



# “You relied on God and your neighbour to get through it”: social capital and climate change adaptation in the rural Canadian Prairies

Amber J. Fletcher<sup>1</sup> · Nancy Sah Akwen<sup>1</sup> · Margot Hurlbert<sup>2</sup> · Harry P. Diaz<sup>1</sup>

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## Abstract

Social capital is increasingly recognized as a key determinant of adaptive capacity to climate change. Beyond formal adaptation infrastructure like insurance and public disaster support programmes, it can be difficult to identify the role that informal social capital—such as relationships, trust, and mutual support between community members—plays in climate adaptation. Drawing on a multi-site qualitative study in the Canadian Prairie region, this paper examines how three forms of social capital (bonding, bridging, and linking) shape rural communities’ adaptation to climate extremes. Based on in-depth interviews with 163 community members, the findings demonstrate how social capital contributes to adaptive capacity, particularly in rural areas where more formal supports may be absent or lacking. We examine how social capital is affected by existing socio-economic sensitivities, such as rural depopulation, which can reduce informal social capital while simultaneously increasing people’s dependence on it. The findings indicate the strengths and limitations of bonding and bridging social capital, particularly in the face of future climate extremes that may exceed local adaptive capacity. Further, we find that informal social capital may also reinforce gender inequality, exclusion, and inter-group differences, indicating its limitations for socially inclusive adaptation. Addressing these structural factors can help communities move past coping and toward long-term adaptation. In the face of increasing climate risks, our findings suggest the importance of public supports that are attentive to local strengths, gaps, and social relations.

**Keywords** Social capital · Climate change · Adaptation · Rural · Farmer · Gender

## Introduction

Social capital is a well-known and widely employed concept in the social sciences, but applications in climate change research are limited. In general, social capital refers to social

relationships, networks, and connections between people, which together constitute a form of capital—a resource or asset to be drawn upon when needed (Bourdieu 1986). Key components of social capital include relations of trust, solidarity, reciprocity, and shared norms or values (Coleman 1988; Putnam 2000; Arneil 2006; Field 2008). Social capital may provide crucial support for challenges that exceed an individual’s own capacity, and it can also facilitate collective action (Paul et al. 2016). Conversely, however, social capital may reinforce power relations and block certain individuals or groups from accessing resources (Arneil 2006).

In its Fifth Assessment Report, the Intergovernmental Panel on Climate Change (IPCC 2014) explicitly acknowledged social capital as an asset that facilitates adaptive capacity; however, this acknowledgement was brief due to lack of existing research (Paul et al. 2016). As individuals and communities face increasingly severe and frequent hazards caused by climate change (Hoegh-Guldberg et al. 2018), it is necessary to examine how social capital contributes to, or inhibits, their adaptive capacity. Social capital can be particularly pertinent in rural communities, where formal institutional

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✉ Amber J. Fletcher  
Amber.Fletcher@uregina.ca

Nancy Sah Akwen  
Nancy.Sah.Akwen@uregina.ca

Margot Hurlbert  
Margot.Hurlbert@uregina.ca

Harry P. Diaz  
Harry.Diaz@uregina.ca

<sup>1</sup> Department of Sociology and Social Studies, University of Regina, Regina, SK S4S 0A2, Canada

<sup>2</sup> Johnson-Shoyama Graduate School of Public Policy, University of Regina, Regina, Canada

supports are distant or lacking, and neighbours often rely on each other (Buck-McFadyen et al. 2019).

Despite the recognized importance of social capital for adaptive capacity (e.g. Adger 2001, 2003a; Cutter et al. 2003; Wall and Marzall 2006), few studies have examined its manifestation in the context of climate hazards. In this paper, we present insights from a large-scale qualitative study on rural communities' experiences of, and responses to, climate hazards like flooding, drought, and wildfire. The findings suggest the importance of informal social capital during climate-related disasters in rural areas, while also revealing the risk of overdependence on social capital in the face of future climate extremes.

## Literature review

Climatological scenarios indicate a growing risk of more severe and protracted climate hazards due to anthropogenic climate change (Trenberth 2012; IPCC 2014). Social systems like individuals, households, communities, and institutions have varying degrees of vulnerability to such extremes. This vulnerability is largely determined by a system's exposure and sensitivity to a climate hazard (Adger 2006). Expansion of the system's adaptive capacity—i.e. its ability to respond to, and cope with, an extreme event—can decrease its sensitivity and thereby its vulnerability in the face of future extremes (Smit and Wandel 2006). Resource-dependent rural communities may be particularly sensitive to climatic shocks due to their dependence on the natural environment for livelihood (McMartin and Hernani Merino 2014) and low access to services (Buck-McFadyen et al. 2019); however, rural communities may also have strong histories of adaptation (Warren 2016) and collective response to change (Leap and Thompson 2018).

In agricultural communities, social capital is not only about collective works such as repairing barns, harvesting, or building bridges, but is also about reinforcing values that make community cohesive, such as mutual trust and reciprocity, as well as the solidarity of the community against external forces. Adger (2006, p. 268) therefore argued that adaptive capacity to climate change is determined, at least in part, by the “capacity to self-organize”, a key component of social capital. Individuals' position within social relations or networks determines the social resources that they can access when facing multifaceted stressors (Scoones 1998; IISD 2003; Leonard and Onyx 2003; Pelling and High 2005). At the same time, however, researchers caution against the uncritical application of social capital, which may result in “uniformly positive” assessments that gloss over the contextual complexity of vulnerability and adaptation (Jordan 2015, p. 111). Understanding how social capital operates to encourage or

even obstruct adaptation can facilitate preparation for future climate risks.

