the Accounts and Sources

Setting aside questions of physical evidence and process for the moment, what are we to make of these accounts? They are presented as straightforward statements of fact, unclouded by doubt or ambiguity. They allege that widening was considerable and that it had been progressive from 1826 onward. They are not merely passing observations but several of them offer thoughts on the consequences and causes of the widening. Anderson, the Nor'Wester, and Ruttan, for example, explicitly recognized the consequences of widening for water levels and flood discharges. The most detailed accounts were by Fleming and Rowan, not surprising since both were engineer/scientists who had inspected the river and were charged with finding the best location for the railway crossing. Fleming made a distinction between the reaches above and below the Parish of St. Andrews, and both he and Rowan provided thoughts on the mechanism by which the widening had occurred (and which presaged engineering opinion of a century later). The similarity between the Fleming and Rowan accounts is striking; it seems likely that they had discussed the matter and the two accounts should probably be taken as a single one.

Macoun's information was clearly obtained from local inhabitants and his phraseology "It is said ..." and "Common report ..." indicates that the idea of widening, whatever the source, was widely-accepted within the Settlement. His is the only account that provides information on the extent of the widening, apparently ultimately derived from Andrew McDermot. McDermot had witnessed the 1826 and other floods but his claims (as repeated by Macoun) that he "first crossed the stream on a small oak tree that had fallen into the channel", or that the Red River had enlarged by four times, or that the Assiniboine had doubled its width, cannot be credible.

There is, of course, the possibility that the statements are simply incorrect, possibly deriving from a common, erroneous, source. Only two of the accounts were written by potential primary sources who might have observed the phenomenon—Anderson and the Nor'Wester. A third, Andrew McDermot, is cited by Macoun and he might be a potential candidate as such an ultimate source. It may be that McDermot's flawed opinion was simply accepted as fact by later observers such as Anderson

and the Nor'Wester and then became part of the folklore of the Red River Settlement. Born in 1789, McDermot arrived in the Settlement in 1812 as a clerk in the Hudson's Bay Company, left the Company in 1825 to become the Settlement's most successful businessman, and served on the Council of Assiniboia and its Board of Public Works. He lived in the Settlement until his death in 1881 and witnessed all of the great and lesser floods. As one of the Settlement's most prominent residents, McDermot's opinions would presumably have commanded respect and might well have been repeated uncritically. He was known for his sense of humour and love of teasing (Lent, n.d.); perhaps he couldn't resist embellishing the truth to improve the story.

If this scenario is correct, the quotations could be dismissed and further discussion would be fruitless. Ironically, the fact that these are the only such quotations known from the large archival record of the region might argue against their accuracy, as widening on the scale that is implied might be expected to have attracted more attention.

Might it be possible, however, that the quotations are not mere folklore but contain some measure of truth? Anderson, after all, experienced the 1852 flood and wrote an extensive account, the Nor'Wester reported on the 1861 event, and both described widening as if it were a phenomenon they themselves had observed. Their statements also imply knowledge about widening following previous floods, perhaps obtained from McDermot but possibly other "old-timers" as well. Anderson and the Nor'Wester were otherwise reliable observers with nothing to gain by manufacturing or repeating a spurious theory which they had no reason to accept and both made the perceptive connection between channel conveyance and the depth of overbank flooding. Furthermore, given Fleming's and Rowan's scientific credentials and the detail they provide about the causes and consequences of the widening and the affected reaches, it seems unlikely that they would be easily fooled by a "tall tale" with no basis in fact. Even McDermot's improbable claim may have had some factual basis with only the magnitude exaggerated through time and repeated tellings.

The next sections of the paper will set aside the question of the accounts' veracity to consider the geomorphic context of the river channel and explore possible widening mechanisms.

The River Channel

The reach of the river considered here extends from the confluence of the Red and Assiniboine Rivers (the 'Forks') downstream to about Selkirk (Figure 1). No tributaries of consequence enter the river in this section and prior to the construction of the Floodway, discharge below the Forks can be considered to have been constant for all practical purposes.

The Red River is not a conventional alluvial river since it does not flow through materials it has previously transported, it cannot freely alter its dimensions or planform, and it does not have a significant floodplain in the normal geomorphic sense of the term. Its banks are principally composed of cohesive but weak Lake Agassiz clays/silts with a surface veneer of non-lacustrine materials. Alluvium is also found along the channel

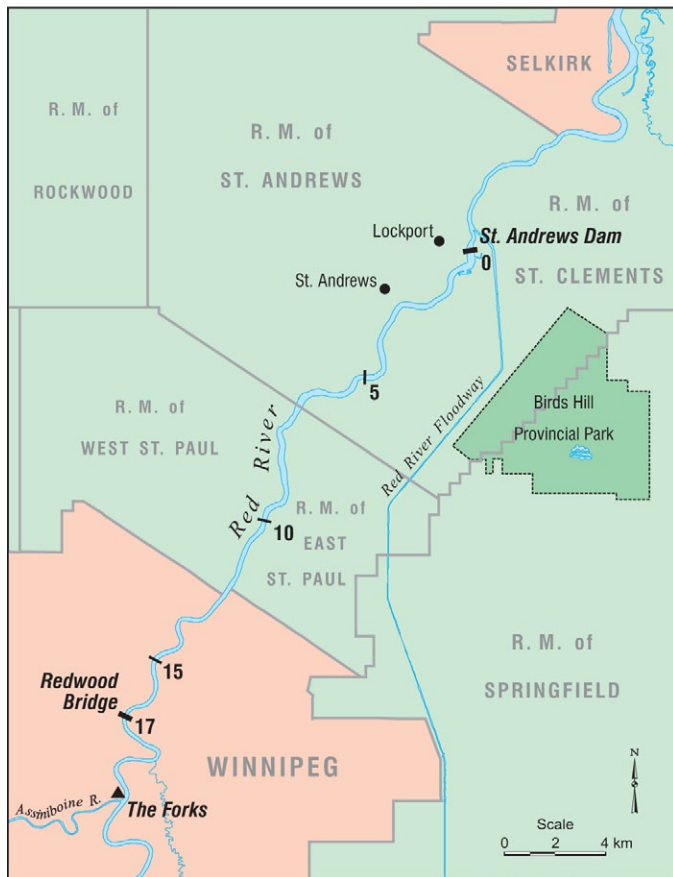


Figure 1: Location map. Numbered lines refer to km from St. Andrews Dam.

margin. These sediments overlie till, which may be generalized into an upper clay-rich, soft, comparatively weak unit and a lower dense, indurated unit with a strength approaching that of weak concrete (Fernando 2007). Glaciofluvial sands and gravel units may occur above, below, or within the till or Agassiz sediments (Tutkaluk 2000). In the Winnipeg area, the channel bed is composed of variable thicknesses of contemporary alluvium over Agassiz clays or till. Beneath the till is Paleozoic carbonate bedrock which rises very close to the channel bed at Lister's Rapids (about 14 km south of Lockport) and remains relatively near the surface downstream (RRBI 1953).

The Paleozoic rock "sill" at Lister's Rapids exerts a control over the river's base level and gradient. Upstream (south) of the "sill", the gradient of the channel bed is irregular in detail but gentle overall. From about Lister's Rapids downstream, the profile steepens. Since 1910, low summer water levels over the sill have been controlled by the St. Andrews Lock and Dam at Lockport to facilitate navigation. This structure maintains summer river stage at artificial levels as much as 2 m above natural stage from the end of the spring freshet to late autumn when the water level is allowed to fall rapidly toward low winter stage (Tutkaluk 2000).

Lateral channel activity is small. Even in the sections with well-defined meanders, there is little physical evidence of either

progressive or episodic lateral shifts in channel *position*. However, it is altered channel *dimension* rather than shifted position that is important to this paper, an inherently difficult proposition to demonstrate since channel enlargement would obscure or obliterate evidence of the former dimensions. Surveyed profiles of the channel from the late 19th and early 20th Centuries have been used to support long-term stability. The Red River Basin Investigation (RRBI) compared cross-sections surveyed in 1886, 1912 and 1951 and concluded that while bank failures have changed the shape of the channel, "the change in the hydraulic properties would not be sufficient to greatly affect the overall channel capacity" (RRBI 1953, p. 10). More recently, KGS Group arrived at a similar conclusion from channel surveys between 1951 and 2001 (KGS Group 2001). Some difficulties with this conclusion will be raised later in the paper.

These observations notwithstanding, the riverbanks have been subject to change by erosion and bank failure. James et al. (2008) distinguished between the form and locations of banks controlled by each process. Erosion-controlled banks are typically found on the inside of meander bends, in alluvial materials, are steep, and are controlled by the undercutting of the lower bank by current, wave action, and ice scour (James et al. 2008). Tutkaluk (2000) cited bank recession of 9 m in 30 years near St. John's Ravenscourt and 5-8 m in 15 to 20 years at Kildonan Park. From bank profiles surveyed in 1912, 1951, and 2001 at one site on Kingston Crescent, Fernando (2007) found that the toe of the bank had receded by 39 m. The channel bed is also susceptible to erosion. Scour pools several meters deep give the bottom profile its irregular "saw-tooth" effect (Baracos and Lew 2003). Failure-controlled banks have more gentle slope angles, occur in lacustrine materials, and are most common on the outside (concave) of meanders or in straight sections (James et al. 2008). These banks are commonly the surface manifestations of large, deep-seated, retrogressive single or multiple failures, most of which show evidence of previous movement.

Bank Failure

Bank instability and failure are almost ubiquitous along the Red and lower Assiniboine Rivers. The RRBI report following the 1950 flood contains numerous photographs of large and small failures and many others were initiated or reactivated during the falling stages of the 1997 flood and the abnormally high summer flows in 2005. Of 141 riverbanks in Winnipeg surveyed by Mishtak (1962), 135 were actively failing, showed evidence of previous failure, or had required stabilization measures; only 6 were judged to be stable. He found failures to be most common on the outside banks of meanders where multiple sliding blocks are normal but the inside banks and comparatively straight sections may also exhibit instability (Baracos and Kingerski 1998). Some failure surfaces are circular, others display considerable horizontal (translational) displacement. Some failures (particularly those initiated by undercutting) are confined to the alluvial or lacustrine materials but the largest and most deep-seated fail along the lacustrine/till boundary. The latter include reactivated older failure surfaces which may extend as far as 80 m from the

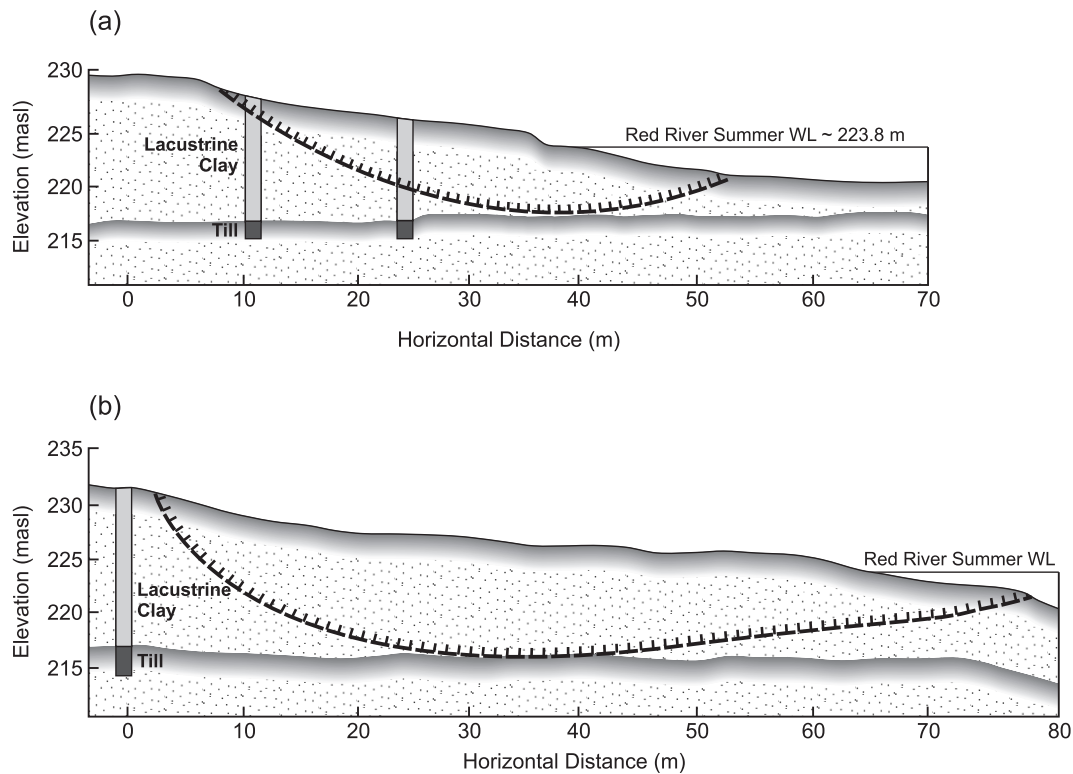


Figure 2: Stratigraphy and failure profiles, St. Boniface (a) and St. Vital (b) (redrawn from Baracos 1978).

river banks (Baracos and Kingerski 1998; Figure 2). Tension cracks that far from the bank were noted by Rowan in 1879.

The factors which contribute to bank instability begin with the inherently low shear strength of the bank materials and the structural weaknesses created by the lacustrine/till boundary or old failure surfaces. The latter provide pathways for the movement of groundwater and the remodeled shear strength along them is especially low. Some failures are directly precipitated by erosion, either by simple undercutting of the bank or by the progressive removal of support from the toe of previous failures. Fernando (2007) suggested that the removal of toe support for the deep-seated translational slides might account for sudden failure after a long period of stability.

The effects of bank erosion and failure are complicated by deposition of new material. Deposition at the top of the slide would add additional weight, increase instability and promote further failure whereas deposition at the toe of the slide would provide support, improve stability, and resist failure (Fernando 2007). Brooks (2005) studied aggradation along concave banks of the Red River channel near Letellier, 80 km upstream of Winnipeg. The concave banks there (as elsewhere along the river) were predominantly landslide zones comprised of multiple slide blocks moving intermittently downward toward the channel. At the base of the lowest block (nearest the channel), accumulated aggradation was up to 4 m thick, thinning rapidly on higher blocks further from the channel (Figure 3). This aggradation represents temporary storage of sediment (on a time scale of

several centuries) until it is reworked by erosion of the toe of the sliding block. In addition to increasing the weight on the block, it offsets some of the erosion and contributes to the apparent constancy of channel dimension and overall low rate of lateral migration.

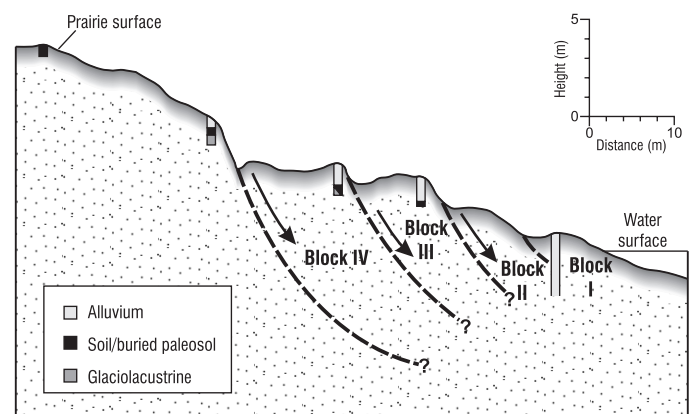


Figure 3: Multiple failure blocks and accumulated alluvium, near Letellier (redrawn from Brooks 2005)

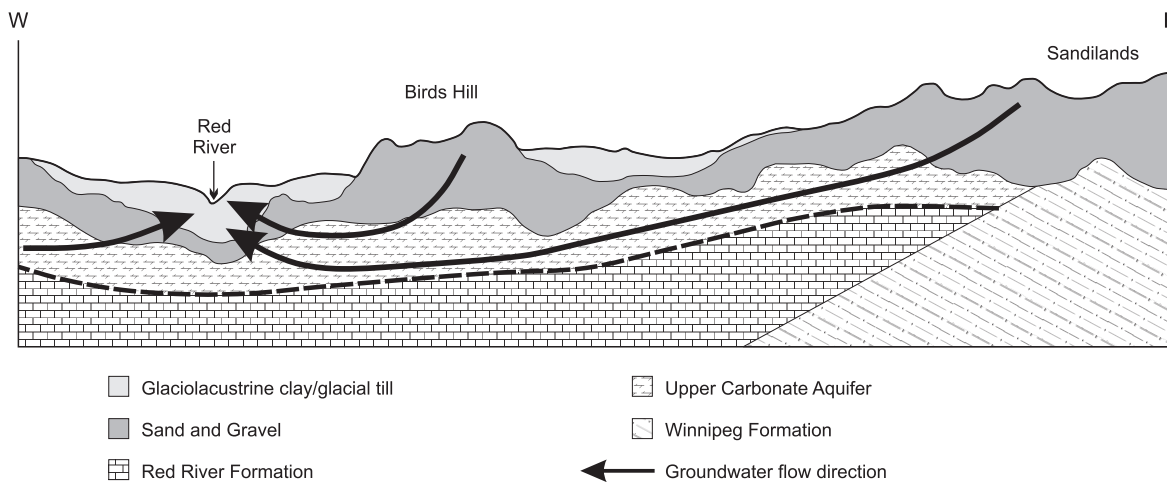


Figure 4: Generalized sequential stratigraphy and groundwater flow (based on Ferguson and St. George 2003).

Bank Stability and Groundwater

While there are numerous causes of specific failures, the Red River Basin Investigation (RRBI 1953) noted that they “occur more frequently after rapid drawdown such as following high water stages of the spring runoff and ... have also occurred after unusually heavy rains” (RRBI 1953, p. 4) and most subsequent studies have implicated groundwater pore pressure conditions in the river banks as a major factor in bank stability.

Groundwater moves toward the Red River along two routes – a set of shallow pathways along the lacustrine/till boundary or through sublacustrine glaciofluvial sands and gravels, and a more important pathway through the Upper Carbonate Aquifer (UCA) of the Paleozoic Red River Formation (Figure 4). These are recharged through the sands and gravels exposed in the Bird’s Hill and Sandilands regions. Groundwater also moves toward the river from the west and northwest from recharge areas in the Stony Mountain, Stonewall and southern Interlake regions (Johnson 1934; Charron 1965).

Under natural conditions (i.e. before urban development in the Winnipeg region), the piezometric surface of the UCA would have descended gradually toward the Red River from the recharge areas to the east and west. Confinement of the aquifer by the Agassiz clays and the till created upward-directed artesian or subartesian pressure conditions over a broad area. Human activity, however, has greatly altered this simple pattern. Beginning in the 1880s, increasing amounts of groundwater were pumped from the UCA, lowering the piezometric surface (Render 1970; Figure 5a). Construction of the Winnipeg Aqueduct reduced the need for pumping for a time but it gradually increased to another peak. Greatest lowering occurred in St. Boniface where industrial use created a broad drawdown cone (Figure 5b). As the piezometric surface lowered, the area of artesian pressure receded toward the southwest, effectively eliminating artesian conditions over a broad area of the Winnipeg region (Johnson

1934; Charron 1965). In the 1960s, the construction of the Red River Floodway east of the Red further reduced the piezometric surface near the river.

The lowering of the piezometric surface from the 1880s onward would have improved general riverbank stability by creating downward (stabilizing) hydraulic gradients in the vicinity of the riverbank. Nevertheless, numerous studies by Baracos and co-authors elaborated a more complex process, involving the interplay among river water level, the height of the piezometric surface, and seasonal changes in pumping and recharge rates. Baracos’ argument can be summarized as follows. Piezometric elevations are highest when recharge is at a maximum during or after spring melt or after unusually heavy rain in the summer. These would ordinarily produce upward-directed hydraulic gradients and reduced stability except that the relatively high water level in the river provides sufficient support for the bank that failures after the spring peak has passed are less common than they might otherwise be (Baracos and Lew 2003). Stability is also improved in the summer when (a) the St. Andrews Dam maintains artificial river water levels about 2 m above natural summer level and (b) a peak in groundwater pumping (largely for air conditioning) causes lower piezometric elevations and downward pressure gradients conducive to stability. As water levels fall in late summer or after the St. Andrews Dam is opened in the fall, the drop in river stage reduces support for the bank at the same time as the piezometric surface is typically rising due to greater rainfall and a reduction in the demand for groundwater pumping (Baracos 1978); in 1983, for example, groundwater pumping rates varied from 20 million l/day during the summer to only c. 5 million l/day in winter (Baracos et al. 1983). From winter until the following spring, bank slippage may continue but at a much reduced rate. Under modern conditions, then, fall is the most critical time for bank instability and failure.

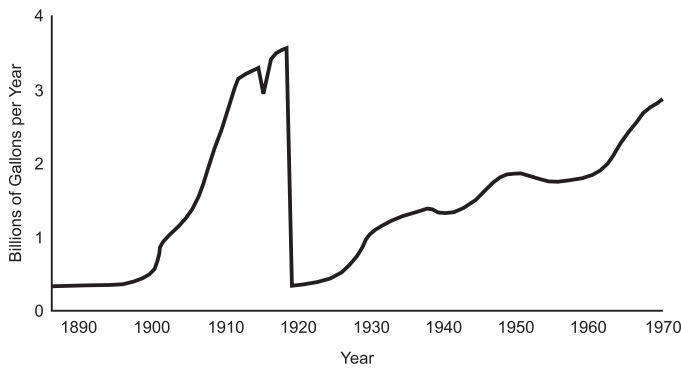


Figure 5a: Groundwater pumping rate, 1885-1970 in Winnipeg;

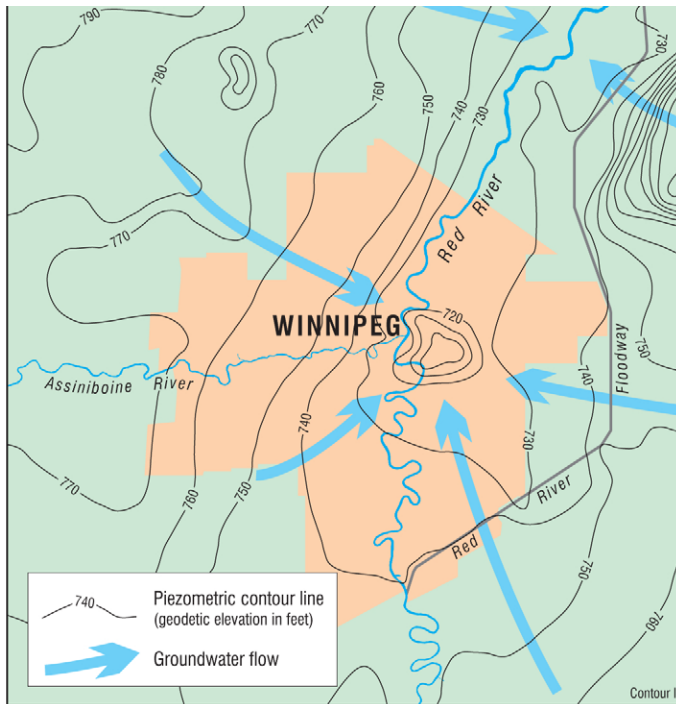


Figure 5b: Piezometric surface (masl) and groundwater flow, Winnipeg region. (redrawn from Render 1970)

Differences Between Modern and Historical Conditions

For significant channel widening to have occurred in the 19th Century, bank erosion and failure must have been more prevalent before the period of surveyed cross-sections (i.e. before the 1880s). A circumstantial but strong argument can be made that all of the dynamic factors favouring bank instability would have been more effective in the early to mid-19th Century than during much of the 20th Century. The reasons for this are both natural and human in origin.

Natural factors involve differences in the hydrometeorology of the region in the first half of the 19th Century. The great historic floods of 1826, 1852, and 1861 are well-known. The

1826 flood was the largest in more than 200 years of documented flood history, with a conventionally-accepted estimated discharge (225,000 cfs) almost 40% larger than the 1997 “Flood of the Century”. The 1852 flood (165,000 cfs) was as large as 1997, and the 1861 flood (125,000 cfs), although the smallest of the three, was still very large, comparable to the 2009 event.

Overlooked in most discussions of the 19th Century floods is the fact that the 1826 and 1852 events were preceded by other, less well-known but large, floods. In 1825, a spring flood (probably of about 1950 magnitude) occurred in April/May and after a brief decline in June, the water level rose again and remained very high throughout the summer. The great 1826 flood was then followed by lesser but still significant floods in 1827 and 1828. The 1852 flood was preceded by large spring floods (probably of 1950 magnitude) in 1850 and 1851 and a summer flood in 1849 (Rannie 1998). Equally important was the fact that the great floods occurred within two decade-long abnormally wet intervals (1824-1834 and 1849-1861) during which virtually every summer was remarkably rainy and summer water levels were high (Rannie 2006). In a number of the years (most dramatically in 1849), it is likely that rainfall amounts were comparable to those of 2005 when record summer streamflows with extensive overbank flooding led to another round of heightened concern about bank stability. Alexander Ross’s comment on the preconditions of the 1826 flood, that “the previous year had been unusually wet; the country was thoroughly saturated. The lakes, swamps, and rivers at the fall of the year were full of water...” (Ross 1856, p. 106), could have applied equally to most of the years during these wet intervals.

It can be assumed, then, that in most of the years surrounding the great floods, the succession of large spring melt and excessive summer rainfall thoroughly saturated the ground throughout the Red River region. Most importantly, recharge of the UCA through the Sandilands and Bird’s Hill must have produced a piezometric surface which was considerably higher than in the 20th Century, with more widespread and stronger upward (destabilizing) hydraulic gradients in the vicinity of the Red River. Johnson (1934) cited reports that in 1894, flowing wells had been known in the northwestern part of the original City of Winnipeg; along the Red River (a few km to the east), the water level in wells was 10-20 feet below the ground surface. By the time of this observation in 1894, however, exploitation of the aquifer had begun and the *natural* piezometric surface near the river may have been higher; it must certainly have been considerably higher during the wet intervals surrounding the great floods earlier in the century.

The increased potential for groundwater-induced riverbank failure would have been compounded by the erosive potential of the floods and prolonged, summer high flows to undercut the banks and remove toe support for the deep-seated large failure surfaces. In fact, without the removal of material, bank failure would constrict, rather than widen, the channel. Fernando’s (2007) modeling indicated that erosion and reduction of the bank safety factor were greatest under medium and high flows of long duration, conditions which were the norm during the wet intervals of the 19th C. For most of the 20th Century (until the

1970s), annual peak flows were low to moderate. Few floods occurred and apart from the 1950 event, all were comparatively small. Even those which were comparable in size or duration to the great 19th C floods (1997, 2009) were in fact very much smaller in terms of their erosive potential since large portions of the discharge were diverted by the Floodway (see below).

If the natural environment of the early to mid-19th Century favoured instability, aspects of urban development from the 1880s onward have favoured relative stability. As was noted above, pumping of the UCA lowered the general piezometric surface, with a pronounced drawdown cone centered on St. Boniface (Figure 5b). The boundary of the area with artesian conditions retreated from Winnipeg and by 1962 was about 25 km southeast of the city (Johnson 1934; Charron 1965). Regulation of summer river levels by the St. Andrews Dam after 1910 provided more support for the toe of the riverbanks than would have been the case with natural summer levels. From the 1960s onward, the Red River Floodway to the east of the river intercepted some of the groundwater which would otherwise have moved toward the river. More importantly, by the time annual peak discharges increased from the 1970s onward, the Floodway was able to dramatically reduce the magnitudes and durations (and thus the erosive potential) of peak flows. During the major floods of 1974, 1979, 1996, and 2005, the Floodway and other flood control structures were used to maintain Winnipeg river stages at or near minimum flood stage (5.6 m above the James Avenue datum), 3.5 m lower than would have occurred under natural (i.e. uncontrolled) conditions. In 1997 and 2009, when uncontrolled discharges were approximately the same as in 1852 and 1861 respectively, stages within the city, although above minimum flood level, were still 3-3.5 m lower than natural, and discharges permitted in the channel within the city were only 50-60% of the uncontrolled values. Moreover the historic floods had much longer durations than the managed 20th Century floods.

Changes in riparian vegetation may also have played a role. A striking feature of photographs of the Red River taken by H.L. Hime during the 1858 Hind Expedition (reproduced in Huyda 1975) is the virtual absence of trees (or any other substantial vegetation) along the river, particularly the west banks. The reason for this is clear- the need for wood for heating and construction materials in a growing settlement strung (mostly) along the western bank between the Forks and Lower Fort Garry. In fact, other photos of many sites in the Red River Settlement show that the deforested area extended for quite a distance from the western bank. Tutkaluk (2000) suggested that the root mass of mature trees may contribute 30% of total soil strength and "a riverbank with mature trees (especially at the crest) would be much more stable than a riverbank without such vegetation." (Tutkaluk, 2000, p. 103). In addition, riparian trees reduce erosion and promote aggradation during high water. Removal of the natural (i.e. pre-Red River Settlement) riparian forest would have begun as the Settlement became established and would have been well under way in the vicinity of the Forks by the 1826 flood. As the settlement grew downstream over the following decades, more of the bank would have become unpro-

tected and each flood would have done its own damage to the vegetation, further reducing the protection. The reestablishment of the riparian forest in the 20th Century would have increased overall bank stability.

The changes in stability produced by these human activities and the implications for failure prior to human intervention were recognized by Baracos.

Before the turn of the century, the river level in the City of Winnipeg was not controlled by locks, nor had the heavy demand for well-water developed. Johnson (1934) cites old records of flowing wells in northwest Winnipeg. This would indicate that hydraulic gradients in the banks would not have their present downward and stabilizing direction. Without the locks, spring high river levels would have been soon followed by the uncontrolled river levels, thus developing conditions less favorable for stability than presently exist. Slides would have developed, which under present conditions are possibly stable or only intermittently active. Whatever the explanation is for the old slide surfaces, they do exist as has been shown for the St. Vital and St. Boniface banks, and at other sites where excavation has revealed their presence. (Baracos 1978, p. 15)

...it can be reasonably presumed that in earlier times [before urban development], hydrostatic or even upward gradients ... may have contributed to the large number of deep-seated slides which are present in the riverbanks... Since the residual strength of the Agassiz clays is very low..., these former landslides are easily reactivated by erosion or construction activity. They are often difficult to stabilize. (Baracos and Graham 1981, p. 395).

These arguments could only have been reinforced had the writers taken the enhanced 19th Century groundwater environment into account.

However persuasive the case is for more vigorous 19th Century bank failure, historical documents make surprisingly little mention of bank failure from 1826 to the 1860s. Nevertheless, it apparently could cause concern. As the 1852 flood receded, Bishop Anderson noted on June 3 that

the land is fast reappearing. The chief fear now is the slip of the bank; many houses are supported and propped up, lest the earth should launch forward and carry them away." (Anderson 1852).

and following the recession of the 1861 flood, Samuel Taylor wrote in his diary for June 30, 1861, that

... a great deal of the bank of the River has fallen about this time the like is never been known I believe." (Taylor 1861).

Another indication of historic bank failure is provided on a detailed map of the immediate vicinity of the confluence of the Red and Assiniboine Rivers surveyed by British military engineers, dated July 31, 1848 (Warkentin and Ruggles 1970).

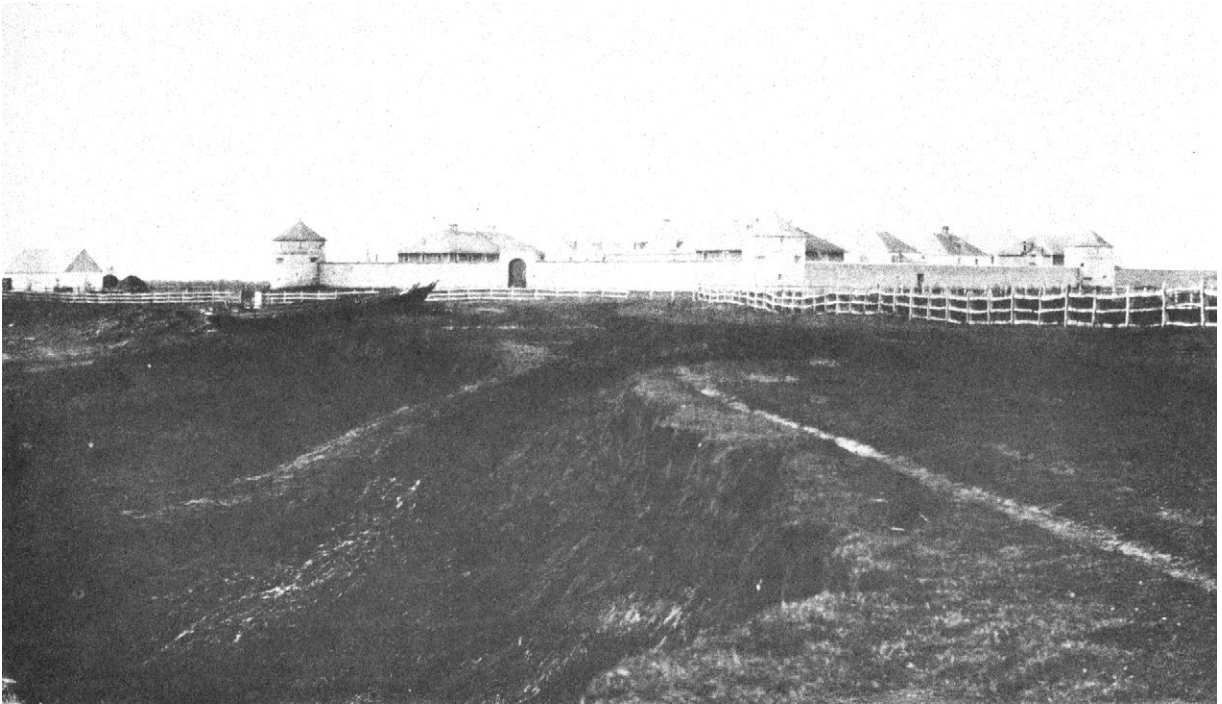


Figure 6: Headscarps and slumps along Assiniboine River adjacent to Upper Fort Garry, 1858. (photo by H.L. Hime, from Hyuda 1975)

The map was annotated “ground subsiding” at four locations along the bank of the Red in the 0.5 km reach immediately downstream of the Forks and at another location on the Assiniboine adjacent to Upper Fort Garry; the map’s shading along the channel suggests that it was a general phenomenon. Finally, several of Hime’s 1858 photographs of the Red River (referred to above) suggest bank slippage; although most are rather indistinct, one clearly shows well-developed headscarps and large slumps along the Assiniboine River immediately in front of Upper Fort Garry (Figure 6).

Discussion and Conclusions

This paper began with the premise that the anecdotal accounts of widening in the Red River deserve attention. The possibility that the accounts are incorrect was discussed above. To the writer, the most compelling reasons for rejecting the accounts are the small number of claims for the phenomena and even smaller number of potential primary sources. Given Macoun’s suggestion that the observation of widening was widely shared within the Settlement, the fact that there are so few accounts in the voluminous archival record is worrisome.

On the other hand, a clear plausible mechanism for widening exists: bank failure accompanied by erosion and removal of the failed material. Most authorities attribute much of the modern bank instability to groundwater pore pressures and there is evidence that the hydrometeorology of the region in the time periods surrounding the floods would have favoured stronger groundwater pressures and greater instability in comparison

with those which have prevailed during the 20th Century and the floods themselves would have had greater erosive potential than any in the modern period. Again, however, the archival record of actual failure or erosion is more slender than might be expected given the importance of the riverbanks to the inhabitants of the settlement.

The closest thing to physical evidence are the surveyed channel profiles from which both the Red River Basin Investigation (1953) and KGS Group (2001) concluded that the channel had not changed its hydraulic properties. However, the use of these profiles to infer channel dimensions during the great floods is problematic. The earliest profile, in 1886, was from the vicinity of St. Andrews Church in a reach which Fleming specifically said had not widened. The only other early profiles come from several sites in Winnipeg reported by the Manitoba Hydrographic Survey of 1912 (when pumping of the UCA was nearing its pre-aqueduct maximum), and from the Red River Basin Investigation following the 1950 flood (RRBI 1953). All of these profiles were surveyed long after the purported widening had occurred and reflect conditions during the period of apparent greater stability due to piezometric lowering. Thus they do not necessarily provide certain evidence of channel dimensions earlier in the 19th Century.

