Of Climate and Weather: Examining Canadian Farm and Livestock Organization Discourses from 2010 to 2015

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ABSTRACT

Producer organizations representing Canada's farm and livestock sectors are powerful change agents and advocates for their industries, particularly during challenging times such as climate- or weather-related hardships. Such organizations have a complex role: engaging with policy-makers, as well as their memberships and the public, to pursue the interests of their specific communities. This paper includes an examination of how farm producer organizations communicate about climate and weather to these various audiences, and the specific needs and recommendations they advance. Of particular interest are commodities related to pasture-based grazing, which is underrepresented in the climate adaptation literature. A collection of 95 publicly available documents is analyzed, representing a snapshot of climate- and weather-related public and policy engagement of Canadian and Albertan farm and livestock producer organizations from 2010 to 2015. Qualitative coding by scale, commodity, and audience revealed three significant patterns within this exploratory study. First, while national ''umbrella'' organizations speak climate to government, Alberta-based livestock/forage organizations speak to their members with a focus on weather. Second, while the two national umbrella organizations examined are politically divergent, they appear to be united on the topic of climate change. Third, common ground was also found between climate and weather discourses around on-farm management, specifically rotational grazing. These three patterns reveal a disjointed dialogue within the Canadian farm and livestock sectors on topics of climate adaptation and mitigation, as well as opportunities for future cooperation, and the need for further research on farm organization beliefs and their capacity to create/manage climate knowledge.

1. Introduction

Producer organizations have important roles to play in adapting food and fiber production to changing climate realities. In fulfilling these roles, they need to advise their membership as well as advocate for resources and support for their members with policy-makers and the public (Dawson 1982), all in reflection of members' experiences and values (Tarnoczi and Berkes 2010). Some policy innovations in conservation agriculture have emerged from the grassroots (Hart et al. 2016), such as the Canadian Alternative Land Use Services (ALUS) program for ecosystem service stewardship (France and Campbell 2015). Other initiatives are more top-down, for instance, Canada's Growing Forward (GF),[1] an investment package, policy framework, and federal–provincial–territorial partnership that aimed to encourage innovation and adaptability, including environmental stewardship, water management, and mitigation of greenhouse gas emissions (Agriculture and Agri-Food Canada 2008). GF comprised several business risk management (BRM) programs, such as AgriInsurance, AgriStability, and AgriRecovery, that aim to support

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[1] Growing Forward (GF) ran from 2008 to 2013 and was replaced by Growing Forward 2 (GF2), which ran from 2013 to 2018. In 2018, GF2 was replaced by the Canadian Agricultural Partnership.

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producers in managing both normal risks in business activities, such as minor and moderate economic shortfalls, as well as catastrophic challenges, such as extreme flooding, disease outbreaks, and market crashes (Agriculture and Agri-Food Canada 2008). A diversity of policy instruments, including a combination of bottom-up and top-down initiatives, is generally required to build sectoral resilience in the face of uncertainty (Bizikova et al. 2014; Swanson et al. 2010). This paper explores Canadian and Albertan farm and livestock organization discourses regarding climate and weather. Analysis of available organizational discourses, including target audiences and organizational mandates, reveals tensions within the farm and livestock organizations that serve as key sources of knowledge and leadership around climate change mitigation and adaptation strategies. Through this analysis, we contribute to several bodies of literature, including climate adaptation strategies (Fazey et al. 2010; Smit and Skinner 2002), the formation and role of farmers' beliefs and attitudes about climate change (Prokopy et al. 2015; Morton et al. 2017b), and the unique position of rangelands vis-à-vis climate change (Joyce et al. 2013; Sherren et al. 2012).

a. Climate adaptation in farming

The two central terms, *climate* and *weather*, are used throughout this paper to capture and examine a discursive dichotomy between long-term and short-term atmospheric states and their terrestrial implications. While weather is a cardinal issue for day-to-day farming, impacting decision-making on daily, weekly, and seasonal bases, weather is also a product of larger and longer-term climate patterns and trajectories, and observations of weather help us characterize climates and track their change. Climate is thus entangled with weather in ways critical for those whose livelihoods are vulnerable to them, but the two terms are discursively distinct. Understandings and meanings of the terms weather and climate are co-constitutive but each represents a unique historically and culturally embedded discourse (Hulme 2016). A better understanding of such discourses is particularly relevant because a focus on short-term capacities for coping with change may be insufficient to reduce our vulnerabilities to environmental change (Fazey et al. 2010).

There are four broad methods available for adapting farming to exogenous changes such as climate: technological developments, such as new crop varieties and improved forecasting technologies; government programs and insurance (e.g., Growing Forward); farm production practices (e.g., grazing methods); and farm financial management (Smit and Skinner 2002). While these categories are not exhaustive or mutually exclusive, they provide a useful typology for comparison with the environmental adaptation types offered by Fazey et al. (2010). The first two are described as "buffering" or "techno-fixes" by Fazey et al. (2010) and are perhaps less preferable because they do not require behavioral changes to prevent human-caused environmental problems.[2] For instance, Organisation for Economic Cooperation and Development (OECD) scholars have noted that payments such as those in AgriStability that reduce the variability of farm income in the face of disasters (whether climate or weather related) tend to reduce the likelihood of farmers changing their practices (Kimura and Antón 2011). Such programs may in fact reduce resilience to future change, as observed by Adger et al. (2011) in the context of international agricultural drought policy; however, the reduction may be hidden by the ongoing anthropogenic inputs that camouflage the ecological signals of environmental decline (Rist et al. 2014). The last two adaptation options—farm practices and financial management—empower the producer to make changes at the farm level, and the best strategies will 1) aim to remove the drivers of negative changes, 2) maintain or increase the potential number of future management options, and 3) improve producer adaptive capacity (Fazey et al. 2010; Tarnoczi 2011; Wandel et al. 2009). The overlapping challenges of climate change adaptation, atmospheric carbon mitigation, and sustained livelihoods can be challenging for individual farmers to manage (Beilin et al. 2012). What is more, farmers are heterogeneous in their willingness to adapt, which is partly a matter of beliefs about the existence and causes of climate change.

b. Farmers' perceptions and climate discourses

The presence of contrasting farmer identities and attitudes means that even if the best strategies for climate adaptation are identified, farmers' decision making will also reflect how they understand themselves (Morton et al. 2017b). That is, it may take a more conservationist-minded farmer to implement climate adaptation and mitigation strategies, suggesting that changes are more than just about income and annual productivity (Morton et al. 2017b). Variability in beliefs about climate change, particularly regarding its human causes (and as a result, the need to react), is problematic for advancing climate adaptation and mitigation strategies (Prokopy et al. 2015). And certain actors in the agriculture sector (e.g., farm groups) act as gatekeepers of climate information, influencing what

[2] There are exceptions to this categorization, as "techno-fixes" such as improved forecasting technologies may involve behavioral changes. There are certainly climate change adaptation options that could be informed by the adoption of such decision support tools (Mase and Prokopy 2014).

content is disseminated and how it is framed (Prokopy et al. 2015). In some cases, the control of climate information can be understood as an effort to "manufacture uncertainty" about the existence of climate change, especially its human causes (Dunlap and McCright 2010). It is important to understand the identities, attitudes, and perspectives that play a role in climate mitigation and adaptation strategies, as well as the embedded discourses from which they arise (and to which they contribute).

