

PRAIRIE PERSPECTIVES

GEOGRAPHICAL ESSAYS

Edited by
Dion Wiseman
Daniel Olsen

Department of Geography
Brandon University

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PRAIRIE PERSPECTIVES:
GEOGRAPHICAL ESSAYS

Edited by
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Preface

Prairie Perspectives: Geographical Essays is an annual publication of the Prairie Division of the Canadian Association of Geographers (PCAG). By and large, the papers contained in each volume represent a subset of those presented at the annual meeting of the PCAG. However, submissions are also solicited from the broader geographic community and considered for publication provided that they represent original scholarly research by prairie geographers and/or concern the geography of the prairies. Each volume is edited by the institution hosting the conference in that year and all manuscripts are subjected to a thorough peer review process.

The 32nd annual meeting of the PCAG was held in Boissevain, Manitoba on September 26th to 28th, 2008. The conference was hosted by the Department of Geography, Brandon University and held at the Red Coat Inn and Boissevain School. A total of 28 papers were presented in six concurrent paper sessions in physical geography, human geography, biogeography, mapping theory and applications, the environment, and tourism and recreation; in addition to eight posters presented in a dedicated poster session. Many of the approximately 70 conference delegates participated in one of the two afternoon excursions; which included an historical hayride through the town of Boissevain or fieldtrip to the International Peace Gardens. The highlights of the conference banquet were the keynote address by Dr. Sterling Evans, Canada Research Chair in History, titled "Nothing New About NAFTA: The Great Plains and North American Connections", and the enduring annual slide competition.

This volume contains 11 papers on a variety of topical areas from cartography, environmental studies, physical geography and human geography. The authors of these papers, with the exception of one, come from institutions from across the Prairie Division.

The editors wish to acknowledge the efforts of those involved in the organization of the conference and publication of this year's volume. In particular, we wish to acknowledge the scholarly contributions of the authors for the following collection of papers and efforts of the reviewers who have contributed considerably to the overall quality of the research presented herein. We would also like to recognize the following individuals for their assistance with organizing the 32nd annual conference: our colleagues in the Department of Geography, Rod McGinn, Chris Malcolm, Derrek Eberts and Wenonah vanHeyst; our department's administrative

assistant, Shirley Slashinski; Kathy McGhan, Administrative Manager, International Peace Garden; Brad White, Principal, Boissevain School; Ron Narland, Manager, Red Coat Inn; Aggie, Amy and Shirley, Tourism Office, Town of Boissevain; Mannix' Horse Drawn Rides and the Irvin Goodon International Wildlife Museum. Finally, we would like to once again recognize the efforts of Weldon Hiebert and the Department of Geography, University of Winnipeg for providing the technical expertise and resources for the publication of Volume 12 of Prairie Perspectives.

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Snapshots of change: applying GIS to a chronology of historic charts of the St. Marys River, Ontario and Michigan

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Abstract: Separating Ontario and Michigan, the St. Marys River is a key historic and geographic feature that has been represented on more than 400 years of cartography, particularly because of the long reach of rapids that impedes navigation at Sault Ste. Marie. Beginning in the 19th century various users altered the river to aid navigation. Changes in the levels of regional geographic knowledge can be assessed from a variety of historical map 'snapshots' and through the application of GIS software. In particular, nineteenth century navigation charts are suitable for recreating snapshots of the bathymetry and for creating interpolated models of the St. Marys River channel. This article situates GIS analysis within a progression of maps of the St. Marys River noting a shift from *terrae semicognitae* knowledge to *terrae cognitae* knowledge, and to data visualization. The article concludes that GIS provides a useful tool for ----the assessment of historical mappings and contributes to the progression of spatial knowledge and channel change of the St. Marys River.

Introduction

The St. Marys River is an important geographic feature that provides a link in the east – west movement of trade, commerce and humankind (Osborne & Swainson, 1986; Woodford, 1994; Dickason, 2002; Arbic, 2003). The 120 km river is part of the Great Lakes navigation system, and links Lake Superior (approximately 183 metres above mean sea level) to Lake Huron (approximately 177 m a.m.s.l.). It flows in an easterly direction through a geologically constricted passageway of rapids and islands that separate Ontario (Canada) from Michigan (USA) (Figure 1). At Sault Ste. Marie, a one-kilometre reach of rapids drops nearly six metres, or more than 90 percent of the total 6.4 meter gradient change.

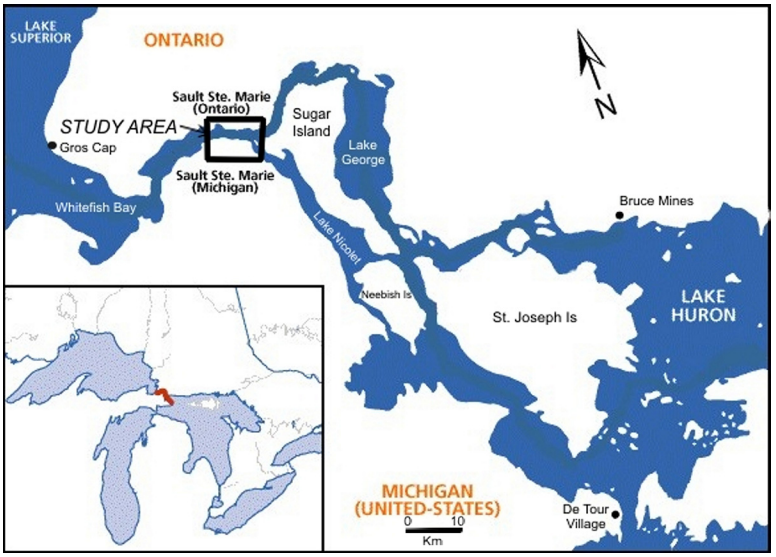


Figure 1: *The St. Marys River connects Lakes Superior to Lake Huron (adapted from Canadian Heritage River System, http://www.chrs.ca/Rivers/StMarys/StMarys-M_e.htm).*

The St. Marys River is a unique geographic feature where that is linked to North American history. Archeological evidence indicates that for more than 2,200 years the Bawating (Ojibwa for rapids) were the focal point within the Ojibwa cultural heartland (Dickason, 2002) and provided sustenance for a concentrated seasonal population of more than 2,000 people (Thwaites, 1925; Schmalz, 1991). The river was also an important link in the Aboriginal trading networks that crisscrossed North America for more than 6,000 years prior to the arrival of the Europeans (Dickason, 2002).

Seventeenth and eighteenth century Euro-Americans adopted this link in their quests for primary resources. However, the rapids were considered an 'insuperable barrier to all navigation between Lake Superior and the lower Lakes' (Mills, 1910, p. 133). During the 19th century the Bawating were the last major obstacle to shipping on the Great Lakes navigation system. Since 1795, the channel has been significantly altered to aid navigation and enhance commerce (Mills, 1910; Osborne & Swainson, 1986; Woodford, 1994; Arbic, 2003).

The St. Marys River is depicted on more than 400 years of cartography that includes sketches, maps, and bathymetric charts that graphically portray the channel morphology for the purpose of navigation. The 17th to

19th century records are few and scattered, and contemporary records generally focus on either the Canadian (British) or American side of the border. None the less, this regional cartography and other historic data depict the location of the original St. Marys River and subsequent modifications, yielding temporal snapshots of change with differing levels of spatial knowledge. However, visualizing the chronology of change by comparing and analyzing old maps is difficult (Knowles, 2002). Map diversity — differing purposes, levels of geographic knowledge, scales, and physical map sizes — makes visual data analysis/extraction difficult. Using GIS to bring together disparate data sources and compare them at the same scale can enhance the researcher's ability to manipulate multiple maps and to extract temporal and spatial data.

As part of a larger project that includes modeling the St. Marys River channel from 19th century bathymetric data, a historic GIS (HGIS) database was created using ESRI ArcGIS software to manage and compare the historic cartography. Combining the various maps in this database drew attention to the temporal progression of regional spatial knowledge. In addition, using GIS to visually model the 19th century channel bathymetry intensified the visual progression of spatial knowledge through the creation of colour images.

This article will lead you through the evolution of geographic knowledge in the Sault Ste. Marie area, as depicted by historic cartographers. Using appropriate cartography, the evolution will be taken further by visually enhancing the historic spatial data. Using a chronology of six selected maps, dating from 1612 to 1913, the progression of spatial knowledge extending from 17th and 18th century *terrae semicognitae* to 19th century *terrae cognitae* and numerical (bathymetric) data are analyzed. The numeric data on three navigation charts (1825, 1855 and 1913) are used to create interpolated digital elevation models (DEMs) of the St. Marys River channel. This data visualization expands the progression of *terrae cognitae* knowledge with a contemporary depiction of the 19th century channel.

Terrae Semicognitae Knowledge and the St. Marys River

Early North American maps were not representative of the actual lands explored by the Euro-Americans. Information regarding the unknown lands (*terrae incognitae* knowledge) was solicited from the Amerindians. The information supplied by the First Nations was a mixture of culturally significant and cognitively structured speech, gesture, pictography and models (Lewis, 1987). First Nations spatial representations were based on

topological principals, not the Euclidean and projective principles of the Euro-Americans. Information extrapolated from these 'mental maps' was assimilated with fragments of existing knowledge to fill in gaps of spatial detail (*terrae semicognitae*). Amerindian information was also frequently used to represent Euro-American explored and known lands, or *terrae cognitae* knowledge. The visual output was a mosaic of discontinuous styles and spatially misrepresented rivers, coastlines, routes and boundaries (Lewis, 1984). The First Nations topological representations were like a 'users guide' — simple enclosed shapes mixed with straight or gently curved lines that changed directions at nodes. Euro-American line work was similar to today's cartography — geometrically complex, irregular and complicated (Lewis, 1987; 1984).

The upper Great Lakes region was explored and mapped by Samuel de Champlain and his men long before other Europeans were navigating Lakes Erie and Ontario, or before the Dutch had settled on Manhattan Island (Woodford, 1994). The first cartographic sketch of the St. Marys River is a 1612 map of New France by Champlain. Two islands are sketched in the general vicinity of Sault Ste. Marie (outlined by a black square), indicating that Champlain had been made aware of the Bawating by the First Nations and by his personal exploration teams — *terrae semicognitae* knowledge (Figure 2). Rivers leading out of the Great Lakes are short, truncated, and often end in tadpole-like lakes, indicating the Aboriginal spatial knowledge (Lewis, 1986). It is recorded that Champlain did not reach the St. Marys River until 1615 — three years after the map was drawn (Thwaites, 1925). The remaining Great Lakes are missing; they had not yet been discovered.

In 1632, Champlain updated and expanded the geographical area of the 1612 map. He labels the Bawating as Sault (French for rapids) de Gaston, after the brother of Louis XIII. Mills (1910) commenting on the 1632 map notes, "their knowledge of the vast territory […] was so meager that the most crude and inaccurate diagrams were the result" (p. 20). This is a harsh assessment considering the map was crafted from the topological descriptions of the First Nations, the Coueurs des Bois, and personal observations. Lewis (1986) notes that the 'tad-pole like lakes' on the 1632 map indicates *terrae incognitae* knowledge of those geographic areas.

The French Jesuit Fathers mapped the upper Great Lakes region during the 1650s on their outreach missions from Sainte Marie [Among the Hurons] Mission (Thwaites, 1925). Mills (1910) compliments the accuracy of the *Jesuit Relation* map of 1671, as an indicator that the Fathers had explored every part of Lake Superior and had firsthand knowledge of the straits connecting the three upper lakes — *terrae cognitae* knowledge. A regional Sault Ste. Marie historian, Bernie Arbic (2003), credits the *Jesuit*

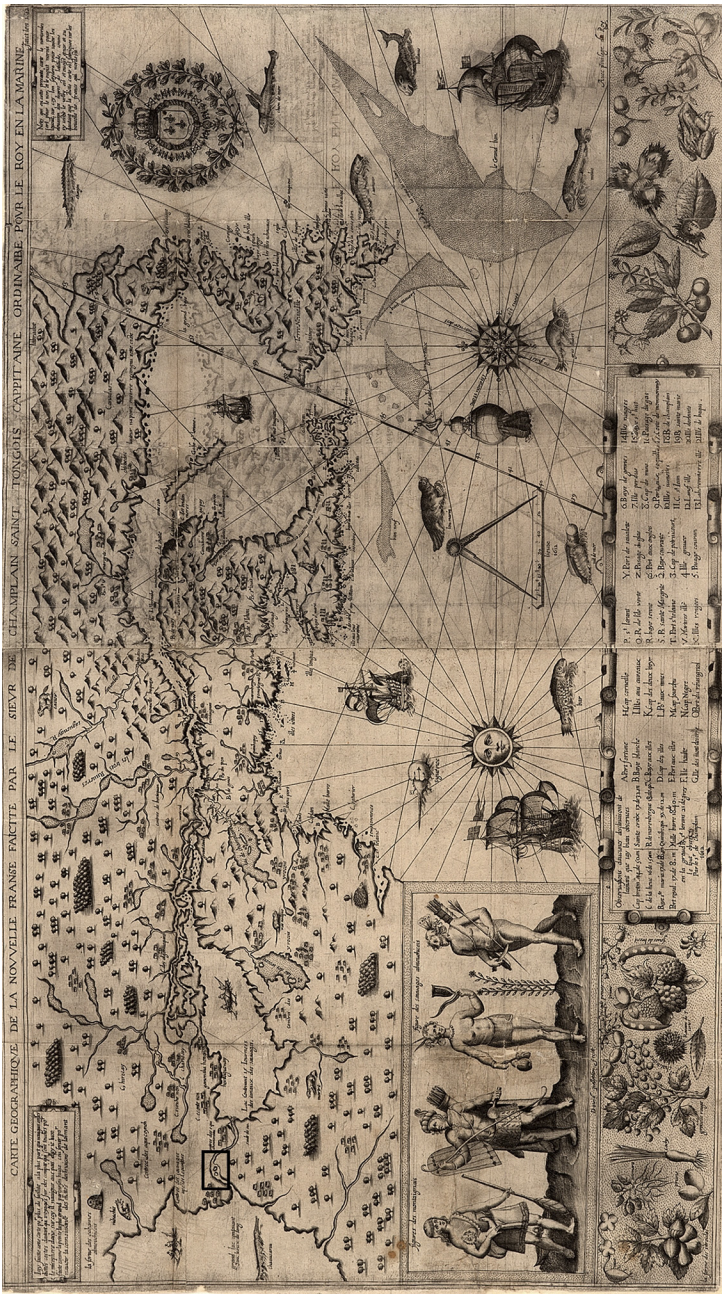


Figure 2: *Map of New France by Samuel de Champlain, 1612.*

Relations maps as being the most accurate maps of the Sault Ste. Marie region for the next one hundred years. These maps were not, however, disseminated to other explorers.

Between the 17th and early 19th century, mapmakers generally drew small-scale maps of North America that covered the extent of the then known continent with varying degrees of geographic accuracy. Ojibwa historian Peter Schmalz (1991) comments that no new geographic information appeared between Champlain and 19th century English cartography, and as a result the French (and others) tended to recopy incorrect data onto newer maps. Lewis (1984) also notes, 'French cartographers' interpretations of topologically arranged information [by First Nations] were wrong' (p. 103). Most small scale maps (including non-French) that depict the St. Marys River show the general placement of the rapids and a Jesuit mission first established in 1641 (Table 1).

The mapping of the Great Lakes region by Britain coincides with the end of the French-Indian War in 1763 (Demers, 2001). After Britain gained political control of the French colonial regime, documented trade routes were required as Britain became more involved with the fur trade industry. These maps are a mosaic of complex and simple line work (Figure 3) that reveals *terrae semicognitae* spatial knowledge (Lewis, 1986). After the end of the American Revolution in 1783 and the demarcation of the British-American border, the mapping of the Great Lakes became serious business. As westward settlement progressed, the British needed to locate safe

Table 1: *Presence of the Jesuit mission and/or rapids at Sault Ste. Marie.*

Date	Map-maker	Labeled As
1673	Father Jacques Marquette	St. Marie and mission symbol
1674	Louis Jolliet (Adrian's brother)	Mission de Ste Marie du Sault; Le Sault [rapids]
1675	Jean Baptiste, Louis Franquelin	Mission du Sault; Le Sault
1685	Minet	Saut St Charles
1679	Franquelin	S Riaeronon Sault
1718	Delisle, Covens, Mortier	Saut St Marie
1742	Philippe Buache	Sault Ste. Marie
1756	John Mitchell (French copy)	Sault Ste. Marie
1761	Unknown [British Fur Trade]	Mission of St Mary, mission symbol; St Mary's Falls

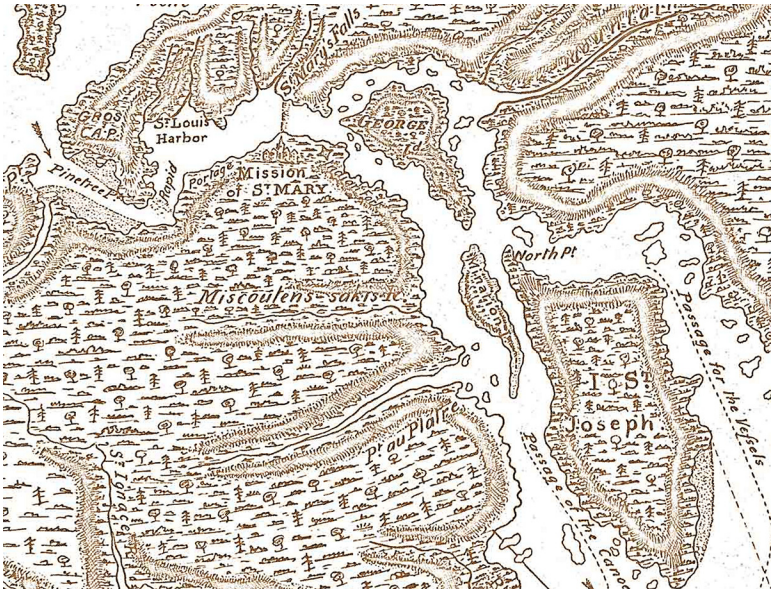


Figure 3: *Part of a 1761 British Fur Trade Map depicting Sault Ste. Marie and the rapids.*

harbours and develop accurate shoreline maps for military and navigational purposes (Woodford, 1994; Demers, 2001).

Terrae Cognitae Knowledge and 19th Century Cartography

In 1788, Lord Dorchester commissioned Gother Mann, Officer of the Corps of Royal Engineers to tour the Great Lakes to examine British fortifications, and to gather navigation information in case of further British/American hostilities (Winnearls, 1991; Woodford, 1994). His *Sketch of Lake Huron* is a composite of accurate surveys, reconnaissance and First Nations input, or *terrae semicognitae* knowledge. On the 1788 map, the St. Marys River is drawn with a somewhat straight west to east orientation, but does depict the major islands, North Channel, and Manitoulin Island. The tributaries are named, but are truncated and frequently end with tadpole-like lakes.

A large-scale inset, *Falls of St. Mary*, which includes some near shore soundings, and the south shore portage, properties and docks are sketched on the 1788 inset. He does not show the Montreal based North West [furtrade] Company wharf and quays, situated on the north shore at the

foot of the falls (Arbic, 2003). Canoe and small vessel channels are sketched in the rapids presumably to mark the path of the *Montreal Canoes*. When fully loaded, the Coeur de bois portaged nearly four tons of furs and goods upstream around the rapids, and shot the rapids going downstream (Arbic, 2003).

In 1796, Lord Dorchester sent a map drawn by Mann to Lord Portland in a letter regarding First Nation trading (Figure 4) (Winearls, 1991). Mann's 1788 sketch re-appears as the *Sketch of the Falls of St. Mary* on this map. The small-scale 1796 map had not been spatially updated since 1788, and has a *terrae semicognitae* aspect to it. It does label canoe and shipping channels on the St. Marys River, but the directional arrows are probably Aboriginal travel routes (Lewis, 1984) and not the direction of the current.

The first mapping of the entire Great Lakes system took place after the War of 1812, when control of the Great Lakes region depended on naval strength (Woodford, 1994). The British Naval Forces on the Great Lakes conducted a rapid 1815-16 *Reconnaissance Survey*. By the end of the first season, fifty charts (Montreal to Sault Ste. Marie) had been made (Winearls,

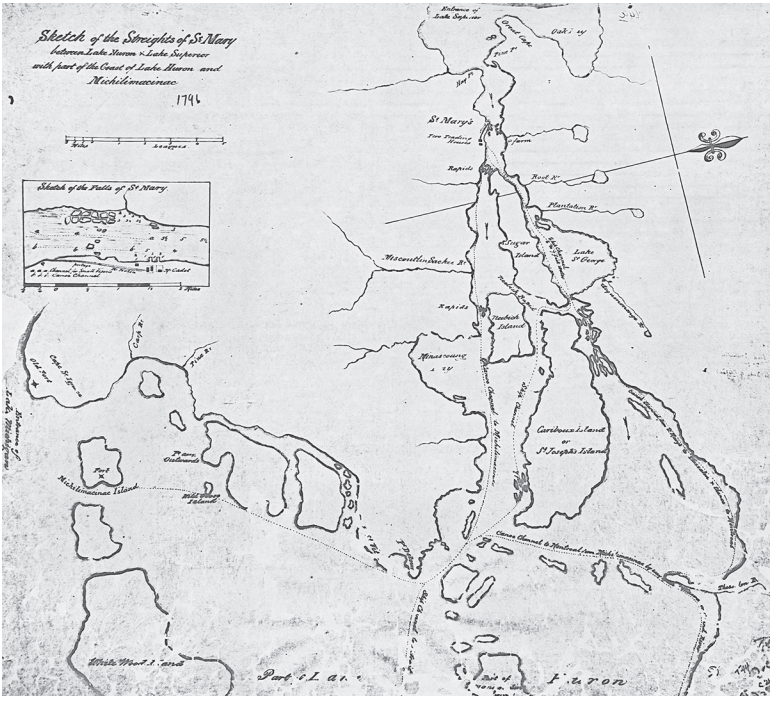


Figure 4: *British map of the St. Marys River by Gother Mann, 1796; Inset, 1788.*

1991). In 1816, the navy proceeded with an extensive bathymetric and shoreline survey of the Great Lakes. A meticulous surveyor, Lieutenant Henry Wolsey Bayfield, assumed control of the survey in 1817 at the age of twenty-two. Bayfield and one assistant worked on the *Great Lakes Survey* for nine years producing charts with amazing shoreline accuracy (Winearls, 1991; Woodford, 1994). In 1825, Bayfield produced two bathymetric charts of the St. Marys River extending from the head of the river to the St. Marys Falls, and from the falls east to Lake George (Figure 5).

Spatial details include the north and south shore, with some topography and French style lots and buildings. The (American) Fort Brady and proposed canal (drawn as an actual boat canal) are on the south shore. North shore details include the NWC property with a pre-War 1812 portage road and canoe canal/lock, and 'Hermintingers [Ermatinger] House'[1]. Bayfield's 1825 charts label the 12 ft. contour, suitable for navigation by wooden hulled schooners. These charts, printed in 1828, were not disseminated to other nations. They provide the first snapshot (including bathymetric data) of an unaltered St. Marys River channel.

As the Sault Ste. Marie region became more known in the 1840s, more terrestrial focused maps were published. These maps, however, show limited shoreline details of only one country or the other. Canada Land Surveyor, Alexander Vidal, produced a series of survey plans for Sault Ste. Marie (1845-1847) which focus on the north shore. His maps had excellent shoreline details and included some bathymetric data near the rapids and at key headland and shallow areas. His areal extent and bathymetric data points are too limited to be useful for bathymetric modeling. They would, however, make an excellent study on their own as one can witness the progression of *terrae cognitae* as Vidal surveyed the local islands, the HBC holdings, and the village of Sault Ste. Marie.

The existence of British navigation charts put pressure on the American government to do something regarding the lack of American charts, and navigation safety in the Great Lakes (Woodford, 1994). By 1841, the US federal government had appropriated $15,000 for the Corps of Topographic Engineers (Corps) to start the first hydrographic and triangulation survey of the northern and northwestern lakes of the United States. This was the start of the *United States Lake Survey*. The first survey, 1841-1882, tied the hydrographic sounding lines into the primary

[1] Ermatinger was a North West Company partner who built the "Old Stone House" in 1814 on the British north shore. It is the oldest surviving house northwest of Toronto. This National Historic Site is labeled on most historic maps making it a good ground control point for georectification in GIS programs.

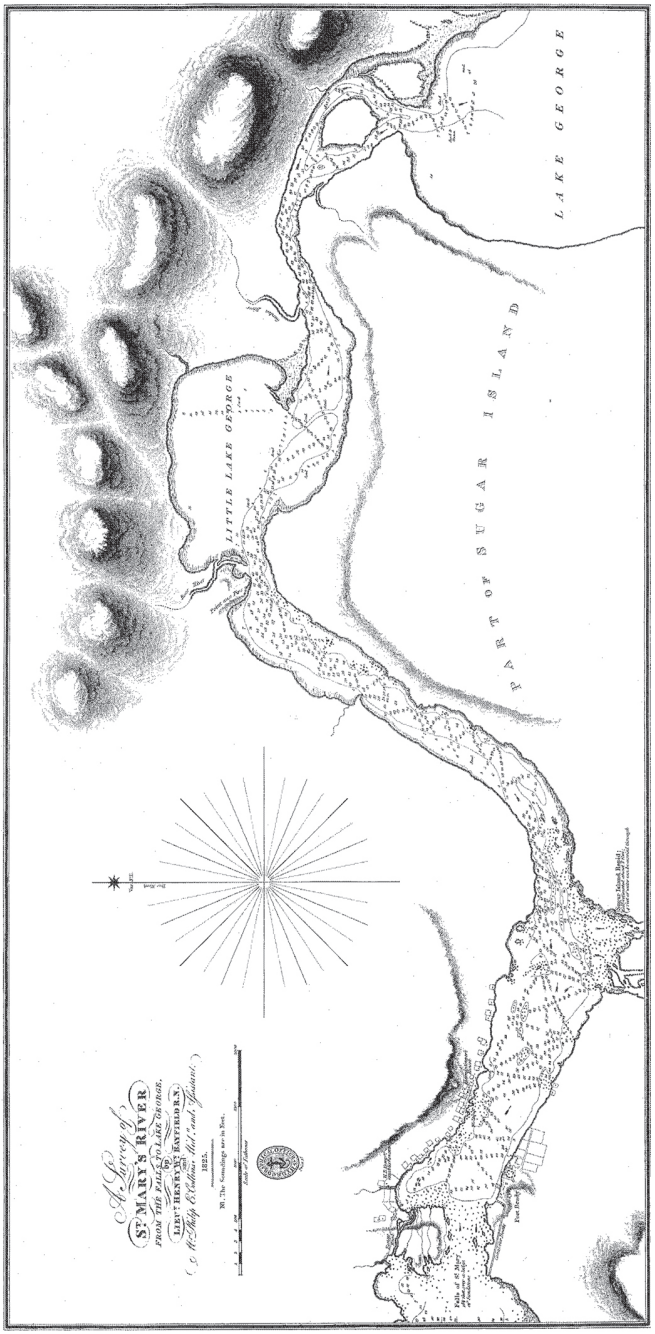


Figure 5: A Survey of St. Mary's River from the Falls to Lake George, *1825.*

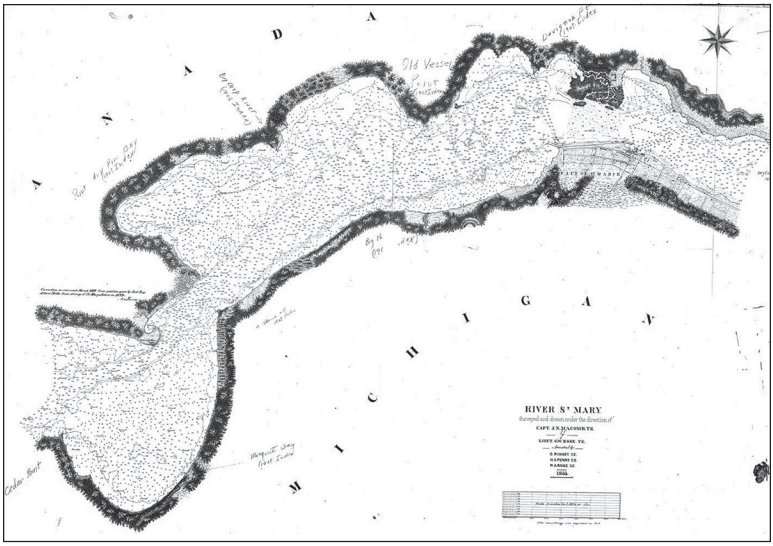


Figure 6: *Bathymetric data depicted on the* River St. Mary Field Sheet, *1855.*

triangulation stations of the topographic survey. All charts from the first survey depict contours to 18 feet (contour interval of 6 feet) accommodating wooden hulled schooners with draughts of 12 feet (Mills, 1910). The 1855 charts are the basis of contemporary navigation charts (Woodford, 1994).

The Corps surveyed and produced a series of three bathymetric charts for the purpose of navigation of the St. Marys River in 1853-1857, and again in 1892-1897 (Woodford, 1994). The first survey was a preliminary navigation survey, preparing for an increase in shipping traffic after the opening of the first tandem lock in 1855 [present day Soo Locks at Sault Ste. Marie, Michigan] (Woodford, 1994). Only one 1855 chart, extending from the rapids to the head of the river, could be located for input to the HGIS database (Figure 6).

The rapids portion of the chart sketches the unnamed canal and tandem locks without depths. Contours indicate the lower approach is > 18 ft, and the upper is 12 to 18 ft. deep. The complete village of Saut de St. Marie, Michigan is depicted. Sault Ste. Marie, Ontario is unnamed, and poorly represented with one street that makes finding control points difficult. The islands to the north of the rapids are not spatially correct, and the north shore is very similar to Vidal's 1846 survey. This survey expands the *terrae cognitae* spatial details of both the channel and shore beyond Bayfield's first survey.

Due to the increase in the size and number of iron and steel hulled ships navigating the Great Lakes in the 1880s, targeted areas on the system were re-surveyed after 1891 (Osborne & Swainson, 1986; Woodford, 1994). Water levels had continually dropped since the early 1880s exposing new and major navigation hazards. Navigation charts were updated to reflect new bathymetry, major modifications throughout the navigation system, changes in town sizes, and new municipalities. In 1905, the survey was tied into the Canadian triangulation system along Lake Huron (Woodford, 1994). Only one 1896 *Re-Survey of St. Marys River* could be located, leaving significant portions of the shoreline and channel not covered in the HGIS database.

International boundary maps are also useful for expanding certain aspects of *terrae cognitae* knowledge. These maps show detail on both sides of the border, and the boundary can be used for georeferencing control points. The American/British boundary survey of the Great Lakes commenced after the *Treaty of Ghent* in 1814. However, the location of the border was based upon the limited spatial knowledge of earlier maps that resulted in major cartographic and survey errors (Demers, 2001). To correct these spatial inaccuracies, the Canadian/American *Boundary Treaty of 1908* mandated the accurate re-establishment of the border through the Great Lakes system. The treaty mandated that the International Waterways Commission [IWC] and International Joint Commission use the newest lake level measurements, and triangulation and topographic data from *United States Lake Survey* and *Canadian Hydrographic Survey* to chart the shorelines and bathymetry of the Great Lakes and communicating rivers (Figure 7), and to accurately survey the boundary and create survey monuments on land and in the water (IWC, 1916).

As a result, the St. Marys River was intensively resurveyed in 1913. By this time, three navigation locks and two hydro power canals bypassed the rapids, and the main navigation channel through the Little Rapids to Lake Nicolet was dredged to 24 feet. A compensating dam was under construction at the head of the rapids to control Lake Superior's water levels. The 1913 chart (Figure 7) shows all these artifacts, plus the detailed geographical positions upon which the survey projections are based, bathymetry, the border and all real world details marking it, and municipal surveys of both Sault Ste. Marie's. The IWC mandated the scale (1:10,000), map measurements (40 x 50 inches), and used the 1913 United States Standard Datum (formerly the United States Standard Datum) (IWC, 1916). These *terra cognitae* details make 1913 a suitable temporal point from which to reference and compare/georeference other historic and contemporary cartography.

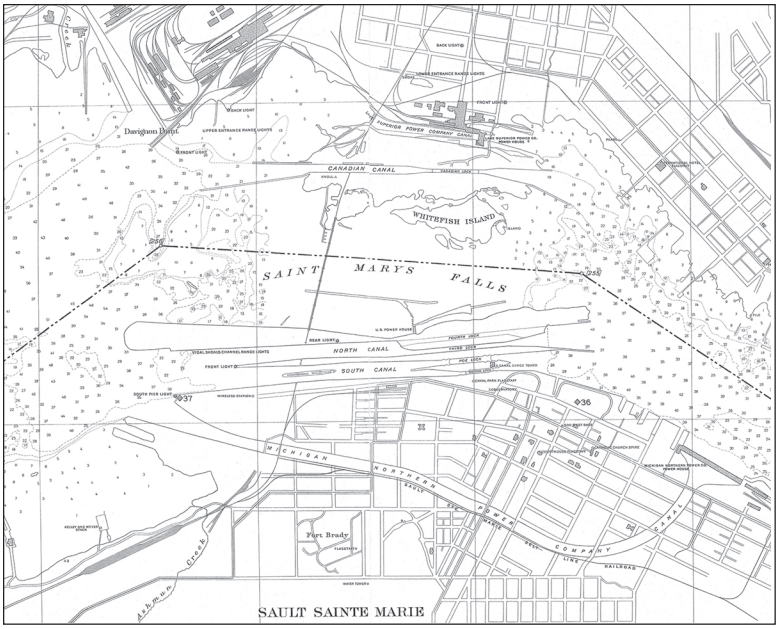


Figure 7: *Channel modifications at Sault Ste. Marie and the rapids, 1913.*

Terrae Cognitae Knowledge Capture and Data Visualization Methods

Translating bathymetry mentally into an image of the real world is difficult; therefore, the bathymetric data was converted into visual models of the channel. All analogue maps were scanned and georeferenced to NAD83, UTM Zone 16 as described in Buck & Stooke, 2007. Due to its large size, the 1913 map was folded in two, scanned, and digitally reassembled using Adobe Photoshop software. Since contemporary spatial datasets stop at the international border, Ontario 1:20,000 digital data (1998) and State of Michigan digital orthophotos and road shape files were utilized, and converted to NAD83, UTM Zone 16. The Michigan and Ontario road shape files were merged to join at the International [car] Bridge, which is the only common artifact on the digital maps at Sault Ste. Marie. The 1913 map was then georeferenced to this digital data (Buck & Stooke, 2007).

Due to landscape changes and a decreasing number of recognizable control points, such as the International Bridge, surveyed streets, prominent or historic landmarks [i.e. the Ermatinger home], marked

navigation hazards or prominent headlands, the scanned maps were georeferenced in reverse chronology of age. For example, the 1855 map was georeferenced to the 1913 map using georeferenced intermediary maps which had control points in common — such as the second *United States Lake Survey* featuring the south shore at Sault Ste. Marie, and Alexander Vidal's municipal surveys of the north shore.

Because the interpolated DEMs are modeling the riverbed only, the recorded depth (in feet) of each bathymetric point was manually recorded as a negative elevation in a point attribute table. In areas where there were too few data points or an abrupt elevation change as a result of dredging, additional points were added using contours values. For the 1913 map, 4,191 points of data were used; 2,385 for the 1855 Corps map; and 876 for Bayfield's combined maps. Using the point data files, the DEMs were created in Spatial Analyst, and TINs were created using 3D Analyst. All interpolated models show either no relief, or highly interpolated relief at the rapids because bathymetric surveys were not conducted in the non-navigable area (Figures, 8, 9, 11).

Description of Data Visualization

Since the St. Marys River rapids are the terminus for both Bayfield 1825 charts, they are merged with overlapping details for complete coverage of the study area (Figure 8). An interpolated model is layered over the digital maps, replacing numerical data with a more familiar blue representation of water depth. The spatial extent of the rapids, maximum channel depth of 60 ft, and shallow areas that schooners avoid are visible. Both settlements are situated at deeper shoreline waters just below the rapids.

In comparison, the 1855 model (Figure 9) better defines the shallows of the south shore, upstream of the rapids — a possible result of more spatial data. The 36 to 54 ft depths are more unified, and the north arm of the deep horseshoe will become the approach to the Canadian Lock, built in 1895 (Osborne & Swainson, 1986). Downstream of the rapids, the colour scheme emphasizes the better and natural depth of the southern portion of the channel and approach to the American [Soo] locks. An unmarked depth of 17 ft was incorporated into the point attribute table to model the lock/canal — a faint line just north of Saut de Ste. Marie. Shoreline development and the narrowness of the navigation channels (> 18 ft) are enhanced with data visualization.

When the 1913 interpolated TIN is layered as a transparency over the original map (Figure 10), the correlation between coloured depth

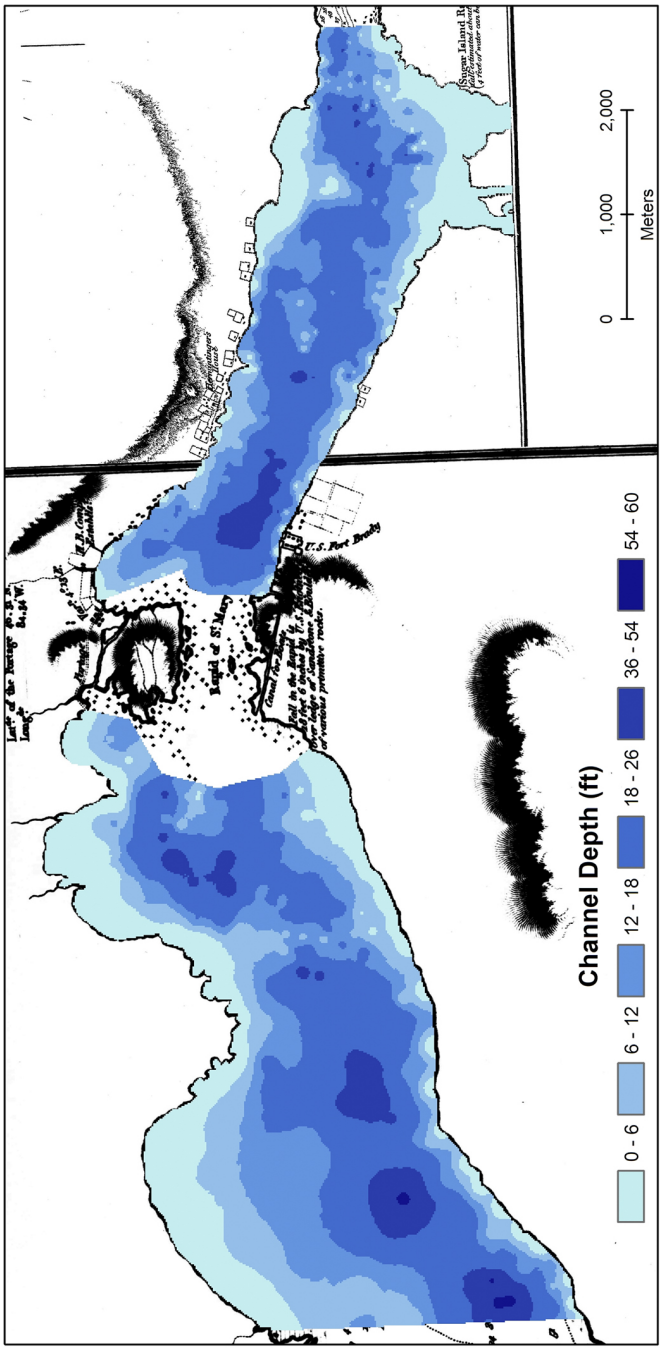


Figure 8: *An interpolated DEM is layered over the original 1825 British chart.*

Figure 9: *An interpolated DEM is layered over the original 1855 American chart.*

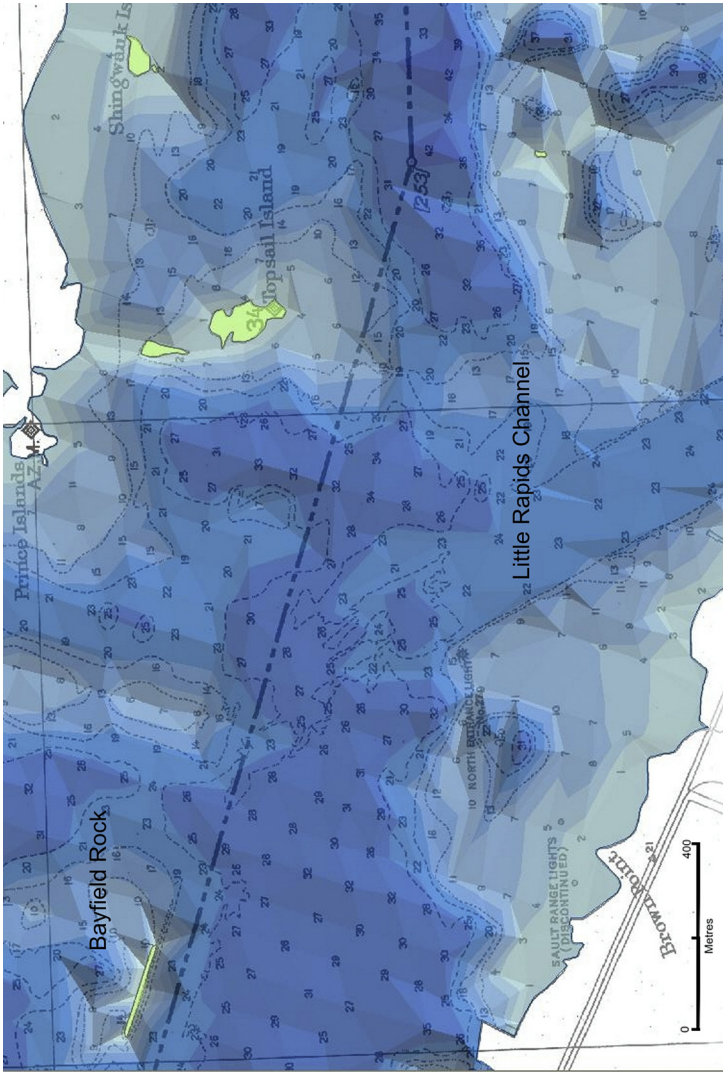


Figure 10: *A semi-transparent TIN is layered over part of the original 1913 chart.*

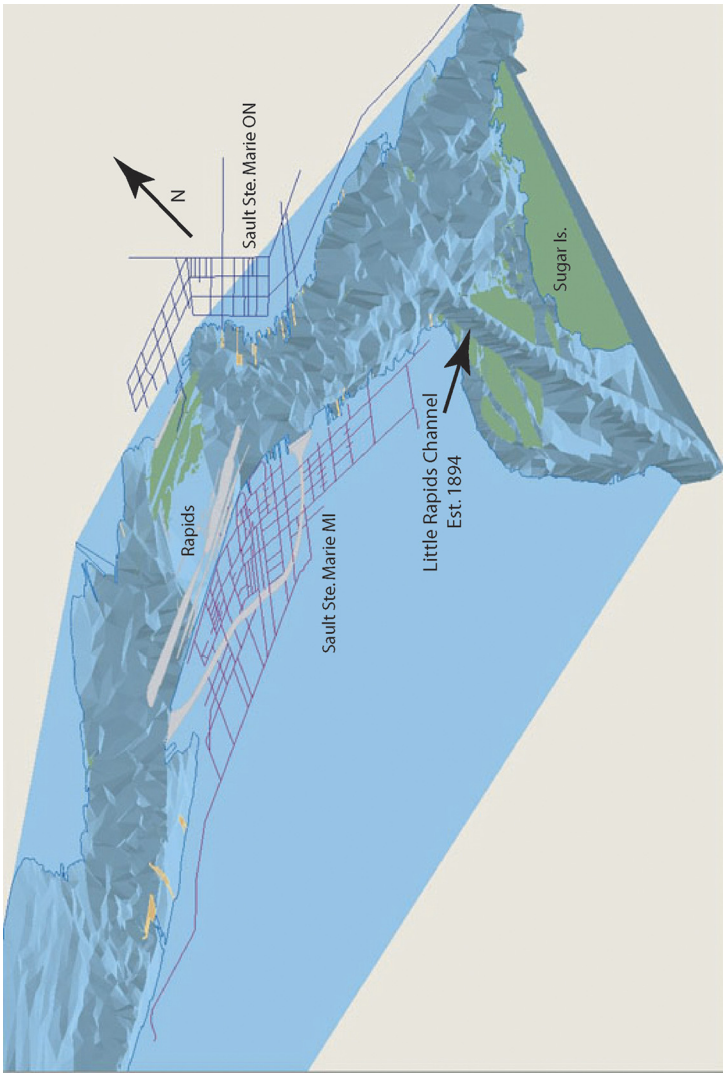


Figure 11: *3D landscape of the 1913 channel, at 10X vertical exaggeration.*

classifications and bathymetric data becomes apparent (Buck & Stooke, 2007). The numerical and text information enhances the coloured depths. The depicted area, 2 km east of the rapids on the international border, shows the natural deep-water channel (> 36 ft) with the navigation hazards of islands, shallows, potholes and rocks that rise quickly and steeply from the riverbed. Prior to dredging to 24 ft in the late 1880s, the flatter bottomed Little Rapids Channel was about 3 ft deep. Dredging turned this shallow channel into the commercial deepwater channel for the St. Marys River. Shallow drafted and private craft use the original, natural channel extending north of Sugar Island into Lake George (Figure 1, 11). Despite boat drafts of 36 ft, the 1913 chart labels contours at 12, 18 and 24 ft; reflecting the continuous 24 ft depth of the entire Great Lakes navigation system, with well marked channels and hazards.