Despite strong theoretical recognition of its importance, relatively few empirical studies have explicitly examined social capital in climate vulnerability and adaptation (Reimer et al. 2013; Reed et al. 2014; Paul et al. 2016; Kopytko 2018). Some studies have used quantitative and mixed-methods approaches to measure the relationship between social capital and adaptation. For example, in Canada, Wall and Marzall (2006) quantified the social dimensions of adaptive capacity through attachment to community, mobility, and number of community events; Chen et al. (2014) used the number of relatives in government as a proxy to measure social capital in China; and in Ethiopia, a survey by Paul et al. (2016) found a negative correlation between community involvement and household-level adaptation strategies.

Although useful, quantitative findings are limited by predetermined questions, deductive indicators, and proxies. Qualitative research can help elucidate the nature and quality of social capital and how it operates in everyday life. Existing qualitative case studies have provided rich analyses of social capital's complexity while also demonstrating its interplay with other forms of capital (e.g. financial and economic) (e.g. Reimer et al. 2013; Jordan 2015; Kopytko 2018). However, with the exception of Reimer et al.'s (2013) study of the Lost Creek Fire in Alberta, few empirical qualitative studies on social capital and climate extremes have been conducted in the Canadian Prairie region. Existing studies in the region have examined formal, institutional adaptation measures (Marchildon et al. 2008; Marchildon 2009; McLeman et al. 2014; Hurlbert 2018) or have quantified capitals with indicators (Diaz and Nelson 2005; Wittrock et al. 2011). However, such measures may not fully reveal the quality of social capital, or how rural actors engage it for adaptation.

As an agricultural region with one of the most variable and drought-prone climates in the world (Sauchyn 2010), the Prairies provide a useful window for understanding how social capital shapes climate change vulnerability and adaptation in rural contexts. Much of the region is located in a semi-arid and drought-prone area known as Palliser's Triangle<sup>1</sup> (Marchildon et al. 2009). Although agricultural producers and communities have built high levels of adaptive capacity to drought (Warren and Diaz 2012; Warren 2016), climatological scenarios for the region indicate more severe drought and flood extremes in the future (Sauchyn and Kulshreshtha 2008;

<sup>1</sup> The region was named for the explorer John Palliser who, upon visiting the area during an extreme drought in 1857–1858, declared it entirely unfit for agriculture (Warren and Diaz 2012). The region has since become one of Canada's most productive agricultural areas.

Wheaton et al. 2016; Bonsal et al. 2017), which will challenge agricultural production (Wheaton and Kulshreshtha 2017). Droughts are accompanied not only by an increase in crop-destroying pests like grasshoppers, but also by wildfires that threaten homes, animals, and farm buildings (IPCC 2014). Climate vulnerability has been compounded by socio-economic and political sensitivities like rural depopulation, erosion of services, and reduction in agricultural safety net programmes (Statistics Canada 2017a, b; Hurlbert and Gupta 2017; Fletcher and Knuttila 2016).

In this paper, we draw on the results of a large-scale qualitative, community-based study to consider how social capital affects vulnerability and adaptation to climate hazards in the rural Canadian Prairies. We focus on highly informal social capital, which exists primarily in the realm of interpersonal interaction and relationships, but which is also underpinned by social structures and systems of power. We describe the relationship between social capital and climate adaptation following Szreter and Woolcock's (2004) threefold framework (bonding, bridging, and linking social capital) to illustrate how social capital affects, and is affected by, vulnerability and adaptive strategies. Our analysis demonstrates the importance

of informal social capital for climate adaptation, while also indicating its limitations in light of future climate risks.

## Methods

This research was part of an intercontinental study called "Vulnerability and Adaptation to Climate Extremes in the Americas" (VACEA). VACEA researchers conducted community vulnerability assessments (CVAs) in Canada and four countries of South America (Argentina, Brazil, Chile, and Colombia). In this paper, we draw upon the results of our Canadian CVAs to explore the role of social capital in climate change adaptation. All research activities were approved by the institutional research ethics board.

Qualitative ethnographic research was conducted in four rural communities in the South Saskatchewan River Basin of the southwestern Canadian Prairies (Fig. 1). Two communities (Rush Lake and Shaunavon) are in the province of Saskatchewan and two (Pincher Creek and Taber) are in the province of Alberta. The rural towns have populations ranging from a minimum of 53 in Rush Lake to a maximum of 8428 in