Research on climate awareness and attitudes toward adaptation reveals important insights about the heterogeneity of perceptions in Canada and elsewhere. A study of British Columbia livestock farmers recently showed that a majority of that group acknowledged the reality of human-caused climate change, particularly among the more recent entrants to the industry (Cox et al. 2015). Markedly less likely to acknowledge anthropogenic climate change, Albertans (as well as residents of Manitoba and Saskatchewan) are more ideologically aligned with the United States than with their more liberal neighbors in British Columbia (Lachapelle et al. Rabe 2012). In the polarized political environment in the United States, typically conservative farmers have been shown to be very skeptical of human-caused climate change (Prokopy et al. 2015; Running et al. 2017), and in the face of climate uncertainty tend to avoid commitments to changing their practices (Morton et al. 2017a). In the United Kingdom, researchers report contrasting discourses about climate awareness and a willingness to change behaviors (Hyland et al. 2016). For instance, Scottish dairy farmers are less skeptical about the trends and causes of climate change than they are about its risks to their own livelihoods (Islam et al. 2013). It has been shown elsewhere, however, that heightened risk perceptions are critical to the willingness of individuals to adapt (Hamilton-Webb et al. 2017; Mase et al. 2017). Discourses developed and disseminated by producer organizations contribute to the overall development of knowledge and perceptions vis-à-vis climate change, and a better understanding of such discourses may point to new avenues for climate adaptation and mitigation.

c. Climate discourse in Alberta's livestock industry

Climate adaptation in the context of livestock commodities is a growing area of study, and quite separate from the discussion related to crops. This separation is perhaps because of the role of livestock as a direct contributor to climate change through methane emissions and land clearing for pasture (McAlpine et al. 2009), and perhaps due to the role of grazing as a potential mitigating factor, through carbon sequestration in native pastures (Joyce et al. 2013). Livestock production covers large areas globally (Erb et al. 2007), and growing global appetites for meat are inspiring that footprint to grow (Foley et al. 2005; Tilman et al. 2002). Associated environmental impacts include: deforestation leading to biodiversity and carbon sequestration losses, increased greenhouse gas emissions, and what has controversially been called desertification (Asner et al. 2004).

Many of Canada's farming areas, particularly the Prairies that cover southern portions of Alberta, Saskatchewan, and Manitoba, are projected to become increasingly warm and arid as climate change continues (Amiro et al. 2014; Sauchyn and Kulshreshtha 2008), leading to uncertainty about water supply (Wandel et al. 2009). In these and other places, increased storm action will cause flooding and erosion as well as threatening livestock. Adaptive practices such as on-farm wetlands (to improve and regulate water quality) and shelterbelts (to maintain water tables and increase soil biomass) are often recommended (Sherren and Verstraten 2013; Tarnoczi and Berkes 2010; Wall and Smit 2005), but there seems to be less agreement about exactly what kind of livestock management (e.g., rotational regime) is best suited to climate futures (Briske et al. 2014; Sherren et al. 2012). For instance, high-intensity but short-duration grazing approaches such as adaptive multipasture grazing or so-called Holistic Management focus on maintaining perennial grass cover and are being examined for their carbon sequestration potential (Teague et al. 2016), among other outcomes.

Alberta is uniquely suited for exploring climate discourses among farm and livestock organizations. With by far the largest cattle herd, Alberta represented two-fifths of the national total in 2016 (Statistics Canada 2017). This production is largely directed at the export market and is dominated by global corporations (Davidson et al. 2016). Furthermore, Alberta's political culture has seen a decades-long favoritism of fossil fuel sector interests over environmental concerns (Adkin 2016), and Albertans are reportedly more skeptical than other Canadians about the existence and human cause of climate change (Forum Research 2014). We set out to understand how livestock and forage producer organizations in Canada and Alberta describe their climate challenges and preferred solutions, by reviewing their publicly available documents, such as press releases and annual reports, which capture the discourses produced by these sectors. This exploratory study offers an initial picture of how Canada's farm and livestock sector understands and communicates about the current and future challenges of climate change, including potential interorganizational divergences across scales or commodities.

2. Methods

We sought to examine the ways in which producer organizations discuss climate- and weather-related challenges

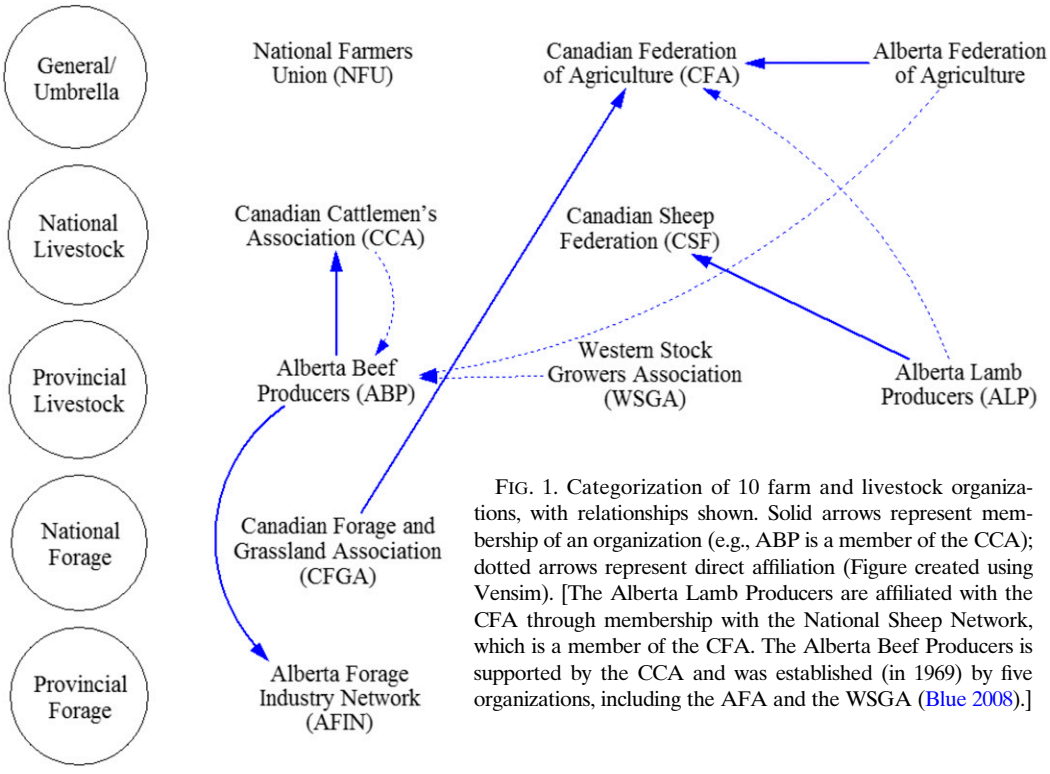

FIG. 1. Categorization of 10 farm and livestock organizations, with relationships shown. Solid arrows represent membership of an organization (e.g., ABP is a member of the CCA); dotted arrows represent direct affiliation (Figure created using Vensim). [The Alberta Lamb Producers are affiliated with the CFA through membership with the National Sheep Network, which is a member of the CFA. The Alberta Beef Producers is supported by the CCA and was established (in 1969) by five organizations, including the AFA and the WSGA (Blue 2008).]