All but two of the accounts suggest that widening was general all along the river but Fleming and Rowan excluded the reach from St. Andrews downstream and both said that the river had widened at “many places”, implying a less continuous phenomenon. The possibility that the other 19th Century observers may have over-generalized from localized widening was raised

by Carson et al. (2002) and non-systematic variations in modern river width provide some support for this view. Figure 7 shows low water channel widths in January, 1951, and the widths during the 1950 flood (103,600 cfs; 2935 m³/sec) from the Redwood Bridge in Winnipeg to the St. Andrews Dam (RRBI 1953).

Width increases in irregular fashion for about 8 km downstream of the Redwood Bridge with fluctuations of 20-40% superimposed on the trend. These fluctuations are most dramatic in the middle section (Mile 36-32) where low-water widths reach their maximum and become extremely variable. Where the banks are subject to extensive failure with multiple blocks moving in translational fashion, the channel margin consists of one or more steps descending toward the water line. Under these conditions, widening would be greatest at the top of the channel margin. This is also suggested by the RRBI data where the sections with the greatest variability also exhibited the greatest difference between the low water and flood widths. Brooks' data indicate that very little of the widening of the upper channel margin is compensated for by aggradation. Several factors undoubtedly contribute to these anomalous width variations (eg. the topography around small creeks, the proximity of bedrock to the channel bed, etc.) but some may reflect the localities where former widening was greatest.

The possibility that the channel widened during the period of the great floods is not merely a geomorphic curiosity but has potential consequences for the understanding of their hydraulics. For example, the discharges of the floods were estimated by the RRBI (1953) using a Manning-type methodology which assumed 20th Century channel dimensions and water surface slopes based on surveyed water elevations on the floodplain reported by Fleming. If the channel were in fact narrower during the 19th Century floods, then the calculations might have produced overestimates of the discharges. However, the RRBI estimates were based on channel dimensions in the lower reach (from St. Andrews downstream) which Fleming explicitly excluded from widening so it is unlikely that such an overestimate occurred.

During their hydraulic studies following the 1997 flood, KGS Group identified anomalies in Fleming's 1826 water elevations such that

the water levels from present-day Lockport to 4 miles below Selkirk are considerably higher than would be expected for peak flows that would be associated with the high water levels reported in Winnipeg. Or, conversely, the water levels in Winnipeg are considerably lower than can be explained by flows that would be required to generate the maximum stages that occurred at, and downstream of, present-day Lockport. (KGS Group 2001, p. 9).

This anomaly, which became known as the "Fleming Conundrum" (Carson et al., 2002), presented problems in the reassessment of the hydraulics of the 1826 flood in the Lockport-Selkirk reach. The possibility of channel morphologic change, based on several of the quotations, was included among six possible explanations considered by KGS Group. Their modelling

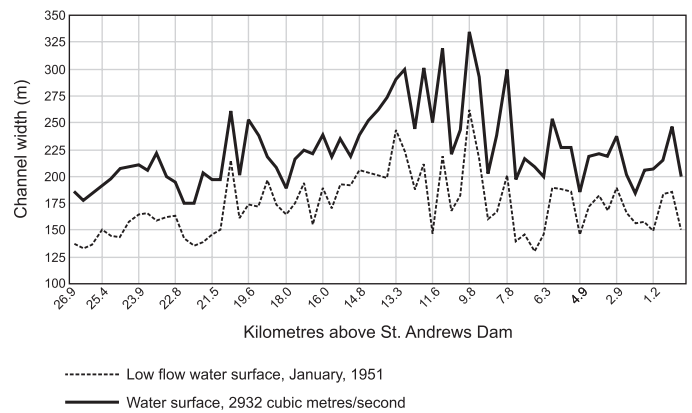


Figure 7: Width of water surface at 1950 flood peak, 103,600 cfs (upper line) and at low flow, January, 1951 (lower line) from Redwood Bridge in Winnipeg to St. Andrews Dam (data from Red River Basin Investigation 1953).

of discharge and water surface profiles in the Lockport area indicated that "a channel only 10% narrower than currently exists could reduce the disparity of the water levels between the reach near Selkirk and in Winnipeg" (KGS Group 2001, p. 13). However, KGS Group rejected widening in general terms because of the similarity of profiles over the last century and specifically in the case of the Conundrum, because they found no explanation for why widening would have occurred only (or at least to a greater degree) in the reach near Selkirk and not within Winnipeg. In their judgment, bank failure might have been more likely in Winnipeg but widening there would have exacerbated the Conundrum. Again because Fleming specifically excluded the lower reach from widening, it would seem that the cause of the Conundrum lies elsewhere.

Whether the Red River was indeed narrower in the 19th Century is not resolved here. Even with additional field and archival research or modeling of bank stability under hypothetical 19th Century groundwater scenarios, a satisfactory answer may not be possible. The small number of potential primary accounts raises alarms and however strong an argument may be made for enhanced bank failure and erosion as mechanisms, the slender historical evidence for it is equally troubling. There is an obvious danger of circular argument when observations of questionable reliability spawn a plausible but speculative explanation which is then used to bolster support for the original observations. On balance, while the accounts of widening cannot be dismissed, they should be approached with caution and a healthy skepticism (as this paper has attempted to do). Nevertheless, KGS Group's finding that a 10% (15-20 m) narrower channel in the Selkirk area could account for the Conundrum indicates the sensitivity of the hydraulics of the 19th Century floods to relatively small changes in channel dimensions; the issue might be worth revisiting when discrepancies arise in future interpretations of the historic behaviour of the Red River.

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Explaining the absence and the characteristics of the migrants: French Canadians in southwestern Saskatchewan at the turn of the 20th Century

Beckey Hamilton

University of Regina, Regina, Saskatchewan, Canada
beckey.hamilton@gmail.com

Abstract

The conspicuous lack of Francophone settlement in western Canada remains a persistent mystery in Canadian history and has influenced the region's population geography. Political and cultural explanations have predominated. Quebec's and New England's elite characterized the region negatively while government policies apparently favoured other nationalities. Linguistic and educational disadvantages also seemed to influence the direction of Francophone moves towards New England. Although it is clear that French Canadians flocked to New England by the thousands while relatively few moved to the prairies and that this limited the development of chain migration, there is room to add to previous explanations of this pattern of movement. While the west was negatively portrayed, the elite described New England similarly. Other studies have shown that processes behind French Canadian migration to New England led to the selection of a particular group of Québécois. This study uses a systems approach and shows the interplay between structural, and individual factors and other links that contributed to this movement. This also provides a parallel to studies that have examined the various factors that contributed to a selection of people who would move in particular directions, in this case to southwestern Saskatchewan. This also allows a comparison with Francophones who migrated to New England and furthers understanding of the various factors that influenced the Francophone frontier in western Canada.

Keywords: Francophones, history, prairies, migration, settlement

Migration Basis

A systems approach is one way of viewing clustered migration (Hoerder 1999, 6). This perspective offers a way to link the large scale structures of the political economy with micro-scale characteristics of migrants (Kritz and Zlotnik 1992),¹ in a way that gives particulars about migration as one response among many potential responses to change within particular contexts (Harris and Moore 1980, 28; Widdis 1988, 272-273). The systems approach also provides reasons why particular destinations were chosen by migrants (Fawcett 1989, 672).

Mabogunje (1970) established the use of this approach in the study of migration. He emphasized links between origins and destinations and factors in both areas that influenced the devel-

opment of migration channels. Later researchers developed his idea. The systems approach to migration thus considers migration as being influenced by:

(1) Macro-scale factors: broad scale socio-economic forces along with local social forces (e.g., local social constraints on migration) affecting the sending and destination locations;

(2) Meso-scale factors: links between localities that influence migration, including family and group influence and strength, immigration and emigration policies; advertizing, assistance provided to emigrants, and communications from migrants about the situation in their new home;

(3) Micro-scale factors: individual characteristics/individual human capital that influences propensity to migrate and mental

¹Cooke and Bélanger (2006) provide one example of analysis of a migration flow using a systems approach.

maps of potential alternate homes (Mabogunje 1970; Fawcett 1989; Gurak and Caces 1992; Kritz and Zlotnik 1992).

For Kritz and Zlotnik (1992) and Gurak and Caces (1992) meso-scale factors, or the links, emerged at the forefront in influencing migration patterns. Although the initial moves that led to the development of migration systems were made for various reasons, including structural reasons, the migrant networks that formed (classified as a meso-scale factor), led to the perpetuation of migration, influenced the selection of migrants, and contributed to the persistence of the system for a period after the reasons for the system's establishment had changed.

This view of migration systems was used to examine the current data on French Canadian migration to southwestern Saskatchewan. It allows an intersection of approaches that, if considered together, have recognized the importance of multiple factors in migration, particularly in its distance, direction and participants. More specifically this approach intersects generally macro scale factors that were elucidated by early writers; namely distance (Christian and Braden 1966), alternate opportune locations (Stouffer 1940) and broad scale economic forces (Ravenstein 1885; Lee 1966) with other forces that were stressed by later scholars who critiqued their predecessors as describing migration in terms of "a mechanical response to an overarching economic rationality" (White and Woods 1980, 7). Thus some stress individual, micro scale factors in migration, examining, for instance, propensity to move at different stages in the life cycle (for example, Ravenstein 1885; Leslie and Richarsons 1961). Other particular, personal characteristics were considered by Bennett and Kohl (1995) when they examined those who left the North American western frontier. On the other hand the development of ideas of place utility (Wolpert 1965) underscored the importance of perception of gains in initial and a variety of alternate locations in the decision to move. Streams of information about potential new places were crucial in the development of utilities assigned to each place. Numerous studies have shown the crucial role of links between places in migration patterns. For instance, Hudson (1976) demonstrated that westward movement in the United States occurred along "information-migration networks." Chain migration, based on links between family, friends, acquaintances and those of more general common background has been well shown to have been important in ethnic migration and the formation of bloc settlements (for example Richtik 1986; Ostergren 1998; Lehr 1999).

Thus numerous studies have viewed migration as highly complex. They have suggested the need to consider the interplay between large scale economic structures, place utilities as they were mediated by culture along with individual, micro scale characteristics; at times this can be described as viewing migration in context (Harris and Moore 1980; Ramirez 1991a, 244; Moon 1995). The use of a technique that considers migration at various, macro and micro scales and that shows how links develop between places that affect perceptions and possibilities of places and decisions relative to movement by particular individuals, from particular places and to particular places, allows this.

Previous Work on French Canadian Migration to the Canadian Prairies

Despite a few early works on Francophone migration that included some information on the move west, such as that by Rimbart (1954) in the early 1960s, little was known about this very extensive emigration (Faucher 1961). Moreover, Rimbart's work dealt mostly with the distribution of French Canadians in the United States, but gave a few comments about their emigration, including some about the limitedness of Francophone migration to western Canada. Interest increased after this, with some statistical work on French Canadian emigration and some study of the general causes of the move (Faucher 1964, 1975; Paquet, 1964; Lavoie 1981; Roby 1982).

While Rumilly (1961) and Rimbart (1954) contended that the Dominion Government had sought to limit Francophone migration to western Canada through high rail fares and the United Empire Settlement Act, Silver (1966, 1969) and Lalonde (1979) suggested that it was Quebec's elite and culture that did not promote mobility and the creation of frontiersmen that limited French Canadian migration to the Canadian west. These assertions too were later questioned. First, it was suggested that French Canadian society was geographically mobile rather than stationary. Mobility was essential to ensure family survival. The image of stability and efforts to promote it were constructed by the elite and had little to do with the social and economic reality of most French Canadians (Morissonneau 1979; Lalonde 1979, 184-185; Ramirez 1991a, 245-246; Lamarre 1998). Painchaud (1987) has written on the involvement of other clerics in French Canadian mobility, these being the western clerics and their attempts to promote movement to the west. Others have studied the role of economics and human capital in the direction of this migration; limited education, little knowledge of English, and large families made the move west uneconomical (Green, MacKinon, and Minns, 2005).

Other more detailed studies of specific migration patterns have been conducted following Vicero's (1968, 217-218) and Allen's (1972) work that showed that French Canadian migrants to specific places in the United States also came from particular common places. Thus, Ennis (1977) provided an overview of the broad factors that attracted various groups of Francophones to western Canada and suggested that the family was important in the move and in settlement. Sylvester (1997, 25) showed that many Francophones who settled at Montcalm, Manitoba had common origins, though he did not specifically study migration patterns. Painchaud (1969) included population statistics in his thesis on repatriation to Manitoba. Yet this portion of his study sought to compare different groups of French Canadians; those from Quebec, repatriates and those from elsewhere in Canada, rather than specifically considering demographics as one micro-scale factor in the selection of migrants. At the same time, he suggested a need for further study of the economic background of French Canadian migrants.

The Present Study

This study considers French Canadian migration to the Canadian prairies using a systems approach. The broad structures and the meso-scale links of this migration have been generally described elsewhere (e.g., Tessier 1974; Ennis 1977; Hamilton 2007); but they are brought together and summarized here. On the other hand, the present study focuses on some of the particular characteristics of the individuals involved in the move. Thus, it examines how the broad structures and the meso-scale links selected particular individuals for migration to this region (White and Woods 1980, 12). More specifically, it considers:

(1) Whether French Canadian migrants to southwestern Saskatchewan shared particular characteristics that would suggest that they were “selected” from the larger Quebec population.

(2) Whether these French Canadians differed from Québécois who opted to move in other directions.

(3) Whether these French Canadians resembled other settlers of the Canadian prairie frontier.

Moreover, by specifically studying the characteristics of French Canadians involved in migration, this work parallels that of Ramirez (1991b), Frénette (1995) and Takai (2001), who have shown that French Canadians who migrated to the United States, to new colonization areas in Quebec, and those who repatriated from the United States had particular micro-scale (individual) characteristics. Their particular characteristics, within the socio-economic context of their home area, and in that of the receiving area, made it beneficial to migrate and to migrate in specific directions. In this regard, Ramirez (1991b) and Takai (2001) refer to a “selection mechanism” that “chose” migrants for particular locales if they had the characteristics and skills that best met the needs of that locale at a particular time. In the same way, it is suggested here, micro-scale individual characteristics, in conjunction with the particularities of the macro-scale contexts involved, and the meso-scale networks, may have led to a selection of migrants for the west, who may have differed from those who “were selected” for New England.

Finally, the study extends the author’s previous work on Francophone settlement. The current study uses a larger group of Francophones, from several communities in southwestern Saskatchewan. The larger group was used for two reasons: first, to attain larger samples, especially of those who had owned land in Quebec and second, to diminish the potential of the appearance of particular demographic and economic backgrounds appearing as the result of recruitment for particular communities.²

Study Area and Time Period

This work used two study areas; a general area for general study and a smaller area for more detailed study (Figure 1). The

²In this regard, Tessier (1974) suggested that Francophone migrants to Gravelbourg and Willow Bunch came from substantially different backgrounds.

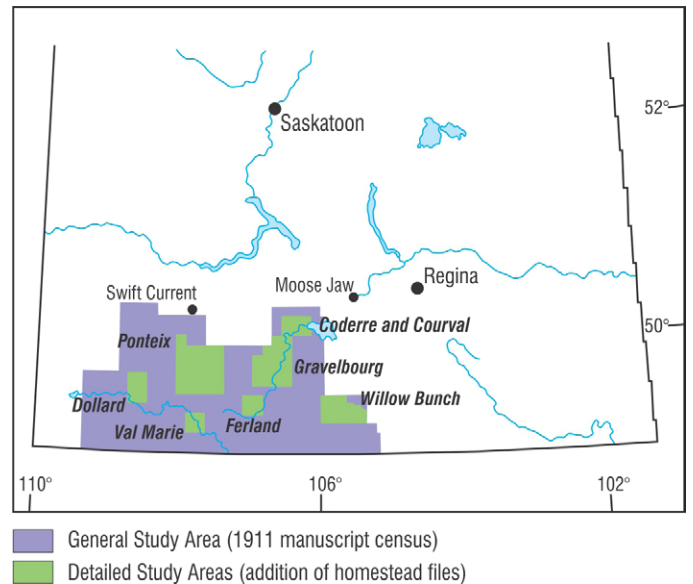


Figure 1: Study area.

general study area approximates southwestern Saskatchewan’s Francophone belt (Lapointe and Tessier 1986, 116). More particularly, the general study area consists of the census areas that cover this Francophone settlement region. Smaller areas were also selected for more detailed study, using homestead files; these areas encompass seven bloc settlements within the Francophone region of southwestern Saskatchewan. The bloc settlements formed the core areas of Francophone settlement in the larger region (Fung 1999). The time needed to consult homestead files is the main reason for the use of two study areas.

The time period consists of the early 1900s. This was the time period in which most of this region was settled. Settlement began earlier in the Willow Bunch area (Rondeau 1923). Only those French Canadians who were still present in the area in the early 1900s were included in the analysis.

Source Material

Manuscript censuses, homestead files and local histories form the main source material for this study. All sources have been used elsewhere in studies of migration and settlement.³ Manuscript censuses provided general information on the origins of settlers and gave details about demographic characteristics. This source is fairly accurate but not error free as it may be subject to transcription errors and to under-enumeration (Galenson and Levy 1986). The homestead files also provided general and on occasion detailed information about homesteaders’ origins.⁴ Some information about families is also included in the homestead files but this is often erroneous (Rodwell 1965, 12). Local histories, on the other hand, provided more details about migrants’ origins. Assessments of the quality of this source have

³See Vicero (1968), Fox (1979), Lewry (1986) and Boyd (1989) for examples.

⁴Homestead files often though not always give only general information on homesteaders’ birthplaces and last residences.

suggested that it is variable and depends on the specific history (Widdis 1992, 263-264).

Study Group and Identification of Settlers

The whole study group consists of 1,820 Francophones who were identified in the 1911 census and with the homestead files. Two subsets of Francophones were used for detailed study. The first includes 870 Francophone household heads and their families who were identified in the 1911 manuscript census. Detailed demographic study was conducted on these Francophones and their families since the census provided detailed information on them, especially on their, their spouse's and their children's ages. This information was not available for Francophones who were only identified in the homestead files. The second subset was used for detailed study of the economic background of the migrants. This subset was created of Francophones who were located to their previous homes in Quebec. First and family names, age and the presence of other family members were used to identify these Francophones as the same people who settled in the study area.⁵ This subset of Francophones consists of 77 landowners and 227 landowners' sons. Although the goal was to locate as many Francophones in Quebec as possible, and to create as large of dataset as possible, many who settled in the study area could not be located in Quebec. In some cases, there was insufficient information to ensure accurate identification. In other instances, migrants may have been in the United States in 1901. Finally, difficulties in matching census, such as differences in spelling, may have affected identification. Although these difficulties and the few Francophones who were located may have biased the results this could not be avoided.

Confirming that settlers were French Canadian was another issue. Various sources were used to determine which settlers in southwestern Saskatchewan fit this category. The 1911 manuscript census included population origins. Other Francophones, who homesteaded, but who were not enumerated in the 1911 census (i.e., those who were identified solely from the homestead files), were identified through tracing to their/their families' origins to Quebec. Métis people, who frequently had Francophone names and who were described in the 1911 census as Francophone were not included in this study. Métis people were separated from Francophones using the 1901 manuscript census, which distinguished them from Francophones, parish records and Métis scrip files.

Results

Macro-Scale Factors

By the turn of the 20th Century, economic and demographic forces had spurred extensive emigration from Quebec for more than half a century. Although emigration from France to Quebec largely ceased following the Treaty of Paris (1763), which

placed Quebec under British rule, the Catholic church promoted a maintenance of culture and the growth of French Canada through large families (the "revanche des berceaux") (Bone 2008, 264). With the average French Canadian couple having 6.7 children, several of whom became inheritors of their parents' seigneurial land,⁶ Quebec's seigneuries became overcrowded (Harris 1966, 131-132; Saint-Yves 1982, 68; Young and Dickinson 1988, 109).

Extensions of seigneurial landholdings into the Richelieu, Chaudière and Yamaska accommodated the population for a period, but further expansions were limited by Quebec's physical environment and by institutions in new settlement areas. The Saint Lawrence Lowlands, an area covered with sandy-clay soil, left by former glacial seas, contains the land that is best suited to farming. Land with suitable relief is limited elsewhere, to pockets of level clay land in the shield and to level terrain in the Appalachians. Soils in most areas are thin, acidic podzols and ill suited to farming. The climate is also limiting. The subarctic climate zone, characterized by long cold winters and a short warm summer season extends through most of the province. The warmer Great-Lakes-St Lawrence climate zone is only found in the southwestern part of Quebec. Thus, the growing season is short through much of the province (Vicero 1968, 15; Bone 2008, 44; 52-56). Land granting and settlement regulations in new settlement areas of the Eastern Townships and the North also hindered Quebec farmers. In these regions they encountered limited transportation, tremendous distances to markets, regulations that made the take up of forest lots difficult, restrictions on sale of timber (which often provided vital income), and company pricing for produce and goods that kept them at a subsistence level (Ramirez 1991b, 77-80).

Farming practices, too, contributed to degradation of the land resource. Cropping patterns in Quebec traditionally involved a two year rotation. Fertilizing had, for generations, been minimal; Québécois farmers were known to dump manure in the Saint Lawrence. Although fertilizer and further rotations were increasingly used by the turn of the 20th Century, both improvements were mostly made by the larger farmers while those with smaller farms lacked the land and resources to modify their practices (Jones 1969, 115-116; Ramirez and Otis 2001, 14-15).

The development of a wheat export economy in the Midwest, Ontario, and the western states by the 1870s heightened the difficulties that Quebec's rural population faced. The new regions' fertile soils and developing transportation systems enhanced their competitiveness. Québécois farmers soon faced a need to change their production to remain competitive. Live-stock farming that could be conducted profitably despite Quebec's relatively limited land resources demanded larger farms. Purchasing additional land was possible for those who owned the larger farms, but this was difficult and even impossible for small farmers. In addition to lacking the finances needed to acquire more land, small farmers faced difficulties obtaining loans to make these purchases. Banks were few in Quebec and they

⁵Lamarre (1998) used a similar technique despite the potential of error.

⁶Inheritance patterns in Quebec involved multiple heirs.

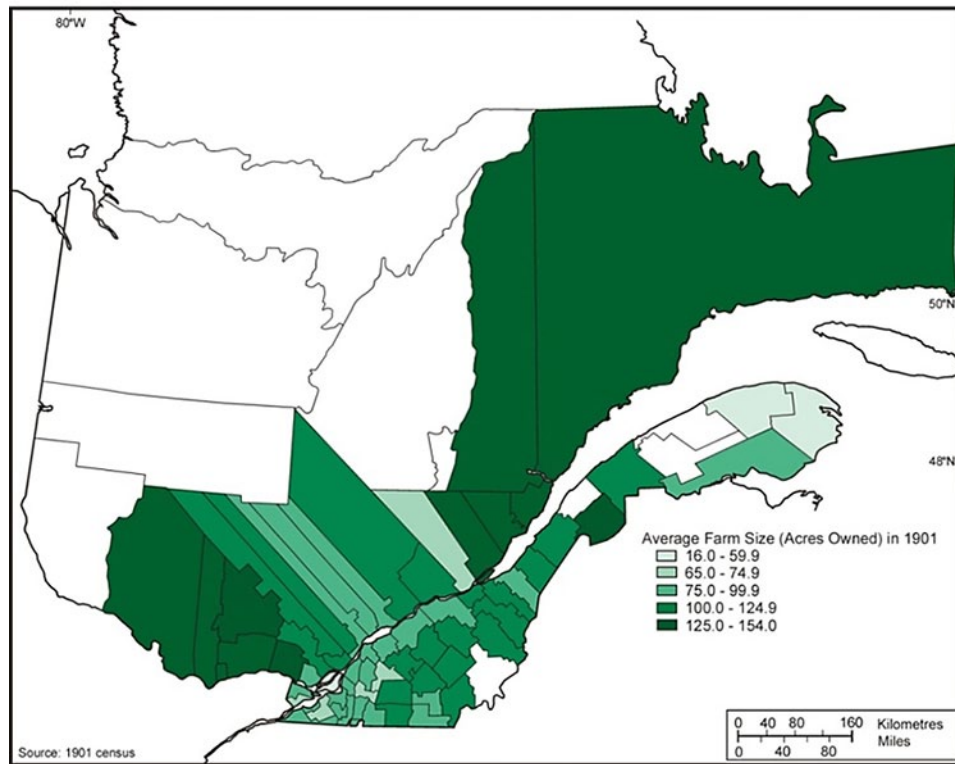


Figure 2: Average farm sizes in Quebec and number of emigrants.

tended to lend only to the elite. (Ennis 1977, 140; Roby 1982, 12; Armstrong, 1984, 80-84; Ramirez and Otis 2001, 14-15)

The result was an abundance of uncompetitive small farmers. This segment of the population was soon forced into either day labour as a *journalier* – an occupation for which there was less demand on the emerging dairy farms than on grain farms – or into joining the ranks of out-migrants (Ramirez 1991b, 26-29). Indeed, Maisonneuve (1985) found that most migrants during the 1850s were families that owned small farms, rather than individuals, Quebec’s surplus offspring.

But economic change occurred unevenly in Quebec, with “... powerful poles of development [...] accompanied by the marginalization of given geo economic areas.” (Ramirez 1991a, 246). For one, industry expanded and industrial centers emerged. However, these did not provide sufficient employment for French Canadians in search of work (Ramirez 1991a, 246). Elsewhere too, emigration decisions were affected by specific local conditions (Ramirez 1991a, 246). Some of the regional differences in Quebec are evident in Figure 2. It is apparent from the figure that the smallest farms were located in the traditional seigneurial area of the province, and in the most fertile areas. Farms were larger in the Eastern Townships and in new settlement areas of Témiscamingue and the Saguenay. In these regions, farms had not been subject to subdivision for generations. But, at the same time, land and climate conditions were less favourable for agriculture.

Nonetheless, Figure 2 and the r^2 value of 0.042634, associating the number of migrants per county with average farm size,

demonstrate very little correlation between Francophone migration and counties with very small farms. Thus, it is suggested that while the structural conditions that hindered Québécois farmers played a role in emigration, highly difficult situations alone did not appear to be the selection factor of migrants to southwestern Saskatchewan. At the same time, these observations do not account for the difficulties Québécois farmers with large land holdings, but who were located in an unfavourable area, may have had.

Figures 3 and 4 show the relationship between migrants’ farm sizes and average farm sizes by county. These two figures show that while some migrants arrived from smaller farms than most people in the counties where they lived, many did not. The most extensive differences between the average size of migrants’ or migrants’ sons land holdings and average farm sizes in Quebec counties are found where few migrants came from a particular county (i.e., in these cases a single migrant’s farm heavily influenced the statistics). Still, land owners who migrated to southwestern Saskatchewan came from farms that were on average 141.7% the size of farms in the counties from which they came from while farmers’ sons came from farms that were an average of 166.3% the size of farms in the counties that they moved from. Yet, again, the information on these figures relative to the land base that migrants had in their homes in Quebec is incomplete. For example, while some Francophones may have come from relatively large farms, their land may have been poor. Western Canada, on the other hand, had emerged as a growing region at the turn of the 20th Century. The end of

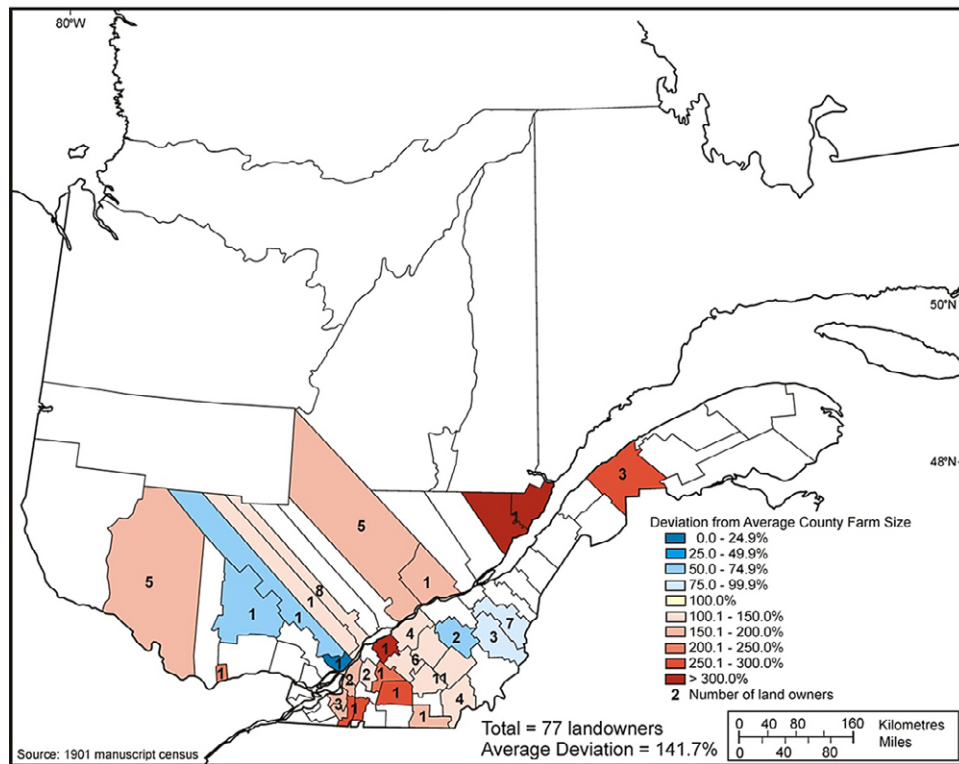


Figure 3: Average farm sizes of migrant landowners compared with average farm sizes by county.

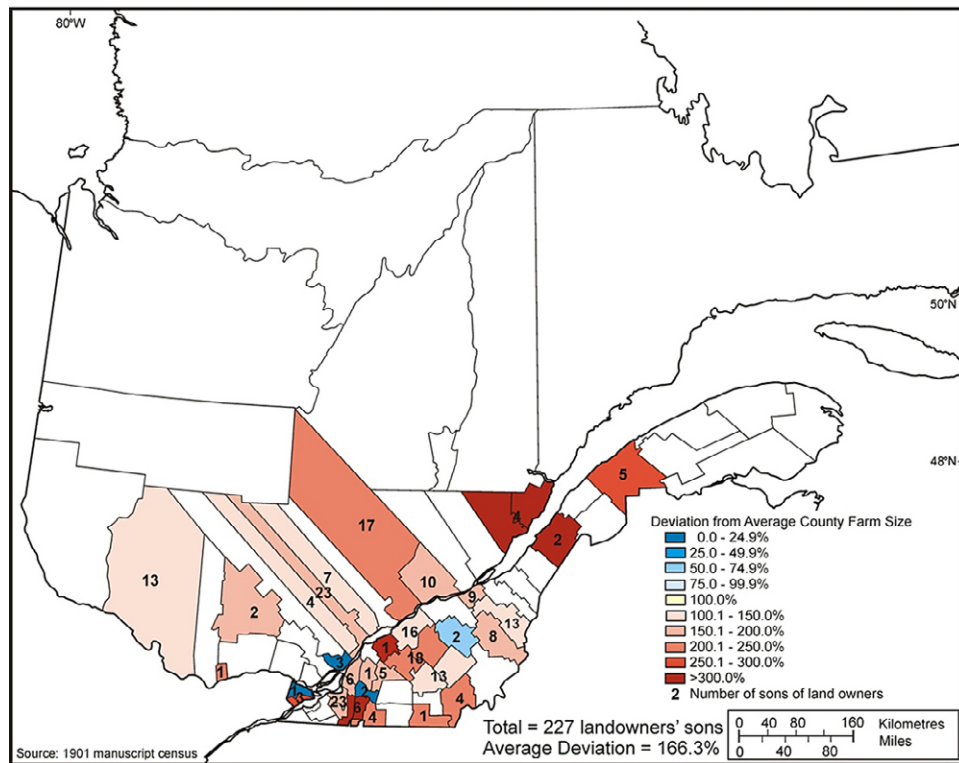


Figure 4: Average farm sizes of migrant landowners' sons compared with average farm sizes by county.

the depression of the late 1800s, the closing of the American settlement frontier, technology breakthroughs in production, and improved transportation were contributory (Norrie 1975). The passing of the National Policy and the Dominion Lands Act had made thousands of acres of fertile lands available for settlement at the low cost of a \$10 entry fee. This provided an enormous pull for many potential migrants (McKercher and Wolfe 1986).

Meso-Scale Links

Several links mediated between individual Francophones and the structures of the local and broader economy. These contributed generally to Francophone migration and more particularly to the selection of Francophones who moved. These links, it is suggested, included government and church politics, distance and rail fares, priests, other organizations developed to recruit migrants and family and acquaintance networks. These links correspond, to some degree, to Fawcett's (1989) conceptualization of linkages between the structural economy and individual migrants.

(1) Government and Church Policy

Government policy relative to settlement of the west represented one of the links between Quebec and the prairies. Shortly after purchasing Rupert's Land from the Hudson's Bay Company in 1870, Canada enacted the Dominion Lands Policy. Attempts to attract migrants to the prairie west soon followed. Francophones were among the desirable settlers for the west (Lapointe and Tessier 1986, 74-75), but the Department of the Interior opposed advertizing in one province in favour of another (NAC file RG76, vol.382, file 535325 part 1, 1914). These efforts represented one part of the National Policy that aimed at spurring economic growth.

Members of Quebec's elite criticized Canadian government policies relative to immigration, suggesting that this link could have been stronger. Dominion government attempts to attract British and European settlers, while not assisting French Canadians who desired to move west, appeared as an attempt to weaken the Francophone position within Confederation and aimed at promoting assimilation. Differences between rail fares, especially those instituted under the United Empire Settlement Act were of concern. Accordingly, every French Canadian paid \$46.45 to travel to Winnipeg, \$86.90 to go as far as Vancouver. At the same time, adults arriving from London paid \$22 to travel to Winnipeg and \$29.80 to travel to Vancouver while their children travelled free (Rimbert 1954, 82; Rumilly 1961, 15-22). Still, this policy was implemented (in 1925) after much of the study area was settled therefore the applicability Rimbert's and Rumilly's contentions to the study area are likely limited.

At the same time, Quebec's elite opposed efforts to attract French Canadians from Quebec to the west (Silver 1966, 1969; Lalonde 1979). Clerics, politicians and journals made it their objective to dissuade French Canadians from moving west.

(2) Physical Distance and Cost

The building of the CPR, which reached the study area by 1883, much facilitated transportation. Still, rail fares were costly, especially compared to fares to New England. It cost \$42.30 to travel from Quebec to Edmonton in 1899, and \$46.45 per person to travel to Winnipeg in 1927. On the other hand, Québécois could travel to Maine for \$14.40 and young children travelled free. Also, the full cost of settlement involved more than the rail fare; between \$300 and \$550 was needed to become established on a homestead (Rimbert 1954, 82; Lalonde 1979, 185; Dick 1981; Rouillard 1985, 28).

(3) Recruiters

Priests consistently played a role in Francophone settlement in western Canada (Lapointe and Tessier 1986). From the early to mid-1800s and especially from the 1870s onward, seeing the arrival of Anglophones and not wishing western Canada to be dominated by non-Francophones, Archbishop Taché appointed colonizing priests. The missionary colonizers distributed advertizing, toured Quebec, Ontario and Francophone areas of the United States attempting to attract co-nationals to settle in western Canada (Painchaud 1987). Fathers Louis Pierre Gravel, Gaire, Roy and Passaplan were most involved in southwestern Saskatchewan. Father Gravel was the most involved with French Canadians, while Fathers Roy and Passaplan generally focused their efforts on attracting European Francophones and Father Jean Gaire was especially involved in the settlement of southeastern Saskatchewan (SHSB L-41180 to L-41181 1911). Thus, Father Gravel made multiple tours through New England and Quebec in search of recruits (Hamilton 2007).

