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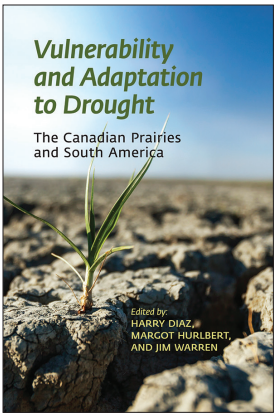

VULNERABILITY AND ADAPTATION: The Canadian Prairies and South America Edited by Harry Diaz, Margot Hurlbert, and Jim Warren

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PART 4

GOVERNANCE SYSTEMS FOR PRAIRIE DROUGHT AND WATER MANAGEMENT

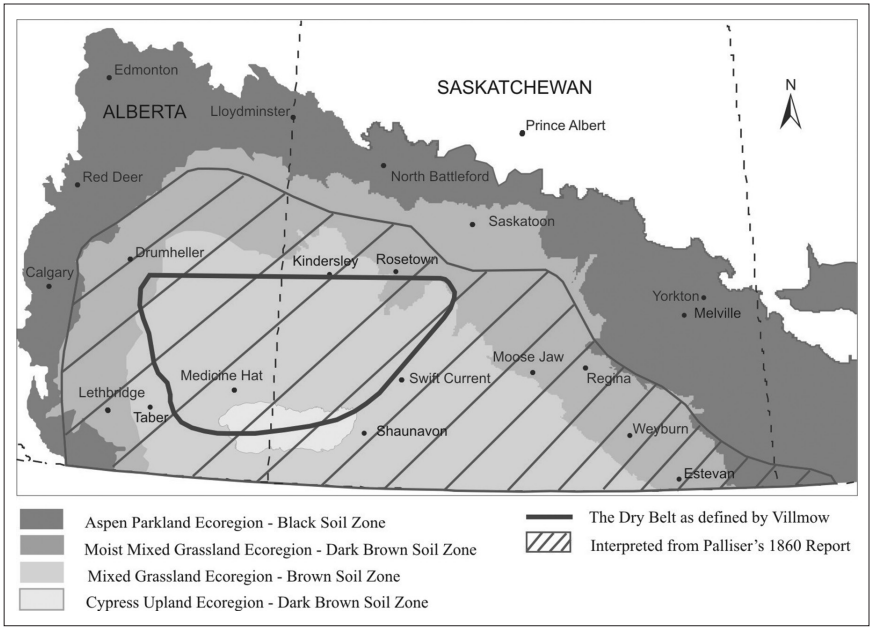
CHAPTER 8

DROUGHT AND PUBLIC POLICY IN THE PALLISER TRIANGLE: THE HISTORICAL PERSPECTIVE

Gregory P. Marchildon

Introduction

The Canadian Prairies have had a distinct climate since the last Ice Age, characterized by extreme seasonal temperatures with short, hot summers alternating with long, cold winters, and by a semi-arid climate with cyclical bouts of severe, multi-year droughts (Davison 2001). Following the region's settlement and use for agricultural production, the Great Depression of the 1930s generated the extreme conditions that made this region well known to North Americans. Collectively remembered as an ecological and human disaster, the prolonged drought of the Dirty Thirties triggered responses by governments at the federal, provincial, and local levels that attempted to address the physical damage and mitigate the human suffering caused by the most prolonged drought in the region in the twentieth century (McLeman et al. 2013; Jones 2002). This chapter reviews the most important of these policy interventions to extract some lessons for the future of the region, a future likely to involve prolonged droughts



Map 1. Palliser Triangle with Prairie ecoregions and soil zones

due to human-induced climate change, especially in the drier sub-region known as the Palliser Triangle.

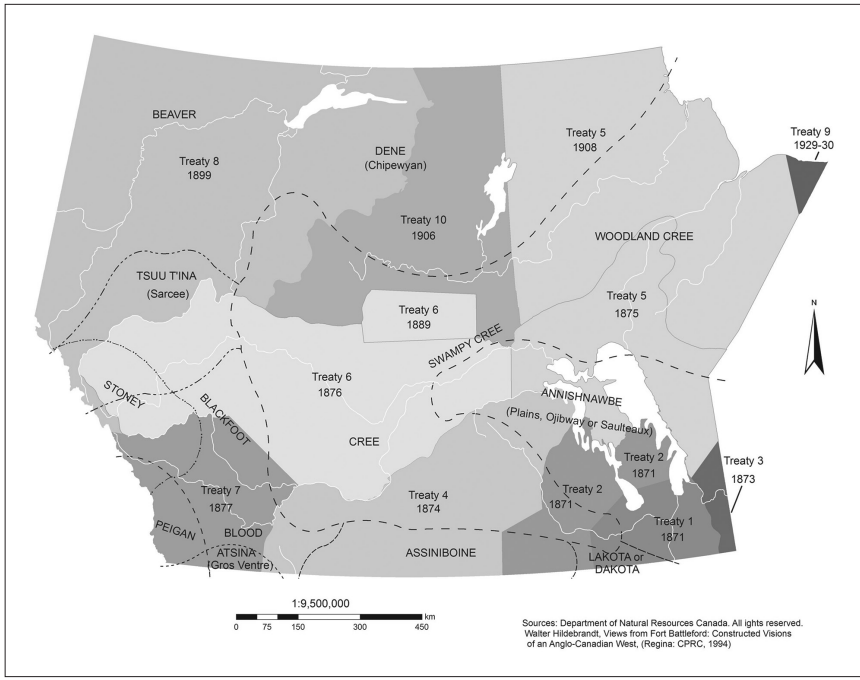
After the arrival of Europeans, and after the international boundary between Canada and the United States was set, subsequent explorers and surveyors notionally subdivided the Canadian portion of the North American Plains into sub-regions. The southernmost sub-region was named the Palliser Triangle (Map 1) after the leader of the British North American Exploring Expedition of 1857–60, Captain John Palliser (Spry 1963). One of this area's longest droughts in the entire nineteenth century occurred during Palliser's expedition on behalf of the British government, leading him to declare the southern Canadian Prairies unsuitable for agriculture. In the twentieth century, the dry inner core of the Palliser Triangle was labelled the Dry Belt by climatologists, a term subsequently used by historians to describe the same area (Marchildon et al. 2009).

A History of Drought in the Palliser Triangle

Given the extreme climate and water scarcity that marks the Canadian Prairies, it is not surprising that vulnerability has been an integral part of the human experience in the Palliser Triangle. This vulnerability also helps to explain the sparse population pattern of the Canadian Prairies in general, and the Palliser Triangle in particular, relative to other southern regions of Canada. Similar to today, low population density was a feature of the Canadian Prairies during its pre-history. Indigenous agriculture ranged from extremely limited to non-existent in the southwestern portion of the Canadian Prairies, even during the relatively warm centuries preceding the dry and cold period of the Little Ice Age, more formally known as the Pacific Climate Episode (AD 1250–1550). However, the grasslands did support the enormous herds of bison that were the mainstay of Indigenous communities. Based on extended clan networks speaking a common language, these communities migrated by necessity, moving their buffalo-skin shelters and minimal belongings to follow the bison herds (Dawson 2003; Thomas 1976).

While hunting and gathering was not as water-intensive as farming, water was still required in this dry environment, and there is some evidence that the Indigenous inhabitants of the Palliser Triangle "developed a water management strategy that buffered them from the effects of even long-term drought" (Daschuk 2009: 17). In a semi-arid environment, this meant protecting non-river water sources, such as beaver ponds by restricting beaver hunting. Bison herds would not move from river valleys to their usual summer ranges in the open prairie during the worst droughts, so protecting river-based water sources was an absolute necessity. During prolonged droughts when river tributaries ran dry, Indigenous populations and bison sought forced refuge along the main river channels and beside bodies of water dammed by beavers. It is interesting to note that the Indigenous restriction on hunting beaver lasted long after the arrival of Europeans, despite the economic incentives for Plains tribal groups to engage in large-scale beaver trapping during the fur trade (Daschuk 2009).