and associated agriculture policy in Canada (national level) and Alberta (provincial level); the intersection of climate concerns and pasture-based grazing was of particular interest. We selected 10 of the most active producer organizations, representing general agriculture, livestock, and forage practitioners at both a national and provincial scale, the latter specifically the province of Alberta in the Canadian Prairies, which has the largest grazing economy in the country. The National Farmers Union (NFU), the Canadian Federation of Agriculture (CFA), and the Alberta Federation of Agriculture (AFA) represent the three umbrella groups looked at, the former two being national in scale. The remaining seven organizations constitute key organizations representing the grazing economy in Alberta and nationally. Importantly, the organizations analyzed in this study are interconnected across scales and scopes (see Fig. 1).[3]

For the years 2010–15 we collected all documents from these organizations that represented communications with the public (news releases), government (policy documents and lobbying registrations), and organization members (minutes, annual reports, and newsletters). While previous studies exist that explore the discourses of agricultural interest groups (Brasier 2002) as well as climate change content in agricultural trade publications (Church et al. 2017), this is the first known account of farm and livestock organization discourses on climate and weather in Canada. Table 1 catalogues the 10 organizations examined by scope, audience, and document type.

Most of the 95 documents comprising the final dataset were found via systematic searches of individual producer organization websites (URLs for all of these documents are available in the online supplemental information). Lobbying registrations were found by searching the same organization names for the same years within the registry of lobbying activity maintained by the Office of the Commissioner of Lobbying for Canada. These documents are the result of a filtering process to ensure that climate or weather themes were discussed. Each document was evaluated to determine whether it was pertinent to the topic of our study, that is, Canadian agricultural producers' experiences with and attitudes toward climate change and climate-related challenges, as well as interactions with agriculture policy. To identify relevant passages the documents were searched for terms determined through a preliminary

[3] The NFU's separation from these groups is notable; this is a direct-membership organization that is focused on the interests of Canadian farm families. The NFU is often critical of the status quo, supports food sovereignty movements (including being part of La Via Campesina), and opposes the concentration of corporate ownership.

TABLE 1. Organizations and document types included in this study (NR = news releases; PD = policy documents; LR = lobbying registrations; M = minutes; AR = annual reports; NL = newsletters) for each audience type (public, government, and membership).

		Public	Government		Membership			
Scope	National (n = 64)	NR	PD	LR	M	AR	NL	Provincial (n = 31)
General/umbrella	Canadian Federation of Agriculture (CFA) n = 12	CFA	CFA	CFA				
	National Farmers Union (NFU) n = 30	NFU	NFU					
		AFA	AFA					Alberta Federation of Agriculture (AFA) n = 10
Livestock	Canadian Sheep Federation (CSF) n = 2	CSF		CCA	CSF	CSF		
	Canadian Cattlemen's Association (CCA) n = 15	CCA				CCA		
		ABP	WSGA	ABP	ABP	ALP		Alberta Lamb Producers (ALP) n = 1
		WSGA				ABP		Alberta Beef Producers (ABP) n = 15
								Western Stock Growers Association (WSGA) n = 3
Forage	Canadian Forage and Grasslands Association (CFGA) n = 5		CFGA				CFGA	
							AFIN	Alberta Forage Industry Network (AFIN) n = 2

review of available documents. The text was first reviewed to find the following terms: climate, weather, storm, flood, moist, wet, rain, drought, dry, disaster, carbon, greenhouse, and greenhouse gas GHG). Additional terms were included in the search that indirectly referred to climate-oriented risk and planning, specifically the following: risk, BRM (Business Risk Management), and Growing Forward (GF).

Though it represents discourse over 6 years, this corpus represents a snapshot. The timespan of 2010–15 was selected because of an observed shift in discussion of climate change in the agricultural community following the Copenhagen Climate Change Conference in 2009. At the political level, the federal government was led by Steven Harper's Conservative government during this time, which included a formal withdrawal from the Kyoto Protocol, and the Alberta government continued its long-standing (over 40 years) Progressive Conservative leadership. Both are right-leaning governments that are less likely to take action on climate change than other parties, and both governments changed leadership in 2015.[4] Additionally, this timespan allows a thorough understanding of Canadian agriculture without the dataset being weakened by inconsistencies in data types and organizational behavior. The organizations did not always use the same document types for the same purposes, or with consistent frequency as other organizations, so a direct "apples to apples" comparison or quantitative summation was not possible as others have done (Church et al. 2017). Neither was an analysis of change over time possible, within organizations or overall. However, the final breadth of the dataset supports an in-depth analysis to develop an understanding of how Canadian producer organizations, particularly those involved in livestock commodities, conceptualize climate change and its impacts.

A mixed deductive–inductive approach to coding was employed. Deductive coding included the scale of the organization (national or provincial), its commodity focus [farming in general (i.e., "umbrella"), livestock, or forage], and the intended audience of the document (public, membership, or government). Documents were then coded using an inductive qualitative approach, with many themes identified only as they emerged in the text. Themes emerged about climate and weather impacts, hardships, risks, and recommendations for how to improve the operating environment for farmers despite all these. The coding process also included a review of the sources of evidence used (e.g., science or farmer knowledge), which are discussed in Kent and Sherren (2017). Document text was reviewed iteratively as new themes were identified, to ensure consistent use of codes. Coding was implemented using NVivo 11 software

[4] In 2015, Justin Trudeau's Liberal government replaced the Harper Conservatives at the federal level, and at the provincial level Rachel Notley's Alberta New Democratic Party replaced Jim Prentice and the Progressive Conservative Association of Alberta.

TABLE 2. Synthesis of dominant climate- and weather-related content across organizational scale, commodity type, and intended audience.