At the same time, repatriation agents sought to attract Francophones to the Canadian west. While they were to focus their efforts on the United States, some worked in Canada, mostly, they suggested, to intercept potential expatriates. Fathers J.A. Ouellette and Moise Blais are examples (see Figure 6).

Francophones, too set up a colonization company, La Compagnie Canadienne de Colonisation, to attract homesteaders. The company advertized and had agents in southwestern Saskatchewan to promote the region (*Le Patriote de L'Ouest* 1916, 1917a, 1917b). Even some Francophones in southwestern Saskatchewan also became involved in the effort. Edmond Gauthier, an early settler at Gravelbourg, who visited friends and family and attracted relatives from Quebec, Cantal and Massachusetts, is an example (Auclair nd, 41).

(4) Media

Western newspapers also attempted to attract French Canadians. *Le Patriote de L'Ouest*, especially, carried articles promoting Francophone settlement in western Canada (Lalonde 1982). The parish paper of Saint Victor and Willow Bunch and Les Cloches de Saint Boniface furthered the effort (Anonymous 1905; Bulletin Paroissial Willow Bunch et St. Victor 1 April 1916).

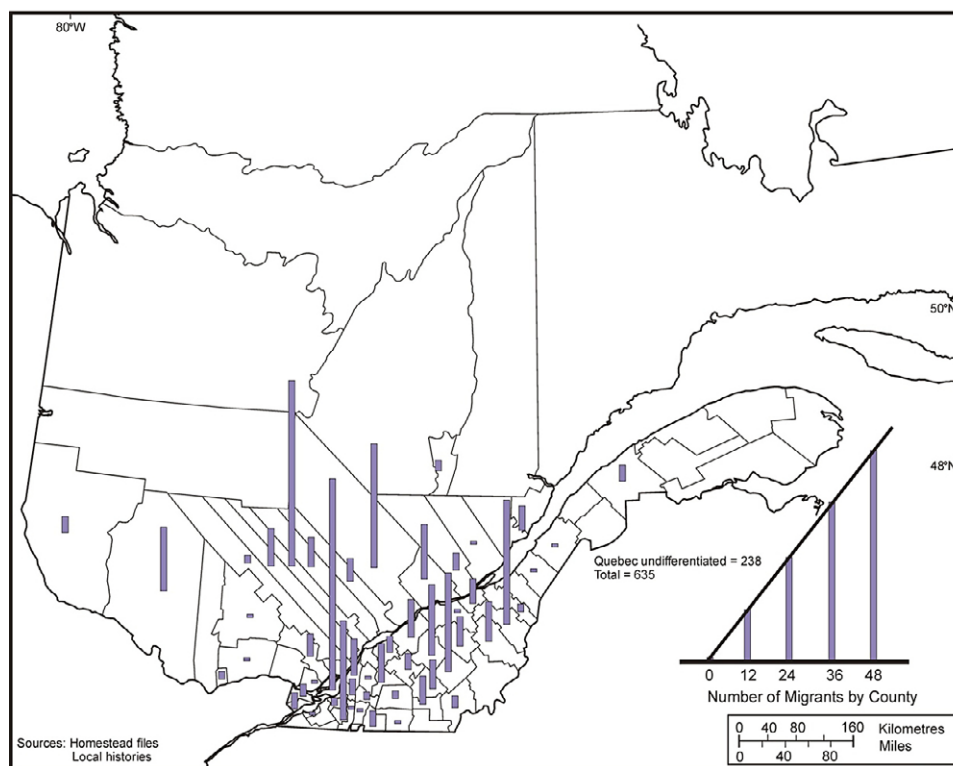


Figure 5: Origins of Francophone migrants from Quebec.

On the other hand, the media, particularly that in Quebec included negative portrayals of Quebec, links that would have hindered emigration (Silver 1969).

(5) Family

Studies well acknowledge the historic importance of the extended family in French Canada and its role in migration patterns. In fact, some suggest that studies of French Canadian settlement should give less emphasis to the parish⁷ as an attraction and institution involved in settlement, and place more emphasis to the family. Rather than the parish, these studies suggest, it was the presence of extended family that attracted French Canadians to settle together in specific locales across the continent (Morissonneau 1979, 36). Evidence of chain migration is apparent in Figure 5 which shows that many Francophones who settled in southwestern Saskatchewan came from a few counties. This observation could be rendered even more exact. Most Francophones from several of the counties were from a few parishes within the counties. Moreover, it was common for most Francophones who migrated to specific parishes in southwestern Saskatchewan to have come from one or only a few parishes in Quebec. For example, numerous settlers at Willow Bunch and the surrounding region came from St-Gabriel-de-Brandon and

L'Acadie, while many who settled at Ferland arrived from St-Clair Dorchester (Anderson 2005, 365). This observation, of chain migration among Francophones, is in common with other ethnic groups who settled on the Canadian prairies.⁸

(6) Importance of the Links

While some studies stress the importance of recruiters in French Canadian migration (Lalonde and Tessier 1986; Painchaud 1976) others have questioned the effectiveness of the recruitment (Hamilton 2007). Further evidence of the limited importance of the recruiters is apparent from a comparison of Figure 6 with the recent residences of Francophone migrants (Figure 7). Relatively few Francophones arrived from the places where clerics most extensively recruited. As Hoerder (1999, 6) points out, this was much in common with other settlers. Emigration often involved the investment of all migrants had in the move. Recruitment brochures that could not be verified were often treated with skepticism. On the other hand, as suggested, family networks were trusted and important.

Spatial Pattern of Migration

The migration pattern combined direct movement from Quebec, movement from one of the colonization frontiers in

⁷Tessier's (1974, 22-23) study is among those that emphasize the parish in French Canadian settlement.

⁸Several studies show the presence of chain migration among settlers of the Canadian prairies. Richtik (1985), Lewry (1986), Boyd (1989), Ostergren (1998) and Lehr (1999) are examples.

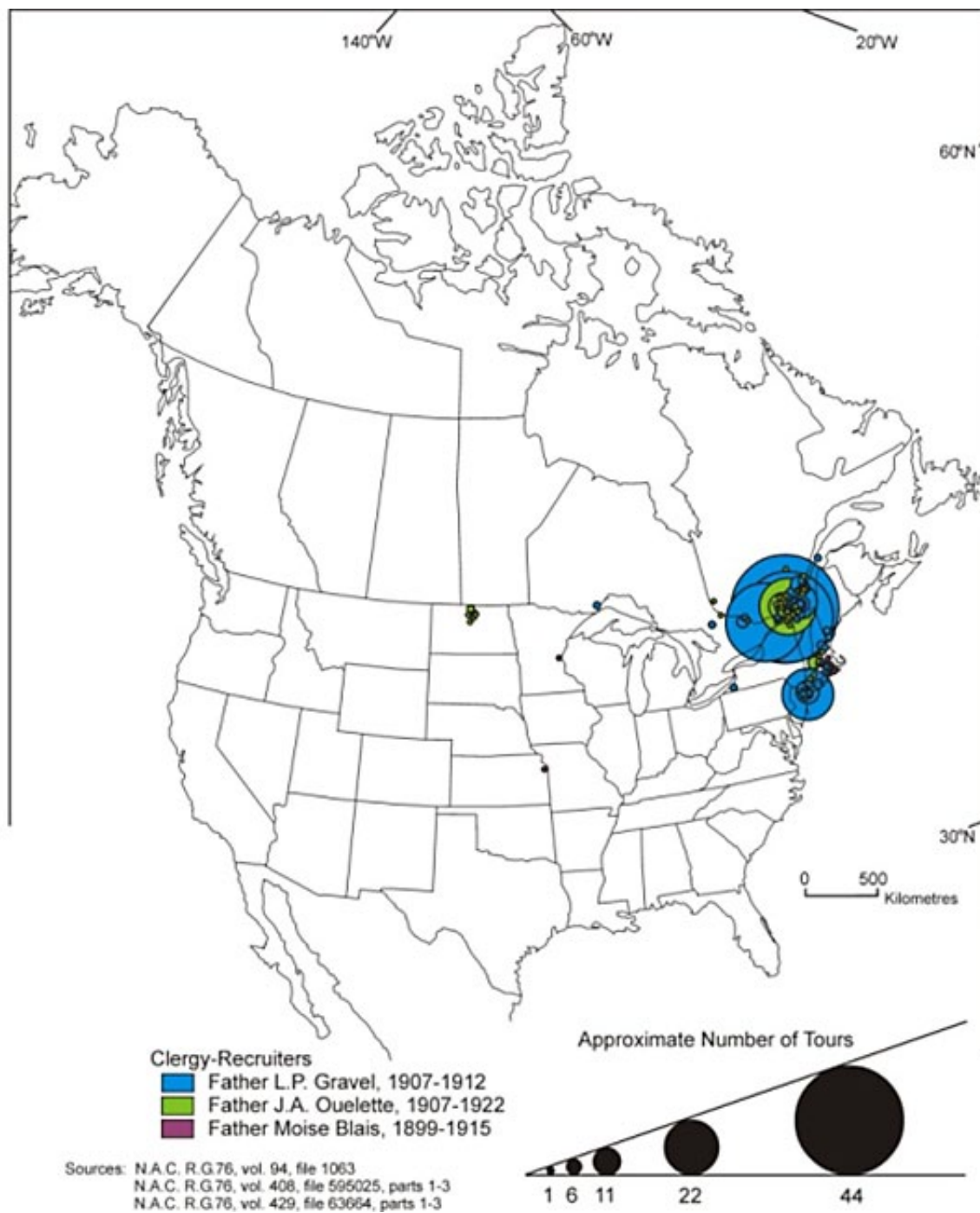


Figure 6: Recruitment by Catholic Priests.

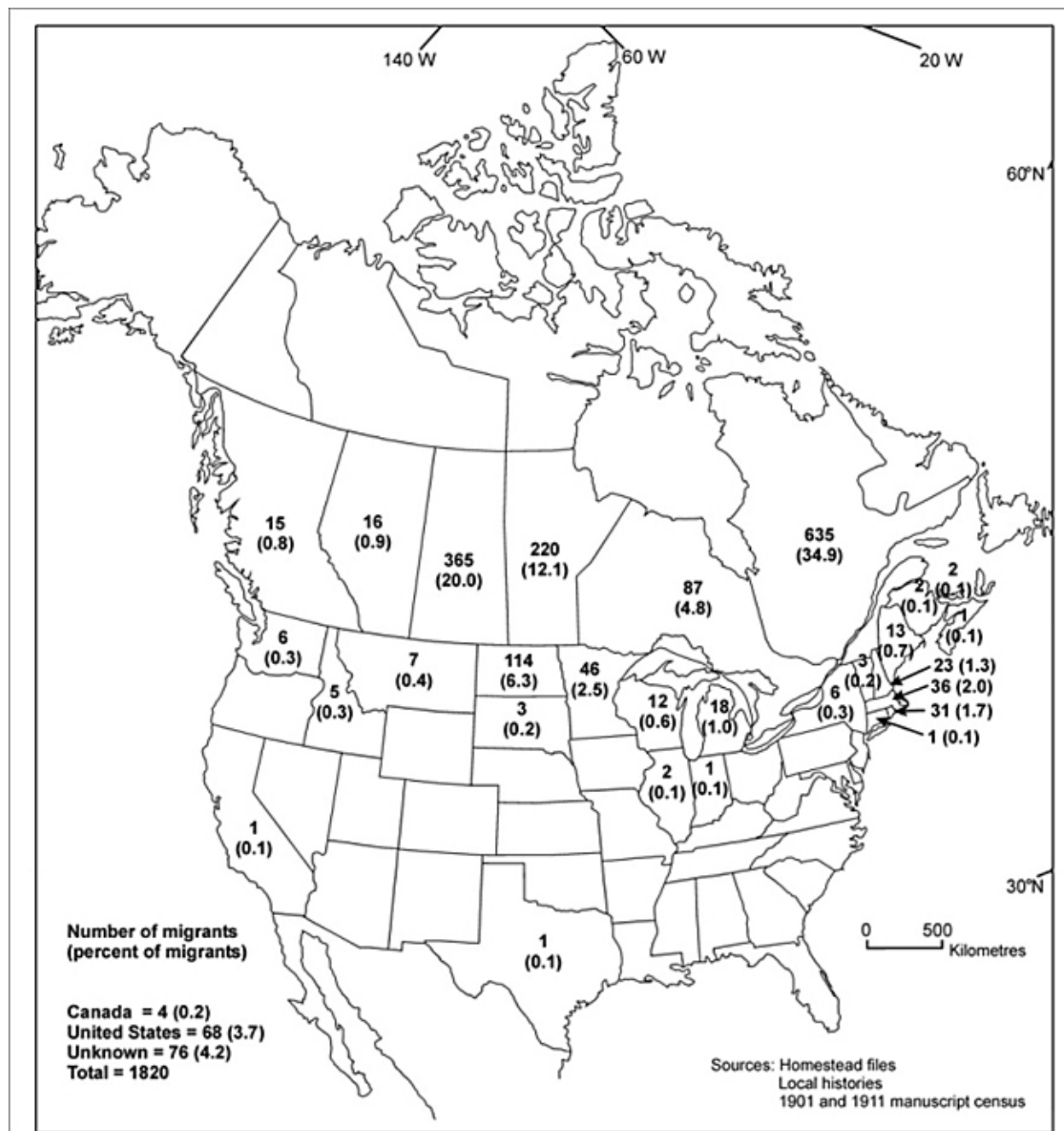


Figure 7: Recent residences of Francophone migrants to southwestern Saskatchewan.

Table 1: Age of household head of Francophone migrants.

Age (1910)	Migrants to Southwestern Saskatchewan	After Frénette (1995)	After Frénette (1995)	After Ramirez (1991)	Quebec Population
	From Quebec no. (%)*	To Wotton Quebec no. (%)	To Lewiston Maine no. (%)	Return from New England	Total Population 1911** no. (%)
< 15	17 (3.0)	2 (11)	0 (0)	na	na
15-19	66 (11.6)			na	100,632 (16.2)
20-29	211 (37.1)	6 (33)	1 (6)	20.6 %	168,995 (27.2)
30-39	142 (24.9)	6 (33)	0 (0)	37.9 %	125,314 (20.2)
40-49	65 (11.4)	3 (17)	7 (39)	26.9 %	89,726 (14.4)
50-59	43 (7.6)	1 (6)	7 (39)	6.3 %	66,335 (10.7)
> 60	25 (4.4)	0 (0)	3 (17)	1.6 %	70,663 (11.4)
Unknown	66	na	na	na	na
Total	635	18	18	na	621,665
Total – unknown	569	18	18	na	621,665

* percent of known

** population to 89 years; percent calculations of population ages 15-89

Sources: 1911 manuscript census, homestead files, local histories, Ramirez 1991b, Frénette 1995

Table 2: Number of children of Francophone migrants.

Age of Family Heads, 1911	Number of Children in 1911 (%)													Total (%)
	0	1	2	3	4	5	6	7	8	9	10	11	unk	
20-24	4	1												5 (4.2)
25-29	5	3	2	3	2									15 (12.5)
30-34	8		3	4	1	2	1	1						20 (16.6)
35-39	1	1	4	1	4	3	2	3		2	1		1	23 (19.2)
40-44	7			1	2	1	1	4	1					17 (14.2)
45-49	1	1	1	1		2	4							10 (8.3)
50-54	4	1	1			1	1							8 (6.7)
55-59	3		2	1										6 (5.0)
60 +	12	2	1											15 (12.5)
Unknown	1													1 (0.8)
Total	46	9	14	11	9	9	9	8	1	2	1		1	120 (100.0)
Percent	38.3	7.5	11.7	9.2	7.5	7.5	7.5	6.7	0.8	1.7	0.8		0.8	
To Wotton Quebec	12	3	2								1			18 (100.0)
	67	17	11								5			
To Lewiston Maine	3	1	1		1	1	2	5	1		1	2		18 (100.0)
	17	6	6		6	6	11	28	6		6	11		

Average 2.5 children

Source: 1911 manuscript census; Frénette 1995

Ontario, movement from the American frontier and, to a lesser extent, movement from New England. This is apparent in figure 7. Thus, 35% of Francophones arrived directly from Quebec, 5% came from Ontario, 33% came from a prairie province, 7% arrived from a plains state; 4% came from the Mid-West, and 5% arrived from New England. Within Quebec, while some arrived from the traditional seigneurial areas, many came from the Eastern Townships and some came from other more recently settled areas, including Témiscamingue. Francophones' recent residences were also clustered, with many arriving from a few counties, Berthier, Montreal, Champlain, Dorchester, Wolfe and Napierville.

Micro-Scale Factors

Micro-scale factors that influence migration include age, family (position in the life cycle) and family situation (Kritz and Zlotnik 1992). Tables 1 to 3 provide information on French-Canadian families who migrated to southwestern Saskatchewan. They also compare these families with those who moved to settlement areas in Quebec, to New England and with repatriates. This comparison is used to examine whether French Canadians who migrated to southwestern Saskatchewan differed from those who moved to New England, a large and growing center of industry at this time, and to compare them with repatriates and French Canadian families who settled in Quebec's colonization areas.

Tables 1 and 2 show that French Canadian families who moved to New England were headed by relatively old household heads. In addition, Ramirez (1991b, 41-42) has commented that other families that migrated in this direction were headed by young household heads. Table 2 shows that families that migrated to New England, headed by older household heads, had numerous children. Although these children would have varied in age, several would have been of age to work in the mills. Ramirez's younger migrants to New England generally did not have offspring, or had very few. On the other hand, tables 1 and 3 suggest that repatriates from New England were those who had headed to the region as young migrants but had returned to Quebec once they had a few children, but mostly children who were not of age to work in the factories.

Other studies have found that two types of families advantageously migrated to New England; first, singles or young married couples with few or no children and second, families with several older children. Both types of families had sufficient workers, either with both parents working and no or few children to support, or with parents and several older children working (Ramirez 1991b, 39-41; Frénette 1995). While this finding may seem most applicable in the early years of Francophone migration to New England when most French Canadians worked in the lowest paying jobs in the factories, it remained applicable in the early 1900s. Although some Francophones had reached better positions in the mills by this time, or had established businesses, other factors contributed to the perpetuation of a need for multiple wage earners to sustain large families.

First, New England cotton mills faced competition from the American South, a region that was emerging as a producer

Table 3: Age of children of Francophone migrants.

Age (years)	Number of Children (%)	Return Migrants from New England after Ramirez
0-4	116 (39.1)	50 (31.8)
5-9	91 (30.6)	48 (30.6)
10-14	57 (19.2)	35 (22.3)
15-19	26 (8.8)	21 (13.4)
20-26	7 (2.3)	3 (1.9)
Total	297	157

Source: 1911 manuscript census; Ramirez 1991b

and was highly competitive. Second, other emigrants had come to New England's factory towns and competed with Francophones. Third, even though some Francophones had managed to advance, many had not; several mill owners considered Francophones as incapable of holding such positions. All of these issues contributed to the continuity of Francophones holding lower-level positions, to salary reductions, to strikes and to cut backs in New England's mills (Vicero 1968; 238-239; Early 1982). Thus, Ramirez (1991a, 250) found that even in 1908, despite the fact that some Francophones had advanced in the mills, and others had, by other means, improved their situation, 40% of French Canadian families relied on the earnings of several family members.

The tables also show the ages and family structure of migrants to southwestern Saskatchewan. Those who moved in this direction somewhat resemble return migrants to Quebec, but, at the same time many who moved west were younger than the families who returned. This is also suggested in Table 2; many who moved to southwestern Saskatchewan had no or few children. Most children of these migrants, as apparent in Table 3, were relatively young. In this respect, migrants to southwestern Saskatchewan shared some resemblance with those who moved to Quebec's frontier, for example, to Wotton. Some were families that would have been at a disadvantage in New England. Notably, however, others, particularly the youngest migrants could have lived viably in one of New England's mill towns.

At the same time, it is suggested that the macro-scale factors, that limited land acquisition coupled with the costly rail fare to the west, may have hindered some families from moving to southwestern Saskatchewan. As previously noted, Maisonneuve (1985) found that French Canadians' economic situation was important in the decision to migrate to New England.

Table 4 shows the occupations held by Francophone heads of household. The vast majority were farmers or farmers' sons. Many fewer described themselves as farm labourers. A few had held other occupations associated with farming and relatively few had been professionals. These results are fairly typical of demographic studies of prairie settlers.⁹

⁹For example see Boyd, 1989

Table 4: Occupations of Francophone household heads.

Occupation	Number of Heads of Household (by age group, 1910)							Total (% of total)
	< 20	20-29	30-39	40-49	50-59	60 +	unk.	
Farmer	0	123	66	27	20	13	35	284 (61.6)
Farmer's Son	49	1	0	0	0	0	1	51 (11.1)
Farm Labourer	4	1	0	0	0	0	1	6 (1.3)
Labourer	7	5	4	3	0	1	5	25 (5.4)
Blacksmith	1	0	1	2	0	0	1	5 (1.1)
Carpenter	0	5	4	2	1	0	5	17 (3.7)
Clergy	0	1	0	0	0	1	1	3 (0.7)
Clerk	2	3	0	1	1	1	4	12 (2.6)
Lumber	0	2	1	0	0	0	0	3 (0.7)
Medical	1	2	1	0	0	0	0	4 (0.9)
Merchant	0	1	4	1	2	0	2	10 (2.2)
Factory/Mill	0	1	1	1	0	0	1	4 (0.9)
Miner	0	0	0	0	2	0	0	2 (0.4)
Other town trade	4	8	9	5	0	1	3	30 (6.5)
Railway	0	1	1	0	0	0	0	2 (0.4)
Other Professional	0	0	0	1	0	0	2	3 (0.7)
Total Household Heads With Known Occupations								461 (100.0)

Source: Homestead files

However, the main interest in this research is to determine if migrants' prior economic situation played a role in their direction of movement. In this regard, the relatively low number of farm labourers (or journaliers) suggests that this had an effect.¹⁰ Figures 8 and 9 further this assertion. First, Figure 8 shows that relatively few migrants came from Quebec's smallest, subsistence farms. Those who did not have land, or who had less than

an acre of land had practiced other occupations. On the other hand, most landowners who moved to southwestern Saskatchewan had held small, medium or sometimes relatively large farms. Also, there was somewhat of a link between the size of farm held and the migrants' ages (r^2 of the association = 0.23317). Generally, older migrants, who notably often had more children, came from larger farms. Figure 9 shows that though a limited number of the migrants who were located in Quebec in 1901 had come to the study area by way of New England or a Midwestern state, those who had come via these places had held among the smaller farms of migrants to southwestern Saskatchewan. These findings show a contrast with Maisonneuves' (1985) observations about French Canadians who moved to New England.

¹⁰The statistics relative to previous occupation as a farmer, farm labourer or farmers' son may not be fully accurate. Francophones' previous occupation was often listed on the homestead files as "farmer" while some of those who were listed as farmers were likely journaliers and others were farmers sons. Unfortunately, the data did not permit full differentiation of these groups.

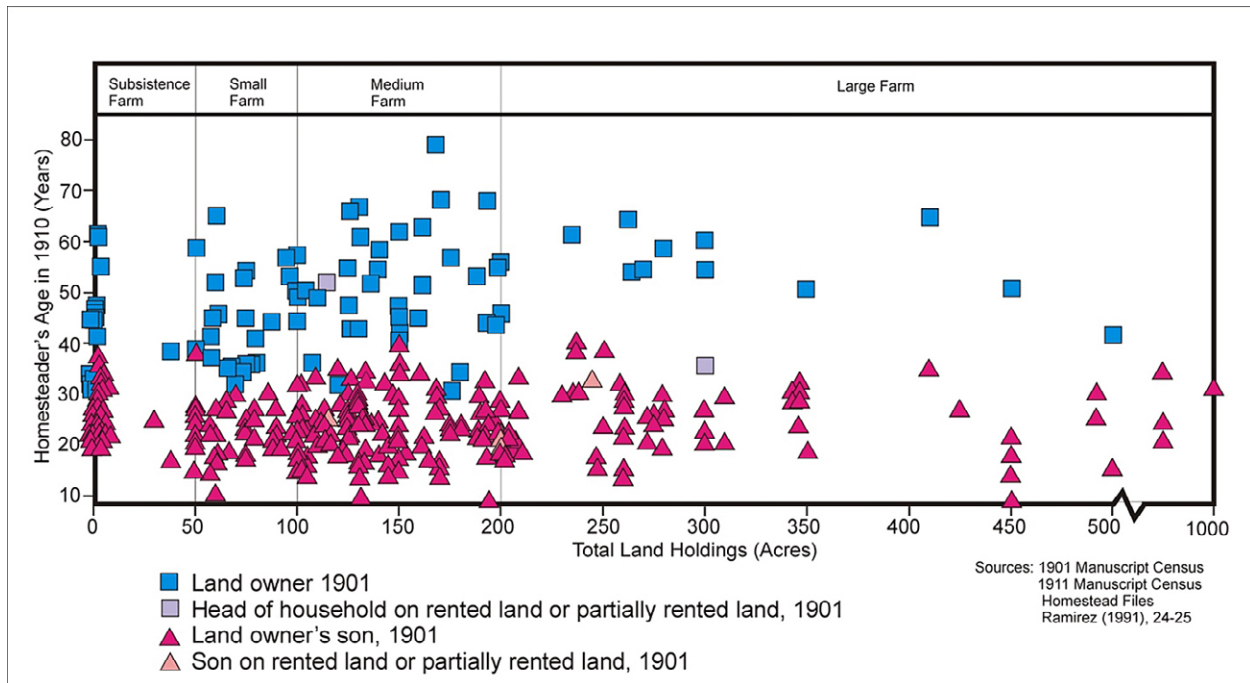


Figure 8: Migrants' farm sizes in Quebec.¹¹

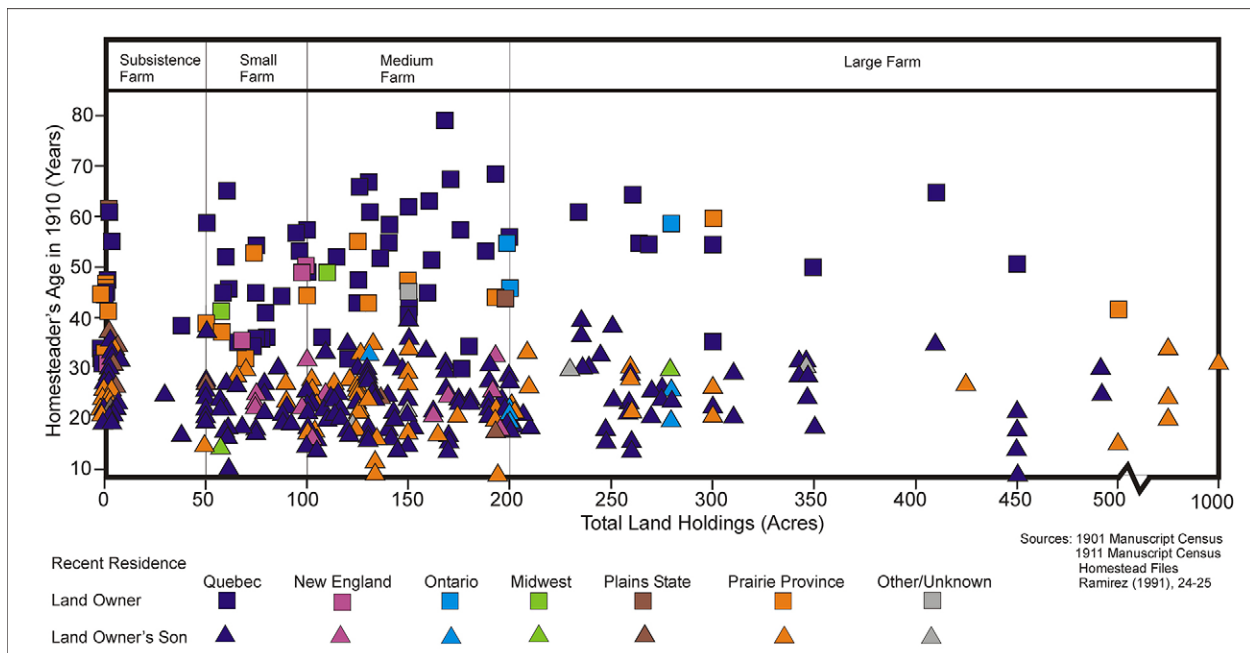


Figure 9: Migrants' farm sizes in Quebec and recent residence.

¹¹Ramirez's (1991b) classifications of farm sizes are used though it is acknowledged that by this time farmers needed increasingly larger farms due to the transition to livestock farming.

Those who migrated to southwestern Saskatchewan were generally not among Quebec's smallest farmers. Older migrants with more family members to transport often came from larger farms. This suggests that migratory Québécois with the smallest farms headed to New England while some with larger farms moved west. Also, some of those who moved from the smaller farms had come by step migration, heading through the United States. Finally, the relatively small families of many migrants to southwestern Saskatchewan would have contributed to lower transportation costs.

Beyond the more tangible micro-factors of age, family cycle and economics, individual perceptions also play a role in migration and are considered among the micro-scale factors affecting migration (Hoerder 1999). While the impressions that individual Francophones had of moving to the study area are unclear, some potential influences are known. Silver (1969) and Lalonde (1979) have well described the elite's negative portrayal of the region. Still, these negative portrayals of the west contrasted with the glowing descriptions elaborated by the western missionary colonizers. The many letters from intending migrants to Father Louis Pierre Gravel, perhaps as a result of these contrasting messages, suggest a mix of impressions and a notable number who knew little of southwestern Saskatchewan (Fonds Famille Gravel). At the same time, other research has shown that previous settlement by other Francophones, and especially by family, played an important role in French Canadians' mental maps of various parts of the North American continent. These impressions were important in the directions they took when migrating. In comparison with New England, to which many colonials had migrated, and from which French Canadians received ample correspondence, western Canada was little known (Takai 2001, 390).¹²

Summary/Conclusion

When looked at from the perspective of migration systems, Francophone migration to the west was influenced by similar macro scale factors as Francophone migration to New England, though the type of families demanded by New England's mills differed from the type of families who fared well on the Canadian prairies. The meso-scale factors too were partially similar, though family networks to New England were much stronger than those attracting migration to the west, and, as importantly, the study area was much further and more costly to move to than New England.

As a result, the micro-scale characteristics of the migrants differed. First, in terms of demographics, Francophones who moved west were relatively young though some older families also migrated in this direction. Some of the older families were parents of the younger families and were part of a pattern of extended family migration that was common in this colonization.

Several of the families who moved west, the youngest and the oldest, may have fared well in New England, while others, in the middle age groups, would most likely have faced hardship due to insufficient available labour to support the family. For this last group, moving west was a better option than New England. Other reasons influenced the other two groups of migrants. Though the west attracted some of the same types of families as New England, this direction of migration represented a different family strategy than moving to New England. The move west was generally more permanent than a migration to New England. Indeed, some spent all they had to make the move and some, facing poor years for farming, would have returned if possible (Saskatchewan Ministère de la Culture et de la Jeunesse 1973a, 1973b, 1973c, 1973d, 1973e, 1973f). Short-term moves to the west generally involved harvest excursions; this to some degree represents the counterpart to the short term moves that some Francophones made to New England (Thompson 1978).

Second, the findings suggest that French Canadian migrants to the study area differed economically from those who moved to New England. The distance and cost of the move appeared to influence who migrated, and thus to influence the direction of Québécois migration. New England was accessible to Quebec's smallest farmers, even to those with numerous families. The Canadian prairies often were not accessible to these French Canadians; this region was particularly inaccessible to Francophones with large families and little land in Quebec. Still, it must be acknowledged that the information presented here on land holdings provides only a glimpse into the socio-economic background of Francophone migrants, and considers neither other factors that affected farming, nor most of the additional temporary moves that many French Canadians made. These temporary moves, which extended beyond step migration to the prairies, also much influenced French Canadian families' situations.

At the same time, in several respects, the French Canadians who moved to southwestern Saskatchewan resembled others who moved to the prairies. "Go West Young Man" had enticed many of them like many others. The many young French Canadians who had left limited possibilities of inheriting land, along with some who had sought a better future for their offspring are typical of migrants to Canada's prairie frontier. At the same time, the fact that they did not represent Quebec's least well to do is also typical of those who moved to this region (Voisey 1988, 16-20).

Finally, while not refuting Silver's (1966, 1969) and Lalonde's (1979) assertions that elite images of the west led to limited Francophone settlement in the region, this work adds to the contention that other factors were involved. First, the importance of chain migration rather than the elite is highlighted. Second, this research forwards Green, Mackinnon, and Minns' (2005) suggestion that economic factors were involved by demonstrating that most French Canadians who moved to the study area came alone or with small families and many had small or medium farms in Quebec. More specifically, although single farmers' sons, without offspring to transport, moved to the study area without having held land in Quebec, older Francophones

¹²Lamarre 1998 also comments on French Canadian farmers' movement to Michigan as following other French Canadians who had moved to the fur trade and frontiers and who had made the region known to them.

who came, often with families, came from small, medium and occasionally from large farms.

Further Research

Further research could elucidate on additional local factors linking the particular locales with southwestern Saskatchewan or other areas of Francophone settlement. Though family and acquaintance links have been identified, Gurak and Caces (1992) have noted that research of this type needs to move beyond the linkage provided by family and friends and should consider how linkages varied over time, and how changes in the macro-scale and meso-scale factors led to the selection of different types of migrants over time. For instance, additional research could consider whether those who came to Francophone settlements considerably later than the first comers were similar in terms of individual characteristics. Moreover, Garigue (1960) has pointed out that family strength, an important link in the migration chains in this study, varied in Quebec. The relative contributions of family network and economic background in this migration could be further examined. Thus, if the sources allow, highly detailed study of the establishment and development of links between parishes in Quebec and the west may be desirable. Some communities are of particular interest, especially Saint Gabriel de Brandon. This parish sent many migrants west, to the study area, and many others south.

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Owa: a Dariusleut Hutterite colony in Japan

John C. Lehr

University of Winnipeg, Winnipeg, Manitoba, Canada
j.lehr@uwinnipeg.ca

Abstract

There are over 480 Hutterite Colonies in North America and one in Japan. This Japanese colony was established in 1972 by a group of Christian Japanese families wanting to practice communal living. This paper describes the process of establishing the Owa colony and explains its relationship with the Dariusleut. Its agricultural economy is contrasted to that of a typical colony in North America. A review of the difficulties of maintaining Christian communal living in a nation that is predominantly Buddhist and Shinto concludes the paper.

Keywords: Hutterites, Japan, Communal settlement, Dariusleut, Owa

Hutterites are a German-speaking Anabaptist group that emerged in Europe during the Reformation. Led by Jacob Hutter, from whom they took their name, they believed that the true practice of Christianity required them to follow the instruction of the New Testament's Acts 2:41-47 and Acts 4:32-37 that they hold all things in common and live communally (Hofer 1982, 2). As Protestants and pacifists they endured persecution across Europe as they migrated in search of a refuge, eventually immigrating into the United States in 1874 where they settled in South Dakota, grouping themselves into three leute: the Schmeideleut, Dariusleut and Leherleut (see *The Chronicle of the Hutterite Brethren Vols. I and II*). After the United States entered the war against Germany and Austria in 1917 Hutterites were again persecuted for their refusal to bear arms and because they were German-speaking people. In 1918, they again migrated, north to Alberta and Manitoba in Canada, where they established six colonies. Fueled by a very high birth rate these initial six colonies multiplied into some 478 colonies now scattered across Canada's Prairie Provinces and the northern states of the American Plains.

Communal living as practiced by Hutterites has become the model for many other groups that attempted to establish communal agrarian societies (Zablocki 1973). With the collapse of the Soviet Union in 1991 the kholkoz disappeared; Chinese agricultural communes lasted scarcely forty years, and even the Israel Kibbutzim are disintegrating after little more than a hundred years. The Hutterite bruderhof in North America has outlasted all its secular and religious counterparts and is a rare example

of a communal agricultural operation that still thrives. There is an extensive literature devoted to the study of the Hutterites that documents the details of their history in North America, their social organization and agricultural operations (see for example, Peter 1965; Hostetler 1974; Ryan 1977; Hofer 1998; Katz and Lehr 1999; Kraybill and Bowman 2001; Esau 2004; Katz and Lehr 2007; Kirby 2007; Hofer, R., 2009; Lehr and Katz 2010). There is, however, one Hutterite colony outside North America about which relatively little is known outside of Hutterite society. This is the Christian Community of New Hutterian Brethren at Owa (Hofer J., 2009; *The Chronicle of the Hutterite Brethren 2003 Vol. I*, 808-809). This paper, based on a visit to this colony in August 2009, describes its establishment, reviews its operation and assesses its future as a viable social and agricultural community.