The first European occupation of the Palliser Triangle was based on open-range cattle ranching. By the 1870s, the western bison herds were nearing extinction because of the demand for bison hides and bison meat, including pemmican and luxury items such as tongues, which was met



Map 2. Plains Indians boundaries, ca. 1850, showing Treaty areas. (Source: Marchildon 2009c: 5)

by faster-loading and increasingly accurate rifles, resulting in the collapse of the herds. As a consequence, the Indigenous occupants of Palliser Triangle—predominantly the Plains Cree and the Blackfoot Confederacy, made up of the Siksika, Peigan, and Kainai (Blood) Nations—faced widespread famine. In exchange for food and medical supplies from the newly established Government of Canada, these First Nations signed Treaty 6 (1876) and Treaty 7 (1877), relinquishing possession of most of their traditional bison-hunting territories in exchange for much smaller parcels of reserve land (Daschuk 2013; Marchildon 2009a; Map 2).

When these treaties were signed, the US Plains were already experiencing a ranching boom that would spill over the border into the southwestern portion of the Canadian Prairies (Olefson 2000; Breen 1983). Eager to establish a cattle industry, the Government of Canada passed an order in council to permit 21-year leases of land up to 100,000 acres

(approximately 40,500 hectares) for the highly subsidized price of one cent per acre. The original leases prohibited homestead farm settlement to facilitate open (unfenced) ranges. To encourage the northern migration of cattle, the Canadian government also permitted ranchers to import cattle duty-free for two years from the United States. These policies favouring open-range ranching ensured that it expanded rapidly in the last two decades of the nineteenth century (Wandel and Marchildon 2010).

The cattle boom ended abruptly in the first decade of the twentieth century. Three major factors seem to have each played a role in bringing this era to an end. First, the introduction of new refrigeration technologies allowed for major import markets, such as Great Britain, to receive less expensive chilled beef from Argentina. Second, an extreme weather event known as the "Killer Winter of 1906–7" decimated the cattle herds in the short-grass prairie of the Palliser Triangle, killing up to 65% of cattle in the Dry Belt. Third, the Canadian government reversed its open-range subsidized lease policy and instead supported and subsidized fenced-off homestead settlement (Evans 1983).

Although cattle ranching remained viable in the western long-grass prairie of the foothills that received higher precipitation, most of the drier short-grass lands of the Palliser Triangle were opened to farm settlement after the Killer Winter of 1906–7. Under the Dominion Lands Act, settlers were given 160 acres (65 hectares) of land under the condition that they cultivate that parcel and establish a permanent homestead on it within three years. In 1909, the Canadian government officially opened the Dry Belt to homesteaders. In conjunction with local real-estate speculators and the Canadian Pacific Railway, the Government of Canada unleashed a major publicity campaign to attract settlers, despite the fact that the Dry Belt received less average rainfall than all other parts of the Palliser Triangle (Marchildon 2007).

A growing British market for imported wheat, coupled with a high world price, encouraged farmers in the Palliser Triangle to cultivate wheat to the exclusion of almost all other grains. The wheat boom brought in both settlers and "suitcase" farmers—individuals from other locales who only worked the land to make a quick profit. The growing population in the region was reinforced by a doubling in the world price of wheat during the First World War. In addition, the region received higher than average rainfall, with even the Dry Belt experiencing bumper crops in 1915 and

1916. However, this boom was the beginning of the end in the Dry Belt in particular, as a prolonged drought took hold in the years that followed (Marchildon 2007; Gorman 1988).

From 1917 until the unusually wet year of 1927, Dry Belt wheat farmers would suffer repeated crop failures due to a lack of rainfall. Drought became an almost permanent feature of the area, recurring year after year. Maps based on a gridded database of mean monthly temperature and total precipitation derived from the Canadian Climate Archive for the Prairie provinces indicate that the Alberta side of the Dry Belt was even more drought-stricken than the Saskatchewan side. These maps also reveal that the extent to which the region was affected by the droughts after 1928 was far larger than the Dry Belt. Indeed, the drought of the Dirty Thirties blanketed the Palliser Triangle and slightly beyond (Marchildon et al. 2008), affecting a far larger population and segment of the Canadian economy. Known within Canada as the "breadbasket of the world," the Palliser Triangle saw wheat yields plummet and residents migrate to British Columbia, Manitoba, and the forest fringe of the Canadian Prairies (McLeman and Ploeger 2012; McLeman et al. 2010).

The droughts resulted in widespread bankruptcy and poverty for farm families. Many left the devastation in the Palliser Triangle to begin new lives in other parts of Canada. As tax revenues plummeted, local governments were unable to meet their obligations to finance schools, maintain roads, and provide relief for the thousands of destitute farm families (Marchildon and Black 2006; Jones 2002).

The government of Alberta intervened long before that of Saskatchewan because the initial impact of the drought had been greater on its side of the Dry Belt, although some of the policies adopted would be the same in both provinces. The first step was to force banks and other financial institutions to negotiate settlements on farm debt. The next step was to defray the cost of relocating farm families and support local governments in their efforts to provide relief assistance to the families remaining on the land. However, the Alberta government would go further than its provincial neighbour by actively promoting changes in land tenure and, where necessary, replacing some local governments with a provincially appointed administration in the Dry Belt.

The environmental shock caused by the prolonged droughts was considerably exacerbated by the collapse in commodity and stock prices in

the Great Depression. In Alberta, per capita income fell by 61%, while in Saskatchewan, where the wheat economy remained dominant throughout the 1930s, per capita income fell by an astounding 72% between 1929 and 1932 (Marchildon 2005). To be sure, there was also a collapse in industrial production affecting central Canada, but the decline in per capita income in Ontario and Quebec (44%) was far less. Having only a small area included in the Palliser Triangle, Manitoba suffered less than Saskatchewan or Alberta: per capita income dropped 49% in the same period, less a result of drought than the decline of business suffered by grain companies and traders headquartered in Winnipeg.

This decline was exacerbated by a collapsing global market in wheat, a market on which Prairie wheat producers depended for the sale of almost all their grain. Beginning in 1928, falling agricultural prices contributed to the stock market crash one year later and would become a major feature of the 1930s (Marchildon 2013). The precipitous decrease in wheat and other grain prices, combined with institutional weaknesses in the banking sectors of numerous advanced industrial countries, initiated a deflationary spiral, which drove a redistribution of income and displaced populations en masse from agricultural regions of countries to non-agricultural regions. Of the wealthier nations in the world, this movement was most pronounced in Canada and the United States, in no small part because of the impact of prolonged drought in the Great Plains of both countries (Madsen 2001).

With the provinces of Alberta and Saskatchewan teetering on the edge of bankruptcy, the federal government intervened, first through large-scale transfers to the provinces for relief payments to thousands of farm families (Marchildon and Black 2006). Eventually, well after similar initiatives in the United States, the federal government created a regional organization to spearhead land and water reclamation initiatives throughout the Palliser Triangle (McLeman et al. 2013).

The remainder of this chapter focuses on two case studies of policy responses to the drought crisis described above. The first summarizes the Alberta government's response to the earlier drought in the Dry Belt and the actions that ultimately led to the establishment of the Special Areas Administration. The second case study focuses on the Government of Canada's response to the more expansive drought of the 1930s and the

creation of the Prairie Farm Rehabilitation Administration (PFRA) to reclaim and conserve both soil and land resources in the Palliser Triangle.