	Theme	Organizational scale	Producer group	Intended audience
Climate related	Climate	National	Umbrella	Government
	Climate-related hardships and challenges	National	Umbrella	Government Public
	Climate proposals and planning	National	Umbrella	Government Public
	GHG emissions and climate adaptation and mitigation	National	Umbrella Livestock	Government Public Members
Weather related	Weather event–related hardships and challenges	National Alberta	Umbrella Livestock	Government Public Members
	Weather event–related proposals and endorsements	National Alberta	Umbrella	Members
	Weather pattern–related hardships and challenges	Alberta	Umbrella Livestock Forage	Members
	Weather pattern–related proposals	Alberta	Livestock Forage	Members

(https://www.qsrinternational.com). The analysis used matrix queries (in NVivo language) to cross-tabulate emergent themes by deductive categories to establish who was communicating what to whom. Two authors performed the aforementioned coding and analysis, which was passed on to another author for final (re) analysis, which helped to ensure reliability and accuracy of analysis. In this subsequent stage of analysis, quotes revealed through the initial coding stages were reanalyzed at a range of discursive levels, including language/word use, authorship and audience, and social and political contexts, as well as textually embedded values and assumptions (Ruiz 2009). In the results, indicative quotes are used within the text, and tables provide a comprehensive synthesis of content. The results section (section 3) and the subsequent discussion section (section 4) include a range of references to data frequencies using phrases such as ''more likely,'' ''most common,'' and ''tend to.'' Such qualitative phrasings are preferred here as they reflect the overall focus on discursive patterns and divergences, as opposed to an analysis of word count frequencies, for example (Sandelowski 2001).

3. Results

a. Climate versus weather

A summary of climate and weather themes in relation to deductive categories (organization scale, commodity, and document audience) shows that dichotomies are at play (Table 2). National organizations proved to be much more likely than Alberta-based organizations to discuss climate issues. Similarly, documents from umbrella organizations and documents created for a government audience discussed climate more than documents from single-commodity organizations or documents prepared for other audiences (Table 2). Generally, only the Alberta organizations discussed weather in documents intended for their members. Umbrella organizations covered both climate and weather themes, but those covering specific commodities—livestock or forage—were more likely to discuss weather. The exception was the Canadian Cattlemen's Association, a livestock organization, which discussed GHG reduction with its members. Forage organizations were exclusively concerned with weather patterns.

1) CLIMATE

The topic of climate was mostly discussed by national organizations in documents intended for governmental and public audiences. This topic was identified using terms like *climate*, *climate change adaptation*, or *mitigation*, *greenhouse gas*, and *increased pests*, rather than *weather*, *storm*, *flood*, *drought*, or other terms suggesting short-term issues. Sample quotes about climate include the following (throughout the paper, the quotation sources can be found in the online supplemental material):

> In order of highest inherent risk the issues are: climate variability, greenhouse gas emissions, species at risk, and manure management. (14 June 2010, Canadian Cattlemen's Association)
> Climate change is altering global hydrological cycles. This will have an impact on seeded acres, yields and crop rotations. It will also have an impact on railroad capacity

> because infrastructure will increasingly be affected by flooding and saturated soils (20 June 2014, National Farmers Union)

Climate was most often discussed in association with challenges to the status quo in the production environment. When national organizations and umbrella agriculture groups discussed climate, they placed an emphasis on challenges to the existing production environment over simply reporting on hardships or government actions. Umbrella agriculture groups focused on changes to legislation, government programs, and a perceived lack of research. For instance, see this from a lobby registration, expressing an intent to lobby

> [regarding the] Federal Budget, in respect to increased public research funding for climate change adaptation and crop varietal development, promoting investment in future risk mitigation [...]. (19 March 2015, Canadian Federation of Agriculture)

Existing programs and strategies were critiqued for not adequately considering or preparing for climate impacts; the National Farmers Union demonstrated a tendency to be particularly scathing in this regard.

> Current policies include a lack of careful planning for the impacts of climate change. (10 September 2012, National Farmers Union)
> [...] neither climate change impacts nor mitigation is specifically mentioned as an environmental concern in the available GF2 [Growing Forward 2] documents, yet it is certainly an increasingly serious problem for agriculture that needs to be addressed through effective policy measures. (February 2013, National Farmers Union)

The documents created for a public audience reported on producer hardships, especially financial hardships. Climate change was seen as a challenge to producers on the ground, but one that must be dealt with at a national and global level through negotiations and international agreements.

> At present we have a complex and often disjointed network of agriculture and food related policies that do not adequately foster long-term sustainability for the agri-food sector. The world's population is expected to double by 2050, climate change will affect production patterns, and farmers are facing unprecedented economic challenges—all of these issues have major implications for the future of our food supply and need to be addressed. (8 February 2010, Canadian Federation of Agriculture)
> The federal government's top priority is the oil industry. Policies and programs that would reduce fossil fuel use and mitigate climate change are being ended and rolled back. Thus, Canada is contributing to, rather than reducing climate change (May 2012, National Farmers Union)

Language use in the above two quotes points to the overall contrasting sociopolitical orientations between the CFA and NFU; climate change discourse appears to be common ground between these two somewhat diverging organizations.

2) Weather events and patterns

We considered reports of extreme weather events and disasters to be separate from general discussions of weather patterns. Weather events were identified by terms such as *flood*, *drought*, *hail*, and *disaster*. Weather patterns were regularly discussed, as confirmed by the appearance of terms such as *weather*, *rain*, *moisture*, *wet*, and *dry*. Overall, the temporal nature of hardships associated with weather was smaller or more acute than climate (e.g., late or delayed rather than altered or increased). The following are exemplars of language use regarding weather. The first quote depicts weather as temporally isolated and the second treats a yearly trend as a series of weather events:

> With dry conditions in many parts of the province, and other areas where precipitation arrived too late, feed supplies may be tight for some producers this winter. (20 October 2015, Alberta Beef Producers)
> Farmers suffer crop losses each year from natural hazards such as hail, drought, flood, frost, wind, wildlife, etc. (26 January 2010, National Farmers Union)

Because weather is a mostly localized phenomenon, the content of the documents generally applied to distinct regions or provinces. Sometimes national groups broadcasted news of such local or provincial events, expanding awareness of regional hardships across Canada. However, there was a notable difference in the types of weather events discussed at the national-level and provincial-level organizations: the national organizations were slightly more likely to discuss floods than droughts, whereas provincial organizations were considerably more likely to discuss drought. This difference may be because Alberta is prone to dry conditions, while the national organizations represent all provinces and a wider array of local conditions. The provincial organizations emphasized one extreme precipitation event, hail, more than their national counterparts; this is a reasonable pattern as Alberta often experiences severe hailstorms during the hottest months of the year, typically in July and August.

Alberta organizations discussed weather patterns with much greater frequency than national organizations, which is likely due to the large number of references to weather made by Alberta Beef Producers. Weather conditions and extreme weather events were the most prevalent topics discussed in the documents

of all three producer groups, but particularly forage organizations. The forage groups emphasized weather patterns, such as dry conditions, rainfall, and hail.

b. Impacts and hardships

Beyond the differences in how climate and weather were discussed (section 3a), a summary of their implications revealed differences too. The language associated with climate was more system- and long-term-focused, which is consistent with the concept and illustrative of trends that need to be planned for rather than responding to discrete events. The climate issues were closely related to criticisms of the status quo in agricultural production, demonstrating a conviction that the industry's current production environment is not sufficiently prepared to face a changing climate and the accompanying challenges.