Owa Hutterite Colony is not easy to find. It is located several kilometers from the village of Owa, which lies several kilometers west of the small town of Kurobane, itself an out-of-the-way place, about 160 kilometers north of Tokyo (Figure 1). The colony is nestled on a wooded hillside at the head of a remote valley and is scarcely visible from the track that winds through the rice paddies on the valley floor (Figure 2). It is unlikely that a casual traveler would stumble across it on a sightseeing trip to Japan.

Japan's population is mostly Shinto or Buddhist, although a small minority is Christian. One of the denominations within this small Christian community is the United Church of Christ in the Koryama district north of Tokyo. Inspired by the example



Figure 1: Location of Owa Colony.

of the long-standing Buddhist commune of Itto-En, near Kyoto, some members of the United Church of Christ resolved to emulate it and in the 1960s began making plans to practice communal living.

Communal living is a part of Buddhist tradition; communal groups called *jikkenchi*, or “places to realize principles” have long practiced communal living in central Japan. In the past, three or four hundred years ago, these were not uncommon. Many villages practiced co-operative agriculture and some practiced communal living to a greater or lesser degree, for example, Shirakawa-go (now a World Heritage Site) is a village where extended families of up to forty people formerly lived together in large dwellings (Figure 3) (Kinda 2009).

When Itto-En was established near Kyoto in 1905 true communal living in Japan was resurrected. Followed Itto-En’s establishment, other communes were established at Atarashki Village and Shorokshinto-Yamatoyama in 1918 and 1920 respectively. Today, one of Japan’s largest communal groups is the Buddhist Yamagishi-kai community of 400 members, founded in 1956 in Toyosoto, Mie Prefecture, not far from Kyoto. Thirty-two other Yamagishi *jikkenchi* scattered around Japan have a further 400 members (Spiri 2008). There are other communal groups in Japan but although a few of the larger communes have between two and three hundred members, most have less than fifty, and many have ten or fewer members. Tamagawa commune near Tokyo, for example, has a mere ten members, Araksa in Shiga Prefecture has eight and Mogura Group in Shiga Prefecture has only four members (Kusakari et al. 1977, 231-235). Most of the communes’ economies are agricultural, based principally on



Figure 2: Owa Colony from the road. (Photo J. Lehr)



Figure 3: Shirakawa-go World Heritage Site. (Photo J. Lehr)

poultry, rice and vegetable production, although Itto-En operates several companies engaged in agricultural research, construction and printing (Brumann 1996, 178). In their socio-economic organization, they range from true communes along the lines of the Israeli *kibbutzim* where members pool all their resources and receive only according to their needs, to co-operative communities based on the Israeli *moshavim* where members farm co-operatively but live independently in economically and spatially discrete family units (Kusakari et al. 1977, 231).

Owa’s founders wished to establish a communal society modeled after the Buddhist Itto-En commune but based on Christian principles. Unlike Itto-En’s philosophy of spiritual enlightenment through zen-like revelation the objective of Owa’s founders was to practice true Christian values in every facet of everyday life. (Kusakari et al., 1977, 54) Owa’s founders had no wish to engage in a spiritual quest in the Buddhist sense, as they already had their answer in Anabaptist Christianity, but they wished to enact Christian teachings that extolled humility,

equality, sharing, compassion, and pacifism. They began communal living in the 1950s in Koryama City, living together in the church headed by their leader, the Reverend Isomi Izeki. The founders of the community came from all occupations and included a farmer, truck driver, electrician, a typist and a teacher. All continued to work in their regular jobs outside their commune and membership in the group fluctuated (Hofer 1985, 66; *The Chronicle of the Hutterite Brethren Vol. I* 2003, 808-809). Lacking a model for the practical organization of religious communal life, they first considered organizing themselves along the lines of the Israeli Kibbutz. When Reverend Izeki visited Israel to study the kibbutzim, he realized that the Kibbutzim's secular philosophy made them unsuitable as a model for a Christian community. Library research led them to Christian Anabaptist societies and eventually to knowledge of the Hutterites (Kikuta J. 2009).

Izeki made initial contact with the Hutterites through the Dariusleut colony of Wilson in southern Alberta. Why Wilson Colony, one of the most conservative of the Dariusleut, served as Izeki's conduit into Hutterite life is uncertain. It is possible that happenstance led Reverend Izeki to contact the senior minister of the Dariusleut, who was then Wilson Colony's minister. Regardless, on the basis of this initial contact, Owa Colony belongs to the Dariusleut of the Hutterian Brethren, even though much subsequent contact has been with the Schmiedeleut and the present model for their organization and rules of behavior owes more to the more liberal Schmiedeleut than the leut to which they are nominally tied (Hutterite Telephone Directories 2003- 2009.)

Following the Hutterite model of communities based on agriculture, the group first sought land locally, but then decided on Owa, about 160 kilometers north of Tokyo (Figure 1). With financial assistance from Wilson Colony, in 1972 they purchased two and a half hectares of wooded hillside land and established a colony of five people. In 1971 the colony had nineteen members, four men, 11 women and four children (Hofer 1985, 69). It reached its maximum population in 1981 when it had about thirty members. In 1985 it had 22 members; by 1986 there were 25 members; in 1989 there were twenty-four (The Chronicle of the Hutterite Brethren Vol. I 2003, 808-809). Since then numbers have continued to decline. As children grew up and married, they left the colony, although two children of colony members still live nearby and visit regularly. When the father of the Hashimoto family, a founding member, passed away, his six children left the colony. Today there are only nine colony members, only seven of whom (one male and six females) actually live on the colony; one member resides in a local personal care home and the other, who is 89 years old, is ill and in hospital. The youngest member is now 28 years old and the last marriage of a colony member was in 1989 (Kikuta M. 2009). The demographic outlook for Owa Colony is grim.

Farming

Owa Colony has only two and a half hectares of land purchased with financial aid from Alberta Hutterites. Although it

is located in an area where rice is the principal crop, and rice is grown in adjacent fields, colony property lies entirely on a hillside so they "grow everything except rice" (Kikuta J. 2009)

The colony is essentially self-sufficient, growing a wide range of crops for their own use and sale. Wheat, soy beans, potatoes, sweet potatoes, grapes, persimmons, onions, raspberries, apples, peaches, kiwi, plums, oranges, tomatoes, carrots, walnuts, sweet chestnuts, watermelons are all grown principally for their own use, although surplus fruit is sold to local merchants. Formerly buckwheat was grown but lack of labour forced the colony to discontinue planting it.

The colony buys its rice from local farmers and sends its wheat off-colony for milling and for processing into noodles. Using their own flour, they bake bread daily in the colony's outdoor oven, which in design and size resembles the traditional eastern-European outdoor oven. Apart from purchasing rice, fish and condiments the colony is self-sufficient in foodstuffs, and even makes its own plum wine (Kikuta M. 2009). Perhaps the colony's greatest natural asset is a fresh-water spring that gives a constant supply of potable water to the colony on a year-round basis (Figure 4). The colony thus does not need to purchase water for drinking or irrigation.

In the 1970s, to obtain capital for colony development, Owa accepted contract work assembling television components on the colony. They discontinued the practice by 1977 because the deadlines imposed by the company interfered with colony life.

Owa Colony members pay taxes on their income but because their cash flow is quite low and "because we earn very little," taxes are low (Kikuta J. 2009). Their principal source of income is from the sale of eggs (Figure 5). The colony now has about 800 chickens, all layers, 200 of which are pullets. This about a third of the number raised when the colony was at its maximum size; lack of labour now makes it difficult to manage a larger chicken operation and the colony does not seem to need additional income as its financial needs are now quite modest. Eggs are sold in the Tokyo market. Apart from the chickens and



Figure 4: Owa's spring. (Photo J. Lehr)



Figure 5: Chicken house. (Photo J. Lehr)

a colony dog, there are no animals. The colony's goat died a few years ago and was not replaced. (Kikuta M. 2009).

The scale of poultry operations at Owa stands in sharp contrast to operations found on most North American Hutterite colonies where the number of chickens is measured in thousands rather than hundreds. Similarly, North American colonies cultivate thousands of hectares. In Manitoba, for example, a typical colony would have a vegetable garden of about fifteen hectares, about three times the area of the entire Owa Colony (Ryan 1977), and cultivates another 2500 to 4000 hectares in cereal crops (Hofer J. 2009). There are vast differences in the scale of operations between the agricultural operations of Owa and those of North American colonies, yet both hold a similar philosophy towards mechanization. Owa mechanizes where it is practical but their chicken operation is too small to warrant a mechanized approach.

Like their counterparts in North America, the Owa Hutterites eagerly use modern technology. The colony has a telephone, fax machine, refrigerator, freezer, and washing machine. It uses agricultural equipment to reduce physical labour, such as a back-hoe, tractor, rotor-tiller and small threshing machine (Figure 6). They purchased their first small tractor in the early 1970s with assistance from New Dale Colony in Alberta (Hofer 1985). They now possess three small rotor-tillers, a medium-sized tractor, a small pickup truck, two sub-compact automobiles and a small caterpillar-tracked thresher. In August 2009, a small caterpillar-tracked back-hoe was also stored in the machine shed.

Colony Life

In its physical layout, Owa Colony shares many of the characteristics of a North American colony. Residential buildings are arranged in a loose square and the agricultural buildings are placed separately from the houses and communal dining area (Figures 7 and 8). Along one side of the square, a large two-story building houses the kitchen and dining room on the ground floor and residential quarters and open work area on the second



Figure 6: Owa's machine shed. (Photo J. Lehr)



Figure 7: Owa colony layout. (Photo J. Lehr)

floor. At the top of the square are two two-storey houses and a building housing the Minister's residence, guesthouse and colony church (Figure 9). Opposite the kitchen, on the far side of the square, are non-residential buildings: store rooms for feed and so forth. At the base of the square is a building that holds the colony bake-oven, an office and an egg-sorting facility.

In Owa's early days, attitudes reflected the austere views of the conservative Dariusleut colonies. Colony members are more familiar with Hutterite, particularly Dariusleut, norms than might be expected, since many of the founding members visited Dariusleut colonies in Alberta while planning to live communally. Several members lived for extended periods in Alberta colonies, including Wilson Colony, their point of first contact. Subsequently others visited colonies in other leute; the present minister's wife spent two years in Canada, living on colonies in Alberta and Manitoba, including spending several months

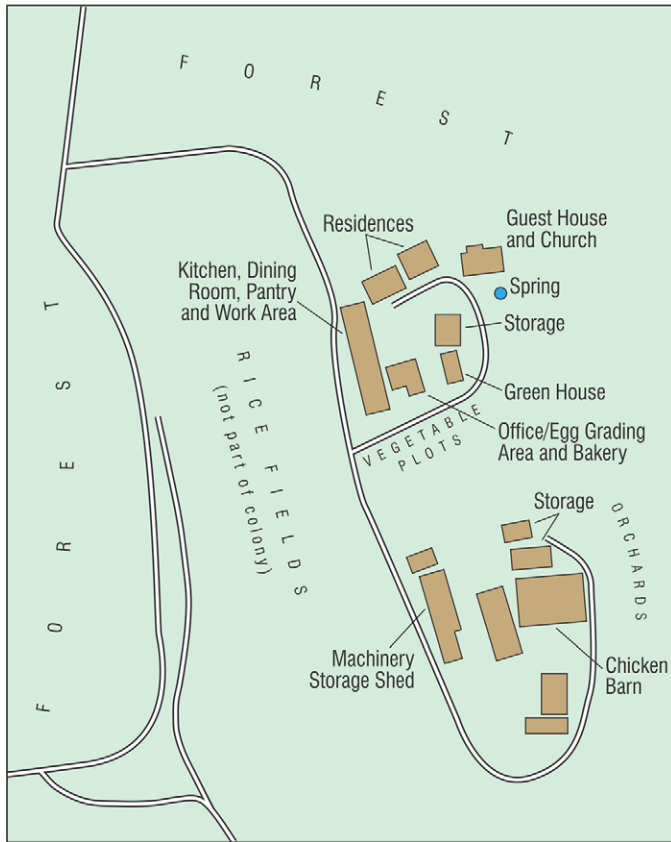


Figure 8: Map of Owa Colony.

on James Valley (Schmiedeleut) Colony near Elie in Manitoba (Hofer J. 2009; Kikuta 2009).

As in all Hutterite colonies in Canada and the United States, Owa Colony members eat together in the colony's dining hall but the minister and his family do not eat separately from other colony members, as is the Hutterite norm, because of the colony's small population (Figure 10). Similarly, its low membership means that the colony functions essentially as a large single-family unit rather than as a full multi-family colony.

Owa members pattern their clothing on traditional Hutterite garb but do not follow it exactly (Figure 11). When the author visited Owa Colony in August 2009, the minister wore a store-bought short-sleeved shirt and dark trousers. He did not wear a hat as is usual on North American colonies (Figure 12). Women wore simple homemade dresses in the Hutterite style or, for work, trousers and a blouse. The minister's wife explained that Hutterite women's clothes were not practical for working in the fields, although North American Hutterite women work in the colony gardens without any such accommodation in dress. In Owa the traditional Hutterite women's polka-dotted headscarf is no longer worn, although it was when the colony was established. Working outside, women wear a large bonnet that gives protection from the sun. The injunction against wearing wristwatches did not seem to apply although colony members wore no other adornment. Minister Kikuta wore a wristwatch, something that would never be seen on a North American Dari-



Figure 9: Colony from the church. (Photo J. Lehr)



Figure 10: Owa Colony dining room. (Photo J. Lehr)



Figure 11: Owa Colony member. (Photo J. Lehr)



Figure 12: Owa Colony's minister and wife with colony member. (Photo J. Lehr)

usleut colony and rarely, if ever, on a Schmiedeleut colony. It is not clear whether these deviations from Hutterite norms were a result of a new spirit of liberalism within the colony, an adjustment to the colony's gender imbalance, which requires women to undertake work ordinarily performed by men, or simply lack of reinforcement resulting from by infrequent exposure to the example of Hutterite mainstream practices.

When Owa Colony was established, there was greater adherence to the Hutterite dress code. Photographs taken in Owa in the 1970s indicate that colony members' dress was virtually indistinguishable from North American Hutterite clothing. Women wore polka-dotted headscarves and traditional style dresses while males wore Hutterite-style hats and jackets (see Hofer 1985, 96-100). Although the "dress-code" of the Hutterites in North America has evolved over the years and, particularly among the Schmiedeleut, has become more flexible, members of Owa have deviated significantly from the North American model. Women wearing trousers, for example, would be unthinkable on any North American colony but it is routine in Owa (Figure 13).

Members of the Owa Colony now display a pragmatic approach to some of the behavioral rules that the conservative parent colony of Wilson observes. For example, attitudes to photography are completely different. Wilson Colony recently lost an appeal to the Supreme Court of Canada that they be exempted from the requirement to have photographs on driver's licenses or passports, arguing to do so impinged on their religious freedom, since the Bible enjoined against making graven images. They interpret photographs as such. Few Hutterites now share this sentiment and most accept the need for photographs for identification purposes; others see no reason for any prohibition as long as the photograph is not an expression of hubris. Attitudes vary as much within the colonies of each leut as they do between the three leute. Owa members openly display family photographs, particularly of their children and grandchildren living off the colony. When questioned about this one member laughingly acknowledged that Wilson Colony would not approve of



Figure 13: Owa member outside chicken barn. (Photo J. Lehr)

their attitude towards photographs but that Wilson would not approve of many of the practices of Owa Colony that she thought to be quite appropriate for Hutterite society. Although some of the liberal Group I Schmiedeleut colonies in Manitoba and the Dakotas permit access to computers and use of the Internet for educational purposes, none would countenance the presence of a television and DVD player in the dining room, as is the case in Owa (Figure 10). Even liberal Schmiedeleut leaders still generally frown on radios and televisions for entertainment.

On most Hutterite colonies in North America, church services are held every day, usually around six o'clock, immediately before the evening meal. At Owa there is only one service a week, on Sunday at ten o'clock in the morning, held in the colony church (built in 1983 with assistance from Canadian Hutterites), which can accommodate forty or fifty people (Figure 14).

The greatest difference between Owa Colony and the North American colonies is in the education of its children. In Canada and the United States Hutterite children remain on the colony for their schooling. Certified teachers come to the colony rather than children leaving the colony to attend a public school where they would mix with other non-Hutterite pupils. This strategy enables the colony to reduce contact with the outside and buffer their youth from the influences of the secular world while fulfilling requirements that the state or provincial curriculum be followed. To make this economically feasible, more than two or three pupils are required. Lacking sufficient numbers of children, Owa Colony never established its own school but sent its children to the local public school, where they did not have an

easy time, enduring teasing for their beliefs and appearance (Kikuta J. 2009).

Continuity and Survival

Owa Colony illustrates the difficulty of maintaining communal life without a self-sustaining critical mass of population. A certain size of population is necessary to permit intermarriage within the group without genetic inbreeding. This has long been a concern of the Hutterites who entered into communal life in North America with a far greater population and more extensive genetic base. Even today they go to some lengths to reduce the chance of inbreeding. They forbid marriage between cousins and discourage marriage between second cousins. Most marriages are between individuals from different colonies within each leut, a practice that widens the genetic pool somewhat.

In its early days Owa Colony members had hopes of it becoming a self-sustaining colony from a demographic perspective, although in the opinion of some Canadian Hutterites this would require a population of at least three hundred. In its early years the membership included several families and the colony had several members of child-bearing age. Children born into the colony were hailed as its future and some intra-colony marriage was anticipated. This did not occur. All of those born into the colony married outside the community. Their spouses were reluctant to enter into communal life thus depriving the colony of a new generation of members and dooming it to a slow death by attrition. It was unlikely that members would find wives and husbands on the colony and it was not genetically desirable that they should do so in the long term. Thus those wishing to marry had to do so off the colony, generally within the small Christian community in the surrounding rural districts. All those who did so remained off the colony. They often continue as members of the Hutterite Church, remain in close contact with their families on the colony, and contribute their labour to the colony when needed, but they do not live on the colony or practice community of goods. In fact, six adult children live locally outside the colony and come back to help with farming operations when they are able. Without an infusion of new recruits the small community of Owa does not have any realistic hope of becoming a stand-alone community from a demographic perspective.

Moving off Owa Colony to live in the wider community is relatively easy for members. There is no distinction of ethnicity or language between the Owa Colony members and their Buddhist, Shinto or Christian neighbours. The only distinction is in clothing and belief. For Hutterites in North America, to leave the colony is more difficult because they are distinguished by accent, clothing, by Hutterite family names and, most importantly, by values and attitudes inculcated since birth. Although many young Hutterites in North America leave their colony to experience the outside world many later return to marry within the community and to commit themselves to communal life. (Hofer D. 2009). The greatest threat to Hutterite solidarity is the influence of evangelical Christianity, which promises salvation without communal living. The loss of individual non-baptized members is far less serious than wholesale defections of en-

tire families, when almost half a colony apostatizes and leaves (Hofer R. 2009)

Shortly after the establishment of Owa Colony, there was dissent over its governance, principally about whether to adopt a conservative or a modernistic approach to colony operation and management. Katizum Tamura pushed for a modern approach and became increasingly impatient with the cautious approach taken by the Reverend Izeki, the colony's First Minister. Frustrated, Tamura and his family left the colony. The loss of five members, including three children, was a serious setback. After their departure the colony gained some new members and one child was born into it, bring its membership in 1985 up to 22, including eight children (Hofer 1985, 70).

Without an infusion of new blood the Owa Colony is destined for extinction within a generation, if not earlier. Attracting recruits from Japan's small Christian community would not seem to be a realistic prospect. As Owa's minister remarked, "they [Japanese Christians] have their own churches and are not interested in communal life" (Kikuta J. 2009). In many ways Owa's demographic situation mirrors that of modern Japan, which suffers from low fertility, a declining birth rate and an aging population. Like the nation, which needs immigration from outside its borders to maintain a balanced demographic profile, the colony needs immigration from outside if it is to arrest decline. In both cases immigration poses complex issues of adjustment, adaptation and acceptance.

Japanese society is still remarkably homogenous and does not easily assimilate newcomers from other backgrounds. Similarly Owa has attracted members only from the limited pool of Japanese Protestants. If Owa is to rejuvenate, which it must do if it is to survive, it must attract new members. If these cannot be found in Japan, the colony must look to Protestant Christian communities outside Japan. A potential source of new members lies in the Philippines which, although predominantly a Roman Catholic nation, has a sizable Protestant population, some of whom are Anabaptist, and many are experienced agriculturalists anxious to immigrate into first-world countries. Furthermore, it is questionable whether the Owa Colony would accept Filipino members whose motivation for moving into colony life might be partly material and whose commitment to the principle of community of goods might not withstand the blandishments of material prosperity outside the colony. On the other hand non-Japanese members might find it difficult to move off the colony into mainstream Japanese society where social acceptance is notoriously difficult to achieve. Experience of defection from colonies in North America suggests that those who choose to leave the community seldom make a direct transition to life on the outside. In most cases they move into a similar kind of cloistered society, most often one that promises spiritual fulfillment without communal life. In North America, fundamentalist charismatic Christian sects proselytize among Hutterites and offer a transition from the protected world of the colony into the wider community. In Japan this would not likely to be the case, so there is reason to believe that members recruited from outside

the country would remain on the colony and thus constitute a new base for its expansion.

Another potential source of members is south Korea and the small Korean Christian community in Toronto, where a number of families bent on communal life have recently contacted and visited Manitoba Hutterites to learn about the Hutterite approach to community of goods (Hofer J. 2009; Murphy 2009). Crossing the cultural divide could be problematic: most likely potential communards would prefer to organize as an ethnically homogeneous group so the prospects for attracting new members from any source appears remote.

Conclusion

It seems clear that Owa colony will slowly atrophy as its members age and cease to be able to work. Other communes in Japan, longer established than Owa, have seen their membership numbers fluctuate but overall their total membership has not declined significantly. They have access to a potential pool of members numbering in the millions, even if only a tiny proportion are attracted to communal life it is enough to secure their economic future. The Owa Christian Community of New Hutterian Brethren, however, differs fundamentally from other forms of communal life in Japan. Most, if not all, other Japanese communes, whether Buddhist, Shinto or secular, were established to seek enlightenment through pursuit of an aesthetic way of life based on a “philosophy of nothingness, penitence, selflessness, love, service communality and peace.” (Kusakari et al. 1977, 57). Owa Colony, on the other hand, sought to offer an opportunity to practice accepted Christian values, as expressed in the Hutterite Confessions of Faith, to Christians who had already found their salvation. In other words, the commune is the pathway whereas the colony is the destination. Owa offers opportunity for Christian communal life in Japan but North American Hutterites do not see it as their responsibility to maintain it at all costs. As one Hutterite questioned, “what is the point, if no one wants it?” This makes it extremely unlikely that Owa would actively recruit beyond the Japanese Anabaptist community and even less likely that the North American colonies would offer it anything more than financial aid and moral support. Owa is open to those Japanese who wish to join and live in community of goods but its role is not to persuade them to do so simply to keep the colony alive.

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Seasonality of imagery: the impact on object-based classification accuracy of shelterbelts

Joey Pankiw

University of Regina, Regina, Saskatchewan, Canada
pankiw2j@uregina.ca

Joseph Piwowar

University of Regina, Regina, Saskatchewan, Canada
joe.piwowar@uregina.ca

Abstract

In this paper, the use of object-based image classification of winter imagery and summer imagery is compared. In previous research it was found that object-based image classification of SPOT-5 2.5 metre panchromatic imagery acquired during the summer months was an effective approach to identify Prairie shelterbelts in remote sensing imagery. It was hypothesized that shelterbelts would stand out darkly against the snow-covered ground. The increase in image contrast between the trees and the surrounding landscape would improve the classification accuracy. It was found, however, that the object-oriented classification performed more poorly with winter imagery than with summer imagery. It was determined that this was due to the lack of contrast between shelterbelt trees with a sparse distribution of limbs and branches and the snow-covered ground.

Introduction

Shelterbelts are an integral part of the Prairie landscape, yet management of this important resource has been difficult due to the lack of knowledge about their locations and numbers. Shelterbelts or windbreaks are barriers that are used to reduce wind speed. Shelterbelts are typically composed of trees or shrubs, although other perennials, annual crops or grass, fences and other materials can also be used (Brandle et al. 2004). Shelterbelts are planted in rows perpendicular to the main wind direction in a given area. Shelterbelts have been used to mitigate the effects of soil erosion due to wind, protect homes crops and livestock from the wind, control snow blowing over roads and highways, and provide wildlife habitat (Wiseman et al. 2007).

Furthermore shelterbelts have been viewed as carbon sinks. Sedjo (1989) and Brandle et al. (1992) examined the potential of tree planting for carbon sequestration. Sedjo (1989) estimated that if 465 million hectares of new forests were planted worldwide, 2.9 billion tonnes of carbon emissions could be removed from the atmosphere. In research on the Canadian Prairies, Kort and Turnock (1999) estimated how much carbon could be re-

moved from the atmosphere by prairie shelterbelts. They found that shelterbelts represent a significant carbon reserve on the agricultural prairie landscape (Kort and Turnock 1999) and concluded that a shelterbelt program that planted six million trees a year could sequester 0.4 million tonnes of carbon (Kort and Turnock 1999).

Agroforestry, which includes shelterbelt planting, represents the largest net gain of carbon per unit land area, which does not interfere with any other agricultural activity. Schoneneberger (2009) notes that this is due to the fact that since no new forests would be created there would be no loss of agricultural land. Agriculture would remain the main focus of land use and shelterbelts added to that landscape would be able to, “sequester carbon over and beyond, of agricultural lands in their natural state” (Schoneberger 2009, 29).

The Canada National Reports on Climate Change have developed several policies to mitigate the levels of CO₂. One such program was the Shelterbelt Enhancement Program (SEP) mentioned in the 2006 National Report (Environment Canada 2006). The goal of this program was to create 8,000 linear km of new

tree and shrub plantings, consisting of riparian, field and farm-yard shelterbelts on agricultural lands in the Prairie region. By March 2005 the program created 2,895 linear km of shelterbelts at a cost of 4 million dollars (Environment Canada 2006). Although the SEP program ended in 2007, it showed that planting trees on the Prairie landscape is a cost effective way to sequester CO₂.

The use of high resolution satellite imagery along with object-based image classification software is a new paradigm in image processing methodology (Oruc et al. 2004). Object-based classification differs from traditional pixel-based classification by examining the spatial characteristics of features along with their spectral properties. While pixel-based classification segments an image by comparing the spectral values of each individual pixel to a known area of pixels in the image, object-based image classification makes inferences about objects by looking at them in context to the surrounding objects (Definiens 2007). In the past decade the increase in high resolution imagery has meant that object-based classification methods have become preferred over pixel-based methods mainly due to pixel value variation within an object or area (Carleer and Wolff 2006; Blaschke 2010). In comparison studies done by Platt and Rapoza (2008) and Oruc et al. (2004) it was found that object-oriented land use classifications were more accurate than pixel-based classifications. When combined with expert knowledge of the landscape, these numbers escalated dramatically.

Object-based analysis in the field of forestry has become more popular over the past decade. Many studies, including Dorren et al. (2003), Heyman et al. (2003), Yu et al. (2006), Lackner and Conway (2008) and Xie et al. (2008), have shown that object based classification procedures produce results more accurate than traditional pixel based approaches. Although these forestry studies were successful, it should be noted that agro-forestry differs from regular forestry activities due to the spatial structure of the shelterbelt, necessitating the use of more spatial features than spectral features. As a result there is very little research on the object-based classification of shelterbelts in agro-forestry systems.

Attempts have been made to develop methods to properly create an inventory of shelterbelts across the Prairies. For example, Wiseman et al. (2007) were able to identify shelterbelts in high-resolution aerial photography with object-based image classification at an accuracy of 95.8%. Although that study was able to identify shelterbelts with high accuracy for a small area, the cost of acquiring appropriate air photos and the processing time required to classify the shelterbelts restricts the application of that method for larger areas.

Pankiw et al. (2008) developed an alternative shelterbelt identification method using 2.5 metre panchromatic imagery from the SPOT-5 satellite and object-based classification that could potentially be applied across entire provinces. The strength behind this approach was the availability of satellite orthorectified imagery for all of Manitoba and Saskatchewan, thereby reducing the financial resources needed for data acquisition and the processing time needed to prepare the imagery for classification. The principal limitation of using these data was

the lack of multispectral (i.e., colour) information. The results showed that when using the SPOT-5 2.5 metre panchromatic imagery a classification accuracy of 84 percent could be achieved. While this accuracy was not as high as that in the Wiseman et al. (2007) study, the authors concluded that the reductions in data costs and processing times outweighed the benefits of the higher accuracy.

Research on shelterbelt classification using object-based methods is not limited to the Canadian Prairies. In a Kansas study Dulin (2009) set out “to rapidly classify windbreaks using object-based classification on County Composite Mosaic (CCM) aerial imagery, to develop a secondary classification to assess windbreak condition (good, fair, poor) and determine the number of acres/hectares that exist in each class, and to identify windbreaks located on highly erodible and impaired soils.” (Dulin 2009,4). There was considerable confusion between windbreaks/shelterbelts and riparian areas, ditches, and some croplands. Dulin (2009) concluded that when supervised multispectral classification is used in concert with the object-oriented approach, a considerable gain in accuracy can be achieved. Another observation made by Dulin was that the boundaries of windbreaks were not consistent with the actual boundaries found on the ground and that the entire area of most shelterbelts was not completely classified. Recognition of boundaries was difficult because identifying snags, gaps and poor growing conditions was complicated.

The accuracy reduction in the Pankiw et al. (2008) study was primarily a result of commission errors as non-shelterbelt objects were included as part of a shelterbelt classification. It was found that most of the errors occurred due to the lack of contrast between the shelterbelts and the surrounding landscape. In particular, the lack of spectral and spatial contrast between grass ditches and some harvested fields with shelterbelts led to incorrect classifications on numerous occasions. As a result, the authors recommended the acquisition of winter imagery where it was hypothesized that the shelterbelts would appear in dark tones, in stark contrast to the light, snow-covered background. The objective of the present study, then, was to compare the efficacy of summer and winter SPOT-5 2.5 metre panchromatic images for classifying Prairie shelterbelts.

Study Area and Data

Study Area

The study area was located approximately 25 km east of the town of Biggar, Saskatchewan, in the Rural Municipality of Biggar No. 347 (Figure 1). The physical location of the site is in township 36 range 17 west of the 3rd Meridian. The area was selected due to the presence of an even mix of field and farm-yard shelterbelts. This site was also selected to be coincident with the study area used in Pankiw et al. (2008). Figures 2 and 3 show the appearance of the study area in both summer and winter imagery, respectively. Note the higher contrast visible in the snow-covered image in Figure 3.



Figure 1: Study area location.

Data

In this study three different data sets were utilized. The first is a SPOT-5 Panchromatic 2.5 metre image that was acquired on July 11, 2006 (Figure 2). The second data set was also a SPOT-5 Panchromatic image with 2.5 metre spatial resolution that was acquired on April 11, 2009 (Figure 3). Although the acquisition date of the winter image was late in the season, there was still

sufficient snow cover at the site location to allow for a robust analysis. In addition to the remote sensing data, building point shapefiles from the National Topographic System (NTS) were also used to identify farm structures. All three data sets were projected to the Universal Transverse Mercator (UTM) grid (zone 13U; NAD 1983).

Analysis Methods

A Definiens Imaging, Developer 7.0 object-based classifier was used to identify the shelterbelts on the satellite images. The object-based classification process was broken down into two steps: segmentation and classification

Segmentation

Segmentation is the foundation for an object-based classification. It is the process of subdividing an image which is represented as discrete pixels into image objects. The segmentation procedure is controlled by three unitless parameters: scale, smoothness, and compactness (Definiens 2007). The scale parameter determines the size of the image objects found. For example, setting a larger scale value would lead to the segmentation of an entire woodlot rather than individual trees. The smoothness parameter is used to identify image objects based on the smoothness of their borders. For example, objects from built environments would be favoured by higher smoothness values over natural features. Lastly, the compactness parameter is used to optimize image objects based on their relative shapes. For example, circular features are more compact than linear objects.

Shelterbelts are typically planted for two reasons: (i) to reduce soil erosion and protect soil moisture along field boundaries – “field shelterbelts”; and (ii) to reduce wind and blowing snow around farm dwellings – “farmyard shelterbelts”. Since these shelterbelt types have very different spatial morphologies, two different segmentation procedures were required in this analysis. Field shelterbelts tend to be long, linear, and run parallel to the east-west and north-south orientation of the Dominion Land Survey land tenure system. Previous research showed that segmenting these features required a scale parameter of 45 and shape and compactness values of 0.5 (Pankiw et al. 2008) (Figure 4). Farmyard shelterbelts were best identified with a smaller scale value of 25 and shape and compactness values of 0.5 (Figure 5).

Classification

The segmentation analysis produced many “candidate” shelterbelt objects in the image, some of which were true shelterbelts, and many more that were other features. The second step in the analysis procedure involved evaluating the spatial attributes of these candidate objects and classifying them as field shelterbelts, farmyard shelterbelts, or neither. By noting that field shelterbelts typically appeared on the imagery as long, narrow rectangular strips and farmyard shelterbelts were commonly visible as square rings of trees, the spatial attributes of asymmetry, size/area, and orientation of the candidate objects were evaluated. Asymmetry was calculated as the ratio of the vari-

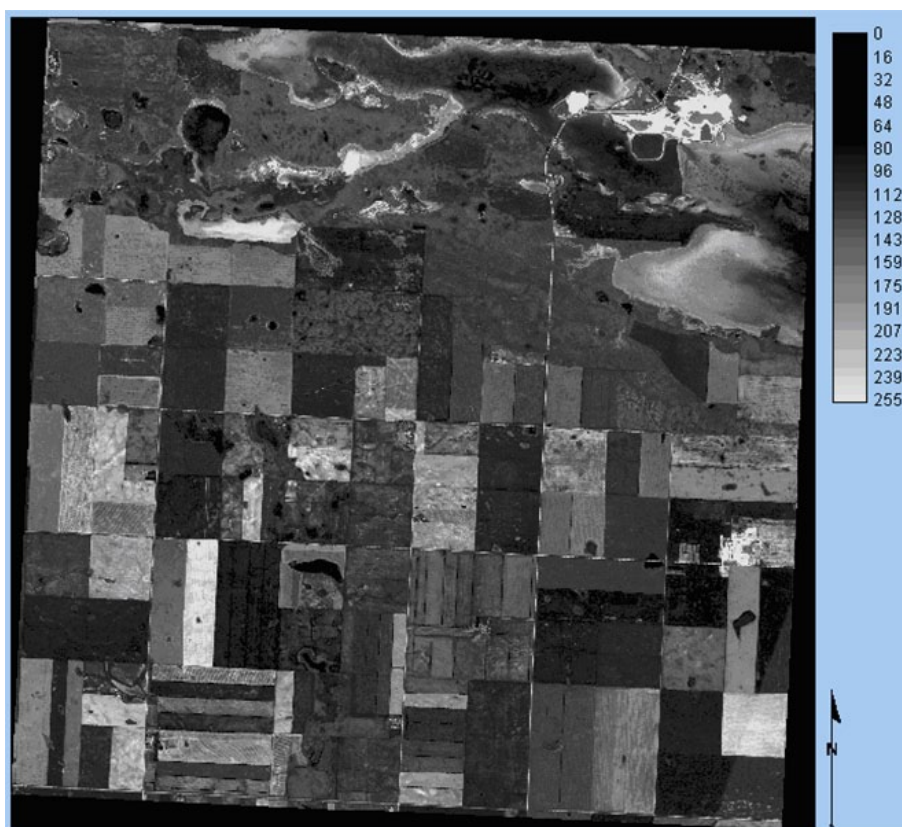


Figure 2: Summer imagery.