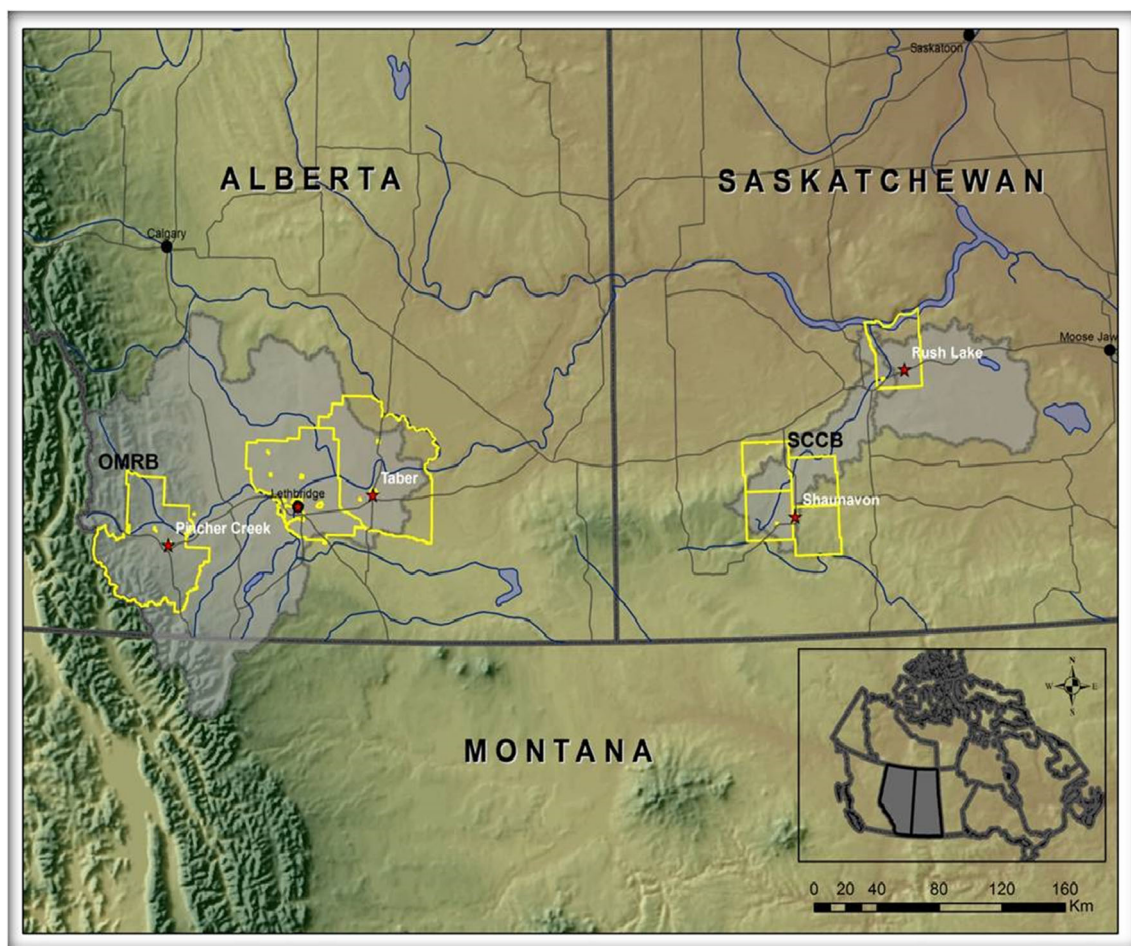


Fig. 1 Location of the four study areas

Taber (Statistics Canada 2017c); however, our sample also included farmers, ranchers, and rural dwellers from the surrounding rural districts. Several criteria were used to select the study communities, i.e. their geographical locations at different points within two watersheds, adaptation activities (e.g. dryland and irrigated agriculture), diverse economic profiles, and drought-prone climates. All four study areas have agricultural economies complemented by tourism and energy (including wind power) in Pincher Creek, food processing/manufacturing in Taber, and oil extraction in Shaunavon. Agricultural production centres mostly on cattle ranching and dryland crop production; however, access to advanced irrigation infrastructure in Taber allows for production of high-value vegetable crops (e.g. potatoes, corn, beets) and large-scale food processing plants. Some Rush Lake ranchers also have limited access to flood irrigation on hay lands.

A team of three researchers (including the first author) spent several months living in the study areas to conduct qualitative CVA interviews and participant observation. The researchers frequented local coffee shops, grocery stores, and museums, and they attended community events like rodeos and parades. A qualitative approach was chosen because, while quantitative surveys may prove “unable to capture complex social constructs at the contextual level” (Poortinga 2012, p. 287), qualitative research facilitates understanding of such micro-level relations. Accordingly, the interview guide began with very general, open-ended questions about general stressors and issues of concern to participants (e.g. “What are some major issues affecting your life as a \_\_\_[e.g., rancher]\_\_\_?”). Through this approach, information about social capital often emerged inductively from the participants. The open-ended discussions were followed by more specific questions about climate extremes and environmental stressors. For example, we asked questions about the experience of flooding, drought, and other climate extremes (e.g.

preparation, activities, roles, and responses at both individual and community levels); the type of formal and informal supports available before, during, or after an extreme event; and the effectiveness or limitations of these supports.

The study used purposive sampling to focus on those with firsthand experience or knowledge of climate hazards. To enhance diversity of the sample, researchers used an adapted snowball recruitment technique, asking participants to refer someone “different” from them in some way. A total of 163 rural residents were interviewed, including agricultural producers (farmers and ranchers), representatives of local government and non-governmental organizations, members of community organizations and clubs, and other rural residents (e.g. retirees, businesspeople in the towns). Representatives of local watershed groups served as community partners, acting as gatekeepers and advising on key matters related to the research. As shown in Table 1, the sample consisted of 92 farmers, ranchers, and other rural residents, along with 71 governance representatives. Despite efforts to recruit women, men ( $n = 115$ ) were over-represented compared with women ( $n = 48$ ), which reflects the predominance of men in both agriculture and local governance councils, which is discussed below. At 59, the average age of participants resembles the average age of farmers generally, which is 55 in Saskatchewan and 55.7 in Alberta (Statistics Canada 2018). Farm sizes were larger than the provincial averages of 1237 acres in Alberta and 1784 in Saskatchewan (Alberta Agriculture and Forestry 2017; Statistics Canada 2017d), although sample averages were increased by the participation of several extremely large farms. Similarly, the high average number of livestock in our Taber sample reflects the inclusion of intensive livestock feeding operations (“feedlots”).

All interview transcripts were coded using NVivo software. A coding framework was developed from the existing literature to capture key determinants of climate change vulnerability and adaptation (e.g. economic, political, social, and

**Table 1** Summary of Participant Demographics<sup>a</sup>

Community	Total #	Participant type <sup>b</sup>			Gender (#)		Age (avg) <sup>c</sup>	Income (modal) <sup>c</sup>	Farm size (avg acres) <sup>d</sup>	Head of livestock (avg)
		FR	CR	GOV	Women	Men				
Pincher Creek	54	25	9	20	17	37	65	\$50,000 to \$99,999	1971	496
Rush Lake	24	16	2	6	10	14	50	\$50,000 to \$99,999	1982	62
Shaunavon	43	19	6	18	17	26	60	\$50,000 to \$99,999	4208	424
Taber	42	11	4	27	4	38	58	\$250,000 to \$499,999	8319	2156
Sample total	163	71	21	71	48	115	59	\$50,000 to \$99,999	3655	772

<sup>a</sup> Some participants declined to provide demographic information

<sup>b</sup> *FR*, farmer/rancher; *CR*, community resident (e.g. retiree, business owner, member of community group, other non-farm occupation); *GOV*, local governance (e.g. rural council member, mayor, staff of non-governmental organization)