In general, weather events were primarily discussed in the context of the challenges they present to producers. Regarding livestock, these challenges related most often to the availability of feedstock and the well-being of animals, as well as environmental conditions and the producers' own finances as they are affected by weather events. Umbrella agriculture groups were much more likely than livestock or forage organizations to address the subject generally rather than refer to specific effects of events. When the umbrella groups did specify, they more often reported on effects to feedstock and crop supplies than on financial consequences or impacts to livestock. When they questioned the status quo in the context of extreme weather events, livestock producer groups tended to emphasize unacceptable market conditions and unfavorable government programs.

When producers' hardships were reported, the underlying attitude about climate was that the problems must be dealt with at a large scale, through national commitments and international agreements. The on-farm implications of climate impacts were largely limited to concerns about water, such as seeded acres and yields, flooded infrastructure, and water supply. The number of on-farm challenges caused by weather events or patterns was greater and more varied compared to climate, including crop failures, feed shortages and competition with struggling wildlife, culling, price fluctuations, and transportation challenges. Weather conditions were sometimes described as ''anomalies'' or ''extreme'' (22 July 2015, Alberta Beef Producers). Weather discourse also highlighted the risk of farmers exiting the industry due to floods or droughts:

> Recovery from the 2011 flood [in Manitoba] continues, and the subsequent impact on producers lingers. Manitoba Beef Producers (MBP) is seeking timely processing of outstanding [insurance] claims to reduce the strain on producers. [. . .] Manitoba Agriculture estimates that more than 400,000 acres of land were still flooded in the spring of 2012. This pasture and hayland was not productive this year leading to forage and pasture shortfalls which resulted in many producers exiting the industry. (31 March 2013, Canadian Cattlemen's Association)
>
> Between the loss of income and the high cost of feed for livestock, the drought will lead to the loss of family farms in Ontario. (3 August 2012, National Farmers Union)

Reports of producer hardships were found in all document classes, but those created for public audience were more likely than other types to mention hardships. Organizations with ongoing relations with policy-makers, namely national and umbrella agriculture groups, favored reports of financial hardships. Other difficulties affecting livestock and the availability of feed following extreme weather events and challenging weather conditions were also reported, sometimes as featured subjects. For example, HayEast 2012, a grassroots program in which western producers provided feedstock and cash to drought-stricken peers in eastern Canada, was praised as an example of nationwide agricultural community support:

> Norm Hall, president of the Agricultural Producers Association of Saskatchewan [. . .] remembers what it was like for Saskatchewan producers to be on the receiving end of hay assistance. ''In 2002, eastern farmers shipped us thousands of bales of hay to help save our herds from starvation,'' Hall said. ''It's 10 years later and the time has come for us to give back to the people who helped us when we needed it.'' (12 September 2012, Alberta Federation of Agriculture)

Finally, challenges to the current market conditions, battered by problematic weather and global trade issues, were also common, as well as a few pointed criticisms of legislation and international agreements, such as those related to government budgets and plant breeders' rights. One clear polarization centered on the introduction of UPOV '91 (http://www.upov.int/upovlex/en/conventions/1991/content.html), the latest Act of the International Convention for the Protection of New Varieties of Plants. While the CFA identified varietal innovations (via UPOV 91) and climate change adaptive innovations as important for increasing the competitiveness of Canadian businesses (September 2014, Canadian Federation of Agriculture), the NFU denounced the international agreement as a move that further restricts farmers' access to the diversity of seeds, and thus to a resource necessary for adapting to a changing climate (17 April 2015, National Farmers Union).

TABLE 3. Climate- and weather-related recommendations by response type (with asterisks noting parallels).

Response type	Climate	Weather
Regulation	Enforceable water policy	
	Reduce GHG emissions, often without including farming in any cap-and-trading program, despite high emissions from livestock	
Infrastructure	Trains rather than trucks, for example, to transport grain to reduce GHG (freight rates, producer rail car rights)	Infrastructure maintenance funding for better culverts, etc.
		More weather stations
Technological fixes	Crop varietal development	More resilient annual and perennial forage varieties
	Raising feed-efficient, fast-finishing cattle (less waste and resource use)	New hydrology models (e.g., to predict flood and drought and to inform insurance)
	Sequestration technology	Better weather data (e.g., hail mapping)
	Improvements to Holos GHG calculator	Remote sensing damage assessment
Insurance		AgriRecovery with scientific ''triggers''
		Improved forage insurance
		Spot loss hail-damage insurance
		Insuring stubble fields against spring flooding
		Disaster fund for consecutive losses
		Quick-response disaster funds
		Defer taxes on destocking sales
		Improved relief/insurance rates
		Livestock production insurance
Buffering		Increased feed storage/forage carryover
		Seed storage and reuse
		Community support (HayEast 2012)
		Use drought affected crops as feed
On-farm management	Managed grazing*	Controlled grazing/stock rotation*
	Well-maintained grasslands	Use drought-affected forage as pasture (use as feed, and animal impact improves water infiltration later)
	Small-scale production	
	Shelterbelts (reverse program loss)	
	Identify Best Management Practices (BMPs) that reduce GHGs	

c. Solutions

Proposals concerning government funding and insurance programs (such as those under Growing Forward 2) were the most frequent of all the recommendations coded. The documents often advocated altering existing programs (or called for making no changes), suggesting that the status quo of government safety nets is preferred. Proposals for research and technology development were also common. The specific recommendations or requests made by producer organizations differed whether they addressed climate or weather effects (Table 3).

1) CONTRASTING RECOMMENDATIONS REGARDING LAW, POLICY, AND TECHNOLOGY

Recommendations discussing climate tended to focus on regulation over other topics, particularly in relation to water and greenhouse gases. Notably, despite advocating for emissions reductions, the Canadian Federation of Agriculture argued that agriculture be excluded from any cap-and-trade system:

> The Canadian Federation of Agriculture (CFA) is encouraged by the National Round Table on the Environment and Economy's (NRTEE) analysis of Canada's potential climate change policy direction and the prospect of harmonization with the United States. The report, ''Parallel Paths: Canada–U.S. Climate Policy Choices,'' examines the creation of a regulated cap-and-trade system that would cover all energy and process emissions. In particular, the report highlights that agriculture should not be included as a regulated and capped industry. (7 June 2011, Canadian Federation of Agriculture)

By contrast, documents that discussed weather focused more on insurance and relief payments as well as buffering the effects of weather events via increased feed storage. For instance, hail insurance was described as an alternative way to ''protect their crops from Mother Nature's white combine'' (31 May 2010, Alberta Financial Services

Corporation), although it is a compensation and risk management initiative rather than protection per se. Given long-term trends, documents that discussed climate described such initiatives as ineffective. For instance, the National Farmers Union argued that insurance would become irrelevant with the effects of climate change: "[I]f climate change means that farmers will face more variable weather, and summer droughts become more common, long term averages will decline, meaning crop insurance payments are going to be less and less helpful" (28 January 2013, National Farmers Union).