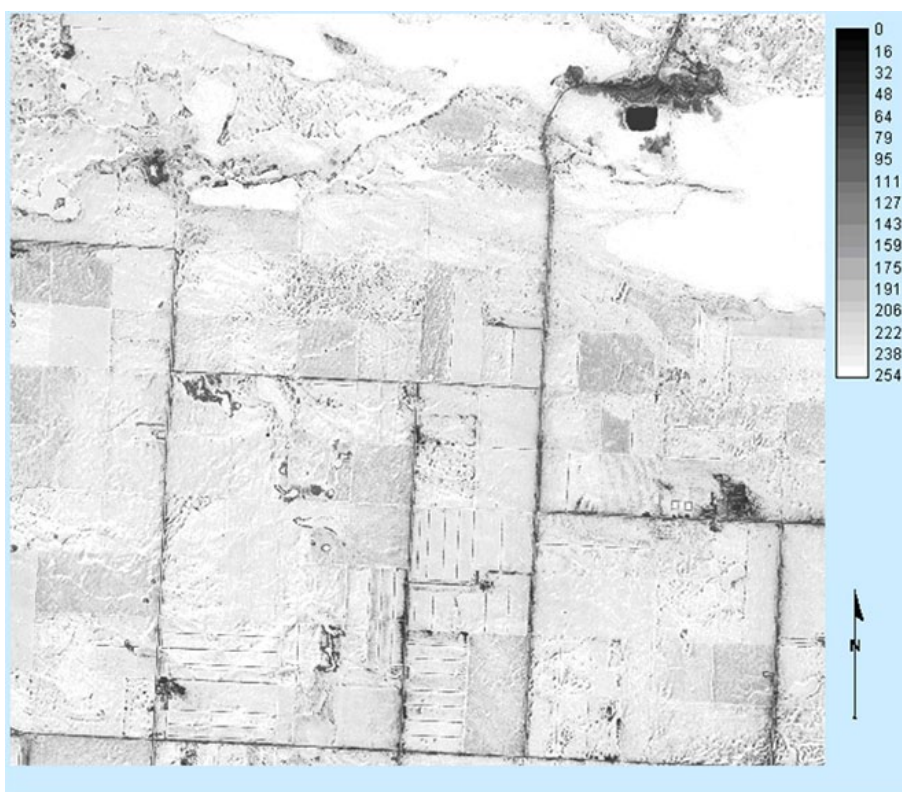


Figure 3: Winter imagery.



Figure 4: Winter and summer field shelterbelt segmentation.

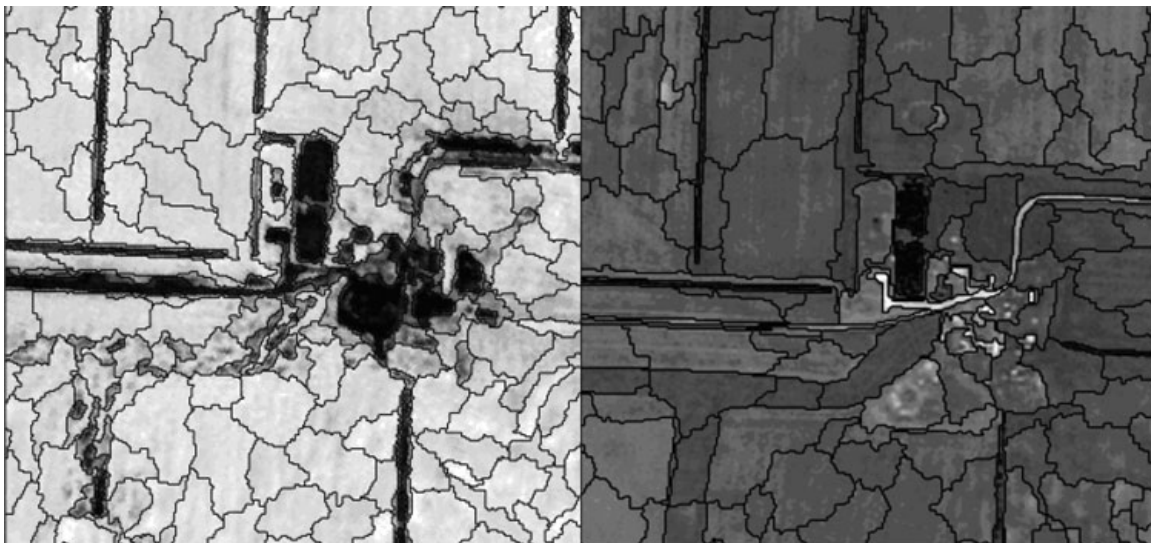


Figure 5: Winter and summer farmyard segmentation.

ance of the object's length to the variance of its width (Definiens 2007). The closer an object's asymmetry value was to 1.0, the more asymmetrical (i.e., less circular) that feature was. An object's shape index was determined by dividing the length of its border by four times the square root of its area (Definiens 2007). Objects with a shape index close to 1.0 have very smooth borders, while irregular objects will have higher shape values. Due to the very different spatial morphologies of field and farmyard shelterbelts, they needed to be classified in separate procedures.

Since most field shelterbelts have long and narrow shapes, they tend to be very asymmetrical and only those candidate objects with an asymmetry value above 0.9 were retained in the analysis (Wiseman et al. 2007). Furthermore, it was noted that

field shelterbelts were relatively narrow, so all candidate objects that had widths of more than 25 metres were removed from the classification. The third spatial attribute that was used to classify field shelterbelts was their orientation. All candidate objects that were not oriented in an east/west or north/south direction were removed. The objects that remained were then classified as field shelterbelts (Figures 6 and 7).

Farmyard shelterbelts were processed separately from field shelterbelts. To start, only those candidate objects with asymmetry values of more than 0.8 and shape indices of 1.5 to 3.5 were considered to be farmyard shelterbelts; the other objects were discarded. It was noted that while many of the remaining objects did define farmyard-like features, they remained

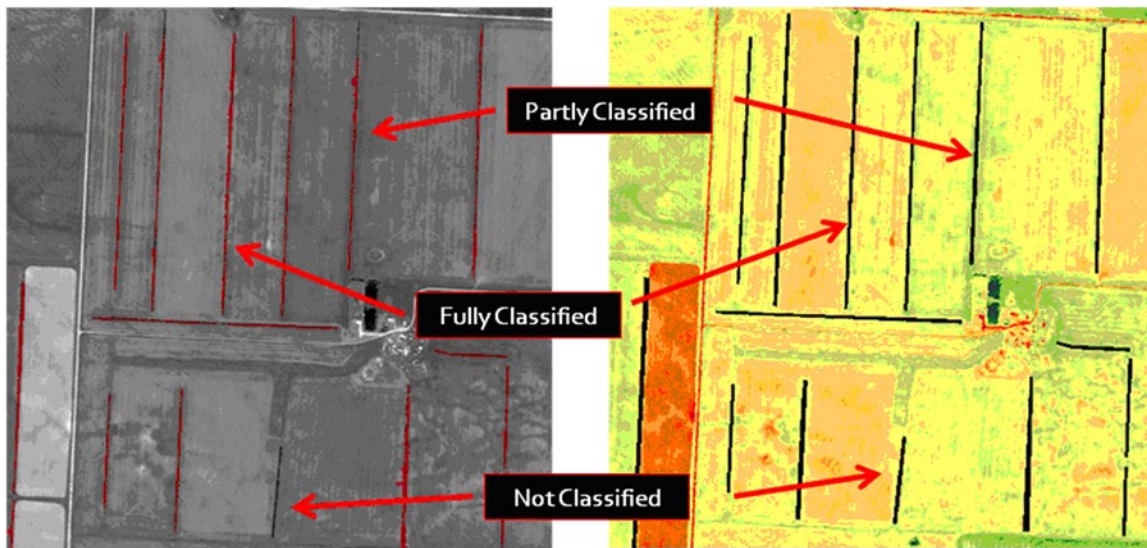


Figure 6: Summer field shelterbelt classification.



Figure 7: Winter field shelterbelt classification.

segmented as clusters of smaller objects. Consequently, a merge function was implemented to join adjacent objects together. After the merge, only those objects with an area of less than 5000 m² were retained in the classification. In order to separate true farmyard shelterbelts from small clusters of natural vegetation, the NTS building footprint locations were buffered to 250 m and then spatially intersected with the candidate objects. The objects that remained were then classified as farmyard shelterbelts (Figures 8 and 9).

The same segmentation and classification procedures were used to process the summer and winter imagery.

Manual Classification

To validate the results of the object-oriented classification each farm and field shelterbelt visible in the study area was manually digitized on the summer imagery. As a result of the different spatial composition of the field and farmyard shelterbelts, their classification accuracies needed to be determined separately.

For field shelterbelts, the total number of field objects was compared to the manual count. The results were broken down to three categories, fully classified (shelterbelts that were totally classified), partially classified (shelterbelts that were mostly classified but had some parts missing), and not classified (shelterbelts that were minimally classified or not classified at all).

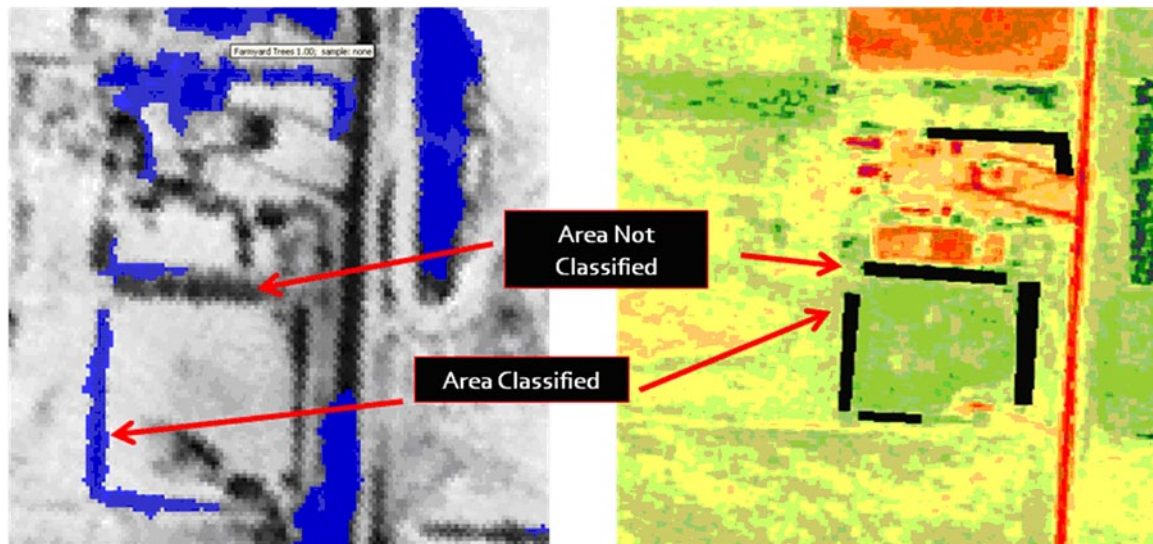


Figure 8: Summer farmyard shelterbelt classification.

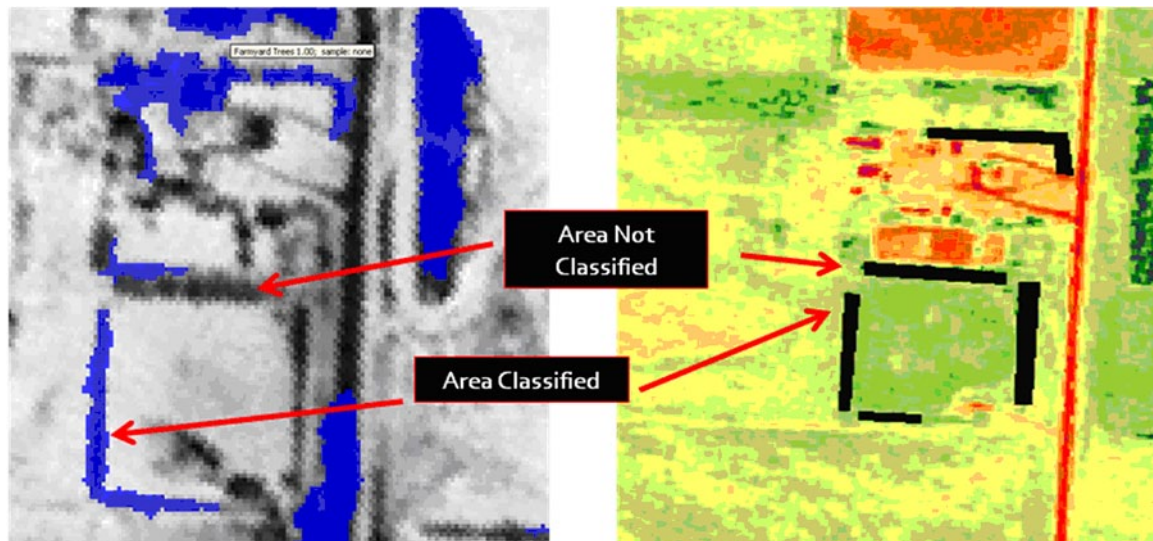


Figure 9: Winter farmyard classification.

Farmyard shelterbelts often had gaps between clusters of trees and a single manually-identified farmyard shelterbelt frequently corresponded with two or three clustered object-oriented farmyard shelterbelts. Consequently, farmyard shelterbelt accuracy was assessed as a comparison of the total classified area between the manual and object-oriented methods.

A determination of the commission error was made by comparing the number of falsely classified objects with the number of shelterbelts that were correctly classified. The omission error rate was calculated as the percentage of actual shelterbelts not detected by the object-oriented classifier.

Results and Discussion

The manual classification found 79 field shelterbelts in the study region. The total farmyard shelterbelt area was determined to be 497,665 m².

An assessment of the object-oriented classification of field shelterbelts in the summer imagery revealed 68 percent to be fully classified, while only 62 percent of the field shelterbelts in the winter image were fully classified. Shelterbelts that were only partially classified also had a higher accuracy in the summer than in the winter: 20 percent compared to 15 percent, respectively. When taking the fully and partially classified field shelterbelts in total, it was found that 88 percent of shelterbelts in the summer imagery were at least partially classified while the winter image had only 77 percent that were at least partially

classified (Table 1). Thus, there was an omission error rate of 12 percent for the summer imagery and 23 percent for the winter imagery. The commission errors, however, were 25 percent in the summer and only 12 percent in the winter (Table 2).

The original hypothesis behind this research was that shelterbelts should stand out in dark contrast to a white snow cover in winter imagery. This was confirmed with lower winter commission errors, showing that the snow cover was beneficial in covering up features, such as grass ditches and harvested crops that were being confused with field shelterbelts in the summer. However, there was a striking increase in omission errors in the winter. Upon further investigation, it was found that this was due to the lack of contrast between shelterbelt trees with a sparse distribution of limbs and branches and the snow-covered ground (Figures 10 and 11).

The accuracy assessment of the farmyard shelterbelts showed 71 percent of the area to be correctly classified in the summer image compared with 57 percent in the winter (Table 3). Thus, omission error rates were 29 percent for the summer imagery and 43 percent for the winter imagery. It was found that 22 percent of objects classified as farmyard shelterbelts in the summer imagery were not actually shelterbelts. This commission error was 29 percent in the winter scene (Table 4).

For farmyard shelterbelts, therefore, the summer imagery provided superior classification results than the winter imagery (Figures 12 and 13). Part of the reason for this was the presence of significant patches of melted snow areas within farmyards that provided little contrast with the shelterbelt trees in the winter imagery. This was not as big an issue in the summer.

Conclusions

The underlying hypothesis of this research was that shelterbelts should stand out in dark contrast to a white snow cover in winter imagery. This study found, however, that for both field and farmyard shelterbelts an object-oriented classification performed more poorly with winter imagery than with summer imagery. It was determined that this was due to the lack of contrast between shelterbelt trees with a sparse distribution of limbs and branches and the snow-covered ground. Thus, the original hypothesis has been shown to be incorrect.

Even when the contrast between the surrounding landscape and the shelterbelts is increased, as was investigated here, there is still a portion of shelterbelts that cannot be classified. It has become evident that the limiting factor in using the SPOT-5 2.5 metre panchromatic imagery for object-oriented classification of shelterbelts is the lack of spectral information. Future studies should be directed at incorporating multispectral information, even from sources with lower spatial resolutions, with the panchromatic imagery.

Table 1: Field Shelterbelt Classification Accuracy: Omission Errors

Shelterbelts Classified	Summer Imagery	Winter Imagery
Fully Classified	68%	62%
Partially Classified	20%	15%
Not Classified	12%	23%

Table 2: Field Shelterbelt Classification: Commission Errors

Image Objects	Summer Imagery	Winter Imagery
Shelterbelt Objects	75%	88%
Not Shelterbelt Objects	25%	12%

Table 3: Farmyard Shelterbelt Classification Accuracy: Omission Errors

Shelterbelts Classified	Summer Imagery	Winter Imagery
Shelterbelts Area Classified	71%	57%
Shelterbelts Area Not Classified	29%	43%

Table 4: Farmyard Shelterbelt Classification Accuracy: Commission Errors

Shelterbelt Objects	Summer Imagery	Winter Imagery
Shelterbelts	78%	71%
Not Shelterbelts	22%	29%

Acknowledgements

Financial support for this work from the Agriculture and Agri-Food Canada's Agroforestry Division and the Natural Sciences and Engineering Research Council of Canada is gratefully appreciated.

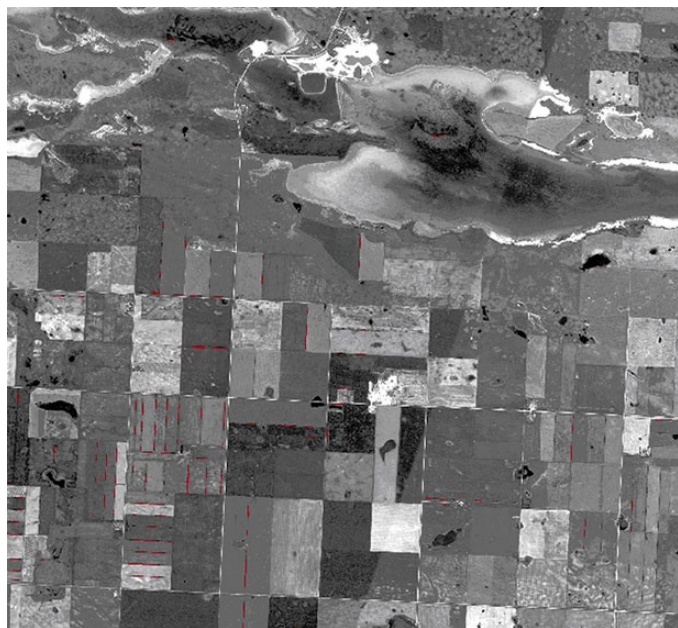


Figure 10: Final summer field shelterbelt classification.

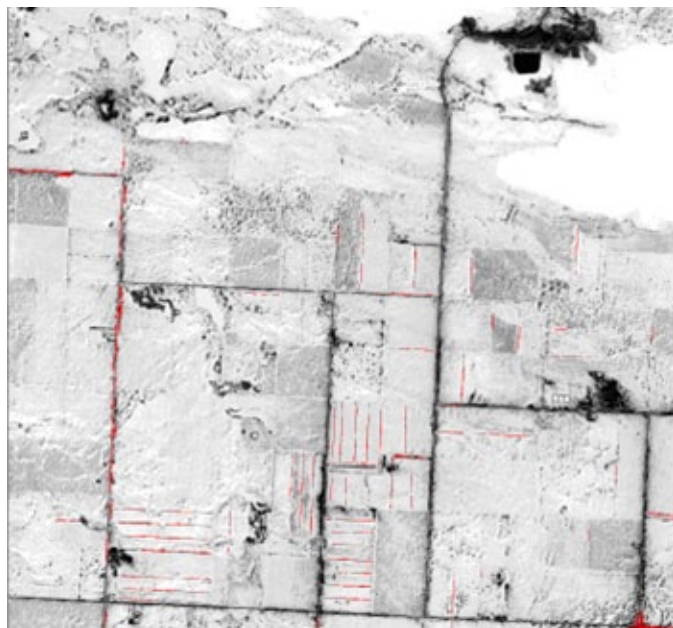


Figure 11: Final winter field shelterbelt classification.

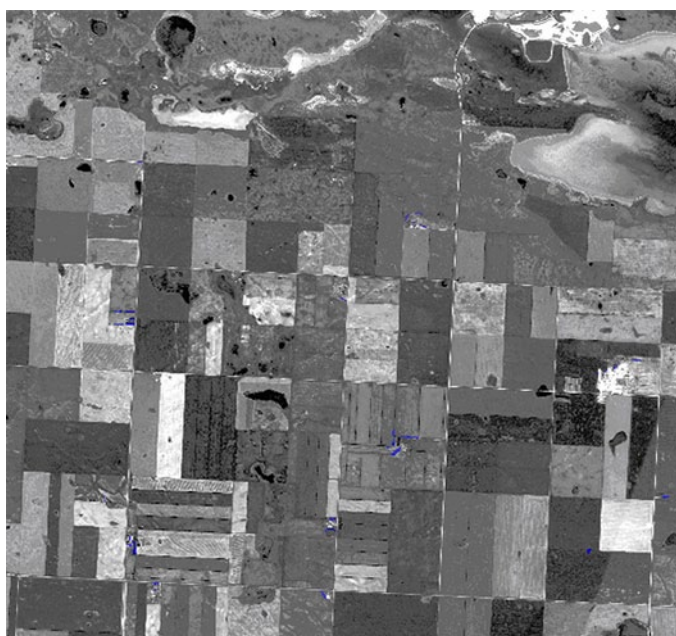


Figure 12: Final summer farmyard shelterbelt classification.

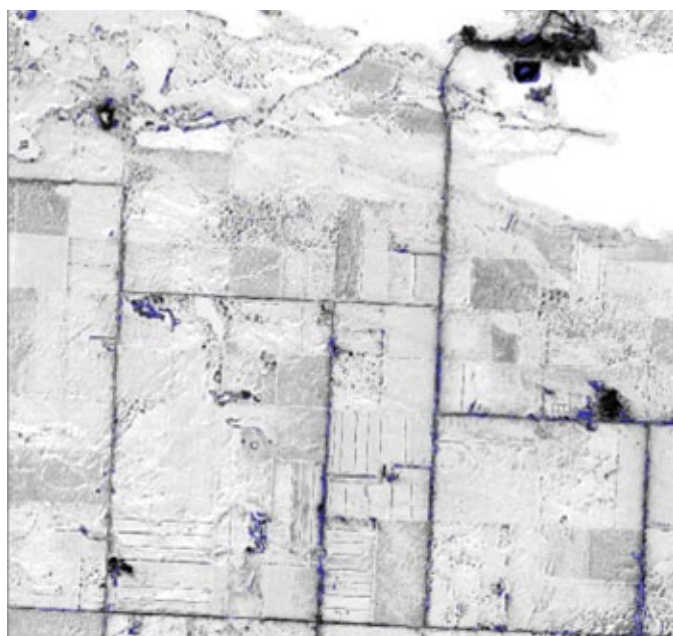


Figure 13: Final winter farmyard shelterbelt classification.

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Resource characteristics of the Lesser Prairie-chicken (*Tympanuchus pallidicinctus*) and its survival on the High Plains of the United States

Johnny Coomansingh

Minot State University, Minot, North Dakota, USA
johnnycoomansingh@minotstateu.edu

Abstract

There are indications that the Lesser Prairie-chicken (*Tympanuchus pallidicinctus*) has been declining in numbers since the late 1800s. Partially responsible for the dwindling numbers of the bird are factors such as farming, hunting and other anthropogenic activities. To date, efforts to include this bird on the endangered species list have been futile. In an attempt to call for a cessation of habitat destruction that would allow the animal to survive, this research brings in view the resource characteristics of the Lesser Prairie chicken on the High Plains of Colorado, New Mexico, Texas, Oklahoma, and Kansas as a means to spark new interest in the preservation of the bird. Bird watching (tourism), photography, fine art, poetry, song, the possibility of community prairie-chicken days and inclusion of studies of the Lesser Prairie-chicken in elementary, middle, and high school curricula could serve as worthwhile activities that may enhance the survival and preservation of the Lesser Prairie-chicken.

Introduction

Although not regarded by some as having any real significance with respect to resource use and development on the High Plains, the Lesser Prairie-chicken (Figure 1) possesses some unique resource characteristics that are worth highlighting. It will be discussed in light of its capability to facilitate tourism ventures such as bird watching, photography, fine art, and sporting (hunting) activities. As part of the ecosystem of the High Plains, its presence plays an integral part in the biodiversity of the area, which includes to some extent, biological control.

In the first part of the paper, the taxonomy, habits and habitats of the Lesser Prairie-chicken will be examined. This will be followed by a discussion of the main reasons for the long-term decline in the number of the chickens. The resource characteristics (potential benefits, economic and otherwise) will then be examined, as will ways to promote these characteristics in the hope of halting or reversing the decline. In a final section, recent and very promising developments regarding the numbers and habitat of the Lesser Prairie-chicken will be presented.

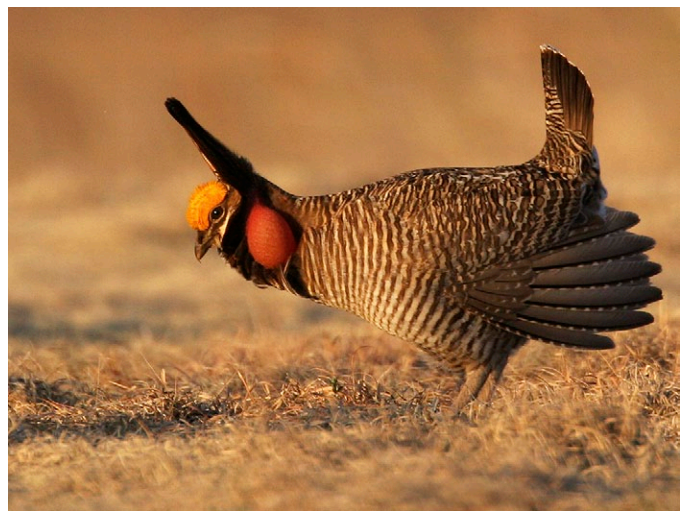


Figure 1: The Lesser Prairie-chicken (*Tympanuchus pallidicinctus*).
(Photo courtesy of John Ennis)

Taxonomy and Description of the Lesser Prairie-chicken

The Lesser Prairie-chicken is categorized in the order Galliformes, the family Phasianidae and the subfamily Tetraoninae (Mote et al. 1998). The adult Lesser Prairie-chicken can weigh between 700 to 800 grams and has a length between 38 and 41 cm (Johnsgard 1983; Olawsky 1987). Smaller than the Greater Prairie-chicken (*Tympanuchus cupido*), the coloration of the stocky, chicken-like, Lesser Prairie-chicken (DiscoverTheOutdoors.com. Inc. 2001-2002) could be a lighter brown or a deeper gray compared to the Greater Prairie-chicken (Grange 1940; Hjorth 1970). On the breast, belly, back, and tail feathers there are alternating dark brown and light buff cross barring stripes. The plumage on cocks and hens are similar. The tail of the Lesser Prairie-chicken is short (Short 1967).

During courtship, the cocks flaunt dull red esophageal 'air sacs' and yellow supraorbital eyecombs complemented by pinnae or long tufts of feathers on the sides of the neck (Copelin 1963; Sutton 1977; Johnsgard 1983). The coloration of these parts of the male distinguishes it from the female. During courtship displays, the pinnae become erect (Mote et al. 1998). It is clear that this gallinaceous bird is quite beautiful and could, with proper promotion, entice birdwatchers, photographers, and artists.

Based on differences in vocalization, habitat use, morphology, and behavior between the Greater and Lesser Prairie-chickens, Jones (1964) reported that there is a distinction between the two. The American Ornithologist's Union (1957) also recognized the Lesser Prairie-chicken as distinct from any other species (Robb and Schroeder 2005, citing Baker 1953 and Sharpe 1968). As a highly social animal, the Lesser Prairie-chicken is characterized by its unique and captivating courtship exhibitions, and 'gobbling' sounds when cocks visit leks or display grounds (DiscoverTheOutdoors.com 2001-2002).

Mating and Reproduction: Lekking

In spring the cocks mark out or set up breeding territories called leks located on hilltops, or slight mounds where the vegetation is minimal, and because they need to be seen by hens, they choose a spot where visibility is excellent (Conway 1995). Cocks also use as leks or mating sites heavily-grazed areas near watering facilities, abandoned oil production sites such as oil pads, unused roads with little traffic, burned areas, herbicide treated areas, and cultivated fields adjacent to grassland (Jamieson et al. 2002; Robb and Schroeder 2005). At these sites, cocks numbering 10-15 at a time will dance, call, and fight at sunrise or at sunset as part of the mating ceremony. The courtship ritual is elaborate. The entire process is called lekking (Taylor and Guthery 1980).

The number of males will fluctuate seasonally or annually depending on habitat type, flock density, and daily weather conditions (Mote et al. 1998). They usually come to the leks 30-60 minutes before sunrise, and may remain for 3-4 hours (Copelin 1963; Sharpe 1968; Crawford and Bolen 1975; Giesen 1998).

Hens are usually attracted to the leks, where dominant males fertilize their eggs. Fertilization occurs during the period late March through May (Mote et al. 1998; DiscoverTheOutdoors.com 2001-2002). Eight to 14 cream to buff-colored eggs speckled with fine dots of pale brown or olive (Mote et al. 1998) are laid in nests sited between three-quarters of a mile to two miles from a lek. Hens may lay one egg per day and sometimes skip a day. Incubation of the eggs takes about 22-26 days, and success of hatching is much greater during wetter years. Denser, taller grass is preferred over shorter, sparser grass. Hatching success may be affected negatively by drought and extremely hot weather (DiscoverTheOutdoors.com 2001-2002).

Range

The historic distribution of Lesser Prairie-chickens is difficult to establish because early observers confused them with the Greater Prairie-chicken. However, Mote et al. (1998) identified that their current occupied range is limited to southeast Colorado, southwest Kansas, western Oklahoma, eastern New Mexico, and northern Texas (Figure 2).

Habitat Requirements

The original habitat requirements of the Lesser Prairie-chicken have not been accurately documented but more recent research has shown that habitat requirements may vary depending on the time of year and the activity for a particular period. Lesser Prairie-chickens require basic habitat types, which include breeding, nesting and brood habitats (Mote et al. 1998). According to Jones (1963) the species prefers vegetative cover where there is a mixture of grass and short shrubs which is found primarily on sandy soils.

Suitable for the survival of the species are two general habitat types: (1) a mixture of sand sagebrush (*Artemisia filifolia*) and sand bluestem (*Andropogon hallii*) and (2) Harvard or shinnery oak (*Quercus harvardii* Rydb.) and sand bluestem. These two habitat types are modified by the species to meet their requirements for breeding, nesting and brood rearing. In Kansas, Oklahoma, Colorado and some areas in Texas and New Mexico the sand sagebrush environment is present. However, in Texas, Oklahoma and New Mexico the shinnery oak environment is also present. Sharpe (1968) pointed out that these two vegetation types conform to the distribution of Lesser Prairie-chickens during the 1800s. The sand sagebrush/grassland environment covers areas occupied by the Lesser Prairie-chickens in Colorado. Present in this area are little bluestem (*Andropogon scoparium*), switchgrass (*Panicum virgatum*), sideoats grama (*Bouteloua curtipendula*), and red threeawn (*Aristida longiseta*) (Taylor and Guthery 1980; Mote et al. 1998; Jamison et al. 2002).

In Kansas the highest densities of Lesser Prairie-chickens can be found south of the Arkansas River in the sand sage prairies. The environment here is quite similar to that of southeastern Colorado (Sexson and Horak 1978). Sand prairies dominated by mid- to short-grasses may also contain a few flocks



Figure 2: Lesser Prairie-chicken distribution in Colorado, Kansas, New Mexico, Oklahoma, and Texas (Modified from K. M. Giesen, Colorado Division of Wildlife, Ft Collins, CO in Jamison et al, 2002).

in southwestern Kansas (Taylor and Guthery 1980). However, Baker (1953), Hoffman (1963), Horak (1985) and Giesen (1991) revealed that in both Colorado and Kansas the species preferred, or was restricted to, areas covered with sand sagebrush, sand dropseed (*Sporobolus crytandrus*), sideoats grama, threeawn and blue grama (*Bouteloua gracilis*). It was noticeable that year round in Kansas, Lesser Prairie-chicken cocks selected sand sagebrush grassland over cropland, tallgrass, Conservation Reserve Program (CRP) grassland (for example, Cimarron National Grassland), and other types of grass habitats (Jamison et al. 2002; Robb and Schroeder 2005). In addition, the optimal habitat for the Lesser Prairie-chicken is a combination or mosaic of various vegetation subtypes which enhances the survival potential of the species in terms of nesting habitat, brood habitat, fall-winter habitat and lek sites (Davis et al. 1979; Applegate and Riley 1998).

Lesser Prairie-chickens in western Oklahoma inhabited three vegetation types. Copelin (1963) states that combinations of shinny oak, mid- and tall-grasses, sand sagebrush, sand dropseed, sideoats grama, blue grama, buffalo grass (*Buchloe dactyloides*), and hairy grama (*B. hirsuta*) formed the habitats of the species in this area. Lesser Prairie-chickens in New Mexico are most abundant in shinny oak and sand sagebrush rangelands (Frary 1956). Also found at New Mexican habitat sites are big bluestem (*Andropogon gerardi*), yellow Indiangrass (*Sorghastrum nutans*), prairie sandreed (*Calamovilfa longifolia*), yucca (*Yucca spp.*), mesquite (*Prosopis spp.*) and fragrant sumac (*Rhus aroatica*).

Most of the vegetation species in the habitats mentioned in the other states can be found in Texas. Sand chicksaw plum (*Prunus angustifolia watsoni*) was the only additional species

found in Texas mentioned in Taylor and Guthery (1980). According to Crawford and Bolen (1976) Lesser Prairie-chickens seem to thrive much better in habitats with shinny oak rangeland combined with a 5-37 percent small grain cropland scenario than they do in 100 percent rangeland. It is apparent that habitats with less than 63 percent native rangeland are not suited or are incapable of sustaining populations of Lesser Prairie-chickens (Mote et al. 1998; Woodward et al. 2001).

Food Habits

The food ingested by the Lesser Prairie-chicken varies by season. A combination of insects and native prairie plant seeds constitutes the major sources of forage for spring and summer months. Not only is shinny oak great protection for the species but also the fruit of this plant makes up approximately 52 percent of the diet of these birds (Bounds 1997). Insects (grasshoppers, beetles and treehoppers), leaves, flowers, young succulent buds, wild buckwheat (*Erigonum annuum*), wheat, western ragweed, blue grama, sixweeks fescue seeds, grain sorghum, corn and other cultivated grains adjacent to native pasture are also eaten (Taylor and Guthery 1980; Mote et al. 1998; Jamison et al. 2002; Robb and Schroeder 2005). Mote et al. (1998) pointed out that the diets of Lesser Prairie-chickens less than 10 weeks of age contained insects, especially short-horned grasshoppers (*Acrididae*), long-horned grasshoppers (*Tettigonidae*), and beetles (*Coleoptera*).

Decline of the Lesser Prairie-chicken

As far as the recorded history of the High Plains show, the Lesser Prairie-chicken is indigenous to the High Plains. Bounds (1997) indicated that the species inhabited the area under review long before Europeans settled North America. In fact, during the Pleistocene era, the species enjoyed a wider range. Bones of the species dating back to this era were found in Oregon (Bounds 1997).