To augment data visualization, the 1913 TIN was input into ArcScene to create a 3D landscape of the channel, at 10X vertical exaggeration (Knowles, 2002; Buck & Stooke, 2007). The georectified 1913 base map was then draped over the scene (Figure 11). What is lost with colour classification (compared to figure 10) is gained with the 3D perspective. At this viewing angle, the landscape reveals what a natural and engineering marvel the St. Marys River really is. The dredged Little Rapids Channel is straight and deep when compared to the natural, non-navigable channels beside it. The natural channel separating Ontario and Michigan is somewhat deeper, but scattered with navigation hazards. To the west of the rapids, the narrow navigation channel becomes more realistic when the extent of the shallows on the north shore is seen. The land and rapids are flat (no data), and the angle of the 3D visualization makes the streets on the north shore, and structures of the locks appear to float in space. This viewing angle somewhat shows the width of the shallows at Sault Ste. Marie on the Canadian shore, necessitating the construction of longer and floating docks to reach deeper navigable waters. Other viewing angles enhance the dredging leading into the three shipping locks.

Conclusion

Data visualization using GIS technology provides new ways of seeing the past and enhances the geographic knowledge of a region (Knowles, 2002). The 400 years of cartography depicting the St. Marys River progresses naturally from *terrae semicognitae* to *terrae cognitae* knowledge as explorers temporally gained more geographic knowledge. Using GIS to spatially align multiple map sources to the same coordinate

system enhances the changing geographical patterns with onscreen visualization.

The spatial details of the St. Marys River changed from two islands representing the rapids in 1612, to 19th century *terrae cognitae* knowledge of the channel morphology. However, the detailed bathymetry depicted on the historic snapshots is difficult to translate mentally into the landscape that it represents. Today's 'digitally visual' society finds that history and geography are easier to perceive and understand with vivid graphic representations of reality (Knowles, 2002). Using GIS technology, the historic bathymetry depicted on the St. Marys River charts becomes viable for data visualization.

The creation of DEMs enables a contemporary depiction of the 19th century channel as a way of illustrating the morphology of the channel. The models visually depict the increased amount of *terrae cognitae* knowledge of the culture, terrain, and chronology of channel modifications on the river. DEMs of Bayfield's 1825 channel show the unaltered river, while the 3D TIN of the 1913 boundary map shows the last of the major channel changes on the river. The layering of maps in GIS enables temporal and visual comparisons between maps. Comparing DEMs with the original bathymetric data shows that historic bathymetry can be interpolated to accurately reconstruct a geographic feature. Using 3D models that can be viewed from any angle enhances the visualization of the underwater topography, and helps the viewer to understand the actual morphology of the historic channel.

Comparing visual models of the St. Marys River channel yield snapshots of change that improve the window of knowledge regarding the chronology of regional 19th century channel change. Cultural aspects of the region are enhanced when terrestrial details are combined with other data visualizations. The gathering of data into a temporal HGIS provides a platform from which other regional historical and contemporary cartography can be added to the sequence for storage and future analysis. Using GIS facilitates historical inquiry, and data visualization is one way of illustrating and enhancing the history of the region. Data visualization contributes to the progression of spatial knowledge and channel change of the St. Marys River.

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Conservation implications of birder visitation to Douglas Marsh, Manitoba: expectation - satisfaction levels of birders on commercial trips versus other birders

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Abstract: The purpose of this paper is to report on the implications of the human dimensions portion of an integrated conservation project concerning of yellow rail (*Coturnicops noveboracensis*) habitat at Douglas Marsh Important Bird Area (IBA), Manitoba. Self-administered questionnaires were made available to birders visiting the Marsh to address demographics, previous experiences and linked expectation-satisfaction levels. Respondents were classified as birders on commercial trips or other birders. Birders on commercial trips possessed higher expectations to visually observe birds and wildlife. This is unrealistic for yellow rails, given the species' secretive nature. Other birders demonstrated little concern for trampling nesting habitat. Satisfaction levels for observing yellow rails were low for both groups. These results indicate a poor understanding regarding yellow rail ecology, which likely leads to unrealistic expectations and low satisfaction. Recent restrictions in access to portions of the privately-owned habitat, where recent surveys have indicated yellow rails are more concentrated, likely increases dissatisfaction. This trend may lead to decreased interest in visiting Douglas Marsh and less opportunity for conservation in the future. Mitigation in the form of increased communication between local stewards and birders, and education programs to foster more realistic expectations, is recommended.

Key words:*birders, conservation, expectation, Manitoba, satisfaction, yellow rail*

Introduction

Human dimensions research can be an important addition to ecological understanding in the development of conservation management programs (Wade and Eagles 2003; Leberman and Holland 2005). The importance of incorporating social and natural understanding in non-consumptive wildlife ecotourism was modelled by Duffus and Dearden (1990), who explained that without an understanding of both the ecological requirements of the species in question and the needs and desires of the wildlife user group effective management cannot be achieved. Reynolds and Braithwaite (2001) expanded upon this model to incorporate satisfaction of the wildlife users within the social component. Hvenegaard and Dearden (1998) further stated that ecotourism activities should contribute to conservation initiatives through an understanding of visitor demographics (Butler and Fenton 1987) and motivations (Manning 1986). Indeed, a contribution to conservation is one of the defining components of ecotourism (Lindberg and Hawkins 1993; Ceballos-Lascuráin 1996).

While there is a strong literature addressing the satisfaction of ecotourists, few studies recognize the importance of also collecting data regarding their expectations prior to engaging in their chosen activities (McKay and Crompton 1988; Wade and Eagles 2003). The benefit of understanding both expectations and satisfactions of ecotourists lies in the manager's ability to assess both what is of primary importance to visitors, as well as their post-experience assessment of those important aspects. One technique to address ecotourist expectation-satisfactions is Importance-Perfomance Analysis (IPA) (Martilla and James 1977). IPA asks pre-experience questions such as "how important are the following services we provide to your experience", followed by post-experience questions such as "please rate your satisfaction with the following services we provide". By plotting importance and performance on an x-y axis respondents' mean results fall into one of four quadrants:

Unsatisfactory experience: an aspect of importance to the respondent, which has not been satisfied,
Satisfactory experience: an aspect of importance to the respondent, which has been successfully satisfied,
Low priority: an aspect of little importance to the respondent, which received low satisfaction, or
Possible overkill: an aspect of little importance which, however, was reported as a satisfactory experience.

Analysis of the results provides a clear indication where management action should be placed, particularly those aspects that fall into the *unsatisfactory experience* quadrant. IPA has been applied to subjects such as automobile service (Martilla and James 1977), health care (Dolinsky and Caputo 1991), banking (Ennew *et al.* 1993), and in a recreation/tourism context to hotels (Martin 1995), guided tours (Duke and Persia 1996), downhill skiing (Hudson and Shepherd 1998), and whale watching (Malcolm 2003). In the case of birding ecotourism, where satisfaction may be related to an encounter with particular bird species, IPA can be a powerful management tool, particularly when target bird species are at-risk as is the case in this paper.

With respect to birding, detailed human-dimension studies have been made of demographics (e.g., Kellert 1985; Hvenegaard *et al.* 1989; Hvenegaard and Dearden, 1998; Eubanks *et al.* 2004), motivations (e.g., Boxall *et al.* 1991; McFarlane 1994; Hvenegaard and Manaloor 2001; Eubanks *et al.* 2004), and specialization (e.g., McFarlane 1996; McFarlane and Boxall 1996; Cole and Scott 1999; Hvenegaard 2002; Scott *et al.* 2005) that provide human dimensions knowledge applicable to conservation. The results of this research reveals that birders tend to be older, highly educated, employed in professional careers, and more affluent than the general public. Birders demonstrate a desire to see birds, improve birding skills, interact socially with family, friends and others of like interests, and to contribute to conservation. Birders can be grouped into the classic specialized beginner to expert typologies (Bryan 1977) but do not necessarily comprise a continuum of demographics, motivations and activities within these typologies. To this point, however, there has been no research linking expectations to satisfaction levels of birders that apply directly to conservation issues.

Documentation of a site as being important for ecotourism coupled with ecological knowledge such as habitat use by a species-at-risk should provide strong pressure for conservation, even in the presence of private land ownership, as is the case in this instance. The purpose of this paper is to report on the human dimensions portion of an integrated social and natural science project to provide recommendations for yellow rail (*Coturnicops noveboracensis*) conservation at Douglas Marsh, Manitoba, Canada. This research looks at the expectations, satisfaction levels and attitudes of birders visiting Douglas Marsh. The results this research will be combined with an ongoing yellow rail census and habitat mapping project to develop recommendations for management.

Background

Douglas Marsh:

Douglas Marsh is a shallow wetland (18 km^2) located 17 km east of Brandon, Manitoba (see Figure 1). The marsh is relatively intact. One main thoroughfare, Manitoba Provincial Highway 340, bisects the marsh north to south, south of the Town of Douglas. Ground water seepage creates a consistently wet environment which has restricted land use activities beyond haying and summer grazing of domestic livestock. Douglas Marsh is a productive ecosystem, characterized by a high degree of biodiversity in locally rare plant and bird species. Breeding bird species include the yellow rail, Virginia rail (*Rallus limicola*), sora (*Porzana carolina*), Wilson's snipe (*Gallinago gallinago*), Nelson's sharptail sparrow (*Ammodramus nelsoni*), and Le Conte's sparrow (*Ammodramus leconteii*) (Cochrane Environmental Consultants 1998). In particular, the breeding population of yellow rails has drawn attention to Douglas Marsh as a locally unique ecosystem of conservation importance. The main conservation challenge at Douglas Marsh is that the land is entirely privately owned.

Yellow Rail Research and Conservation Status:

Yellow rails prefer to remain under a canopy of vegetation rather than flying, and are extremely difficult to flush. In addition, the males vocalize almost exclusively at night. These characteristics make the yellow rail one of the most elusive birds in the world (Bookhout 1995). The yellow rail has also received little research attention; it is likely one of the least understood birds in North America (Bookhout 1995).

This lack of understanding is particularly true with respect to migration and winter range (Bookhout and Stenzel 1987; Bookhout 1995; Kehoe *et al.* 1998; Robert and Laporte 1999). The species is suspected to be a population in decline, due to habitat loss in both its breeding and purported wintering range (Bookhout 1995; Alvo and Robert 1999). Alvo and Robert (1999) estimated the population to be 8000 breeding pairs, 5000 of which are suspected to breed in the Hudson Bay Lowlands, 2000 in south-central Canada and 800 in the United States. Bookhout (1995) cautions, however, that the yellow rail may be more numerous than suspected, due to its elusiveness and the limited research focus applied to the species. Of concern is that the lack of knowledge and research may also lead to unidentified yellow rail habitat in need of conservation.

The yellow rail is specialized in terms of nesting habitat, which may further imperil its conservation status. Nesting habitat use has been the most common type of research conducted on the species (e.g., Bart *et al.* 1984; Gibbs *et al.* 1991; Cochrane Environmental Consultants 1998; Kehoe

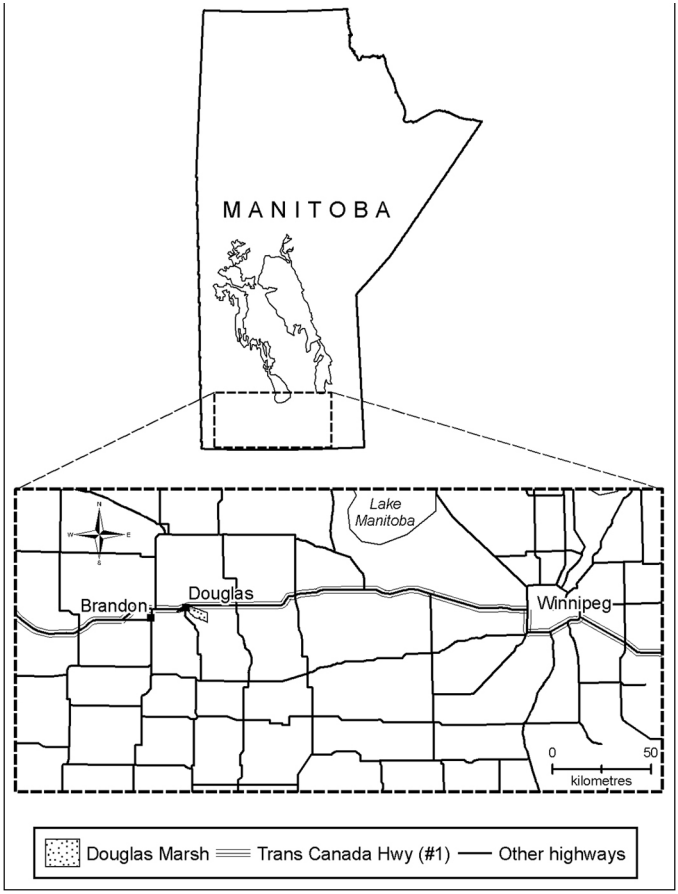


Figure 1: *Location of Douglas Marsh, Manitoba.*

et al. 1998). Current knowledge indicates that yellow rails prefer to nest in large marshes dominated by low graminoids with a senescent canopy. Nests have most often been found constructed in water less than twelve centimetres deep, over substrate that is saturated throughout the breeding season (Bookhout 1995; Alvo and Robert 1999). These structural characteristics appear to be more important than use of particular plant species (Alvo and Robert 1999; Goldale *et al.* 2002).

The yellow rail is designated by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as a species of "Special Concern" (Alvo and Robert 1999) and is listed as such in Schedule 1 of the Canadian Species-at-Risk Act. It is not listed federally under the United

States Endangered Species Act, but is listed as "Endangered" in Illinois (Bowles et al. 1981), "Threatened" in Michigan (Hyde 2001), and a species of "Special Concern" in California (Remsen 1978) and Minnesota (Minnesota Department of Natural Resources 1996).

Yellow Rails and Conservation in Douglas Marsh:

Yellow rails have been recorded in southern Manitoba since the 1930's (Freyer 1937) and specifically the area east of Brandon since the 1960's (Lane 1962). The bisection of Douglas Marsh by Highway 340 makes Douglas Marsh easily accessible and the Town of Douglas (see Figure 1) advertises itself as "Home of the Yellow Rail". The only rigorous research project to document yellow rails and habitat use in Douglas Marsh prior to 2003 was conducted by Cochrane Environmental Consultants (CEC) (1998) and funded by Manitoba Highways as part of an environmental impact assessment to explore the diversion of Highway 340 around the Town of Douglas. CEC recorded 108 yellow rail calls in 1993 and 89 in 1994, and located eleven nests during searches from 1993 to 1996. CEC concluded that: i) yellow rails used recently burned sites at the marsh for feeding, ii) all nests in the marsh were in or near water, and iii) yellow rails at the marsh tended to prefer sites with dense cover having no more than 20 cm depth of water. All birding and research activity has been focussed along Highway 340, south of Douglas, due to private land ownership.

In 1999, Douglas Marsh was declared an Important Bird Area (IBA), under the IBA Canada co-operative initiative between Canadian Nature Federation (now Nature Canada), Bird Studies Canada, and BirdLife International. The IBA program in Canada is an initiative to "identify, conserve and monitor a network of sites that provide essential habitat for Canada's bird populations" (IBA Canada 2004). Local efforts by the Douglas Marsh Community Action Committee, a sub-committee of the Brandon Naturalists Society, are currently being made in coordination with the IBA Canada program and Brandon University to monitor the yellow rail population, and with Manitoba Habitat Heritage Corporation to establish Conservation Easements on the private lands that compose Douglas Marsh. Recent surveys of habitat use by yellow rails in 2003 and 2004 indicate that yellow rails prefer habitat on the west side of the highway (Malcolm and Wilson 2004).

Birding at Douglas Marsh:

The presence of suitable habitat along Highway 340 makes this breeding population of yellow rails one of the most accessible in North America. In addition, a small portion of land (0.17 km^2) on the east side of the highway, just south of Douglas, has been made accessible to birders

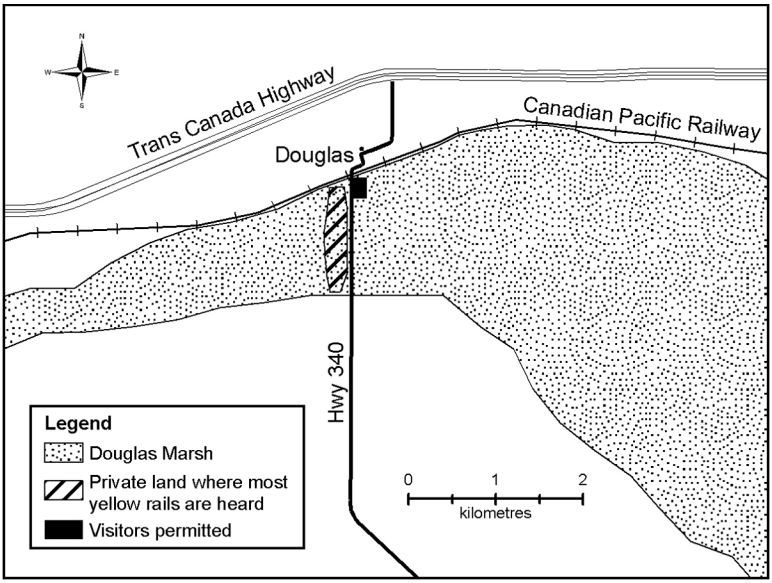


Figure 2: *Area visited by birders at Douglas Marsh.*

by the landowner (Figure 2). Thus, in recent years this site has become a "celebrated locale" for yellow rail birding experiences, and is often included as an important stop during birding tours that pass through Manitoba (Manitoba Avian Research Committee 2003, 156). However, following a change in land ownership in 2002 the land directly opposite on the west side of the highway, which had in the past has also been available to birders, has been restricted by "No Trespassing" signs.

Birding for yellow rails takes place at night, when the males vocalize. Due to the species' elusive nature, birders who wish to observe the species visually often employ spotlights, gradually pinpointing locations from successive vocalizations of an individual yellow rail. The authors of this paper has observed that some birders will also attempt to coax males from their cover by playing vocalization recordings or using stones to imitate vocalizations. The Douglas Marsh Community Action Committee was initially formed due to a concern of nest trampling by birders attempting to observe yellow rails visually at Douglas Marsh (J. Horton, pers. com.). Cochrane Environmental Consultants (1998) reported one observation of a trampled nest in their report.

Methods

A four-page questionnaire, composed of two main sections, was administered to birders by intercepting them when they arrived at Douglas Marsh. Section One, answered when birders arrived at the site, included demographic, type of birding group, previous birding experience and expectation questions. Type of birding group options were "commercial birding trip", "non-commercial, organized birding trip", "single individual" or "with friends and/or family". Previous experience questions were included to establish a simple specialization continuum along which to analyse expectation, satisfaction and management opinions. Questions included frequency of birding, interest in birding and nature, level of knowledge about yellow rails and Douglas Marsh, and previous learning regarding yellow rails. Expectation questions asked the participants to rate the importance of the following: "view a yellow rail", "view many yellow rails", "hear a yellow rail", "view a variety of birds", "hear a variety of birds", and "view a variety of wildlife." The expectation options provided were "very unimportant", "somewhat unimportant", "neutral", "somewhat important", and "very important".

Section Two, answered following the birding experience, included satisfaction and management questions. Expectation and satisfaction questions were linked. Respondents were asked to report their satisfaction on the same expectation items from Section One; expectation options were "very dissatisfied", "somewhat dissatisfied", "neutral", "somewhat satisfied", and "very satisfied". Based on the importance-performance model (Martilla and James 1977), mean expectation and satisfaction scores for each item were plotted against each other to assess the respondents' viewing experiences at Douglas Marsh.

Data were first analysed for frequencies by question. Birders were then classified into two groups, 1) birders on commercial trips and 2) non-commercial trip birders. Chi-square tests (significance level = 0.05) were then used to examine for differences between the two groups that might point towards management and education needs.

Results

A total of 65 questionnaires were completed: 34 in 2004 and 31 in 2005. There was a 7.5% refusal rate. Data for the two years were merged given the small sample size.

Demographics:

Most of the birders visited Douglas Marsh as part of a commercial birding trip (44%), followed by single individuals (24%), groups of friends/ family (22%), and non-commercial, organized birding trips (10%). When grouped together however, the non-commercial trip birders formed 66% of respondents. Similar to other birder studies, all participants were above middle age: 6.2% reported their age as 40-49, 56.9% were 50 to 59 years of age, and 36.9% indicated they were 60 to 69. There was a statistically significant difference in age between birders on commercial trips and other birders; non-commercial trip birders were slightly older ($Ç^2$=7.017, df=2, p=0.030).

Birding experience:

Table 1 indicates that participants in both groups were characteristically experienced birders. Approximately 78% of participants had been on more than ten birding trips. Almost half (43.1%) of the respondents had previously taken part in six or more commercial birding trips and 90.7% had travelled outside their country of origin to engage in birding activities. There was a statistically significant difference between the two birder groups with respect to previous participation on commercial birding trips. While 65.5% of birders on commercial trips had previously participated on six or more commercial trips, only 25.0% of non-commercial birders had done so ($Ç^2$=21.651, df=4, p<0.000).

No respondents indicated their level of birding expertise as "beginner" or "occasional", while 77.0% of the participants indicated they were "experienced" or "very experienced". The lack of beginner and occasional birders prevented the creation of a simple specialization continuum. There was no statistically significant difference between the two birder groups for indicated level of birding expertise.

Table 2 reveals which type of medium participants learned about yellow rails before visiting Douglas Marsh (if at all). Although the samples for each learning medium were too small to perform tests for statistical differences, the results indicates that 23.7% more birders on commercial trips had spent time learning about yellow rails from a guide / interpreter, 23% more from field guides, and 16.6% more from magazines or journals, than non-commercial birders.

Environmental attitudes / knowledge:

Table 3 shows that respondents rated themselves as very interested and concerned about birds and the environment, somewhat knowledgeable about yellow rails (commercial birders: 44.8% somewhat high; non-commercial birders: 44.3% somewhat high) and relatively uninformed about

Table 1: *Results of statements regarding birder experience.*

	Percentage of Respondents			
Question	Birders on Commercial trips	Non-commercial birders	Combined Groups	χ^2
About how many birding trips have you been on before?				
None	0.0	0.0	0.0	
1 to 5	6.9	0.0	3.1	0.103
6 to 10	27.6	11.1	18.5	
11 to 15	13.8	13.9	13.8	
More than 15	51.7	75.0	64.6	
About how many commercial, organized birding trips have you participated?				
None	0.0	38.9	21.5	
1 to 5	34.5	36.1	35.4	0.000
6 to 10	41.4	25.0	32.3	
More than 10	24.1	0.0	10.8	
About how many times have you travelled outside your country of origin on birding trips?				
None	6.9	11.1	9.2	
1 to 5	65.5	52.8	58.4	0.155
6 to 10	27.6	36.1	32.3	
More than 10	0.0	0.0	0.0	
Please indicate your level of birding expertise:				
Beginner	0.0	0.0	0.0	
Occasional (can identify a few birds and their calls)	0.0	0.0	0.0	
Relatively Experienced (can identify numerous birds and their calls)	34.5	13.9	23.1	0.066
Experienced (can immediately identify many birds and their calls)	31	58.3	46.2	
Very Experienced (can immediately identify many birds and their calls; birding is an important part of my lifestyle)	34.5	27.8	30.8	

the Douglas Marsh ecosystem (commercial birders: 79.3% low scores combined; non-commercial birders: 88.9% low scores combined). There were no statistically significant differences between the two birder groups for these items.

When asked about the potential impact of trampling (given that yellow rails and other marsh birds nest on the ground and birding takes place in the dark), 75.5% of birders on commercial trips and 13.9% of non-commercial birders agreed that their own group could have a somewhat high to very high impact; the difference in agreement for this item is statistically

Table 2: *Previous learning about yellow rails.*

Learning Medium	Percentage of Respondents		
	Commercial	Non-commercial	Groups Combined
Never before	9.1	10.7	10.1
Guide / interpreter	27.3	3.6	14.3
Magazines / journals	27.3	10.7	18.2
Internet	9.1	10.7	10.2
Field guides	40.9	17.9	28.4
Other books	13.6	10.7	12.2

Table 3: *Attitudes toward the environment and Douglas Marsh.*

Statement	Percentage of Respondents					X^2
	Very Low	Somewhat Low	Somewhat High	Very High	Not Sure	
Your interest in birds:						
Birders on commercial trips	0.0	0.0	6.9	93.1		0.3
Non-commercial birders	0.0	0.0	13.9	86.1		66
Your interest in nature:						
Birders on commercial trips	0.0	0.0	6.9	93.1		0.3
Non-commercial birders	0.0	0.0	13.9	86.1		66
Your concern for the environment:						
Birders on commercial trips	0.0	0.0	6.9	93.1		0.0
Non-commercial birders	0.0	0.0	25.0	75.0		53
Your level of knowledge about the yellow rail:						
Birders on commercial trips	13.8	20.7	44.8	20.7		0.0
Non-commercial birders	36.1	13.9	44.4	5.6		90
Your level of knowledge about the Douglas Marsh ecosystem:						
Birders on commercial trips	27.6	51.7	13.8	6.9		0.3
Non-commercial birders	50.0	38.9	8.3	2.8		02
Your opinion of the following potential impacts to the Douglas Marsh habitat:						
i. Vegetation trampling by your own group						
Birders on commercial trips	6.9	27.6	31.0	34.5	0.0	0.0
Non-commercial birders	36.1	50.0	2.8	11.1	0.0	00
ii. Vegetation trampling by other groups						
Birders on commercial trips	6.9	34.5	24.1	34.5	0.0	0.2
Non-commercial birders	25.0	22.2	27.8	25.0	0.0	07
iii. Highway traffic						
Birders on commercial trips	6.9	20.7	27.6	27.6	17.2	0.5
Non-commercial birders	0.0	25.0	36.1	25.0	13.9	36
iv. Wetland drainage						
Birders on commercial trips	0.0	6.9	6.9	69.0	17.2	0.2
Non-commercial birders	11.1	2.8	11.1	50.0	25.0	35
v. Domestic farm animals						
Birders on commercial trips	0.0	6.9	24.1	55.2	13.8	0.0
Non-commercial birders	11.1	25.0	13.9	36.1	13.9	73

significant ($Ç^2$=20.367, df=3, p<0.000). There was similar agreement between birders on commercial trips and non-commercial birders regarding potential trampling impact for groups other than their own; 58.5% of birders on commercial trips and 52.8% of non-commercial birders felt that groups other than their own had a somewhat high to very high potential for impact.

With respect to potential impacts of other human activities on the Douglas Marsh habitat, responses were varied but no statistically significant differences existed: respective percentages for birders on commercial trips versus non-commercial birders who indicated "somewhat high" to "very high" impact were 55.2% and 61.0% for "highway traffic", 75.9% and 61.1% for "wetland drainage", and 79.3% and 50.0% for "domestic farm animals".

Expectations / satisfaction:

Using the importance-performance model (Martilla and James 1977), Figure 3 presents the expectation-satisfaction data comparing birders on commercial trips versus other birders. The most important expectation for birders on commercial trips was "view a variety of bird species" (x=4.59), followed by "view a yellow rail" (x=4.52), "view a variety of wildlife" (x=4.38), "hear a variety of bird species" (x=4.17), "hear yellow rails" (x=4.24), and "view many yellow rails" (x=3.03). The most important expectation for non-commercial trip birders was "hear yellow rails" (x=4.28), "view a yellow rail" (x=4.22), "view a variety of bird species" (x=3.81), "hear a variety of bird species" (x=3.61), and "view a variety of wildlife" (x=3.58). "View many yellow rails" was reported as unimportant (x=2.69).

Statistically significant differences in expectation between birders on commercial trips and non-commercial trip birders exist for "view a variety of bird species" ($Ç^2$=16.246, df=3, p=0.001), "view many yellow rails"($Ç^2$=11.914, df=4, p=0.018), and "view a variety of wildlife" ($Ç^2$=10.372, df=4, p=0.035). In each case birders on commercial trips possessed higher expectations that non-commercial trip birders; for "view many yellow rails" birders on commercial trips possessed an important expectation, while non-commercial trip birders considered it to be unimportant.

The highest satisfaction level for birders on commercial trips was "hear a variety of bird species" (x=3.58), followed by "view a variety of bird species" (x=3.52), and "hear yellow rails" (x=3.41). "View a variety of wildlife" (x=2.83), "view a yellow rail" (x=1.97), and "view many yellow rails" (x=1.90) were deemed unsatisfactory.The highest satisfaction for non-commercial trip birders was also "hear a variety of bird species" (x=3.89), followed by "view a variety of bird species" (x=3.56), "hear yellow

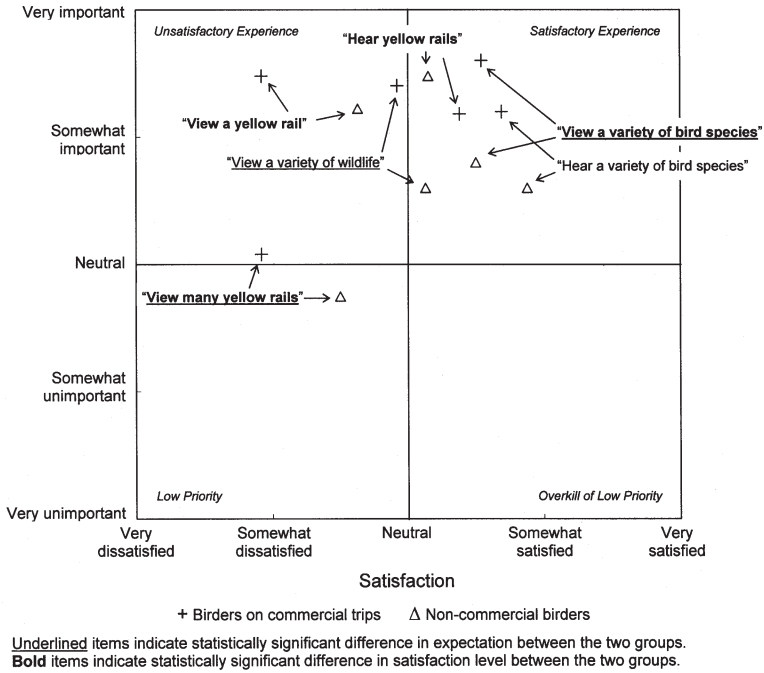


Figure 3: *Expectation-satisfaction scatter plot for birders on commercial trips versus other birders.*

rails" (x=3.15), and "view a variety of wildlife" (x=3.13). "View a yellow rail" (x=2.61), and "view many yellow rails" (x=2.50) were unsatisfactory.

Statistically significant differences in satisfaction levels between birders on commercial trips and non-commercial trip birders exist for "view a yellow rail" ($Ç^2$=20.628, df=3, p<0.000), "view a variety of bird species" ($Ç^2$=22.000, df=4, p<0.000), "hear yellow rails" ($Ç^2$=15.198, df=4, p=0.004), and "view many yellow rails" ($Ç^2$=8.615, df=2, p=0.013). Birders on commercial trips had a lower satisfaction level for "view a yellow rail", "view a variety of bird species" and "view many yellow rails", while non-commercial birders had a lower satisfaction for "hear yellow rails".

Discussion

Analysis of the data presented here reveals an important conservation issue: the possible loss of interest in Douglas Marsh by birders, particularly by commercial birding trips. This possible loss of interest is revealed in

the unsatisfactory experiences observing yellow rails by the respondents of the questionnaire and reinforced by comments made to the author by the leader of one of the commercial bird watching tours: "Douglas Marsh has not been what it used to be…Yellow Rail [sic] has been so tough the last few years that we put less emphasis on it." (J. Langham, pers. com.). A loss of interest on the part of birders could lead to a general lack of local public interest in conservation of the habitat as visitation and publicity decline. This concern can be avoided through active management in the form of education and effective communication. The theoretical benefits of eco-education as a conservation management tool have been explored by authors such as Forestell (1993), Thorn *et al.* (1994) and Orams (1996, 1997), and successfully tested by Orams and Hill (1998), who found that pre-visit education limited touching of dolphins at a dolphin feeding site.

Figure 4 illustrates the factors leading toward a trend of disinterest in the case of Douglas Marsh. Important factors include inadequate on-site interpretation, inadequate guide interpretation, and lack of knowledge, which may lead to unrealistic expectations on the part of birders visiting the site. Unrealistic expectations are evident in the high importance of "view a yellow rail" on the part of both the commercial trip and other birders. While the majority of both groups of birders indicated they were experienced, possessed a relatively high level of knowledge about the yellow rail, spent time learning about the species, and were concerned about the environment, they apparently did not possess a sufficient understanding of yellow rail behaviour to lower their expectations to observe one visually. The respondents' lower reported knowledge of Douglas Marsh and local ecological impacts is indicative of a need for education about the local context before arriving at the site.

Education should be an effective means to temper unrealistic expectations. This needs to occur both at the site and through guides on commercial birding trips. On-site interpretive education could incorporate reflective signs and pamphlets at the gate and/or community volunteers present during high visitation times. Both on-site and commercial guide interpretation should emphasise the cryptic behaviour of yellow rails and the fragility and vulnerability of their nests (along with other resident ground-nesting species). Pre-trip education could be supplied by guides for commercial birders by way of websites, research papers and field guides.

Beyond the general interpretation above, birders on commercial trips and other birders require different emphases in education treatments. For birders on commercial trips viewing their birding quarry (be it yellow rails or other species) is of paramount importance. The top three expectations for this group are the "view" expectations (variety of birds, a yellow rail, and wildlife). The "hear" expectations are less important; "hear a yellow

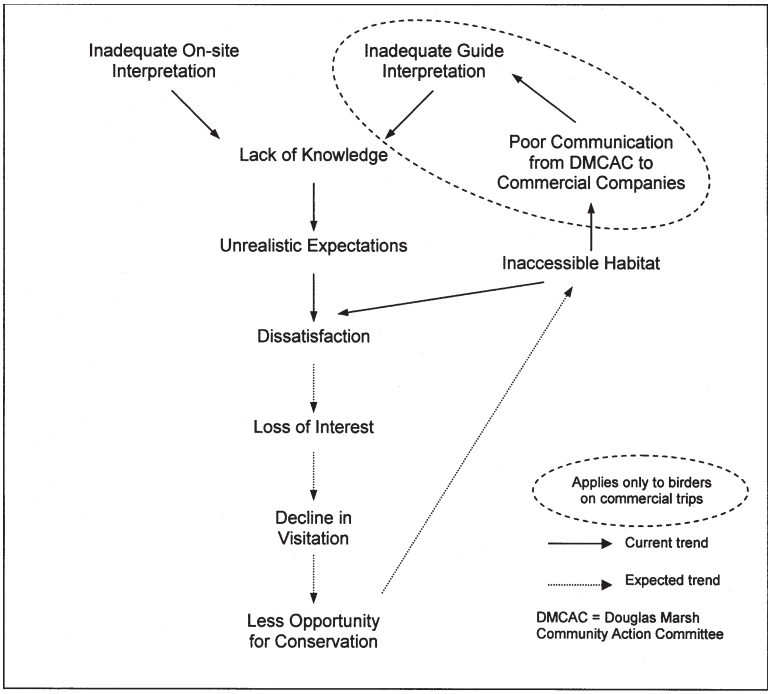


Figure 4: *Elements of declining interest, visitation and opportunity for conservation at Douglas Marsh.*

rail" is rated even less important than "view a variety of wildlife". A high expectation placed on visual observation of a yellow rail will invariably lead to a low level of satisfaction due to the remote probability of viewing an individual. For this group further emphasis should be placed on the rare opportunity provided by Douglas Marsh to access yellow rail habitat for the purpose of *listening* to their unique vocalizations. If the "hear" expectations become the more important grouping of expectations, with the "view" expectations less so, satisfactions will likely be higher, given realistic expectations. Hearing yellow rails, although given less importance than viewing yellow rails and other species, currently receive satisfactory scores from birders on commercial trips.

Birders on non-commercial trips reported their most important expectation as "hear a yellow rail" and indicated that they were generally satisfied with what they heard of the species. They also indicated that "see a yellow rail" was very important, and can therefore also benefit from interpretation that deemphasises visually observing yellow rails. However, for this group management needs to address the lack of concern regarding

trampling impacts of their own groups; this is evidence again of insufficient appreciation that yellow rail nests are essentially invisible in the dark, underneath a canopy of dead vegetation, and that individual rails will rarely flush to indicate nest locations.

Currently, inaccessible habitat at the site likely compounds the dissatisfaction of visually observing a yellow rail, particularly as the research indicates that yellow rails prefer habitat on the west side of the highway, recently closed off to the public by new landowners (Malcolm and Wilson 2004). This is principally applicable to birders on commercial trips, led by guides who have been able to access the western habitat in the past. More efficient communication by the Douglas Marsh Community Action Committee with commercial companies known to visit the site should place guides in a better position to prepare their clients before arriving. This communication should include information regarding appropriate interpretation (to give beforehand and direct their clients to on-site) to provide context and achieve the goal of realistic expectations.

Since the land within Douglas Marsh is privately owned, maintaining public interest in conserving the habitat is important. Without public interest and support there is less impetus for agencies such as Manitoba Habitat Heritage Corporation and Manitoba Conservation to engage in collaborative initiatives with landowners to conserve the habitat.

Conclusion

This research reveals the utility of examining linked expectation-satisfaction responses of birders. When coupled with previous experiences and opinions toward conservation issues management needs can be identified. In this case a combination of directed on-site and guide-based interpretation, along with effective communication between local stakeholders and commercial companies, was identified as a means to foster realistic visitor expectations, heighten visitor satisfaction, and maintain visitor interest in yellow rail birding and conservation at Douglas Marsh.

The research also reveals differences in previous birding experiences, expectations, satisfaction levels, and opinions between birders on commercial trips and non-commercial trip birders. The human dimensions of these two groups of birders should be investigated further for trends that can inform site development and management in various situations.

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A political ecology of source water protection

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Abstract: Across Canada, and elsewhere, the concept of source water protection (SWP) has gained prominence in the drinking water resources literature. The logic behind SWP is that it is easier, cheaper, and safer to protect a drinking water source from contamination than it is to repair the water source after contamination. However, the literature also suggests that various capacity- related factors operate to constrain SWP implementation on the ground. This article reports the results of applying Robbins' (2004) dominant narratives of political ecology to help explain conditions operating to constrain SWP at the local water purveyor level. The results are based on case study research from the Okanagan Valley, British Columbia. Data was derived from semi-structured key informant interviews and document review. Results reveal that the dominant narratives of political ecology provide a useful means of explaining factors constraining SWP. This article answers the call for a 'First World' political ecology while contributing a politically-inspired perspective to water resource management in Canada.

Introduction

Since the tragic events of May 2000 in Walkerton, Ontario, global interest in source water protection and the multi-barrier approach from academics, water industry, and government has been meteoric. Across Canada, the emergence of source water protection has re-configured the provincial regulatory landscape respecting safe drinking water. Source water protection (SWP) is broadly defined as watershed management for the protection of drinking water supplies and is operationalized through watershed management programs with the specific goal of protecting drinking water supplies (National Research Council 2000; Harrigan-Farrelly 2002; Gullick 2003). Within the water resources literature the concept of

source water protection is integrated within a broader water management strategy known as the 'multi-barrier approach [that] directs attention both to water supply systems and to source water areas' (de Loë and Kreutzwiser 2005, 242). The multi-barrier approach involves a number of stages, or barriers, based on the concept of system "redundancies" to safeguard the delivery of public water supplies. SWP is widely regarded as the key first barrier in the multi-barrier approach followed by the water treatment barrier, the distribution system barrier, and the monitoring barrier (O'Connor 2002; Hrudey et al. 2003; Government of Canada 2004).

It is widely accepted in this literature that SWP is not only a logical imperative but also an economic necessity. It is deemed logical because it aims to reduce the human health risk of water borne contamination at the source (Hrudey et al. 2003; Davies and Mazumder 2003). SWP is deemed an economic necessity because it is many times less expensive to protect a water source from contamination than it is to remediate after contamination (Job 1996; Leccese 1998; National Research Council 2000; Gullick 2003). However, there are indications in the literature that a host of institutional and organizational factors currently constrain the implementation of SWP on the ground (Government of BC 1998/1999:5; de Loë et al. 2002; Davies and Mazumder 2003; de Loë and Kreutzwiser 2005; Peckenham et al. 2005). Some of these constraints include lack of jurisdictional (political) control, shortages of technical and expert knowledge, and absence of financial capacity at the local, water purveyor level. The level of constraint facing local water operators in Canada with respect to source water protection implementation has initiated research focusing on capacity limitations (Timmer et al. 2007). While this literature has been helpful in identifying the relevance of capacity enhancement to undertake source protection it has provided little to explain causation of capacity deficiency at the local level. This research was motivated by the prospect of what political ecology might offer as an explanatory tool to understand the political conditions that operate to constrain local implementation of source water protection. This article reports the result of employing a political ecological perspective to help identify factors that may operate to constrain SWP.

Political Ecology

Political ecology is defined as "the analytic focus on factors that shape relations of power among human groups and that influence relations between these and diverse aspects of their environments" (Paulson et al. 2003). The political ecological perspective has been employed more commonly in 'Third World' research to help provide fresh insight into, and

explanation for, environmental degradation resulting from uneven power relations operating between different actors (Jackson 1992; Bryant 1997; Crifasi 2002; Ivey et al. 2006). Political ecology offers an alternative to the more popular accounts of the environmental crisis traditionally nested in inappropriate technology, overpopulation, or poor land use management. Instead, political ecology focuses on relations of power between and among various actors. Applied research in political ecology has typically centred on local scale, peasant land management issues in the Third World. Calls have recently gone out for a broadening of political ecology to include First World research (McCarthy 2002; Robbins 2002; Schroeder et al. 2006). Within this call are concerns for thematic continuity between Third World and First World research themes (Schroeder et al. 2006). Methodologically, McCarthy (2002) has argued for a continued presence of 'extended fieldwork using intensive case studies and ethnographic techniques' in First World political ecology as a means of 'discovering the Third World within'.

Dominant Narratives

Robbins (2004) identified four general narratives, or theses, that dominate the political ecology field as indicated in Table 1. These varied and distinct narratives are an indication of the evolving breadth of political ecology. The first political ecology thesis, the land degradation and marginalization thesis, borrows from political economy to explain land degradation in terms of exclusion, marginalization and exploitation, where one person's accumulation is another person's degradation (Robbins 2004).

Table 1: *Dominant narratives in political ecology (Robbins 2004).*

Thesis	What is explained?	Relevance
1. Degradation and marginalization	Environmental change: why and how?	Land degradation, long blamed on marginal people, is put in its larger political and economic context
2. Environmental conflict	Environmental access: who and why?	Environmental conflicts are shown to be part of larger gendered, classed, and raced struggles
3. Conservation and control	Conservation failures and political/economic exclusion: why and how?	Usually viewed as benign, efforts at environmental conservation are shown to have pernicious effects, and sometimes fail as a result
4. Environmental identity and social movement	Social upheaval: who, where, and how?	Political and social struggles are shown to be linked to basic issues of livelihood and environmental protection

Where local, traditional production systems become usurped by state intervention or regional and global market shifts, rules of resource access and control undergo change. Such conditions may lead to exploitation of the land in a quest to produce surplus capital for outside interests. Such exploitation, as the thesis goes, leads to local poverty and, cyclically, continued exploitation and land degradation. More recent (and more politically-related) assertions of this thesis hold that "modernist development efforts aimed at improving local production systems such as state enclosure (parks, protected areas) of traditional collective lands and imposition of new or foreign institutions (World Heritage designation) actually operate to decrease local unit production, sustainability, and equity of resource distribution" (Robbins 2004 14). The land degradation and marginalization thesis avoids consideration of potential benefits arising from new opportunities for local production systems.

The second thesis, the environmental conflict thesis, is concerned with conflicts that evolve between resource user groups that result from increasing resource pressures caused through land (or water) enclosures or appropriation by state authorities, private firms, or social elites (Robbins 2004).

An aspect of this thesis is that it is multi-dimensional. For example, environmental conflicts may surface when local groups secure local control of collective resources at the expense of others, including those from outside the local community. This perspective challenges the dominant view of private capital gaining control over local resources. Another dimension includes resource conflicts between local communities resulting from changes in state conservation or resource development policy.

The third thesis, conservation and control thesis, argues that the struggle over local command and control of resources by regional, national or global authorities erroneously characterize local and benign production practices as unsustainable. Subsequently, these same state authorities organize to preserve the environment under the mantra of 'conservation'. The control and management of these areas by the state, according to this thesis, removes opportunities for local production practices creating conflict over resource access leading to local poverty and the possibility for environmental degradation through over-harvesting on an imposed limited land base.

The fourth and final thesis from political ecology, the environmental identity and social movement thesis, suggests that changes in environmental management regimes and environmental conditions create opportunities for local, and often disparate, groups to band together politically. As a result, powerful national and even global political and

economic forces become themselves the target of coordinated local opposition.

This research pays close attention to these four theses by testing their applicability to the results from this case study research. If one or more of the dominant narratives are applicable to case study results then it can be shown that political ecology is a useful explanatory tool in water resources research.

Research Problem

In spite of its broad support in the water resources literature_the practice of SWP has been slow to develop (de Loë and Kreutzwiser 2005; Peckenham et al. 2005; Ivey et al. 2006). To date, the water resources literature has focused on capacity-related deficiencies, particularly at the local level, to identify factors constraining SWP implementation. These capacity-related deficiencies centre primarily on technical, financial, jurisdictional, and social components of water management at the local level. While the capacity literature has contributed to a better understanding of factors facilitating and constraining SWP, the capacity literature is limited as an explanatory device. For example, while the identification of jurisdictional capacity limitations may be helpful to initiate policy (re)direction, it provides little to explain why local areas may lack jurisdictional capacity within their watershed. The possible explanations may be tied to provincial priorities of resource extraction over watershed protection, state sponsored land designation such as park or intensive development, or private versus public land ownership within a watershed. This research sets out to determine the role of political ecology as an explanatory tool to identify conditions that constrain SWP at the local level.