Documents from the livestock and forage groups, as well as general/umbrella organization documents created for members, proposed to remedy challenging weather circumstances through interventions. These interventions include government programs and insurance-like BRM programs and production insurance, and, in the case of forage groups, by adopting farm-level practices. Improved data and regular monitoring was a common theme; for instance, documents from the Alberta Beef Producers include the following statements:

> Dr. Daniel Itnefisu, ARD [Alberta Agriculture and Rural Development], discussed the Alberta agro-meteorological network and current weather conditions. There is a need for quality weather data. They [ARD] use Alberta historical weather data and current weather data for projections. (Alberta Beef Producers 2011)
>
> Perhaps have weather triggers at township level. If crops are hailed are [sic] looking at having field strips and hail mapping as a pilot project as part of the crop inspection process. Will be looking at remote sensing for individual farm crop damage assessment. (10 June 2015, Alberta Beef Producers)

Documents created for members of the organizations frequently suggested increasing research capacity and supporting technological developments. The Canadian Cattlemen's Association, for instance, regularly commented on technology-based efficiency efforts adopted by its members at the local farm scale, based on scientific innovation:

> Modern efficiencies allow us to produce more beef from fewer cattle and less feed. Improvements in crop and livestock genetics, feed production, processing and utilization technologies enable industry to produce as much beef today as it did 60 years ago, but on 45 million fewer acres. Research will continue to play a strong role in driving further improvements in these areas, with a focus on reducing impacts through improving feed quality and improving herd health and reproduction, methods identified by our science and the FAO as the best ways to lower GHG. (27 September 2013, Canadian Cattlemen's Association)

In these organizational documents, discussions of technological developments changed based on organizations' scope and scale. Forage producer groups reported on technological developments such as crop varietals and discussed grassland management and risk management as important considerations for facing challenging weather patterns. Livestock organizations often suggested farm-level practices, such as stockpiling forage to prepare for lean months. Provincial organizations rarely mentioned actions that producers may undertake at the farm level to counteract unfavorable weather.

Documents that discussed climate and weather together endorsed technological fixes like new breeds and varieties and better modeling and weather prediction. Technologies for sequestration and reduction of GHG emissions were also advocated by livestock commodities organizations when climate was discussed.

> The CFA encourages the federal government to work with their provincial partners in focusing climate change research on two key themes: Emission reduction and sequestration techniques and technology, [and] Adaptation." (Canadian Federation of Agriculture 2015)
>
> The end products [of program proposals submitted to Growing Forward] are technology transfers to producers in three ways; demonstrations of BMPs that reduce GHGs; economic analysis of adopting BMPs; and improvements to the Holos greenhouse gas calculator [Alberta Government supported online GHG tracker]. (14 June 2010, Canadian Cattlemen's Association)

The Canadian Cattlemen's Association and Alberta Forage Industry Network asserted the value of well-managed grasslands in natural carbon sequestration, among other benefits:

> In Canada, cattle production contributes only four to five per cent of man-made GHGs, while well-maintained grasslands sequester as much atmospheric carbon as old-growth forests. (27 September 2013, Canadian Cattlemen's Association)
>
> Science proves that forage and grasslands promote biodiversity, reduce soil erosion, and assist in carbon sequestration. As well, grasslands provide habitat for wildlife and insects that pollinate crops, and enhance water quality and quantity. (Alberta Forage Industry Network 2012)

These two quotes capture a critical aspect of the livestock sector's positionality with regards to climate; these organizations use positive frames about the carbon sequestration potential of grasslands in an effort to manage the discourse about the climate impacts of cattle production.

As extreme weather events are often catastrophic in nature, stories and suggestions of remedies were often associated with reports of disasters. National organizations frequently proposed remedial action following extreme weather events in the form of programs and insurance, some new and some existing, such as AgriRecovery. Other proposals, especially from the Canadian Forage and Grasslands Association and the Alberta Federation of Agriculture, involved technological innovations, particularly improved crop varietals, to adapt to new and/or erratic climatic conditions. In a few cases, more often by provincial organizations and documents created for organizational members, there were reports of practical, adaptive practices instituted by producers to mitigate the impacts of extreme weather events.

2) On-farm management as a point of convergence

On-farm management changes were mentioned in documents discussing climate as well as those discussing weather. While some recommendations offered no common ground between approaches to climate and weather, the topic of grazing was revealed as a point of convergence. Both climate and weather discourses featured recommendations regarding rotational grazing or grazing management, in part because of their role in fostering the perennial grasslands to sequester carbon.

> Canadian beef cattle producers are already among the most efficient in the world. They are utilizing tools like managed grazing and raising genetically feed-efficient cattle to maintain that trend. Canadian scientists calculate that greenhouse gas (GHG) emissions per kilogram of live animal weight decreased from 16.4 to 10.4 kg of CO2 equivalent from 1981 to 2006. (1 April 2011, Canadian Cattlemen's Association)
>
> The Waldron [a grazing co-operative in Alberta] places high value on rangeland health, such as grasses, sedges and trees for erosion control and preservation of native species. Pasture rotation and timing also play a very important role to encourage an increase in desirable grass species. Proper rotation allows for increased efficiency in grass utilization, even during times of drought. (14 June 2010, Canadian Cattlemen's Association)

In some cases, the advocacy for controlled/managed grazing was implied by stating what happens if it is not applied:

> Pastures that were managed rotationally were very good to excellent. Pastures that were not managed vary from good to fair depending on time of livestock turn out. [. . .]. The dry conditions through August have stopped growth on pastures not managed by controlled grazing. ''It is very notable by fall forage growth which pastures were or were not using managed grazing,'' said Carla Amonson, manager of the West Central Forage Association in Evansburg. That is true elsewhere also. (Alberta Forage Industry Network 2013)

One document noted the value of ''hoof and tooth'' action, derived from rotational grazing, to regenerate drought-affected forage:

> The Board held a long discussion about the very dry conditions affecting many parts of the province. There was talk about producers being able to use insured forage land for pasture, both to salvage some feed from the forage and to put the stand into better condition to respond to rains that hopefully will come. There also was discussion about using insured grain crops for pasture or feed. Producers who are forced to sell cattle due to the drought would benefit from being able to defer the taxes on these sales. (8 June 2015, Alberta Beef Producers 2015)

Besides rotational grazing, the climate and weather discourses differed in their recommended on-farm practices. The climate discourse included BMPs like shelterbelts—specifically arguing against the 2012 cancellation of the Prairie Shelterbelt program—to create more resilient farm landscapes:

> With a wild swing of its budgetary axe, the federal government is about to hack down the 111-year-old Prairie Shelterbelt Program. This shortsighted [sic] destructive move will have negative consequences for prairie farmers, their crops and livestock, soils, wildlife and the climate. ''Talk about a scorched earth policy! To end the Prairie Shelterbelt Program makes no sense at all when we are dealing with increasing climate volatility and erratic weather patterns. The Shelterbelt Program has not only provided trees to buffer the effects of wind, heat and snowfall, but has created unique knowledge and expertise about how to plan, maintain and nurture trees on the prairies for the benefit of farmers and the broader public. To end this program now to save a bit of money is worse than shortsighted,'' said Ed Sagan, NFU Saskatchewan Regional Coordinator. (16 April 2012, National Farmers Union)

Provincial organizations referred to adaptive farm-level practices more than national groups, suggesting that these organizations are ''closer'' to the producers. Adoption of farm-level practices was also most common among documents created for organizational members, suggesting that farm practice themes were intended for—or of greater interest to—the producers themselves.