It is, however, apparent that the area occupied by, and the numbers of, Lesser Prairie-chicken have declined dramatically since the latter part of the 1800s. Estimates of these declines vary, but one source claims that the geographic area occupied by Lesser Prairie-chickens encompassed 358,000 km² in the 1800s, but declined to 125,000 km² by 1969 and only 27,300 km² by 1980 (Robb and Schroeder 2005, citing Taylor and Guthery 1980, based on Aldrich 1963 and Taylor and Guthery 1980). Within the occupied area it is estimated that there has been a decline of 97 percent in the number of Lesser Prairie-chicken since the mid- to late-1800s (Mote et al. 1998; Hagen et al. 2004; Robb and Schroeder 2005, citing Giesen 1998). For studies of declines in recent times for the various parts of the area, see Giesen (2000) for Colorado, Boyd and Bidwell (2001) and Horton (2000) for Oklahoma, Bailey and Williams III (2000) and Bailey et al. (2000) for New Mexico, Jensen et al. (2000) for Kansas and Sullivan et al. (2000) for Texas.

The pace of these declines appears to have varied spatially and temporally, however. Arritt (1998, 1), for example, cites Walter Colvin's description of the prevalence of the Lesser Prairie-chicken in the region in the early 1900s (Outing magazine 1914):

We saw a flock of 500 or more, and when they arose it seemed that a hole had been rent in the Earth. Two miles farther along we came to Ed Ward's. Such a sight I have never seen before nor since. Chickens were flushing everywhere, and droves of fifty to a hundred would take down the corn rows, sounding like a moving avalanche. As we trashed back and forth across the grain field, the chickens arose in flocks of fifty to five hundred. Mr. Ward and I estimated that there were from thirty-five hundred to four thousand chickens in this one field, a sight never to be forgotten.

Bounds (1997) supports the findings of Arritt (1998), that until at least the latter part of the nineteenth century that populations of Lesser Prairie-chickens were quite high. The concentration of the species in these five states was probably attributable to the 'patchwork type of farming' employed during this period, which invariably provided a food source for fall and winter (Jackson and DeArment 1963 cited in Taylor and Guthery 1980, 2; Bounds 1997, 3). In other words, farming was probably not as intense as it was to become and, apparently, there was plenty of habitat space complemented by a cultivated food source that augured well for the growth and development of the Lesser Prairie-chicken.

What then were the factors that caused the decline of Lesser Prairie-chicken populations on the High Plains? Jamison et al.

(1999) argue that the long-term population decline in Kansas is possibly attributed to the conversion of sand sage prairie to centre-pivot irrigated crop fields. Such irrigation exploits are made possible by tapping into the Ogallala aquifer, the water of which is being withdrawn ten times faster than its recharge rate (Opie 1992). Conway (1995) suggests that the decline of Lesser Prairie-chicken in Colorado has occurred for much the same reasons. The Kansas population of Lesser Prairie-chickens has experienced an overall 90 percent decline since the late 1800s, and this decline has been primarily due to intensive agricultural practices which led to fragmentation of the breeding habitat and populations. Combined with the effects of farming were the deleterious effects of intensive market hunting of the bird and the prolonged drought of the 1930s (Jensen et al. 2000, 170).

Chadwick (2002, 52) reported that market hunters ushered in the "first wave of assault," and then came the crop farmers who destroyed thousands of acres of Lesser Prairie-chicken habitat. Uncontrolled grazing by livestock also contributed to the decline because Lesser Prairie-chickens experience difficulty in raising their young if grazing of livestock is too intense on the native sand sage prairie. In this case, the birds lose their protective cover of tall grasses and shrubs and may become targets for predators (Conway 1995). In Texas, for example, the Lesser Prairie-chicken million-strong population was reduced to a mere 9000 by 1937, largely because of farm expansion coupled with urban sprawl around Houston. According to Woodward et al. (2001, 271), "Lesser Prairie-chicken populations have high site fidelity and may be dependent upon landscapes with minimal change. Stability of shrublands appears to be particularly important to Lesser Prairie-chickens." In addition, droughts followed by stormy breeding seasons wiped out about 500 birds in one county in Texas. However, some of the greatest threats to the species now come from disease (Schafer 2001), storms, starvation, and collision with fence wire and other anthropogenic installations. Predators including hawks, owls, snakes, and mammalian species such as coyotes, badgers, ground squirrels (Rodd and Schroeder 2005) and skunks also take toll on Lesser Prairie-chickens. "Don't tell these chickens the sky isn't falling. The sky is falling...no false alarm", wrote Chadwick (2002, 52).

The Natural Resources Conservation Service (NRCS) of the United States Department of Agriculture in 1999 also reported that the Lesser Prairie-chicken has experienced a sharp drop in population since the late 1800s. This situation has been exacerbated today by anthropogenic factors such as herbicide use, hydrocarbons and other mineral extraction activities, excessive grazing of livestock on rangelands, the conversion of native rangelands to cropland, fragmented habitat and decreased habitat quality (Sullivan et al. 2000; Breen 2001). According to Smalling (2001), the Lesser Prairie-chicken remains a candidate to be entered in the federal endangered species list. Plummeting numbers of the species in New Mexico during the 1990s raised some concerns, and the bird was recommended for the endangered species list, but it failed to make the list in 1996. Moreover, farmers, ranchers and oil and gas developers expressed concerns about the bird making it on the list. They argue that

state listing of the Lesser Prairie-chicken on the endangered species list could negatively affect their industries (Smalling 2001).

Beyond any shadow of doubt, the Lesser Prairie-chicken is facing an uphill task with respect to its continued survival. Many are the factors both natural and human-induced which prevent the growth and successful development of larger populations of the species. As Schafer (2001,1) posits: "Lesser Prairie-chickens aren't booming, but the birds do continue 'booming' on the High Plains." During the lekking season, cocks court females by enacting colorful displays while simultaneously making gobbling or booming vocalizations. These sounds can sometimes be heard a mile or more away (Bounds 1997; Mote et al. 1998; Bain and Farley 2002). Intensity of this performance heightens when hens are on the lek (Mote et al. 1998). It may very well be that the 'booming' could be the ticket to getting the bird the attention it deserves towards its preservation on the High Plains.

Resource Characteristics: The Inherent Value of the Lesser Prairie-chicken

Tourism is not the panacea or the ever-present solution to solve difficult scenarios such as the dire situation with the Lesser Prairie-chicken. However, tourism activities in areas where the species is still present could greatly enhance not only the economic position of such communities but also stake a claim for the promotion of the Lesser Prairie-chicken and its continued survival. The lekking behavior of the Lesser-Prairie chicken could very well be one of its characteristics for attracting tourists. Dunne (2004, 20) describes the experience: "A seat in a blind by a lek in Canadian, Texas: \$75. The booming of a Lesser Prairie-chicken: priceless." In the same vein, Lantz (2007, 44) opines that the Lesser Prairie-chicken "has found an unlikely ally in the rancher...few in this part of the world considered that outsiders might pay to watch birds, rather than hunt them."

Communities in the five southern states that are largely dependent on a single resource for existence, be it corn, wheat, or cattle, may fall prey to the ill effects of international pricing structures, disease, and market pressures exerted by supply and demand. Such communities may also suffer as a consequence of the total obliteration of primary activities when production factors change for the worse such as the probable drying up of the Ogallala aquifer or when mineral mines or gas and oil wells become uneconomical. In the world of business, especially in a market economy, the bottom line is what matters. When a community is dependent on a single resource for its existence Krannich and Lulloff (1991) warned that caution should not be thrown to the wind. Could the humble Lesser Prairie-chicken save the economy of such communities?

What is it that tourists desire to see? What is it about the Lesser Prairie-chicken that is so unique, and intriguing? What type of experience do tourists want to get from viewing the bird? An attempt to answer these questions is addressed in the account given by Johnsgard (2001, 1) about the Lesser Prairie-chickens of the sand sage prairies of Kansas (Garden City to be exact) as follows:

There was a bright moon in early April, and I approached the display ground, or lek, where I had already set up a small blind, almost an hour before sunrise. The males were already present on the ground, calling in a way that I might not have even recognized as coming from prairie-chickens if I hadn't already heard recordings of their calls. As darkness gradually gave way to dawn, it was evident that nearly 20 males were present, just as I had hoped. They paid almost no attention to the blind, except when camera sounds startled them. Their performance struck me as something resembling a choreographed drama that I had previously witnessed, but that now was being performed in an entirely distinctive manner, and on a very different ecological stage. The bird's movements were surprisingly fast and their aggressive cacklings were unusually high-pitched. The repeated threats made by males at their territorial boundaries were apparently mostly bluffs...I never saw an actual fight.

According to Youth (2000, 12) the tourist searches for the "intensity of fascination," to be held captive by a work of nature behaving in all its glory, to taste the essence of what is natural, and to embrace the feeling of what is wild. This growing fascination with wildlife appears to be a global phenomenon with large economic and ecological implications (Youth 2000, 12). How much value, then, should be tagged to a pair of Lesser Prairie-chickens? Many people would pay much money to see the return of the green Carolina Parakeet, the Passenger Pigeon, the Heath Hen, the Great Auk, or the Labrador Duck, but these species are now extinct because of habitat mismanagement and destruction. Cokinos (2000, i) penned these lines as a reminder:

There was a time when massive flocks of Passenger Pigeons blotted out the Sun, and bright green Carolina Parakeets were so numerous, that they looked, according to an early American pioneer, "like an atmosphere of gems." But these birds—as well as the Labrador Duck,... the Heath Hen, and the Great Auk—now live only as tantalizing but hazy legends.

In terms of the vulnerability of the species, Youth (2007, 5) adds:

The abundance of lekking grouse once seemed as unshakable as the plains and sagebrush ranges that stretched across the horizon. Ranchers, farmers, hunters, and birders still enjoy watching the early-morning spring rites of the lekking grouse that typify the wide-open range. But the performances play at fewer venues each year. Today, these birds seem to be riding an imaginary pendulum, one that could swing toward the heath hen and extinction, or toward an endless continuation of the "sex play" upon which these species depend for survival.

Will the Lesser Prairie-chicken suffer the same fate as the extinct birds discussed in Cokinos (2001)? Indeed the Lesser Prairie-chicken is in a very vulnerable state at the moment in light of the destruction of habitat, and the constant encroachment of irrigated agriculture on sand sage rangelands.

There is no doubt that the Lesser Prairie-chicken has some commercial value. In Kansas alone, a total of \$629,300 was realized in 1996 from bird-watching activities, which included the Lesser Prairie-chicken; the species was viewed on the Cimarron National Grassland, the Finney Range, and the Pratt Sandhills (Mote et al. 1998). What can communities do to create a particular climate around a particular species such as the Lesser Prairie-chicken? Through the sequence of awareness, interest, evaluation, trial, and adoption, residents in communities could present a united front to offset the destruction of the biome by establishing the species as integral to the survival of the community.

Recommended for the survival of the Lesser Prairie-chicken are Prairie-chicken days or Prairie-chicken festivals, with the inclusion of categorized competitions with respect to Prairie-chicken dances, costuming, art, booming, poetry, song, prose, photography and parades. These may stimulate a community's economy as well as give the clarion call to preserve the species. In view of such type of activities, Youth (2007, 1) gave an example:

Native Americans...emulated the spring mating rituals of prairie-chickens on the North American plains with their wriggling, shaking, stomping, and feather-flipping prairie-chicken dance. Prairie-chicken dances held an honored place in many powwows, and—like the birds' displays—took place after harsh prairie winters. Mimicking the prairie-chickens, male dancers pranced around inside a circle, their female counterparts watching from outside the ring.

These suggestions may sound far-fetched, but just think about what the "Yellow Brick Road" did for Sedan, a small town in Kansas (Kansas Wildflower Society 2004; Straf 2007). Not surprisingly, there is now a Yellow Brick Road Festival in Sedan. There certainly could be a Sagebrush Festival with the Lesser Prairie-chicken as the mascot or centerpiece. An event of this nature, the annual High Plains Prairie Chicken Festival, first occurred at Milnesand, New Mexico in 2004 (Robb and Schroeder 2005). Creativity for such activity is a valued talent, and this means that a high degree of purpose and cooperation will be at stake for the creation of a product. The aesthetic value of the species could surface at such events. The Lesser Prairie-chicken is a thing of beauty, something to be photographed and filmed, something that is worth putting on canvas and something worth saving.

Programs of this nature require astute coordination and organization, as well as funding from corporate sponsors and other sources. Marketing the product must involve a well developed strategy. Such programs call for cooperation from all sectors, especially private landowners on whose holdings the Lesser Prairie-chickens can be found. Even though enabling such activity sounds like a great idea, there are social and political repercussions, and ensuing conflict and uncertainty when ideas of this nature are bandied about. Nevertheless, events of this nature bring money into the community via fuel sales, food sales,

souvenir purchases, lodging, and other taxes such as trespass fees.

Despite the fact that Lesser Prairie-chicken numbers are dwindling in Kansas and Texas, the hunting of Lesser Prairie-chicken is still legal. According to Pearce (2010), the only state with a season for hunting Lesser Prairie-chickens is Kansas. In Kansas, the revenues from hunting the Lesser Prairie-chicken amount to close to \$200,000 annually. In 1996 and 1997, the hunting season for Lesser Prairie-chicken in New Mexico was suspended (Arritt 1998). It is accepted that one of the resource characteristics of the Lesser Prairie-chicken is sport in the form of hunting (Arritt 1998; Mote et al. 1998). However, it must be understood that in light of all the forces which stand in opposition to the survival of the species, there should be a moratorium on hunting in all five states for at least five years. This author is not averse to the hunting of the Lesser Prairie-chicken, but allowing a little window of time for the animal to regain a better population status is advisable.

The soil that sustains agricultural production in the present was produced by the interactions of fauna and flora working in tandem with the physical environment in the past. It is more than a measure of arrogance to ignore the Lesser Prairie-chicken as integral to the smooth harmony in the biological workings of the High Plains. The presence of the Lesser Prairie-chicken is an indicator of the health of the ecosystem because it facilitates biological control of other species of animals such as grasshoppers, beetles and treehoppers (Taylor and Guthery 1980; Mote et al. 1998). Although the literature does not provide any evidence of the daily quantities of insects in terms of weight that are eaten by Lesser Prairie-chickens, Mote et al. (1998, 10) described the general biological role of Lesser Prairie-chickens as they relate to the High Plains as follows:

The prairie has value that exceeds the sum of the values of its individual species. By living, eating, excreting, moving about and dying, Lesser Prairie-chickens contribute to their prairie ecosystem through seed dispersal, recycling, transport and concentrations of nutrients and providing a food source to predators and scavengers. If the prairie ecosystem has value, its value must be diminished whenever ecosystem components are lost through extirpation or extinction. To paraphrase Aldo Leopold (1949): "The first rule of intelligent tinkering with productive ecosystems is to save all the parts."

Recent Developments and Concluding Remarks

The great philosopher Jean Jacques Rousseau once said that if we reverse the usual practice we might almost always do right. However, unless there is some real reason, be it political, social, economical, or otherwise, to abandon the resource development processes and irrigated fields of the High Plains, there will not be any reversal in the decimation of the Lesser Prairie-chicken. In the psyche of many Americans, development means removal of native grassland for replacement by cropland, road building, irrigation, electrification, telephonization, and resource mining. Structures are erected adjacent to Lesser Prairie-chicken

habitats, which serve as perches for predators such as hawks and owls (Bounds 1997). Grazing cattle also damage nesting sites and leks (Taylor and Guthery 1980). In Power Engineering (2008, 112) it was recorded that in Oklahoma, Lesser Prairie-chickens would keep their distance from wind turbines and will not breed amongst the installations. The article further states: "Maps of wind power potential overlap almost exactly with the Lesser Prairie-chickens' Oklahoma habitat. Eighty-seven of the 96 known Lesser Prairie-chicken breeding circles in the state are within five miles of 'excellent' wind farm territory."

Coupled with all the factors that work against these birds, seasonal hunting continues to reduce numbers. Can anything be done to stem the tide of the slaughter of the birds and the destruction of their habitat? We must remember that without substantial numbers of the birds, the tourism effort will go for naught in rural communities. It is quite possible that at the rate of decline of the Lesser Prairie-chicken the sensitive balance of the High Plains ecosystem could be well out of alignment. Only time will tell.

However, all is not lost. There is some good news. In recent times, certain steps were considered to avert the disaster of the bird's extinction. Arritt (1998, 3) states: "Overwhelming scientific evidence suggests that the Lesser Prairie-chicken is biologically threatened in a significant portion of its historic range." In view of this, Marie E. Morrissey, a biologist based in Boulder and Denver, Colorado, petitioned the U. S. Fish and Wildlife Service (USFWS) to list the bird under the endangered species act (ESA). Morrissey, cited in Arritt (1998, 3) opines: "The bird must receive statutory protection before this unique species becomes extirpated from its entire range and we lose the opportunity to recover [it] in the wild." Morrissey's valiant effort to save the species from extinction led to some positive steps. A salient aspect in this regard was that in 1996 the Lesser Prairie Chicken Interstate Working Group (LPCIWG) was inaugurated. This new group operates in a state partnership program with the states of Colorado, Kansas, New Mexico, Oklahoma, and Texas to enhance the welfare of the species. Decisions regarding the bird are done in conjunction with the United States Forest and Wildlife Service (USFWS), the Forest Service, the Bureau of Land Management (BLM), businesses and individuals from the private sector. The goal of the group according to Arritt (1998, 4) "is to develop a regional conservation plan that will ultimately reverse the decline of the Lesser Prairie-chicken before it is too late."

In light of this, property owners in Oklahoma and Kansas are cooperating to increase the number of Lesser Prairie-chickens (Grass & Grain 2003) in the area. A grant in the sum of US\$100,000 to the Comanche Pool Prairie Resource Foundation (CPPRF) has been recently approved by the USFWS to assist with prairie chicken habitat restoration. Around 7,000 property owners in southern Kansas and Northern Oklahoma comprise the CPPRF. Property owners have the opportunity to apply for funds from the CPPRF to help with habitat restoration, part of which is the removal and destruction of red cedar trees in pastures. Removal of cedar trees on grazing land will greatly

enhance Lesser Prairie-chicken habitat (The Associated Press 2001; Grass & Grain 2003).

Concomitant with all the ideas projected to keep the decline of Lesser Prairie-chickens at bay, a serious program concerning all aspects of the species and its management in terms of sustainability should be immediately woven into the curricula of schools, at least in the five states where Lesser Prairie-chickens are found. Elementary, middle, and high schools should embark on a strategy in their environmental science modules to educate students about the ecology of this animal through the USFWS, agricultural extension services, hunting associations, the Audubon Wildlife Society, and birding societies.

A statement uttered by Chief Seattle will convey my true feelings about this wonderful creature: "What is man without the beasts? If all the beasts were gone, men would die from great loneliness of spirit, for whatever happens to the beasts also happens to man. All things are connected. Whatever befalls the earth befalls the children of the earth" (Nerburn and Mengelkoch 1991, 2).

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The rise and fall of Winnipeg's modern project (1958-1972): causes and failures

Joshua Warkentin

University of Waterloo, Waterloo, Ontario, Canada
newbedlamalumni@hotmail.com

Marc Vachon

University of Winnipeg, Winnipeg, Manitoba, Canada
m.vachon@uwinnipeg.ca

Abstract

This article focuses on a second-tier city proposal of a modernist urban renewal project: that of Winnipeg. Our objective is to illustrate how the *Metro Plan of 1969* would have transformed the downtown into a 'modern metropolis' and explores the numerous causes for its failures. The first section consists of an overview of Winnipeg's urban planning history from 1958-1972. Section two examines the main objectives and components of the *Metro Plan* to illustrate the radical transformation which it was aiming to accomplish in order to 'modernize' downtown Winnipeg. The analysis of the *Metro Plan* concludes with an overview of the causes which led to the plan's subsequent abandonment by the City of Winnipeg. In doing so, the plan's legacy is considered, as are the effects that the *Plan* may have had on the downtown had this modernist urban renewal project been undertaken.

Keywords: modern metropolis, City of Winnipeg Metro Plan, urban renewal, modernist

Introduction

For Canada's urban centres, the 1960s was the era of the bulldozer and construction crane. Flush with resources from a decade of un-paralleled economic growth and government funding, cities aggressively sought to modernize both their infrastructure and image. To do so, civic leaders focused primarily on revitalizing their decaying downtown and surrounding inner city neighbourhoods. Guided by comprehensive renewal plans, cities cleared these areas to build high density housing and commercial developments, open and recreational space and transportation infrastructure such as freeways, street expansions and public mass transit. The central business district was also cleared to make way for the construction of massive office tower complexes, public recreation facilities and public infrastructure. Such drastic changes in the CBD were undertaken in part to help reaffirm the centrality of city commercial sectors.

This was certainly the case for Toronto and Montréal. Seeking to claim their spots as the country's economic hubs and major players on the global level, both cities aggressively modernized their inner cities using modern renewal techniques. Urban

renewal emerged in recognition of the fact that the housing stocks of many Canadian communities were old and in some case in need of major repairs. This situation also affected old factory and warehouse buildings and many other industrial sites in need of repair. Thus, urban renewal was a strategy to redevelop downtown in order to end the exodus to the suburbs and modernize the housing stock. In many cases, once these 'blighted' housing areas were razed the land was deemed more important for commercial value than residential value (Rose 1958; Gans 1969). Not surprisingly, urban renewal became highly unpopular due to the fact that in many cases, from Montréal to Halifax, it caused the displacement of residents and the destruction of close-knit neighbourhood units and communities. In Montréal, the development of its CBD was characterized by massive office tower complexes such as Place Ville Marie and Place Bonaventure and the underground pedestrian concourses (Marsan 1994). Accompanying these developments was the construction of a subway system, major highways such as Décarie Boulevard, and high-density housing blocks. As history shows, this process re-

quired the destruction of historical buildings and public space and, more often than not, the eradication of viable and vibrant neighbourhoods. Although much focus is placed on the Toronto and Montréal renewal programs, the desire for modernization spread far beyond Canada's two largest cities (Hodge and Gordon 2008). According to the CMHC, by 1969 more than fifty different cities had created comprehensive renewal schemes. Of these fifty cities, approximately thirty actually implemented a portion of their scheme's recommendations. One of these 'secondary city' renewal plan's was the *Downtown Development Plan (1969)*, created by Dr. Earl Levin, the head of the Metropolitan Corporation of Greater Winnipeg's Planning Division as a way to transform downtown Winnipeg's blighted and decaying image into a modern and cosmopolitan one over the span of twenty years. The downtown area of Levin's plan is similar to the one of today; it is the area bounded by Notre Dame Avenue, Main Street, the Assiniboine River, Memorial Boulevard and Colony Street. The *Metro Plan*, as it will be referred to, represented the most stunning and comprehensive renewal effort the City of Winnipeg or Metropolitan Corporation had attempted to date.

To accomplish the transformation, the *Metro Plan* called for 400 acres of the traditional downtown to be rebuilt based on five important elements. These elements included high-rise residential towers, public parking facilities, open and green space, public recreation facilities and an elevated skywalk system. By investing \$161 million dollars in public facilities and amenities, the Metropolitan Corporation expected that the downtown would lure 75,000 residents from the suburbs and help fill many of the downtown's empty lots with commercial activities. The population decline of Winnipeg's downtown from 1941 to 1969 was remarkable. In 1941, Winnipeg's downtown had a resident population of 15,567 and 25 years later, in 1966, the population had dropped to 8,706 (Metropolitan Corporation of Greater Winnipeg 1969, 6). In other words, in 25 years, the downtown population declined by 44 percent. In 2011 the population of the downtown is around 15,000 residents.

The large scale and dramatic recommendations of the plan were deemed necessary by the Planning Department due to the downtown's deep seated problems. Since 1945, the area had shed nearly 44 percent of its population, surface parking lots occupied 30 percent of the downtown, one-third of all buildings were in poor condition and nearly 20 percent of the downtown's commercial structures were vacant. (Metropolitan Corporation of Greater Winnipeg 1969, 19-22) The recommendations were also to be used to improve the overall image of the city's economic importance on a national and global scale.

Although the *Metro Plan* was heralded by many as the downtown's salvation upon its release in 1969, it was subsequently abandoned by the City of Winnipeg and the Metro Corporation less than two years later. While it may seem like just one of the city's many failed planning initiatives, the *Metro Plan* is of particular interest as it illustrates the currents of thoughts and processes found in the framework of post-war urban planning in Canada. Our objective here is to illustrate how the *Metro Plan* of 1969 would have transformed the downtown into a "modern

metropolis" and to explore the numerous causes for its failure. The analysis is therefore divided into three parts. The first section consists of a short overview of Winnipeg's urban planning history from 1958-1972 which is thought to have informed the 1969 *Metro Plan*. Section two examines the main objectives and components of the *Metro Plan* to illustrate the radical transformation which it was aiming to accomplish to 'modernize' downtown Winnipeg. The analysis of the *Metro Plan* concludes with an overview of the causes which led to the plan's subsequent abandonment. In doing so, the plan's legacy is considered in addition to the potential consequences for the downtown had this modernist urban renewal project actually been undertaken.

Winnipeg's Modern Project 1958-1972

During the post-war era, Winnipeg's inner city was characterized by a dramatic socio-economic transition which threatened its long-term viability. Faced with the promise of ample green space, cheap housing and infrastructure geared towards the automobile, many simply abandoned the crumbling inner city for the suburbs. As a result, neighbourhoods in the central part of the city were losing their population at a rapid pace with some posting losses as high as 25 percent (Metropolitan Corporation of Greater Winnipeg 1969).

In 1958, the City of Winnipeg established the *Board of Renewal and Revitalization*. The primary purpose of the *Board* was to identify areas within the inner city which either showed signs of blight or had the potential of decay. After identifying these areas, comprehensive renewal plans would be created to restore the neighbourhood back to health.

Despite being disbanded only three years later, the *Board of Renewal and Revitalization* managed to produce six reports on the socio-economic and physical conditions of the inner city and it identified three areas of significant blight: Lord Selkirk Park (Renewal Area 1), Logan – C.P.R. (Renewal Area 2) and the west bank of the Red River running from South Point Douglas to the C.N.R. east yards (Renewal Area 3) (Figure 1). It also recommended the creation of a large housing complex near Burrows Avenue and Keewatin Street to help reduce the shortage of healthy housing in the North End.

While its tenure was short, the impact of the *Board of Renewal and Revitalization* on the physical and planning environment in Winnipeg was immense. Using Toronto's Regent Park housing project as a template, the heart of Winnipeg's Jewish community was turned into the Lord Selkirk Project and changed the traditional neighbourhood environment (Silver 2006).

The Lord Selkirk Park Renewal Project was characterized by high densities, abundant green space, uniform land use and alterations of the existing street pattern. Likewise, the Burrows-Keewatin projects turned large portions of the North End into low-income row-housing projects. Despite receiving critical praise at their inception, both projects are now considered to be among the worst planning mistakes in the city's history.

However, the *Board's* most important contribution was its use of modernist planning theory to guide the recommendations of its renewal plans and reports. The theory's foundation was



Figure 1: Board of renewal and revitalization: downtown renewal area. Source: Murray V. Jones & Associates 1969 *An Economic Evaluation of the Metropolitan Corporation report "Downtown Winnipeg"* (Winnipeg, MB)

based on the belief that the problems of the post-war city were caused in large part by the *laissez faire* planning practices of the 19th and early 20th centuries. To rectify the situation, modern planners would have completely cleared away the existing built environment and replaced it with one based on rational and scientific principles. As a result, the modernist landscapes were characterized by a number of key features: the separation of residential, industrial and commercial land uses, separation of vehicular and pedestrian traffic, rigid geometry, high densities and widespread demolition of the existing landscape.

The use of modern renewal practices in Winnipeg was a symptom of two underlying factors (goals): to modernize the inner city and do so in an efficient and effective manner. The latter was crucial, for time was of the essence given the fact that the decay of the inner city and downtown was seemingly accelerating with each passing year and municipal finances were at a premium. It was therefore considered much more efficient to clear away an entire neighbourhood in one fell swoop than to evaluate the physical condition of each house.

More importantly, by replicating the urban renewal practices found in Montréal and Toronto, officials hoped to change Winnipeg's image from that of a tired, industrial gateway city to one that was modern and cosmopolitan. Thus, by replacing the decayed and crowded housing with new freeways, row housing and high-rise apartment blocks, Winnipeg was to become known as the 'City of the Future.'

The Shift Downtown

Although several more comprehensive renewal plans were created by the Metropolitan Corporation during the early 1960s, none were solely focusing on the downtown. Despite the fact that it passed its renewal responsibilities to the Metro Corporation in 1961, the City of Winnipeg initiated major renewal activity to address the blighted business district. In 1965, the city began its work on the *Cultural Centre Renewal Scheme*, a renewal plan which sought to completely redevelop the entire Study Area 3 (see Figure 1). Budget constraints, however, forced the city officials to curtail its focus on the 180 acres immediately across from the newly constructed modernist City Hall.

Aside from removing blight from the study area, the objective of the renewal scheme was to ensure that the downtown would remain the region's primary entertainment and leisure hub. To do so, planners envisaged that the area would become home to a ballet school and performing theatre, a large museum and a concert hall. In addition, to help create a vibrant, 24-hour, year round attraction, these developments would be flanked by a pedestrian mall on Market Street, a sunken plaza with a fountain, an amusement park, underground parking, residential towers, a hotel and an underground commercial concourse. The attractiveness of the area was to be further enhanced by placing all of the parking facilities below ground and altering the existing street pattern to reduce the noxious effects from vehicular traffic.

Murray V. Jones Plan - 1967

Despite having the largest study area of any metro Winnipeg renewal plan to date, the *Cultural Centre Renewal Scheme* managed to cover only a small portion of the downtown core. In response, the Metropolitan Corporation announced it would begin work on a comprehensive renewal plan to study the remaining 400 acres of the area. Planners began work on the *Downtown Development Plan* in 1967 by undertaking a detailed physical and socio-economic survey of the downtown and hiring the Murray V. Jones & Associates consulting firm to study the constraints hampering renewal (Murray V. Jones & Associates 1969).

Although it was intended to be comprehensive, budget constraints limited the consultants to focus on only four key issues, including downtown land costs and taxes, problems caused by the new downtown zoning by-law and various institutional impediments such as the preference of single family housing over apartments. In addition, the firm was given the task of creating a conceptual renewal plan to help guide the efforts of the team of the city Planning Department.

Due to the city's modest growth rate, Jones and Associates could not rely on renewal practices used by other cities such as Montréal, Toronto or Calgary. Whereas Montréal and Toronto could rely on corporate head offices to fill vacant land and parking lots, the demand for office space in Winnipeg was simply too low to have any noticeable effect. Similarly, the population growth experienced by Canada's two largest cities ensured that residential growth would eventually spill from the suburbs into the downtown. By adding only 8,000 people every year, Win-

nipeg simply did not have enough residential growth for any to spill-over from the suburbs into the downtown.

As a result, Jones and Associates proposed that the only way to redevelop the downtown's empty spaces was to fill it with medium and high-density housing. To create a vibrant environment which could effectively compete with the suburbs, the plan argued that the population of the downtown should range from 50,000 to 75,000 residents. However, due to the city's slow growth, it was estimated that nearly one-third of all the housing units constructed in the metropolitan area between 1968 and 2000 would have to be constructed downtown (Murray V. Jones 1969, 17).

To attract both investors and residents back downtown, Jones and Associates abandoned modern renewal theory and instead relied on the 'neo-urban' principles to guide its renewal of the area. Seemingly influenced by Jane Jacobs' urban critique, the *Murray Plan* sought to balance the needs of the pedestrian and automobile and in turn help create a more inviting and exciting street environment. It would do so by encouraging new developments to feature mixed land uses, street oriented commercial activities, and reduced floor space ratios. The current ratio, which was nearly two and a half times that of Toronto's, was perceived to be detrimental to the street environment by reducing the amount of sunlight hitting the street, the loss of a human scale and the creation of a wind tunnel, and other undesirable characteristics. To avoid such degradation, the plan recommended that the majority of high density structures fall between four and ten stories, with the former placed immediately adjacent to any public open space.

To further help improve the attractiveness of the area, the *Murray Plan* also sought to dramatically increase the amount of green and open space in the downtown. In addition to the proposed riverbank park system, the plan proposed constructing a pedestrian mall, urban plazas, pocket parks and a shared boulevard. These elements were to be connected to each other via 'fingers' of green and open space which would begin at the riverbank parks and crisscross through the downtown. To compliment these public spaces, the plan placed a large number of residential, cultural, commercial, entertainment and educational facilities.

The only areas to remain relatively untouched by Jones and Associates were the commercial functions of Portage Avenue and Broadway, which the proposal called relatively stable. To accommodate the modest growth expected for these functions, the plan made room adjacent to these areas for the expansion of office activities and the creation of parking structures.

The Downtown Development Plan - 1969

In the late 1960s, downtown Winnipeg was experiencing a building boom not seen since the beginning of the 20th Century. None of the projects were more anticipated than the Metropolitan Corporation's *Downtown Development Plan*, released in 1969. Although the plan's goal was identical to those of previous renewal efforts, it was the way in which city planners would attempt to fulfill their objective which stirred the hopes and ex-

citement of the community. Even Metro's most vocal detractor, Winnipeg Mayor Stephen Juba, exclaimed that with this plan, "Winnipeg would become a 21st Century city....a city of the future' (Burley 2006, 46).

The *Development Plan* would create this futuristic city primarily by rebuilding the existing built environment and replacing it with one which was deemed modern, progressive and cosmopolitan. This new downtown was to be vibrant and exciting — a self-sustaining 24-hour, and year round utopia unlike anything seen not only in the prairies but in all of Canada. Using Montréal's renewal program as an example, and in particular the Expo 1967 as a template, Winnipeg's modern downtown was to be comprised of five core elements including high-rise residential towers, public parking facilities, an above grade system of enclosed walk-ways, public open and green space and recreational facilities such as an aquarium and conservatory.

Taking heed of the *Murray Plan*'s recommendation, Metro planners aimed to increase the downtown's population from just over 10,000 in 1968 to over 75,000 in twenty years. According to the *Development Plan*, such a large population was necessary to help stimulate demand for commercial and retail uses. These activities were seen not only as a way to provide amenities for residents but also as an inexpensive way to fill the empty and under-utilized spaces which were making the area unattractive.

Although not explicitly stated, the plan called for developers to take full advantage of the city's high floor space ratio. Real estate companies were expected to build residential towers ranging in height from twelve to twenty-two stories as part of comprehensively designed complexes which would encompass entire square city blocks. In addition to having a minimum of 1,000 residential suites, these complexes were also envisaged to house commercial, retail and recreational uses on their lower levels.

The increase in the area's population was expected to come not from a large influx of new residents to the region, but also by capturing a significant portion of Winnipeg's growing demand for apartments. This growing demand was created in large part by the increasing number of childless adults, seniors and young adults under the age of 25 within the Winnipeg metropolitan area. These population cohorts, the first wave of the Baby Boomers generation, were crucial to apartment demand as they either could not afford to live in a detached suburban home or simply preferred the lifestyle an apartment afforded (Metropolitan Corporation of Greater Winnipeg 1969, 69). Thus, these two factors help explain why the number of new apartments constructed in 1968 was nearly three times greater than the number of new single family units constructed that year (Metropolitan Corporation of Greater Winnipeg 1969, 66).

But in order to capture this portion of the apartment market, the downtown's physical and investment environment would have to be dramatically improved. One of the most pressing problems identified by the plan was the large amount of surface parking in the downtown. Although surface parking occupied almost 30 percent of the downtown's surface, much of it was considered to be inconvenient, particularly in winter months. As a result, the large amount of parking in combination with its

poor location was deemed to be one of the causes of the lack of vibrancy of the downtown while simultaneously imposing a heavy toll on the aesthetics of the area. The *Development Plan* also recognized that the high cost of providing tenant parking was reducing the attractiveness of constructing real estate in the downtown. To help ease the burden of high parking costs as well as eliminate the need for surface parking, the second element of the plan was the construction of a comprehensive system of publicly-funded parking structures.