<sup>c</sup> Age and income data were not collected for governance representatives

<sup>d</sup> Farm size includes total land managed (owned and rented)

environmental capitals). Recognizing the inverse relationship between vulnerability and adaptation (i.e. higher capacity for adaptation reduces vulnerability; lower adaptive capacity increases vulnerability) (e.g. Smit and Wandel 2006; Fritzsche et al. 2014), factors identified as contributing to vulnerability were coded as “VUL”, or vulnerability/sensitivity codes, while factors contributing to adaptation were coded as “ADA”, or adaptation codes. Data were further coded for key capitals—for example, a social capital contributor to adaptation would be coded “ADASOC”; in contrast, lack of social capital contributing to vulnerability would be coded as “VULSOC”. This first round of coding resulted in 101 pages of data for the ADASOC code and 112 pages for VULSOC, indicating the prevalence of social factors (Table 2). As shown in Table 2, summative code counts provided an indication of the most frequently mentioned issues. In the next round of coding, the ADASOC and VULSOC data were inductively coded and subanalyzed to identify the key components of

social capital discussed in this paper (see Table 3). Such inductive coding does not use pre-defined codes; rather, the sub-themes were drawn from the data (Auerbach and Silverstein 2003; Miles et al. 2014).

## Findings

The results demonstrate the clear importance of social factors for both climate adaptation and vulnerability (Table 2). Social dimensions were the most frequently mentioned issues in the “Adaptation” code, and the third most frequent in the “Vulnerability/Sensitivity” code. In the latter, only precipitation and drought vulnerability were mentioned by more people, and only economic vulnerability and precipitation-related vulnerability were mentioned more often than social vulnerabilities. Several overarching qualitative themes were identified within these social data.

**Table 2** Summary of top 5 codes with frequency counts and definitions

Code	# of transcripts referencing	# of total references coded	Description
<b>Vulnerability/sensitivity codes</b>			
VULPRECIP	95	375	Vulnerabilities and sensitivities due to conditions, stresses, changes, or forces that affect the respondent, his/her family and/or community, and local livelihoods related to excess precipitation (torrential rain, flood, excess precipitation, snow).
VULDROUGHT	81	257	Vulnerabilities and sensitivities due to conditions, stresses, changes, or forces that affect the respondent, his/her family and/or community, and local livelihoods related to drought.
VULSOC	80	345	Vulnerabilities and sensitivities due to conditions, stresses, changes, or forces related to social arrangements and relationships that affect the respondent, his/her family and/or community, and local livelihoods. Including elements related to social capital, church, and the support of family and friends.
VULECO	78	438	Vulnerabilities and sensitivities due to conditions, stresses, changes, or forces related to the economy that affect the respondent, his/her family and/or community, and local livelihoods.
VULENVIRO	68	297	Vulnerabilities and sensitivities due to conditions, stresses, changes or forces that affect the respondent, his/her family and/or community, and local livelihoods as related to issues related to the environment. Including issues related to soil, wildlife, nutrients, and loss of biodiversity.
<b>Adaptation codes</b>			
ADASOC	81	383	The different ways in which the respondent, his/her family, and the local community have adapted to the social conditions. This includes adaptations in the form of social capital including the support of family and friends, church, and informal social networks.
ADAECO	62	291	The different ways in which the respondent, his/her family, and the local community have adapted to the economic conditions.
ADADROUGHT	55	249	The different ways in which the respondent, his/her family, and the local community have adapted to the conditions related to drought.
ADAPRECIP	49	136	The different ways in which the respondent, his/her family, and the local community have adapted to the conditions to excess precipitation (torrential rain, flood, excess precipitation, snow).
ADAENVIRO	48	102	The different ways in which the respondent, his/her family, and the local community have adapted to the conditions related to the environment. Including issues related to soil, wildlife, nutrients, and loss of biodiversity.

**Table 3** Summary of findings: connecting climate, adaptation, and social capital<sup>a</sup>

Area <sup>b</sup>	Sensitivity	Adaptative strategy	Relevant form(s) of SC	Relationship with SC	Implications for climate change and adaptation								
Sensitivities/vulnerabilities PC RL SV TB	Farm depopulation Urbanization		Bonding Linking	Sensitivities negatively affect SC	<ul style="list-style-type: none"> <li>- Increased geographical and social distance between neighbours</li> <li>- Reduced informal resources for emergency response (e.g. neighbours)</li> <li>- Reduced formal resources for emergency response</li> <li>- Cause of conflict and division within community</li> <li>- Affects cohesion and mutual support in crisis</li> <li>- Fuels depopulation trend</li> <li>- Homophily reinforced</li> <li>- Less broad community cohesion</li> <li>- Marginalized people may not have strong support during crisis</li> <li>- Over reliance on informal social capital during disasters</li> <li>- Climate challenges may override local capacity</li> </ul>								
						Farm size tension/land grabbing	Bonding	Sensitivity negatively affects SC	<ul style="list-style-type: none"> <li>- Less broad community cohesion</li> <li>- Marginalized people may not have strong support during crisis</li> <li>- Over reliance on informal social capital during disasters</li> <li>- Climate challenges may override local capacity</li> </ul>				
										Ethnic tensions or racism	Bonding Bridging	Bonding SC contributes to sensitivity Sensitivity negatively affects bridging SC	<ul style="list-style-type: none"> <li>- Environmental consequences (e.g. oil well abandonment)</li> <li>- Gas flaring as cause of fire</li> </ul>
PC RL SV TB	Insufficient formal emergency services or disaster planning Exploitation, problems caused by oil/gas companies and other corporations Negativity toward/exclusion of “new” families		Linking	Lack of linking SC exacerbates sensitivity	<ul style="list-style-type: none"> <li>- Reduced adaptive capacity to drought (divestiture of dams in Rush Lake)</li> <li>- Reduced trust in government</li> <li>- Gender roles re-entrenched during crisis (e.g. women make sandwiches)</li> <li>- Reduced agency for women in crisis response</li> </ul>								
						Government divestment	Linking	Mutually reinforcing	<ul style="list-style-type: none"> <li>- Excluded families may not have strong support during crisis</li> </ul>				
										Gender roles reinforced	Bridging Linking	Bridging SC contributes to sensitivity Sensitivity negatively affects linking SC	<ul style="list-style-type: none"> <li>- Reduced adaptive capacity to drought (divestiture of dams in Rush Lake)</li> <li>- Reduced trust in government</li> <li>- Gender roles re-entrenched during crisis (e.g. women make sandwiches)</li> <li>- Reduced agency for women in crisis response</li> </ul>