Methodology

Semi-structured interviews:

Semi-structured interviews using an interview guide were conducted with a range of participants from both inside and outside the Okanagan Valley, British Columbia. This research will report responses from the local interviewees including water managers, consultants, and elected officials. In total, approximately 50 interviews were conducted between August 2004 and July 2005.

Document review:

Document review helped corroborate interview material as well as provided an additional source of quantitative data. Documents reviewed for this study included professional reports, purveyor newsletters, government documents, internal and external reports produced by water associations and water purveyors, and correspondence specifically related to the individual case study areas. The documents represent a wide range of local, regional, and provincial scale material. In total, 45 documents ranging from single page newsletters to multi-page documents were utilized.

Case Study Areas:

The four case study areas in this research are all located in the Okanagan Valley of BC (see Figure 1). The Okanagan Valley offers a rich water resource landscape in one of the most important basins in the Southern Interior (Cohen and Kulkarni 2001). The Okanagan Valley is roughly 160 km in length, averages 50 km in width, and encompasses approximately 8200 km^2 of land surrounding Okanagan Lake and Okanagan River. Located in the rain-shadow of the Coast (BC) and Cascade (US) Mountain Ranges the Okanagan Valley has a dry continental climate. The semi-arid region receives approximately 30 cm of precipitation per year; of this 85 percent is lost annually to evaporation and evapotranspiration (Cohen and Kulkarni 2001).

The Okanagan Valley is divided politically into 3 regional districts, 11 municipalities, 40 improvement districts, and the Okanagan Nation Alliance comprising seven Indian Band Reserves (Cohen et al. 2004). For the purposes of this study, specific case study research was conducted within the Regional District of North Okanagan and the Regional District of Central Okanagan. It is important to note that in all four case studies the municipal or irrigation district boundaries do not coincide with the respective boundaries of the water supply watersheds.

The main potable water source for the Okanagan is the mountain valley tributary streams. These sources generally supply adequate quantity, are gravity fed, and require minimal treatment or filtration. Within the North Okanagan Regional District approximately 70 percent of potable water supplies originate in mountain source areas. The percentage for the Regional District of Central Okanagan is lower at 40 percent, owing mainly to Okanagan Lake supply (valley bottom) to the Kelowna City.

The Okanagan has experienced rapid expansion in agriculture and other resource activities as well as significant population growth since the mid-1900s. The combination of these activities has placed enormous pressure on water resources, a condition that, in part, initiated the Canada-British Columbia Okanagan Basin Agreement (March 1974) and, more

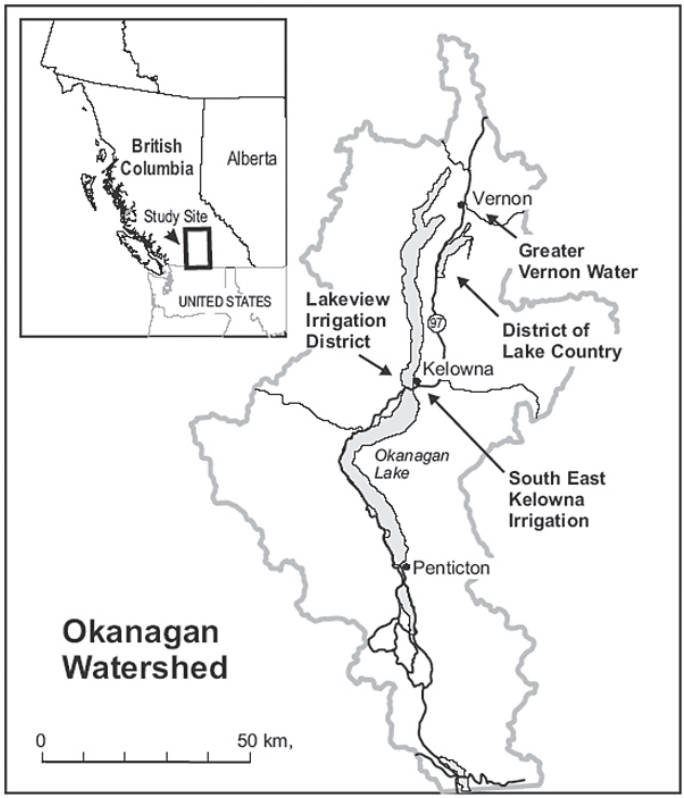


Figure 1: *Okanagan Basin case study areas.*

recently, has generated debate over water governance throughout the valley (Cohen and Kulkarni 2001; Cohen et al. 2004; Okanagan Partnership 2004). Drinking water quality has long been a concern in the Okanagan, most notably the 1996 *Cryptosporidium* outbreak in Kelowna with over 10,000 confirmed epidemiological cases. Additionally, the Okanagan Valley has not escaped BC's long history of enteric illnesses and aesthetic quality concerns (Government of BC 1998/1999; Parfitt 2000; Phippen 2001; Government of BC 2001).

The criteria for case study selection included non-metropolitan surface water suppliers drawing from mountain surface water sources. As well, the case study areas all operate under identical regulatory framework and occupy similar bio-geoclimatic regions. An effort was made to include a range of public water purveyors, including irrigation districts (South East

Kelowna and Lakeview), a district municipality (Lake Country), and an amalgamated regional water authority (Greater Vernon Water).

Results

A broad range of factors was reported as constraints to SWP. Factors identified as constraining SWP are reported in Table 2. Values reported in Table 2 reflect the percentage of interviewee responses identifying a specific constraining factor. The right-hand columns in Table 2 provide the aggregate percent total for each constraining factor across all case studies.

Lack of purveyor authority within the watershed (53%) was the most frequently cited constraint to SWP. Other leading constraints reported by interviewees included the lack of single agency responsibility (47%), conflicting mandate of provincial government (44%), and the lack of funding and experience (43%). As a contribution to the capacity-building literature these results identify lack of jurisdictional, financial and human capacity as main factors constraining local SWP. In these examples, capacity limitations provide a valuable contribution to our understanding of factors constraining SWP. However, it is argued that the capacity literature alone

Table 2: *Factors constraining SWP (values in percent).*

Factors Constraining SWP	LID	SEK	DLC	GV	Total
Purveyors lack authority (lack shared jurisdiction)	15	17	12	9	53
No one agency responsible for watershed authority	10		22	15	47
Conflicting mandate of provincial government	15	12	5	12	44
Lack of funding, experience to do SWP	10	12	15	6	43
Lack provincial staff to do enforcement	8	12	5	6	31
Lack of public education on SWP	8	12	10		30
Multi-use nature of watershed	2	12			14
Lack prov. land use communication to purveyors		7		6	13
General lack of knowledge on how to do SWP		7		6	13
Increased development pressure			10		10
Lack local staff		7			7
Rapid population growth in Okanagan Valley	6				6
Drinking water Officers lack watershed experience				3	3

LID = Lakeview Irrigation District; SEK = South East Kelowna Irrigation District; DLC = District of Lake Country; GV = Greater Vernon Water

can not describe the full range of reported constraints to SWP listed in Table 2. More importantly, the capacity literature alone can not explain the political causes contributing to lack of capacity.

The dominant narratives identified by Robbins (2004) may offer an explanatory tool to help understand broader political conditions constraining SWP. Table 3 links those factors constraining SWP reported in Table 2 to a dominant narrative from political ecology. Factors linked to capacity and external factors have also been identified in Table 3 and are not discussed further in this article.

Table 3: *Factors constraining SWP linked to a dominant narrative.*

Factors Constraining SWP	Dominant Narrative			
	1	2	3	4
Purveyors lack authority (lack shared jurisdiction)	✓			
No one agency responsible for watershed authority	✓			
Conflicting mandate of provincial government		✓		
Lack of funding, experience to do SWP	Capacity-related			
Lack provincial staff to do enforcement	Capacity-related			
Lack of public education on SWP	Capacity-related			
Multi-use nature of watershed		✓		
Lack prov. land use communication to purveyors			✓	
General lack of knowledge on how to do SWP	Capacity-related			
Increased development pressure	External factor			
Lack local staff	Capacity-related			
Rapid population growth in Okanagan Valley	External factor			
Drinking water Officers lack watershed experience	Capacity-related			

Discussion

Factors constraining SWP that have been linked to a dominant narrative are listed in Table 4. The following provides a discussion of these constraining factors in relation to the dominant narrative to which they associate.

Dominant Narrative 1: Degradation and marginalization thesis

Lack of water purveyor authority:

Lack of water purveyor authority in the watershed was cited most frequently as a factor constraining SWP. For example, the District Manager for Lakeview Irrigation District (19 October 2004 interview) voiced frustration in not having any jurisdiction within the watershed:

Table 4: *Dominant narrative.*

Factors Constraining SWP	Narrative 1	Narrative 2	Narrative 3
Purveyors lack authority (lack shared jurisdiction)	✓		
No one agency responsible for watershed authority	✓		
Conflicting mandate of provincial government		✓	
Multi-use nature of watershed		✓	
Lack prov. land use communication to purveyors			✓

> 'We've been charged with the responsibility of providing safe drinking water with no means of enforcement. We have our hands tied. The province is allowing multiple uses up into our watershed, including forestry, cattle range, and now intensive (motorized) recreation. We have no jurisdiction, no enforcement, and no compensation coming back to us for watershed damages'.

An elected official from South East Kelowna Irrigation District (31 May 2005 interview) expressed concern regarding the lack of purveyor authority respecting industrial and recreation watershed activities:

> 'We (South East Kelowna Irrigation District) have no enabling legislation to enforce bylaws or enforce control over activities within our watershed'.

While lack of local water purveyor jurisdiction within a watershed was frequently noted, in no interview was there the suggestion that watersheds be closed-access areas for the exclusive use of the local water purveyor. In the words of the General Manager of Infrastructure Services at the Regional District of North Okanagan (11 August 2004 interview):

> 'We simply can't do what they do in Vancouver and put a big fence around and close off the watershed, we don't have that luxury'.

In another interview, the Senior Planner for the Regional District of Central Okanagan (10 August 2004 interview) noted:

> 'If we manage watersheds for a single use we lose tourism, outdoor recreation, forestry, mining, it could be damaging to your local economy'.

Lack of water purveyor authority in the watershed was consistently identified by the purveyors as a factor constraining SWP. This reported factor represents a form of water purveyor marginalization. Powers to

make decisions in the watershed are held exclusively by provincial agencies (e.g. forestry, mines) to the exclusion of local water purveyors. Interviewees reported that this arrangement not only constrained SWP implementation at the local level but also contributed to watershed degradation. While water purveyors were not expecting, nor asking, for exclusive control over watershed decision-making, they were asking for a larger voice on matters concerning the watershed. This response is taken here as a sign of water purveyor marginalization by provincial government agencies and their respective watershed management structures. SWP is constrained in this case because of the marginalization of local water purveyors as a result of provincial agencies unwilling to share jurisdictional powers.

No single agency responsible for water:

Several reports to the BC Government reference the lack of a single agency responsible for water as a factor constraining SWP. For example, one of the Auditor General's final recommendations is that the Province "[d]esignate within Government a lead agency for drinking water interests, to coordinate government policy and action on drinking-water sources" (Government of BC 1998/99). The call for a lead agency was repeated once more in 2002 in the Final Report of the Drinking Water Review Panel (DWRP) commissioned by the newly elected BC Liberal Legislature. In DWRP's Final Report it is stated that the province should "[c]reate a single lead Drinking Water Protection Agency reporting to the Minister of Health Planning, to integrate the skills, resources and authority of all provincial ministries with responsibility for drinking water protection" (DWRP 2002 8). A private engineering consultant in Vernon, BC stated:

> [t]here is no leader, this is the heart of the problem, it is the core of the problem, absolutely. It was recommended at least three years ago after Walkerton and also by the BC Drinking Water Review Panel (Final Report, Feb. 2002). It said we should have one water ministry, and guess what, it hasn't been done. If we had one water ministry … we'd have better coordination, fewer barriers … and absolutely this would help source protection".

The Senior Engineer for the District of Lake Country (31 May 2005 interview) expressed frustration in not having a single agency structure responsible over water:

> 'If you ever phoned (the BC Government) to find out who is in charge of your watershed you'd get the switchboard from hell. I think it is authority that is the key word we are looking for, who has the authority

> in the watershed to deal with drinking water issues? In my opinion they are not there.'

Local water purveyors reported that the partition of responsibility for water management in BC was a constraint to SWP. This partitioning of responsibility is taken here to be a form of marginalization wherein local water purveyors are not only isolated from watershed decision-making but also unable to efficiently communicate their concerns to a single agency. Under this condition, local water operators remain frustrated in their efforts to undertake SWP. In the absence of a single water agency structure, local purveyors are unable to effectively communicate their concerns to provincial agencies, and therefore remain marginalized.

Dominant Narrative 2: Environmental Conflict

Conflicting mandate of provincial government:

The third most commonly cited constraint to SWP was the apparent conflicting mandate of the provincial government (43 percent). Provincial Acts and regulations were commonly cited as operating at cross-purposes. This constraint extends the notion of agency fragmentation to policy fragmentation and illustrates the problem facing SWP where contradictory Acts and regulation are in place. Several interviewees identified the contradiction between the legal requirement of the purveyor to provide 'safe drinking water' under the BC Drinking Water Protection Act and the absence of any watershed authority among water purveyors. For many, this was interpreted as the hand of government forcing water treatment upon the local purveyor. Emphasis on treatment, something for which the purveyors do have authority draws attention away from watershed management and SWP. This situation was a significant source of frustration to the local water purveyors, many of whom could ill afford expensive water treatment facilities.

One key land use activity seen to be posing a threat to water quality was urban growth including the deregulation of septic field installation approval by provincial health authorities. A new sewage system regulation took effect May 31, 2005 with the intent of shifting responsibility from provincial health authorities to private industry. This 'results-based approach' is intended to enhance industry effectiveness and accountability. The new sewerage system regulation applies to site assessments, installations, and maintenance of onsite wastewater systems, from septic systems for single family homes to complex systems for multi-residential, industrial and commercial applications (Government of BC, 2005). However, others feel such deregulation of provincial health authority may

compromise public safety. In the words of a water resource consultant based in Vernon, BC (2 June 2005 interview):

> 'Septic regulations are changing, no longer inspected or meet specifications. It will be left to the discretion of recognized practitioners. The Ministry of Health is no longer going to be involved. So at the same time as trying to add protection for drinking water they are making it easier for people to build lousy septic tanks around the lakes that people drink out of.'

In a second example, the same water resource consultant pointed to the contradiction between the new 'results-based' Forest and Range Practices Act (FRPA) (Government of BC 2002) and the new BC Drinking Water Protection Act (DWPA) (Government of BC 2001).

> 'The DWPA is a strong regulatory instrument … on the other hand there is the new FRPA that is a very flexible, results-based instrument. As a result the forestry companies can cut right up to streams, they can do basically whatever they want now. The theory goes if the result was fine then the practice was fine. But there are problems; some of the impacts will not happen until well after the activity, there will not be any monitoring, so no chance of following-up, damage will be done. That legislation is conflicting with the DWPA. So they are at cross purposes. The wording in the new FRPA says protect streams, as long as protecting streams does not get in the way of forest harvesting and timber supply. It is protection when it is convenient.'

Noted above is evidence provided by interviewees of the conflicting mandate of the provincial government respecting SWP. This conflicting mandate is taken here as an example of Robbins' (2004) environmental conflict thesis wherein access to environmental resources are bundled and controlled within a provincial regulatory system favouring resource development over drinking water source protection. Privileging access to certain resources over others (e.g. wood fibre over drinking water) through legal regulation created environmental conflict, thus constraining the practice of SWP by local water purveyors.

Multi-use nature of watersheds:

Watersheds in Crown areas of British Columbia are provincially owned and therefore designated as multi-use areas. The multi-uses of these areas were a regular concern among water purveyors. Allowing multiple users on Crown–owned land, in the view of many purveyors, allows for unmanaged land use activities and the potential for negative watershed

impacts regarding water quality. For example, the Water Quality Technologist at the District of Lake Country held the opinion that the management focus of provincial agencies prioritizes resource extraction over water quality protection. This, stated the Water Quality Technologist, was a main constraint to SWP:

> 'If we would have had any say in the land resource management planning, we were told loud and clear, that these were multi-use watersheds, there was no way that they were going to eliminate range, no way that forestry was going to be kept out of those areas. We would never have the chance to say we do not want anybody to be in there, that this is a community watershed; they are huge basins, and sub-basins. But sometimes they (provincial government) look at it as though they are managing it, but they are managing it for the land base but not (for) the water."

In addition, the Water Quality Technologist highlighted the contradiction of the provincial government regarding resource extraction and water quality:

> 'I don't think the political will is there to ensure drinking water quality. Everybody is still very much looking after themselves, from range to forestry to whatever; they are all looking after their product and their market as directed by government. There are people in industry that are dedicated to water quality, but they have to look out for their industry too.'

The conflict emerging from multiple-use activities within a community watershed was common place in many interviews. This constraining factor to SWP fits within the environmental conflict thesis and shows that conflicts are part of jurisdictional struggles over resource access and control. In a resource rich province such as BC, SWP competes with other crown-land users resulting in conflict. These industrial watershed users pre-exist SWP planning and initiatives. Under such conditions, SWP will be difficult to operationalize at the local level.

Dominant Narrative 3: Conservation and Control

Lack of provincial land use communication to purveyors:

Lack of provincial land use communication to the purveyors was regularly reported by case study interviewees. Lack of communication from the province to the local purveyor is being linked in this paper to the conservation and control thesis (Robbins 2004). The Okanagan Shuswap Land and Resource Management Plan (LRMP) will be used to provide the

example. The LRMP was a multi-year, provincially-driven land use plan for the Okanagan Shuswap, an area including the Okanagan Valley. One of the many land use designations that resulted from this process was the Resource Management Zone RMZ designation of 'Intensive Recreation (Motorcycle – Bear Creek)' over the entire LID watershed (BC Okanagan-Shuswap LRMP 2001 REC 4-10). This designation, and the process that enabled it, remains a controversy between LID and the adjacent Westbank Irrigation District (WID), their consultants, and the then provincial agency behind the process, the Ministry of Sustainable Resource Management (amalgamated 2005 into the new Ministry of Environment). For example, a water resource consulting engineer in Kelowna stated:

> 'The BC Government did a land use plan, an LRMP, there were two people there representing the water districts, and somehow this intense recreational area for motorcycles got approved in a community watershed, and without the knowledge of the irrigation district because they weren't at the table'.

In separate interviews the LID manager and the WID manager expressed grave concern over the LRMP process that legitimized dirt bike activity through the 'Bear Creek Motorcycle Recreation Zone' (RMZ) land use designation. For example, the WID manager summarized the process by stating:

> 'a couple of different BC Government agencies got together and allocated this huge motorized recreation zone, the RMZ without any consultation with Lakeview or Westbank, which is totally unacceptable'.

In this example it is shown that efforts toward a land use designation for a specific user group (bike club) created political and ecological exclusion (irrigation districts). Alienated and ignored, the local water purveyors were placed in a reactive position to a land use designation process that favoured one special interest user group (dirt bike enthusiasts) over public water purveyor and domestic water users. Here, the conservation and control thesis provides a lens through which a seemingly benign land use designation is shown to have negative effects on institutional relations and environmental quality.

Conclusion

This research sought to identify factors constraining SWP at the local, water purveyor level. Expanding upon previous work in the capacity-building literature, this research adopted a political ecology approach to help identify explanatory causes for the slow uptake of SWP at the local, water purveyor level. The use of Robbins' (2004) dominant narratives of political ecology enabled a means of categorizing interviewee responses. In this research, three of the four dominant narratives offered explanation for the slow uptake of SWP in the Okanagan Basin. Lack of water purveyor authority as well as the lack of a single water agency structure in BC is seen as conditions that marginalize local water purveyors. Such marginalization disables the ability of SWP to effectively develop on the ground. Additionally, the conflicting mandate of the provincial government and the designation of multi-use watersheds are seen to contribute to environmental conflict, further reducing the potential for SWP to develop at the local level. Lastly, poor communication between provincial agencies and local water purveyors, caused in part by provincial control over resource use, is seen to be a factor constraining SWP practice at the local level. Therefore, the dominant narratives approach provides a useful analytic tool to explain conditions constraining SWP implementation at the local level.

Continued research into a 'first world political ecology' is warranted. To this end, there is an important place for a First World political ecology in the area of water resources management. SWP will particularly benefit from a political ecological perspective where power relations that serve to constrain SWP are revealed. Attention also needs to evaluate alternative, cooperative models of watershed management. While SWP is supported throughout the water management literature there is a need for more applied research that will assess new models of watershed planning to help operationalize SWP with greater emphasis on power-sharing and partnership arrangements between different levels of authority.

To help address the damaging effect of uneven relations of power a shift is necessary from the "management" of watersheds to the "planning" for watersheds. Watershed planning could emphasize power sharing between the land manager (Province) and the many users, including the water purveyors. The traditional "command and control" model of watershed management of Crown land by fragmented and overlapping provincial agencies has served to concentrate power within certain provincial resource ministries and related industries thereby negating opportunities for shared decision-making and true watershed collaboration with all stakeholders. Robbins' (2004) dominant narratives of political

ecology provide a useful means of understanding the broader conditions that may serve to constrain SWP.

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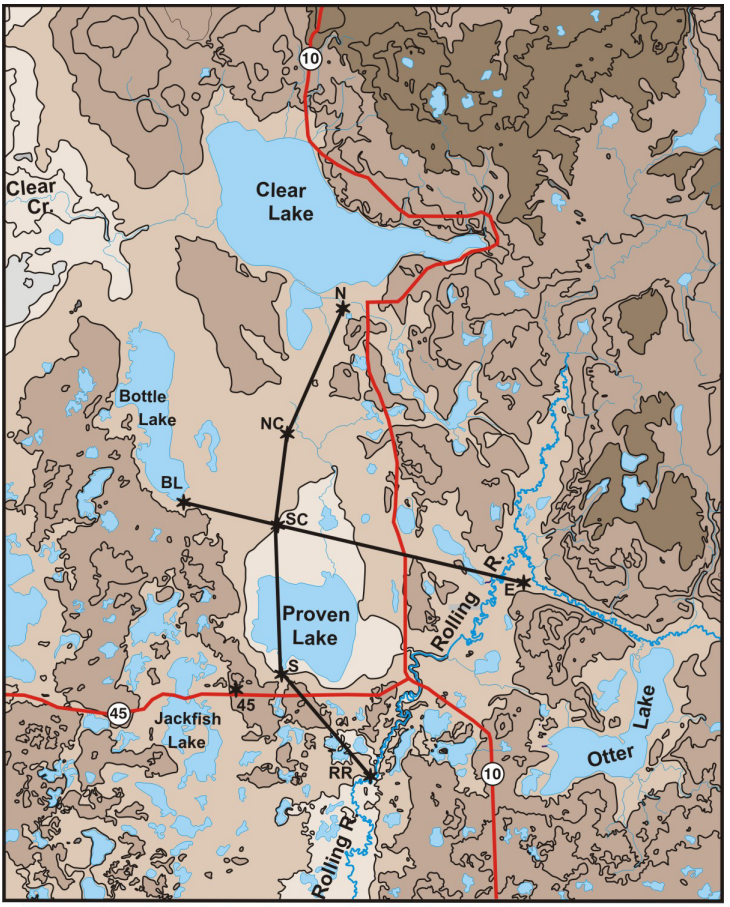
Terminoglacial lacustrine sediments and other deposits in the Glacial Lake Proven basin, Riding Mountain, Manitoba

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Astract: The 2005-06 core-sampling program in the Glacial Lake Proven basin was designed to provide subsurface sedimentological data to the base map data previously collected and estimate of the nature and thickness of lacustrine sediment in the terminoglacial Lake Proven basin. The secondary objective was to integrate the terminoglacial stratigraphy with the previously described supraglacial sequence of lake sub-stages. A third objective was to search for datable organics and diatoms. Five cores extracted from the terminoglacial Lake Proven basin indicate a rich sediment supply and a variety of terminoglacial lacustrine facies: lacustrine complexes, lacustrine bottomsets and lacustrine complexes grading to shallow water lake-margin deposits. These glacigenic facies represent a continuum of supraglacial/terminoglacial lacustrine sedimentation throughout the history of the glacial lake. The terminoglacial lacustrine facies represent a major sub-stage in the lake history and the general stratigraphic sequence of facies exposed in the cores suggests that water levels in terminoglacial Lake Proven fluctuated periodically. While no datable material or diatoms were found in the cores, sedimentation rates, as indicated by rhythmic laminations exposed in the cores and stratigraphic sections, could help estimate the duration of both the supraglacial and terminoglacial lake sub-stages.

Introduction

The Lake Proven basin covers an area of approximately 340 km^2 on the Riding Mountain Uplands in Manitoba (Figure 1). The topography is generally less than 625 m in elevation and includes the present day; Clear Lake, Bottle Lake, Proven Lake, Jackfish Lake and Otter Lake. Higher elevations, in excess of 670 m, are located to the north and east of the Lake



After McGinn 2002, Figure 2

Figure 1: *Physiography of the Glacial Lake Proven basin.*

Proven Basin (Figure 1). The Rolling River drains the southern portion of the basin to the south; the northern portion of the basin drains towards the west by way of Clear Creek. Both drainage routes join the Little Saskatchewan River and eventually drain into the Assiniboine River to the south.

Klassen initially mapped the southwestern third of the Lake Proven area as "silt, deposited in part in a superglacial lake" and referred to this supraglacial lake as "Glacial Lake Proven" (Klassen 1966, 117). The associated 1:250,000 map published in 1965, however, makes no reference to the name Glacial Lake Proven or to the mode of origin of the deposits. In later work, Klassen (1979, Map 1469a) describes the supraglacial lacustrine deposits as "a gently irregular to hummocky glaciolacustrine complex composed of mainly silt and sand." Associated lacustrine deposits are described as "silt and clay or organic deposits on poorly drained flats" (Klassen 1979, Map 1469a). There is no mention of Glacial Lake Proven in the 1979 memoir. The Quaternary surficial map of Riding Mountain (Manitoba Energy and Mines 1980), based on Klassen's 1979 map, describes the deposits as "lacustrine silt and clay deposited in basins peripheral to the main Lake Agassiz basin."

In these small-scale surficial mapping studies (1:250,000) there are virtually no details regarding the environmental conditions, depositional mechanisms, and lithologic characteristics, which are associated with the Glacial Lake Proven deposits. Furthermore, the actual extent of the deposit is poorly mapped due to its relative small size and the fact that some of the sediments have been subsequently buried.

Detailed surficial mapping based on stratigraphic descriptions obtained from road and river cuts (McGinn 1991, 1997, 2000, 2002, McGinn et. al. 2004 and 2007) has determined that early Glacial Lake Proven deposits (Proven I Complex) occur at elevations above 615 m in the region to the west and southwest of the topographic basin (Figure 2). These rhythmite deposits exposed at the Bottle Lake (BL), Hwy 45 (45) and Rolling River (RR) sections represent a supraglacial lacustrine facies (McGinn 2002). The deposits of the later phases of Glacial Lake Proven (Proven II Complex) are believed to represent a topographically controlled terminoglacial lacustrine facies, perhaps supraglacial, but with only a thin ice base (McGinn 2002). Exposures of the Proven II complex are found in the upper units of the Rolling River section (McGinn 2002). No other natural or anthropogenic exposures of the terminoglacial lacustrine facies have been found.

To date, diatoms, pollen, and other datable organics have not been found in the Glacial Lake Proven basin deposits. Consequently, there is no absolute or relative chronology for the Glacial Lake Proven stratigraphy or any estimates as to the longevity of the lake. To some extent this is not

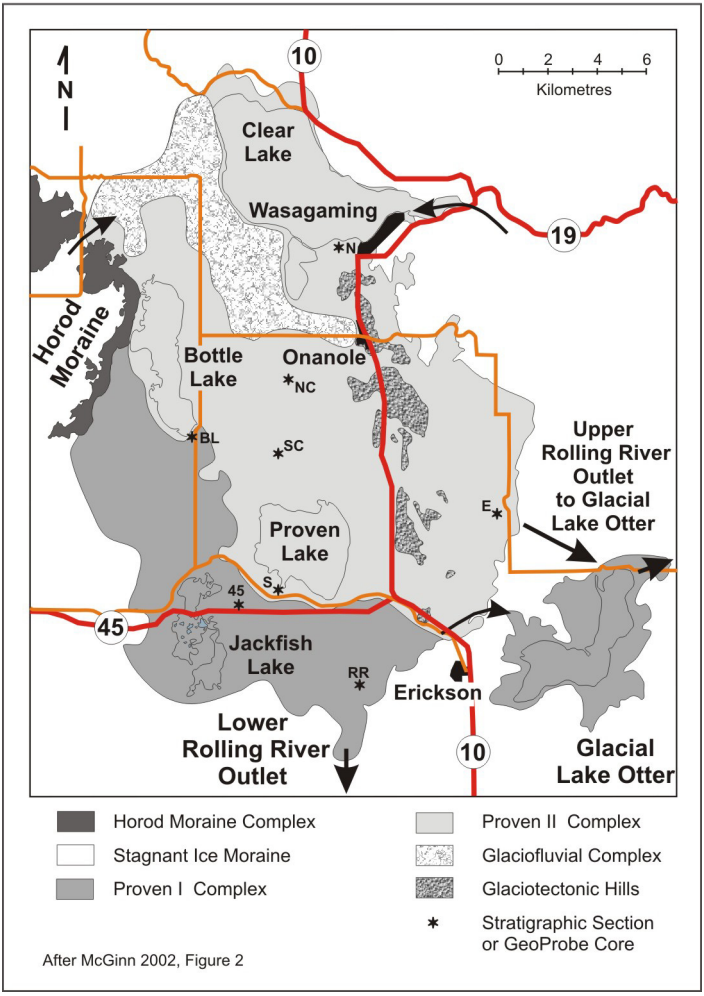


Figure 2: *Surficial deposits of the Glacial Lake Proven basin.*

surprising, as the supraglacial subenvironment is located a significant distance from acknowledged ice margins. Stratigraphic position and interpretation become the default relative dating technique. Consequently, the authors undertook a coring project in the summers of 2005 and 2006.

Objective of the 2005 Coring Project

The objectives of the Glacial Lake Proven coring project were fourfold:

1. To verify the presence of glaciolacustrine sediments in the terminoglacial Lake Proven basin,
2. To identify the types of terminoglacial lacustrine sediments,
3. To integrate the terminoglacial lacustrine sediment facies into the general Glacial Lake Proven facies model (McGinn 2002) and
4. To search for datable organics and diatoms in the core material.

Glacigenic Sediments

In 1989, the INQUA Commission on the Genesis and Lithology of Quaternary Deposits published a Genetic Classification of Glacigenic Deposits (Goldthwaite and Matsch, eds. 1989). In this volume, Ashley (1989) reviews the sedimentary processes and lithofacies units in glacier-fed lakes and establishes lithofacies groups with commonly occurring lithofacies units. The lithologic criteria outlined in this publication will be used in this research.

Brodzikowski and Van Loon (1991) present a synthesis of Glacigenic Sediments and establish a four-level systematic classification based on a general "glacial" or "periglacial" environment, the depositional subenvironment (e.g. supraglacial, englacial, subglacial), facies and the characteristics of the deposits. The fourth level indicates the deposits associated with a specific depositional mechanism. For example three types of deposits can be distinguished in the continental glacial, supraglacial, lacustrine facies; complexes, lake-margin deposits and bottomsets. The Brodzikowski and Van Loon (1991) nomenclature is employed in this research.

Procedures and Methodologies

The Bottle Lake and Highway 45 stratigraphic sections and the previously described Rolling River sections (Figures 1 and 2) of supraglacial Lake Proven deposits (Proven I Complex) were visited and examined. Five GeoProbe® cores were taken in the terminoglacial Lake Proven basin (Figures 1 and 2), split and logged.

Geoprobe® is a truck-mounted direct push hydraulic coring unit that can extract up to 15 m of soft unconsolidated sediment such as fine gravels,

sands and silt (McGinn *et al*. 2007). Thick diamicts and massive clays are rarely penetrated. Wiseman and Zaniewski (2008) have identified data logging problems associated with the direct push hydraulic coring procedure, specifically core-wall deformation in fine sediment beds and of primary sedimentary structures, under representation/exclusion of thin sediment beds and significant inaccuracies in bed thickness measurements. Detailed logging of lithofacies and transition facies is not recommended. Despite these typical soft sediment coring issues, GeoProbe® cores provide a reconnaissance stratigraphic log of subsurface sedimentary stratigraphy were road and river cuts are unavailable.

Standard sedimentological observations were made (Stow 2005); specifically, site locality and lithofacies descriptions. Lithofacies observations include bed thickness, texture (use of comparator charts, hand lens and experience) and a description of sedimentary structures present: erosional, deformational, and bedding/lamination (parallel, wavy, cross, and graded). Observable paleocurrent indicators and fabric were measured with a conventional pocket transit (Brunton compass). Other lithofacies parameters recorded include (Munsell colour, grain/clast morphology and lithology. Digital photographs were taken and sectional sketches, sketch logs and graphic logs constructed. Geoprobe® and other cores are conventionally logged from the top down, whereas stratigraphic sections are described from the base unit upwards (Stow 2005, 17).

Lithofacies units identified in the stratigraphic section logs and core descriptions are compared to the characteristics of the Brodzikowski and Van Loon (1991) four-level classification system derived for glacigenic sediments. Specifically, the characteristics of the "melting ice," "fluvial," "lacustrine" and "mass-transport" facies and the deposits associated with the "supraglacial" and "terminoglacial" subenvironments. The Brodzikowski and Van Loon (1991) criteria formulate the basis used for all facies interpretations in this text.

Fence diagrams founded on identified lithofacies, stratigraphic position and geographic location are employed to correlate core and section logs across the Glacial Lake Proven basin.

Supraglacial Sediments Exposed in Stratigraphic Sections in the Glacial Lake Proven Basin

Bottle Lake Sections (E424281, N5604557, Zone 14, NAD 83):

Section BL_1 is located approximately 4 m above section BL_2 at an estimated elevation of 623 m (Figure 1). All elevations are either measured

from a hand held GPS, interpolated from the 1:50,000 National Topographic Map Sheets 62K9, 62K J12 (cross-sections) or derived from Google Earth. The upper Bottle Lake section exposes approximately 2.0 metres of rhythmiticly bedded fine sand and silt (Figure 3). The rhythmites are generally 2.0 - 4.0 cm thick. There is noticeable ironstaining along fine-grained bedding planes. Based on the Brodzikowski and Van Loon (1991) criteria, the section is interpreted to be lacustrine bottomsets.

Section BL_2 (Figure 1) is located 200 m downslope from BL_1 at an estimated elevation of 619 m. Here, 2.6 metres of laminated fine sand and silt are exposed. There is some regular lamination of the finer sand and silt, evidence of coarse intercalations and material supplied by mass movements or wash off (a 33 cm thick sandy-silt diamict) and numerous dropstones (Figure 3). These lithofacies characteristics are consistent with supraglacial lake margin deposits and a subaqueous mass transport complex as described by Brodzikowski and Van Loon (1991). The section is interpreted to be a supraglacial lake margin - subaqueous mass transport complex.

Provincial Highway 45 Sections (E425904, N 5597211, Zone 14, NAD 83)

Two stratigraphic sections are exposed on provincial trunk road 270 near the intersection of provincial highway 45 (Figure 1). The first section 45_1 is approximately 3 metres deep in a small erosional gully from the 628 m surface elevation. The slightly deformed (tilted) alternating layers of sands and silt are interpreted as a supraglacial lacustrine complex.

Stratigraphic section 45_2 is located 5.5 metres below the surface of section 45_1, 50 metres south at the intersection with provincial highway 45 (Figure 1). Here, over 2.5 metres of rhythmiticly bedded fine sand and silt lacustrine bottomsets are exposed. Silt units are 1- 3 cm thick. Occasional, 2 cm thick, units of fine to medium sand are present. There are no apparent deformation features.

Rolling River Section (E430772, N5593749, Zone 14, NAD 83):

McGinn (2002) describes the Rolling River section in detail. A supraglacial melting-ice facies (Zelena Formation; a melt-out complex) is exposed at the base of the sequence (Figure 3). Klassen (1979) suggests that the Zelena formation was deposited during the final stages of glacial stagnation during the Late Wisconsinan. Consequently, the Zelena formation represents the uppermost tills and intertill sediments on the Riding Mountain Uplands. Oxidized Zelena Till is usually yellowish brown or very dark grey brown in colour (Munsell Colour Chart). Fresh (unoxidized) exposures are dark olive grey or very dark grey (Klassen 1979). The till is massive and of moderate compaction. The prominent clasts are typically the more resistant Interlake region carbonates and shield metasedimentaries, such as the local Odanah Shale clasts, which

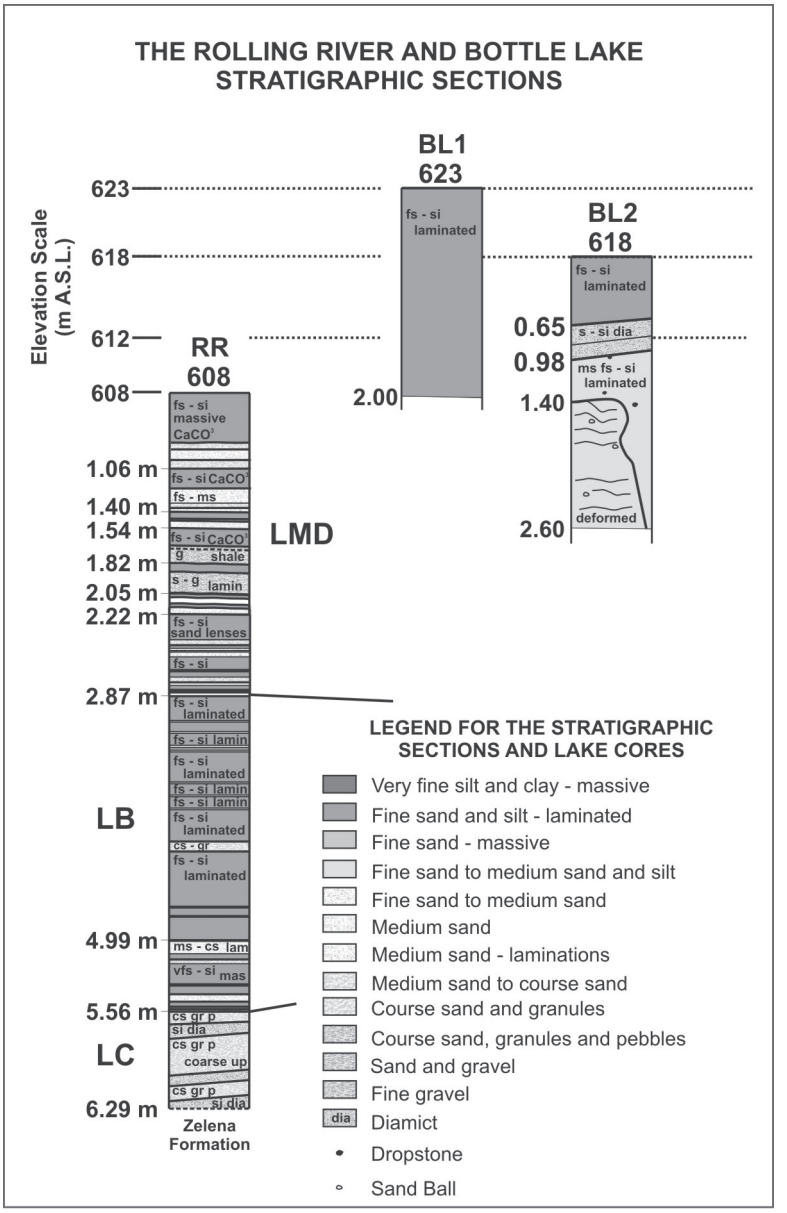


Figure 3: *The Rolling River and Bottle Lake stratigraphic sections and terminoglacial Lake Proven cores.*

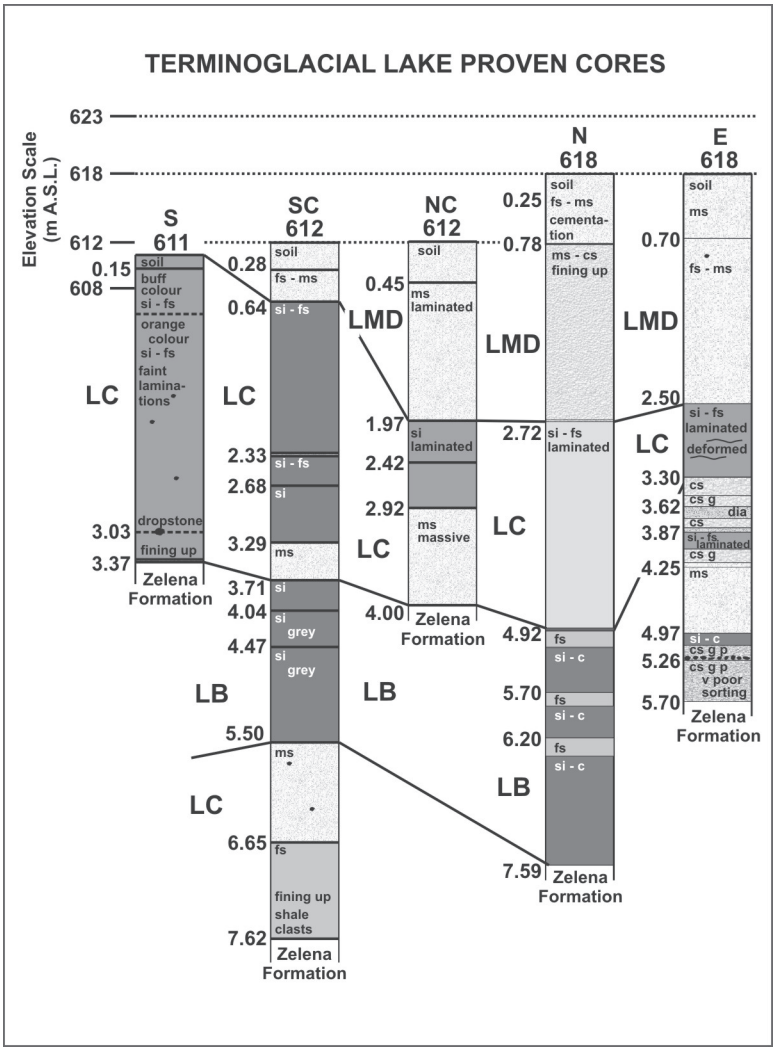


Figure 3: *(continued)*

are quickly crushed or abraded to matrix size or terminal grade during glacial transport. Some larger shale clasts are evident but difficult to remove without fracture, so it is difficult to determine a percentage composition of shales. Carbonates constitute approximately 26% - 36% of the clasts (Klassen 1979).

Depositional evidence suggests that there was an abundant sediment supply into early Glacial Lake Proven depositing a 0.73 metre thick supraglacial lacustrine complex that conveys an impression of alternating layers of coarse sands and gravels and silty-clay diamict (Figure 3). These relatively coarse paralacustrine deposits, interpreted as Incipient Glacial Lake Proven deposits (McGinn2002) are overlain by a 2.69 m thick sequence of lacustrine bottomsets consisting of sands and granules and silty-clay rhythmites that fine upwards to fine-medium sands and silt rhythmites (Figure 3). The lacustrine bottomsets are interpreted as early supraglacial Lake Proven deposits (McGinn 2002) and mapped as "Proven I Complex" (Figure 2). A 0.65 m lacustrine complex consisting of alternating laminae of fine sand and silt and coarser sands, represents the transitional phase from a supraglacial lacustrine environment to the terminoglacial lacustrine environment as the ice-walled lake expanded to the north and east (McGinn 2002).

In the upper 2.2 m of the section, seven distinctive very fine sand-silt beds (Figure 3) are interpreted to be low energy (ice cover) sedimentary units interbedded with higher energy (open-water) coarser material and ice rafted mass transported diamicts. Regular lamination of the finer sand and silt, evidence of coarse intercalations and material supplied by mass movements or wash off are the lithofacies characteristics of a supra/ terminoglacial lake-margin deposit (Brodzikowski and Van Loon 1991).

Terminoglacial Lake Proven Cores

Glacial Lake Proven North core (N) (E430263, N5611299, Zone 14, NAD 83) was extracted a few hundred metres from the south shore of Clear Lake (Figures 1 and 2). The site elevation is recorded to be 618 m a.s.l.; approximately 4 m above current lake level. The 7.59 m core is generally described as 2.72 m of coarse to medium sands grading upward to thickly bedded fine sands (Figure 3). Below this unit, 2.2 m of laminated (parallel) fine to medium sands and silt is underlain by 2.67 m of rhythmiticly bedded fine sand and silt (Figure 3). Zelena Till was encountered at the base of the core. No datable material was present in the core.

The Glacial Lake Proven North Central core (NC) (E428085, N5606833, Zone 14, NAD 83) was extracted approximately 4.75 km SSE of the Glacial Lake Proven North (N) core location (Figures 1 and 2). Site elevation is 612 m a.s.l. Approximately 1.97 m of laminated (parallel) medium sands overlie 0.95 m of alternatively bedded fine sand and silt (Figure 3). This unit overlies 1.08 m of massive medium sands. A few centimetres of Zelena Till

were incorporated into the base of the core. No datable material was found in the North Central core.