The Special Areas Administration

The Special Areas of Alberta refer to a large—currently 5.2 million acres (2.1 million hectares)—and sparsely populated region on the Alberta side of the Dry Belt. Since the late 1930s, the Special Areas has been governed and managed by a provincially appointed administrative board rather than democratically elected local governments. Although nothing on the order of the droughts of the 1920s and 1930s has recurred, the residents have shown limited desire to eliminate the Special Areas Board and revive the old rural municipality system, in large part because of a continuing fear of drought (Marchildon 2007).

Even by the early 1920s, mounting evidence already suggested that the farm settlement of the Dry Belt had been a mistake. Not only was there less precipitation on average than in the rest of the Palliser Triangle, but the Dry Belt seemed even more prone to sustained episodes of drought than the rest of the Palliser Triangle. In 1921, the United Farmers of Alberta (UFA) formed the provincial government, elected in part to address the drought catastrophe in the Dry Belt. According to historian David Jones (2002), the Dry Belt was likely the greatest problem that faced the UFA government in the 1920s and would remain one of its most intractable problems until its defeat in 1935.

Initially, the UFA encouraged the renegotiation of bank loans made to farmers by empowering a government commissioner to negotiate the settlement of debts. By 1922, most farmers had endured the misfortune of five successive years of drought, which in turn had exacted a toll on local businesses, municipalities, and school districts. The purpose of negotiating settlements between debtors and creditors was to save the farms, businesses, school districts, and local governments in the Dry Belt.

However, even with debt rescheduling, only a minority of farms and businesses remained viable, so the UFA government then offered free transportation to destitute farm families who were willing to leave the Dry Belt. Sharing one-third of this cost with the federal government and railway companies, the provincial government provided each family with up to two railway cars to transport its machinery, farm supplies, livestock,

Table 1. Vacant or abandoned farms in the dry belt, 1926

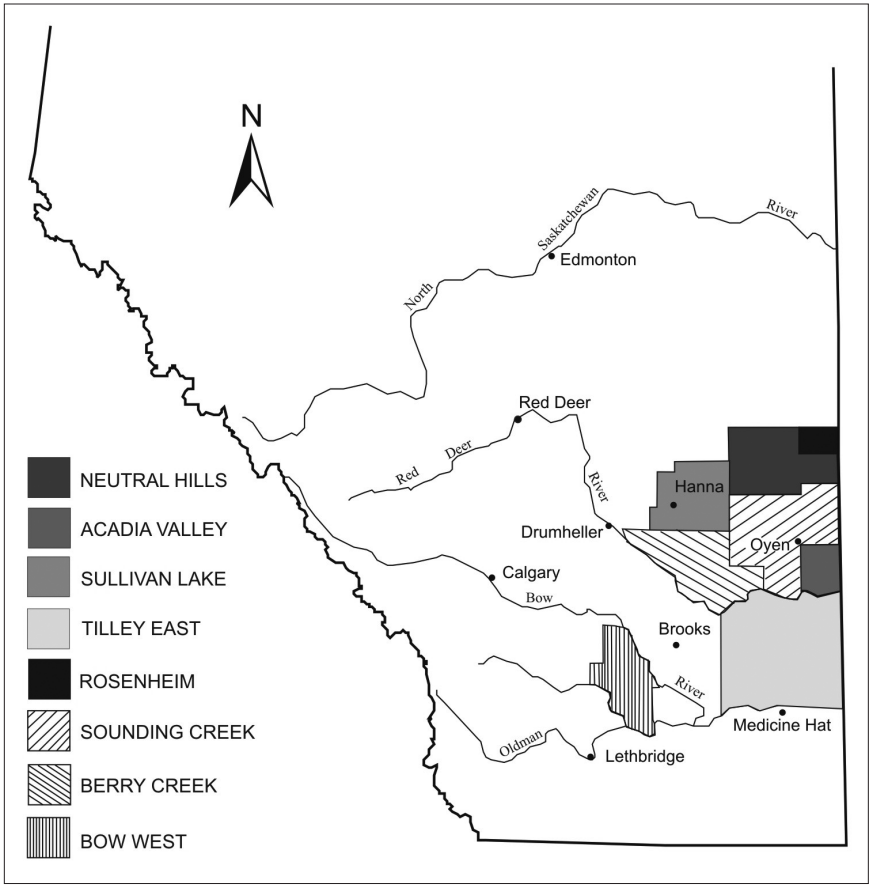
	Population	Vacant or abandoned farms (number)	Vacant or abandoned farms (acres)
Alberta Census Divisions 3 and 5	39,365	5,124	1,287,594
Saskatchewan Census Division 8	44,667	916	212,091

Source: Derived from Tables 1,3,4 and 6 in Jones (2002), pp. 254–57.

and furniture. By 1926, almost 2,000 farm families had taken advantage of the assistance to move north of Calgary or further west to the irrigated districts near Lethbridge (Marchildon 2007).

That same year, the provincial and federal governments established a commission to study the Red Deer and Saskatchewan Rivers, from the town of Tilley in the west to the Saskatchewan border in the east. Covering 1.5 million acres, the Tilley East area (subsequently known as Special Area No. 1) had lost 80% of its peak population by 1926, the result of continual crop failures. Farms were abandoned at such a rate that the viability of the few remaining farms was further threatened by blowing topsoil from the untended fields encircling them. As indicated in Table 1, deserted farms were far more prevalent on the Alberta side of the Dry Belt (roughly contained in Alberta Census Divisions 3 and 5) than on the Saskatchewan side.

The federal-provincial commission recommended that a single board manage all land and water resources throughout the Tilley East Area so that the government could repossess abandoned land for non-payment of taxes. This practice would then allow the government to lease the better land at subsidized rates to the smattering of viable farmers and ranchers left in the area and reseed the worst land, converting it to community pastures to be used by mixed farmers and ranchers for minimal cost. However, implementing the commission's recommendation was difficult because all public (Crown) land was owned by the Government of Canada and thus not available for allocation by the provincial government.



Map 3. Special Areas, ca. 1942.

It was only through a constitutional change—the Natural Resource Transfer Agreement of 1930—that it became possible for the provincial government to create the Tilley East Area Board and assign it the power to own and reallocate lands. With its new powers, the Tilley East Area Board leased and sold land to enlarge the most viable ranch or mixed ranch-farm operations, and actively discouraged farmers who were attempting to continue a wheat monoculture. The board also converted abandoned farms into community pastures. The experiment proved so successful that the provincial government created a similar body in the Berry Creek Area,

northwest of Tilley East. In addition, the school districts were also dissolved, and schools were placed under the administrative control of the Berry Creek Special Area Board. This was followed by the establishment of the Neutral Hills, Sounding Creek, and Sullivan Lake Special Areas in 1935. In the next two years, the provincial government also set up the Acadia Valley, Rosenheim, and Bow West Special Areas (Map 3).

In 1938, during one of the worst drought years of the 1930s, all of these areas were consolidated under a single Special Areas Board. Although appointed by the provincial government in Edmonton, the board and its members were headquartered in the Dry Belt community of Hanna. The provincial government dissolved the 34 separate municipalities and improvement districts, effectively eliminating local government and putting all legal and governmental control in the hands of the new board. The rationale behind the change was to ensure that the Special Areas Board had all the necessary tools at its disposal to manage land and water resources, as well as roads, schools, and other physical and social infrastructure, for almost one-third of the province's agricultural land base. The three-member board was conferred a remarkably broad mandate to manage the Special Areas in the "manner it deemed most efficient for the remaining residents" of the Alberta Dry Belt (Marchildon 2007: 263; Gorman 1988).