**Table 3** (continued)

Area <sup>b</sup>	Sensitivity	Adaptative strategy	Relevant form(s) of SC	Relationship with SC	Implications for climate change and adaptation
PC	Division and conflict over land use		Bonding Bridging	Negative effect on SC	- Lack of women on councils reduces women's involvement in adaptation planning Conflict and division within community affects cohesion and mutual support in crisis
Adaptive strategies					
PC		Neighbourly support in crisis	Bonding Bridging	Mutually reinforcing	Enhanced local support for fire, flood, other disaster response (neighbours helping neighbours)
RL					Enhanced local support for fire, flood, other disaster response
SV					
TB		Hutterite firefighting brigades	Bridging	Mutually reinforcing	
PC					
RL		Information sharing between farmers	Bonding	Mutually reinforcing	Increased information to improve environmental and adaptive practices
SV					
TB					
RL		Resource sharing (e.g. water rights, equipment)	Bonding Bridging	Mutually reinforcing	- Increased adaptive capacity (access to water, firefighting equipment) - Reduced financial vulnerability (e.g. shared equipment to save costs)
SV					
TB					
PC		Women's contributions to disaster response (e.g. food provisioning)	Bridging	Mutually reinforcing	Enhanced coping ability and provision of essential needs during crisis
SV					
TB		Mutual support between citizens, local emergency response, and provincial government	Bridging Linking	Mutually reinforcing	- Multi-level governance integration to support emergency response and long-term adaptation - Enhanced formal emergency response (e.g. fundraising for new firefighting equipment) - Environmental remediation and conservation - Drought preparedness Support for evacuees and others experiencing climate disasters
PC		Landowners' rights groups, irrigation groups	Bonding	Mutually reinforcing	
TB					
PC		Local emergency support groups/committees (including religious groups and churches)	Bridging	Mutually reinforcing	
TB		Municipal and provincial intervention in water conflict, disaster management	Linking	Positive or negative (depends on process and outcome)	
SV					
TB					

Table 3 (continued)

Area <sup>b</sup>	Sensitivity	Adaptative strategy	Relevant form(s) of SC	Relationship with SC	Implications for climate change and adaptation
PC		Hutterite communal disaster fund	Bonding	Bonding positively affects adaptation	- Problems in programme administration (e.g. slow response) can hamper faith in government for future issues
SV		Volunteer run fire and emergency management	Bonding Bridging Linking	Mutually reinforcing	Enhanced adaptive capacity for Hutterite colonies
PC		Land easements with NGOs	Linking	Linking positively affects adaptation	Increased resources for fire response Environmental preservation

<sup>a</sup> Some findings likely exist in all communities; however, findings are labelled according to the community in which those findings appeared in the data

<sup>b</sup> PC, Pincher Creek; RL, Rush Lake; SV, Shaunavon; TB, Taber

Social capital was often connected to existing sensitivities and specific adaptive strategies. Farm depopulation, coupled with increasing average farm size, was a commonly mentioned socio-economic sensitivity that increased both geographical and social distance between neighbours, negatively affecting social capital. A Rush Lake farmer (#6) said “You know, the population density is so low here now that if I go west from here I don’t run into occupied land for at least four or five miles [6.5 to 8 km]. There is nobody”.

Reliance on neighbours for fire response—one of the most commonly mentioned adaptive strategies—is problematic when neighbours are increasingly few and far between. As retired Pincher Creek farmer (#3) noted:

When it is dry, if for some reason a fire starts out here in the middle of the field before I even know it’s there, they [neighbours] are probably here ... I don’t think it is as good as it used to be years ago. I think back 70 years and you were always doing something for your neighbour.

In Shaunavon, participants spoke about the centrality of informal social capital for emergency response. Crucial public services like the fire department, food bank, and emergency coordination were provided by a few volunteers who believed in the cause. They were occasionally assisted by formal organizations (e.g. provincial emergency management authorities).

In Rush Lake, a very small community with proximity to a small city, both rural depopulation and urbanization had led to social fragmentation and reduction of social capital. While social capital was evident primarily amongst certain families with a long history in the area, some participants indicated that exclusion may exist toward “new” families who had recently come to the area. Such exclusion may prevent people from accessing supports during times of crisis. A Rush Lake resident (#11) gave an example:

Now speaking of these people whose house burned, I tried to generate some community support for them and it just wasn’t there. Now maybe because they were young, they were new, they weren’t long timers here, didn’t have any family in the community.

In Taber, high economic capital (due to advanced irrigation and production of high-value vegetable crops) is linked to social cooperation; for example, farmers have self-organized into irrigation organizations. Taber participants espoused a strong individualism and resistance toward government intervention, preferring self-organization to more formal government involvement. In contrast, the Pincher Creek community featured more formalized social capital, particularly bridging



and linking types, which was facilitated by the relatively high levels of formal education amongst residents (a form of human capital). Pincher Creek participants had established formal groups for water management or environmental issues, which often interacted with higher levels of government. However, the groups were not always in agreement with each other, and the community has been embroiled in debates over issues such as logging, power lines, land subdivision, and wind power. Pincher Creek also featured (relatively) high social heterogeneity caused by the presence of retirees, urban weekenders, and tourism providers—drawn to the area by the combination of prairie, forest, and pristine mountain views—alongside established ranching families.