The 7.62 m Glacial Lake Proven South Central core (SC) (E427549, N5603563, Zone 14, NAD 83) was taken on the Dudman farm approximately 3.5 km south of the NC core location (Figures 1 and 2). Site elevation is measured to be 612 m. Approximately 0.64 m of medium to fine sands are underlain by 2.04 m of laminated fine sand and silt (Figure 3). A 42 cm thick bed of medium sands separate the laminated fine sands and silt from 1.79 m of rhythmiticly bedded grey silt and fine sand. This unit is underlain by 0.97 m of fine sand and shale clasts. Zelena Till marks the base of the 7.62 m SC core. No datable material was present in the Dudman core.

A fourth core, Glacial Lake Proven South (S) (E427567, N5597887, Zone 14, NAD 83), was extracted at the Proven Lake Farms homestead, 5.67 km south of the Dudman farm core site (Figures 1 and 2). The site elevation is 611 m a.s.l. Here, 3.37 m of faintly laminated fine sand and silt with occasional dropstones overlies Zelena Till (Figure 3). There was no datable material present in Proven Lake Farms core.

The fifth Geoprobe® core, Glacial Lake Proven East (E) (E436913, N5601034, Zone 14, NAD 83) was taken east of the Rolling River along the eastern shore of the lake (Figures 1 and 2). The site was selected to provide a west to east transit through terminoglacial Lake Proven. Site elevation is measured to be 618 m a.s.l. Approximately 2.50 m of medium sands alternating with fine to medium sands overlie 0.80 m of partly deformed rhythmiticly laminated fine sands and silt. These stratigraphic units are underlain by 2.40 m of alternating layers of coarse sands and gravels, silty diamicts and laminated silty-clay beds (Figure 3). Zelena Till is present at the base of the core. No datable material was found in the fifth Glacial Lake Proven core.

Interpretation and Discussion

The nature of the glaciolacustrine sediments in terminoglacial Lake Proven:

Glaciolacustrine sediments appear in all five terminoglacial Lake Proven cores.Depositional evidence suggests that there was a more abundant sediment supply into the terminoglacial lake stages than previously hypothesized (McGinn 2002) depositing over 7.0 m in deeper parts of the lake. Most of the sediment units are classified as glacial lacustrine complexes (LC on Figure 3), in that there is no sedimentological distinction evident between lacustrine bottomsets and lake margin deposits. These lacustrine complexes consist of mixtures of dropstone-

rich fine sand and silty-clay varvites, and subaqueous debrisflow mass transport diamicts. Lacustrine bottomsets (LB on Figure 3) consist of rhythmites constructed of laminae of fine to medium sand grading to silt/clay. Massive sand strata can occur but are uncommon. Massive silt units or fine sand-silt units are frequent. Occasional dropstones can be found in these massive fine sand-silt rhythmites. Deeper water lacustrine complexes grade to lake margin deposits when water levels fluctuated. The lake margin deposits (LMD on Figure 3) are relatively thick units (up to 1.5 m) of laminated medium sands/fine sands or fine sands/silts. There is evidence of frequent coarse intercalations and material supplied by mass movement or wash-off, and numerous dropstones. Massive coarse sands and gravelly beds are indicative of periods of higher energy (open water); fine sand/silt units are characteristic of low energy ice cover conditions.

Integrating stratigraphic cross-sections and core data:

Figure 4 illustrates a topographic/stratigraphic cross-section from south to north through the Rolling River section and the S, SC, NC, and N terminoglacial Lake Proven cores (Figure 1). The Bottle Lake and Highway 45 sections are transposed to the appropriate positions on the diagram.

Hypothesized ice walls enclose the early supraglacial Lake Proven. A supraglacial lacustrine complex and lake margin - subaqueous mass

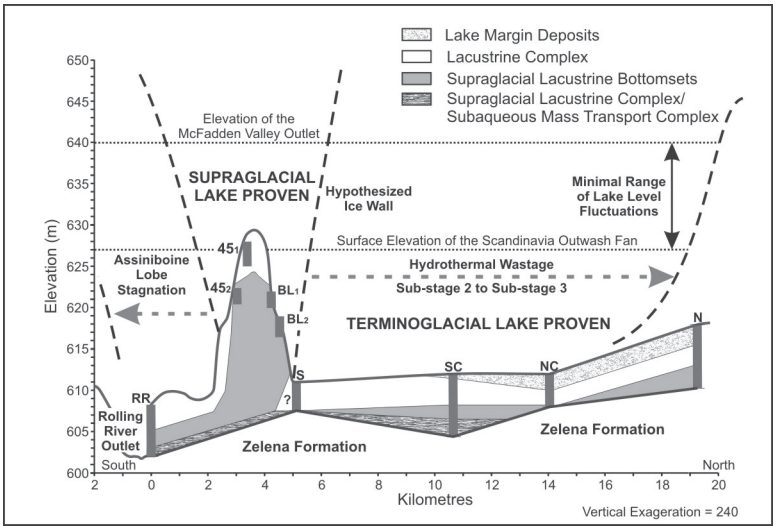


Figure 4: *Composite south to north cross-section through stratigraphic sections and cores.*

transport complex are overlain by approximately 2 m of supraglacial lacustrine bottomsets and 3 to 8 m of a supra/terminoglacial lacustrine complex (RR). The steep 10 m bluff, coincident with an early ice wall position, separates the higher elevation supraglacial lake sediments (45_1, 45_2, BL_1 and BL_2) from the deposits of the terminoglacial lake sub-stages (Figure 4). Subaqueous mass transport deposits occur adjacent this steep bluff (e.g. BL_2 section).

Hydrothermal wastage resulted in a recessional sequence of ice wall positions northward across the relatively flat Lake Proven plain. In terminoglacial Lake Proven a 3.0 m thick lacustrine complex overlies discontinuous supraglacial lacustrine deposits (S, SC, NC and N). There is no evidence of deformation in the extensive and continuous lacustrine complex. This supports the hypothesis that Glacial Lake Proven was now a topographically controlled terminoglacial lake. The underlying supraglacial deposits are characterized as a lacustrine complex fining upward into lacustrine bottomsets. Towards the north the overlying extensive and continuous lacustrine complex thins to approximately 2.2 m and is overlain by shallow-water lake margin deposits (SC, NC and N) and a supraglacial fluvial facies (sandar plain deposits, Figure 2).

Figure 5 illustrates a topographic/stratigraphic cross-sectional from west to east and includes the Upper Bottle Lake stratigraphic section (BL_1) and the SC and E terminoglacial Lake Proven cores (Figures 1). The

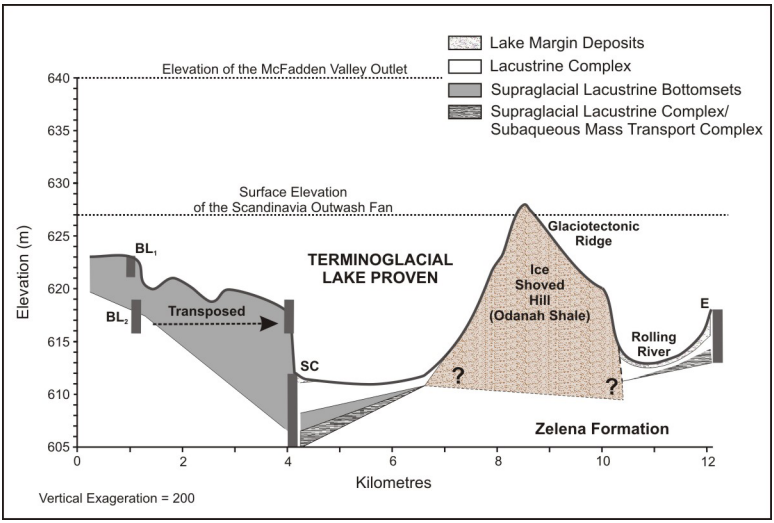


Figure 5: *Composite west to east cross-section through stratigraphic sections and cores.*

Bottle Lake 2 section is transposed to the appropriate position on the Figure 5 cross-section.

As in Figure 4, supraglacial lake deposits appear at elevations above 615 m (BL_1 and BL_2). A prominent ice shoved hill composed of Odanah Shale (McGinn 2000) is surrounded by terminoglacial Lake Proven deposits Figure 5). West of the glaciotectonic ridge (SC), a supra/terminoglacial lacustrine complex grades into lacustrine bottomsets that are overlain by a 2.0 m thick terminoglacial lacustrine complex. East of the glaciotectonic ridge, the basal supraglacial lacustrine complex contains two 8 - 13 cm thick diamicts that may be the down-flow extension of a subaqueous mass transfer facies originating in the Otter Lake sub-basin (McGinn et al. 2007). The overlying 0.8 m thick terminoglacial lacustrine complex is itself overlain by over 2 m of glaciofluvial deposits associated with the Holocene Rolling River (E).

Summary and Conclusions

The glacigenic facies in Glacial Lake Proven basin represent a continuum of supraglacial/terminoglacial lacustrine sedimentation throughout the history of the glacial lake. Two lacustrine sedimentary environments are represented in the sediments; the supraglacial and terminoglacial. Supraglacial lacustrine facies are exposed in several road and river cuts in the southwestern regions at elevations above 615 m. There are no known natural of anthropogenic exposures of the terminoglacial lacustrine facies on the Proven Lake plain.

The 2005-06 core-sampling program in the Glacial Lake Proven basin was designed to provide subsurface sedimentological data to the base map data previously collected and provide estimates of nature and thickness of lacustrine sediment in the terminoglacial Lake Proven basin. The secondary objective was to integrate the terminoglacial stratigraphy with the previously described supraglacial sequence of lake sub-stages (McGinn 2002) and search for datable material.

Five cores extracted from the terminoglacial Lake Proven basin indicate that there was a rich supply of sediment into the lake in that up to seven metres lacustrine material was deposited in the deeper regions of the lake. Sediments exposed in the cores represent a variety of terminoglacial lacustrine facies: lacustrine complexes, lacustrine bottomsets and lacustrine complexes grading to shallow water lake-margin deposits. Coarser sediments associated with fluvial environments occasionally overlay the glacial lacustrine deposits.

The terminoglacial lacustrine facies represent a major sub-stage in the lake history. The general stratigraphic sequence of facies exposed in the cores suggests that water levels in terminoglacial Lake Proven fluctuated periodically. As the northern ice-wall lakeshore hydrothermally wasted towards the northeast, water levels are believed to have dropped as the lake surface area to meltwater volume ratio increased. During this phase of the Glacial Lake Proven a relatively coarse-grained supra/ terminoglacial lacustrine complex was deposited in the deeper regions of the lake (SC). Stagnant ice wastage within the glacial lake watershed account for a return to high water levels in the evolving terminoglacial lake. Rising water levels and a high sediment to runoff volume ratio resulted in a 2 metre thick sequence of rhythmic bottomsets deposited in the deeper areas of the lake (SC and N). A 2 - 3 metre thick lacustrine complex overlies the discontinuous lacustrine bottomsets facies. These two terminoglacial lacustrine facies (bottomsets overlain by a lacustrine complex) are themselves overlain by shallow water lake margin deposits (SC, NC and N) which are believed to have been deposited during the final drainage phase of Glacial Lake Proven.

While no datable material was found in the cores, sedimentation rates as indicated by rhythmic laminations exposed in the cores and stratigraphic sections could help estimate the duration of both the supraglacial and terminoglacial lake sub-stages. More detailed stratigraphic data on mean rhythmite thickness however, is required to pursue this approach.

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Twenty-metre biophysical variability within the northern mixed-grass prairie

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Abstract: The northern Great Plains of North America are second only to the Arctic, for their sensitivity to climate change in Canada. This study is part of a larger research project that is using remote sensing data to understand the climate impacts on native mixed-grass prairie environments. The primary objective of this study is to develop an understanding of the how grassland vegetation and soil characteristics vary within the spatial domain of a medium-resolution satellite image pixel. A secondary objective is to identify the native vegetation communities, 'climate indicator' regions, that will likely show the clearest climate signals when analyzing the 30-year remote sensing image record. During the summer months of 2006 and 2007 field data were collected from over 60 sites in Grasslands National Park of Canada. Measurements were made of the vegetation type, percent ground cover, soil colour, soil moisture, and spectral reflectance over a 20m by 20m area at each site.

The results show that at sub-20m scales, the grasslands are remarkably heterogeneous, both biophysically and spectrally. There is a tendency toward more consistent vegetative covers where soils are moister: at higher elevations and along coulee bottoms. These may be key places to monitor for climate change because impacts may be first apparent there. This study also revealed that at sub-20m scales, ground cover variability is markedly different than spectrally measured variability. This suggests that remote sensing observations acquired at finer spatial resolutions than 20m may not be useful for monitoring vegetation communities for climate impacts.

Climate Change on the Northern Great Plains

The Great Plains of North America are significant for three reasons: (i) They are the source for much of the food produced in this continent (Riley et al. 2007); (ii) They encompass the last remaining native habitats of many endangered species (COSEWIC 2009); and (iii) Their vulnerability to climate change is second in North America only to the Arctic (Sauchyn et al.

2003). Paleoclimate records for the northern Great Plains show prolonged droughts far more extreme than those that have been experienced since European settlement (Sauchyn et al. 2003). There is concern that one of the most immediate impacts of global warming in this region will be a return to past dry conditions, putting tremendous strains on the sustainability of natural, physical and social prairie infrastructures (Herrington et al. 1997, Lemmen et al. 1997, Seager et al. 2005).

This study is part of a larger research project in which we are trying to understand climate impacts on native mixed-grass prairie environments. Data collected by remote sensors on Earth-orbiting satellites play a key role in this analysis because of their routine, repetitive, and synoptic coverage (LeDrew 1992). The spatial resolutions of pixel data in the longest archives of remote sensing images range from 80m, for Landsat Multispectral Scanner data from 1972, to 30m, for Landsat Thematic Mapper (TM) data from 1982, and 20m, for SPOT High Resolution Visible (HRV) data from 1986. The primary objective of this study is to assess the variability of vegetation and soil classes found in native mixed-grass prairie grasslands at a sub-Landsat and SPOT pixel scales to develop a clearer understanding of the biophysical contributions of these environments to their measured spectral reflectances.

The remote sensing image archive is a temporally and spatially rich source of global land cover information spanning over three decades. It is expected that image time series will be useful to define environmental normals and contain evidence of recent shorter-term shifts in climatic conditions (Piwowar 2008). Climate impacts are evident as departures from long-term normal conditions, particularly departures that can be spatially and temporally correlated with known atmospheric anomalies. There are many false-positive results in such an analysis because there are many non-climate related activities that can produce changes in land cover. Since the largest factor precipitating land cover change generally is human disturbance, regions with natural and undisturbed ground covers are key environments to monitor for climate impacts. However, just as weather patterns change from year-to-year, a considerable amount of inter-annual land cover variability exists, even in natural environments. Before it is possible to mine the remote sensing data archive for climate change signals, specific regions or land covers that have the potential to show definitive changes above the noise of inter-annual variability must be found. Thus an important secondary objective of this study is to identify the native vegetation communities, "climate indicator" regions, that will likely show the clearest climate signals.

The focus of this study is on native mixed-grass prairie environments in Grasslands National Park of Canada. Grasslands National Park (GNP) is

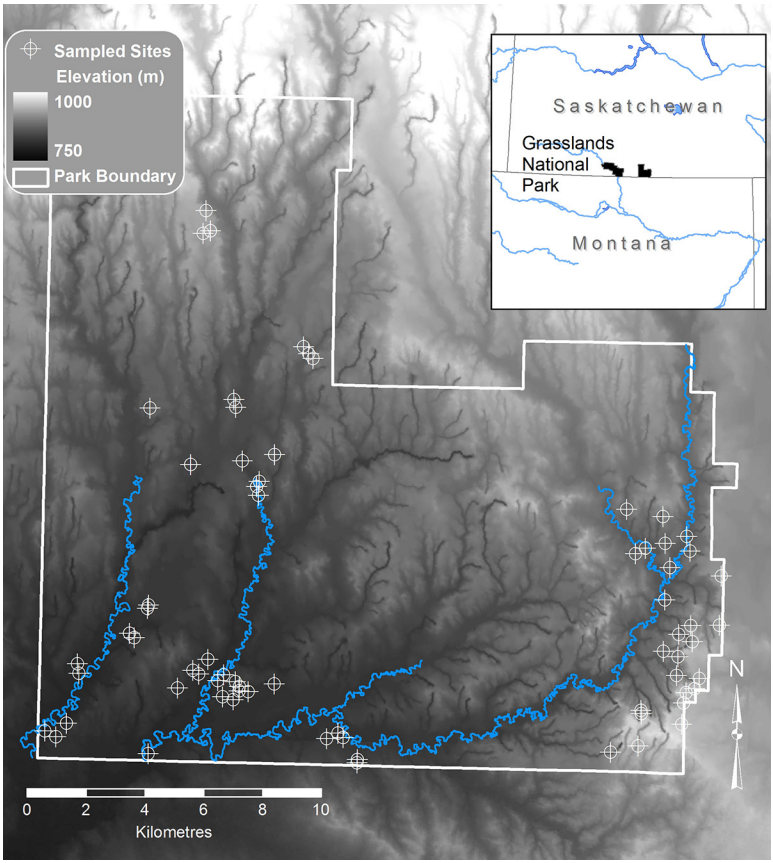


Figure 1: *Grasslands National Park East Block.*

situated in the northern Great Plains of North America, along the Saskatchewan-Montana border (Figure 1). This region has a continental climate with long, cold winters and short, hot summers. The semi-arid environment receives less than 350mm of precipitation annually, mostly during heavy summer thunderstorms. This climate supports the natural growth of both short and mid-height grasses that are regionally referred to as the 'mixed-grass' prairie (Parks Canada 2001). The northern mixed-grass prairie in and around GNP is an important preserve for many plants and animals included on Canada's list of endangered species (COSEWIC 2009). The topographic expression of GNP includes gently rolling hills, coulees, badlands, and wide-open spaces with elevations ranging from 750m a.s.l. along the river channels of its southern limits to 1000m a.s.l. in

the Wood Mountain Uplands in the north. Administratively, GNP is divided into two sections: the West Block and the East Block. Our research is concentrated in the East Block where there are more tracts of native prairie that have not been disturbed by human management practices.

Field Methods

During the summer months of 2006 and 2007 field data were collected from over 60 sites in GNP. As described below, these sites were selected from nine spectral classes that were found to be representative of the vegetation found within the northern mixed-grass prairie ecosystem. *In situ* measurements were made of the vegetation type, percent ground cover, soil colour, soil moisture, and spectral reflectance over a 20m by 20m area at each site.

Field Site Selection

An initial analysis by the author of the growth-senescence cycles of the major grasses found on the mixed-grass prairie indicated that, when the data are spatially averaged across landscape scales, the vegetation growth reaches a maximum around July 1. This was corroborated by a multi-temporal analysis of low-resolution AVHRR satellite imagery that showed the annual normalized difference vegetation index (NDVI) values over the mixed-grass prairie to also peak shortly after the Northern Hemisphere summer solstice. Consequently, July 1 was selected as a nominal data collection target date: all data were collected within a three-week window of this day.

Potential field sampling sites were identified at locations that had unique spectral responses in remote sensing imagery that were assumed to be related to singular vegetation and soil characteristics. Potential sites were chosen by from a sample of the classes created by an unsupervised classification of a Landsat 5 Thematic Mapper (TM) image from July 17, 2006. This image was selected because of its high optical clarity and because it was acquired within three weeks of July 1. The image data from TM bands 3, 4, 5, and 7, and only those pixels which fell within the proposed park boundary, were segmented into nine classes by an ISODATA clustering algorithm.[1] Potential field sites were randomly selected from each of the nine spectral classes. The probability for including mixed

[1]Using the software PCI Geomatica V10.1.

pixels was minimized by excluding points that fell within a one-pixel buffer distance between the sample point and an adjoining class.

Since we were ultimately interested in understanding the spectral appearance of mixed-grass prairie in satellite remote sensing data, we concentrated our data collection on those surface characteristics that are important in influencing vertical spectral reflectance: plant species and their areal extents, as well as soil colour and moisture content (Csillag et al. 2001, McCoy 2005). During mid-summer, when the field data for this research study were collected, many native grass species are approaching senescence and have a similar spectral appearance, limiting the potential of their spectral separation. Therefore, field data collection was more focused on those features that would most heavily influence a spatially-averaged spectral response: the relative proportions of green and senescent vegetation cover and the amount of exposed soil, soil colour and moisture content (Davidson and Csillag 2001).

Once in the field, sites to be surveyed were selected from the list of potential field sites based on: their representativeness of the nine spectral classes (to ensure that several sites from each class were visited); their accessibility; and their proximity to other sites (of any class) that could be measured at the same time (to maximize sampling efficiency). Sixty different field sites were visited during the summers of 2006 and 2007 (Figure 1).

Field Site Data

The UTM coordinates of the selected sites were loaded into a handheld GPS and used for field navigation. All sites were visited on foot since vehicle movement within GNP is restricted. With the Wide Area Augmentation System (WAAS) feature enabled on the GPS units, field sites were located with a nominal accuracy of 5m, well within the spatial resolution of the SPOT HRV and Landsat TM sensors.

The air temperature, wind speed, and relative humidity were taken at each sampling site at a height of 1.5m with a Speedtech Instruments Skymaster SM-28 device. These data were collected to determine the relative atmospheric optical clarity influencing the spectral data. Additional site data included date, time, and site elevation (from the GPS).

Within-Site Quadrat Data

In order to quantify the spatial variability of vegetation and soil features that could be expected over an area approximately the size of a medium

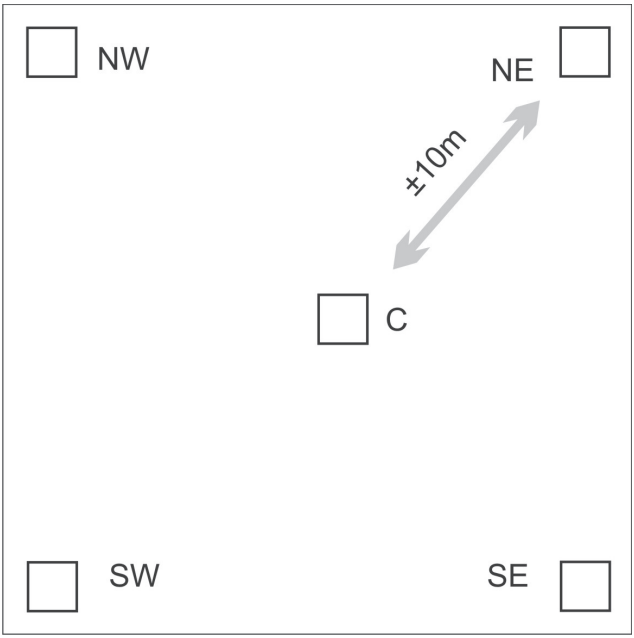


Figure 2: *Sampling Site configuration showing the relative locations of the 1m² quadrats.*

resolution satellite image pixel, data were collected from five 1m² quadrats within each sampling site. These quadrats were: the site centre (as indicated by the site's location coordinates); and one quadrat located at a nominal distance of 10m from the centre to the southwest, southeast, northwest, and northeast (Figure 2). The purpose of this arrangement was to simulate the spatial variation that could be present within a 20m SPOT HRV or 30m Landsat TM pixel. Each quadrat within a site was assigned a letter designation - C, SW, SE, NW, NE - to indicate its place**.** Measurements were taken at each quadrat of the soil and vegetation characteristics and *in situ* spectral reflectance, as described below.

Soils data:

When there is incomplete ground cover, as is frequently the case in the mixed-grass prairie, soil characteristics can have a large influence on the spectral reflectances measured by space-borne sensors (Huete 1988). The two most important soil characteristics that influence spectral reflectance in the visible and near-infrared regions of the electromagnetic spectrum are its colour and moisture content (McCoy 2005). To make an accurate assessment of soil colour, a standard Munsell Soil Color Chart

was used (Munsell 2000). Soil colour data were recorded for each $1m^2$ quadrat where the ground was exposed to a vertical view by an incomplete vegetative cover.

Where there were exposed soils, soil moisture data were also collected. However, since the largest contribution of soil moisture to soil spectral reflectance is evident in tonal changes (that are already included in the soil colour data), these data were not directly used in this analysis.

Vegetation data:

Visual estimates were made of the percent of each quadrat that was covered by photosynthetically active vegetation (G - green), senescent or dead vegetation (B - brown), and bare ground (S - soil). Mean canopy height within the quadrat was also measured. A colour digital vertical photograph of each quadrat was taken.

Spectral data:

Solar reflectances were collected with an Analytical Spectral Devices (ASD) FieldSpec 3 JR field spectroradiometer. Spectra were acquired over the range from 0.35 – 2.5 μm at a spectral resolution of 0.003 μm in the visible and 0.03 μm in the infrared spectral regions. A white reference calibration was made at each field site before the spectral measurements were made. Twenty spectral measurements were averaged at each of the five site quadrat positions by pointing the fibre-optic probe vertically down to the ground from a height of 1.5 m. From this height, the bare fibre-optic probe had a 0.6 m (nominal) circular field-of-view.

Analysis Methods

The native mixed-grass prairie is a diverse assemblage of grasses, mosses, and exposed soils (Davidson and Csillag 2003, Davidson et al. 2007). Measures of spatial and spectral heterogeneity were needed to parameterize the variability of the ground cover and its *in situ* spectral reflectance. A review of existing empirical (e.g., Woodcock and Strahler 1987, Woodcock et al. 1988a, Woodcock et al. 1988b), probabilistic (e.g., (Haralick and Shanmugam 1974, De Cola 1989), and mathematical (e.g., Davidson and Csillag 2003, He et al. 2006) heterogeneity measures determined that these indices were unsuitable for this analysis because: (a) their methods were not adaptable to the field and spectral data collected here; and/or (b) their data requirements were too restrictive. Consequently two new empirical heterogeneity indices were developed for this study.

Within site ground cover variability was measured by determining the first-order statistics of the field data. In particular, the standard deviations of each of the green vegetation (G_σ), brown or senescent vegetation (B_σ), and bare soil measurements (S_σ) from the 5 quadrats were calculated. A ground cover heterogeneity index (GHI) was then created by summing these standard deviations and the number of different soil colours present within the five quadrats (C):

$$GHI = G_\sigma + B_\sigma + S_\sigma + nC$$

The number of soil colours (C) was adjusted with a scalar (n = 10) to balance its range with the other three factors. Theoretically, the GHI ranges from 0 for a totally homogeneous ground cover ($G_\sigma = B_\sigma = S_\sigma = 0$) with no exposed soil (C = 0) to 215 for a site where the five quadrats have completely different ground covers ($G_\sigma = B_\sigma = S_\sigma = 55$)[2] and exposed soil colours (C = 5). Our experience with the GHI shows, however, that in reality the GHI for a mixed-grass prairie rarely exceeds 100.

The ASD instrument acquired reflectance spectra in 2151 samples over the range from 0.35 – 2.5 ìm. Data between 1.36 – 1.42 ìm, between 1.80 – 1.98 ìm, and between 2.42 – 2.50 ìm were masked from further analyses because of atmospheric attenuation in these bands. The variances among the five quadrat spectra for each of the 1818 remaining samples were calculated. A spectral heterogeneity index (SHI) was then created as the average variance for all samples from a site:

$$SHI = \frac{1}{n}\sum_{1}^{n}\sigma_\lambda^2$$

where: σ^2 is the variance of the measured spectral reflectances in a particular wavelength range λ; and n = 1818. The SHI varies with spectral heterogeneity: larger spectral variances will produce higher SHI values. Theoretical SHI values range from 0 to 10,000; but in reality SHI maximums rarely exceed 100.

Results

The field site data were sorted into two separate rankings: increasing GHI and increasing SHI. The characteristics of similarly ranked sites were

[2]The value 55 is the maximum possible standard deviation of five numbers taken from within the range {0..100}.

evaluated to develop an understanding of why they had comparable index values. Evaluation criteria included site elevation, slope, aspect, soil moisture, and soil colour data. When appropriate, corresponding broadband spectral reflectances extracted from a Landsat TM scene acquired on July 17, 2006 and vegetation community classifications from a GNP vegetation survey (Michalsky and Ellis 1994) were also examined. The results are presented below for sites with low ground cover heterogeneity, low spectral heterogeneity, high spectral heterogeneity, and high ground cover heterogeneity.

Low ground cover heterogeneity:

Sites with low ground cover heterogeneity have GHI values less than 25 and have almost complete green vegetative cover with no exposed soil. There are two vegetation communities that characterize this group. The first is that of the buckbrush (*Symphoricarpos occidentalis*) community that lines the coulee bottoms (Figure 3b). Buckbrush is a dense, woody shrub that grows up to 1.5m in height (Michalsky and Ellis 1994). When viewed vertically from above, there is a complete (100%) green vegetation cover that is very spectrally homogeneous at scales greater than 1m (Figure 3a,c).

The second vegetation community of low ground cover heterogeneity is a mixture of two dominant grasses, western wheatgrass (*Agropyron smithii*) and needle-and-thread grass (*Stipa comata*), that typify the native mixed-grass prairie (Vance et al. 1999). In early July these grasses form a 90% green vegetative cover intermixed with up to 10% senescent or litter vegetation (Figure 3d). Spectra acquired in different quadrats are reasonably consistent and produce moderately low (~20) SHI values (Figure 3f). In the East Block of GNP, this vegetation community is found primarily on level slopes at higher elevations (above 900m a.s.l.) (Fargey et al. 2000).

Low spectral heterogeneity:

Not only does buckbrush have a low GHI, it also produces some of the lowest SHI values measured (Figure 3c). Of the grasses, the needle-and-thread grass (*Stipa comata*) – blue grama grass (*Bouteloua gracilis*) - pasture sage (*Artemesia frigida*) community exhibits very low spectral variability, with some sites producing SHI values close to 1 (Figure 4c). Interestingly, this vegetation community has a diverse expression on the ground with a mixture of grass types and small sage plants (Figure 4b). Within the sampled quadrats, there is about 70% green vegetation, 25% senescent and litter vegetation, and 5% soil exposure, as well as 2-3 different soil colours and textures (Figure 4a). Ground heterogeneity index values between 50 and 70 are common.

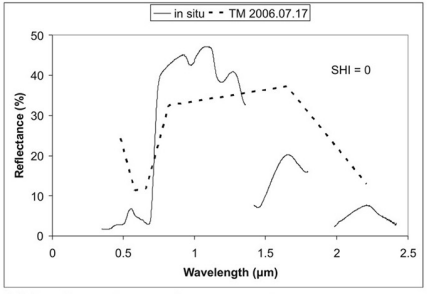
Buckbrush



(a) vertical photo of 1m quadrat

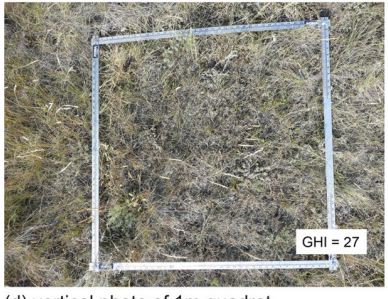


(b) site photo



(c) *in situ* and spaceborne spectra

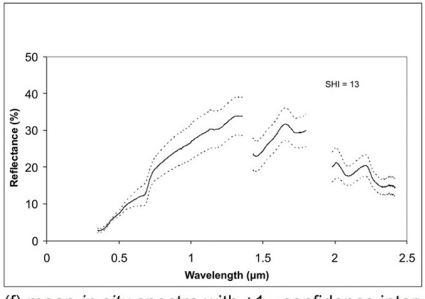
Wheatgrass / Needlegrass



(d) vertical photo of 1m quadrat



(e) site photo



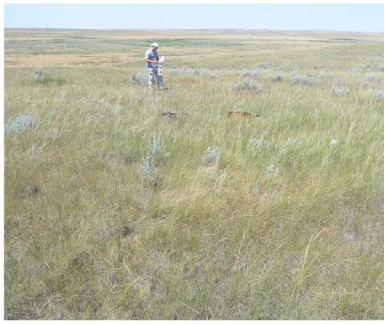
(f) mean *in situ* spectra with ±1σ confidence intervals

Figure 3: *Low ground cover heterogeneity.*
GHI – ground cover heterogeneity index SHI – spectral heterogeneity index

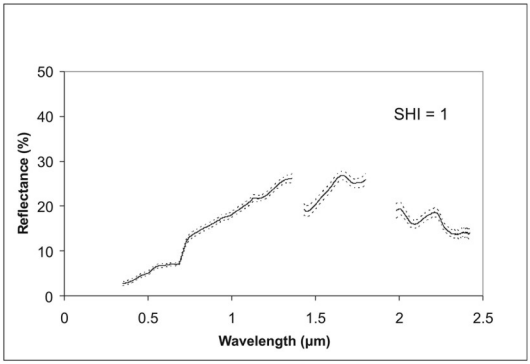
Needlegrass / Grama Grass / Sage



(a) vertical photo of 1m quadrat



(b) site photo



(c) mean *in situ* spectra with ±1σ confidence intervals

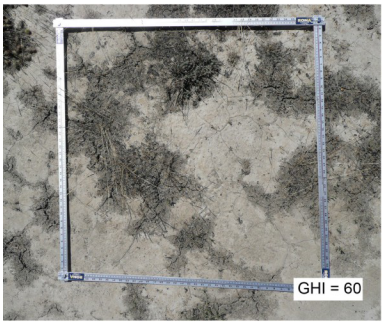
Figure 4: *Low spectral heterogeneity.*
GHI – ground cover heterogeneity index SHI – spectral heterogeneity index

High spectral heterogeneity:

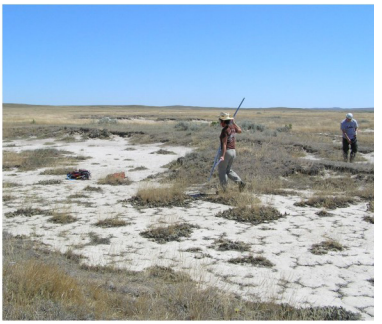
The spectral heterogeneity of the vegetation tends to increase in areas of sparser ground cover. The highest SHI values observed (SHI = 204) were derived from data collected over seasonally flooded pans (Figure 5c). The exposed Solonetzic soils are highly reflective and are interspersed with darker patches of alkali grass (*Distichlis stricta*) in a 70%:30% ratio (Figure 5b). It was common to observe 3-4 different soil colours and textures that appeared to be related to small changes in soil moisture. Interestingly, the ground cover heterogeneity indices for the sites of high and low spectral variability are similar (Figure 4c, Figure 5c).

A similar spectral heterogeneity is observed between reflectances retrieved from several Landsat TM pixels sampled from within this region (Figure 5c).

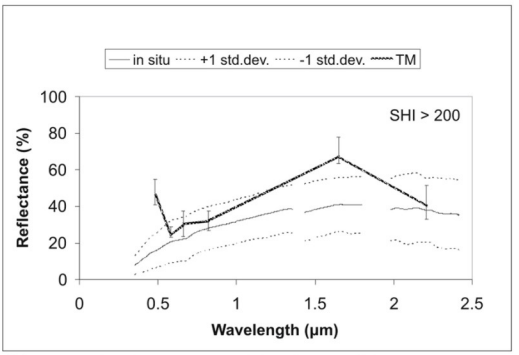
Salt Pans



(a) vertical photo of 1m quadrat



(b) site photo



(c) mean *in situ* spectra with ±1σ confidence intervals and mean spaceborne spectra with minimum and maximum error bars

Figure 5: *High spectral heterogeneity.*
GHI – ground cover heterogeneity index SHI – spectral heterogeneity index

High ground cover variability:

Although the seasonally flooded pans discussed above have a moderate amount of ground cover variability, the areas with the highest GHI values observed (GHI > 90) are found in the lowland pasture sage (*Artemesia frigida*) – wheatgrass (*Agropyron smithii*) – cactus (*Opuntia polycantha*) vegetation communities. The grass and shrub growth in these areas is not dense and many sites have up to 50% Spikemoss (*Selaginella densa*) cover and frequent soil exposure (Figure 6a). Although the vegetation is very heterogeneous spatially (Figure 6b), the spectral measurements taken both *in situ* and remotely indicate that at 20m

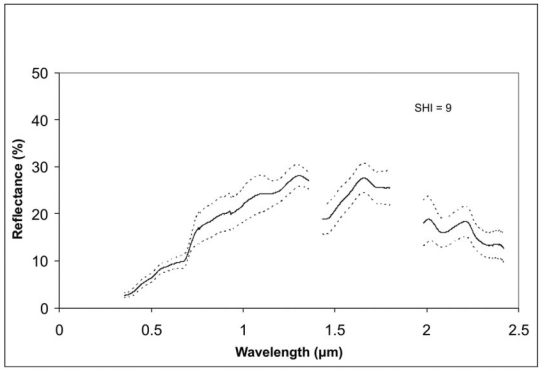
Sagebrush / Wheatgrass / Cactus



(a) vertical photo of 1m quadrat



(b) site photo



(c) *in situ* and spaceborne spectra

Figure 6: *High ground cover heterogeneity.*
GHI – ground cover heterogeneity index SHI – spectral heterogeneity index

resolution, this vegetation community produces a relatively homogeneous signature (Figure 6c).

Discussion

Grasslands National Park is situated in the mixed-grass prairie of the Great Plains of North America. The label 'mixed-grass prairie' is given to this region because it lies along a transition between the tall-grass prairie to the east and the short-grass prairie further west. By definition, therefore, we would expect to find a variety of short and tall grasses in this region (Parks Canada 2001). Not surprisingly, the GHI value averaged across all

sites was relatively high (~50) with a low standard deviation (~15). This suggests that, in general, there is much variation in surface expression across the study area, regardless of the specific ground covers. Because of this, finding a clear inter-annual spectral signal that could be useful for monitoring climate variations using the remote sensing archive could be difficult. However, there is a tendency toward more consistent vegetative covers where soils are moister: at higher elevations and along coulee bottoms. These, then, may be key places to monitor since climate change impacts may be first apparent there.

As noted above, there can be remarkably consistent, or remarkably variable, ground coverage at the ends of the SHI scale. Interestingly, those grassland communities which had the lowest/highest GHI values did not have the most extreme SHI measurements. The converse was also true: The ground cover variability indices for the sites of the highest and lowest SHIs were similar. A subsequent correlation analysis between the SHI and GHI values, however, showed no linear relationship between them (Figure 7). The reasons behind this incongruity likely stem from differences in the fundamental modes of observation used in this study. Although there may be many different vegetative species occupying a particular quadrat, when viewed from a vertical remote sensing perspective (as in Figure 4a), much of it is monochromatic. In mid-summer, when the field data were collected, most of the native grass species were approaching senescence and have limited photosynthetic activity, particularly in their

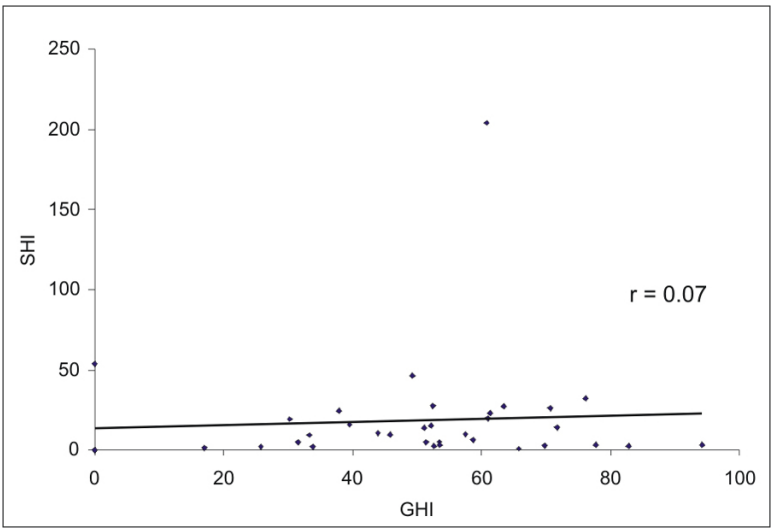


Figure 7: *The ground-spectral heterogeneity relationship.*

leaves. Although these grasses are quite healthy, their spectral responses are subdued, particularly in the near-IR (Figure 4c), regardless of the particular species in the field of view. Clearly then, ground cover variability cannot be used to infer spectral variability, or *vice versa*. Therefore caution must be exercised when attempting to understand the spectral contributions of ground features in a fine-resolution satellite image pixel.

Scale is a critical factor when measuring the variability of the northern mixed-grass prairie. At the sub-20m scales measured here, ground cover variability is markedly different than spectrally measured variability. This suggests that remote sensing observations at these scales may not be useful for monitoring vegetation communities for climate impacts. Other studies by Davidson and Csillag (2001), Guo et al. (2004), and He et al. (2006) found that this situation is resolved at 30-50m scales. At 30-50m scales, much of the spatial variation of grassland communities is retained in the spectral observations.

Conclusions

Recognizing and understanding the linkages between our changing climate and natural ecosystems is the underlying theme of this research. Climate change is expected to impact different areas at different rates, however. The identification of 'climate indicator' regions, where a strong climate change signal might first be evident above the background annual variations, is an important contribution. This study has shown that at sub-20m scales, the grasslands are remarkably heterogeneous, both biophysically and spectrally, but the heterogeneity increases on drier soils. This suggests that the moister, less heterogeneous communities may be ideal climate indicator regions to be explored when analyzing the satellite image archive for significant changes.

This study also revealed that at sub-20m scales, ground cover variability is markedly different than spectrally measured variability. This suggests that remote sensing observations at these scales may not be useful for monitoring vegetation communities for climate impacts. A new study is already underway to measure spectral variability from spaceborne sensors at 10m, 20m, 30m, 80m, 250m, 500m, and 1000m ground spacing distances. This will be the subject of a future communication.

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Characteristics of habitat used by pileated woodpeckers in Great Lakes–St. Lawrence forest region of Ontario

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Abstract: We documented habitat used by pileated woodpeckers for foraging in Great Lakes – St. Lawrence forests of Ontario of central Ontario at the tree and stand scales. At the tree scale, we found that the pileated woodpeckers used a range of tree species and used trees that were generally larger than other trees available at the site. We also found that pileated woodpeckers used a higher portion of snags compared to live trees. All five snag classes were used, but classes 4 and 5 (higher decayed classes) were used more than expected. At the stand scale, we developed a habitat suitability index (HSI) model that predicted the presence of pileated woodpecker foraging activity based on forest-type, stand age, and canopy closure. Foraging use by pileated woodpeckers appeared to peak in stands ca. 120–150 years of age and with a canopy closure of approximately 60%. Foresters are encouraged to set management objectives at both the tree and stand scales. At the tree scale, it is important to retain larger trees (i.e. > 25 cm dbh), especially snags, of a variety of species for foraging opportunities. At the stand scale, a variety of forest types can provide pileated woodpecker foraging habitat. Our findings suggest that pileated woodpeckers may not be 'old-growth obligates' but actually prefer foraging in forests mature in development with a partly open canopy (i.e. approximately 60% canopy closure).

Key words: Dryocopus pileatus, foraging, forest management, pileated woodpecker, habitat supply modeling, HSI, Ontario.

Introduction

The pileated woodpecker (*Dryocopus pileatus*) is the largest woodpecker in North America, averaging 42 cm in length (Kilham 1983). The species is widely distributed throughout forested regions in North America from Great Slave Lake to Texas and Florida (Dance, 1987). In Ontario, the pileated woodpecker favours forested areas south of the Hudson Bay Lowland (Speirs 1985). Pileated woodpeckers are strong excavators and feed primarily on ants (especially carpenter ants *Camponotus* spp.) nesting in dead wood (i.e. snags) or living trees with advanced heartwood decay (Hoyt 1957, Bonar 2001). Pileated woodpeckers are most often associated with large tracts of old forests (e.g. Bull and Meslow 1977, Renken and Wigers 1989, Bull and Holthausen 1993, Conner et al. 1994, Flemming et al. 1999, and Lemaitre and Villard. 2005).

Several jurisdictions across North America (including Ontario) have identified the pileated woodpecker as an umbrella species for forest management because its habitat needs are believed to encompass those of a larger group of wildlife species that require mature and old forest with abundant cavity trees, snags, and downed woody debris (Bull and Meslow 1977, Koven and Martel 1994, Aubry and Raley 2002). For example, the pileated woodpecker provides excavated cavities that are in turn used by a number of other species such as the boreal owl (*Aegolius funereus*), screech owl (*Otus asio*), saw-whet owl (*Aegolius acadicus*), wood duck (*Aix sponsa*), common merganser (*Mergus merganser*), American kestral (*Faco sparverius*), common flicker (*Colaptes auratus*), northern flying squirrel (*Glaucomys sabrinus*), and American marten (*Martes americana*) (McClelland 1977, Bonar 2000).

To develop effective guidelines to help forest managers conserve habitat for this species, it is important to identify the forest habitat characteristics used by the pileated woodpecker. Little is known about pileated woodpecker habitat use in the Great Lakes-St. Lawrence (GLSL) forest of eastern North America. Differences in forest types and timber harvesting systems between western North America, where a majority of research has taken place, and Ontario (where little has taken place) make it difficult to transfer existing knowledge of pileated woodpecker habitat use to the GLSL. Conservation of pileated woodpecker habitat requires the understanding and protection of forest at two scales: the tree and stand. At the tree-scale, it is important to identify the tree characteristics (e.g. certain types and sizes of trees, snags, etc.) of used habitat, in order for them to be managed during harvest activities. At the broad scale, forest managers need to identify the types, ages, and structure of forest stands used by the pileated woodpecker. Forest managers can then analyse habitat

supply to evaluate different forest management regimes, and ensure that a certain amount of pileated woodpecker habitat is conserved across the broad forest landscape.