The provincial government's chief policy objective was to reduce the drought vulnerability of the Dry Belt by thinning out both population (Table 2) and infrastructure, and transforming land tenure from small and unsustainable wheat farms to larger ranches and ranch-farms (Marchildon 2007; Jones 1978). Private ownership was increasingly supplanted by public ownership, under the managerial control of the Special Areas Board. Ranchers and mixed farmers obtained access to the land through inexpensive Crown leases and community pastures. In its first year of operation, the Special Areas Board leased grazing lands for 2.5 cents per acre and rented crop lands for a one-sixth share of the annual crop. Both rates were well below prevailing market values in the rest of the province (Marchildon 2007).

In 1936, farms in the Alberta Dry Belt were already 1.7 times the size of the average Alberta farm. However, with the intervention of the Special Areas Board, these Dry Belt farms would grow to 3.6 times the size of the average Alberta farm by 1956, even though the absolute size of the average farm or farm-ranch had also grown considerably over this period

Table 2. Rural and urban populations in the Special Areas, census years 1916–76

	Rural	Urban	Total
1916	21,715	2,449	24,164
1921	26,031	3,658	29,689
1926	19,344	3,529	22,873
1931	20,320	3,754	24,074
1936	14,976	3,038	18,005
1941	11,794	3,325	15,119
1946	9,542	3,504	13,046
1951	8,430	4,076	12,506
1956	8,723	4,657	13,380
1961	8,799	5,256	14,055
1966	7,974	5,354	13,328
1971	7,050	5,250	12,300
1976	5,854	5,128	11,036

Source: Martin (1977), p. 49.

(Marchildon 2007; Gorman 1988). Thus, the policy objective of improving the viability of farm-ranch operations by increasing their size was attained.

Despite the fact that the policy came at the price of residents not having democratically elected rural governments, residents in the Special Areas have consistently rejected a return to local rural governments. Although there have been no sustained multi-year droughts since the 1930s, enough residents continue to fear the possibility of prolonged drought to support this institutional arrangement, one that is unique in the Canadian Prairies. Despite at least two major reviews by the provincial government, one in 1953 and another in 1960, residents rejected a return to more local democratic control (Marchildon 2007).

The Prairie Farm Rehabilitation Administration

In contrast to the Alberta government, the federal government failed to establish any institutional mechanisms to address recurrent drought in the Palliser Triangle until the mid-1930s. Prior to this, the federal government directed its resources to help the provinces fund relief for the Triangle's rural residents. In July 1931, Prime Minister R.B. Bennett described the drought ravaging the Triangle as perhaps "the greatest national calamity that has ever overtaken this country" (Marchildon and Anderson 2008: 79). Relief was essential to provide the basic foodstuffs and clothing, as well as seed and other essential farm supplies, to ensure that farm families had sufficient nutrition and were also able to feed their remaining livestock and plant another crop. However, most municipalities in the Palliser Triangle lacked sufficient revenues to fund relief. This situation forced the provincial governments to intervene with relief paid for out of provincial revenues, but they too were unable to sustain the relief efforts without assistance from the federal government.

It was impossible to predict how long the droughts—or the Great Depression—would persist, so the federal government transferred money to the provinces for relief payments on a year-to-year basis. Saskatchewan was the province that received the most relief funding, because of the greater number of wheat farmers in the Palliser Triangle. In the 1931–32 season, some 305,000 Saskatchewan residents, nearly one-third of the population of the province, received relief (Marchildon and Black 2006).

The Dirty Thirties became synonymous with the Palliser Triangle because of the tendency of lighter soil types in the Triangle to blow and drift (McLeman and Ploeger 2012). Governments and agricultural experts had been encouraging dryland farmers to allow a portion of their land to go fallow each year to amass moisture for the following year's crop. However, this practice would prove disastrous on the light lands in the Palliser Triangle. The frequent cultivation required to clear the surface of moisture-robbing vegetation pulverized the soil to a powder, making it highly susceptible to wind erosion during a prolonged drought. These lighter soils, combined with high winds, resulted in dust storms that blackened the prairie skies (Wheaton 1992).

One of the main purposes of rural relief was to encourage farmers to "stay on the land" rather than drift into the cities seeking what turned out

to be non-existent employment, a situation that could lead to civil unrest. However, even with relief, farm families were still abandoning their farms in the areas of the Palliser Triangle that had been rendered a desert by the drought and topsoil erosion. Although the Alberta government had concluded that wheat farming alone was no longer tenable in the Palliser Triangle, a contrary view was held by decision makers in Saskatchewan and Ottawa, who felt that with a few exceptions, most of the Palliser Triangle could be reclaimed and once again made productive for grain farming. As such, the exodus of thousands of farm families from southern Saskatchewan to the southern edge of the boreal forest was a source of disquiet to both governments (Marchildon 2009b).

In 1934, in response to pressure from political leaders in Saskatchewan and Manitoba, farm groups, the agricultural press, and segments of the general public, the federal government began working on a concerted effort to reclaim the Palliser Triangle. Early the next year, the Prairie Farm Rehabilitation Act was passed in Parliament to allocate money to the federal Department of Agriculture to plant grass in blown-out areas, build small earthen dams to conserve water, and establish demonstration farms in some of the most drought-stricken parts of the Palliser Triangle. Although the Bennett government was defeated mere months after the Act came into force, these initiatives were actually augmented over the next few years. In 1937, the PFRA was established as a separate agency of the federal government with its head office in Regina—at the time the largest city in the Palliser Triangle (Gray 1967).

As part of this expansion, the PFRA was mandated to take possession of drought-stricken land offered up by the provinces for the purpose of creating community pastures. The Saskatchewan government supported the scheme from its inception, but the Manitoba government would not agree to transfer heavily eroded lands in the southwest part of the province to the PFRA for community pastures until 1939. Alberta refused, permanently, to support the PFRA's community pasture program, in part because of its own extensive administration of community pastures through the Special Areas Board. However, the Alberta government eventually co-operated with the federal government to allow the PFRA to develop large-scale irrigation and dam projects. These projects captured the water flowing from the eastern slopes of the Rocky Mountains to the Canadian Prairies. The earliest irrigation projects were in the Lethbridge area but

were soon extended to the 30,000-acre Rolling Hills project near Brooks (Balkwill 2002).

By the end of the Great Depression and the extensive droughts of the 1930s, the PFRA had facilitated the construction of thousands of dugouts—artificial farm ponds—and earthen dams for watering livestock. Dozens of PFRA community pastures were providing inexpensive access to grass for mixed farmers and ranchers in southern Saskatchewan and southwestern Manitoba. In addition, the PFRA had conducted a comprehensive soil survey of 90% of the Palliser Triangle. With its 200 agrologists, engineers, hydrologists, soil scientists, field husbandmen, and other highly trained staff, the PFRA would become a fixture in the southern Canadian Prairies for the remaining decades of the twentieth century. By 2010 the PFRA had ceased to exist as a separate branch within the federal Department of Agriculture and Agri-Food, and its community pasture program had been dismantled by the federal government.

Conclusion

The two case studies reflect the extent to which governments, both provincial and federal, were capable of intervening to facilitate more effective adaptation to the extreme drought conditions, first in the Dry Belt in the 1920s and then in the whole of the Palliser Triangle in the 1930s. Both the Special Areas Board and the PFRA altered existing institutional arrangements to reduce individual and community vulnerability in the most vulnerable part of the Canadian Prairies.

In both cases, governments initially intervened with programs and policies that were more incremental in nature. Only later, after it was clear that the drought was not a temporary phenomenon, did the provincial and federal governments intervene to facilitate more radical changes to the institutional environment.