In the following sections, we discuss these themes using Szreter and Woolcock's (2004) threefold framework of bonding, bridging, and linking social capital. *Bonding* social capital refers to closely knit groups joined together by friendship, kinship, or some kind of shared social identity. *Bridging* social capital refers to relations between bonded groups or “between people who know that they are not alike in some socio-demographic (or social identity) sense” (Szreter and Woolcock 2004, p. 655). Whereas bonding and bridging relations tend to exist between (more or less) horizontal groups; *linking* social capital describes vertical relations between individuals or communities and broader political, economic, and institutional structures with different levels of authority (Szreter and Woolcock 2004; Poortinga 2012). The findings illustrate how each type of social capital is affected by existing socio-economic sensitivities, and how social capital facilitates adaptation to extreme events. The “Discussion” section highlights key implications of social capital for climate change adaptation.

## Bonding social capital

Like many other rural communities in North America, the populations of the four communities are quite socio-demographically homogenous.<sup>2</sup> Participants were predominantly white, of European heritage, English-speaking, and were bonded by a shared agricultural history and identity. This homogeneity facilitates what Lin (2001) called “homophilous” social interaction between people with shared sentiments. Bonds and allegiances were based heavily on kin, friendship, and neighbour relationships.

Bonding social capital within homogeneous groups sometimes fuelled collective resistance against the extractive power of external forces. A group of Pincher Creek farmers had

<sup>2</sup> For example, 2016 Census profiles show that in Pincher Creek municipal district (MD), 95% identified as “non-Aboriginal identity” and 99% as “not a visible minority”; in Rush Lake (rural municipality of Excelsior), 98% and 100%, respectively; in Shaunavon (town of), 93% for both; and in Taber MD, 99% and 97% (Statistics Canada 2017c). Because the Shaunavon study area included four surrounding RMs, town-level data are provided here as an indicator.

come together to challenge oil companies' abandonment of unused oil wells on their property. One group member (PC #2) explained that “With the oil and gas...we are really having to come together to fight for our rights here...we had to get together as landowners to fight to get this stuff taken care of, because really nobody in government is helping”. Indeed, as discussed later, informal social relations often filled the gap for insufficient public supports.

While homophily strengthened bonding social capital, heterogeneity and differentiation negatively affected bridging social capital. Driven by economic pressures and productivism (Fletcher 2017a), larger farms are growing larger and some smaller-scale farmers are leaving the industry altogether (Statistics Canada 2017a, b). Tensions have erupted over access to land and accusations of “land grabbing” by larger farmers. A comment by one Taber farmer (#7) illustrates this issue:

Right now, because there's a certain segment of our agricultural community that are very aggressive, there are problems [...] they don't think nothing of stepping all over their neighbour. Yes, and affluence breeds two ugly children, greed and indifference, and that's sad.

In contrast to the region's history of collective agrarian protest during the early 1900s (Fowke 1957; McCrorie 1964; Fletcher 2017b), participants noted a strong ideology of individualism that decreases social capital: “It would be nice if there was some old school person that would help [...but] people nowadays are just too ‘me, me, me’ and ‘how do I benefit from this?’” (Rush Lake resident #11). In sharp contrast to local Hutterite communal farms,<sup>3</sup> resource sharing amongst most farmers was limited to a few farmers who shared equipment or water sharing during crisis. Many, however, engaged in information sharing as a form of bonding.

The farm size tension is linked to a second line of differentiation, i.e. ethnicity and immigration. In Rush Lake, Shaunavon, and Taber, nearby Hutterite communities were sometimes blamed for “land-grabbing” and, due to their communal society and collective farm operations, were seen to have “deeper pockets than your average individual family farmer” (Rush Lake producer, #4). However, Hutterite colonies provide an example of how collective action can facilitate climate adaptation. A Hutterite participant described how colonies across North America had created a collective emergency fund for colonies experiencing drought or other disasters.

In Taber, racism and anti-immigrant sentiment existed toward Mexican immigrant workers. As one farmer described it:

<sup>3</sup> The Hutterian Brethren or Hutterites are a culturally distinct faith-based group who live and farm communally. Hutterite colonies can be found across the prairie region of North America. Many Hutterite communities are engaged in large-scale, industrialized, and highly technological farming. For more information, see <http://www.hutterites.org>

“what I find is there is a lot of people that absolutely hate them [Mexican immigrant workers], because they’re immigrants, and [...] the government throw[s] so much money at trying to get them to go ahead it doesn’t make sense” (TB #12). In this way, bonds between homogenous residents were sometimes cemented through notions of ethnic difference from Hutterite communities or immigrants. As discussed below, however, bridging social capital blurred these cultural boundaries in times of crisis.

### **Bridging social capital: it takes a (climate) crisis**

Bridging social capital was often latent until activated by a crisis (Pelling 2011); as a Taber farmer (#7) stated “You may never visit [neighbours], but when they’re in trouble, you’ll help them out”. Mutuality in crisis transcended lines of difference across bonded groups (Hawkins and Maurer 2010). Despite ethnic tensions described previously, many participants praised the contributions of Hutterite communities during wildfire events. Many Hutterite colonies had purchased decommissioned fire trucks and firefighting equipment. They were often the first to arrive during a fire: “[If] you have got a fire, the colonies will show up with 100 men ready with shovels to start fighting fires” (Shaunavon town resident, #17). Between-group differences became less significant during a crisis, with allegiances shifting depending on the issue at hand.

Crises also transcended tensions about farm size. Larger farmers, for example, were seen to have the resources to help their neighbours:

Lots of the neighbours in that little hamlet [small village] wouldn’t have the resources [to fight fire]. But there’s probably four farmers in the area that would say, hey, we’ll bring our 500-horsepower tractor and blade out, and help you out, because there still is that sense of community in a crisis, and that’s true worldwide. In a crisis most people will tend to help others out (Taber producer #9).