The objective of this study was to document habitat use by pileated woodpeckers in central Ontario at the tree and stand scales and to use this information to develop a habitat suitability index (HSI) model that could be used to conduct habitat supply analyses across the broad landscape. The focus of the paper is on quantification of foraging habitat; however we also present some descriptive and qualitative data on nest and roosts to provide a complete compilation of pileated habitat use identified in this study.

Study Area

We conducted our study of pileated woodpecker habitat use within the GLSL forest region (Rowe 1972) of central Ontario, Canada. The region extends from 45°N to 47°N and from 78°W to 85°W. This forest is a transition zone between the conifer-dominated boreal forest to the north and the hardwood-dominated deciduous forest to the south. The hardwood forest in this region include both tolerant hardwood forest (forests that are tolerant to shade) and intolerant hardwood forest (forests that like full sun exposure or intolerant to shade). Overall the forest cover in the GLSL is characterized by sugar maple (*Acer saccharum*), yellow birch (*Betula alleghaniensis*), American beech (*Fagus grandifolia*), eastern hemlock (*Tsuga canadensis*), eastern white pine (*Pinus strobus*), and red pine (*Pinus resinosa*) (Chambers et al. 1997). The area has a temperate continental climate with cool winters and warm summers. Elevation ranges from 150 m above sea level (asl) along the shores of the Great Lakes and the Ottawa River to 575-600 m asl on the Algonquin Dome and the eastern shores of Lake Superior (Chambers et al. 1997).

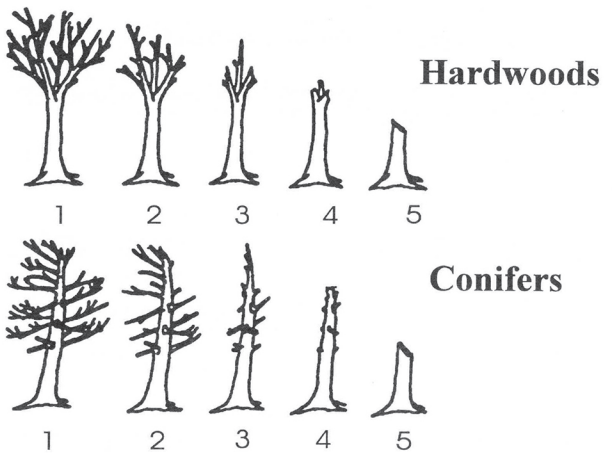
Methods

Study sites were selected from sample plots established for the purpose of developing a forest ecosystem classification (FEC) for central Ontario by the Ontario Ministry of Natural Resources. The FEC defines 25 dominant forest community types (referred to as 'ecosites') within the GLSL forest of central Ontario based on analysis of data from a network of 1539 sample plots (Chambers et al. 1997). The FEC sample plots were located in forest stands with uniform site characteristics, species

composition, stand structure, and had no disturbance (e.g. from fire, wind, or timber harvesting) within the past 25 years (Chambers et al. 1997). Each FEC sample plot covers 0.04 ha. Information on vegetation community type (ecosite), species and size of all standing or leaning trees (live and dead), overstory age (age of stratrum of tress above other vegetation in the uppermost canopy), and overstory canopy closure had already been collected for the majority of plots (although some snag data were determined to be missing after we visited the sites and was re-measured). From these original 1539 plots used in the creation of the FEC, we used stratified-random sampling on FEC type to select our subset of study sites. In total, we visited and surveyed 466 plots during May through August 1995. Each tree and snag (free standing or leaning) in each plot was surveyed for evidence of foraging, roosting, or nesting activity by pileated woodpeckers. Foraging by pileated woodpeckers was distinguished from other species by noting holes that were at least 5 cm in depth and/or 5 cm in length (Bull et al. 1990). Nest holes were distinguished by dome-shaped entrance 10 – 13 cm high and 7 – 10 cm wide (Bull et al. 1990) and appeared to open up from the entrance. Roast activity was distinguished by 2 of more holes similar to nesting holes (although often more round than dome-shaped) and usually 30 – 60 cm from each other (Bull et al. 1990).

We initially attempted to estimate the age of the foraging activity but ultimately pooled data for analysis due to sample size. However, very old holes (i.e. those with dark wood or with moss growing inside) were not recorded because they may have been created when the forest stand had rather different characteristics than at the time of the survey. The intensity of foraging was also considered. Trees with up to four small holes (5-15 cm long), or one large hole (>15 cm long) were classed as having low intensity. Those with five to ten small holes or two to four large holes were classed as having medium intensity. Trees with five or more large holes were considered to have high intensity. Snags were classified into one of five decay class categories (Hayden et al. 1995), with class 1 being the least decayed and class 5 being the most decayed (Figure 1). The foraging location was recorded in one of four categories: stump (0-1.3 m height), bole (main trunk above 1.3 m), dead branches, or crotch (where two or more large branches meet the trunk).

In addition to feeding holes, excavated nest holes and roost holes were recorded. After each plot was completely surveyed, four transects were walked to locate additional nests and roosts in an attempt to augment habitat selection data. Transects were 40 m in length and radiated from the center of each plot in the four cardinal directions. Transects were restricted to this size in an attempt to stay within the original forest stand-type of the



Decay Class 1 - Tree is recently dead. Top is intact. Most fine branching is still present. Bark is intact.

Decay Class 2. Top is intact. Most of the fine branches have dropped. More than 50% of the coarse branches are left. Bark may begin to loosen.

Decay Class 3 - Top is intact. Fewer than 50% of the coarse branches are left. Depending on the species, bark may (e.g. white pine) or may not (e.g. white brich) have sloughed off.

Decay Class 4- Top is broken. No coarse branches remain. Bark may or may not have sloughed off. Height at least 6 m.

Decay Class 5 - (stub) Top repeatedly broken. No coarse branches remain. Bark may or may not have sloughed off. Height less than 6 m.

Note: Trees that have died before attaining a height of 6 m should be assessed using the diagrams. They are not automatically classified as Decay Class 5.

Similarly, if the tree in question has never attained a height of 6m, it cannot be coded as a Decay Class 4.

Figure 1: *Snag decay classes (Hayden et al. 1995).*

sample plot (i.e. the 0.04 ha). All visible nests from the transect line within approximately 10-15 m were recorded.

Statistical Analyses

We used descriptive statistics to characterize foraging activity at tree and stand scales. We performed chi-square goodness-of-fit tests to determine if foraging was distributed among tree species in proportion to

their availability. We then followed techniques described by Neu et al. (1974) to determine which sites were selected, avoided, or used in proportion to their availability. Because tree dbh was not normally distributed, we used the nonparametric paired Wilcoxon test to compare the trees used for foraging with the average dbh of trees in the stand. We also used the nonparametric Mann-Whitney U test to compare the intensity of use between live trees and snags. We used chi-square tests to determine if foraging differed between groups of foraging trees (e.g. conifers and hardwoods, live and dead trees). We also used chi-square tests to compare the intensity of foraging and location of use on the tree with that which was randomly expected. Because of the small sample size of nests and roosts located in and around the plots, we developed only descriptive statistics for these data.

For the stand-scale analysis, we developed descriptive statistics of foraging use by FEC ecosite type. We performed chi-square goodness-of-fit tests to determine if foraging was distributed among habitats (i.e. FEC ecosites) in proportion to their availability. We then followed techniques described by Neu et al. (1974). When the chi-square tests determines a difference in usage, a Bonerroni z-statistic is used to determine which sites were selected, avoided, or used in proportion to their availability.

We used stepwise logistic regression analysis to develop a model to predict the probability of encountering pileated woodpecker foraging activity. We used stepwise because we wanted to predict a dichotomous dependant variable (i.e. present/absence of foraging activity) and we wanted to do exploratory analysis of variables relationships rather than theory testing (Manard 2002). Some pitfalls in using the stepwise logistic regression approach have been identified in the literature and should be considered interpretation of our results including: bias in parameter estimation, inconsistencies among model selection algorithms, and inappropriate reliance on the best model (Whittingham et al. 2006, Mundry and Nunn 2006). We acknowledge that variables in the model identified may not be causing the pileated woodpecker foraging presence, but maybe valuable variables for forest managers to use in the predicting of pileated woodpecker foraging presence. Habitat variables were used in a logistic regression, with foraging activity as our dependent variable, with ±-to-enter = 0.5 and ±-to-remove = 0.10, using the computer program SAS (SAS Institute, 1990). For the logistic regression model results we presented the likelihood ratio test (chi-square difference) and the predicted classification of the original categories. All of other results are presented as mean $\pm$ SE. *P*-values ≤ 0.05 were considered significant.

Results

Foraging Tree Selection:

We located 312 trees with foraging evidence from the 466 plots. The majority of the trees used for foraging were snags (75%), followed by live trees (25%). Foraging trees represented a low percentage of the available live trees (0.6%) and snags (10.7%, n = 299 plots). Eighteen tree species were used, with aspen (*Populus* spp.) being used most frequently (35.9%). Hardwoods (n = 182) were used more than conifers (n = 128) (X^2 = 10.05, P = 0.02). We found that frequency of foraging activity was not independent of tree species (X^2 = 236.7, df = 17, P < 0.001). Of the 18 tree species used, we found six to be used more than expected: aspen, white pine, sugar maple, white cedar (*Thuja occidentalis*), white birch (*Betula papyrifera*), and balsam fir (*Abies balsamea*). Black ash (*Fraxinus nigra*), white ash (*Fraxinus americana*), American beech, yellow birch, hemlock, red pine, black spruce (*Picea mariana*), and white spruce (*Picea glauca*) were used less than expected. We also found that two species, ironwood (*Ostrya virginiana*) and basswood (*Tilia americana*), were not used for foraging at all, despite being common within plots (> 75 trees).

Foraging trees averaged 24.5 $\pm$ 0.6 cm dbh (range 9.5-62.7 cm). Snags were used more than live trees (X^2 = 78.0, P < 0.001). Snags used for foraging were on average 23.1 $\pm$ 0.7 cm dbh and were significantly larger than available snags (n = 163, Z = -6.4, P < 0.001). Live trees used for foraging averaged 28.3 $\pm$ 1.2 cm dbh and were significantly larger than the average of live trees in the same plot (n = 78, Z = -5.3, P < 0.001). All five snag classes were used (Table 1), but classes 4 and 5 were used more than expected (X^2 = 13.2, df = 2, P = 0.001), and represented 70% (164 of 222) of the standing snags used. There were 1.2 standing snags used per plot (226 standing snags from 187 plots) which represents 30 standing snags used per ha.

Table 1: *Characteristic of dead trees (snags) used for foraging by Pileated Woodpeckers in central Ontario.*

Snag Decay Class	Used Trees (%)	Mean dbh (cm)
Class 1	4.3	22.8
Class 2	0.3	25.7
Class 3	10.3	24.9
Class 4	34.2	24.9
Class 5	35.9	19.8
Total/mean	**234 trees**	22.4

The majority of trees used for foraging had a low intensity of foraging activity ($n = 176$), followed by medium intensity ($n = 105$) and high intensity ($n = 31$). Trees with higher intensity use had larger dbh ($X^2 = 13.2$, $df = 2$, $P = 0.001$) (Table 2). Snags had significantly higher intensity of foraging compared to live trees ($U = 6972$, $P < 0.001$).

Table 2: *Frequency of foraging on trees by Pileated Woodpeckers.*

Frequency of Use	Number ofTrees	Mean dbh (cm)	Snags	Live Trees
Low	176 (56.4%)	21.4	118	58
Medium	105 (33.7%)	23.6	90	15
High	31 (9.9%)	29.7	26	5
Total/Mean	312	23.2	234	78

Pileated woodpeckers appeared to forage equally within the tree, between the stump ($n = 124$) and the bole ($n = 111$) ($X^2 = 0.7$, $df = 1$, $P = 0.396$), with 68 trees exhibiting foraging both on the stump and the bole. There was also some foraging on dead branches ($n = 7$) and in tree crotches ($n = 2$). When we examined conifers separately, there was a preference for foraging at the base on the stump (n = 75) compared to the bole (n = 26) ($X^2 = 23.7$, $df = 1$, $P < 0.001$). Conversely, there appeared to be more foraging on the bole (n = 84) of hardwoods ($X^2 = 9.2$, $df = 1$, $P = 0.002$) compared to the stump (n = 49).

Nests and Roosts Description:

From transects surrounding the plots and from within the plots, we found eight pileated woodpecker nest trees and 17 roost trees (Table 3). Of the eight nests, all were in hardwoods, with trembling aspen (*Populus tremuloides*) used most commonly ($n = 5$), followed by beech ($n = 2$), and sugar maple ($n = 1$). Live trees were primarily used for nesting (7 of 8). Nest trees averaged 44.2 $\pm$ 3.0 cm dbh (range 29.2-58.5 cm). Roosts were also mostly in hardwood trees, with trembling aspen again the most commonly used species ($n = 8$), followed by sugar maple ($n = 4$), yellow birch ($n = 2$), beech, ($n = 1$), white ash ($n = 1$), and white cedar ($n = 1$). Both snags ($n = 8$) and live trees ($n = 9$) were used for roosts. The roost trees averaged 45.7 $\pm$ 3.8 cm dbh ($n = 16$, range 24.0-74.4 cm).

Stand-Scale Selection:

Of the 466 plots surveyed, 187 had at least one tree with some pileated woodpecker foraging activity. All forest ecosite types (and groups) had some evidence of foraging activity (Table 4). We found that foraging trees were not distributed among ecosites in proportion to their availability (X^2

Table 3: *Characteristics of trees used for nesting and roosting by Pileated Woodpeckers in central Ontario.*

Activity	Tree	Tree Condition	Snag Class	DBH (cm)	Plot or Transect
Nest	Aspen	Snag	3	29.2	Transect
Nest	Aspen	Live		41.5	Transect
Nest	Aspen	Live		44.5	Transect
Nest	Aspen	Live		46.9	Transect
Nest	Aspen	Live		58.5	Transect
Nest	Beech	Live		38.7	Transect
Nest	Beech	Live		45.9	Transect
Nest	Sugar Maple	Live		48	Transect
Roost	Aspen	Snag	4	24	Transect
Roost	Aspen	Snag	3	29	Transect
Roost	Aspen	Snag	3	31	Transect
Roost	Aspen	Snag	3	31.9	Transect
Roost	Aspen	Snag	4	33.5	Transect
Roost	Aspen	Snag	4	42	Plot
Roost	Aspen	Snag	4	47	Transect
Roost	Aspen	Live		54	Transect
Roost	Sugar Maple	Snag	3	47	Transect
Roost	Sugar Maple	Live		44.5	Transect
Roost	Sugar Maple	Live		63.3	Transect
Roost	Sugar Maple	Live		70.9	Transect
Roost	Yellow Birch	Live		60	Transect
Roost	Yellow Birch	Live		74.4	Transect
Roost	White Ash	Live		34	Transect
Roost	Beech	Live		45	Plot
Roost	White Cedar	Live		undeter.	Transect

= 71.1, $df = 24$, $P < 0.001$). Of the 25 ecosite types, we found three to be used more than expected: ES14 (White Pine-Largetooth Aspen-Red Oak), ES19 (Aspen-Jack Pine-White Spruce-Black Spruce), and ES34 (White Cedar-Lowland Hardwoods). We also found that ES25 (Sugar Maple-Beech-Red Oak), ES26 (Sugar Maple-Basswood), ES28 (Sugar Maple-Hemlock-Yellow Birch, and ES30 (Hemlock-Yellow Birch) were used less than expected, while all other ecosites were used in proportion to their availability.

We further examined stand-scale selection with logistic regression analysis to build models to predict the presence of Woodpecker activity based on plot age, canopy closure, and dummy variables representing ecosite type. We initially tried dependent variables of differing amounts of use (i.e. plots with high versus low use considering the number of trees and intensity), but ultimately found that a dependent variable reflecting

Table 4: *Evidence of foraging activity by Pileated Woodpeckers within 25 forest community types (Ecosites) in central Ontario.*

Ecosite type	Sites Sampled	Sites With Foraging	Percent	Number of Trees Used	Utilization Availability
White and Red Pine Group					
ES11 (White Pine-Red Pine)	19	13	68.40%	20	Proportional
ES12 (Red Pine)	8	3	37.50%	6	Proportional
ES13 (Jack Pine-White Pine-Red Pine)	19	9	47.40%	13	Proportional
ES14 (White Pine-Aspen-Red Oak)	33	22	66.70%	41	Selected
Jack Pine and Black Spruce Group					
ES15 (Jack Pine)	8	2	25.00%	4	Proportional
ES16 (Black Spruce-Pine)	19	8	42.1	16	Proportional
Intolerant Hardwoods and Mixedwoods Group					
ES17 (Aspen-White Birch)	11	6	54.50%	9	Proportional
ES18 (Aspen-White Birch-White Spruce- Balsam Fir)	25	12	48	19	Proportional
ES19 (Aspen-Jack Pine-White Spruce-Black Spruce)	11	7	63.60%	16	Selected
ES20 (White Pine-Red Pine-White Spruce-White Birch-Trembling Aspen)	6	3	50.00%	5	Proportional
Tolerant and Mid-Tolerant Hardwoods Group					
ES21 (White Cedar-White Pine-White- Birch-White Spruce)	6	2	33.30%	3	Proportional
ES22 (White Cedar-Other Conifer)	9	2	22.20%	3	Proportional
ES23 (Red Oak-Hardwood)	19	7	36.3	11	Proportional
ES24 (Sugar Maple-Red Oak-Basswood)	23	8	34.80%	10	Proportional
ES25 (Sugar Maple-Beech-Red Oak)	21	6	28.6	7	Avoided
ES26 (Sugar Maple-Basswood)	14	4	38.6	4	Avoided
ES27 (Sugar Maple-White Birch-Aspen-White Pine)	43	16	37.2	21	Proportional
ES28 (Sugar Maple-Hemlock-Yellow Birch)	23	7	30.4	8	Avoided
ES29 (Sugar Maple-Yellow Birch)	23	6	26.1	12	Proportional
ES30 (Hemlock-Yellow Birch)	25	4	16	7	Avoided
Conifers and Hardwood Lowlands Group					
ES31 (Black Spruce-Tamarack)	14	3	21.4	5	Proportional
ES32 (White Cedar-Black Spruce- Tamarack)	20	8	40	15	Proportional
ES33 (White Cedar-Other Conifer)	10	5	50	12	Proportional
ES34 (White Cedar-Lowland Hardwoods)	31	16	51.6	33	Selected
ES35 (Lowland Hardwoods)	26	8	30.8	11	Proportional
Totals	466	187	40.1	311	

presence or absence of feeding activity performed the best. The final model included age, age^2, canopy closure (cc), canopy closure^2, and dummy variables for 14 of the 25 ecosites. The equation was significant ($X^2 = 39.4$, $df = 18$, $P < 0.003$) and correctly classified 57.7% of the original plots. The equation form is represented by $P(Y) = 1/1+^{e-Y}$ where P (Y) = probability of the plot being used and Y= intercept + 3.9691* age - 1.9764* age^2+ 4.1486* cc - 3.2455* cc^2. P(Y) provides an HSI score for a forest stand ranging from 0 to 1. The intercept terms are ecosite-specific (Table 5). Because of the

Table 5: *Ecosite-specific intercepts for the non-spatial HSI model.*

Ecosite type	Intercept
ES11 (White Pine-Red Pine)	-2.196
ES12 (Red Pine)	-3.3
ES13 (Jack Pine-White Pine-Red Pine)	-3.3
ES14 (White Pine-Largetooth Aspen-Red Oak)	-2.276
ES15 (Jack Pine)	-4.123
ES16 (Black Spruce-Pine)	-3.3
ES17 (Aspen-White Birch)	-2.759
ES18 (Aspen-White Birch-White Spruce-Balsam Fir)	-3.3
ES19 (Aspen-Jack Pine-White Spruce-Black Spruce)	-2.475
ES20 (White Pine-Red Pine-White Spruce-White Birch-Trembling Aspen)	-3.3
ES21 (White Cedar-White Pine-White Birch-White Spruce)	-3.3
ES22 (White Cedar-Other Conifer)	-3.3
ES23 (Red Oak-Hardwood)	-3.3
ES24 (Sugar Maple-Red Oak-Basswood)	-3.647
ES25 (Sugar Maple-Beech-Red Oak)	-3.931
ES26 (Sugar Maple-Basswood)	-3.896
ES27 (Sugar Maple-White Birch-Aspen-White Pine)	-3.3
ES28 (Sugar Maple-Hemlock-Yellow Birch)	-3.71
ES29 (Sugar Maple-Yellow Birch)	-4.264
ES30 (Hemlock-Yellow Birch)	-3.897
ES31 (Black Spruce-Tamarack)	-4.593
ES32 (White Cedar-Black Spruce-Tamarack)	-3.684
ES33 (White Cedar-Other Conifer)	-3.3
ES34 (White Cedar-Lowland Hardwoods)	-3.3
ES35 (Lowland Hardwoods)	-3.734

* Note higher intercept value = higher preference
For Ecosite definitions see Chambers et al. (1997)

quadratic terms in the model, HSI scores increase initially with stand age up to ca. 120 - 150 years but then decline (Figure 2). Similarly, HSI scores increase with increasing canopy closure to about 60%, and then decline (Figure 2).

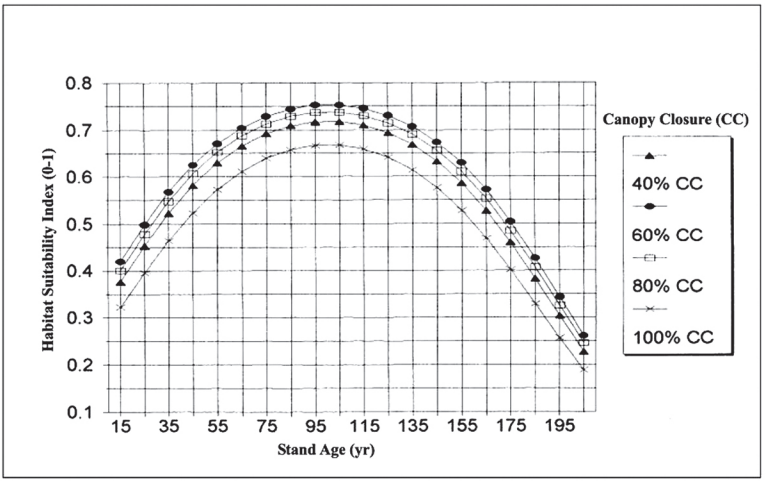


Figure 2: *HSI scores for Ecosite 11 as a function of stand age and canopy closure.*

Discussion

Foraging Tree Selection:

In central Ontario, pileated woodpeckers used a range of foraging trees, including 18 species of both living and dead trees of differing decay classes. However, our findings suggest that pileated woodpeckers select foraging trees with from there options in an unequal non-random manner. Pileated woodpeckers foraged on live trees and snags that were larger on average than those available in the stand. Several authors have also found a preference for foraging on larger trees (Bull and Meslow 1977, Bull and Holthausen 1993, Flemming et al.1999, Bonar 2001, Lemaitre and Villard 2005). The larger trees in our study also experienced higher foraging intensity. This may suggest that pileated woodpeckers are getting an even larger portion of their diet from larger trees. Pileated woodpeckers appeared to forage more frequently at the bases on coniferous trees, as compared to the boles of hardwood trees. Bonar (2001) found pileated woodpeckers foraged more frequently at lower heights on conifer trees,

but attributed some of this foraging position difference to seasonal behaviour (with more foraging at the base during the winter). Our finding of increased foraging occurring on snags (75%). versus live trees is high compared to existing literature (e.g. Bull 1987, Millar 1992, Conner et al. 1994, Bull and Holthausen 1993, Lemaitre and Villard 2005).

Stand-Scale Selection:

Results from the availability analysis (Neu et al. 1974) helped us identify the forest types that had a higher use based on their availability. Considering of sampling design of forest plots in all forest types across the broad region, this information can help identify the forests that are more likely to be used across the landscape. Forest types that were rated preferred in central Ontario included those dominated by white and/or red pine, white cedar, upland black spruce, intolerant hardwoods, mixes of intolerant and tolerant hardwoods, and mixes of intolerant hardwoods and various conifers. Although we did find some foraging in all forest types, we would not go as far as calling pileated woodpeckers a habitat generalist at the stand, as Bonar (2001) did. It rather appears that pileated prefer a number of forest types and yet avoid others. These preferred forest types may be more likely to have the tree foraging characteristic identified either and the stand-scale characteristics (e.g. canopy closure) identified in the logistic regression analysis.

The pileated woodpecker is often considered a species reliant on or characteristic of 'old-growth' forest (Bull and Holthausen 1993, McClelland and McClelland 1999). While our HSI model results suggest that habitat use generally does increase with increased forest age, they also demonstrate that pileated woodpeckers will forage in forest of a wide range of ages. This supports the contention of Bonar (2001) that most ages of forests are used. Moreover, use eventually appeared to decline as the forest approaches 'old-age' (Figure 2). This may reflect the loss of relatively short-lived intolerant hardwoods (i.e. aspen) that were found to be preferred foraging trees.

The pileated woodpecker also is typically considered a species of dense forest (Renken and Wiggers 1989, Bull et al. 1992). Bull and Holthausen (1993) suggested that a canopy closure of 60%+ was optimal for nesting and roosting in Oregon. High canopy closure is likely beneficial as it may reduce the hunting efficacy of the pileated woodpecker's primary predator, the northern goshawk (*Accipiter gentilis*) (Auser 1989). Our HSI model results also suggest that 60% crown closure is optimal, but that use may actually decline if forest is denser (Figure 2). Similarly, Bonar (2001) found that stands with > 70% canopy closure were not preferred. Denser

stands have microclimates that are less suitable for carpenter ants which are the pileated woodpeckers' primary prey (Bonar 2001).

Nests and Roosts Description:

Considering the caveat of our small sample size, nest and roosts tree selection did show some similarity to the foraging tree selection. Nest and roost trees were larger-sized trees, with a variety of tree-species and both live and dead trees being used. Bonar (2000) also found similar patterns for nest and roost tree selection to forage tree selection at both the tree and stand-scale. This supports forest and wildlife managers modelling habitat selection on more easily obtainable local foraging selection data than nesting/roosting selection data. The descriptive results of nest and roost tree selection provides an important baseline data not previous collected for this region.

Management Considerations:

This study has provided some important understanding of pileated woodpeckers habitat use but can also provide some important information for forest and wildlife managers to consider. Managing habitat for pileated woodpeckers will require both the provision of tree-scale and stand-scale habitat features. At the tree scale, it is important to retain larger trees (i.e. > 25 cm dbh) of a variety of species for foraging opportunities. Larger trees in this study provided higher frequency foraging. Although we did find evidence of foraging on trees as small as 9.5 cm, managers should be careful about applying minimum size standards (based on minimum field value) and would do better to consider mean values (Conner 1979, McClelland and McClelland 1999). Managers often apply minimum dbh size retention in forest harvest blocks (as foraging or nest trees for pileated woodpecker) based on smallest recorded dbh (McClelland and McClelland 1999). Loggers may opt to leave more of smaller sized (slightly above the minimum) than the higher volume (more timber valuable) larger trees. This may be detrimental to pileated woodpecker populations. Mean values of dbh (tree > 25 cm) may provide more optimal foraging opportunities for pileated woodpeckers.

Standing dead trees (the most-used tree in this study) should be retained where they do not pose a safety risk to forest workers during harvesting, site-preparation, or other field activities. Special attention should be given to the retention of standing snags in advanced stages of decay, which represented 70% of the snags used for foraging in our study.

Bonar (2000) provided an extensive list of species that use pileated woodpecker cavity trees. Interestingly, we observed a red-breasted nuthatch (*Sitta canadensis*) and a flying squirrel using cavities found in

this study. Although our sample size of nest and roosts trees was small, based on the results obtained we recommend that those trees retained to be potential cavity trees be at least 45 cm dbh.

At the stand scale, forest managers should consider that a variety of forest types can provide pileated woodpecker foraging habitat. Our findings suggest that pileated woodpeckers may not be 'old-growth obligates' but prefer foraging in forests mature in development with a partly open canopy (i.e. 60% canopy closure).

We feel our HSI habitat model has an advantage to local managers over others pileated wood pecker models available (e.g. Schroeder, 1983) because this model has gone through calibration and verification (Brooks 1997). Our model was first calibrated by being designed to fit local forests and local forest classification (i.e. FEC). The model was then verified based on pileated woodpecker use at 466 sites. The model has also gone through separate landscape validation (Bush 1999) where the increases in the total amount and core areas of preferred habitat (as described by model in this paper) were positively correlated with pileated woodpecker presence. Our HSI model has also been adapted into a categorical (i.e. preferred, suitable, unsuitable) habitat supply model that is used in forest management planning activities in Ontario (Kloss 2002). Other jurisdictions can adapt our findings and/or approach to local forest types.

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Surfing Lake Superior

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Abstract: Surfing, a sport normally associated with the ocean, has begun to be practised by a small band of enthusiasts on the waves of Lake Superior. This article looks at the nature of the Lake Superior surfer; what he (and sometimes she) likes and dislikes about the lake as a surfing location; how the lake compares with the ocean for the sport; how the surfers learned about the use of the lake; what their principal motives are for surfing; and whether the surfers would like to see the sport grow on the lake.

Introduction

The sport of surfing appears to have originated some three or four thousand years ago in the Pacific Islands (Pearson 1979) and is thought to be one of the world's oldest and most organized athletic activities (Carrol 1991). After 1945, "surfing changed from a leisure-time activity of a select few, to the focus of an alternative lifestyle, which eventually involved thousands of youths" (Hamel 2001, 25). However, in an activity that conjures up images of bronzed bodies on sun-drenched beaches, even the keenest aficionado may be surprised to learn of it being practised on Lake Superior.

For the surfer, there are several negative points about Superior. First, although it is the largest freshwater lake in the world in area, there is only a very limited distance for waves to form. The longest possible fetch is about 500 km; and for most wind directions well under half of that. This results in periods usually six seconds or shorter in between waves. The shorter fetch often results in heavy onshore winds and choppy unpredictable waves. Ocean waves are usually generated by storms more than a thousand miles away, which results in 12 second periods between waves and clean, consistent waves. The large fetch of the ocean

furthermore creates longer swells that have the ability on the right break to provide surfers with extended rides up to five minutes long. The waves on lake on Lake Superior do not have swells as long and therefore the rides on its waves are shorter, regularly lasting less than 30 seconds (Strazz 2000).

Second, Lake Superior remains cold year round: surface temperatures between 1966 and 1975 ranged from an average of 0.1° C in March to 12.8° C in September (Derecki 1980). Although surface water temperatures are reported to have warmed by about 2.5° since 1979 (Austin and Colman 2007) this is hardly inviting compared with Hawaii's cold-season sea temperatures of 23° C (Hawaii 2008): especially as the best waves for surfing on Superior are often during the Fall and Spring (Deur 2004).

Third, the water, being fresh, is less buoyant than the ocean. This has an impact on surfing, as surfing requires one to stay afloat on the wave. The disadvantage of the less buoyant fresh water is that it is harder to catch the wave and stay on the wave in comparison to the ocean. However, an advantage of the fresh water is that it is easier to paddle past breaking waves in the form of duck diving (Deur 2004), the method of burrowing through or beneath an incoming wave that is either cresting or already broken (Warshaw 2003). To compensate for the difference in buoyancy, surfers on Lake Superior use thicker surfboards than ocean surfers, with the lake boards needing to be about an inch thicker in order to achieve the same buoyancy as on the ocean (Deur 2004).

Despite all these negative points, there are some positives for the Superior surfer. What is surely the greatest attraction is that there is little need to fight crowds on the beach or in the water lining up to catch the best waves[1]. There is a good chance that on any given day there will be no one or only one or two surfers at any given surf spot on Lake Superior. Further, for some, the opportunity to surf locations on Lake Superior that have rarely or never been surfed before is appealing.

The first time anyone is known to have surfed Lake Superior was in the 1940s, according to eye witness accounts (Strazz 2000). A few others began in the 1970s. The Great Lakes Surfing Association was created in 1964 from surfers on Lake Michigan. It was not until the late 1980s that the first Lake Superior surfers from Duluth, MN joined the club. The surfing population of Lake Superior remained few and far between until the twenty first century. Then a growing number of surfers from Duluth, Minnesota

[1]This is enough of a problem at popular locations that there are web sites giving advice on how to cope with the throngs on the beach and in the water. One suggestion is "Don't shower for a week, the smell you emit out in the water should thin the crowds out around you for a couple of metres" (SRO 2008).

and Thunder Bay, Ontario started surfing. Eventually suitable locations were being surfed all around the lake, though the largest numbers seem to be concentrated on the northwest shore. In Thunder Bay the surfing population grew from 3 in 2001 to about 30 in 2008. In Duluth the surf population has grown to more than 40. The Duluth surfers have a club, the Superior Surf Club, which hosts a competition every year (Tema 2007).

One may question the characteristics of those who brave the cold and surf Lake Superior. Therefore, the aim of this study is to examine the nature of the individuals who pursue their sport in such unlikely waters; to find what they like and dislike about the location; and what motivates them to carry on their activity.

Methods

Information for this paper was collected in part through the technique of participant observation. The second author has been a regular surfer on the north shore of Lake Superior since 2004; both on his own and in the company of others. Further data were collected by means of a questionnaire given to surfers in the Thunder Bay, ON and the Duluth, MN region.

There are known to be about 70 regular surfers in and around the two cities. Initial contacts were made in Thunder Bay with surfers known to the second author, and in Duluth with the president of the surf club there. Then the snowball technique was used to contact additional surfers. Since the surfing community is a close-knit group where everybody knows everybody, the snowball technique was highly effective. A few more respondents were located through two Lake Superior surfing online forums. Because of the small base population, no attempt was made to sample.

The questionnaire was designed to produce quantitative data. Nominal data were obtained through closed-ended questions and ordinal data were acquired by Likert -type scale questions. The questionnaire was pre-tested on a small sample prior to distribution.

Questionnaires were distributed and returned by email. Email was also used to remind those who had not responded. It is possible that a few surfers, who did not have an email connection or who did not use it, were missed. In all, 60 surfers were contacted, which resulted in 30 completed questionnaires. Although a small number, this represents nearly half of the active surfing population in the area. However, data obtained from the questionnaire are used in a purely descriptive form as the numbers are too small for meaningful statistical analysis.

Findings and Analysis

The popular image of the surfer is personified by Gary Trudeau's *Doonesbury* character Zonker Harris: the male "beach-bum," dropping out of society to improve his tan and catch the best waves. Although the number of women surfers worldwide is growing, they total only a small fraction of their male counterparts. In competitive surfing, women face opposition and hostility from men (Toms 2005). Even without the pressures of professional surfing, it is expected that the nature of Superior waters will deter all but the most determined female surfers.

How closely do Lake Superior surfers fit this 'Doonesbury' image? Certainly most are committed surfers. Nearly half of the respondents consider surfing to be an important part of their lives and two-thirds define themselves as strongly committed to the activity. Of the thirty respondents, twenty-five are male and only five female. However, the beach bum image can be dismissed. This is not a young dropout population. The ages of surfers in this study range all the way from 18 to 58, with a mean of 30. Two-thirds of them are in full-time employment (and some of the others are full-time students); all but one have some post-secondary education and over two-thirds graduated from university or college. In any case, a true beach-bum would find the Superior shore a far from ideal place to work on a tan.

Surfing may have been practised for centuries; but not on Lake Superior. None of the surfers in this study had started before the year 2000 and the great majority had begun in or after 2004. In two-thirds of the cases, surfers learned about the possibility of pursuing the sport on Superior by word of mouth and a few simply by noticing someone surfing there.

This may change. The media have recently begun to show some limited interest in this activity. The magazine *Canadian Geographic* had a short piece in 2007 about the growth of surfing on Lake Superior (Dutkiewicz 2007). The next year locally-owned Thunder Bay Telephone included an item in its newsletter sent to customers (TBAYtel 2008) and early in 2009 the *New York Times* carried an article on surfing at Duluth (Regenold 2009.) It seems reasonable to suppose that this publicity may not only alert local residents to this recreational opportunity, but may even bring surfing enthusiasts from further afield.

Such growth may not be appreciated by all current local surfers. Half of those asked would like to see surfing on Lake Superior grow. If you participate in a little-known activity that you are sure others would enjoy if only they knew about it, it is natural to want to spread the word. Most of those surveyed wanted the number of surfers to remain the same, while

four did not care whether or not the popularity of surfing on the lake grew. It seems that the lack of crowds at surfing spots is so attractive that many do not want this pleasure spoiled by growing numbers.

The questionnaire asked respondents why a surfer should come to Superior if an ocean beach is equally accessible. Since ocean waves tend to be bigger, more buoyant, more regular, and crest for longer than those on Superior, it seems natural to assume that anyone who has experienced both will prefer the sea. In fact, preferences are not that clear. Twenty-four of the thirty respondents in this study have experienced ocean surfing. Fourteen of these state that they do prefer the ocean, but ten like the lake better.

The questionnaire also asked what it is that surfers like about Lake Superior. The fact that the lake is close to home certainly helps: a large proportion cited geographic proximity as an attraction and for some respondents a strong attraction. Even those who would prefer to be experiencing Pacific or Atlantic rollers are not likely to turn down the opportunity to catch a few waves a short drive from home. However, there is little indication that surfers are moving to Lake Superior primarily to pursue their sport. Almost all indicate that they live near the lake for other reasons—family, work, school—but do appreciate its convenience from a surfing point of view.

It is clear that the number one attraction, overcoming even the advantage of nearness to home, is the absence of crowds. Only one of the 30 respondents who answered this question felt that this was not important. The friendly atmosphere of Superior surfing was also mentioned almost as often as its being close to home. The friendliness is doubtless closely linked with the lack of crowding. You are much more likely to strike up conversations when you may be the only other person surfing that beach that day. It is worth noting that while "relaxation" is given as the most common motivation for surfing, it is closely followed by "spending time with friends."

Many respondents noted that the frontier aspect of surfing—pursuing your sport in an apparently hostile environment; to boldly surf where few have surfed before—also has its attractions, though a sizeable minority does not consider this to be important. From the literature and from the experiences of the second author, it was thought that the element of *risk* would be an important motivation to surf. Since surfing the bigger waves of winter often involves dodging chunks of ice as you ride the waves, the risk is unavoidable. The assumption is that, as with sports such as caving and rock-climbing, the risk is part of the enjoyment. A recent study comparing surfers with golfers found that "the sample of surfers in this study were characterised by higher levels of Disinhibition, Thrill and

Adventure Seeking and Experience Seeking dimensions of sensation seeking and Openness to Experience" (Diehm and Armatas, 2003: 675). Among Lake Superior surfers opinion was divided: asked if they surfed "to experience a sense of risk" the same number said "No" as said "Yes".

What is it that surfers do *not* like about Superior? Anyone who has experienced the lake's water anywhere except in sheltered bays after a long spell of warming by the sun would naturally suppose the cold water to be the part of the experience that would put people off the most. In fact, this is not so. About as many are indifferent to the water temperature as feel negatively about it. Neither the poorer quality of the waves compared with the ocean nor the lesser buoyancy of the water seemed to be of much concern. By far the biggest complaint is the inconsistency of the waves. It seems that with modern wet suits and somewhat thicker surfboards the quality of the surfing on lake poses no serious problems. Only the wait for a decent wave causes annoyance.

Conclusion

Surfing is a sport that has only just begun to impinge on the public consciousness around Lake Superior. Few have been surfing the lake for more than a few years and the activity has only recently begun to appear in the media as something unusual and unexpected. Because there has been no publicity until very recently, most current practitioners learned about the local opportunity from friends.

Like its much older, worldwide, manifestation, surfing on Lake Superior is still predominantly a male occupation; though the male surfers are mostly somewhat older, more likely to be employed and have had much more education than the popular representation of the surfer (which seems to be an erroneous image anyway).

While a majority of those who have surfed both in the ocean and in the lake not surprisingly prefer the former, a significant minority actually rate the lake higher. The main reason is the absence of the crowding that can ruin the surfing experience at the more popular ocean sites. The companionship that springs up among the small group of enthusiasts is also valued, coming narrowly second the relaxation as reasons for surfing.

With modern neoprene wetsuits and thicker boards, neither the cold water nor the lower buoyancy compared with salt water cause many problems, nor do the shorter rides on smaller lake waves. The principal disappointment is with the irregularity and unpredictability of the waves: the newsletter article by the local Thunder Bay telephone company made

much of the usefulness of cell phones to quickly communicate the whereabouts of surfable waves (TBAYtel 2008).

With the media beginning to get interested it seems inevitable that more people will begin to join in this activity. The current surfing population has mixed feelings about this. About half welcome the idea of more joining in their sport. The question of safety cannot be overlooked. Several currently surf on their own for lack of companionship. It might be reassuring to know that somebody else would be there to notice if you got hit on the head with a floating chunk of ice[2]. However, with lack of crowds being seen as the biggest plus of lake surfing, others are clearly anxious that Superior beaches do not get like Waikiki, with people jostling in line to get into the waves.

Overall, it seems unlikely that Lake Superior will ever become a surfing magnet like Hawaii or California. Even current enthusiasts admit that they surf the lake because they live near it; not that they chose to live near it so that they could surf. Nonetheless, as the news spreads that the sport is possible and enjoyable in Superior's waters some growth may be expected. It is probably still safe to predict that, for the foreseeable future, the biggest attraction of the biggest lake for surfers will be the lack of crowds.

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[2]After the second author's public presentation of his initial findings, his mother made this point quite firmly to the first author.

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Through the ages: sense of place in Caliento, Manitoba

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Abstract: Since the turn of the nineteenth century, the Caliento area of south-eastern Manitoba shifted from booming Ukrainian settlement to more culturally diverse population. Changes in the population, technology and economy have significantly impacted how Ukrainian descendants use and perceive the landscape. Through the concept of sense of place, these changes can be better understood. Sense of place is a perception of place experienced by people when meaning is given to a space through emotional and social attachment. The purpose of this research is to understand the sense of place associated with people in the Caliento area of south-eastern Manitoba and to document changes over time and across generations. Data collection included a literature review, direct observation, semi-structured interviews with nine residents and a workshop that involved the use of photos and mental maps. Interview participants represented three generations of Ukrainian immigrants who either grew up or currently reside in Caliento. Findings illustrate that although each generation had a strong shared affinity for the homeland, the geographic size of this homeland expanded over time. As technology and faster modes of transportation became more accessible, so did the ability to transcend space and thus form attachment to places outside Caliento, especially for members of the third generation. Nonetheless, a sense of place remains most intense for the immediate homeland area for each generation included in the study.

Keywords: *Sense of place, Ukrainian Immigrants, Rural Canadians, Caliento, Manitoba*

Sense of Place and Caliento, Manitoba

The concept of sense of place has been a focus of cultural geographers for over thirty years (Cresswell 2004). Sense of place is commonly defined as the social or emotional attachment given to a space having a particular significance to a person or a group (Simpson-Housley and Williams 2002). Through physical interaction with and cultural learning about places, people assign meaning to a space (Tuan 1977; Stedman *et al.* 2004). Thus sense of place is both individual and shared: individual, as it is based on emotional experiences; shared, as a group of people have similar social and cultural experiences with a particular locale (Tuan 1977, 1980). Cultural geographers, therefore, study sense of place in order to gain a better understanding of the subjective relationship of people and places (Buttimer 1980).

One of the interesting things about sense of place and people's attachment to particular places is that people of the same generation or age group may attach similar meanings to places based on shared experiences within a temporal context. This sense of place can be expressed over time in the landscape through architecture, infrastructure, demographic changes and within the social imagination in the form of place memories (Feld and Basso 1996). Further, people within a generation form strong emotional and social attachments over time to a homeland in which they experience significant life events (Tuan 1977). For this reason, it is not surprising that attachment to homeland can be one of the most intense forms of sense of place and often forms the center of how people organize their world (Tuan 1977; Cuba and Hummon 1993). As people make stronger emotional connections to a location, sense of place intensifies over time (Rowles 1980; Tuan 1977, Stedman *et al.* 2004).

The purpose of this paper is to understand the sense of place associated with people in the Caliento area of south-eastern Manitoba and to document changes over time and across generations (see Figure 1). Located in the Rural Municipality of Stuartburn, Caliento is an area of southeastern Manitoba with a strong Ukrainian history. The Caliento area was once a booming settlement for Ukrainian immigrants in the 1920s, with Stuartburn being one of nine major Ukrainian settlements established in the early 1900s (Lehr 1991, 1996). The time frame of this immigration was relatively short (approximately twenty years, between 1900 and 1920) and the Ukrainian population was clustered. Caliento has seen significant demographic changes since the arrival of the first Ukrainians, as changes in transportation technology and decreasing economic opportunities resulted in a now-familiar trend of rural depopulation. While the area has a relatively large population of young people (Statistics Canada 2006), the

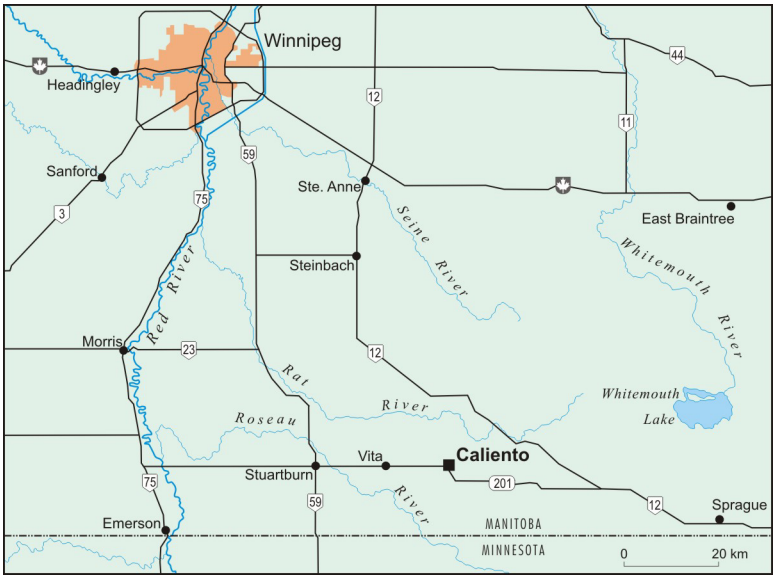


Figure 1: *Map showing location of Caliento in southeastern Manitoba.*

population of original descendents is an aging one (Reimer 2008). However, there remains a strong cohort of people of Ukrainian descent related to the original homesteaders that make their living through employment in one of the few industries in the area (health, education or agriculture) or by commuting to larger towns or cities (such as Steinbach or Winnipeg) to find work.