4. Discussion

We set out to capture a snapshot of the discourses fostered by Canadian producer organizations regarding

climate and weather, related hardships, and proposed solutions. Through a mix of deductive and inductive coding of 95 publicly available documents by 10 producer organizations at various geographic scales and commodities, we found discourses about weather and climate follow their own distinct patterns. Here, we identify key messages from this exploratory study and outline potential implications for the farming sector, policy-makers, and researchers.

a. Speaking in different directions

Discursive differences at the level of organizational scale and target audience suggests that there is a rift in the climate change dialogue. National organizations speak about climate ''upward'' to government as well as ''outside'' to the public, compared with the provincial organizations that speak about weather ''inside'' toward their membership. The types of climate responses recommended by national groups, and the lack of engagement with the topic of climate by provincial groups, point to particular organizational standpoints regarding the perceived causes and risks of climate change, as well as who is best suited to address it. Additionally, these organizations can be thought of as prioritizing the needs of their ''clients'' (see Church et al. 2018), framing their discourse in a way that complements the views of their audience and/or the membership they are responsible for representing.

The two national umbrella groups—CFA and NFU—dominated discussions of climate, typically directed at the public or government; and the CCA (national, livestock) contributed to climate discourse as well. All three encouraged further government research and investment regarding climate, but differed in their depictions of climate risks and mitigation responsibilities. The NFU was particularly vocal regarding climate-related hardships and challenges, and the need for improved policy measures. The CCA pointed to existing GHG efficiencies in the livestock industry, and the need for further efficiencies in terms of feed. Recommendations regarding climate adaptation were largely focused on what Smit and Skinner (2002) would consider ''technological developments'' (such as new crop varieties) and ''government programs and insurance'' (see Table 3); Fazey et al. (2010) would considered these recommendations ''buffering'' and ''techno-fixes'' that fail to address the ultimate causes of the problems being addressed. National and umbrella groups (particularly CFA and CCA) may benefit from a shift in attention; there is a need for ''greater emphasis on addressing human behavioral causes of environmental problems and enhancing the values and skills of, and capacities for, people to adapt to future change'' (Fazey et al. 2010, p. 414).

Inclement and unusual weather was more often reported by organizations closer to producers—that is, provincial groups and livestock and forage organizations. Similarly, documents created for organizational members were more likely to report on weather patterns. This discourse may be a way of saying ''we hear you.'' Such ''weather talk'' may be a shared or code language by which organizations convey their sympathies and build trust with farmers (Arbuckle et al. 2015). Importantly, weather talk may not be counterproductive: past short-term events may in fact be important diagnostic and framing tools for farmers and farm advisors as they try to assimilate scientific information and understand and manage risks (Li et al. 2017; Mase et al. 2015; Wilke and Morton 2017). By not including climate talk, however, the importance of climate change may not be effectively conveyed to farmers (at least from these sources).

Provincial groups tended to either exclude discussions of climate or remark on the carbon sequestration potential of grasslands as a sort of defense of cattle production. By avoiding such climate talk, provincial organizations in Alberta speaking ''inside'' toward their membership may be managing their messages in order to avoid less agreeable terminology. The experiences of agriculture advisors guiding farmers on various topics, including climate and weather, provides an interesting parallel to farm and livestock organizations. In addition to the background and expertise of advisors impacting their willingness to advise on climate-related matters, there is explicit attention to producers' needs—agriculture advisors gauge their inclusion/use of climate-related advice based on the needs, perceptions, and values of their clientele (Church et al. 2018; Haigh et al. 2015). Communication regarding climate adaptation using phrases like ''climate change'' is identified as potentially less effective as discussing the long-term management of extreme weather events (Church et al. 2018). As such, farm and livestock organizations may be gauging how they speak to their audiences and membership (i.e., clientele). Discourse directed at farmers necessarily focuses on their immediate short-term needs, while discourse directed at government speaks to their interest in long-term visions and strategies.

The avoidance of climate talk at these scales/audiences may be a result (or even a part) of the ''climate-denial machine'' wherein conservative-minded organizations work to ''manufacture uncertainty'' regarding the existence, risks, and causes of climate change (Dunlap and McCright 2010). Controlled messages to producers wherein climate discourse is removed or renamed have the potential of impacting the development of beliefs, perceptions, identities, and practices related to climate.

That is, messages avoiding or augmenting climate talk may help to confirm doubts of climate denial, and contribute to a de-prioritization of climate adaptation by focusing on more immediate, short-term issues. This impact being more probable if the farm organization is viewed as a trusted source for information (Arbuckle et al. 2015).

With national and provincial producer organizations speaking in different directions and contributing to different discourses, it is unclear if membership attitudes and perceptions are being manufactured, represented, or both. Morton et al. (2017a) found farmers' uncertainties regarding the causes and risks of climate change negatively impacted the adoption of climate adaptation practices, and found agricultural information networks prompted these uncertainties. Also, Arbuckle et al. (2015) found U.S. farm groups opposed to climate change policy influence farmers' beliefs and attitudes about climate, as long as these groups are a trusted information source. Farmers' beliefs about the existence of climate change, and the perceived risks toward their farms, play an important role in adaptation behaviors (Mase et al. 2017), which means understanding how these beliefs are formed and influenced is essential.

b. Common ground despite political divergence

Among the producer organizations selected for this study, two are categorized as both national and umbrella groups: the Canadian Federation of Agriculture (CFA) and the National Farmers Union (NFU). While holding deviating points of view, these two organizations appear to find common ground on the general topic of climate change, both pointing to a need for improved policies and funding with respect to climate adaptation and mitigation. In this section, we briefly account for the diverging political and ideological perspectives of these two organizations, and follow up with critical reflections on the potential implications of finding common ground on climate change.

Based on a review of each organizations' websites and the documents selected for analysis, as well as a review of relevant literature, it is evident these two organizations, while not antithetical, are politically divergent. According to Skogstad (2008), commodity groups, which represent growers' specialized interests (e.g., wheat, canola, and cattle), are often situated ''ideologically right of centre compared with the umbrella farm federation, the Canadian Federation of Agriculture, and the more leftist National Farmers Union'' (p. 38). While the NFU and CFA have a history of rivalry (Skogstad 2008) as well as cooperation (Desmarais and Wittman 2014), there are clear dividing lines between their perspectives. The NFU is visibly oriented toward social justice, prioritizing issues regarding women, youth, and international organizations like La Via Campesina. The NFU also describes itself as ''unique among farm organizations in working for people's interests against corporate control of our food system''. The CFA is ''a farmer-funded, national umbrella organization representing provincial general farm organizations and national commodity groups'' (Canadian Federation of Agriculture 2018a). Among their six listed corporate partners are Nutrien and Syngenta (Canadian Federation of Agriculture 2018b); notably, Syngenta is among the ''Big Six'' agrochemical companies that control much of the world's seed and pesticide markets (ETC Group 2015).