### **Linking social capital**

Although formal organizations may encourage social capital between actors (Adger 2003b), our findings indicate that informal social capital was most relevant (see Table 3). Informal bonding and bridging social capital sometimes compensated for a lack (or perceived lack) of more formal linking social capital. In rural areas with limited resources and geographical dispersion, emergency services can be a long time coming: “You really rely on neighbours and stuff like that in those initial moments” (Shaunavon producer #13b). A local

government representative in Shaunavon (#11) pointed out a key rural/urban difference, explaining that

When a disaster happens in a city, you learn to count on the people who are paid to look after those things, to look after them for you. When you live in a smaller community, you learn to look after yourself because there isn’t necessarily always that help coming in the time period you need it to come, and you know that.

The study communities also featured a strong ideology of rural independence, which runs contrary to government intervention. Participants often felt misunderstood by urban people and policymakers. As one Pincher Creek rancher (#2), who was heavily involved in grassroots conservation groups, put it: “we as agriculture have to start educating not just those [city] people, but government because [the city] is where our government is coming from”. Indeed, informal arrangements were often seen as preferable to formal ones imposed by outside authorities from urban areas. The case of a widespread regional drought in 2001–2002 showed the importance and flexibility of social capital. In Alberta, water licences for irrigation are governed by a “first in time, first in right” principle, where producers with the oldest licences (often passed down intergenerationally) were the first to receive water. During the severe drought of 2001–2002, junior licence holders were unlikely to receive any water allocation for their crops. In response, community members joined together to override the formal water rights system. One participant described the agreement:

In 2001, what we did—and this had never happened in history, but it was a historic thing—everybody got together and we all shared. It was share and share alike...It’s much more complicated than that, but that was the idea...so that was one of the things we did to mitigate that drought (Taber producer #13).

In a similar vein, Rush Lake irrigators expressed concern about a recent federal government decision to divest from publicly funded irrigation infrastructure in the area. The divestment had fuelled some anger toward government and, for some, revealed the precariousness of relying on government supports.

Adaptation and mitigation efforts were often self-organized in explicit resistance against formal policies. Several feedlot operators had joined together to implement environmentally responsible practices such as waterway protection. One of these Taber producers (#15) explained the motivation, stating that “We’re hoping to self-govern how things get done rather than having a heavy-handed approach from government or something else. And find the solutions and work together”.

Despite the general prominence of informal and self-organizing social capital, linking between emergency management organizations and farmers did occur frequently in the case of fire response. In Taber, a representative of the fire department (#2) pointed out that “in the rural areas...if we have a major grass fire, we can’t do it with fire trucks—we need cultivators and ploughs and graders that make fire breaks—so farmers are really good [as a resource]”. Several communities had also locally fundraised to purchase new firefighting equipment. Conversely, at times, local governments were seen to stand in the way of citizens’ own adaptation efforts. A Rush Lake participant described a grassroots effort to organize a regional emergency management organization; according to the participant, these efforts had been hindered by territorialism amongst local government officials.

Despite the value of informal arrangements, assistance from government may be necessary to support coping and adaptation efforts, particularly in the face of more severe and widespread climate hazards. For example, many municipalities rely on provincial disaster assistance, such as the Provincial Disaster Assistance Program (PDAP) in Saskatchewan, to deal with drought and flood disasters. Government intervention was also sought when social capital failed. For example, when neighbours argued over water drainage during flood events, farmers sought recourse through the local and provincial governments, thus illustrating the importance of linking social capital for reconciling conflicts. One local government representative (#5) in the Taber area pointed out that “[Farmers] get the County to deal with it and they let Alberta Environment deal with it...they probably don’t even deal with each other. They just complain to the County right away and then the County starts calling Alberta Environment”. In the Pincher Creek area, disagreements about land use and development had caused some landowners to sign formal conservation easements with national environmental organizations like the Nature Conservancy of Canada to ensure their land was protected in the future.

## Gender and social capital

Although gender was not a main focus of the study, it emerged inductively as a significant cross-cutting dimension across all three forms of social capital. Buchanan et al. (2016, p. 352) noted that scant attention has been paid to the gender dimensions of various capitals, including “how men and women contribute differently to these capitals”. Gender divisions of labour remain strong in industrialized agricultural contexts, where farming is consistently constructed as a masculine profession (Carter and Lopez 2019) and women’s contributions are often marginalized as support work (Alston et al. 2018). Gendered work roles shape both impacts of, and responses to, climate disasters (Fletcher and Knuttila 2016; Fletcher 2017a), and crises may further entrench existing gendered relations of

power (Alston 2006). For example, a Shaunavon participant (#16) described the gendered division of labour during a historic wildfire:

Well, you see there was [the towns of] Shaunavon, Eastend, Maple Creek and some of the Hutterite colonies, they all banded together and this is why they phoned us and asked the [women’s club] ladies if we would make them sandwiches...so then we say, ‘alright, we have to make 1,000 sandwiches’ and you make a phone call and you maybe have 20 ladies up there like an assembly line making sandwiches.

Gender roles and discourses also tended to reinforce ideas about women’s “natural” or universal roles. A Pincher Creek rancher (#01a) who belonged to several women’s groups suggested that these behaviours are characteristic of women:

I just can’t believe how tight the community is in the face of adversity. I think, from talking to these women about the history of this, *they came together just like any women do with little children*...because of the disasters they have had including that fire, which has just cemented their relationships and their need now to work together. It is amazing. [emphasis added]

Although the importance of women’s contributions must be recognized, social capital based on rigid gender roles and ideologies may exclude women from the “front line” of climate response, including decision-making and control (Fletcher and Knuttila 2016). Municipal councils play a leading role in preparation and response to fire, flood, and other climate extremes. In the study areas, these councils consisted overwhelmingly—and sometimes entirely—of men. A male member of rural council (SV #12) volunteered that

[The councillors] are all farmers or ranchers, yes, and they’re all men. I only ever had one lady councillor when I first started ... It was nice because they bring a different perspective to the table and I don’t know why we can’t get more ladies involved. They just think it’s a man’s [job], all of this road construction and all of this, so they think they can’t figure it out and they can’t understand it.