There are, however, a number of people living in the area that are the direct descendents of the original homesteaders. This population is of research interest for several reasons, including understanding the motivation of people to stay in rural areas and why people choose to remain in an area with few economic opportunities (Heald 2008). Indeed, scholars have documented the process of migration amongst Ukrainian immigrants in Western Canada, including the push factors (e.g., overpopulation, feudal land tenure system, and lack of available land) and pull factors (e.g., chain migration) compelling settlement in Western Canada (Lehr and Moodie 1980; Petryshyn 1985; Lehr 1991). Other studies include role of government policy in settlement, factors influencing land selection, and impact of immigration on the landscape (Petryshyn 1985; Lehr 1996). Furthermore, there is a body of work that considers the contributions of Ukrainian immigrants to Canadian society (Czuboka 1983; Ewanchuk 1994, 2000). More recently, some attention has turned to understanding the

current economic and socio-cultural factors influencing current traditional Ukrainian communities in southeastern Manitoba (Heald 2008). Of interest here is how this Ukrainian population attaches itself to place. In the face of decreasing local amenities, what compels this population to remain in the region? Therefore, the purpose of this research, again, is to understand what sense of place is associated with the descendents of original homesteaders in this area and what, if any, changes become clear over time and across generations.

Methods

Primary data collection for the research included, semi-structured interviews with nine residents of the Caliento area, a workshop with research participants, and an examination of both archival records and current census data. In addition, the first author, a descendant of Ukrainian immigrants in Caliento, was able to offer data and experience from direct observation as she grew up in and still retains familial ties within the Caliento area.

Understanding of individual and community sense of place was derived through semi-structured interviews. Research participants represented three generations of residents, all direct descendants of Ukrainian immigrants. The first generational cohort included three people between the ages of 70 and 80, the children of original immigrant homesteaders (Interviews 1-A; 1-B; 1-C). All were born, raised, and currently reside in the area. The second generational cohort included three people between the ages of 35 and 60 who are the children or spouses of the first generation and currently live in the area (Interviews 2-D; 2-E; 2-F). The third generational cohort included three people who are the grandchildren of the first generation. All of these participants were raised in Caliento but now reside in Winnipeg, MB (interviews 3-G; 3-H; 3-I). Lasting between 60 and 120 minutes, the interviews were conducted in the residences of the participants and consisted of a loosely structured set of questions formulated to obtain as accurate a description of their sense of place as possible. Questions addressed a range of issues related to place attachment, including basic demographic data (how long have you lived here?) and questions related to place attachment (What were/are the most important places you frequent? When you were growing up, how often did you leave home? What were important attributes of the place that made it significant?). Where possible, storytelling was encouraged to elicit more candid responses and descriptions of participants' sense of

place. In addition, participants were encouraged to utilize photographs and mental maps as a means of illustrating their sense of place.

Due to the small sample size, research participants were invited to a workshop to ensure the validity of findings and collect additional information. In total, six participants representing all three generations contributed to the workshop: Participants 1-A, 2-D, 2-E, 3-G, 3-H and 3-I. By gathering participants together to discuss their personal views on sense of place, there was an added opportunity for participants to critically reflect on their sense of place, particularly when contrasted with different generations. Once data was collected, it was analyzed by doing a comparative analysis of the information gathered from the interviews and workshop.

Findings

It is important in the development of place identity and thus the formation of sense of place to understand basic and everyday life processes which lead to place attachment (Buttimer 1980). When asked to discuss their sense of place or attachment to Caliento, each participant would often tell stories that described the activities that happened at the place rather than list the reasons why they are attached to the locale. For example, Participant 1A recalled vividly the paths she walked to school and with whom they were traveled. On Sundays, it was a local tradition to meet at the bridge for the evening to play music and socialize. The "Corner", as it was commonly called, was the site of fond memories:



Figure 2: *Part of the "corner gang". The corner gang met on what is now part of the land owned by Participant 2-D. Source: Participant 1-A, c1943*

> We'd (the participant and her family) go every Sunday in the summer to the bridge. They called us the Corner gang (see Figures 2 and 3). We would all come around 5 o'clock, my mother would bring a basket of fresh melons for us to eat and then we'd go home for chores. After they were finished we all met up again. Michael would bring his fiddle, and we'd stay out dancing on that corner until 10 o'clock when it was time to go home (Interview 1-A).



Figure 3: *The "corner gang". Source: Participant 1-A, c1943*

In discussing this example, the participant drew a mental map of important features related to the story (see Figure 4); the "Corner", her childhood home, and her married home are the three focal points of this illustration. The mental map appears to the reader as a series of dots and lines, but as Participant 1-A related her stories the mental map came alive with people and places. It was as if the physically deteriorating or non-existent buildings became a series of profound places over time (Rowles 1980). Most of the small dots told the story of a member of the Corner gang with lines representing direction of travel to and from the Sunday gathering place. Others highlighted features included the home in which she grew up and the home that she built with her husband and two sons (see Figures 5 and 6). The places on the map she drew remained consistently within a two-mile boundary of place attachment.

The other participants also described activities that took place in and around the Caliento area. Whether it be cutting and gathering wood for the winter (Participant 2-F), taking care of the family farm (Participant 2-F), playing soccer at the school field (Participant 3-I) or attending social gatherings at friends' houses (Participants 3-G and 3-H), these daily events illustrated the importance of interacting within a given location. As significant as the places were on their own, it was "being able to do things with people; …having something to do on the farm that is more important sometimes than the farm itself" (Participant 2-F). Discussing each activity to the degree of detail that they did allowed each participant to have an active role in their descriptions of place.

Participants also illustrated the importance of familial ties to place attachment. As Participant 1-B noted, "It's something when you can say

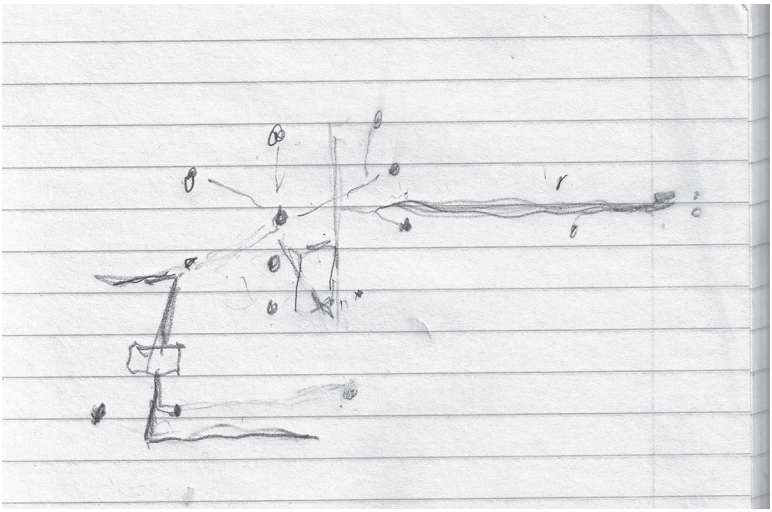


Figure 4: *Mental map drawn by Participant 1-A to depict important places in the past. The "X" near the center of the map represented the corner where the gang (Figure 3) met on Sunday afternoons. Each dot above the "X" represented each gang members' house. The house that she grew up in (figure 5) is located at the rectangle near bottom left corner. Directly to the bottom left of that is the house she lived in once she was married (figure 6). Source: Participant 1-A, 2007*



Figure 5: *Participant 1-A's first home. This was also the house that her father received patent for in 1921. Source: Participant 1-A, c1950*



Figure 6: *The first homeland Participant 1-A lived on when she was married. She is pictured here with both of her sons. Source: Participant 1-A, c1953*

the farm you have was started by your grandparents, worked on by you, and now is being operated by your children. It wouldn't be the same if we didn't have that". This relationship was highlighted by each generation. For example, Participant 2-D noted, "This is where my family is, where my home is". The land which this participant referenced is in fact just north of where his grandparents established their homestead in 1921. Participant 2-D and his brother presently own four quarter sections of land that have been in their family since their grandparents immigrated to the area from the Ukraine in the early 1900s. When asked why the area meant so much to her, Participant 2-E simply stated that "this is home – it just is. My family is here" (Participant 2-E). The history that participants shared with the land on which they lived and in some cases, depended on for their living, is one that appears to be of significant value.

Even though they may not live full time in the Caliento area, for third generational participants it is the familial ties they have that kept them coming back and that impacted their long-term attachments to place. Having family in the area "defines who you are. It's a part of your past that makes you who you are today. It'd be like losing a piece of yourself, not having that place to go to" (Participant 3-I; see Figures 7 and 8). "Our ancestors made such deep, deep roots there that I think it would be hard to tear that up" (Participant 3-G). It was clear that this generation, although physically removed from the area at present time, retains a sense of place that is strongly influenced by a shared family history in the landscape.



Figure 7: *This photo was provided by Participant 3-G and depicts the same land shown in Figure 5. It was the site of annual activities such as mushroom picking and harvesting wild edible plants. The frame of an old barn can still be seen in the present day landscape. Source: Participant 3-G, 2008*



Figure 8: *This photo is another of the land pictured in figure 5, and is still an important place for Participant 3-H. Source: Participant 3-H, 2008*

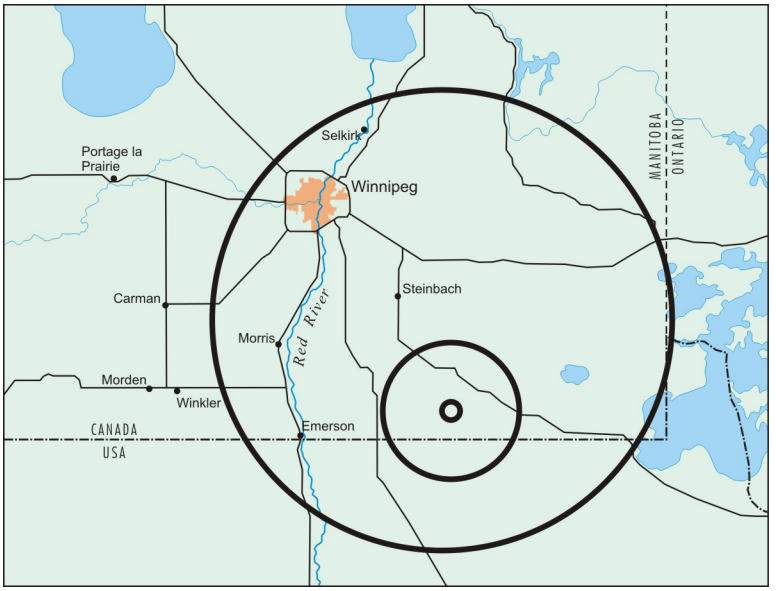


Figure 9: *Map showing the peripheral boundary changes of sense of place for members of the first (small circle), second (middle circle) and third (outermost circle). The inner-most circle also indicated the most intense location of place attachment for residents: the homeland.*

Beyond these familial connections, one of the most striking findings from the data was that the geographic dimension of sense of place expanded over time and across generations (see Figure 9). Participants in the first generation exhibited the strongest attachment to places within a two-mile radius of their home, while the second and third generations formed attachments to places beyond this central site. Participant 1-A lived approximately two miles south of Caliento and two-and-a-half miles east of Strand School where she received her education. The places she frequented were all within two-and-a-half miles from her home (see Figure 4 for reference). Walking to and from locales was a common phenomenon and often it would become a social activity in itself. "If we were lucky we got a ride, but walking was fun in a way. It meant seeing your friends" (Participant 1-C). Transportation seemed to be the main factor influencing sense of place for the first generation, as automobiles were not popular in the area until the 1940s, mostly because they were too expensive for homesteaders to afford (Participants 1-A and 1-B). This meant that people traveled by foot or horse-drawn wagons in order to get from place to place. The Caliento area did not have any major infrastructure except for

the railway until the mid-1950s when roads and hydro poles were built (Participants 1-B and 1-C). To get to Winnipeg, passengers had to connect with the mainline and then travel north to the city, a one-way trip that "could take all day" (Participants 1-B and 1-C).

With time, the extent of sense of place increased significantly. The second generation made use of spaces beyond the two-mile radius, in part because it was made easier by the introduction of cars. By the time he was growing up, participant 2-D was able to form a sense of place within a twenty-mile radius of home, which included social activities in Caliento and Sundown. When the third generation arrived, places were mostly experienced by vehicles. "We took the bus everyday to school, drove to work, to soccer games; we even drive on the farm to pick mushrooms sometimes" (Interview 3-G). "We are able to travel faster and farther than our grandparents and parents did; that has opened up a lot of space" (Interview 3-G). Third-generation residents were thus, in this area, able to experience a larger geographic area. For participants of the first generation, sense of place began within a small area of home. As seen in Figure 9, the outer circle represents the wider range of place attachment experienced by the third generation, and inevitably the place attachment experienced by the first generation over time. As new technology was brought into the area and travel became easier and faster, the spatial extent of their place attachment extended to include towns past Caliento and covered a much larger area. The sheer ability to conduct daily activities outside the homestead or local community meant people were able to make attachments to places outside of Caliento. The friction of distance was overcome through modern transportation methods and participants being able to access and experience more places (Ramsey *et al.* 2002), a phenomenon only experienced by the first generation over a long period of time. As Participant 1-C stated, "Before, it took almost a whole day to get to Winnipeg, that's why we only went maybe once a year. … Now we can go there and back three times in one day".

There were three towns in the Caliento area included within the 20-mile radius of places frequently visited: Vita, Sundown and Caliento (largest to smallest in size), each of which was characterized by unique geographic and historic progression (Sandalack 2002). Vita was a major town in southeastern Manitoba and had the region's only hospital. It featured five general stores, an auto dealer, blacksmith, four garages (for auto body repair), two barber shops, three restaurants, a school and pool hall (Participant 1-A and 2-D). Sundown had three garages, five general stores, a barbershop, two restaurants, a post office, a school and a pool hall (Participant 1-C and 2-D). Caliento was site of three general stores, a post office, pool hall, school and dance hall. These towns were service centers

that provided business for the surrounding area. Like most of the prairies, towns were about 8 miles apart and usually only connected to each other by the rail line. However, the rail line was out of service by 1960, and in 1979 the tracks were taken out of the ground (Participant 1-B and 2C). The first generation visited town about once a week for mail and supplies; by 1962 the second generation went at least twice a week, and the third generation visited town daily by the late 1980s. More interesting, however, is how each generation interpreted the meaning of "town".

For each first-generation participant, "town" meant Caliento or Sundown (depending on proximity of their homes) while each second-generation participant almost always referred to Vita as "town". And while the third generation most commonly referenced Vita as "town", its members also referenced both Steinbach or Winnipeg as "town", depending upon the context in which they were discussed (Participant 3-H and 3-I). Today, Vita is the only town with retail operations: a school, gas stations and hospital that serves three municipal regions in the area. It has become what all the small service centers used to be for homesteaders: "I go to town (Vita) once every one or two days for the mail, groceries or for other errands" (Participant 2-E). Sundown still has a post office, though most residents get their mail from Vita. There is no question that the introduction and popularization of the automobile contributed to the decay of small towns across the prairies, and the Caliento area is no exception. While members of the first and second generation could still recall a time when their sense of place included the town of Caliento as a functioning service center, technological changes dictated a shift in this mentality for the third generation. Caliento has since been transformed into a ghost town, a phenomenon which can be attributed to the advent of motorized transportation. While the railway had a profound influence on the settlement of the Prairie region (Paul 2000), the advent of the highway and motorized vehicles had a significant impact on both the cultural landscape and the economic functions of small towns and contributed to their demise. There simply was no longer any need for towns spaced every eight miles, as transportation made it possible to drive farther and faster for goods and necessities. The general stores in Caliento used to sell everything that people might require, and if the general store did not have what you wanted in stock, "all you did was place an order and the train would have it there in two days" (Participant 1-B). Once the highway was built and people could more easily get from homestead to town, goods and services began to collect in central towns such as Vita. For the first generation, going to town in Caliento was to purchase necessities only; everything else could be accomplished on the homestead. For the second generation, going to town in Vita was for a mixture of entertainment and necessity.

"We went to Vita about once a month and once a week to Caliento for the mail and some groceries. On Sundays we would hitch up the horses and go for a treat" (Participant 2-D). As the years passed, going to town would become less of a novelty and more apart of daily life. "Going to town is nothing now, we only know it as being more a daily thing than anything else" (Participant 3-H).

The school was one of the most referenced places among all the participants. In addition to the schools in the towns, there were three schools in rural areas to serve the children who lived farther away. For most of the older participants, school was only accessible by foot, and was located up to three miles away through thick bush and swamp (Participants 1-A, 1-B, 1-C and 2-D). For participant 1-A, the most memorable feature of growing up in Caliento was having to "[walk] to school in any kind of weather – through snow drifts that were 20 feet high" (Participant 1-A). Even if it meant traveling on the backs of older classmates, students went to school under all but the most extreme circumstances (Participant 1-B). Aside from learning, school was an important site of socialization as it was "the place where [people] saw their friends and played games" (Participant 2-D). It seemed that school was equally as important for social attachment as it was for education (Participant 2-D). As time progressed and school buses became more widely used, the only school to serve the area was in Vita. It was the third generation of participants who went to school in Vita, which in part added to their broader sense of place.

With respect to environmental usage, there was a noticeable shift from the first generation. Often because there was nothing else to do, people from the first generation would take time to explore their quarter section of land until every physical feature was locked into memory (Participants 1-A and 1-B). This knowledge of the landscape was passed down to their children and thus became part of their sense of place as well. The two-mile radius of sense of place decreased significantly in the winter months. As one member of the first generation, recalls, "snow made it hard to go anywhere, so we had to stay home most of the time-except to go to school" (Participant 1-C). The gathering of the Corner gang was therefore restricted to the summer when it was warm enough for people to be outside. During the winter, it was more practical to remain indoors or at least stay within the boundaries of their respective yards at home. Even participants from the second generation remembered the seasonal limitations. As Participant 2-D noted, "We didn't do much in the winter, not necessarily because we couldn't, but because we didn't want to". The third generation, on the other hand, did not experience nearly as much seasonally restricted travel. They had the benefit of always having access to modes of transportation that made travel easier in winter months.

Early settlers of the area built everything with their bare hands, from the small log dwellings for their families to churches and halls for serving the community. In fact, the St. John Ukrainian Catholic Church was built in 1910 on a foundation of stones that had been removed by hand from nearby fields in order to clear land for small crops and pastures (Kasian 1991). The father of Participant 1-A was the parishioner who delivered the first load of stones taken from his field. This sense of place, however, is in danger of being permanently lost or altered in the face of "inexorable homogenizing processes of globalization" (Sandalack 2002, 240) Perhaps it was because the first generation was able to make significant alterations to their own landscape that makes the landscape more meaningful for them. For the third generation, the inability to transform the landscape directly and lack of hands-on farming has equated to a degree of loss in terms of attachment for the natural environment. Nonetheless, Participants 3-G and 3-H insist on maintaining a natural connection to the land, even though the way in which they interact with the landscape is significantly different than the first generation. Participants largely use the environment as a setting for social activities; but their choice of activities, and the specific local are consciously linked to historic use (Tuan 1980). Going to pick mushrooms, for example, has become more an activity of recreation than survival. "I remember Baba and Dad showing us all the good spots to pick mushrooms and plums in the summer on the old farm. It's fun, and those are the places that I go to most often," (Participant 3-H, see also Figures 7 and 8). Land use by the first generational cohort often reflected choices necessary for survival, such as gathering or growing food. With subsequent generations, the same locations are used for similar activities, but these choices are made more for recreational purposes.

Each generation had many memories that take place on the land, and these constituted much of their respective "senses of place". As Participant 3-G commented, "The land has a history. To know that when we walk, we walk on fields that were turned by our great grandparents and that there are no rocks there because they removed them by hand—that means something. That means a lot". In fact, the land that Participant 2-D and his family live on is the same land that his mother's (Participant 1-A) two-mile radius encompassed and on which the Corner gang got together. The route that the Corner gang took to get to school runs through the field behind participant 2-D's current house. This familial land history directly influenced the sense of place of his children. When asked how time has influenced her sense of place, Participant 3-H replied, "I've spent my whole life here. I've listened to stories from my family and of older people and they have each added to my own story. The more time I spend here, the more I like it" (Participant 3-H).

Discussion

The findings of the research reflect a dynamic sense of place, both over time and across generations. Geographically, sense of place expanded over a wider area due to increased access to technology and infrastructure for all three generations (see Figure 9). Despite this marked expansion there remained an intense attachment to the homeland where most daily activities occur and where memories of the past are the most vivid. Sense of place, as experienced by each participant, was not eliminated from the expansion of transportation technology; rather, it remained centered on the homeland despite a geographic shift outward. There was also evidence in the findings of a shift in how each generation defines the meaning of 'town,' attributed to the ghost-town phenomenon found across the prairies. And finally, the research revealed pronounced differences in each generation's environmental use. Each of the aforementioned factors contributed to the changing nature of sense of place.

The importance of homeland was profound as it offers a permanent place of reassurance for people to return to, literally or in memory (Tuan 1977, Entrikin 1991). The strong sense of place associated with home evoked a similar reaction among all participants and not surprisingly was strongest for the first generation. Most of what people experience about home was not consciously processed; therefore at times the participants had difficulty finding the right words to describe their experiences and attachments to Caliento (Buttimer 1980). Nonetheless, through the telling of stories these experiences about home were revealed. From personal experience, Shuwera was aware of the intense place attachment and connection to the land belonging to the people she interviewed despite their occasional loss for words in responding to questions. It was clear through each interview that sense of place was most meaningful around Caliento, even though the place identity associated with the Caliento area became more influenced by exterior forces rather than being produced from cultural and traditional interactions characteristic of the first generation (Sandalack 2002).

As illustrated above, sense of place changed significantly with each generation. The expansion of place attachment occurred over time for each generation but was especially noticeable amongst the third generational cohort. Nonetheless, the direct vicinity of homeland remained the most intense site of place attachment for each generation. This intense form of sense of place is characteristic of people who form emotional attachments to a home locale because it is the focal point for their social world (Tuan 2004) and a profound center of meaning (Buttimer 1980; Godkin 1980). However, the scale of homeland expanded over time, in part due to

advances in technology and faster modes of transportation. Findings illustrated the meaning denoted by the term "town" shifted geographically from the once vibrant Caliento, to the larger service center Vita. Over time, technology led to a marked change in how "hand-made" and "human-made" landscapes influenced the sense of place of each generation. The third generation expressed different connections to the physical environment when compared to the first generation, expressions which were closely linked to the influence of technology in the area.

Conclusion

Place attachment is undoubtedly a subjective and individual phenomenon, but sense of place can be also be common to a group of people or generation sharing similar cultural experiences. The first generation of Canadian Ukrainians has seen their landscape shift over the past 80 years. This group witnessed friends and families relocate to larger urban centers and watched as time and technology swept over the region bringing forth a new generation of material features and landowners. As the first generation of immigrants pass away, descendents of the original homesteaders migrate to larger centers to attend school or find work. Still, there remains a small population of homesteader descendents that call the Caliento area home and maintain a strong sense of place for the immediate homeland. Even though the tangible reality of place changed significantly for each generation, perhaps it is the relatively unchanging qualities of the natural environment (Relph 1976), strong familial ties and cultural linkages that make the Caliento area most appealing and thus creates a site for an intense sense of place. This intense form of place attachment is transferred to members of the second and third generations, despite a marked geographic expansion. Even though the population of Ukrainian descendents is decreasing over time in the R.M. of Stuartburn (Reimer 2008), familial ties to the area act as "the bridge for people who want to come back" (Participant 3-G). Despite an expansion in the peripheral boundaries of place attachment, the focus remains centered on the homeland, the place each participant discussed with the most enthusiasm.

Though the sample size in this research was relatively small, multiple methods of data collection were used to ensure the trustworthiness of the findings. Triangulating results among participants and direct observation strengthened confidence in the results. Reviewing the interview findings with participants at a workshop further strengthened confidence in results. Thus what the study lacks in limited interview participants, it overcomes

through multiple methods. Together each generation shared a similar sense of place in that they began with a geographic radius of about two-miles, and then each expand outward over time toward Vita, Sundown, Steinbach or Winnipeg. The third generation's geographic sense of place was much larger than the first, encompassing original homestead property in addition to surrounding towns and cities where daily activities take place. Through it all, the children of original homesteaders in the Caliento area developed and maintained a strong sense of place in their homeland that has been impressed upon their children and grandchildren. Despite a vast difference in experiences, the third generation has managed to carry on a similarly felt sense of place to the very landscape their ancestors helped build. It is clear in the Caliento area that although geographically the area of sense of place increased, the strongest emotional ties remain centered on the homeland.

The research outlined above contributes to a growing body of literature surrounding sense of place and in particular explored how sense of place differs across generations, a concept not documented in recent publications. The concepts of sense of place outlined above have several practical implications and similar research methods can be incorporated into land-use planning. Allowing participants to explore their sense of place serves to identify community assets. These resident-identified locations can be incorporated into community based land-use and sustainability planning.

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Horizontal partnerships in image-building: local level collaboration for place promotion in the Swan Valley

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Abstract: Many rural regions that have traditionally relied upon agriculture as the main source of income are realizing the importance of diversification in order to improve the resilience of their local economies. However, exploration and development of such new avenues can be costly and difficult for a small town or rural municipality to carry out alone. To overcome these obstacles, the seven towns and rural municipalities that comprise the Swan Valley in Manitoba have pooled their resources and are working cooperatively, along with other stakeholders, to create a "brand" for the whole region in order to attract economic development, tourists and new residents. Spear-headed by a local economic development corporation, the image-building effort capitalizes on the relatively pristine nature of the area and the economic and lifestyle opportunities it affords. This paper provides a descriptive case study of the Swan Valley strategy and analyzes the experiences of the Swan Valley against existing image-building and collaboration literature in order to determine the degree to which the Valley's approach could be used as a model for other rural regions that need to strengthen themselves in the face of a changing and uncertain economy.

Introduction

For much of the 20th century, the Swan Valley region of Manitoba, Canada, had an economy based mainly on agriculture and forestry. In the late 1800s, farmers were attracted to the valley by its fertile soil, an immigration no doubt in part influenced by image-building efforts of the time, including promotional brochures and hand-outs about opportunities in the western Canada (Rees 1988). While these brochures often exaggerated the chances of prosperity, many who moved to the Swan

Valley did find success. The land continues to be bountiful in the 21st century; in 2006, the Swan Valley had the "second highest agricultural production for a region in the Province of Manitoba" (Swan Valley Enterprise Centre 2006, 7).

However, with the well-documented increases in farm size across the country, the decline of "family farms" and decreasing populations in many rural areas (Statistics Canada 2006a; Newman 2007) it became apparent to some politicians and residents in the last decades of the 20th century that it would be beneficial economically and demographically for the region to be seen as more than agricultural. Therefore, in 2005, the Swan Valley Enterprise Centre proposed to the municipal governments, to businesses, and to residents in general, that the region "re-brand" itself in order to build a new image that could help strengthen its economy. The resulting collaboration led to the articulation of a strategy to attract new residents, new and expanded businesses and tourists. However, the process was not without problems. In particular, friction already existed between stakeholders.

Nevertheless, the Swan Valley managed to create something that did not exist in the other two rural case studies that were part of the larger study of which the Swan Valley research is a part. In the case studies of Town of Winkler and the Rural Municipality of Stuartburn, leadership was either non-existent or distanced from the rest of the community.

This paper will first present an overview of existing image-building and collaboration literature. In particular, the literature review will focus on what other scholars have found to be factors for success for image-building and collaboration, as well as what the common problems are for these types of initiatives. Next, the case study of the Swan Valley will be described. Lastly, the experiences of the Swan Valley will be analyzed to determine what other places considering image-building strategies could learn from the Valley's example, and to what degree the Swan Valley could be used as a model for rural image-building.

Methodology

Choice of study site:

The Swan Valley was chosen as one of four study sites[1] for a larger study on image-building in Manitoba, Canada[2]. The Swan Valley was selected to represent a more northerly agricultural location relative to the

[1] Other locations in the study were the Rural Municipality of Stuartburn, the City of Winkler and the City of Winnipeg.

other study sites, which were closer to the Canada-US border. At the time of the location's selection, it was unbeknownst to the researchers that the region was in the midst of developing an image-building strategy.

Data collection:

The first step of this research project was to explore relevant concepts through a literature review. A semi-structured interview schedule was then developed by the team of researchers involved in the image-building aspect of the multi-university project; the same interview questions were used for studies in Saskatchewan and Prince Edward Island. These questions guided the interviews, but follow-up and probing questions were used when necessary.

The researcher generated a list of potential interviewees by researching Swan Valley image-building stakeholders on the internet. These potential interviewees were then contacted by phone, introduced to the research concept, and asked if they would agree to schedule an interview in the time period during which the researcher would be in the Swan Valley. Interviews were then carried out in-person[3] when the researcher visited the Swan Valley.

Literature Review

Image-building for economic development, tourism and resident attraction:

Image-building is a somewhat nebulous term, frequently interchanged with similar terms such as place branding, place promotion and destination marketing (Harvey 2009). There appears to be no agreed upon distinction between the terms, and many academics use them interchangeably; therefore, for the purposes of this paper, they will be considered synonymous terms.

Ward and Gold (1994, 2) define image-building as "the conscious use of publicity and marketing to communicate selective images of specific geographic localities or areas to a target audience". This definition focuses on the act of promoting a place. Lindsay (2000) offers a slightly different

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[2] This paper is part of a multi-university collaborative research initiative, sponsored by the Social Sciences and Humanities Research Council, that adopts this broader definition of image-building. Therefore, the results of the entire project will provide significant advances in knowledge of broad-based image-building and multi-stakeholder collaboration across Canada.

[3] One interview, McCrae (2006), was carried out by phone.

definition, with image-building being "the totality of thoughts, feelings, associations and expectations that come to mind when a prospect or consumer is exposed to an entity's name, logo, products, services, events, or any design or symbol representing them" (as cited in Van Ham: 129). This definition focuses on the reception of the promotion offering. Both definitions are relevant to the current case study because the act of brand creation and the intended effect of the promotion of the Swan Valley will both be discussed (although this research only recorded intended effect, not *actual* effect).

Many studies of image-building focus mainly on its tourism aspects (e.g., Frenkel, Walton and Anderson 2000; Ylanne-McEwen 2000; Walmsley 2003; Nelson 2005). However, image-building can also be conceived of more broadly. For instance, there is a growing literature linking image-building to local economic development (e.g., Gordon 2007). Such an all-encompassing view was taken by researchers in the Multi-Collaborative Research Initiative, "Multilevel Governance and Public Policy in Canadian Municipalities: Image Building," of which this study is one part. All of the scholars in this initiative adopted the same definition of image-building: that it is how a community, town, city, region or country attempts to sell itself "to investors, to tourists, [and] to the current and prospective residents, in a competitive market" (Harvey 2009, 7).

Image-building in rural areas:

While image-building is not a new concept, scholars have noted its increasing importance in recent decades as various economic and demographic circumstances have changed for rural communities around the world (Hankinson 2001; Murtagh 2001; Hannigan 2003; Walmsley 2003; Kavaratzis and Ashworth 2005). Since the 1970s, residents of rural areas have found that their traditional activities, most notably agriculture, are no longer always adequately supporting their economies. Across the developed world, the out-migration of residents, often to urban areas, has led to declining populations. The age of remaining residents in many rural areas are often above the national average (Walmsley 2003; Jenkins 2005; Markey, Halseth and Manson 2008). Changes in rural economies (e.g. the movement away from 'family farms') has also had negative effects (Hopkins 1998; Wilson et al. 2001; Walmsley 2003).

While image-building is often considered a "big city" endeavour, Hopkins (1998, 68) suggests that there has been a "reinterpretation of rural identity" through recent place promotion initiatives.There is a good variety of place promotion literature, but the balance of this literature focuses on the promotional efforts of urban areas (e.g., Holcomb 1994; Coles 2003; Green 2005; Vanalo 2008 "Helsinki"; Vanalo 2008 "Turin") and

entire countries (e.g., Dinnie 2008; Jansen 2008) rather than by small towns or rural regions (Kneafsey 2000; Walmsley 2003; Runyan 2006; Lehr 2007).

In some cases, rural places have marketed themselves as escapes from cities and the dangers, crime and busy lifestyles associated with them. Gardyn (2002) observes that rural areas have been particularly able to market themselves as "safe" post 9/11. Hopkins (1998, 78) also found that place promotion literature for rural southwestern Ontario emphasized safe and tranquil elements of rural areas to the point of "mythologizing" the countryside. Roberts and Hall (2004, 254), too, note the marketing of safety, as well as that of peacefulness, health "and even restorative experience". If a rural community can successfully "sell" these characteristics to consumers, it may be able to successfully reach out to both tourists who want holiday escapes and new residents who yearn for security from urban threats, perceived or real, and a quieter lifestyle.

Rural place promotion can also focus on other elements such as agri-tourism and food production (e.g., Glenn and Rounds 1997; Boyne, Hall and Williams 2003), ecotourism (e.g., Weaver *et al*. 1995), cultural heritage and history (e.g., of migration and settlements) or attractive geographic characteristics (Wilson *et al*. 2001). Nature-based tourism may be particularly popular in regions where land is not entirely converted to agricultural uses. Forests, native prairie, mountains and lakes all offer the potential for the marketing of outdoor activities such as bird-watching, hiking, picnicking, fishing, biking, fishing and hunting (Weaver, *et al*. 1995; Roberts and Hall 2004; Lehr and Zubrycki 2009).

However, some authors warn that place promotion may not be the appropriate solution for all struggling rural areas (Palermo 2000; Walmsley 2003). Roberts and Hall (2004) warn that marketing nature and rurality will not work for all areas that simply possess natural attributes and rural landscapes. Many more factors are necessary for a place promotion campaign to succeed in such a "niche" market, including the ability to attract of high numbers of people, the ability to charge a high premium and the existence of unusual or quality attractions to draw these high numbers and charge this high premium. If a rural area is remote, travel distance also becomes an issue. Walmsley (2003, 61) offers a similar analysis of rural tourism. He notes that "tourism is often seen as a panacea for the ills of declining rural communities", but that a location that is far from large populations could have difficulty in creating a successful image-building campaign, particularly if tourism is the campaign's main goal. He suggests that places that are distant from major centres may have to rely on unique attractions (e.g., geographic beauty or unusual festivals) to attract visitors, investment and new residents. Schultz (2004, 101) makes the same observation, writing: "If you're located in the middle of nowhere, without

a strong population base for hundreds of miles, you had better develop something that sets you apart from everyone else".

Wilson *et al*. (2001, 134) offer one of the most comprehensive guides to whether or not a rural region should consider turning to tourism to aid its economy. In their study of rural communities in Illinois, they were able to create a list of factors that could contribute to the chances that a tourism attempt would succeed. In the discussion section of this paper, the situation of the Swan Valley will be measured against these factors, which include:

1) A complete tourism package;
2) Good community leadership;
3) Support and participation of local government;
4) Sufficient funds for tourism development;
5) Strategic planning;
6) Coordination and cooperation between businesspersons and local leadership;
7) Coordination and cooperation between rural tourism entrepreneurs; and
8) Widespread community support for tourism.

Many of these factors for successful tourism development also extend logically to broader economic development.

Collaboration in image-building:

Traditionally, cities, towns and municipalities have most often taken a competitive view in terms of image-building, if they have undertaken image-building at all. However, numerous academics (Hankinson 2001; Finucan 2002; Nel and Binns 2002; Fyall and Garrod, 2005) observe that multi-stakeholder, regional collaboration has become increasingly common, both in metropolitan and rural areas. This observation holds true for both collaboration in terms of tourism and in terms of economic development; Olberding (2002) suggests that regional collaboration on economic matters in the United States increased fourfold from the 1970s to the 1990s.

However, academic study has not thoroughly tracked this development and scholars repeatedly note that many questions are still left unanswered or under-explored (Medeiros De Araugo and Bramwell 2002; Olberding 2002; Hankinson 2004; Fyall and Garrod 2005; Lehr 2007). In many cases, studies have dealt with either tourism (Medeiros de Araujo and Bramwell 2002; Boyne, Hall and Williams 2003; Fyall and Garrod 2005; Wang 2008), economic development (McGuire 2000; Olberding 2002; Hauswirth *et al*. 2003; Gordon 2007) or the attraction of new residents (Niedomysl 2004).

Fewer studies have undertaken the comprehensive approach to image-building tying all of these considerations together within the context of collaboration.

Various scholars have offered definitions of collaboration. Wood and Gray (1991, 146) suggest that "collaboration occurs when a group of autonomous stakeholders of a problem domain engage in an interactive process, using shared rules, norms, and structures, to act or decide on issues related to that domain". Huxham (1993, 603) proposes the concept of "collaborative advantage" to counter the more traditional notion of "competitive advantage"; he suggests that collaboration allows stakeholders to carry out initiatives they could not have undertaken on their own, and that objectives might be better-achieved than if undertaken unilaterally. The bulk of collaboration literature (e.g. Wood and Gray 1991; Selin and Chavez 1995; Huxham and Vangen 1996; Fyall, Leask and Garrod 1999; Young and Kaczmarek 1999; Gardyn 2002; Nel and Binns 2002; Hankinson 2004; Greasley *et al.* 2008; d'Angella and Go 2009; Naipaul, Wang and Okumus 2009) suggests that key characteristics of collaboration are:

- The need to address a problem shared by multiple stakeholders;
- Input and decision-making from all stakeholders;
- Interaction between stakeholders; and
- The maintenance of autonomy during collaboration.

These characteristics are discussed further in the following sections.

Why collaborate?

Academic tourism literature identifies various reasons why stakeholders in the image-building process might choose to collaborate. One of the most common reasons for partnership is to tackle a problem shared by all stakeholders (KPMG Management Consulting 1995; Fyall and Garrod 2005). Fyall and Garrod (2005, 146-147) relate collaboration for this purpose to "relational exchange theory," where "organizations operating within an increasingly complex problem domain are expected to develop inter-organizations relationships that will help them solve their problems by working together… collaboration is the result of organizations recognizing the interdependence of problems in their domain and the benefits of developing reciprocal relationships aimed at solving them". For instance, in the current case study (see below), the common problem shared by all stakeholders is the decline of agriculture, the loss of population and the need to diversify the economy.

Another common reason why collaboration occurs is to increase efficiency and reduce duplication through the sharing of resources and information, resulting in less duplication of efforts. An Industry Canada-sponsored report (KPMG Management Consulting 1995, 13) promoted this idea before much of the academic literature on collaboration was produced: "The sharing of common resources, a buildup of 'critical mass', and less duplication of effort can result in economies of scale. Partnering can allow you to share overhead costs, increase your buying power, expand your marketing reach, improve your performance, [and] improve your potential for financing…". Academic literature also emphasizes these benefits (Welford and Ytterhus 2002; Caffyn and Dahlstrom 2005; Fyall and Garrod 2005; Greasley *et al*. 2008; Naipaul, Wang and Okumus 2009).

Partnering can also open up access to funding. Numerous academics note that governmental money is often tied to collaboration as a precondition (Hall 1999; Roberts and Hall 2004; Fyall and Garrod 2005). For instance, the Federal government's Rural Secretariat (Government of Canada 2009) emphasizes partnership in a large number of its programs, including the Rural Partnership Development Program.

In addition, Lehr (2007) suggests that partnerships can strengthen the image of towns or cities in the eyes of potential investors, and industry seeking new locations. Just one example of how partnerships can appeal to investors is that a partnership allows the marketing of a *region's* population to potential investors, rather than just each community's population, thereby appearing to have a larger workforce than just the one community would on its own.

Problems with regional collaboration:

While there are many benefits to collaboration, rarely does a collaborative effort occur that does not encounter problems. For instance, the pursuit of public funds, discussed above, may lead to acrimonious partnerships. In their study of public-public partnerships (i.e., partnerships between governments), Greasley *et al*. (2008, 309) discovered animosity between some of the participants. One participant described the relationships as "a mutual loathing in pursuit of government funds". Existing animosity may also preclude the option of collaboration. One documented example of enmity between cities preventing collaboration is that of the neighbouring Manitoban towns of Winkler and Morden (Lehr 2007; Lehr and Zubrycki 2009). Competition between the two towns is so long-standing and fierce that it took twenty-seven years of bickering over the best location of a new hospital for the area before a provincial minister decided to place it mid-way between the two communities. Issues between the two communities revolve around differing values (Winkler has a

stronger Mennonite contingent) and work ethic (Morden focuses on "recreation and leisure" while Winkler emphasizes business) (Lehr 2007, 108). Due to these long-standing contentions, cooperation on an image-building strategy is improbable in the near future, even though the close proximity of the towns and the potential benefits make collaboration logical.

However, even when partnerships are formed without underlying resentment, disagreements commonly arise. Wang (2008) observed that conflict is a common issue, often centred around stakeholders emphasizing their own individual benefits before common benefits. Gardyn (2002, 41) writes that when nine counties in Indianapolis merged into one, consensus on image-building was nearly impossible to reach. Not only did all of the counties have differing ideas of what images should be portrayed, but also different private and nonprofit groups separate from government were promoting their own images for the area. The end result was a "too many cooks in the kitchen" scenario.

In addition, Greasley *et al.* (2008) note that one partner may be stronger in some ways (e.g., finances, size, influence) than others, possibly resulting in the stronger party dominating the process, and the smaller ones developing resentment. In Wang's (2008) case studies, resolution of conflict was usually reached through striking a balance between individual and common benefits. Greasley *et al.* (2008) recommend that conflicts be mitigated through frequent discussion and communication between all parties involved.

Lack of communication is a commonly cited problem within partnerships. Wood and Gray (1991), Greasley *et al.* (2008) and Huxham and Vangen (1996) all stress that communication is key to successful collaboration. Problems with communication can stem for many reasons, from a situation where one stakeholder prefers to dominate the process and does not communicate information to other stakeholders, to where some stakeholders are not enthusiastic or committed to the initiative (Greasley *et al.* 2008; Wang 2008). In some cases, some partners might receive communication from other stakeholders, but do not offer much in return, making the process essentially a one-way communication. Sometimes, a situation such as this arises when a stakeholder prefers to limit involvement to funding, and not man hours, expertise, ideas or information. A study for Industry Canada by KPMG Management Consulting (1995) suggests that to simply provide funds is merely "sponsorship," and that collaboration requires more engagement.

Also, when creating a regional image, the validity of the image is important (Greasley *et al.* 2008). Hankinson (2001) notes the importance of having the residents in the region identify with any "brand" that is developed to market the area. If the citizens do not feel that the brand

represents them, it may be difficult for the brand to get any traction. For example, Manitoba's 2006 image-building campaign, which branded the province with the words "Spirited Energy," was widely criticized for not ringing true with residents (Sinclair 2006; Gerbasi 2007; Hirst 2007; Smith 2007; Welch 2007; Lehr and Zubrycki 2009). Issues raised by the many detractors of the slogan included that it was confusing and vague (Peikoff 2008; Sawatzky 2008; Lambert 2007; Welch 2007; Armstrong 2006; Lazarenko 2006; Oleson 2006; Rollason 2006), that it was redundant – one citizen wrote that "[b]y definition, energy is always spirited. Have you ever heard of dull energy?" (Cecchini 2007), that it was "top-down" and did not consult enough with everyday Manitobans (and, therefore, rang less true) (Kives 2009) and that Manitoba's old slogan ("Friendly Manitoba") was preferable and rang more truthfully (Peikoff 2008; Sawatzky 2008; Rollason 2006). Even focus groups held prior to the brand's release were not impressed with the "Spirited Energy" idea (Welch 2007).

As will become evident below, many of the problems noted above were encountered during the development of a collaborative image-building strategy for the RM of Swan Valley. This descriptive case study that illustrates how these problems arose and were overcome can be of use to other rural areas also wishing to undertake collaborative image-building.

The Swan Valley

The town of Swan River is located 370 kilometres north-west of Winnipeg and approximately 410 kilometres from the nearest 24-hour border crossing (see Figure 1). The town does is not in close proximity to major populations; the closest city of notable size is Dauphin, approximately three hours from the town of Swan River by car. With a population of 3,859, Swan River serves as a hub for the surrounding villages and towns of Minitonas, Benito, Bowsman, Kenville and Durban (Statistics Canada 2006 "Swan River"). These towns, and the Rural Municipalities (RMs) of Swan River, Mountain and Minitonas, make up the entire Swan Valley, which has a population of roughly 11,350 people (2006). Geographical attractions in the region include the Porcupine Mountains in the north, the Duck Mountains in the south, as well as the rolling landscape in general. Therefore, the area has some potential to capitalize on geography quite different from that in the flatter southern Manitoba. In addition, a relatively high percentage of the Swan Valley's black bear population are prized "colour-phase bears," a genetic variation of black bears, which attracts a niche market of hunters (Collinge 2006; McCrae 2006; Benson 2009).