Where governments did not feel they needed to act, they did not do so, as illustrated in Saskatchewan's portion of the Dry Belt during the 1920s. In any case, no government acted proactively in advance of the drought crisis. Once established, however, the organizations created out of the crisis continued to operate with considerable public support for decades afterward, despite the fact that multi-year droughts on the scale of the 1920s and 1930s did not reoccur in the Palliser Triangle. While the Special

Areas continue to operate in Alberta, the same is not true for the PFRA, only recently dismantled by the federal government. One can only surmise that the policy assumption underlying this decision is that the severe and prolonged drought conditions of the 1930s will never again return to the Palliser Triangle, a questionable assumption at best given the cyclical nature of prolonged periods of drought in the region and future climate change effects, which are likely to exacerbate these extreme climate conditions (McLeman et al. 2013).

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CHAPTER 9

THE GOVERNANCE OF DROUGHTS

Margot Hurlbert

Introduction

An important determinant of a community's ability to adapt to future climate change impacts and current climate variability is its institutional setting and the degree to which this setting facilitates or hinders the community's adaptive capacity (Willems and Baumert 2003; see also IPCC 2001: 891, 897 and Chapter 10 by Hurlbert on water governance in this volume). Institutions contribute to managing a community's assets and, in the case of drought, the assets relating to rural agricultural producers' livelihoods: land, soil, crops, and income. Institutions also contribute to the community members' relationships with natural resources—for example, the provision of drinking water, property rights to land, or access to community pastures. Both formal institutions (e.g., government, non-profit organizations, and civil society organizations) and informal institutions (e.g., social norms, values, and contexts) contribute to the relationships of people to each other and natural resources.

This chapter focuses on government policy in relation to drought—one facet of the institutional context of adaptive capacity and the governance

setting. Governance encompasses laws, regulations, and institutions, as well as governmental policies and actions, national activities, and networks of influence, including international market forces, the private sector, and civil society (Demetropoulou et al. 2010: 341). In this chapter, I describe government policies and programs that assist, or enhance, the adaptive capacity of rural agricultural producers in preparing for and responding to drought in Saskatchewan and Alberta, and then analyze their potential effectiveness at doing so. These policies and programs are divided into three categories in this chapter. The first category includes policies and programs that have been developed to assist agricultural producers in building adaptive capacity to withstand drought. An example is a program facilitating the building of dugouts or water pipelines. The second category includes policies and programs that assist agricultural producers in times of drought, for example, an income-stabilization program. The third category includes climate change and adaptation; this would include regulations reducing greenhouse gas emissions.

Policies Assisting Adaptation to Drought

Drought response and adaptation have been a constant reality for the people of the Canadian Prairie provinces, and for all levels of government, since the beginning of the settlement period. The region has one of the most variable natural climates (ranging from extreme heat to extreme cold) and variable hydrological resources. Droughts and floods are frequent, and the frequency and intensity of droughts are anticipated to increase in the future (Sauchyn and Kulshreshtha 2008; see also Chapter 3 by Wheaton et al. in this volume). Policies and programs that respond to this increased risk of drought will become increasingly important. These policies and programs can be divided into two groups: those that assist rural agricultural producers in adapting to more intense water shortages of longer durations and those that help producers respond to a drought after it has been declared as such.

The federal government's strategy to support farm programs entitled Growing Forward was reintroduced in December 2012 as Growing Forward 2. This second iteration continued to offer a suite of business risk-management programs aimed at helping farmers manage risks from

income declines resulting from drought, flood, low prices, and increased input costs. These programs include the following:

- AgriInvest: This program helps cover small margin declines. It is a self-managed producer-government savings account whereby producers can set aside up to 1% of their allowable net commodity sales, and the federal government will match it (up to $15,000 per year). Funds can be withdrawn at any time.

- AgriStability: This program assists producers in cases of large margin declines in farm income, which may have resulted from low prices and rising input costs. If a producer's margin (allowable revenue less allowable expenses) drops below their average margin from previous years (a historical reference margin) by more than 30%, governments will provide a share of the lost income.

- AgriInsurance: This program protects against production losses related to specific crops or commodities caused by drought, flood, hail, disease, or other natural hazards. Delivered by provincial agriculture departments, this crop insurance program provides for cost sharing of premiums between the producer, the province, and the federal government. Producers receive a payment when their production is below their guaranteed insured level of protection. To address flooding, unseeded acreage benefits were expanded in 2012. Livestock price insurance coverage is being explored.

- AgriRecovery: This program helps farm businesses return to operation following disaster situations. It provides a framework for federal and provincial governments to work together and cost share (on a 60/40 basis) funding on a case-by-case basis in response to natural disasters (e.g., extreme weather, disease, pests). This program provides coverage when assistance is needed beyond that available from other existing programs.

Three new programs under the Growing Forward 2 strategy were created in 2013:

- AgriInnovation: This program is designed to accelerate the pace of innovation by supporting research and development activities and facilitating the adoption, demonstration, and commercialization of innovative products, technologies, processes, practices, and services. Two lines of support exist. An industry-led research and development stream provides non-repayable support for agri-science projects (individual research projects that can be local, regional, or national in scope) or projects that are in the agri-science cluster (aimed at mobilizing and coordinating a critical mass of scientific expertise in industry, academia, and government, which is national in scope). The second line of support provides loans to facilitate the demonstration, commercialization, and adoption of innovative agri-based products, technologies, processes, or services.
- AgriMarketing: This program invests in projects to enhance the agriculture sector's access to international markets or assist in developing assurance systems and standards to give Canadian products a competitive advantage internationally.
- AgriCompetitiveness: This program provides directed investments to help the agricultural sector adapt to rapidly changing and emerging global and domestic opportunities and issues, and respond to market trends.

When the Growing Forward strategy was reintroduced in 2012, it was reported that just over $10 billion had been expended through federal and provincial contributions and payments since 2007, and it was announced that over the ensuing five years (2013–17), $3 billion would be invested in the programs (Government of Canada 2012). Two of the business risk-management programs, AgriStability and AgriInvest, had benefits reduced in the 2012 iteration of the strategy.

Agricultural programming is an area of the Canadian federal system where both levels of senior government—federal and provincial—play roles in program financing and delivery. Over the course of the 1990s, government funding for programs such as AgriInsurance and AgriStability tended to reflect a 60/40 split between the federal and provincial governments, respectively, although for AgriInsurance a portion of the provincial share included in-kind contributions related to program delivery. The federal-provincial AgriInsurance program requires producers to pay premiums accounting for up to one-third of program costs. AgriStability does not require a cash contribution from farmers.

Field research undertaken prior to the 2012 reintroduction of the strategy identified considerable dissatisfaction among Prairie farmers with the AgriStability program (RCAD 2012; Warren and Diaz 2012). A common complaint was the onerous application process. Many farmers required the services of an accountant to complete the required forms, and the cost for these services runs from $1,000 to $3,000 per application. Another area of concern involved the five-year averaging system, which saw the likelihood of payments to producers reduced in conjunction with extended periods of weak commodity prices coupled with rising input costs. After paying to submit an application, a farmer had no assurance that a support payment would be forthcoming. Producers were also frustrated by the lack of agricultural knowledge on the part of program administrators located in large urban centres such as Winnipeg. Recently some provinces, including Saskatchewan and Alberta, have worked to improve the quality of program delivery for AgriStability by taking over program management. While more localized administration may reduce some of producers' frustrations, it is unlikely that the reductions in overall program support associated with the 2012 strategy will be welcomed.

The federal-provincial AgriInsurance system has received mixed reviews from producers in the drought-prone regions of the Prairies, although complaints have historically been more common in Saskatchewan than in Alberta (RCAD 2012; Warren and Diaz 2012). Frustration in Saskatchewan stemmed from the effects of severe drought in the late 1980s and 2001–2 on finances for the program. Following a succession of years when payouts overtook the value of farmer premiums and government contribution levels, the Saskatchewan program fell into deficit. In response, premiums were raised to levels that farmers found exorbitant,

and payout levels were reduced during the 1990s and early 2000s. The Saskatchewan Party government, elected in 2007, addressed farmer concerns by injecting the cash required to make premiums and payouts more attractive. Since 2007, farmer participation in AgriInsurance in Saskatchewan has increased significantly. In Alberta, the provincial government has apparently been more consistently amenable to providing financial resources to maintain attractive premium rates in the wake of major drought events. The programs in both drought-prone provinces (Alberta and Saskatchewan) have benefited from the fact that, with a few localized exceptions, there has not been a severe region-wide drought on the Prairies since 2002.