Managed by an independent public authority, these parking garages were to be integrated as a secondary use in newly constructed office towers and public recreational facilities. By placing these structures on the lower levels of these buildings, Metro planners attempted to place every structure in the downtown within 1500 feet of parking and to remove the blight associated with surface parking. More importantly, by providing residential parking within these facilities, residential developers were relieved of the cost associated with providing tenant parking. By reducing the risk and cost of construction, it was assumed that the downtown would not only become more economically competitive with the suburbs but that the overall cost of renting would decrease as well. The latter was deemed particularly important in achieving the plan's population target and increasing the area's economic and social diversity.

To offset the discomfort created by Winnipeg's extreme climate, the *Development Plan* called for the creation of an elevated, weather-protected system of pedestrian corridors. While concerns for pedestrian comfort were significant for Metro planners, so was the need to move vehicular traffic efficiently and quickly through the downtown's street network. By moving traditional retail and social activities off the street and into the elevated corridor network, interference caused by pedestrians would be reduced. Since these corridors were designed to replicate the traditional activities of the street, the walkway system was conceived as a public space to be owned and operated by the city as part of its regional street system. To discourage pedestrians from using the street during warmer months, the *Development Plan* sought to establish 'the second story habit' through creative design elements, flanking the corridor with commercial and retail activities and by placing public attractions above these corridors. By forcing patrons to move through the corridors to get to their destination, Metro planners expected that pedestrians would not only enjoy the atmosphere, but prefer it to the street below (Metropolitan Corporation of Greater Winnipeg 1969).

According to physical surveys conducted by the Metro Planning Department, only 10 acres, or 2.5 percent, of the downtown was devoted to green or recreational space; in contrast, nearly 30 percent was devoted to surface parking. Consequently, the *Development Plan* made the creation of open and green space one of the major elements in its vision of a modernized downtown. The rationale for doing so was based on the assumption that these amenities would increase the appeal of the area and therefore attract investors, visitors and residents to the area. Although it was assumed that either the City of Winnipeg or the Metropolitan government would be responsible for the maintenance of these spaces, developers were nonetheless expected to

not only set aside room for this amenity but sell it to the public parks authority for one dollar.

The design and form of these public spaces was to take two forms, half of which would be devoted to open air gardens and plazas and the remainder to a series of winter garden conservatories. These enclosed green spaces were designed to help provide residents with a lush escape from the bitter winter weather and, more importantly, a chance to reconnect with nature and one's spirituality. Access to these public areas was provided by the elevated pedestrian corridors to ensure year round comfort and to keep people from using the street below.

The final element of the *Development Plan* was the construction of public recreational facilities in key locations throughout the downtown. Some of the proposed facilities included a conservatory, aquarium, enclosed skating rink, swimming pool, a regional library and a convention centre featuring a botanical garden. Metro planners placed a high emphasis on creating these amenities due to the belief that, if properly developed, such assets could act as catalysts for growth and in turn create a profound change in the character and attractiveness of the area.

In applying these elements, the *Development Plan* chose to concentrate them in two areas rather than disperse them as had past renewal efforts. By concentrating approximately \$169 million in the Broadway–St. Mary and the Ellice–Cumberland sectors over a twenty year span Metro planners hoped to transform these areas into catalysts for future downtown development (Figure 1). While both renewal areas were small, it was expected that their success would not only spur development in the surrounding areas but would also influence the architecture and layout of these developments. Despite incorporating all five elements in each renewal sector, their applications and orientations were varied in each sector.

Sector One: Broadway – St. Mary

The primary organizing features of the Broadway–St. Mary Sector were the traffic arteries which surrounded and ran through the renewal sector (Figure 2). To provide easy access for visitors and to shelter residents from the noxious effects of traffic, non-residential buildings were placed primarily along these major traffic arteries while residential buildings were placed between them on lower priority streets.

These non-residential buildings, which were to occupy an entire city blocks, would be constructed with public funds and contain the parking, shopping, recreational and entertainment facilities required to make the downtown attractive. Each building was to house the recreational facilities (such as the aquarium and conservatory) on its upper level while the pedestrian corridor and commercial shops would sit immediately below it. At street level, the building would house a multi-level parking garage providing access to the corridor network and recreational facilities. The vertical placement of these functions was meant to ensure that residents and visitors became accustomed to using the corridors instead of the sidewalks.

Although the *Development Plan* provided flexibility on the arrangement and appearance of the residential structures which were to occupy the space between these public amenities, there

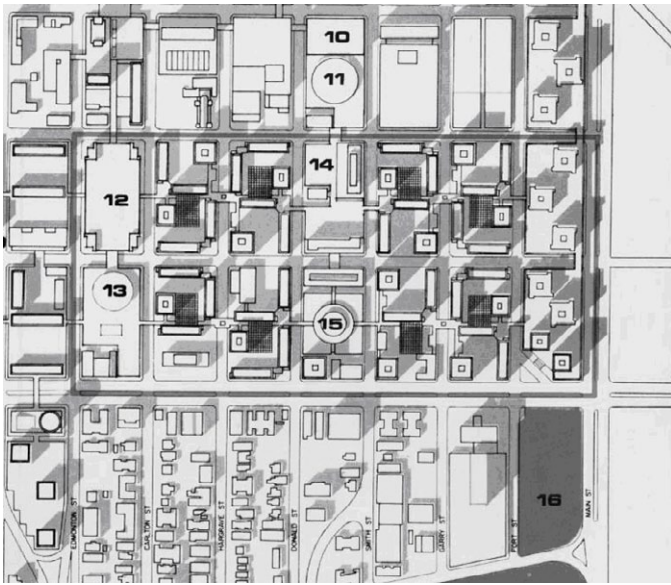


Figure 2: The Broadway – St. Mary Sector. Source: Metropolitan Corporation of Greater Winnipeg 1969 Downtown Development Plan Section 10, Plate 16 (Winnipeg: Metropolitan Corporation of Greater Winnipeg 1969)

were nonetheless a number of stipulations. Metro planners expected that developers' projects would encompass entire city blocks and maintain a minimum density of 1,000 suites per block. In addition, developers were expected to set aside space for the pedestrian corridors and a public green or open space. These open areas, which were to be transferred to the Metropolitan Government, would be transformed into public parks and winter garden conservatories. The latter were designed to provide a year round "oasis of verdant foliage, colourful flowers, open pools and playing fountains" in the midst of the harsh Winnipeg winters (Metropolitan Corporation of Greater Winnipeg 1969, 56). In most cases, these open spaces were placed in the middle of the block and surrounded on three sides by apartment structures.

With growing interest in a downtown convention centre, the plan also included architectural renderings to show how such a structure could fit within the sector and influence development outside of it. One of the most unique features of the convention centre was the conservatory restaurant above the pedestrian corridor. Featuring a lush décor of plants, flowers and reflecting pools, the restaurant was designed to provide Winnipeggers another escape from the winter and surrounding prairie environment. As with all such developments, the purpose of the convention centre was not only to provide a catalyst for future growth but to help establish Winnipeg as an emerging centre of commerce.

To help celebrate the city's diversity, Metro planners created the 'Avenue of the Nations' on York Avenue between Main Street and Edmonton Street (Figure 3). Although it was designated as a major thoroughfare in the downtown, the *Development Plan* nevertheless transformed it into a processional avenue and

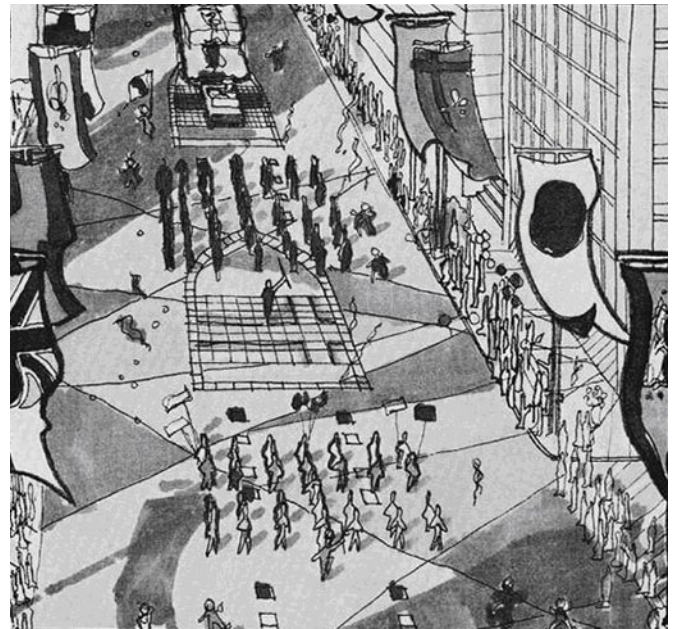


Figure 3: A ceremony on the Avenue of the Nations. Source: Metropolitan Corporation of Greater Winnipeg 1969 Downtown Development Plan, n.p.n. (Winnipeg: Metropolitan Corporation of Greater Winnipeg 1969)

envisaged that it would host a number of cultural festivals and parades during the summer months. Between these activities the street would continue to promote diversity by emblazing twelve different coats of arms into the pavement, each representing one of the city's dominant ethnicities.

Sector Two: Ellice-Cumberland

To redevelop this sector north of Portage Avenue, the Development Plan focused much of its effort on expanding two of the area's existing uses. The first called for the University of Winnipeg to expand its campus onto the former St. Paul's College site at Ellice Avenue and Balmoral Street. It was expected that by introducing a large concentration of staff and students to the area, demand for housing, shops, entertainment and other services would increase and therefore stimulate new construction.

In addition, the *Development Plan* also called for Central Park to be expanded south of Ellice Avenue and its landscaping and amenities to be modernized (Figure 4). Though the park was intended to act as a catalyst for high-density residential towers along its perimeter, its renovation and expansion was also designed to provide the area with a world class recreational amenity. Citing examples such as New York City's own Central Park, the plan argued that the renewed park would give the downtown the charm and character it needed to compete with the suburbs and other Canadian cities for investment.

The plan also contended that Central Park could serve as a major tourist attraction for the metropolitan region and Canada itself. While the park was designed to provide year round activities, Metro planners envisioned that its greatest potential lay in its winter uses (Figure 5). The highlight of these winter activities was to be a winter fair which was to feature "ice sculptures,

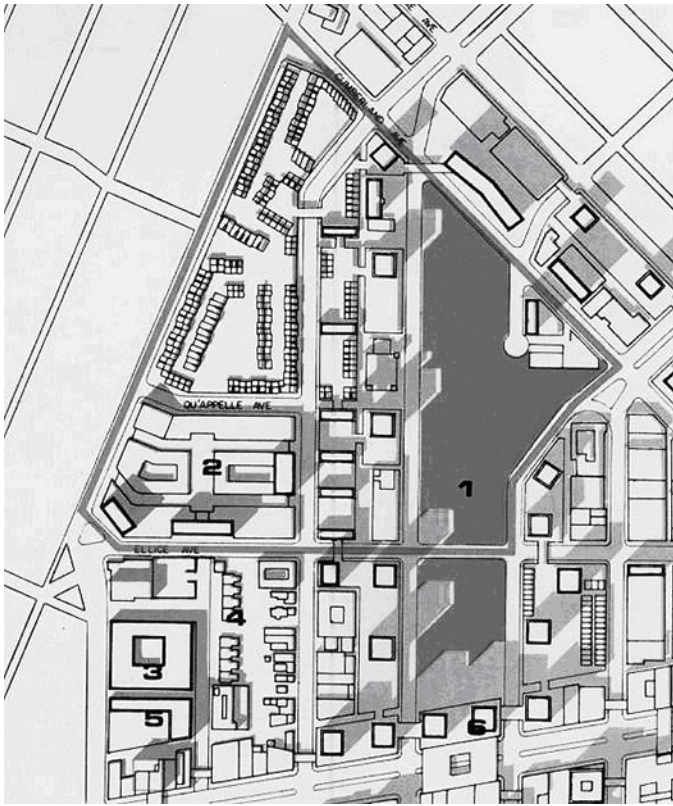


Figure 4: The Ellice – Cumberland Sector. Source: Metropolitan Corporation of Greater Winnipeg 1969 Downtown Development Plan Section 10, Plate 16 (Winnipeg: Metropolitan Corporation of Greater Winnipeg 1969)

torchlight parades, snow events and outdoor dancing and barbecues.” (Metropolitan Corporation of Greater Winnipeg 1969, 84). Such a festival would be so great, the plan stated, that it would overtake Quebec City’s Bonhomme Winter Festival in terms of its attractions and vibrancy.

Other Recommendations:

Although the *Development Plan* provided public funding for the redevelopment of the two renewal sectors, it nevertheless created a conceptual plan for the rest of downtown. Some highlights of these recommendations include the creation of a riverbank park system, an entertainment district near Notre Dame and Ellice Avenue, the development of mixed use structures on the north side of Portage Avenue, a new downtown library on Graham Avenue and the transformation of the row houses on Vaughan Street into specialty shops and restaurants to serve the expanded University of Winnipeg campus.

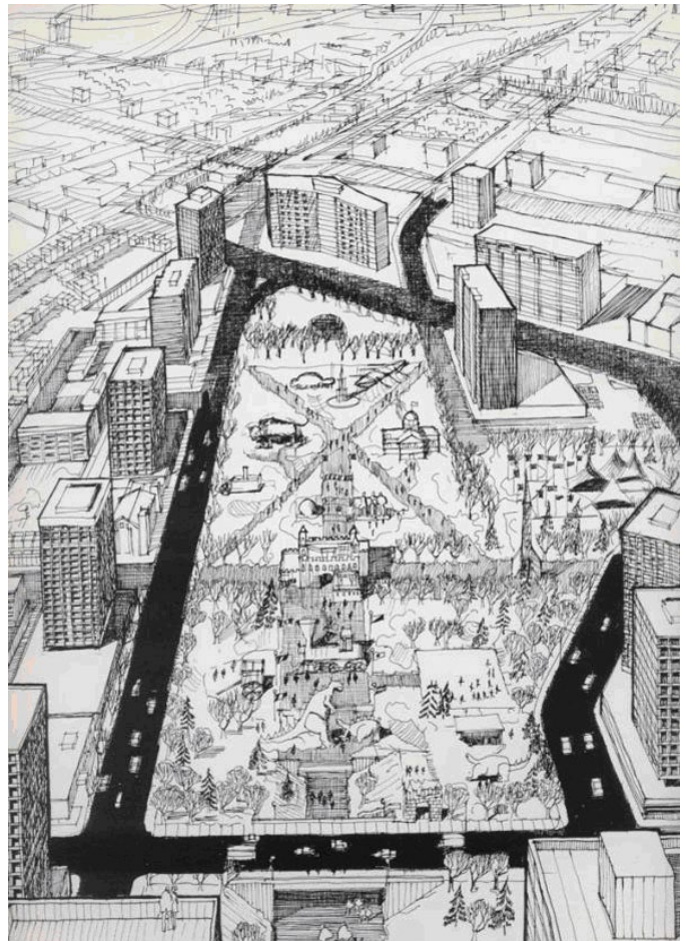


Figure 5: Ice sculptures in Central Park. Source: Metropolitan Corporation of Greater Winnipeg 1969 Downtown Development Plan Section 10, Plate 26 (Winnipeg: Metropolitan Corporation of Greater Winnipeg 1969)

The Fall of Winnipeg’s Modern Project

Shortly after the Province of Manitoba accepted the *Development Plan* in 1969, Metro Planners set about implementing the plan’s recommendations in the Broadway – St. Mary Sector (Figure 2). With funding from the provincial and Metropolitan governments, and also the Federal government, construction for a state of the art convention centre commenced in the spring of 1970 at the corner of York Ave and Carlton Street. Not long after, Lakeview Properties announced that it would start construction on a massive development adjacent to the Convention Centre. Lakeview Square, as it was billed, would feature open space and a Japanese garden which was to be surrounded by two high-rise residential towers, two office towers and a first class hotel. A second-story skywalk was designed to provide a weather-proof connection to each building and the convention centre. Subsequent additions to the skywalk soon enabled residents and visitors to walk to various points throughout the downtown in a comfortable, climate controlled environment. The skywalk system continues to be a popular idea even today with its most

recent expansion connecting the convention centre to the City Place shopping mall.

Although Metro's public investments had altered a large portion of the downtown and brought private investment capital into the area within a short period of time, the *Development Plan* failed to maintain the enthusiasm it received during its initial release. In addition to being vocally derided by Mayor Juba at every possible occasion, the demise of Winnipeg's largest comprehensive renewal plan was also caused by a number of local and national socio-economic and political events which unfolded during the early 1970s.

One of the most devastating of these events was the beginning of a long and deep lasting economic recession in the early 1970s. Due to the nature of the city's size and economic status, the majority of the *Metro Plan's* proposed mega-block real-estate developments were to be funded by national and international real estate firms. During the economic boom of the 1960s, it was possible for Winnipeg to attract these firms as cheap credit reduced the risk of investing in Winnipeg's slow growth market. As interest rates rose steadily and the economy fell into recession, the risk of investing in Winnipeg was simply too high and many firms retracted fully from the city. With the local economy in tatters and the absence of outside capital, there was simply no will or money available to build the vision of the Metro's planners.

One must also point out that by the end of the 60's and early 70's there was a marked change in philosophy regarding how urban renewal should be undertaken. The focus was now on small projects, rehabilitation and restoration rather than big projects and the bulldozer approach which characterized urban renewal during the 50's and early 60's. Winnipeg's transformation to a city of the future did not fit this philosophical change in urban planning.

Conclusion

Had the *Development Plan* been adopted by the City of Winnipeg, it is difficult to know whether or not its goals would have been attained. Although it attempted to emulate the success of Montréal's underground city, it is difficult to predict whether or not Winnipeggers would have embraced the so-called 'second story habit'. Had the walkways failed to attract sufficient numbers of pedestrians, both the street and the enclosed spaces would have, in effect, become dead spaces. The result would have been opposite of what planners intended; rather than making the area more attractive, the modernist mantra of separating vehicular and pedestrian traffic would have created an even more hostile and unattractive environment.

While Metro planners believed that improving the downtown through public investments would help attract close to 75,000 residents from the suburbs, in hindsight it is apparent that such a figure would have been virtually unattainable. In order to achieve such a number, nearly one-third of all new apartments in the metropolitan area would have had to be constructed in the downtown, a number only an area-wide growth management plan could have accomplished. At the time, it was

highly unlikely that the 13 surrounding cities and towns, many of which were eventually amalgamated with Winnipeg in the early 1970s, would have ever allowed their residential and commercial growth to be siphoned into downtown Winnipeg.

But perhaps the most damning factor was the growing desire for residents to live in detached, single-dwelling houses in the suburbs. Although the construction of new multi-family buildings outnumbered new housing starts during the late 1960s, one of the primary reasons for this trend was the high cost of constructing new houses in the city. According to a study on housing (Murray, Jones & Associates 1969), the cost of constructing a new single family home in Winnipeg in 1968 was the second highest on the prairies. With few affordable housing options, those wishing to leave the dilapidated neighbourhoods of the inner city were forced into renting an apartment.

Although one cannot blame the demise of the *Development Plan* for the continued decay of Winnipeg's downtown, it is nevertheless interesting to note that the problems it sought to address 40 years ago are still present. Nearly 30 percent of the downtown is devoted to surface parking lots; abandoned buildings and vacant lots mar the landscape; most shops close after working hours and, most importantly, the image of the downtown remains one of crime, decay and empty streets.

If there is one lesson to be learned from this situation, it is that planners and politicians must carefully examine the benefits and possible repercussions that each new project will have on the downtown. Buildings cannot simply be seen in terms of how much tax they will generate, but also how they can complement existing buildings and improve the environment. As the *Development Plan* has shown, the easiest way to accomplish this frame of thought is to create a comprehensive master plan which sets guidelines on the design and nature of new developments. In the absence of such a plan, Winnipeg's renewal efforts have been characterized as being piecemeal and left strictly to market forces. In the rush to increase tax revenues, planners have catered only to the needs of investors and unwittingly helped contribute to the area's dysfunction. While numerous renewal projects have been heralded as being 'the saviour of downtown,' one needs to look only at the empty buildings and sidewalks on Portage Avenue to see that they have been anything but.

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An overview of destruction and recovery in the Mt. Mayon volcano region, Bicol, Philippines, resulting from lahars initiated by Supertyphoon Reming

Geoffrey A. J. Scott

University of Winnipeg, Winnipeg, Manitoba, Canada
g.scott@uwinnipeg.ca

Abstract

On November 30th 2006 the southern eye-wall of Supertyphoon Reming (aka Durian) crossed the Luzon coast close to Mayon Volcano at Legaspi, Bicol, with gusts up to 260 km/h. That day Legaspi recorded 466 mm of precipitation with the maximum hourly rainfall intensity at 3 p.m. reaching 135 mm. Reming continued across Mt. Mayon where orographic effects augmented these rainfall totals. Winds buckled hydro pylons, flattened wooden structures, and damaged coconut plantations. Flooding caused rivers to undermine river banks while rice irrigation channel overflow damaged low-angle terraces. Most devastation and loss of life resulted from lahars initiated on the southern and eastern flanks of Mayon. So rapidly did they form and so extensive were they that many communities around Mayon's base were completely overwhelmed as lahars cut new paths and breached existing sabo structures (dikes). The number of dead exceeded 1,250 while tens of thousands were displaced. Post-typhoon lahar-mitigation and recovery included immediate steps to re-channelize ash filled river beds, the building of ash banks to redirect any subsequent lahars from the unstable slopes above and the building and repairing of concrete sabo dikes close to settlements.

Key words: *lahar, Supertyphoon Reming, sabo structures, Mt. Mayon*

Introduction

Natural disasters resulting directly from volcanic eruptions and indirectly from such activity as lahars (ash debris flows) are characteristic of the Pacific Rim (Neall 2007). The 1985 eruption of Nevado del Ruiz in Columbia melted part of the ice-field causing lahars to descend the surrounding valleys, killing 23,000 people, mostly in the town of Armero. The devastating eruption of Pinatubo in west-central Luzon in 1991 filled surrounding valleys with ash to depths often exceeding 60 m and for at least the following four monsoon seasons major lahars caused widespread destruction and death in the lowlands. The worst Pinatubo lahars developed in June 1991 when monsoon and typhoon rains joined to produce 780 mm of precipitation in one 24-h period (Neall 2007). Historically the Mt. Mayon region of the Philippines has also been particularly hard hit by lahars because of volcanic eruptions that produce ash deposits on steep volcanic slopes which may later become mobilized by heavy cy-

clonic rains (Orense 2007). As volcanic materials often develop into fertile soils capable of supporting highly productive plantations and rice, humans are attracted to lower volcano slopes and are placed in harms way during typhoon passage (Figure 1).

This paper reviews the circumstances surrounding the impact of lahars which were responsible for more than 1,250 deaths on the lower slopes of Mt. Mayon, that resulted from ash remobilization as Supertyphoon Reming (aka Durian) crossed south-eastern Luzon on November 30th, 2006. The paper focuses on lahar damage as well as the rehabilitation of drainage channels, and the construction and repair of sabo structures. Sabo is a Japanese term that generically refers to all engineering structures built in an attempt to control mass movements, flood waters and related events in order to reduce damage to infrastructure, farms, homes and humans (Fano et al. 2007). In the case of the Philippines most sabo engineering structures are lahar-confining concrete and ash dikes built to contain flows



Figure 1: Mayon volcano from one of the new lahars of 30 November 30, 2006, Guinobatan, Bicol. Large volcanic rocks, similar to those carried by the 1814 Cagsawa lahar, are clearly visible on the surface.

and protect populations in the lowlands below (Figure 2). Their construction is directed by the ‘Flood Control and Sabo Engineering Center (Department of Public Works and Highways)’, Pasig City, Manila, which receives both financial and technical assistance from the Government of Japan.

This paper concludes with a review of potential Mayon lahar damage mitigation in the future. The author first carried out field research around the base of Mt. Mayon in January 1979. Two additional field periods were carried out in February 2007, and January 2009, specifically to examine the aftermath of Supertyphoon Reming.

The Regional Setting

Mt. Mayon possesses almost perfect symmetry and is one of the most active composite volcanoes on the planet. It rises from sea level to a height of 2,462 m with a diameter of 20 km (Figure 3). Upper slopes are quite steep while slope angle diminishes in a very regular way with descent to sea level (Fano et al. 2007) (Figure 4). It is constantly degassing and has erupted violently 54 times in the last 400 years (Ramos-Villarta et al. 1985). Most eruptions involve large ash-cloud discharges, though pyroclastic and lava flows are also common, and magma composition is basaltic to olivine-bearing pyroxene andesite. Regionally the lahar event of November 2006 was the largest since a comparable event in 1814 when the Cagsawa church (Busay) was destroyed by a lahar following a major eruption (Ramos-Villarta et al. 1985; Paguican et al. 2009) (Figure 5).

Mt. Mayon’s upper slopes are bare rock or ash covered and, in descending order, are surrounded by *Miscanthus* grasslands, grazing lands, coconut plantations, and a mixture of low-angle rice terraces, and other agricultural field-crop activities including sugar cane and acaba (Manila hemp). Through this sequence run gullies of varying capacities and depths down which most lahars would flow when activated. A major variable is the un-

equal provision of ash following frequent pyroclastic discharges and the rate these new layers become at least temporarily locked in place by invading *Miscanthus* and soil profile development. New gullies can form when lahars overflow gully banks or encounter recent lava or lahar deposit barriers. Most Mayon lahar ash never arrives at the ocean directly, as on reaching gentler lowland slopes hydration levels decrease and they cease flowing. As these are the very regions where settlements are most common, the consequences are home and field burial and valley infilling. An effusive event from Mayon’s crater occurred in July-August of 2006 providing both fresh upper-slope pyroclastics and a major lava flow that required the temporary evacuation of 40,000 residents (Figure 6). This new ash later made a major contribution to the lahars initiated by Reming. Renewed ash and lava discharges began again in December 2009 when again over 40,000 people were evacuated to displacement centres (PHI-VOLCS 2009). As of 3 January 2010, rockfall events, volcanic earthquakes and sulfur dioxide degassing were continuing.

Control Measures in Place Between November 30, 2006

The Flood Control and Sabo Engineering Office of the Philippine Department of Public Works and Highways (DPWH-FCSEO) has responsibility for providing protection from flooding and debris flows in the Philippines and in the construction



Figure 2: A concrete dike constructed at Daraga in 2007-8 following major loss of life in the 30 November 2006 lahar event.

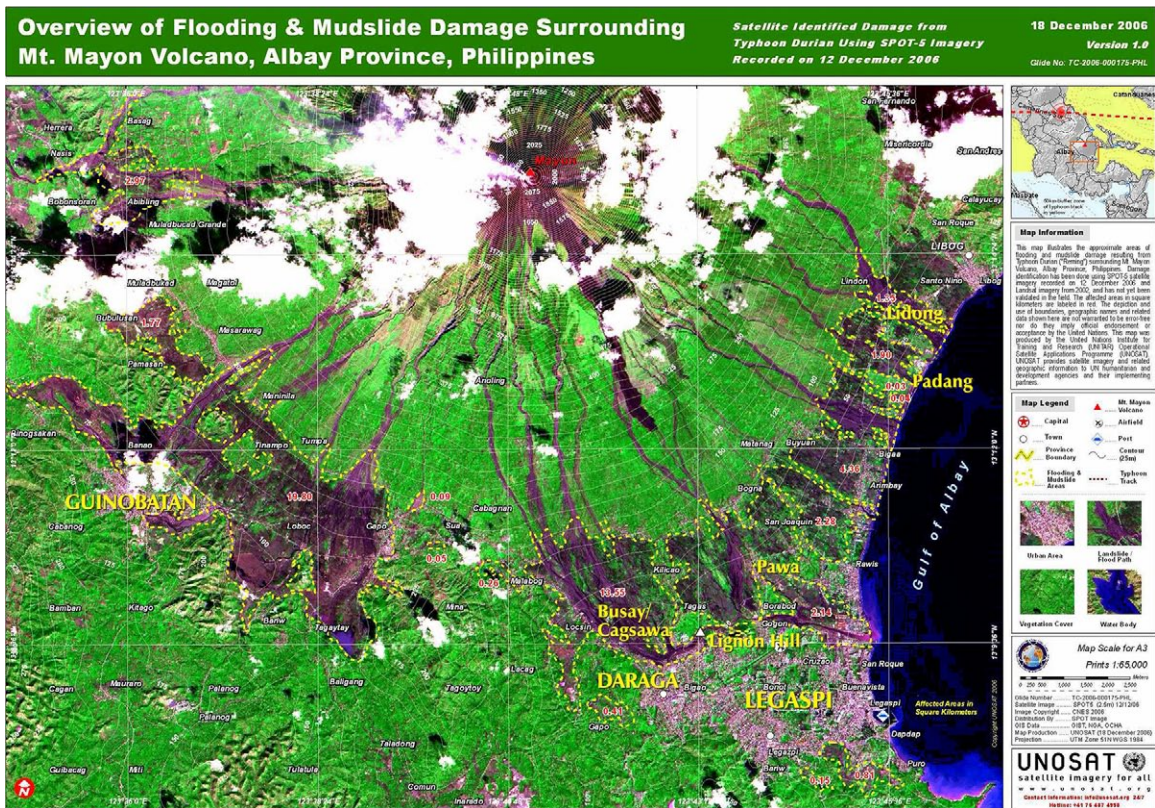


Figure 3: Satellite image of the area most impacted by typhoon Darian-initiated lahars, 30 November 2006. Image of 12th December, 2006 (UNOSAT 2006).



Figure 4: Mayon volcano viewed from Lignon Hill on February 15, 2007, eleven weeks after the devastation caused by typhoon Reming initiated lahars of 30 November 2006. A large grey-coloured lahar has filled the river bed and floodplain in the right portion of the photo while coconut plantation damage caused by typhoon winds is visible.



Figure 5: The belfry of Cagsawa church, Busay, left standing after the lahar episode of 1814. Large rocks carried by the 1814 lahar are clearly visible in the church yard.



Figure 6: Black lava flows of July-August 2006, as seen from Ligñon Hill. The deep gullies visible on the upper slopes were incised by the rains of supertyphoon Darien, 30 November 2006.

of new control structures and in highway protection (Fano et al. 2007). With the assistance of sabo engineers from the Japan International Cooperation Agency (JICA) two reports were prepared to help direct mitigation: 1) *Study on Mayon Volcano Soba and Flood Control Project (1978-1981)* and 2) *Study on Comprehensive Disaster Prevention Around Mayon Volcano (1998-2000)*. Based on the first study it was recommended that P2.1 Billion be spent on sabo structures over the following ten years. Unfortunately, so little money was released by the Philippine Government that sabo construction was deferred until 1984 when a renewed volcanic eruption and lahar episode created the impetus for construction and infilled-valley dredging to begin. With JICA financial and technical assistance sabo construction consisted primarily of ash/soil dikes (spur or ring dikes) designed to redirect lahars away from significant or populated areas. Ash core dikes were occasionally reinforced with thin steel bars and veneered with at least 4 to 7 cm of concrete. The simple dredging of lahar deposits from infilled valleys with the displaced fill being formed into dikes later also proved valuable. Where this was not done waterway banks were more easily overtopped (Fano et al. 2007).

Supertyphoon Reming and Lahars of November 30, 2006

North-west Pacific tropical storms and typhoons are particularly common between the months of September and December. In 2006 four Category 4 supertyphoons (winds > 210 km/h) crossed Luzon, each producing swaths of devastation. Reming developed into a typhoon on November 28th and reached supertyphoon status on the 29th before its eye crossed Legaspi, making an almost direct hit on Mayon the following day (Figure 7). Legaspi rainfall between 10 a.m. and 4 p.m. on the 30th exceeded 450 mm (PAGASA, 2006) with an hourly total at 3 p.m.



Figure 7: Track of typhoon Reming (aka Durian) in its passage from the western Pacific to the South China Sea, November 28 – December 3, 2006 (modified from Fano et al. 2007). Base map courtesy of Natural Earth.

reaching 135 mm (Figure 8). Orographic effects on Mayon undoubtedly augmented this, as earlier research had shown rainfall intensities at 600 m were normally enhanced at least two fold during typhoon passage (Rodolfo and Arguden 1991). While storm surge activity was easily predictable and coastal communities had ample warning, the onset of heavy rains was so sudden that warnings of impending lahar activity did not reach the general population quickly, a problem exacerbated by the collapse of the power grid caused by typhoon winds. Rivers initially filled with sediment-laden runoff and then lahars started flowing from the lahar-initiation fields on the upper slopes. These upper-slope *Miscanthus* grasslands had been anchoring the predominantly ash soils but started to become unstable as saturation and increasing mass caused overloading (Figures 9-11). Breaking loose almost in unison, this liquified ash took only 9 to 21 minutes to descend Mayon, overrunning at least six lowland communities before subsiding in a matter of minutes (Paguican et al. 2009). Lahars inundated all of these communities at approximately 2 p.m. with widespread damage occurring as they overtopped river bends, eroded many ash dikes and breached six concrete sabo dikes. Only on the eastern flanks between Legaspi and to just north of Lidong, where Mayon slopes intersect the coastline, did lahars enter the ocean directly (Figure 3). Since subsequent river flow began to excavate in-filled river beds, additional fines continue to be transported to lower levels and to the ocean.

Immediate Aftermath: Short and Longer-Term Needs

Following Reming, DPWH-FCSEO was faced with initiating a combination of both short- and longer-term projects. Important short-term needs included: 1) channelization of river beds to re-establish drainage networks, 2) rehabilitation of chan-

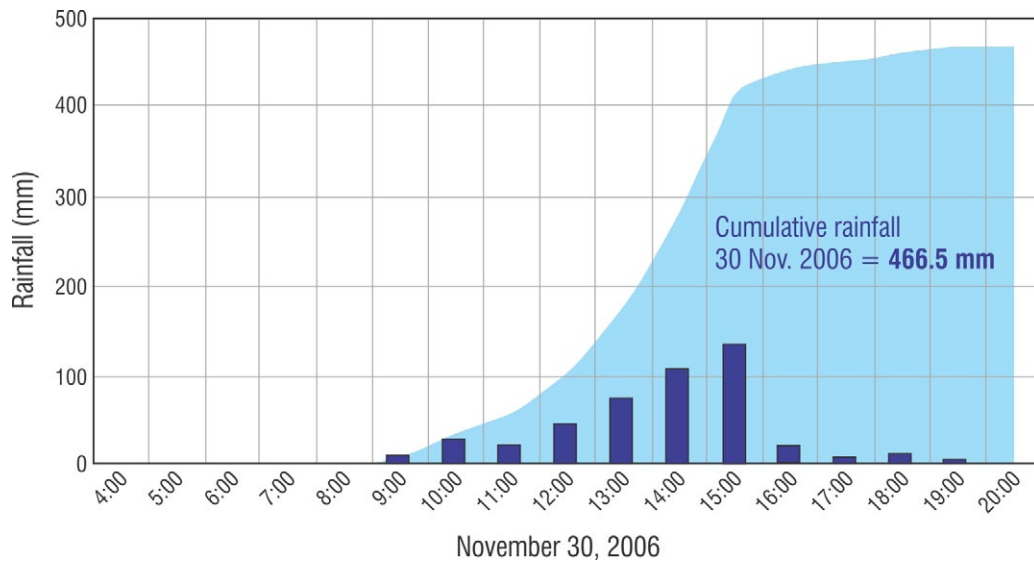


Figure 8: Hourly rainfall at the PAGASA research station (# 444), Legaspi, 30 November, 2006 (modified from Fano et al. 2007). PAGASA is the acronym for the Philippine Atmospheric Geophysical and Atmospheric Services.



Figure 9: Erosion scars in the lahar-initiation fields visible on the south-western flanks on Mt. Mayon together with the deep gullies down which they flowed. Photo taken in February 2007, 10 weeks after the lahar event of 30 November 2006.