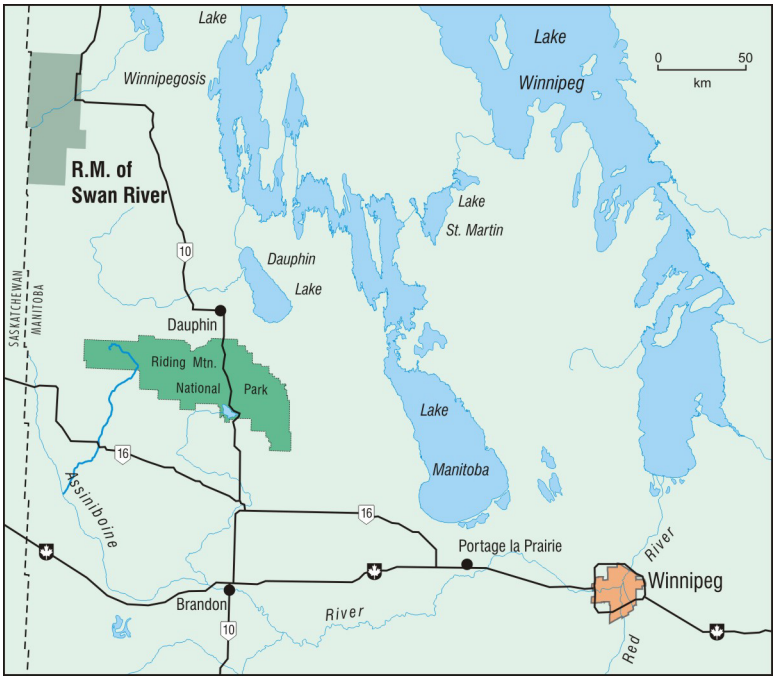


Figure 1: *Location of the Rural Municipality of Swan River.*

The region initially developed around the agricultural industry in the late 1800s. Current agricultural activities include cereal farming, oilseed farming, elk farming, and mixed farming of dairy, cattle and pigs. While agriculture has served the Swan Valley Region well in the past, changes in the agricultural industry, such as the development of large-scale farms, high farming input costs, and a decline in the viability of "family farms"[4] has required some farmers to look for new employment (Baldwin 2006; Swan Valley Enterprise Centre 2006). This change, in turn, is requiring Swan Valley to diversify its economy and turn to areas such as tourism and value-added processing such as biofuels (Swan Valley Enterprise Centre 2006).

The Valley also has several interrelated demographic problems. First, the existing population is aging. In the 2006 Statistics Canada census, the

[4] For example, Statistics Canada (2006 "Agriculture") reports that "the median total income for farm families on unincorporated farms in 2005 [in Canada] was $56,412, compared to $63,846 received by census families in the general population."

median age of a Manitoban resident was 38.1, but the median age in most of the Swan Valley area measured higher than that, the highest being in the Village of Benito at 50.7 years[5]. In part, this difference is caused by the loss of youth to "greener pastures." This trend is reflected nationally; Statistics Canada (2006 "Agriculture") reports that the median age of farmers in Canada, 51 years, is the highest of any occupation. The median age for the overall labour force is 41.2 years. As in other rural and somewhat remote areas, younger people are not carrying on the farm tradition as they once did and are being attracted to larger centres such as the Manitoban cities of Winnipeg, Dauphin or Brandon (Doleman 2006; Reich 2006; Statistics Canada 2006a). In addition, not only is the population ageing, but it is also decreasing. Depopulation is a common trend in rural areas, and every village, town and RM in the Swan Valley saw this change in the 2006 census, each losing between 1.6 and 11.4 per cent of the population measured in 2001[6] (Statistics Canada 2006b, 2006c, 2006d, 2006e, 2006f, 2006g, 2006h).

In 2005, the Swan Valley Enterprise Centre (SVEC), the regional economic development office, proposed that it facilitate a plan to confront these economic and demographic problems. With its offices in the town of Swan River, the SVEC receives about thirty-five per cent of its funds[7] from the villages of Bozeman and Benito, the towns of Swan River and Minitonas, and the RMs of Swan River, Mountain and Minitonas[8]. It carries out economic development activities throughout the region. As such, it was a logical organization to spearhead the development of what was first termed an "investment attraction project" and which later broadened into a "branding strategy" (Collinge 2006).

The logic behind the project was that it made sense for the towns and RMs to pool their resources and create a regional image-building strategy

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[5] Other median ages were: for the Town of Swan River, 45.1 years; for the RM of Swan River, 41.8 years, for the town of Minitonas, 43.2 years; for the Village of Bowsman, 38.7 years; and for the RM of Mountain, 45.3 years.

[6] Specifically, the Village of Bowsman saw a 1.6 per cent decrease (2006c), the RM of Minitonas 4.1 per cent, the town of Swan River 4.3 per cent, the RM of Swan River 4.8 per cent, the Village of Benito 10.8 per cent and the RM of Mountain 11.4 per cent (Statistics Canada 2006b, 2006c, 2006d, 2006e, 2006f, 2006g, 2006h)

[7] Other funding comes from the provincial and federal governments, as well a private funders.

[8] Over the years, several of these members have periodically joined and left SVEC, depending on whether or not they felt the Centre was meeting their current priorities, but all have been members at some point (Collinge 2006; Reich 2006).

rather than have each entity create its own. Rich Reich, Reeve of the RM of Swan River, strongly advocates the region working together as much as possible: "What we have to do is sell ourselves as one place. It's about image. To me, the perfect image is a strong, financially viable place…if we can save money and become more cost-effective, we become more viable, which gives us a good image" (2006).

Challenges to Building Partnerships

The beginning of the project entailed holding a public brainstorming session in the Fall of 2005 to solicit the views of residents and invite them to become participants throughout the process. Of the eighty people that attended the session, eight became members of the "Investment Attraction Committee," a SVEC-coordinated group in charge of the strategy. The SVEC also hired a marketing consultant to develop the official plan and conduct a "SWOT" analysis, a common marketing strategy that identifies strengths, weaknesses, opportunities and threats for the community in question (Kotler and Lee 2007).

It was at this point that a problem became evident: there was very little active interest from the local government in the plan. No councillors joined the investment attraction committee; instead, the people who joined were eight interested citizens, a representative from the chamber of commerce, a local tourism representative, a member from the provincial Member of the Legislative Assembly's office, and three of the SVEC's own employees (see Figure 2). Darlis Collinge, Economic Development Manager for the SVEC, felt disappointed by this lack of interest (2006). "You would think that the municipalities would be more involved in how they're represented, but they're not," she said. "I think image-building is a very valuable exercise for a community. I think all communities should do it so that they know where they fit and what their niche is."

However, the SVEC still tried to solicit input from the seven local town and rural municipality councils by sending them the marketing materials that were developed and asking them to fill out questionnaires about their impressions and ideas. Unfortunately, the responses were unenthusiastic. Only two of the seven councils returned the questionnaires and the feedback provided was very basic. For instance, the open-ended questions were rarely answered (Collinge 2006).

Reich (2006), who sits on one of the councils, did not see a problem with the feedback his council provided. "We got to pick the colours," he says of their contribution to the materials. In part, the problem may be that councillors like Rich Reich see local government's role as more distanced

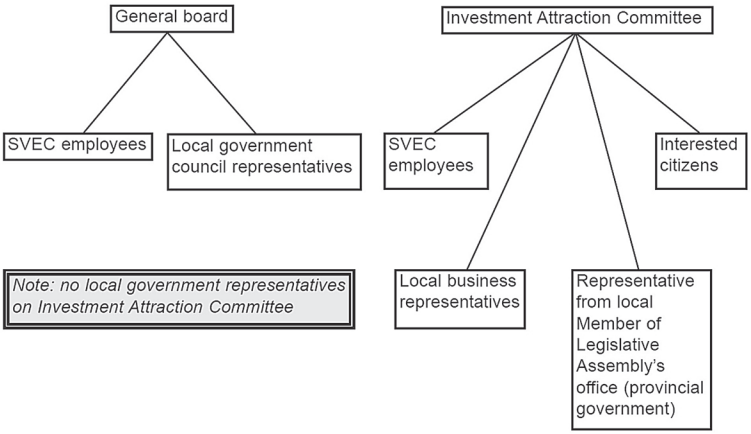


Figure 2: *Swan Valley Enterprise Centre (SVEC): Comparison of General Board and Investment Attraction Committee.*

from image-building than does the SVEC. In an interview, Reich emphasized that the municipal councils generally deal with more day-to-day concerns, such as roads, infrastructure and taxes. He pointed out the benefit to having non-elected people in the Investment Attraction Committee to "get the layperson's view."

However, Swan River town councillor, Ken Doleman, suggests that municipal government can contribute to both day-to-day concerns and "higher-level" issues such as image-building (2006). Unlike the majority of local government officials, he feels each of the town councils should be contributing ideas and energy to the image-building process, not just money. He suggests that it could be useful to have councillors involved in the branding process because it is crucial to have those who live in, work in and run the government of a "branded" community believe in their own brand. As head of the local credit union, and owner of a bed and breakfast, he believes an effective image, supported by the community, can help "sell" the region to visitors and investors.

While council support of image-building efforts has been passive, with most support being monetary, there does appear to be recognition that working together strengthens the region. Reich (2006) is even known for advocating the amalgamation of the seven separate villages, towns and RMs into one political entity. "I'm a firm believer that our valley is *one.* We do have seven municipalities and we try to have seven different identities, but we are one. We have to work together or we won't survive…We have 11,000 people and 42 elected officials that look after

them…Winnipeg has only 15 councillors [for approximately 633,000 people]." Reich feels there is too much duplication of efforts. The thinking behind this view is similar to that behind the image-building strategy: that by pooling resources, the region can more easily and efficiently overcome economic problems and pursue investments, tourism and new residents. In this case, less money could be spent on administration and, therefore, more on improving the region. "It's like having too big a mortgage and the interest eats up all your money instead of making payments," he explained. While there are many who still disagree with Reich's view, he says an increasing number of residents are becoming supportive. For instance, local Member of the Legislative Assembly, Rosann Wowchuk, has told him she finds it helpful to be able to go to government and say the region is able to cooperate on development. It may increase the Swan Valley's ability to access provincial-level funding and support.

Developing the Marketing Materials

Despite the drawback of having only partial and passive municipal government support, the SVEC worked with the community volunteers who wished to participate actively in the development of materials. It was not overly difficult to identify the appropriate image for the region. Collinge (2006) explains that the natural beauty of the region made the outdoors the obvious best choice for visual imagery in the campaign. "What we decided to focus on is blue skies, clear air and pristine lakes….We're presenting ourselves as a healthy, environmentally-conscious, clean way to be," she says. The natural beauty of the area is something that residents themselves value in the area and feel is an appropriate image to convey to outsiders (Doleman 2006; McCrae 2006; McKay 2006; Potten 2006; Walker 2006).

Therefore, the visual imagery created by the campaign and displayed on the brochures, web site <*www.swanvalleycanada.com*> and the trade show booth at the Rural Forum in Brandon in April 2006 reflect these environmental virtues. Images include non-threatening, puffy clouds, blue skies, lakes, golden fields and rolling landscapes. The *Investment Attraction Marketing Plan* (Swan Valley Enterprise Centre 2006) suggests that natural assets should be emphasized in order to attract immigrants from Europe, where ecology and clean air are "prized" (10). In addition, a family-oriented image is conveyed through the inclusion of a mother, father and child walking hand-in-hand in a field with a blue sky behind them, and a young girl on a swing. This family-oriented imagery is the embodiment of the *Marketing Plan's* stated objective to present "high quality rural lifestyles" (1). By presenting family themes in its imagery, mixed with outdoor settings,

the campaign is reaching out to potential new residents. The family theme is further built by the campaign's slogan: "A Community of Communities,"[9] which implies that the region is friendly and welcoming. In addition, the family-focused approach could have a positive effect on two of the strategy's other target markets, entrepreneurs and industry, as it suggests that the Swan Valley would be a pleasant place for employees to live.

While the "brands" of being nature-oriented and family-focused came easily to the developers of the campaign, other aspects were more difficult to agree upon. In particular, there were disagreements over what the campaign's logo should be. While some members felt a swan would be a logical symbol, others argued that it would focus the campaign too much on the town of Swan River, which already uses a swan as its logo and has the word "swan" in its very name. Collinge explains that the other political entities already felt some antipathy towards the town of Swan River, as there was the perception that it receives an imbalanced amount of resources and facilities (e.g., hospital, new businesses). Therefore, some members felt that to use a swan as a logo would make people living in the areas without the word "swan" in their name resentful (Benito, Bowsman, RM of Mountain, town of Minitonas, RM of Minitonas). In other words, there is some concern that the town of Swan River and the Rural Municipality of Swan River would benefit more. Therefore, in the end, it was decided that a swan would not be the logo. "We made a very conscious decision that nowhere at any time were we going to include a swan…because it would further alienate those other municipalities…We knew that from the outside looking in, a swan would make sense, but we also knew that if we didn't have people from the inside who supported it, it wouldn't matter what it looked like from the outside" (Collinge 2006).

Instead, the logo is a stylized "V" incorporated into the word "Valley" (see Figure 3). Further controversy arose when participants discussed whether the words "Swan River Valley" or "Swan Valley" should be used. This seemingly small difference caused "the most discussion" during meetings (Collinge 2006). Again, the conflict was based on resentment of the town of Swan River – some members argued that to use the words "Swan River" would focus attention too much on the town. Eventually, it was decided that "Swan Valley" would be used "because then it clearly encompasses the entire region" (Collinge 2006).

These decisions came at the price of losing one of the committee's members who felt that the group was squandering its time discussing

[9] The slogan has since been changed to "The Natural Choice" to complement the nature-based images of the campaign. A triple-meaning is also created, suggesting that the Swan Valley is a good place to visit, move to or to establish a business.



Figure 3: *The Swan Valley logo.*

minor details. Don McCrae (2006), a trapper from nearby Cowan and owner of Trapper Don's Lodge and Outfitting Services, resigned in frustration over the never-ending discussion. "I drove 80 miles and they spent 90% of the meeting discussing the logo," he says. "The logo doesn't sell trips." While McCrae finds it promising that the region is developing an image-building strategy (he realizes other regions are not so fortunate) he strongly disagrees with their methods. In particular, he felt that they lacked goals such as how many busloads of tourists they wanted to draw per year or how many new residents they wanted to attract. "If they wanted to attract immigrants, they needed to speak with people who have immigrated to Canada, find out why they came to Canada, and find out why they came to a certain spot instead of another spot," he explains. In his opinion, this type of market research is more important than the materials disseminated to the markets: "When you're selling soap, you've got to know the soap. If you're selling fish, you've got to know the fish. You have to know the market in order to sell to it." McCrae does have some expertise in the field of attracting people to the region; at the height of his company's success, it did up to $1.6 million in business per year, attracting the likes of former United States President Jimmy Carter and actor Rob Lowe to hunt in the area.

Despite the difficulties encountered during the creation of the strategy, by February of 2006 the SVEC representatives attended an immigration trade fair in the United Kingdom armed with a completed display, brochures and a newly minted plan. The fair attracted 15,000 people considering emigrating or building vacation homes abroad. The *Marketing Plan* (SVEC 2006) identifies Europeans as potential candidates to be new residents because some are "anti-urbanites," seeking non-crowded, rural areas. For example, even before the image-building strategy was launched, a German-

language magazine, *Kanadischer Stern*, published an article on the region that attracted one family with five children from Germany. The family now takes advantage of the region's open spaces and operates an apiary, or bee-keeping business. Collinge says several families at the trade fair also expressed interest in the combination of rurality and amenities in the region, with two couples planning visits to determine if the Swan Valley meets their needs.

Discussion

In light of existing image-building and collaboration literature, the Swan Valley initiative appears to be a fairly good candidate for using image-building to counter rural decline through a cooperative approach. The Valley is fortunate in that it possesses a more hilly landscape than most of southern Manitoba, therefore giving it the potential to attract nature-seeking tourists from nearby regions. One downside, however, is the Valley's distance from major population centres; the six-hour drive from Winnipeg may be a deterrent to Winnipeg residents. As numerous authors note, remote places may struggle with image-building tourism initiatives unless they can provide something truly unique (Schultz 2004; Walmsley 2003). For instance, the town of Churchill, Manitoba, attracts visitors from around the world, despite its remoteness, because it can offer an experience unequalled elsewhere – polar bears. The Swan Valley does not have an attraction quite so unusual. Were the Swan Valley's plan to focus on just tourism, the academic literature suggests it might not fair well. However, its broader approach, encompassing economic development and resident attraction, suggests more promise and resiliency. Given this three-pronged strategy, perhaps some unavoidable weaknesses in the tourism component of the strategy are acceptable.

In addition, despite its relative remoteness, the Swan Valley meets many of Wilson *et al*.'s (2001) factors that contribute to successful tourism initiatives. Most notably, strong leadership is provided by the SVEC. This organization can certainly be credited with determination. First, it received rather indifferent support from municipal government for its proposals. Then, members of its investment attraction committee argued incessantly over details of the plan. The Swan Valley initiative coped with these obstacles and managed to achieve more planning and coordination than in the other two rural case studies in the larger study of which the Swan Valley research was a part (see Lehr and Zubrycki 2009).

Also, a "complete tourism package" (i.e. various activities and appropriate tourism infrastructure) exists in the region, based most strongly

around nature-based tourism. In particular, before the development of the official image-building program outlined in this paper, the SVEC supported an initiative by the Mixedwood Forest Research and Advisory Committee (2002) to develop an eco-tourism guidebook. This guidebook, which also had numerous local partners, presented three driving routes through which readers could explore the natural and cultural heritage of the region. Guides such as this can help keep tourists in the area for longer durations of time and therefore contribute to some additional economic development.

Wilson *et al.*'s (2001) factor of strategic planning is also met by the Swan Valley through its *Investment Attraction Marketing Plan* (SVEC 2006). By identifying regional strength, weaknesses, opportunities, threats, and target markets, the Swan Valley is able to visualize its desired future and take steps to achieve that future.

Wilson *et al.* (2001) also mention cooperation as critical to a successful strategy. This study shows that cooperation was perhaps only moderately successful. Local government cooperation was limited mostly to economic contributions, a situation that collaboration literature suggests is "sponsorship," not partnership. Still, the funding was absolutely necessary for the Valley to even embark on such a project and, therefore, the local governments still contributed in an important way. Other community stakeholders such as the Chamber of Commerce and some businesses were willing to have more hands-on involvement in the creation of the region's image. The fusion of their involvement and financial support from local government resulted in the Swan Valley having a workable, albeit a bit imbalanced, situation.

Another positive observation can be made about the ability of the participants to solve problems that did arise, such as disagreements over details or feelings of resentment towards the Town of Swan River. The successful mitigation of these problems through discussion indicate dedication to the creation of the strategy and may bode well for the ability of the communities to collaborate.

However, the Swan Valley does not fully meet Wilson *et al.*'s requirement of community support. Collinge (2006) notes that more "internal marketing" has to be done within the Valley to encourage residents to present a more positive view of the region. The SVEC's *Marketing Plan* (2006, 4) notes local attitudes as a weakness, saying that the "local view of being 'remote' [could be] communicated to visitors" if when they travel around the area, they hear the locals disparaging the region. While community feedback on the marketing materials has been positive, and residents agree that an outdoorsy and family-oriented image is accurate, there is still a degree of negativity about the region. For example, some residents wish they could live closer to a major centre so that they could

have access to a wider range of amenities and entertainment facilities. The SVEC, however, hopes to counter these sentiments; while the SVEC cannot single-handedly add new amenities, it does hope to foster more pride within residents about their region. The hope is that this attempt will create a positive atmosphere for visitors. Therefore, part of the initiative will involve reminding residents of the attractions the Swan Valley *does* offer (even if it lacks some amenities that large centres have), attempting to engage residents in the initiative (e.g. through public meetings) and attempting to build a stronger sense of community and connectedness (for instance, the slogan is a reminder of community).

Another weakness for the Swan Valley may be indifference from some stakeholders, for example the businesses and tourism operators who do not wish to participate in collaboration. These businesses may be taking a "competitive" approach to development, rather than a "collaborative" one, as discussed in this paper's literature review. One way in which the SVEC is trying to increase community support of the strategy is by having manufacturers and businesses find ways to include the strategy's logo on their products or business materials to increase a feeling of cohesiveness. However, reception was lukewarm to this proposal with many businesses refusing to participate.

Conclusion and Recommendations

The Swan Valley may have avoided treating image-building as a panacea for rural decline due in part to its inclusion of economic development and immigrant attraction in its image-building strategy rather than just tourism. In particular, the initiative appears to have a strong focus on resident attraction, and while the degree of success or failure of this approach cannot yet be assessed early feedback at immigration fairs were positive (Collinge 2006). The attraction of new residents to slow or reverse the decline of the region's population is important in order to strengthen the local economies. Other regions seeking to build their own strategies should consider the image-building aspects considered in this paper – for economic development, resident attraction and tourism. Each region could tailor its own plan that includes these elements and takes into account the region's own particular strengths and weaknesses.

The Swan Valley example also demonstrated the importance of having an entity to champion the cause of image-building. Once the SVEC proposed the idea of a branding strategy, it became apparent that there was latent interest amongst other stakeholders. However, without an organization like the SVEC to initiate a project, a rural region may not awaken to the

possibilities image-building offers. Therefore, it is important to identify possible leaders in the community to organize and run such an operation. If no such champions are apparent, Lehr and Zubrycki (2009) suggest that higher levels of government could take the lead to encourage image-building and foster champions.

The value of collaboration was also demonstrated in this case study. Without the cooperation of the numerous stakeholders involved it would have been difficult for the SVEC to attempt to alter the Valley's image. Both the knowledge contributions of the committee members and the financial support of the seven local governments were critical to the development of the strategy.

However, this study also demonstrates that local government officials may not consider image-building to be a high priority. It does not appear that the lack of participation by government officials greatly handicapped the Swan Valley's branding attempt, but other rural regions hoping to undertake a similar initiative should be aware of such passivity. Academic literature suggests that, ideally, all stakeholders should be involved as participants, not just sponsors. Therefore, attempts should be made to convince government members that they should take some responsibility for their community's image and include image-building in their mandate.

Finally, other regions considering a collaborative project should know that conflicts will likely arise between participants. Differences in opinion are a natural part of the process. The Swan Valley study demonstrates that persistent, if sometimes tedious, discussion and debate between stakeholders can lead to a plan that most of the stakeholders support. Collaboration literature shows that without deliberation and compromise, collaborative initiatives are more likely to break down (Selman and Wragg 1999; Fyall, Leask and Garrod 2001; Hardy *et al.* 2003; Lester and Weeden 2004; Greasley *et al.* 2008; Naipaul, Wang and Okumus 2009).

While there were certainly kinks in the development of the Swan Valley strategy, the simple fact that many stakeholders throughout the large region were willing to support an image-building strategy may bode well for the future. As has been noted, in many places, community rivalries can make cooperation in image-building difficult; while this study found some degree of antagonism between the communities, particularly antipathy towards the town of Swan River, the stakeholders managed to work through these difficulties.

It is perhaps too soon to say if the Swan Valley image-building strategy has been successful. It is notoriously difficult to measure the success of place promotion, and it may be years before conclusions can be made. Indicators could be the development of new industries and businesses, attraction of new residents, increased tourism and the reversal or slowing

down of the depopulation and ageing trends. Regardless of the outcome, the Swan Valley branding experience provides insights into the process of collaborative planning. The Swan Valley strategy can perhaps be viewed as a rough model for other struggling rural areas wishing to improve their fortunes. Other regions considering regional collaboration can consider the methods used by the Swan Valley – some of which were productive, the problems encountered in the creation of the strategy and the ways in which disputes were resolved in order to develop image-building strategies that position them more visibly and competitively for the 21st century.

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The availability of locally-grown food in Regina

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Abstract: This study investigates the supply, distribution, and consumption of locally-grown food in Regina, Saskatchewan. Interviews were held with both producers and retailers of local food to examine the local food systems in Saskatchewan, and more specifically in Regina. In addition, the first author explored the question of local food accessibility to Regina consumers by attempting to eat locally for a month.

There are many barriers to sustaining the growth of a thriving local food market in southern Saskatchewan. Local producers are challenged by rising costs associated with producing locally, the inaccessibility of sizable food markets in which to sell their product, and a lack of consumer knowledge about the availability of local food products. As well, local retailers face the challenges of standardization in that they need local producers to standardize products in order to attract consumers. Finally, consumers are challenged by a lack of knowledge in local food as well as issues such as the seasonality and accessibility of local foods in the Regina area. All of these issues are underscored by a demanding regional climate and geography.

Introduction

As environmental concerns mount across the globe, Canadians are gradually becoming more aware of their impact on the world around them (Eberts 2004). Across Canada, households are increasingly implementing sustainability initiatives, such as recycling and composting, into their daily routines (Maclaren 2004). A relatively new sustainability initiative, popularized by books such as *The 100 Mile Diet* (Smith and MacKinnon 2007), is local food consumption: eating food grown and processed as close to home as possible.

Local food consumption is more of a *renewed* than a *new* concept. Throughout history, humans have consumed food primarily grown locally. People grew and ate whatever they could in the environment they inhabited,

sometimes trading food, seeds and new agricultural methods with neighbouring social groups. However, as improved transport and communication networks facilitated a more connected world, a new food market emerged. Following the Second World War, a 'global food system' developed where food distribution was controlled by large corporations connecting producers to consumers (Maggos 1987). Through the process of vertical integration (where all aspects of the production system, from seed to field to factory to store to plate are controlled by a single group of business enterprises), these corporations continue to own or control the majority of means of production of food, determining the price producers receive and the price consumers pay (Lapping 2004).

The global food system has provided Saskatchewan residents with a plethora of fresh food choices at any time of the year for relatively low cost, regardless of seasonality or production distance. Because of this, most Saskatchewan residents can enjoy a wide variety of nutrient-rich food year-round. Consumers are also spending an even lower percentage of their income on food than they have in the past. For example, in the 1930s North American consumers spent approximately 25% of their disposable income on food while today they spend less than 10% (Statistics Canada 2008, USDA 2008). Furthermore, the global food system allows consumers to purchase all of their food items at one location—the supermarket— eliminating the commute time and cost between small market places to purchase groceries.

In spite of a number of positive attributes, mostly economic in nature, the global food system is riddled with problems. For example, food labels rarely list the place of origin for every ingredient in a product. Further, consumers are often unaware of the pesticides and hormones used on the food they purchase and the social costs of its production. Consumers are accustomed to purchasing fresh produce out of is local season that has been grown, processed and shipped from half way around the world.

Within the global food market the economy receives primary consideration, leaving environmental and social issues by the wayside. For example, the practice of 'redundant trade', where a food product is imported into a region where that same product is locally grown, puts pressure on the local economy (Smith and MacKinnon 2007). In Saskatchewan, locally grown garbanzo beans are exported while cheaper canned garbanzo beans from the Middle East are imported. Not only could this force Canadian producers to sell their beans at below the cost of production, it is an environmentally inefficient process that needlessly expends energy to ship produce around the world.

Many producers in third world countries stop growing local food subsistence crops and instead plant export cash crops to be sold on an

unstable world market. These same third world countries then become dependent on imported food to feed their population, thus weakening their economic and food security. Further, farm workers in some third world countries are forced to work under lower labour, health and environmental standards than in Canada (Eberts 2004). However, these complex social and environmental problems are often deemed unimportant in the light of the economic viability of such an exchange.

Following the transition from local to global food systems, North American farmers markets—the once popular method for connecting producers with consumers—gradually lost their importance as grocery stores took over as the main source for food buying (Maggos 1987). Some producers and consumers felt isolated in a food market that no longer heard their concerns or addressed their needs. Local producers faced smaller returns caused by the absence of buyer competition paired with increased competition from foreign producers operating under lower overhead costs (Maggos 1987).

By the mid-1970s some concerned consumers wanted access to healthy and traceable food while supporting local producers and the local economy and farmers markets once again began to garner interest (Hinrichs 2000, Norberg-Hodge *et al.* 2002). These markets have now become a mainstay in most Canadian cities as a place to sell produce and specialty items made in the local area, if only on a small scale relative to more popular chain supermarkets.

Today the local food movement has expanded beyond farmers markets. As concerns around food security and food traceability mount, there are a number of places consumers access local foods. In many urban centres specialty food shops carry local food. And, in response to mounting pressure from the public, some chain grocery stores have expanded to include locally grown and processed food.

Local food is lauded by many environmentally-conscious consumers as a positive and sustainable alternative to the global food system. Whereas producers are typically underpaid on the global food market, farmers often receive a higher return by selling locally to small-scale grocers or directly to the consumer. In local food systems, economic, social and environmental considerations are all taken into account and often producers focus on sustainability initiatives, such as incorporating organic production methods, to attract customers and market their goods.

The local food movement in Saskatchewan is in its infancy and there is not one umbrella organization that has assumed the role of sponsoring the production, marketing and consumption of locally grown produce. Some organizations that do promote local food are the various Saskatchewan farmers' markets that spring up in larger communities during

the summer months, The Saskatchewan Regional Centre of Expertise on Education for Sustainable Development (an United Nations sponsored NGO that seeks to transform education for sustainability in our region), Saskatchewan Organic Directorate (a producer sponsored organization that is an information source for organic production practices), and Farmer Direct Regina (a co-operative of 70 organic family farms on the Canadian Prairies that grow cereals, pulses and oilseeds, and raise organic beef and bison).

Community supported agriculture schemes (CSAs) directly connect farmers to consumers. Based on an agreed contract, the farmer provides and delivers a set amount of vegetables, fruits, eggs, and meat products per month to the consumer. Consumers have the option of visiting and working on the farm whenever they desire. This system ensures fresh local produce for the consumer and a steady income for the farmer year round. Currently, there is one CSA in operation in the Regina area.

In the Saskatoon region, a diverse collective of groups and individuals that included producers, processors, community food action organizations, and local government have developed the Saskatoon Food Charter to ensure food security for all residents by researching and advocating for policy that will support access to an equitable, healthy and sustainable local food system. Since it was drafted in 2002, this Food Charter has played a central role in developing the local food market, not only in Saskatoon but in other prairie markets as well.

Though local food is increasing in popularity, it is by no means an effective alternative to the global food system. Instead, local food is a niche or speciality market that functions within the global food system. Local food systems are restricted by a number of factors, including high pricing and a lack of consumer education, that limit their growth.

This study investigates the supply, distribution, and consumption of locally-grown food in Regina, Saskatchewan. Information on food supply and distribution was obtained through interviews conducted with both local producers and retailers. The consumer perspective is represented by the description of a personal experiment to eat a local diet for one month (see below).

Objectives

The challenges of establishing a local food market in Regina are significant, in part because of the geography and climate of the region. Saskatchewan is located near the centre of the North American continent and experiences large temperature fluctuations from season to season

because of its distance from the ocean. The province is located on a high plain in the rain shadow of the Rocky Mountains and is subject to variable but limited amounts of precipitation. In the southern parts of the province dry grasslands are dominant, although there are pockets of more moist land that can support shorter trees and bushes (Cote 2005). Both the climate and the soils of the southern regions favour the growth of wheat and oilseed crops such as flax and canola (Carlyle 2005). The climate and soils do not favour fruit and vegetable production, however, so market gardens and orchard farms are restricted to a select few moist green belts within valley areas, such as in the Qu'Appelle River valley near Lumsden.

In this article we move beyond the geographic and climatic restrictions to explore additional barriers limiting the accessibility of local food to the urban consumer in the city of Regina, Saskatchewan. These limitations are examined from three perspectives: the difficulties faced by the growers and producers of local foods; differences in the modes of retailing locally produced foods; and a first-hand account of attempting to eat a local diet. Thus, our objectives were to:

1. Gain an understanding of the challenges producers encounter in growing and marketing their produce at a local level;
2. Evaluate the importance that retailers place on making local food available to the consumer; and
3. Explore a consumer's perspective of the local food system.

Research Methods

'Local' has no clear or regulated definition: it is entirely determined within the context of its use. In Canada, local food is typically defined by one or more of the following geographical criteria (Chinnakonda and Telford 2007: 5): proximity (e.g., less than 100 km); travelling time (e.g., one hour); political jurisdiction (e.g., municipal or provincial boundaries); and bio-region (e.g., in the Lumsden Valley). However, the definition of local food often goes beyond geography. For many international non-governmental organizations (NGOs) local food also implicitly considers the social, economic and environmental attributes of the food (Chinnakonda and Telford 2007). For example, the UK-based NGO Friends of the Earth suggests that:

> [L]ocal food should be produced and processed as locally as possible using a diversity of sustainable agricultural practices and marketed through direct or short supply chains to local

> people, ensuring a fair price for producers at an affordable price (Chinnakonda and Telford, 2007 p5).

In this research we defined local food as food produced (grown, harvested, processed, or preserved) within the political boundaries of Saskatchewan. This definition permits access to food grown throughout the many bio-regions of Saskatchewan and provides a glimpse into producer experiences from across the province. However, because the study took place in Regina, the majority of the local food encountered came from the Lumsden Valley, the origin of most of the local produce marketed in Regina (see Figure 1).

Producer selection:

In order to gain an understanding of the challenges Saskatchewan producers encounter in growing and selling their produce close to home, a set of local food marketing questions was developed and delivered to food producers around the province. Since there is no single food producers' association in Saskatchewan, a list of producer participants was collated through web searches, magazines, food labels in stores, and links from local food web pages. This list was refined to include only Saskatchewan-based producers who grow for the local (Saskatchewan) market, provided that market can support their business. Participants were selected from around the province, with approximately half from the Regina

Table 1: *Producer interview questions?*

1. What percent of your product is Saskatchewan made?
2. Where in Saskatchewan is your product made?
3. How many full and part time jobs come out of your production system?
4. Where do you market your food to (i.e. Saskatchewan, Canada, the World)?
5. How do you sell your food locally (i.e. through farmers markets, private stores, from home)?
6. What percent of your product is sold in Saskatchewan?
7. Is it difficult to sell to the local (Saskatchewan) market? Why?
8. What are the barriers you face in increasing your production?

area in order to reflect the general makeup of local food availability in Regina (Table 1). Both a fruit producer and a livestock producer who market locally were also selected. In addition, three value-adding local producers—a hempseed oil company, a quinoa products company and a sprouting seed company—were selected to participate.

Retailer selection:

Regina, like any large urban centre, is home to a number of different food retailers. These retailers provide food to urban consumers—many of whom do not produce any foods for themselves. To evaluate the availability of local food being sold in Regina three food retailers representative of three distinct food markets in the city were visited: a supermarket; a local health food store that focuses on local, organic and fair trade food; and a farmers market. Although the supermarket belongs to a major grocery store chain, its size is small relative to the typical store size operated by this chain, giving it a more local consumer appeal. Nonetheless, it was the largest retailer studied. These three locations were chosen because they are all small-scale and represent three different kinds of food markets.

The retailer locations are within close proximity of each other and compete to cater to the same local population. They are all situated in Regina's Cathedral district, considered by many to be Regina's most bohemian neighbourhood. We acknowledge that our list of retailers is by no means comprehensive, but we sought to provide general insight into local food for sale in Regina in the neighbourhood where it is in highest demand.

In order to evaluate the availability of local food for the consumer, an inventory of local products was taken at each location. In cooperation with the producers at the farmers market, the following items were noted: the total number of (food) products for sale; the number of products produced or processed in Saskatchewan; the number of products made with all Saskatchewan ingredients; and the number of products with no ingredients from Saskatchewan or where the origin of the ingredients is unknown.

At the other two retailer locations, however, a comprehensive inventory of local products could not be carried out because the management of both stores could not give an accurate count. Consequently, the management of these stores was interviewed following a set of questions developed to better understand their role in local food markets.

Consumer perspective – a local diet experience:

It is one thing to research and discuss local food, but it is an entirely different experience to try to eat locally for any amount of time. Most consumers who are successful at eating a diet of locally grown and produced food are often well-prepared environmentalists who spend a considerable amount of time growing, purchasing, processing and storing produce or live in a locality where local food is freshly available year-round. However, these individuals are not typical of the more general population who are unable or unwilling to devote the same level of effort to eating locally, even though they may still wish to participate in the local food economy to some degree. In order to obtain a more realistic appreciation of the consumer's perspective, a local food diet was attempted by the primary author of this article. The goal of the diet was to eat as locally as possible with the limited food that was available while still following a healthy diet as defined by the Canada Food Guide (see Table 2).

Table 2: *Interviewed producer types and locations.*

Producer Type	Location
Market Garden	Lumsden
Market Garden	Craven
Market Garden	Lumsden
Fruit Orchard (focus on cherries)	Lumsden
Sprouting Seed Processing Plant	Shellbrook
Livestock farm and Butchering	Osler
Quinoa processor	Kamsack
Hemp Seed Oil Processor	Regina

The dieting experiments were conducted in the off-season months of November and December and no food was procured nor stored ahead of time. Daily notes were made on the food type, the food's classification in the Canada Food Guide, where the food was produced, where the food was purchased, the distance from farm to store, and the distance from the store to kitchen. The local diet lasted 28 days.

To provide a reference framework for the local diet, it was followed by another 28 days where a 'regular' diet was consumed. Again, a log was kept to describe the food's ingredients and their origins, as well as its classification in the Canada Food Guide.

Although this section of the study was a personal experience that cannot be repeated quantitatively it provides important context to understanding the local food economy in a prairie city.

Results

Producer practices:

The selected producers were asked a series of questions to identify the challenges they face when producing for a local food market in Saskatchewan. The questions were based on other studies from different locations in Canada and around the world, such as local food in the Niagara region (Feagan et al. 2004) or local food in Northern Ireland (Chinnakonda and Telford 2007). Their responses to the interview questions are summarized below.

1. What percent of your product is Saskatchewan made?

The majority of the producers interviewed sell products exclusively grown or made in Saskatchewan. The market gardeners and cherry producer grow most of the produce they sell (some market gardens also sell fruit from British Columbia). Some producers make value added products, such as jams, that contain non-local ingredients, but are processed within the province. For example, the sprouting seed company uses only 50% Saskatchewan grown crops and the rest of the seeds comes from out of province. The hemp seed oil company exclusively uses Saskatchewan grown crops.

2. Where in Saskatchewan is your product made?

The market garden and orchard producers all grow their own crops within the Lumsden Valley green belt. Other producers and processors (those that value add, such as meat processing and sprouting seed packaging) use product from a number of different producers around the province. For example, the meat producer butchers meat from farms within a 20 km radius of his farm in the Osler area. The sprouting seed company uses seeds from all over Saskatchewan but especially in the south and south east of the province. The quinoa processing facility buys quinoa within the Kamsack area from approximately ten farmers a year.

3. How many full and part time jobs come out of your production system?

For the most part, producers earn enough money to employ themselves full time and depend on seasonal and part-time labour during peak times, such as seeding and harvest. The market gardens operate in this way—during the winter months, they have no employees, but from spring to harvest (about May 1st to November 1st) they employ a fluctuating number of seasonal workers, the numbers ranging from one to thirty extra employees. This number is dependent on the time of year as well as on the weather and the size of the crops they are seeding or harvesting that day. The work and hours are very informal and are generally determined by the specific job that needs to be done that day such as weeding a pumpkin patch or harvesting cucumbers.

The same situation applies to livestock harvesting—up to thirty seasonal staff will be employed at butchering time, and even then the larger animal butchering will be deferred to another better-equipped plant. This work is not steady but it does contribute to the informal sector of the rural economy.

Other producers, notably those that value-add, keep a small full time permanent staff because the work flow remains steady throughout the year. Furthermore, because many producers link together, either to provide each other with services such as butchering livestock or milling grain or providing each other with products such as meat, seeds or fruits, they form horizontal linkages that strengthen the stability of the local economy and increase the prosperity not only of the producers but also the entire region.

4. Where do you market your food to (i.e. Saskatchewan, Canada, the World)?

Once again the response to this question varies by the type of producer. For some, notably the value added 'health food' producers (e.g., hemp seed oil and sprouting seeds) it is difficult to market locally because they do not have a large enough 'health conscious' consumer base in the province. Instead these producers market to larger Canadian centres such as Vancouver and Toronto as well as internationally to the United States and Europe.

The livestock producer, on the other hand, is required by law to sell his products within Saskatchewan because slaughter plants are provincially inspected. The market gardeners sell their product locally (both to Lumsden and Regina area consumers) because they have a good sized local market.

5. How do you sell your food locally (i.e. through farmers markets, private stores, from home)?

Producers that sell locally use a number of venues to market and sell their product. Primarily, they use the direct marketing technique of selling at farmers markets and in their own on-farm stores. Some producers manage to sell wholesale to local grocery stores, and increasingly producers use Internet websites to advertise and sell their products within and beyond Saskatchewan borders. This is especially true of those producers whose markets lie outside of Saskatchewan. Both the hemp seed oil company and the sprouting seeds company use the Internet to advertise and sell their products to clients and retailers around the world.

6. What percent of your product is sold in Saskatchewan?

The market garden producers and livestock producer sell all of their products locally because staple products such as vegetables and meat are in high local demand. The cherry producer sells the majority of his products within Saskatchewan, although he has started marketing out of province, particularly to Alberta. The value added processors— hemp seed oil, sprouting seeds, and quinoa products—sell the majority of their products within Canada (although mostly outside of Saskatchewan), with some exporting to the United States and overseas. Approximately 1-5% of their product sales are within Saskatchewan.

7. Is it difficult to sell to the local market? And if so, why?

Market garden crops and many meat and organic crops are primarily sold on a local market. For some producers, the market and consumer base in Saskatchewan is far too small to sell locally. The population is too small to support a niche market.

Another challenge is marketing. It is not logical for those who produce for the national or international market to spend a lot of money on advertising in Saskatchewan when they could spend the same amount of money advertising to a much larger audience in Ontario. Marketing and advertising are also challenging for producers with a local consumer base. One local producer has to rely on a number of venues to get his message out: word of mouth, websites, radio advertising, newsletters, and even press releases.

It is also very difficult for market gardeners to sell their produce wholesale. One interviewee claimed it was “near impossible”, while another stated that he could only sell his pumpkins (a specialty crop) to a wholesaler, and that the wholesaler would only sell these within the province. The majority of the food produced in the Lumsden Valley costs more than what wholesalers are willing to pay for it, especially when wholesalers can access the same product for less on the global food market.

8. What are the barriers you face in increasing your production?

Cost is one of the main barriers most of the producers interviewed face. Processors face large upfront costs such as buying, processing and marketing a raw product. Two producers explained that they often do not see returns for their investment for over half a year, which forces them to manage their finances very carefully in order to make ends meet during that time period.

Hitting a critical mass is another huge challenge and barrier. A producer needs to sell enough products to cover all the start up and maintenance costs of an operation and then sell even more on top of this to make a decent and desirable profit. Achieving a sustainable critical mass of sales is challenging for a number of the producers interviewed.

Although the cherry producer makes a high number of sales and is very successful, the overhead costs of purchasing extra supplies in order to make more specialty products prevents them from reaching a desirable profit. Furthermore, the overhead of installing infrastructure, such as mechanizing a production line, can be crippling, even though the upgrades are necessary to increase production efficiency and enable the producer to compete within the market.

Escalating production and labour costs also limit expansion. Most of the Lumsden Valley Market gardeners face labour shortages and rising fuel, water, and seed prices. They cannot compete with grocery store production costs and are unable to cater to those consumers who seek the lowest cost product.

Because some processors and producers rely on other producers for their product (such as quinoa), they are limited by the quality of product they are supplied, as well as product availability. Therefore, if it is a bad year for crops the processor may not have access to the volume of product they need to run a successful business.

Retailer Experiences:

Although three retailer types were studied, only two of these fit into normal retailer format. Both the health food store and the chain supermarket are shopping centres that purchase food from wholesalers and producers and sell these food items to the consumer. Interviews took place at both of these retail centres to learn more about local food retailing in the city.

1. What local products do you sell?

The health food store begins to receive fresh produce in mid- to late June and supplies last into late harvest. The store also stocks a comprehensive list of local food items year round, including eggs, wild rice, flour, beans, lentils, oats, goat's milk, meat, fish, frozen berries, garlic,

and pasta. They also have root vegetables, provided these are not sold out.

The chain grocery store sells locally produced dairy products, although it is not labeled as such because all Dairyland milk is processed in Saskatoon (Ehman 2007). A number of other staple items, such as eggs, are from the other Prairie Provinces. The supermarket sells only limited quantities of local fresh produce in the summertime.

2. What percent of the products you sell is Saskatchewan made?

The health food store focuses primarily on organic foods but also sells local foods. As a result, they provide quite a few local food products such as Saskatchewan eggs. Approximately one third of their frozen meats are local and about two thirds of their bulk grains, pulses and legumes are of local origin. They also sell about 2% local fruit and 20% local vegetables when they are in season.

The chain grocery store, on the other hand, does not have a clear inventory of their Saskatchewan products, but they estimate approximately 2% of all products are locally made.

3. Do you consciously attempt to provide Saskatchewan products?

This is the health food store's second priority (after organic food). However, the proprietor of this store has been on the forefront of the local food movement in the Regina area for the past ten years. He also runs a farm that grows organic market produce.

The chain grocery store sees lowest price quality produce as its first priority. Location does not factor into purchasing considerations, although if food, especially produce, is locally grown then it will be advertised as such in store.

4. What percent of in-store sales do Saskatchewan products represent?

Saskatchewan products represent approximately 28% of total sales at the health food store. Interestingly, the total percent of inventory from Saskatchewan is considerably less. The reason the sales volume is so large is because many of the Saskatchewan products they sell are staple products. Items such as meat, eggs, flour, and beans move very quickly because they are items that most people buy regularly.