A female government representative (RL #3) responsible for water regulation felt a lack of trust from male rural stakeholders, noting that it “might be a bit of a gender thing”. Similarly, a Taber farm couple (#01) discussed the rigid gender roles that continue to exist

in agriculture generally, pointing out that farming remains “a man’s world” where men make the decisions. Accordingly, several participants were reluctant to pass the farm down to their daughters: “even the odds of [daughter] finding some young gentleman to marry that would actually want to farm right now, and have the skills to, is a little daunting” (SV farmer #2).

The intersection of gender and social capital may, at times, constitute a “dark side” to social capital (Field 2008) that reinforces existing social inequalities and gender roles in times of crisis. When gendered roles and stereotypes persist in agriculture and rural governance, women are less likely to play an agential role in adaptation planning and disaster response—both on and off the farm. Indeed, conversations about fire or flood response often centred on the activities of men, indicating the ongoing invisibility of women’s contributions in times of crisis.

## Discussion

Overall, our findings demonstrate the salience of informal bonding and bridging social capital for rural communities facing climate hazards—albeit with significant caveats. During a crisis, informal social capital is a crucial form of support: for many rural residents, the first and best source of help is the neighbour down the road. As one Taber participant (#12) put it, “you relied on God and your neighbour to get through it”. Beyond optimistic and often-romanticized portrayals, however, the findings add important social, political, and economic nuances to otherwise positive assessments of social capital for climate adaptation.

Bourdieu (1986) argued that social capital reflects the “structure of the social world” with its associated power disparities and structural constraints (Bourdieu 1986, p. 15). Our qualitative findings support Bourdieu’s materialist orientation and the ongoing influence of political-economic structure on social capital. Economic vulnerabilities were mentioned most frequently by participants, while social factors were the most commonly mentioned adaptations (Table 2). As shown in Table 3, social capital was negatively affected by broader socio-economic sensitivities like increasing farm size and depopulation. Participants spoke of the growing distance between farmers, loss of rural businesses and services, and an individualism and competition that runs counter to the region’s history of agrarian collectivism (Fowke 1957). These political-economic trends can damage social capital while paradoxically increasing people’s dependence on it.

Entrenched bonding social capital may, at times, reinforce existing prejudices and social cleavages (van Deth and Zmerli 2010), leading to social exclusion that could render some people more vulnerable than others. Tensions and exclusions on the basis of race, ethnicity, immigration status, and other

“difference” were exacerbated by economic issues (e.g. perceived “land grabbing” by Hutterites and hostility about government supports for Mexican immigrant farmers). While a crisis had the power to bridge people together across ethnic difference, the same crisis tended to reinforce gendered roles and responsibilities (Alston 2006; Fletcher 2017a), limiting women’s agency in adaptive decision-making on the farm and on local councils. Social exclusion and marginalization means that important voices may not be heard in adaptation planning. Further, when combined with highly informal approaches to emergency response—such as relying on neighbours to warn each other of an impending fire or flood—marginalized people could be left behind.

Despite its importance in rural communities, informal social capital should be approached with caution as a solution for adaptive capacity in the face of climate change. Overdependence and overemphasis on informal social capital may reinforce the status quo of neoliberalism and social inequality. Dependence on informal social capital may imply that “differentials can be fixed ‘on the cheap’ with ‘social support’ and ‘self-help’ networks, without needing to give any serious attention to the more contentious issues of inequalities in ownership of wealth and in distribution of power” (Szreter and Woolcock 2004, p. 652). Addressing the structural factors that shape vulnerability may require larger-scale, organizational responses that go beyond collective self-organization to foster proactive adaptation (Jordan 2015)—particularly as rural communities face increased risk from climate change (Wheaton and Kulshreshtha 2017).

## Conclusion

The combination of socio-economic sensitivity, reliance on informal social capital for adaptation, and impending climate risks suggests a precarious future for Prairie farmers. Despite the strength of bonded networks and existing adaptive capacity in the region overall (Warren and Diaz 2012; Warren 2016), depopulation has thinned social networks (McLeman 2010) and reduced economic capital increases vulnerability to future disasters. Future climate extremes may exceed the current abilities of local individuals, groups, and communities to respond.

There is a need for more effective linking of social capital between rural residents, their governments at various levels, and other formal organizations. While social capital may fill the gaps for missing institutional responses and may even be preferred over institutional responses, more severe and expensive disasters will require public support from multiple levels. Social capital was particularly relevant in immediate disaster response,

but larger-scale support will be needed to push beyond coping and toward longer-term adaptation. Although informal social capital must be recognized, respected, and supported as a key aspect of climate adaptation, it cannot serve as a replacement for government assistance with disaster coping and adaptation. Increased social acceptability of services and programmes provided by formal organizations is key, especially in locations with a degree of scepticism toward government. Successful institutional adaptation will require strong relations of linking social capital and trust in organizations (Jones et al. 2014). Reimer et al. (2013) presented examples of successful horizontal governance between bureaucratic actors, community associations, other local community members, which constitute multiple forms of linking social capital in response to a wildfire event.

In light of tensions toward urban policymakers, social acceptability of a service or programme is important (Adger 2003b; Leap and Thompson 2018). Attention must be paid to what works (and does not work) for communities, which requires careful attention to social dynamics and social capital. Policymakers should conduct meaningful consultation that recognizes local values, sensitivities, and diversity within rural communities. This means taking steps to ensure inclusion of marginalized voices. Such approaches can result in practical and useful adaptation policies and programmes designed through linking social capital. Although discretely identifiable, the three forms of social capital do not stand alone. Interconnected and mutually reinforcing relations between bonding, bridging, and linking social capital are crucial in preparation for future climate change.

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## Compliance with ethical standards

**Conflict of interest** The authors declare that they have no conflict of interest.

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