Future efforts to affect industry and policy changes on issues related to climate change in Canadian agriculture may benefit from coalition building between the CFA and NFU, for instance, with regard to increased government support for research on climate-adaptive farming techniques. Such coalition building may also present important challenges as the NFU's priorities on smaller scale family farms, for example, may conflict with the CFA's mandate which is much wider in scope. As the NFU might be considered the ''radical alternative'' to the more influential CFA (Coleman et al. 1996), there may be value in coalition building around the least objectionable policies and programs. Magnan's (2007) research on the coalition of actors that successfully opposed the introduction of genetically modified (GM) wheat in Canada points to their mutual agreement on market risks, which he describes as the ''lowest common denominator'' among the groups opposing GM wheat. Although the opposition to GM wheat (and similar coalitions) has seen success, it remains a question to whether such compromises are the best avenues for affecting change (Tourangeau 2017). Given historical efforts to spread climate change denial (Dunlap and McCright 2010), compromises may push adaptation responses toward less effective technofixes (Fazey et al. 2010), which better complement the ideology of environmental skeptics, which places trust in science and technology to produce solutions (Dunlap 1983).

c. Divergent solutions, except for rotational grazing

The rift around climate and weather discourses largely followed through into the coping mechanisms and policy recommendations organizations discussed as a response to such pressures. In this study, organizations discussing climate were unique in describing a need for increased regulation, and organizations commenting on weather topics generated a lengthy list of desirable insurance or relief policies and programs not present in the climate

discourse. Our results show recommendations for insurance and relief programs, for instance, were not associated with discussions on climate. Many requests for such programs were made within the discussions of weather events and shorter-term phenomena like drought or flood, and may indicate a current lack (or at least diversity) of adaptive capacity among producers (Briske et al. 2015; Marshall et al. 2016). A shift away from a focus on such ''buffering'' approaches is positive (Fazey et al. 2010), as they may serve simply to delay the likelihood of voluntary adaptation (Kimura and Antón 2011). Of course, climate changes comprise weather changes, and such risk management services need to persist, if farmers who are vulnerable to climate are to endure its change. However, risk management services should not be the primary strategy for dealing with new norms.

Livestock producer organizations were clearly aware of the need to address climate issues such as farm and industry emissions but preferred to endorse efforts in research and technology (e.g., livestock genetics) over emissions pricing or cap and trade. GHGs are a sensitive matter for this industry maligned in the media for methane and other emissions (Arbuckle et al. 2015; Burbi et al. 2016). The willingness (or lack thereof) of producers to mitigate GHGs may relate to a lack of awareness regarding the scale of the problem, as well as the contribution of agriculture to it (Hyland et al. 2016). Such organizations instead advocated for efficiency measures such as quick-finishing cattle breeds, as well as sequestration opportunities such as grasslands and shelterbelts. While many ideas such as grassland carbon sequestration and shelterbelts are supported by research [see Vaisey and Strankman (1999) and Smith et al. (2005), respectively], measures such as more efficient cattle breeds may be antithetical to more holistic farming approaches wherein methane emissions are considered natural, and ''the association of methane reduction with intensification is anathema'' (Bruce 2013, p. 18).

A site of common ground regarding climate- and weather-related recommendations was found in the topic of on-farm management solutions (see Table 3). Rotational grazing was the only farm management recommendation shared among both discourses, highlighting the potential for a dual-purpose policy scenario that accounts for weather risks and also addresses the need for climate adaptation strategies. Livestock and forage associations were particularly frequent advocates for rotational grazing approaches, regardless of whether climate or weather was being discussed. Grazing management was raised as a sequestration opportunity, given the typical use of perennial grassland, but this potential is disputed in, for instance, rangeland settings (Joyce et al. 2013). High-intensity, short-duration rotational practices such as Savory's Holistic Management have been shown to be adaptive in drought conditions in Australia (Sherren et al. 2012), not so much for climate mitigation as for the consistency of ground cover it fostered when, comparatively, those using set stocking had to buy feed. Broader claims for the method's benefits for mitigating climate change have been disputed (Briske et al. 2013; Nordborg and Röös 2016). Variants such as adaptive multipaddock (AMP) or multipasture grazing are being explored for large-scale carbon sequestration using farm-scale field trials (Teague et al. 2016).

Although this work did not reveal any apparent uncertainty on the part of producer organizations about the benefits, polarization in the scientific literature on such grazing approaches may be slowing the development of policy support (Sherren and Kent 2017), for example, by reducing adoption barriers such as transition costs (Wreford et al. 2017). Transition costs to alternative practices such as rotational grazing are often high, given the need for increased fencing and water points, not to mention labor. One relevant example of policy support for rotational grazing practices is the Species at Risk Farm Incentive Program (SARFIP) delivered through the Ontario Soil and Crop Improvement Association (OSCIA) in Ontario, Canada. This program allocates cost-share funding to farmers interested in implementing on-farm best management practices to help protect species at risk, which includes native-tree planting and wetland restoration, as well as the installation of cross fencing and watering systems to support rotational grazing practices (OSCIA 2017). The Ontario government endorses rotational grazing as a Best Management Practice (BMP) that can be used to improve the health of farmers' pastures and cattle, while also benefiting the environment (MacPhail and Kyle 2012).

5. Conclusions

We set out to explore how farm producer organizations communicate about climate- and weather-related issues, including the role that such discourses might play in reflecting and shaping these issues. This was achieved through an examination of 95 publicly available documents that represented a snapshot of climate- and weather-related public and policy engagement of Canadian and Albertan livestock producer organizations from 2010 to 2015. As pasture-based grazing has since been underrepresented in climate adaptation literature, this topic was highlighted in the analysis. Overall, three discursive

patterns proved to be particularly enlightening: 1) as climate discussions tend to be communicated to government audiences, and weather-related topics tend to be communicated to farm organization membership, further research is needed on whether provincial organizations in Alberta are accurately representing farmers interests or helping to ''manufacture uncertainty'' about climate change. 2) NFU and CFA, the two national umbrella organizations reviewed in this study, while largely incompatible with regard to their sociopolitical and ideological perspectives, have a common goal in addressing climate change; further research is needed to better understand their positions and potential for cooperative efforts. 3) Policy recommendations regarding climate and weather tend to diverge in many areas, but converge on the topic of rotational grazing practices, revealing the possibility of dual purpose policy scenarios that account for both weather risks and climate adaptation strategies. Further, rotational grazing may offer an opportunity for improved dialogue between provincial organizations and their members, addressing short-term weather concerns while also discussing climate.

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