The staff at the chain grocery store did not know what percentage of in-store sales Saskatchewan products represent. They had no way of determining this.

5. What are the difficulties in acquiring Saskatchewan-made products?

The health food store acquires all its Saskatchewan made products directly from local producers and processors. This means the store does direct transactions with Saskatchewan producers. As a result, the local producer receives a higher percentage of the consumer's food dollar (for example 69 cents versus 10 cents from chain grocery stores). Also, being part of a short food supply chain ensures that both the retailer and the consumer have easier access to the producer to ask questions about production methods and comment on the quality of the produce.

Working directly with producers also means dealing with issues such as consistent product availability and quality. Quality levels vary between crop years, or between producers. The Canadian Organic Livestock Association (COLA) provides the health food store with its meat products. COLA has approximately 42 livestock suppliers all operating in different ways, with some producers provide high quality tender meat while others providing tough meat. The store does not have a choice between these producers and has to accept whatever COLA sends it.

Presentation can also be an issue. Because producers are accustomed to harvesting and selling their product at a farmers market on the same day they do not feel the need to provide a product that appears fresh for much more than a day. For example, when harvesting chard, most farmers cut the chard off and leave it on the ground while they finish the row, then pile it up at the end of the row to be collected later on in the day. The resulting chard is limp and unattractive to the consumer. However, retail-marketed food needs to look fresh for about a week, so producers must change the way they harvest their product in order to better satisfy retail consumers. Getting producers to change entrenched harvesting practices can take a long time.

Because the grocery store is a chain retail operation all of the food purchased and sold in-store is provided to the store by a warehouse located in Calgary. This warehouse does all of the food ordering, working with a wholesaler so local store management cannot decide whether or not to buy and sell local food products. The distance between producer and consumer is much further, increasing the difficulty of any type of interaction between the two groups.

6. Do you receive consumer requests for local food?

The health food store has noted an increase in local food requests over the past year, although the owner has been pushing local food for the past ten years. The only requests for local food the chain grocery store receives is specifically for locally produced organic food.

Farmers market:

The third retailer type, the farmers market, is a different retail situation because it is a venue for producers to come and sell their products directly to the consumer. Every week the combination of producers is different and there are usually different products available. An inventory was made to identify how many Saskatchewan grown and produced items, Saskatchewan produced (but not grown) items, and non-local items were for sale. The inventory is representative of one market day in November.

There were approximately 180 food products for sale at the farmers market that day. Although all of the 180 products were produced (processed) in Saskatchewan, only 30 products contained some ingredients made in Saskatchewan, and only 13 items (all produce) were grown in the province. Approximately 137 of the 180 products at the farmers market were made with ingredients that originated from out of province or out of country, or whose origins were unknown.

Local diet experience:

When the local diet started in early November, the only fresh local produce available were root vegetables, such as squashes and cabbages, and eggs. The selection of dried local produce was limited to a few varieties of legumes and beans as well as flour. It was a constant challenge to find dairy products. Occasionally, the health food store would carry some local goat's milk, but often the supply was unreliable. Locally made cheese, butter, milk or yogourt could not be found.

An analysis of the origins of the foods consumed during the local diet showed that most came from within 50 km of Regina (see Figure 1). The fresh vegetables were from Lumsden and the pulse and grain crops were from the Qu'Appelle area (see Table 3).

After completing the first month on a local diet, the eating during second month consisted of a non-local, regular healthy diet (see Table 4). Although it was difficult to determine the exact origin of many of the foods consumed, we estimate that most products must have travelled over 2,000 km to reach the consumer.

Discussion

In this study, the local food economy in Saskatchewan is examined from three perspectives: the producers', the retailers', and the consumers'.

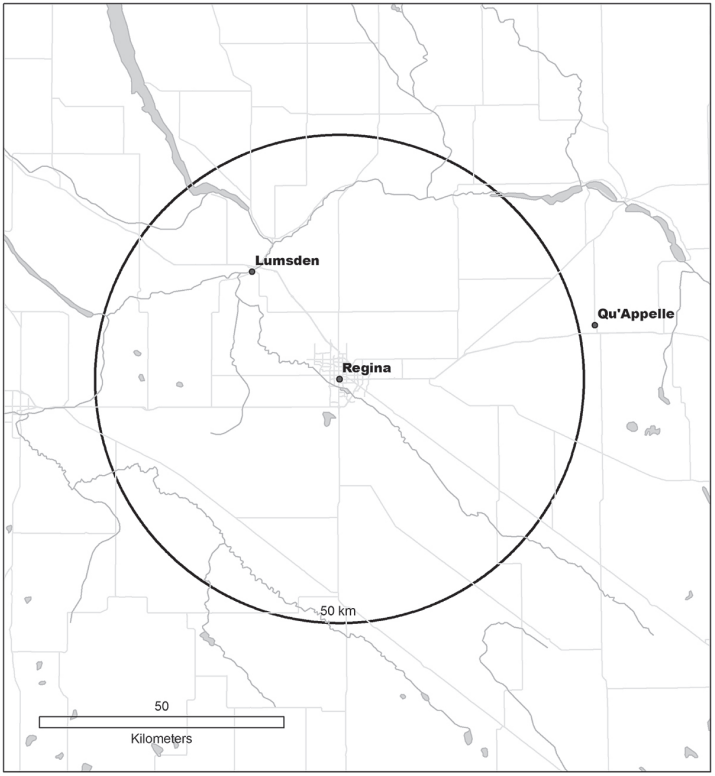


Figure 1: *Map of Regina, Saskatchewan area.*

Table 3: *Retailer interview questions.*

1. What local products do you stock?
2. What percent of the products you sell is Saskatchewan made?
3. Do you consciously attempt to provide Saskatchewan products?
4. What percent of in-store sales do Saskatchewan products represent?
5. What are the difficulties in acquiring Saskatchewan-made products?
6. Do you receive consumer requests for local food?

Table 4: *The Canada Food Guide daily recommendations (Health Canada 2007)*

1. Seven to eight vegetables and fruits
2. Six to seven grain products
3. Two dairy and alternative products
4. Two meat and alternatives products a day for a female aged nineteen to fifty.

Producer issues:

The biggest and most important challenge to producers is finding a sufficient and sustained consumer base to which to market their product. Without this consumer base there is no reason to produce anything at all. In Saskatchewan, conventionally grown grain crops and value added products are sold directly onto a wholesaler market where they are distributed for retail sale on an inter-provincial or international scale.

Although most producers market outside of the province, some have experienced growth within Saskatchewan. According to the sprouting seed company, direct sales in both Saskatchewan and Alberta have grown over 300% since 2005. However, this may have less to do with increased interest in local food and more to do with increased interest in health foods.

Because market gardeners are dependent on local customers they have observed consumer food eating trends over the past number of years. Many producers believe there is a natural fluctuation in sales—some years many people will buy local produce but other years they will not. One producer noted that business has slowed as family sizes decrease and as people become busier and less willing to spend time cooking food from fresh ingredients. She believes more families are eating value added convenience meals and going out for supper while fewer people, especially young people, are cooking from scratch.

Most local producers rely on direct marketing to sell their products and depend on consumers to come to them. If consumers do not make that effort the producers make no money. One producer said sales are hugely affected by the weather—if a weekend is rainy and cold no one will come out to the farm to purchase food, but if it is a sunny and warm weekend they will be very busy. This is an aspect of range where weather can actually decrease the minimum distance consumers will travel to purchase goods.

Local growers who provide foods grown in Saskatchewan are the cornerstones of the Farmers Market. These producers primarily sell

vegetables, honey, eggs, meat and other staple products directly to the consumer. Often the Saskatchewan grown produce is sold along side of local value-added products such as pickles, breads and cookies that contain additional non-local ingredients. For example, although all of the baked goods at the farmers market were cooked in the Regina area the ingredients came from around the world, as many of the producers got their ingredients from large chain supermarkets. This balance between locally grown and locally produced varies dramatically by season. When the farmers market was surveyed in late fall for this study there were many more value added products that were produced locally but not grown locally compared to locally grown goods. This proportion would have been dramatically reversed if the inventory had been taken in the middle of July when a number of local vegetables are in season.

Retailer issues:

The issue between retailers and local food can be summed up as a problem of standardization. On the one hand, local producers cannot convince retailers and wholesalers to carry their product because chain grocery stores are vertically linked and all decisions are made at higher levels in different provinces or even countries. As a result, produce is often bought from around the world based on the lowest possible buying price (and thus the largest possible profit margins) and shipped out from one central distribution centre to all chain locations in a region.

On the other hand, retailers are hesitant to purchase local food because of a lack of standardization. Local producers need to standardize their business practices—deliver crops on time, ensure the produce is harvested correctly and uniformly, and try to create a local brand—in order to perform and excel within the retail environment. Retailers need producers they can depend on, and the best way to achieve this is through producer coalitions and cooperatives that ensure retailers a steady supply of the goods they need when they need them.

Consumer issues:

Eating locally incurs an increased cost to the consumer. During the local diet experience it was very difficult to find local foods that were non-organic. This type of "co-marketing" forces the consumer to assume the combined costs of both local food and organic food. For example, one dozen local organic eggs cost approximately $4.00 while the same number of non-organic eggs of unknown origin at a supermarket cost around $2.00. In addition, although locally produced frozen berries were available in November they were prohibitively expensive. Price differences on a per-

item basis may not seem great but they continually add up when multiple items are purchased for longer periods of time (see Tables 5 and 6).

Eating locally also requires a more substantial time commitment. Shopping for local food is not as simple as stopping at a single grocery store. Because locally food is not universally available in all grocery stores, consumers have to diversify their shopping—perhaps buying flour from a farmer, eggs from the corner store, meat from a health food store and vegetables from the farmers market. Because all of these items cannot necessarily be found in one place consumers must make numerous trips in order to complete their food shopping. Some consumers are reliant on public transit or cannot/will not afford the extra time and costs of driving to the farmland surrounding the city for food.

Adding to the time commitment is the necessity to cook the food from scratch. People following a local diet must often bake their own bread and cook their own vegetables, meats, desserts and snack foods. Although a multitude of ingredients are available to make endlessly varying meals the significant time obligation is not necessarily realistic for someone who

Table 5: *Sample daily local diet consumption.*

Meal	Food Item	Origin	Distance from field to plate (km)	Cost ($, approximate)
Breakfast	-Brown bun (local flour and eggs)	Qu'Appelle	55	0.50
	-Honey	Silton	53	0.10
	-Egg	Abernethy	104	0.33
Lunch	-Brown bun	Qu'Appelle	55	0.50
	-Egg	Abernethy	104	0.33
	-Cabbage	Craven	39	0.60
Supper	-Egg	Abernethy	104	0.33
	-Cabbage	Craven	39	0.60
	-Onion	Craven	39	0.90
	-Potato	Craven	39	0.50
	-Oil (Hempseed)	Regina	0	0.50
Snacks	-Pumpkin seeds	Lumsden	34	1.00

Table 6: *Sample daily non-local diet consumption.*

Meal	Food Item	Origin	Distance from field to plate (km)	Cost ($, Approximate)
Breakfast	-Cereal	Unknown	Unknown	0.30
	-Soy milk	British Columbia	1,800	0.50
	-Banana	Guatamala	4,181	0.24
Lunch	-Bread	Canada	Unknown	0.20
	-Cheese	Canada	Unknown	0.75
	-Avocado	California	2,800	1.60
	-Tomato	Canada	Unknown	0.50
	-Mayonnaise	Canada	Unknown	0.10
Supper	-Broccoli	USA	Unknown	0.30
	-Onion	USA	Unknown	0.30
	-Can of tomatoes	Canada	Unknown	1.10
	-Spices	Unknown	Unknown	various
	-Spaghetti	Canada	Unknown	0.50
Snacks	-Apple	British Columbia	1,800	0.25.
	-Orange	USA	Unknown	0.25

is working, going to school, raising a family or doing a combination of all three.

In Regina some food is available year round. Dried goods such as legumes and grains can always be bought. So too can frozen meats and fresh eggs. However, items such as fresh fruits and vegetables are difficult to find year round. For those who wish to consume local foods out-of-season it is important to pre-purchase all the food necessary and to store it appropriately by canning, freezing, pickling or using cold storage.

In addition, some staple foods are difficult, if not impossible, to find locally. Most food items on grocery market shelves do not provide precise information on the origin of a food product. The country of origin is almost always given but more specific details are not available. For example, most dairy products on grocery store shelves do not provide the province of origin or processing but only the wholesaler's head office.

Many consumers are simply unaware of where they can purchase local food, so they do not know they have a local option. Saskatchewan is home to many producers who are actively trying to create a viable and attractive local food system and retailers who are willing to participate in this alternative food system. Right now Regina's local food system is small, supported mostly by one or two health food shops, the farmers market and a handful of market gardens in the Regina area. However, if more consumers realize the benefits of local food this market can expand, allowing for new sectors of the local food economy such as restaurants and specialty local food stores.

Consumer access to local food today is really limited by one factor—consumer education. If more people know about local food, more producers and retailers will offer local food in response. As the demand for local food grows it will become increasingly lucrative for more businesses to be involved.

Conclusion

The global food system we live in has removed our knowledge of where food comes from and how it is grown. We do not know what pesticides were used to grow it and the labour conditions under which it was harvested. Local food movements seek to reverse that trend by providing a forum where producers and consumers can meet and consumers can begin to understand the life cycle of the local eco-system and the foods they eat. Local food production is more than just a resistance to global forces but also "the beginning of a process of rebuilding more agro-ecological systems which begin to integrate space and nature into production processes" (Marsden and Smith 2005: 299)**.** Local food, then, attempts to reconcile human eating patterns with the natural world by acknowledging the processes and importance of nature and using that wisdom to create a place-specific food system.

The challenges of eating a local food diet in Saskatchewan arise from a combination of geographic, economic and social factors: the climate and soils of this region are not conducive to growing fruits and vegetables; the consumer market is too small to sustain a large-scale local food industry; and consumers may be unwilling to assume the added costs and time needed to eat a local diet. It is clear that Saskatchewan, and more specifically the Regina area, has enough consumer interest to support some local producers, but the market may not be large enough to support many more producers than are already established in the Lumsden Valley area.

Eating locally in the Regina area is difficult but not impossible. Saskatchewan is blessed with an abundance of food types and producers who know the importance of adopting environmentally sustainable practices. Saskatchewan also has a few retailers that value selling local food, and the population of the province can demand more local food from the chain supermarkets if they so choose. Saskatchewan local food has a long way to go—eating locally is a young concept, and producers are only starting to see the benefit of marketing right here at home. There are still many distribution, production and processing issues that need to be addressed, but the future looks bright for local food provided more people learn about it and the benefits it can offer.

Local food is not a trend that will fade away to make room for the next eco-style. The local food market is an important approach to food, one that the mainstream population in industrialized societies abandoned years ago when we decided convenience and price were priorities over the environmental, social and economic effects of creating a huge and anonymous food system. As we learn more about how our decisions affect the planet we live on, we must decide if we want a food system of cheap convenience or a food system that acknowledges our inextricable link to the earth and to one another; where food is a blessing for everyone whose hands it passes through.

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Image building in the Rural Municipality of Stuartburn, Manitoba: the need for policy

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Abstract: Once only the concern of tourist destinations and vibrant industrial centres, image building has now become relevant even to agricultural communities on the margins. The Rural Municipality of Stuartburn, once one of Manitoba's poorest municipalities, has embraced the need to promote itself to the wider market in the hope of enhancing its modest economic growth. Within the community itself there is no agreement as to the approach to be taken in promoting the area. The situation is exacerbated by the lack of coherent image building policy at both the Provincial and Federal level. Promotional efforts in Stuartburn remain fragmented and conflicted and not particularly successful. The example of Stuartburn highlights need for the development of a cohesive policy at the Municipal level that interlocks with Provincial development strategy and a broad-based Federal policy that will enable small rural municipalities to coordinate their efforts and develop promotional strategies that are compatible and mutually supportive.

> *The power to make a community is not luck. It is not alone a question of nature, or kindness, nor is it a matter of chance, on the contrary, communities are built … where men (sic) want them, where men of business initiative, imagination and business co-operation, determine where they shall be built using advertising or publicity as one of the principal mediums.*
>
> George Warren 1927

Image building has always been a part of western Canada's development. From the early 1870s until the close of the frontier, railway companies, the Manitoba Government, and the Federal Government were all engaged in selling the West, attempting to craft an image of the prairies that would appeal to prospective settlers and investors. During this time the burgeoning urban centres of western Canada enthusiastically promoted

themselves as the next Chicago or attempted to convince the undecided of their considerable, albeit self proclaimed advantages.

This promotional aspect of western Canadian settlement history has drawn the attention of a number of historians and is now well covered in the literature. Peel (1966) offered a broad bibliographic survey citing examples of promotional hyperbole by small-town boosters and immigration agents promoting western Canada as a destination for overseas immigrants. Dunae (1984-5) has examined the promotion of Canada to prospective immigrants, while Stich (1977) considered the rhetoric of propaganda emanating from the developing west during the same period. Lehr (1983) described immigration propaganda directed at prospective Ukrainian immigrants in the period 1895 –1914. He argued that even if information was technically accurate, its recipients could easily misinterpret it when meaning was distorted by translation and radically changed contexts. When land agencies and towns were promoting settlement and themselves to prospective settlers, the Canadian Pacific Railway was also attempting to attract tourists to its Rocky Mountain resorts and waging well-focussed campaigns to persuade wealthy easterners to undertake scenic rail journeys through Alberta and British Columbia (Hart 1983).

In the post settlement era thousands of small prairie towns struggled to separate themselves from the crowd and develop a positive image in the minds of potential investors. Advertising was crucial in the promotion of Winnipeg in the late nineteenth and early twentieth century and, when coupled with an advantageous geographical location, secured the primacy of the city as the gateway to the prairies (Artibise 1970-71, 1981). Small town businessmen were perhaps the most vigorous boosters of all. Sinclair Lewis' fictitious George Babbitt was the epitome of such small town boosters who were convinced that economic progress and business success depended on business people promoting their community at every opportunity (Lewis 1922). His smug dedication to the interests of business, his parochial attitude to local business promotion, and determination to engage the whole community in boosting their town, was a parody of a North American mind-set that Lewis abhorred. Nevertheless, self-promotion was vital for embryonic small towns on the prairies and such small town boosters were determined that their community would find its place in the sun. Despite wild enthusiasm on the part of some participants, boosterism was not always particularly sophisticated or co-ordinated. Claims of economic growth and sanguine projections of expected growth were trumpeted in local and regional newspapers as boosters engaged in place-making in both a literal and figurative sense. Town building was thus a social process underpinned by promotional efforts as much as it was a physical activity (Voisey 1981, 1988, 58-66; Potyondi 1981).

There is a paradox embedded in the rhetoric of small town promotion. Sandalack (2002) noted that the image and 'sense of place' of small towns might erode when they adopt city-like buildings and urban form. She stresses the need for towns to adopt policies that will maintain and protect their image and identity. Wetherall (2005) agrees that small towns often claim moral superiority, portraying the city as vile and threatening, while boasting of their own city-like conveniences, buildings and services. Olfert and Stabler (2000) on the other hand, contend that small towns must change in order to remain competitive with larger urban centres. They argue that failure to do so will result in continued economic decline. It seems that small towns and other marginal places find themselves caught in a dilemma of development, whereby the achievement of economic goals threatens the qualities that boosters promote (Heald 2008, 25).

Studies of contemporary place marketing, as Niedomsyl (2004) has pointed out, have focussed on national and regional efforts or those of large metropolitan centres seeking to attract tourists, immigrants or business investment. Such studies have examined the marketing of communities from a number of disciplinary perspectives (Gartrell 1988; Kotler, Haider and Rein 1993; Phillips 2002; and Ward 1998).

Contemporary place marketing differs radically from the type of place promotion usually associated with small town boosters on the prairies. Early boosters sold visions of economic opportunity claiming that those who failed to seize the moment at a particular place and time would lose forever any chance of economic success within the region. After the passing of the frontier, as communities stabilized, they sought to maintain their position by promoting the infrastructure and services offered by their community to potential investors. After 1945 the promotion of symbolic values became more important and the increase in market segmentation necessitated adoption of theming to appeal to a highly differentiated consumer public (Phillips 2002, 8). This type of approach to place promotion is known as "community concept marketing," by which communities try to provide a strong sense of place and incorporate it into their development plans as they jockey for position in the urban system. Measurement of the effectiveness of image manipulation is difficult, even more so than the measurement of the effectiveness of traditional advertising as an agent of city promotion (Paddison 1993, 141).

An extreme form of image manipulation occurs when communities restructure their built environment in order to secure a place in the public's consciousness. This landscape theming implies development of a community in accordance with a specific concept, such as a community's ethnic heritage or its association with a particular sports or arts activity such as mural development (Lehr and Kentner-Hidalgo 1998; and Widdis

2000). Concepts developed may range from historic preservation to the creation of a mythical past that has no basis in fact (Phillips 2002, 13-14). This latter approach is most closely associated with the quest for tourists and has recently been used with some success by communities in Canada such as Kimberly, and Osoyoos in British Columbia, which respectively have reinvented themselves as Bavarian and Spanish towns.

Developing a strong image of place is now seen as crucial for the successful promotion of any place as a visitor destination (Hernández-Lobato et. al. 2006, 344-347; Tasci and Gartner 2007, 423). Although it is a seemingly simple concept, "image of place" is in fact extremely complex and dynamic, possessing cores "around which 'flow' subsidiary themes . . ." (Ryan and Cave 2005, 149). As Ekinci and Hosany (2006, 128) have pointed out, like other inanimate and non-human objects, places are anthropomorphized and described or conceptualized as having human personality traits. George Warren (1927) employed this strategy in the promotion of Victoria, British Columbia over eighty years ago. He was aware that successful promotion depended on the creation of a sense of place, which he described then as "personality." He was also convinced that the "personality of a community, when corrected, broadened or capitalized" would determine a community's future. For Warren the image of a tourist destination was akin to a set of human characteristics associated with a place, usually as perceived by the visitor rather than from the standpoint of a local resident. Many studies have since confirmed that because consumers see places as human-like, people develop active relationships with places that are similar to interpersonal relationships (Ekini and Hosany 2006, 128). There also may be paradoxes embedded within the image of a place, just as there may be in relationships between individuals when both positive and negative images of a person are held simultaneously (Ryan and Cave 2005).

It is clear that designing or shaping the image of a place affects what visitors do or want to do during a trip and this should be critical to formulating the appropriate image (Tasci and Gartner 2007, 418). This applies to all destinations but the reality is that it is only the larger, better organized and well funded development agencies that are usually located in larger centres, which can contemplate this kind of structured manipulation of their image. For smaller communities developing local symbols of place and establishing partnerships is crucial in order to coordinate marketing and image-building efforts (Schmidt 1999).

Recent work on place promotion, image building and tourism has tended to focus on established tourist destinations. There have been a few studies of the role of image building and place promotion in small centres but with the exception of Wetherell's (2005) historical account of

the post-pioneer era in Alberta none that have examined the role of policy in the image building process undertaken in small Canadian communities. Two undergraduate dissertations have examined contemporary place promotion and image creation in Manitoba's small towns (Squire 1985; Lehr 2007), but neither specifically addresses the role of policy. Even for large centres the role of public policy in the image building process has been somewhat neglected. Its role in developing image-building strategies in small rural communities, whose resources restrict their ability to develop sophisticated promotional campaigns that reach a wide audience, remains unexplored.

In an attempt to fill this lacuna this study examines one such area, the Rural Municipality [RM] of Stuartburn, which is located in the south-eastern quadrant of the province of Manitoba (Figure 1). This community was initially selected to be studied as a part of a broader multidisciplinary survey of the role of public policy and image-building in municipalities across Canada. In Manitoba, Winnipeg, Winkler, Swan River and Stuartburn (Figure 1) were chosen for this larger study on the basis of their representation of the province's municipal diversity in terms of their size, geographic location, ethnic composition, and economic structure.

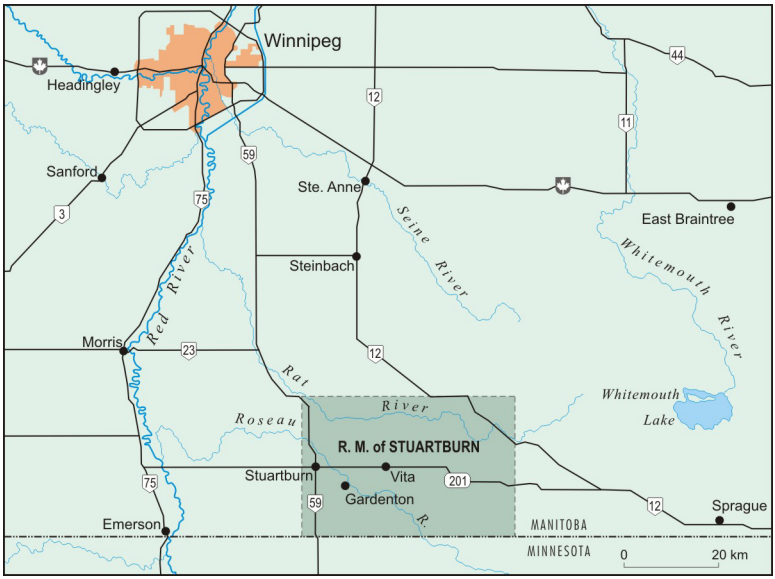


Figure 1: *Location of the Rural Municipality of Stuartburn.*

The Rural Municipality of Stuartburn

Ukrainian immigrants from the former Austro-Hungarian Empire first settled the area in the last decade of the nineteenth-century (Kaye 1964). Until 1902 the settled part of the district lay within the RM of Franklin. By 1900 many Ukrainian settlers felt that their taxes were benefiting the longer settled areas occupied principally by Anglophone settlers and so agitated to have their own municipality. When it broke away from Franklin the new municipality of Stuartburn assumed a significant proportion of Franklin's debt. Immediately disadvantaged, Stuartburn faced high debt ratios and always struggled to be financially viable. For years the Municipality remained locked in poverty; farmers were under-capitalized and agricultural development lagged far behind that seen in longer settled areas. Always a mixed farming area, the district never produced sufficient grain to warrant the building of an elevator. Well into the 1940s farmers relied heavily on sales of cream and seasonal off-farm work to make ends meet. Even after decades of settlement, many farms in the RM remained semi-subsistence. Many farmers were unable to meet their tax obligations and the RM eventually became insolvent. It was "disorganized" and administered by the Public Trustee as a Local Government District from 1944 until 1997.[1]

Much of the area is poorly drained, low-lying, stony land classified by the Canada Land Inventory as Class 6 agricultural land with little economic potential for agriculture. It was one of the last areas in Manitoba to be electrified and even today is poorly served by some major telecommunications companies. Mixed farming with an emphasis on beef and dairy cattle is still the predominant activity. Considerable areas within the municipality that were once cultivated have now reverted to grass, either as a result of rural depopulation or the difficulties of arable farming on sub-marginal land. Several sections of such land were acquired by the Prairie Farm Rehabilitation Agency (PFRA), which operates them as a community pasture. Some parts of the Municipality were never cultivated, only grazed, and they now constitute the remnants of the tall grass prairie. The Nature Conservancy of Canada (NCC) purchased some of these lands to operate as protected areas, and is currently expanding its holdings.

[1] The term "disorganized" when applied in this sense simply refers to the transfer of the administrative responsibility from elected local control to that of a higher authority. In this instance the finances of the municipality came under provincial administration. On the 1st January 1997, all Local Government Districts were restored to Rural Municipality status by a decree of the Provincial Government. The principal change was that, as a rural municipality, the district no longer needed the Provincial government to co-sign all cheques (Reimer 2009.)

According to the 2006 census the Municipality's population is 1629 people with a density of about 1.4 persons per square kilometre (Manitoba Government 2007). The only settlement of any size within the municipality is Vita, a village of some 300 people. Vita has a few stores, a hotel and motel, a regional high school, hospital, post office, a gas station, the administrative offices of the municipality, and recreational facilities. Other smaller communities within the Municipality include Gardenton, with a population of less than fifty and no services; Sundown, and Stuartburn, with less then thirty people, and Caliento and Sirko each of which has a population of less than ten. (Reimer 2009).

Rural depopulation has seen out-migration of the descendents of the original Ukrainian settlers and, since the late 1960s, immigration of many non-Ukrainians, principally Mennonites from Manitoba and farmers from the United Kingdom, so the social character of the municipality, once solidly Ukrainian, has changed considerably in the past thirty years. Economically though, little has changed, though a fairly recent innovation has been the introduction of intensive livestock operations into the district. Further development of these operations was halted by concerns over their environmental impact and a recent provincial moratorium on hog-barn expansion in the Red River Valley.

In the second and third decades of the twentieth century the Stuartburn district was described as the "homebrew capital of Canada," and was portrayed in the Ukrainian-language press as a dysfunctional community fractured by religious rivalries. These old-country legacies began to fade only in the 1950s. Stuartburn is now anxious to represent itself in a more positive fashion. Early promotional efforts in Stuartburn RM were directed at those who had left the district. In 1967 the Gardenton Museum first held *Barvinok Days*, an annual home-coming event and celebration of Ukrainian culture that appealed almost exclusively to descendents of the district's pioneers (Machnee 2008).

In the late 1980s, change started to take place in Stuartburn on two fronts. Firstly, the Nature Conservancy of Canada began to acquire remnants of tall grass prairie, land that was undisturbed and uncultivated due to its low agricultural potential (Figure 2). NCC's intention of developing this resource was the first time the region had any real potential for attracting outside visitors for tourism. Secondly, in the 1990s, Parks Canada expressed interest in developing a National Historic Site to commemorate Ukrainian settlement on the prairies. They partnered with the Gardenton Museum to acquire the Korol homestead, two miles south of Gardenton. The property had a log house and ancillary farm buildings erected about 1911 by an immigrant from Bukovyna that were regarded as fine examples of Ukrainian rural domestic architecture. Abandoned in the

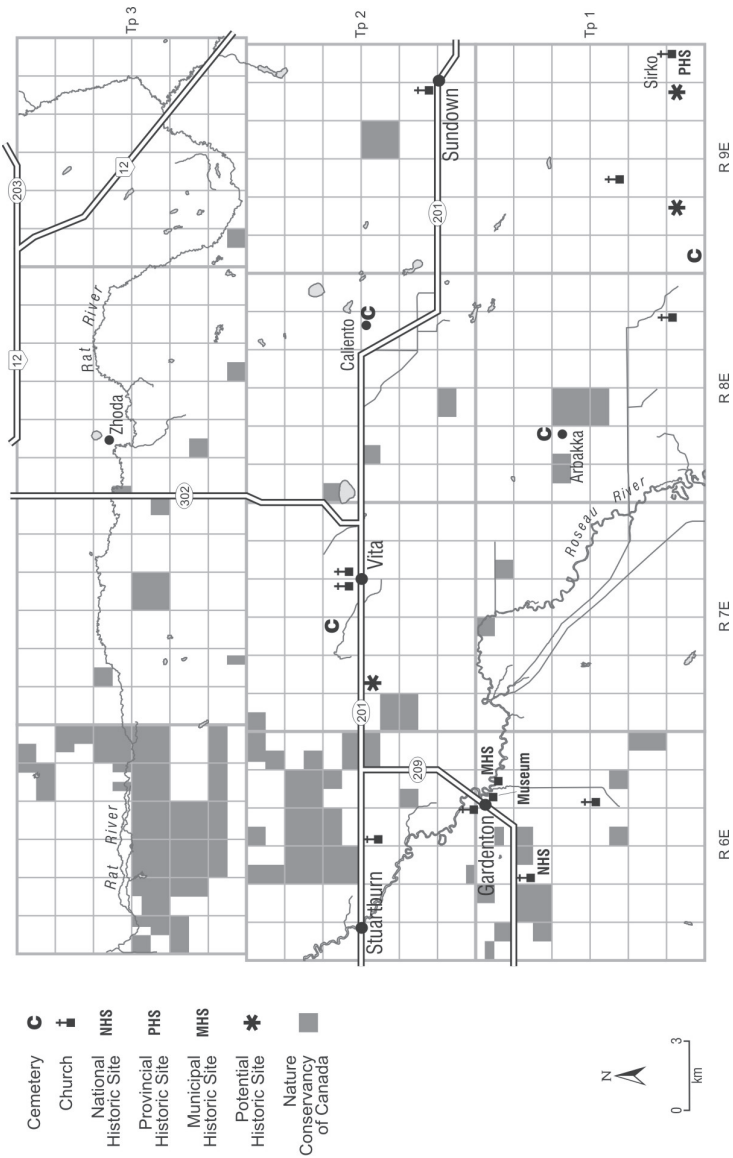


Figure 2: *Natural and cultural heritage resources in the R.M. of Stuartburn.*

mid 1960s, it had deteriorated considerably but was still in sufficiently good condition in the late 1970s to be used as a backdrop for a location shoot by a major film company. Acquisition of this property was a protracted process because of Parks Canada's policy of off-loading ownership and operational responsibility for new National Historic Sites to local community groups. By the time that such a local group had been assembled, steered through the bureaucratic maze that attends application for funding, and had negotiated the purchase of the quarter section on which the building stood, deterioration was so advanced that the building proved to be unsalvageable. Like the house, the project collapsed.

One attempt at image building in the mid 1990s was a response to a perceived threat rather than an attempt to develop a particular natural attribute. There were proposals to build hog farms in the municipality by developers who were attracted to the area by its low population, low land costs and proximity to Winnipeg. Those opposed voiced environmental concerns, principally fears of contaminating the relatively high water table and fears of improper waste disposal and unpleasant odours. The *Concerned Citizens of Gardenton* was formed to oppose hog barn development in the municipality. Some felt that Gardenton and Stuartburn could be marketed as a "hog-free" RM for those wishing to live outside of, but near to, Winnipeg. All residents of the RM do not share this opinion, and in fact Vita tends to be quite supportive of hog barn operations whereas Gardenton tends to be more opposed (Shewchuk 2006; Reeves 2007). This split in attitudes between the two communities reflects the relative ability of each to profit from such operations. Vita has a commercial service function whereas Gardenton does not. Thus, Vita is in a position to benefit from the injection of capital associated with intensive livestock operations; Gardenton, on the other hand, could at best benefit from the creation of one or two jobs but would possibly lose amenity value through the environmental consequences of hog farms in its vicinity. Since the collapse of hog prices in 2008 producers find it difficult to turn a profit and interest in hog-barn expansion has waned.

In a detailed study of Gardenton, Heald (2008) assessed its options for development and concluded that place-making was vital for Gardenton's future. This promotion, she advocated, should centre on its rural setting, its proximity to the Tall Grass Prairie Preserve and the relative absence of intensive livestock operations within the area. Given that some residents of the Rural Municipality already commute daily to Winnipeg on a year round basis, there would appear to be opportunity to attract new residents by placing the community within the perceived commuter belt of Winnipeg. An additional attraction for potential residents would be significantly lower property taxes than in competing exurban communities closer to

Winnipeg, lower land and house prices, and good highway linkages with the city.

The RM of Stuartburn has given serious thought to image building only since 2006. Driven in part by a change in council membership, and especially by the vision of a new Reeve, the RM has begun to weigh the benefits that might accrue from building a positive image and promoting itself as a destination for Manitoba-based eco-tourists and as an attractive venue for entrepreneurs seeking to establish livestock and other agricultural operations. Although there is some support for the idea within the community, no formal image-building policy has yet been articulated and image-building efforts have been piecemeal, largely because the proposal to promote the Municipality lacked a clearly defined objective. On the other hand it should be noted that Stuartburn is the only Rural Municipality in the south east of Manitoba that has attempted to engage in the image building process.

To develop an effective promotion strategy and to determine how it wishes to shape its image the RM of Stuartburn must first establish its objectives. According to the current Reeve the intent is to encourage tourism with the hope that bus tours or automobile tourists will visit Vita and use its retail services or accommodation services (Swidersky 2009). However, if the objective is to attract agricultural operations there may be other better-focussed and more effective approaches targeting a narrow group of potential entrepreneurs. If exploitation of the natural and cultural heritage of the Municipality is the objective, mechanisms for profiting from the investment must be identified. Put simply, the objective is not just to attract tourists but also to provide tourists with an opportunity to spend money within the Municipality. At present opportunities to do so are limited to a few service facilities in Vita and the Museum in Gardenton.

There is evidence of a new attitude to be seen in the placing of a standardized welcoming sign on the approach to each community within the municipality, albeit with a signature skyline silhouette that has a generic clip-art appearance (Figure 3). Within Vita, signs placed at the major intersections within the settlement directionally indicate the principal public buildings, such as the municipal office, the hospital and school. These signs were commissioned when it became aware that visitors to the community were unable to immediately locate crucial services. Vita is a small community that sprawls over some twelve blocks and it seemed to some local residents that there was little point to this initiative as, “everyone knew where everything was” (Reimer 2007). However, it was pointed out that not everyone who required access to these places was local.

Recent image development has centred on the presence of the Western Prairie Fringed Orchid, a rare and endangered plant that, in Canada, occurs



Figure 3: *Signage for the village of Stuartburn. (Author photo)*

only in the RM of Stuartburn (Figure 4). The reeve and council are enthusiastic about using the orchid as a symbol for the RM, and are hopeful that it could be an attraction for nature tourism. This is not an unreasonable expectation, as the RM already attracts nature-oriented groups who visit the NCC's Tall Grass Prairie Preserve. Unfortunately, the municipality's population is split on the desirability of its promotion in this way. Farmers are generally opposed, as they see the orchid as a threat to their livelihood; they fear that, as it is an endangered species, their ability to cultivate will be restricted and they will face heavy fines if they inadvertently destroy one. As yet, the only action that has been taken by the council is to produce a souvenir pin that stylizes the orchid and bears the name of the municipality. Orchid sites are not yet marked and visitors are left to their own devices to locate them. According to Reeve Jim Swidersky (2008, and 2009), the project is "coming along slowly." A few bus tours visit the area each year to see the Tall



Figure 4: *The Western Prairie Fringed Orchid. (Author photo)*

Grass Prairie Reserve and to see the orchid. The appeal of the orchid seems to be particularly strong with younger people.

The Municipality of Stuartburn faces some very real difficulties in using development of its cultural heritage to build its image although it has the (largely undeveloped) heritage resources to do so. The first Ukrainian Orthodox Church in Canada, St. Michael's Ukrainian Orthodox Church, now a National and a Provincial Historic Site, lies some two miles west of Gardenton, and St. Elias Ukrainian Orthodox Church in Sirko, is a Provincial Historic Site. Spanning the Roseau River a short distance from Gardenton is a wooden Howe Truss bridge built in 1918, which was declared a Municipal Heritage Site in 2002. Nearby, the Gardenton Museum has a few pioneer era buildings moved from their original locations and a museum exhibit building themed around the Ukrainian pioneer experience, housing displays of pioneer implements and an excellent collection of traditional clothing brought over by settlers from Ukraine. It has facilities to accommodate visiting groups for home-cooked traditional Ukrainian meals and to host the annual *Barvinok* festival. Its small gift shop carries souvenirs and a small assortment of books.

There are, however, many other *potential* heritage sites within the RM (Figure 2). These include cemeteries, churches built in the traditional Ukrainian style, pioneer memorial cairns, and a few houses and farm buildings that have survived since pioneer times. The problem is not so much that the district lacks heritage resources or a broad volunteer base but a lack of leaders committed to heritage preservation. Both leaders and volunteers are vital for the development of heritage resources. The failure of the Korol Homestead project was partly due to the inability of the community to mobilize a solid cadre of leaders to rally support and develop a strong volunteer base. Furthermore, the ethnic character of the area is still changing and many newcomers from outside the district have no association with Ukrainian culture and little feeling for the history of the area. Rural depopulation exacerbates the situation, making it difficult to assemble sufficient people with the experience, interest, skills, and free time to take a leadership role in advocating for heritage preservation.

Even if policy-makers recognize that image building is part of their mandate, there is still the question of community unanimity on what the nature of Stuartburn Rural Municipality's image should be and to whom should it direct its promotion. Even more importantly, it is unclear whether the rationale for image building is for encouragement of tourism to the Municipality, to attract economic ventures or simply to promote a sense of community pride. Image building is not simply a matter of self-promotion; it must have clearly defined objectives and be integrated with policy that can exploit any success that image building achieves. When small

communities vie for regional attention they need to be able to distinguish themselves in some way, or as Warren (1927) would have said "to develop their personality." Most often it is through entry into the already overcrowded field of "Provincial capital of . . . . ," or the erection of massive roadside art, which Marling (1984) described as "the colossus of roads," as there is no other distinguishing quality to promote. Typical of this type of initiative is the erection of a 1: 28 scale replica of the Eiffel Tower in the village of Montmartre, Saskatchewan, which hopes to promote itself as "The Paris of the Prairies" (White 2009). On the other hand, if the district is blessed with a colourful history, has locally recognizable symbols and is rich in heritage resources, place-making and image building has a reasonable chance of being successful (Peterson and Saarinen 1986, 164-168.) Heritage resources, which Stuartburn has in abundance, when developed, can constitute the basis for regional tourism development. Unfortunately the tourism industry tends to exploit resources but seldom invests in them. In general, tourism and heritage are regarded as separate activities, when in fact they are intimately related. Even at the Federal and Provincial levels, tourism departments only promote, they do not invest in the development of heritage resources. Only about one percent of tourism revenues are reinvested in heritage (Dul 2007). If the heritage sector is under-funded and badly under capitalized, opportunities for place-making are lost and the process of image building suffers.

Conclusion

In the Municipality of Stuartburn a number of individuals are loosely allied in their desire to see the area have a stronger and more positive image but there is no agreement on how to attain their objectives. Nor is there any clearly articulated policy that defines the objectives of such schemes. The Gardenton Museum wishes to promote the Ukrainian character and historical resources of the area although the social character of the area is changing and the Ukrainian support base is eroding. Others, including the Reeve, wish to capitalize on the natural assets of the area, especially the presence of the Western Prairie Fringed Orchid and the Tall Grass Prairie Preserve. Needless to say, there is also a large portion of the community that is content to continue to rely on agriculture with some off-farm work, and who are not particularly interested in developing any kind of image building policy as they fail to see any direct personal benefits.

One of the attractions of life in Gardenton, and by extension, in the RM of Stuartburn as a whole, is its marginal nature, and lack of development, and the quality of rural life. Heald (2008, 21-22) concludes that the population

has a colonialist mentality that assumes that outsiders "are more capable of determining their needs, judging their values, and organizing their economic activities."

A further barrier to the further development of locally derived development policy is the nebulous concept of image building. It is difficult to convince policy-makers working in such disparate fields as agriculture, infrastructure, and heritage, that image building should be considered as part of their mandate, especially when there is no immediate measurable financial return.

Horizontal links must be established between local interest groups, regional agencies and other Rural Municipalities that have an interest in economic and tourist development. Securing intra-regional cooperation and developing policy that will ensure community cooperation is more easily said than done. For a number of reasons it is difficult to establish such horizontal linkages. In small municipalities the administration's attention is focussed on the immediate needs of the population, primarily maintaining infrastructure and services with a limited tax base. In many rural areas there is a tendency to regard adjacent Municipalities as rivals rather than as potential partners, though as Schmidt (1999) argues, constructing partnerships is a far better approach. Stuartburn and adjacent Rural Municipalities try to work together (in image-building) "but each wants to put their own edge on it" so efforts to secure full cooperation have not been particularly successful (Swidersky 2009). Since the Western Prairie Fringed Orchid is found only in Stuartburn, using it as a central part of a co-operative regional promotion would not have great appeal for Stuartburn's neighbouring Municipalities. Furthermore, like many Rural Municipalities in Manitoba, Stuartburn has a small population and a bare-bones administrative staff. Only the larger Rural Municipalities in the more prosperous areas can afford the luxury of an Economic Development Officer to develop an over-arching policy that facilitates implementation of the long-term co-operative programs that successful image building requires (Gaudry 2008). If the image-building efforts of small Rural Municipalities such as Stuartburn are to achieve any measure of success the higher levels of government must be actively involved in the development and co-ordination of policy.

The RM of Stuartburn has sufficient natural and cultural heritage resources to support a small seasonal tourism industry. It is widely recognized that the key to successful heritage tourism is good interpretation of heritage resources. In fact, some authorities maintain that the interpretation is more important than the actual resource (Beck and Cable 1998). To effectively explain the history of Ukrainian settlement in south eastern Manitoba a holistic approach is necessary, making involvement

with the neighbouring RM of Franklin crucial. In fact, until 1902, what is now the west part of Stuartburn RM was a part of Franklin Rural Municipality. The western boundary of Ukrainian settlement extends beyond the western limits of the RM of Stuartburn, past the community of Tolstoi, and well into the R.M. of Franklin. Further west, still in Franklin, Dominion City was the supply base and bridgehead for settlement and should be an integral part of the interpretation of the region's settlement.

Furthermore, if partnered with surrounding Municipalities, the range of potential attractions open to the region's visitors could be expanded. The Rural Municipality of Piney, to the east of Stuartburn has a rich natural history with forests and wetlands whose interpretive potential that would complement the resource of the Tall Grass Prairie Reserve in Stuartburn. There are many opportunities for co-operation.

It is also clear that it is not possible for every small town or Rural Municipality in the province to establish itself on the mental map of Manitoba's population as a desirable tourist destination. Image building policy developed at the provincial level should therefore focus resources on endeavours that have clearly identified objectives and hold promise of yielding economic returns. Such policy must consider how the tourist market can be exploited before investment is made in image building. Regional and inter-governmental cooperation with strong vertical links to provincial agencies is also crucial for local success. Local initiatives must be underpinned by sound policy objectives set by local governments in consultation with provincial and federal agencies, if dissipation of effort and haphazard development of the supporting infrastructure is to be avoided.

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