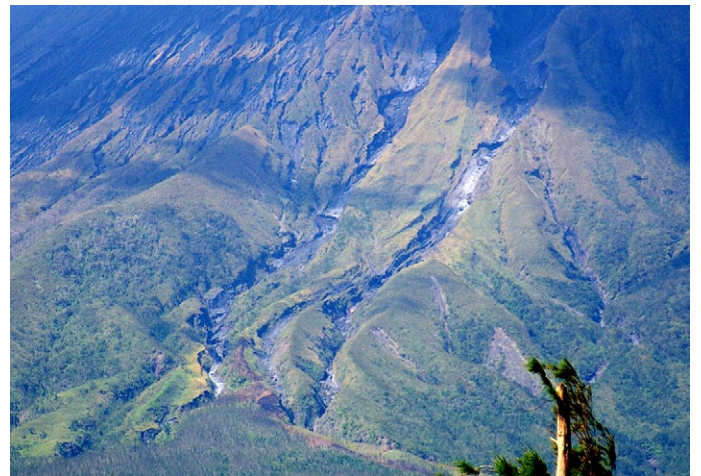


Figure 10: Valleys on the south-western mid-slopes on Mt. Mayon carved by lahars and deepened by subsequent rainfall. February 2007.

Figure 11: Lahar initiation field gully cut through *Miscanthus* grassland just below the crater of Mt. Mayon. This view is southeast to the lowlands east of the large lava flow of July-August 2006 (see Figure 6). Here lahar gullies fan out before many reach the coast between Lidong and Legaspi. Photo by Troy Scott, February 2007.





Figure 12: Immediate excavation of an ash-infilled river channel to protect from any new lahar activity, Lidong, February 2007.



Figure 13: Construction of ash dike in the Lidong area, National Highway (February 2007).

nels under bridges, temporary bridge construction and highway clearing and rehabilitation, and 3) immediate construction of ash dikes to help mitigate any new lahar activity that could still descend from Mayon's upper slopes following new rain storms. Immediately following the passage of Reming, DPWH assigned heavy equipment to lahar-damaged areas. Large sections of the National Highway north of Legaspi were eroded and/or buried and required immediate attention. Figure 12 shows efforts to remove ash from an infilled valley floor near this highway at Lidong with the excavated ash and boulders being used for ash dike construction adjacent to the same river (Figure 13). Figure 14 shows remedial action to clear the bridge channels under the National Highway just downstream of these two examples.

Sabo construction activity of this type was repeated throughout the disaster zone and occurred in tandem with the efforts of other government agencies to rehabilitate homes, public buildings and agricultural lands. Because of its historic and economic importance, numerous ash and concrete sabo were quickly constructed upslope and around the historical site at Cagsawa (Figure 15) where only the church belfry survived the 1814 catastrophe (Figure 5). Lahars initiated by Reming flowed around both sides of the site with one actually coming up against the north wall of the compound before being deflected to the east around the site where both lahars then joined (Figure 16). Viewing Cagsawa from the north of the wall shown in Figure 16 demonstrates how quickly the low rice terraces were rehabilitated and cropped (Figure 17a, b). Some farmers adapted ash-covered fields often within just a few months. One field illustrated in Figure 18 shows that sweet potatoes were planted within only ten weeks of field burial by ash. Many salvageable homes and Barangay (Municipality) schools were also rehabilitated quite quickly (Figures 19-21). The hot humid climate of the region is also beneficial in terms of the recovery of such things as coconut, abaca and banana plantations and natural vegetation. Figure 22 illustrates the fate of one tree on Lignon Hill which appeared

killed by the supertyphoon winds but which recovered almost completely within two years.

Longer-term needs include: 1) the continued repairing of old ash and concrete dikes and the building of new ones close to settlements, 2) the continued removal of re-worked lahar ash that aggraded river beds, and updating the mapping of lahar flow channels. Concrete sabo construction has already advanced in some of the Baranguays where deaths were in the hundreds. Figures 23-25 illustrate concrete dike conditions before February 2007 and after January 2009 at Guinobatan, Daraga and Pawa. A concrete dike has also been constructed on the southwest flanks of the Cagsawa site. Other strategies which clearly help with the reduction in loss of life include: 1) developing better lahar forecasting models based on precipitation events (as in Figure 8), 2) broadening valley dredging operations that function as lahar ash settling basins, 3) improving automated rain-gauge monitoring systems or acoustic flow monitors in the lahar initiation zones at higher elevations, 4) improving vulnerability assessments following every lahar and eruption event, 5) better co-ordination among the major government agencies involved, 6) construction of elevated evacuation sites, and 7) possible community relocation (Fano et al. 2007; Paguican et al. 2009).

Conclusion

Forecasting Mt. Mayon volcanic events by PHIVOLCS is so well advanced that forced evacuations before the eruptions of the summer of 2006 led to no loss of life. By contrast, a mere three months later the difficulties in quickly forecasting lahars and issuing forced evacuation notices led to over 1,200 deaths. While better forecasting of lahar events and the related issuing and execution of evacuation notices is needed, such events are extremely difficult to predict. This is because their formation depends on so many variables, the more important of which are the availability of easily removed ash on steep slopes and the prediction as to where the centre of a cyclone or the eye of a ty-



Figure 14: Cleaning ash from an in-filled bridge at Lidong on the National Highway, north of Legaspi (February 2007).



Figure 15: Ash dikes constructed upslope of Cagsawa, Busay, in 2007. Note *Miscanthus* grass which has germinated from seed transported down slope by a November, 2006 lahar. Photo taken in January 2009.



Figure 16: A lahar came up against but did not overtop the retaining wall of the Cagsawa National Museum site and was deflected to the left. A stream has re-established itself and continues ash sediment transport. February 2007.



Figure 17: **a)** Damage above the northern wall surrounding the Cagsawa site shown in Figure 16 (February 2007). **b)** The same view following rehabilitated and cropping to rice, January 2009.



Figure 18: **a)** Cropping sweet potatoes on ridges in an ash-covered field at Lidong 10 weeks following burial by a thin layer of lahar (photo in February 2007). **b)** The same field in January 2009 planted to cassava.



Figure 19: **a)** A primary school at Lidong in February 2006, and **b)** in January 2009.



Figure 20: a) This building in Padang doubles as both a Barangay office and a day care centre (photo taken in February 2007), and b) the same building in January 2009.



Figure 21: Damage and rehabilitation of the lahar damaged day care classroom in the building shown in Figure 20. a) In February 2007 volunteer plants growing in the lahar ash include banana and taro, while the message on the blackboard warns people to stay away; b) the same room in January 2009.

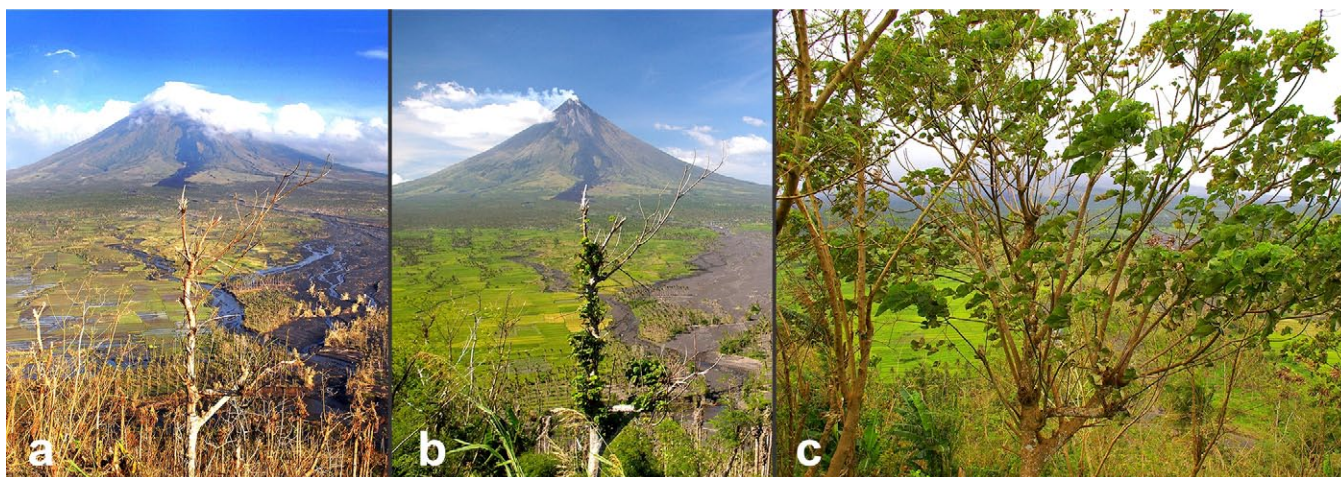


Figure 22: a) Photo taken one week after Reming crossed Bicol in early December 2006 from Ligñon Hill of an apparently 'dead' tree in the foreground behind which is seen the Mayon volcano lava flow of July-August 2006 (from Rice Today 2006: 6(1) – original supplied by the International Rice Research Institute, Laguna, Philippines, with permission), b) the same tree on 15 February 2007, after only ten weeks of recovery, c) the same tree on 19 January 2009, looking quite normal.



Figure 23: a) Destruction caused along the river passing Guinobatan by lahars on 30 November 2006 (photo February 2007) and b) post concrete sabo construction (January 2009) at the same site.



Figure 24: a) Destruction caused along the river passing through Daraga by lahars on 30 November 2006 (photo February 2007) and b) post concrete dike construction (January 2009) at the same site.

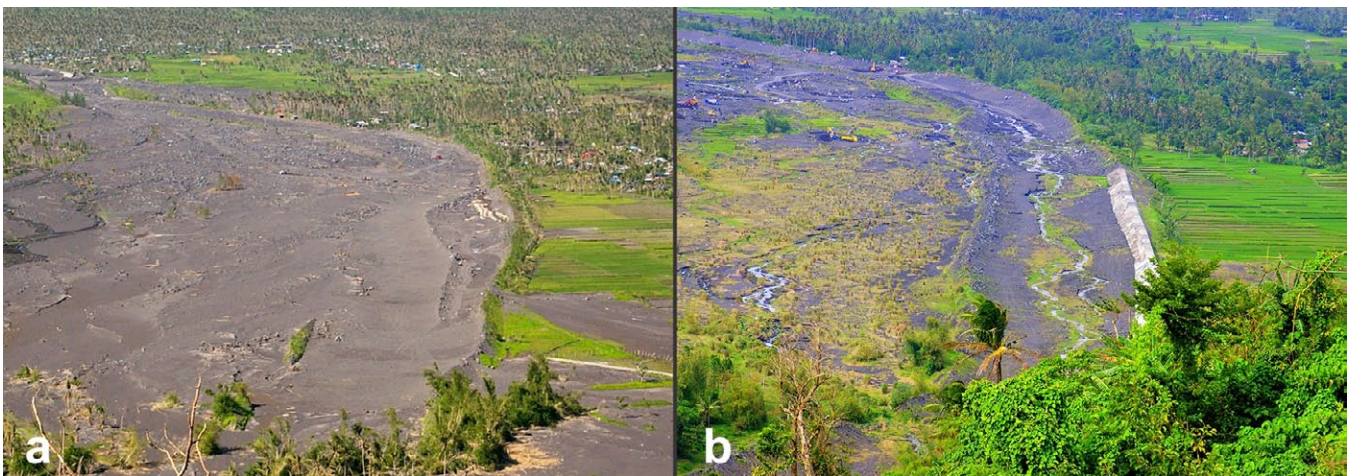


Figure 25: a) Destruction caused along the river passing Pawa by lahars on 30 November 2006 (photo from Ligñon Hill, February 2007) and b) post concrete dike construction (January 2009) at the same site.

phoon will pass to provide the necessary precipitation. As a caution it had been noted that in 1967 a typhoon brought more than 475 mm of precipitation to the Legaspi area in a 24-h period but no lahars were reported. This was attributed to the fact that new pyroclastic deposits had not developed since an eruption in 1947 so stabilization and soil profile development kept most slopes intact (Paguican et al. 2009). With Reming, fresh ash from the eruptions of the summer of 2006 was available along with deposits from some years earlier, so the potential for lahar activity was being monitored. Now that these 2006 deposits and more vulnerable previous lahar layers have been reworked by Reming it might be assumed few major lahars can now form. Unfortunately, the current eruptive phase which started in December 2009 continues (see <http://www.phivolcs.dost.gov.ph/> for updates), so any such assumption should be dispelled. Since Mayon volcano lahar events are a problems which will simply not go away, the need to remain vigilant is paramount.

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Western Australian battlers and coastal squatter settlements: heritage from below versus regulation from above

John Selwood

University of Winnipeg, Winnipeg, Manitoba, Canada and
University of Western Australia, Perth, Western Australia, Australia
j.selwood@uwinnipeg.ca

Roy Jones

Curtin University, Perth, Western Australia, Australia
r.jones@curtin.edu.au

Abstract

The informal, frequently illegal vacation shacks and settlements hugging Western Australia's coast are expressions of the Aussie Battlers' pioneering spirit and reminiscent of the early Australian squatters who opened up the country. From the early twentieth century onward, these coastal destinations have become for many Australian families a holiday experience spanning several generations. However, the campers and shack dwellers of the unplanned settlements are increasingly threatened by the authorities who are seeking to upgrade these communities and impose order on the coastal environment. Destruction of the settlements not only represents the removal of the rudimentary dwellings; it also signifies the destruction of shackies' holiday traditions, their lifestyle and their cultural heritage. These processes are illustrated by reference to Western Australia's south-west coast, where former holiday squatter sites have now become permanent communities and up to the state's North West Cape, favoured by long-stay, seasonal and 'unmanaged' campers.

Keywords: Australia, coastal development, heritage from below, squatter settlements

Introduction

Much Australian myth has been built around 'the battlers,' pioneering spirit, their survival in the face of adversity, their fierce independence, their rejection of upper class pretension and their resistance to conformity. Tied in with this concept is the early history of Australian colonial settlement and the role of the squatters who were central to the effective occupancy of substantial areas of the eastern interior. The beach and the coast have also played a central role in Australian iconography. Families, and sometimes larger groups travelled from cities and from inland mining and farming districts to bays and beaches where they camped or erected basic shelters for their vacation enjoyment. From the early 20th Century onwards these coastal destinations have become the sites of quintessentially Australian

holiday experiences. However the denizens of these informal and often illegal settlements now threatened by, not only to their holiday experiences and to their simple accommodations, but to their way of life and even their heritage. This will be illustrated by reference to a range of Western Australian coastal sites ranging from the southern coast, where former holiday squatter camps have now become legitimate, to permanent coastal resorts and settlements, and to the coastline well north of Perth which was, until very recently, much less accessible (Figure 1). The original settlements were generally produced by so-called Aussie 'battlers', working class, down-to-earth, practical, self-sufficient pioneers—manly personages with the ability to 'make do' (Bean 1934; Ward 1966; White 1981; Page and Ingpen 1982;



Figure 1: South-western Australian coastal settlements.

Jones and Birdsall-Jones 2008). Such descriptors contain an element of truth and the settlements are often perceived as symbols of the cultural heritage of the common people.

Proximity to the coast has always been highly valued and sought after by Australians. Although there have been regular waves of population movement inland as immigrants took up land for agricultural settlement (Meinig 1970; Powell 1970) or to discover and develop mineral resources (Blainey 2003), with mechanization and corporatization the populations of many inland towns have subsequently declined, in what demographer Bernard Salt (2001) has termed the “big shift”, and Australia’s population is becoming increasingly coastal once more. This modern “Seachange” (Burnley and Murphy 2004) movement, fuelled by an increasingly affluent, mobile, ageing and growing population, is generating strong development pressures for second home, retirement home and tourism-related growth in many scenic coastal localities around the country.

However, in many coastal regions of Western Australia, a number of scenic locations had already been colonized—albeit informally and seldom on more than a seasonal basis—by what might be termed recreational pioneers. In the early 20th Century

many such pioneers were farming families from adjoining inland properties seeking pasture for their stock in the drier months and who subsequently returned to those coastal locations for recreational reasons (Selwood et al. 1996). With development of the crayfishing industry shortly after World War II, fishermen took up moorings and temporary accommodation along the coast. These developments were accelerated after the mid-20th Century by rising motor vehicle ownership and four wheel drive vehicles, leading to the creation of networks of tracks to the embryonic settlements. More recently, city dwellers, especially from metropolitan Perth, have sought holiday sites at the settlements (Selwood and May 2001; Selwood and Tonts 2004; 2006). Over time, the rudimentary camp sites became more permanent in nature as people shipped in and constructed shacks from timber, corrugated iron and any other material that could be put to good use (Gabbedy 1988; Bolton 1994; Jones 2001). While these structures were characteristically Australian, they were also an Antipodean variant of the English interwar plotland developments described by Hardy and Ward (1984, 2):

It was invariably a world of single-storey houses, simply built and often using wood, though never refusing whatever material (corrugated iron, asbestos, precast concrete and bricks) lay at hand. Some could have taken their place alongside more conventional bungalows but others, a colourful kaleidoscope of shacks and shanties, were a world apart.

Thus, by what has been a fundamentally spontaneous process over several decades and generations, ‘ordinary’ Western Australians have camped, built shacks and enjoyed the opportunity for unsupervised and unregulated coastal holiday experiences. In a ‘frontier’ state, their right to camp, to fish and even to build ‘shacks’ largely went unchallenged until the late 20th Century and came to be seen as a part of their heritage. Like the 19th Century squatters before them (Powell 1970), they had moved into areas arbitrarily claimed by distant imperial or colonial authorities that lacked the means to control and administer them. They were characteristically Crown lands that, at the time, were not being used by any other elements of the settler population. Unlike the pastoral squatters, however, the shackies generally did not and do not possess the same economic or the political power as their forebears..

So, when in the late 20th Century many coastal sites were becoming increasingly prized real estate and pressure grew for greater regulation of coastal development, the shackies had to confront growing challenges to what they saw as their idyllic and, in many ways, quintessentially Australian, lifestyle. They had to face the opposing and official position that the flaunting of formal legal and proprietorial constraints is a transgressive form of behaviour not to be condoned. Nevertheless, condemnation and removal of the shackies and their shacks can also be considered another instance of the widespread disregard for elements of society that represent the heritage of the common people or, as observed by Robertson (2008), another example of embattled heritage from below. In response to recent events,

shackie communities have progressed down different paths. Especially on the south coast, at Windy Harbour, Peaceful Bay and elsewhere, settlements have gradually been incorporated into approved coastal holiday settlements, whereas at many localities on the west coast they are being replaced by permanent towns, temporary holiday parks, or recreation grounds. At this point, only the substantial settlements at Grey and Wedge Point are holdouts. However, an anomaly is Naval Base, a shack community within the Perth metropolitan area (Figure 1) which has been allowed to remain in place and now is formally designated a heritage site. These issues will be explored more thoroughly employing detailed case studies of the southern and western coastal areas undertaken by the authors in recent years, supplemented by monitoring of newspapers and government documents up to the present.

Southern Coastal Settlements - Moving to the Mainstream?

In the late 19th and early 20th centuries, settlers moved into the Lower Great Southern region of Western Australia to develop farms and to establish a forestry industry. These developments tended to occur inland. Nevertheless, some farm families were allowed to take out pastoral leases on the coastal scrub around Peaceful Bay to provide grazing for their cattle in the drier summer months. Residents from the nearby town of Denmark also camped at the bay to take advantage of the good local fishing. The area's reputation as a camping and fishing spot grew and, particularly after the track to Peaceful Bay was upgraded in 1954, the numbers of campers grew and some began to erect shacks at the site (Selwood et al. 1995).

This growth raised concerns locally and at the state level. In 1956, the engineer for the Denmark Road Board (1956) (the local authority, renamed Denmark Shire in the 1960s) reported his disquiet about the growing number of campers and the poor sanitation standards at the bay. In the same year the Department of Lands and Surveys expressed concern over the proliferation of coastal shacks throughout the southwest of the state. In an attempt to regularize the situation, the road board/shire developed a subdivision plan for 160 small lots behind the frontal dune at Peaceful Bay. By 1963 these had all been taken up on ten-year leases, largely by farm families from the local area who had become regular campers at the site. During the 1960s, the Shire used income from the leases and grants from the Tourism Development Authority to improve road access and to develop water supply and drainage systems. When proposals for dwellings to install and pay for septic tanks were made in 1961, a local Progress Association was formed to fundraise, to coordinate local volunteer projects and to lobby for infrastructure improvements (Figure 2). The association has since agitated to obtain improved telephone and refuse collection services for the settlement and has even brought about the expulsion of consistently disruptive tenants.

By the 1990s, further change was occurring. The Shire approved a new subdivision for larger, more permanent second (or even first) homes; the leases on the original plots were extended



Figure 2: Peaceful Bay traditional shack.



Figure 3: Peaceful Bay "Home Sweet home".

from 10 to 21 years and the annual fee quadrupled to \$600 per year (still well below market rates for equivalent property). The first calls were made by some residents to obtain freehold title to their plots and the custom whereby plots and shacks had characteristically been passed on to relatives and friends began to give way to sales through estate agents. These moves facilitated two other changes. Firstly, Peaceful Bay was 'discovered' by visitors from Perth. Even though the majority of leaseholders are still from the largely rural Great Southern and South Western regions of the state, the proportion of leaseholders from metropolitan Perth grew from five per cent in 1964 to 15 per cent in 1994 and continues to rise (Selwood et al. 1995, 155). At the same time, many shacks were upgraded. With improved power, water, telephone and sewer systems, sealed road access and rapid population growth in the nearby town of Denmark (Selwood et al. 1996), permanent occupancy became increasingly feasible (Figure 3). This practice was nonexistent in 1964, but it had risen to include five percent of the leaseholders by 1984 and eight percent by 1994.

Further to the west along the coast, a parallel but, as yet, a more gradual process is occurring at Windy Harbour (Selwood

and Tonts 2004; 2006). In the 1920s, workers from the timber towns to the north began camping and fishing at the coastal reserve at Windy Harbour. In the 1940s some locals began building shacks there. By the 1950s there were about 80 at the site and the local road board/shire sought to regularize the settlement by surveying blocks, laying out streets and (at least partly) funding this through a system of annual one-year leases. The squatter/leasee settlement has continued to grow and there were around 220 second homes at the site in 2002 (Selwood and Tonts 2004). Development has not progressed to the same extent as at Peaceful Bay. Windy Harbour still depends on generators (which must be shut off at 10 p.m.) for power and this has caused divisions between those who see the 'basic' nature of Windy Harbour as part of its charm and those, currently in the majority (Selwood and Tonts 2004, 158), who advocate its development as a more mainstream tourist and second home destination. With the recent decline of local employment in the timber industry, many see tourism and second home development desirable ways to economically diversify.

In its 1999 Management Plan for Windy Harbour, the Shire of Manjimup appears to be leaning towards preservation, rather than further development. It advocates maintaining leasehold tenure, and limiting development in terms of building size and design. However, leases are being extended from one to 21 years and state building codes will require that standards of building safety and sewage disposal are raised significantly above those of the early postwar 'shacks'. Almost inevitably, the extra costs of providing better services to the settlement will create pressures on the Shire to allow further development to fund these changes. Many residents of both the Denmark and Manjimup Shires view the extensive (and expensive) tourism and second home developments elsewhere in the southwest corner of the state with apprehension (Selwood and Tonts, 2006). They fear that the character of their own smaller and more informal coastal settlements would be lost if comparable developments were to occur locally. But it is clear that both Peaceful Bay and Windy Harbour are experiencing regulatory and development pressures which are gradually drawing these idiosyncratic communities into the mainstream. Although they retain some of the informality associated with their origins, they are losing the distinctiveness that would earn them heritage status.

West Coastal Settlements – Moving to Oblivion?

The coastline north of Perth likewise became the site of numerous shack settlements from the early- and mid-twentieth century onwards (May and Selwood 1992; Suba and Grundy 1996; Selwood and May 2001). Farmers from the adjacent inland only began to make the (at the time, two day) journey to west coastal camp sites in the interwar years. During World War II, however, tracks to some coastal sites were upgraded and wells were sunk to provide facilities for a military coast watch service. In the immediate postwar years, fishers' campsites and shacks were established as the Western rock lobster industry grew rapidly (Suba and Grundy 1996). This led to the gazettal of several townsites along the Central Coast during the late 1950s



Figure 4: Grey ocean frontage shacks.



Figure 5: Grey foreshore shack with penthouse and patio.

into the 1960s, some of which became legitimate communities. Jurien, for example was gazetted in 1956, Leeman in 1961 and Cervantes in 1963 (Landgate 2009). However, others were never properly established, although some, for example Grey, became favoured sites for squatters (Figures 4 and 5). Because the Central Coast is only 100-300 kilometres north of Perth, once 4WD vehicles became more popular, its colonization by Perth-based recreationists became increasingly intense. By 1997 the Grey Community Association (now Grey Conservation and Community Association) was claiming that around 4,000 shackies/holidaymakers were using Grey in the summer and a further 6,000 the nearby settlement of Wedge Point (Selwood and May 2001).

Possibly because of their greater numbers and their greater proximity to Perth, the west coast settlements received more critical government attention than did those on the south coast. In 1968, state cabinet set up a committee to report on the unlawful use of Crown land on the west coast north of Perth and the resultant "Stokes" Report of 1970 recommended the removal of squatters and their settlements (Suba and Grundy 1996). In 1980, legislation was enacted "for the express purpose of providing the necessary means to remove squatters from public lands" (Suba and Grundy 1996). A Government Position Paper



Figure 6: Remove the shacks prohibition sign.

on Coastal Planning and Management in Western Australia, released in 1983, stated that coastal squatter shack development was unacceptable. A statewide policy for the administration of coastal squatter shacks developed in 1988 forbade the construction of squatter shacks on Crown land along the coast (Figure 6).

Although the state government adopted these measures, it was the shires, as the local planning agencies, that were required to implement them. As yet progress has been patchy. The Shire of Gingin, which is closest to Perth, cleared all its shacks in the early 1980s, as did the Shire of Coorow in 1994, followed by Irwin and Carnamah in the mid-1990s. Both the threats to remove the shacks and their actual destruction had two possibly predictable results. The first was the ‘domino effect’ whereby shackies dismantled their properties in shires where they were under greater threat and reconstructed them in shires where such settlements were still tolerated or where lack of resources and poor coastal access made it difficult to police and control illegal structures. The second was that shack dweller communities, most of which already had well established local associations/pressure groups, were galvanized into more fervent defense of their interests. The strong social and community bonds that had developed between families who had been holidaying in these settlements for generations facilitated this process. The Grey Community Association was formed in 1974 and, like its south coast counterparts, collected membership fees and in a bid to gain respectability and acceptance spent increasing amounts on improvements such as “tip maintenance, removing car bodies, dune and rehabilitation, improving ‘roads’ and planting native trees” (Grey Community Association 1992, 2). Other settlements have done likewise and, in an era of rapid electronic communication, these groups can readily share information and coordinate their actions.

The status of the remaining west coast shackie settlements is still not totally clear. Leases issued to shackies in several shires have expired, but extensions were granted in some cases and a few of the settlements remain in place. The state’s official policies still call for their total removal, despite several reports (e.g. Whelans Town Planning Consultants 1997; CALM 1999) appearing to favour a more gradual mainstreaming of the settle-



Figure 7: Jurien Bay rehabilitation area sign.

ments, as has occurred on the south coast. Agreement and action on the heritage value of these sites would seem to be even more uncertain. Heritage was first raised as a planning issue in 1991 (Selwood 1991) and enthusiastically supported by the shackie community associations. In addressing this issue shortly afterwards, the government supported the production of a “photographic and descriptive record” of the west coast shack settlements (Suba and Grundy 1996), which stated in its Executive Summary that “the shacks have aesthetic value as a group which forms a unique cultural landscape, historic significance for their association with the opening up of the coastline and social value for their representation of a disappearing lifestyle”. This disappearing lifestyle was chronicled on a display board, or ‘interpretive centre’, at the site of former shackie settlements in the mid section of the Central Coast (May and Selwood 2001, 388). However, by 2008, even that display board had disappeared. Its replacement merely makes reference to the government having removed the shacks, while outlining a landscape rehabilitation program and the creation of a number of picnic sites and recreation facilities in their place (Figure 7). No casual camping is allowed along this section of the coast and holidaymakers and tourists are confined to established town sites and commercial caravan parks. Similar treatment has also been meted out to the former settlements in the northern portion of the Central Coast, which is now serviced by a new coastal highway. Only a few licensed ‘professional fishermen’ now have the privilege of being able to retain shacks along the coast.

The same policy is being extended to the remaining unserved portion of the coast centred on the communities at Grey and Wedge which, until very recently, were still relatively inaccessible, except to 4WD vehicles. Despite energetic lobbying by their respective community associations, the most recent government report on the settlements still denies their appeals for a continued existence in anything resembling their current informal and unique form. The progress associations of the two communities did succeed in persuading the former State Labor government to revisit the issue. However, only one meeting was held. The new government has held no further meetings, a good indication of its lack of commitment to the squatter heritage.

Meanwhile, the coast road connection between Cervantes and Lancelin has recently been completed and sealed, so it now appears only a matter of time before Grey and Wedge suffer the fate of the other squatter settlements along the Central Coast. In a last ditch effort to save the communities from complete destruction; a petition calling for heritage recognition comparable to that accepted in several other Australian states is currently circulating in hopes of obtaining a stay of execution (Wedge Island Protection Association 2009). However, the future looks bleak indeed for the squatter settlements of the Central Coast. In very distinctive circumstances, however, one shackie settlement has not only survived, but has been deemed worthy of preservation as a heritage site.

Naval Base - Saved by the Smokestacks?

Many coastal/estuarine shack settlements were established within what is now the Perth metropolitan area and the adjoining Peel region, but during the late 20th Century virtually all of them were engulfed by the spreading tide of suburbanization as Perth's population grew from less than 300,000 at the end of World War II to over 1.5 million in 2006. However, the Naval Base Caravan Park, which was established ca. 1933, has remained largely unchanged (City of Cockburn 2004). The main reason for this is its location immediately adjacent to the state's main heavy industrial area at Kwinana. This industrial/port complex has been growing since the early 1950s and the caravan park is next to (and, indeed, was partially swallowed by) the heavy industrial site. As such, it is located in the buffer zone surrounding the industrial land at Kwinana and has ceased to be a desirable location for more conventional coastal development. Its survival is reminiscent of those heritage areas in inner cities that have persevered due to their being by-passed by more recent developments seeking localities perceived to have greater amenity or functionality than the older, obsolete districts (Ashworth and Tunbridge 2000).

Somewhat atypically, Naval Base was a local government controlled recreation and camping reserve, rather than Crown land as such, so residents did not 'squat', but from the park's inception paid a small council leasing fee. In virtually all other respects, however, it developed fairly rapidly into a shack-like Western Australian coastal holiday settlement. Almost from the start, the council allowed caravan owners – perhaps illegally – to build permanent extensions on to their caravans (Figures 8 and 9). The contemporary shacks are becoming progressively more uniform in style, or have been virtually replaced by new structures, partly due to the devastation caused by a near tornado in 1968 (City of Cockburn 2004, 8). However, the shacks are still not individually serviced by mains power, running water or sewers. The listing in the heritage inventory describes one shack (named "Gudday") as having been built for \$100 in a weekend with the nails being the only new materials used. The park is immediately adjacent to the beach, with swimming, snorkeling and fishing among the residents' main activities.

In social terms, too, it remains a typical shackie settlement, with many extended families having used their shacks for gen-



Figure 8: Naval Base extended caravan.



Figure 9: Naval Base shack with industrial backdrop.

erations; there is an active community association that aims "to protect the lifestyle we all love" (City of Cockburn 2004, 2) and, at Christmas and Easter, the residents all celebrate collectively. The Cockburn Council has facilitated the preservation of this settlement and community in several ways beyond its inclusion of the site on the municipal heritage inventory in 2004. Leasing rates remain low (\$650 per annum in 2004). A maximum building size of 5.2 metres by 5.2 metres is enforced – a regulation complemented by an unwritten rule that any new extensions must not block other residents' views of the ocean.

In political and planning terms, the 1990s was a period of uncertainty because the site was threatened by further industrial and port expansion, complicated by a number of other planning studies looking into broader issues of coastal development. During this period, no transfers of ownership of the shacks were allowed, leading to the residents forming a pressure group to protest the threat to their community. Although the public outcry from the local residents at Naval Base probably had little impact on the decision, proposals for the more immediate expansion of port facilities in Cockburn Sound were suspended, and in 2000 sales resumed with 35-36 of the total of 178 shacks changing hands for sums ranging from \$5,000 to \$18,000 in 2000-2001.

In 2004, the site was included on the City of Cockburn Municipal Heritage Inventory (City of Cockburn 2004). The “Statement of Significance” (p.3) reads as follows:

The Naval Base Caravan Park has aesthetic, historic, representative, social and rarity cultural heritage significance. . . . The Naval Base Caravan Park is now an anachronism in the Perth Metropolitan Area. There are no longer any other holiday camps of this type existing along the coast. This place therefore, is unique and has significant rarity heritage value.

Ironically, the recent changes in Cockburn’s regulations pertaining to the Caravan Park are making it less of an anachronism and reducing its unique qualities. Upgrading of the shacks is occurring at an accelerating pace as owners now enjoy greater security of tenure and work to meet more stringent building regulations. Shacks which once were required to be on wheels and transportable are being replaced by more permanent, frequently prefabricated, or ‘pattern book,’ structures (Figure 10). As a result, the settlement is rapidly losing its idiosyncratic appearance and being transformed into a more conventional-looking compact holiday chalet subdivision. These developments could well lead to the loss of any valid claim to heritage value based on the settlement’s distinctive vernacular architecture. Given that a significant component of the heritage designation is said to rest on the community’s ‘exceptional social historical value,’ whereas the shacks can now be marketed freely to the highest bidder (one shack overlooking the water was being advertised for \$90,000 in the summer of 2009), their heritage value is also becoming a less compelling feature. In reality, it seems that the local authority has only limited commitment to the heritage listing. Of far greater significance from a heritage perspective is the recent recognition that Naval Base is located virtually on the site of the original townsite of Clarence, or Peel Town, the first, albeit ill-fated, European settlement of the Swan River Colony. Archaeological digs have already exposed thousands of specimens in the immediate vicinity (Amalfi 2006). As a result, much of the area is likely to be designated as a site of national historical importance for reasons totally unrelated to the shack settlement.

Discussion and Conclusions: Heritage from Below vs. Regulation from Above

In *The Coast Dwellers*, a volume which Philip Drew (1994) subtitled a radical reappraisal of Australian identity, the author contended that “the beach is the twentieth century’s rejoinder to the bush, a wet tradition of sun, surf and sand, a tradition based on freedom and pleasure” (Drew 1994, 114). Problems arise, however, when some people’s “freedom and pleasure” is perceived to be at the expense of other social values, such as environmental protection, public order or even public health. Drew’s (1994, 116) assertion that: “The beach is for everyone. That is why it is so free. Going to the beach we leave society and its constraints behind,” raises two questions that are central to the disputes between the shackies and unmanaged campers on the one hand and the public authorities on the other. When



Figure 10: Naval Base post-cyclone rebuild.



Figure 11: Save the shacks as heritage bumper sticker.

the numbers of shackies and campers were small and competing demands on the coastal land essentially non-existent, these beaches and campsites/home sites could indeed be for “everyone” – or at least for anyone who wished and was able to frequent them. Furthermore, while the early shackies and campers could and did “leave society and its constraints behind”, society and its constraints have gradually caught up with them as both the Western Australian population and the effective demand for coastal land have grown significantly in recent decades.

Shackie and camper groups’ attempts to maintain their recreational lifestyles in increasingly prized environments are seen as a threat to the social order (Figure 11) and their efforts to protect their shacks and their lifestyles thus becomes a “heritage from below” initiative and a battle identical to those of the English plotlanders where:

On the one side were people of modest means defending pathetic homes on land that none had previously wanted in any case; and on the other a bureaucratic machine without compassion, growing with every new bylaw and parliamentary clause (Hardy and Ward 1984, 33).

These settlements certainly evoke nostalgia in their users and a degree of fascination from wider society. But the greatest threat that they face is that they are no longer in out-of-the-way

geographical locations frequented only by those who cannot afford or who choose to live according to a more basic lifestyle and are prepared to 'go the extra mile' to achieve that objective.

The old times may disappear, but we can hope that the heritage of generations of West Australians can be preserved, both mentally and physically. But it is not just the imposition of regulations from above that is causing the death of the informal, unregulated coastal holiday settlements, it is their erosion from within by the shackie 'gentrifiers' that is undermining their heritage value.

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