Agriculture and Agri-Food Canada provides information on drought through the Drought Watch website (Agriculture and Agri-Food Canada, n.d.). Timely information on weather and climate relevant to the agriculture sector in Canada is posted, including historical weather and climate conditions; impacts of these conditions on the sector; short-term forecasting products; and information on mitigating and adapting to the impacts of weather and climate.

In 1935, the federal government established rural water programs to address drought, following the devastating multi-year droughts in the 1920s and 1930s. From 1935 to 1940, the Rural Water Development Program existed to provide funding to help develop secure on-farm water supplies in the Prairie provinces. Group and community projects were added after 1980. From 1980 to 2004, the program expended an estimated total of $154 million. The Prairie Farm Rehabilitation Administration (PFRA), an entity created by federal statute, managed the program from its inception (Government of Canada 2002; see also Chapter 8 by Marchildon in this volume). The National Water Supply Expansion Program (2002–9) expended approximately $102 million across Canada, with roughly $68 million on the Prairies (Wittrock and Koshida 2005: 9). These programs were most often shared with the provinces.

The Saskatchewan Farm and Ranch Water Infrastructure Program (FRWIP) continued this type of programming from 2008 onward. The FRWIP supports the development of secure water sources in Saskatchewan to expand the livestock industry, encourage rural economic activity, and mitigate the effects of future drought. Projects such as community wells, large and small diameter wells, shallow or deep buried pipelines,

and dugouts are eligible for funding. Project costs are shared between the proponent (i.e., producer or municipality) and the federal and provincial governments (Government of Saskatchewan 2011, 2012). This program was designed specifically to deal with hydro-climate extremes (i.e., drought) by providing producers and rural communities with increased access to water resources through infrastructure developments.

The Canada-Saskatchewan and the Canada-Alberta Farm Stewardship Programs (FSPs) assist agricultural producers in adapting to water shortages. Specifically, these programs assist agricultural producers in responding to environmental risk and water supply threats, thereby potentially reducing producers' vulnerability to climate and environmental change by increasing their adaptive capacity. The FSPs are designed specifically with the stated goal of helping producers address on-farm environmental risk (not directly responding to climate change). The programs provide eligible producers with financial assistance to implement beneficial management practices (BMPs) to help maintain or improve the quality of soil, water, air, or biodiversity resources. These BMPs are intended to ensure the long-term health and sustainability of ecological resources used for agricultural production, positively impact long-term economic and environmental viability of agricultural production, and minimize negative impacts and risks to the environment. Federal and provincial funds are available to assist in implementing BMPs. Although they are not specifically designed to improve adaptive capacity for climate variability, there are a number of complementary benefits associated with BMPs (e.g., reduced soil erosion, improved pasture management) that augment producer capacity to deal with variations in climate.

Drought Response Policies

The *Agriculture Drought Risk Management Plan for Alberta–2010* plans for and responds to drought and weather extremes through strategies aimed at three situations: 1) normal or near normal conditions, 2) exceptional/notable conditions, and 3) extreme conditions. Drought is defined as "an extended period of below-normal precipitation resulting in decreased soil and subsoil moisture levels and diminished surface water supplies affecting crop growth, livestock water or irrigation water" (Alberta Agriculture and Rural Development 2010). This management plan integrates policies

allowing adaptation and response to drought and establishes a drought advisory group, which provides advice and oversees the plan.

In Saskatchewan, an intergovernmental drought monitoring committee led by the Saskatchewan Department of Agriculture includes representatives of the Water Security Agency, Crop Insurance Corporation, and Ministry of Environment. This committee provides advice and meets weekly regarding agricultural drought. The committee has drafted drought plans, but they have never been finalized. The last documented plan was the 2002 draft "Drought Risk Management Plan for Saskatchewan," which was designed to help government agencies develop a coordinated response to prepare for, mitigate, and respond to drought (Agriculture and Agri-Food Canada 2002).

Cities and urban municipalities have adapted to water shortages for many years. The City of Regina developed contingency plans in 1988, including water conservation programs and expansion of water treatment and delivery capacity (Cecil et al. 2005). Many urban municipalities have found voluntary alternate watering guidelines very effective (Warren and Diaz 2012).

Watershed groups have commenced planning for drought and excessive moisture. Plans have been developed for the North Saskatchewan River watershed (Rowan et al. 2011) and the Upper Souris River watershed (East et al. 2012); these plans were facilitated by the provincial Water Security Agency and Natural Resources Canada. For the North Saskatchewan plan, representatives mapped their watershed by identifying key characteristics (e.g., where poor drainage, good drainage, and wells existed), reviewed potential future climate scenarios, and then identified vulnerabilities and adaptations to these future scenarios. This adaptation planning exercise was then organized by actions for producers, municipalities, and for policy and programs. For the Upper Souris Watershed Plan, representatives identified components of the plan that were key action items related to preparing for drought and excessive moisture, and began implementing them through three activities: 1) an Ecological Change Workshop was held to document past changes in adaptive capacity using participatory mapping; 2) cattle producers participated in a drought planning workshop; and 3) a survey established a baseline for assessing watershed understanding in the community. So far, these drought planning exercises have only occurred in a handful of situations. No strategy currently exists for

conducting planning exercises, integrating planning among watersheds, and coordinating planning with other interested groups (e.g., civil society organizations). Although these exercises are an important beginning for drought planning, much is left to be done.

The provincial drought response committees offer timely, responsive problem solving in a drought situation. The institutional context for various government ministries is established so decisions can be made quickly. However, in Saskatchewan, priority should be given to finalizing a drought plan for the entire province to allow for coordination of not only the government ministries but also civil society organizations, non-governmental organizations, municipalities, producer associations, and businesses.

Climate Change and Adaptation Policies

As outlined in Chapter 10 the Prairie provinces have had specific policies surrounding climate change and adaptation for the past several years. Saskatchewan's previous New Democratic Party Government issued an *Energy and Climate Change Plan* in 2007—a cross-governmental vision in response to climate change and the development of a province-wide climate change adaptation strategy, which included working with research organizations and supporting critical local research on climate change and adaptation (Government of Saskatchewan 2007). These goals have been reiterated in the *25 Year Saskatchewan Water Security Plan* (Water Security Agency 2012). Several watershed groups have developed drought plans, as outlined above. Currently, climate legislation relating to mitigation remains on the legislative agenda, but it is yet to be proclaimed.

In Alberta, legislation has existed since the Climate Change and Emissions Management Act (2003), a precursor for *Alberta's 2008 Climate Change Strategy* (Government of Alberta 2008). In addition to establishing a carbon offset market and providing consumer rebates in relation to energy efficient products, two programs were introduced, a greenhouse gas reporting program and a greenhouse gas reduction program. These programs relate to the establishment of a greenhouse gas limit and in 2015 a carbon tax was announced (Bakx 2015). In 2003, the Alberta government also created a *Water for Life* strategy focusing on issues of quantity, quality, and conservation of water—all important issues in preparation for

and during drought (Government of Alberta 2003). The strategy initiated three important activities: 1) planning for future management of water via the provincial Climate Change Adaptation Strategy, 2) developing land-use frameworks, and 3) watershed planning through local watershed groups.

Manitoba legislation acknowledges climate change considerations and adopts the precautionary principle and sustainable resource management practices. Recently, the Government of Manitoba announced that the International Institute for Sustainable Development would assist the province in updating its climate and green economy plan to address public concerns about reducing emissions and preparing for climate impacts. The initiative will engage representatives of key sectors, including agriculture, transport, industry, academic, civil society, and others (Pelletier 2013). Sector-wide adaptation as outlined in Manitoba's strategy makes provisions for increasing reliance on energy efficiency and minimizing reliance on fossil fuels (Government of Manitoba 2015).

Alberta and Manitoba are the only two Prairie provinces with policies in place to mitigate climate change. Alberta has passed legislation requiring large emitters to reduce their emissions by 12% using an average of 2003 as a baseline. These requirements apply to emitters making up 70% of Alberta's emissions. Manitoba's legislation requires a reduction of 6% of Manitoba's total 1990 emissions. These requirements are to be achieved in numerous ways, including embracing more renewable sources of energy and developing technology in things such as geothermal and other energy sources and developing hydrogen technologies for transportation.

Canada embraces many measures in these areas as well, but it has no legislated reduction targets for greenhouse gases. The most recent communication filed by Canada in 2010 with the secretariat for the United Nations Framework Convention on Climate Change states that Canada expects to be 802 Mt above its Kyoto Protocol target of 2,792 Mt during the 2008 to 2012 period (Government of Canada 2010). In December 2011, Canada withdrew from the Kyoto protocol. The Conservative government blamed the previous Liberal government for having made an error by committing to the protocol. Prime Minister Stephen Harper has set a target of reducing annual emissions to 17% below 2005 levels by 2020. This threshold is much lower than the Kyoto Protocol target to cut emissions to below 1990 levels (CBC 2011; De Souza 2012). Publicly Stephen Harper

rejected carbon pricing or a carbon tax (supporting regulating each sector instead). However, in Privy Council documents obtained under access to information, Canada stated its support for the development of new market-based mechanisms expanding the scale and scope of carbon markets (De Souza 2013). The new government of Justin Trudeau has spent much time in climate change discussions with other world leaders and the premiers. It would be safe to conclude that we shall see a change in the federal government policy.

Discussion

It is expected that the impacts of climate change in the future will be increased variability of climate with longer durations of drought and extreme moisture (see Chapter 3). This review of policies and programs relevant to climate change and related problems of mitigation, adaptation, drought, and disaster shows that short-term drought strategies are planned at the federal and provincial levels. Farm income stabilization policies do offer a level of protection in the event of both drought and flood. The economic impacts are clearly planned for with a suite of agricultural producer programs available. Research in southern Alberta and Saskatchewan confirms that available protection assists producers for a time frame of only a few years. Given that future droughts are expected to be of longer duration, these policies are not likely to protect producers. If these policies are not redesigned to respond to longer, more severe droughts, it is probable that many producers will not be able to continue farming. Further, long-term drought strategies are missing.

The absence of policy responding to long-term drought appears to be due in part to uncertainty surrounding *when* such an event might occur, which may reflect disagreement on the certainty of climate change science. Alternatively, difficulty in preparing and implementing strategy and policy to respond to long-term drought could relate to values and norms. Government has competing priorities in terms of its attention and its budget, which must be addressed through bargaining. Given these two competing characterizations of the policy problem, it would appear that work needs to be done to overcome both issues. Thus, attention should be given to increasing dialogue and focus on climate change science, specifically in relation to the needs and requirements of policy makers, and

bargaining within the policy system for increasing focus, attention, and priority on climate change and its impacts.

Government attention and funding need to address adaptive measures. These measures might include additional water storage, irrigation infrastructure, and programs to incentivize water conservation. Prioritizing these initiatives needs to be done through public engagement and dialogue, wherein conflicts resulting from different values and norms surrounding these decisions can be resolved. Currently, programs that encourage adaptive measures (e.g., FRWIP and FSPs) are "sold" on the basis that they enhance efficiencies and improve profitability of farm operations. These programs are not directly marketed to the public and producers as assisting in adaptation to climate change. This allows the policy problem with which these programs are attempting to assist to be structured as improving farm profitability rather than adapting to climate change. Incorporating the climate change problem into these policies would enhance them by encouraging producers to incorporate climate change science into planning for a longer term, thus improving their adaptive capacity.

A challenge surrounding drought policy is the fact it is "creeping" in time (over several weeks, months, or even years) and space (occurring often in a dispersed manner within various rural municipalities). This creeping characteristic accentuates the policy problem of drought. The goals of government are somewhat uncertain as governments are hesitant to allocate today's resources to what could be tomorrow's (or the next government's) problems.

Although provincial governments have an apparatus of intergovernmental committees ready to respond in the event of a drought, the federal government is absent in the field of this policy problem in relation to long-term proactive planning. Although droughts were once listed as four of the five top disasters in Canada (Public Safety Canada 2007), droughts no longer appear in the listing, and other than several droughts in the 1990s, total costs are not estimated for droughts. The federal government's lack of policy on drought is notable and cause for consternation. Responding to droughts without formalized institutional relationships and policy is problematic. Although the federal programs associated with Growing Forward offer individual producers some income protection, research has shown this to be inadequate for droughts lasting longer than two years.

The federal response to climate change, climate mitigation, and adaptation to climate change is even more problematic. Canada's performance in relation to the Kyoto Protocol is dismal. Canada's plans for greenhouse gas reduction are confusing. A void in policy responding to climate change problems exists.

Many municipal governments and individual agricultural producers have plans in place for adaptation to climate change. Plans for disaster response to floods, plans for conservation of water in the event of dry years, and plans to deal with drainage access issues have always been part of the Prairie landscape; ensuring that these strategies meet the future anticipated climate is the challenge. Policies exist to encourage best farm practices (e.g., FSPs), many of which allow producers to adapt to climate change by building infrastructure such as dugouts and pipelines (e.g., FRWIP). Although these individual initiatives are important, more concerted planning needs to occur at community and regional levels for responding to flood and drought. This planning would alleviate the pressure placed on individual adaptive initiatives.

Often, policy that responds to flood does not consider drought, and vice versa. For instance, when infrastructure is built and considerations of flood are paramount, communities and government may construct dams or weirs to retain water and protect communities. When infrastructure is built and considerations of drought are paramount, communities and government may construct water storage facilities. Often water storage infrastructure constructed for one of these events is not appropriate for the other. For example, when irrigators in southern Alberta were confronted with significant flooding, their irrigation infrastructure, constructed for water retention in times of drought, was not effective in times of flood (Hurlbert et al. 2015). Predictions of increased variability and more rapid swings between drought and flood should result in a holistic approach to water planning and policy aimed explicitly at responding to both flood and drought and this new condition of extreme variability.

The governments have not holistically responded to our changing climatic future with proactive policy changes. Nevertheless, Canadian climate change policy exhibits some strengths. These strengths relate to long-standing programs, such as crop insurance programs, the FRWIP, and FSPs. However, a comprehensive policy consideration of future climate change has not yet occurred. From this brief overview, it is apparent

that policy response is fragmented and considered only in relation to the structured policy problems of impacts (droughts and floods). Reduction of greenhouse gases in the future, or mitigation, is not even being considered as one long-term adaptation to future climate change. To date, Canada is far from achieving its Kyoto commitments and has in fact given up and removed itself from the Kyoto Protocol. Sparse lip service is paid by the federal government to mitigation of climate change, with mixed messages about tools and strategies. To effectively respond to future climate change, a comprehensive strategy is required that uses the policy framing approach identified herein (see Hisschemöller and Hoppe 1996; Hisschemöller and Gupta 1999; Hoppe 2011). Continuing in a fragmented manner as has been done in the past clearly will not work in the future.

Conclusion

Producers in the Prairie provinces have a long history of adapting to droughts. Future climate change is expected to result in increasing climate variability, including increasing duration and intensity of droughts and floods. One of the key determinants of rural agricultural producers' ability to adapt to drought is the capacity of institutions interacting with these producers to assist with adaptation. Government policies and programs relating to drought are key determinants of whether producers will be able to adapt to future climate change.

This chapter reviewed the institutional governance setting, specifically in relation to drought and flood policies and programs, that impacts a producer's ability to adapt to climate change. This institutional setting is informed by government policies and programs appropriate to water shortages or drought that draw from agricultural policy, water governance, and disaster response. These policies and programs are many and varied when one considers the totality of programs relating to climate change and climate change adaptation, as well as the policy problems of building resilience through drought and flood infrastructure, anticipating future floods and droughts, and responding to present-day droughts. This chapter assessed the successes and challenges that exist in this institutional framework in relation to helping producers adapt to one impact of climate change—drought.

Although policies and programs for responding to present-day droughts and floods have existed for some time, these initiatives have not been reinvigorated to respond to droughts lasting more than two years, as is anticipated with future climate change. Many policies and programs do assist with adaptations, but they are not currently structured around responding to this larger issue. Framing these programs and policies in relation to future climate change may assist in their implementation, allowing producers to plan for a longer term. Local watershed planning is a perfect forum for pursuing discussions of anticipated future climate change and appropriate community and watershed adaptations.

The federal government's lack of attention to drought and climate change mitigation and adaptation is cause for concern. Leadership is required at the national level to comprehensively tackle future climate change, especially in the areas of climate mitigation and greenhouse gas reductions. Provinces, municipalities, and local watershed groups have led the way with comprehensive, sectoral initiatives. These important policies and programs need to be expanded with federal government support. As well, the federal government needs to enter into the policy and program space in relation to climate change adaptation and mitigation, not only in its national coordinating and planning role but also in relation to all sectors under federal jurisdiction, including international and interprovincial trade, energy, and waters.

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CHAPTER 10

WATER GOVERNANCE IN THE PRAIRIE PROVINCES

Margot Hurlbert

Introduction: Water Governance and Adaptive Capacity

Water resources, water infrastructure, and livelihoods that depend on water (e.g., agriculture, forestry, and recreation) are expected to be significantly impacted by climate change in many regions of the world. An important determinant of a community's ability to adapt to future climate change impacts and current climate variability is its institutional setting and the degree to which this setting facilitates or hinders the community's adaptive capacity (Willems and Baumert 2003). As the Intergovernmental Panel on Climate Change (IPCC) argues, nations with "well developed institutional systems are considered to have greater adaptive capacity," and accordingly, developed countries have a better "institutional capacity to help deal with risks associated with future climate change" (2001: 896 and 897). Institutions contribute to the management of a community's assets, the community members' interrelationships, and in turn their relationships with natural resources. Both formal institutions (e.g., government,

non-profit organizations, and civil society organizations) and informal institutions (e.g., social norms, values, and contexts) contribute to the relationships of people to each other and natural resources.

The institutional context of adaptive capacity can be studied through an investigation of the institutions involved in governance. Governance encompasses laws, regulations, and organizations, as well as governmental policies and actions, domestic activities, and networks of influence, including international market forces, the private sector, and civil society (Demetropoulou et al. 2010: 341). It entails the interactions among structures, processes, rules, and traditions that determine how people in societies make decisions and share power, exercise responsibility, and ensure accountability (Cundhill and Fabricius 2010: 14; Raik and Decker 2007; Lebel et al. 2006). Thus, governance involves institutions through which citizens and groups articulate their interests, exercise their legal rights, meet their legal obligations, and mediate their differences (Kiparsky et al. 2012; Armitage et al. 2009). A rich literature has developed regarding adaptive governance, adaptive water governance, and specifically how the wider institutional context of governance can facilitate adaptation and improve adaptive capacity of communities. Adaptive capacity is especially important in responding to drought events. The governance framework surrounding drought (constituted by such things as water allocation laws, programs and policies facilitating drought preparation, and income stabilization in the event of drought) plays an important role.

A large body of literature is available on the adaptive governance of water and the subsumed institution of water law. Water law establishes the formal framework of rules within which people and organizations operate in relation to water, and it constitutes a foundation of water governance. Water governance refers to the range of political, social, economic, and administrative systems that develop, manage, and distribute water resources (GWP 2009: 14). It involves public and civil society organizations and comprises norms, programs, regulations, and laws relevant to the management of water resources (Hall 2005; see also Conference Board of Canada 2007; UNDP 2007; de Loe and Kreutzwiser 2007).

This chapter reviews adaptive institutional design principles applicable to water governance, the structure of water governance in the Canadian Prairie provinces, and the legal tools and instruments most germane

to water and the occurrence of drought. These legal instruments are then analyzed in relation to the principles of adaptive governance.

Adaptive Institutional Design Principles

How do we recognize a system of water governance as adaptive? Within the adaptive capacity literature, several dimensions have been identified as important characteristics called institutional design principles, or features of governance systems that define an institutional system as adaptive. These dimensions include such things as "availability of information," "openness for experimentation," "flexibility," "learning," and others. The discussion in some cases is generic and applies to institutions in general (Gupta et al. 2010; Olsson et al. 2006; Folke et al. 2005; Gunderson and Holling 2002;) and in other cases applies to specific institutional regimes, such as water governance (Huntjens et al. 2012; Hill 2012; Cook et al. 2011; Young 2010; Mollenkamp and Kastens 2009; Huitema et al. 2009). The literature refers to a proper understanding of the complexities of the phenomenon of climate change, which include the requirements imposed by boundaries, levels, sectors, and diverse stakeholders, as well as the uncertainties surrounding, and long-term time frame of, climate change (Gupta et al. 2010; Frohlich and Knieling 2013; Cook et al. 2011). Table 1 outlines these various dimensions.

Adaptive governance entails a more flexible, participatory, experimental, collaborative, and learning-based design and approach to policy making and governance to increase adaptive capacity of institutions and sustainability of natural resources (Pahl-Wostl 2010; Pahl-Wostl et al. 2007a, 2007b, 2007c; Kallis et al. 2006; Tompkins and Adger 2004; Walters and Holling 1990; Lee and Lawrence 1986; Walters 1986). Adaptive governance shifts focus from rule-based, fixed organizations to a view of institutions as dynamic, flexible, pluralistic, and adaptive in order to cope with present and future uncertain climatic conditions and the limits of predictability (IISD 2006: 5; Carpenter and Gunderson 2001; Levin 1999). Adaptive governance then becomes a means to achieve adaptive capacity (Cook et al. 2011). Assessing whether a governance regime is adaptive entails a consideration of its institutional structure and its most important constituent parts (or instruments). For instance, crop insurance is an instrument that helps producers stabilize income in times of drought.

Table 1. Institutional design principles of adaptive governance

	Institutional design principle of adaptive governance	Related principles / sub-principles	Explanation	Literature
1	Responsiveness		The ability of governance networks, organizations, and actors to respond appropriately and in a timely manner to climate variability, hazards, and extreme events in a manner that accounts for ecosystem dynamics	Hatfield-Dodds et al. 2007; Kjaer 2004; Dietz et al. 2003
		Robust and flexible process	Institutions and policy processes that continue to work satisfactorily when confronted with social and physical challenges but at the same time are capable of changing	Huntjens et al. 2012: 73; Mollenkamp and Kastens 2009
2	Variety of problem frames		Openness to multiple frames of reference, opinions, and problem definitions offering diverse and sometimes competing solutions and options to assess a problem as well as resolve conflict	Gupta et al. 2010
		Multi-level – redundancy	A variety of problem frames inherently involves participation of a variety of different actors, levels of government, and sectors in the governance process and collective choice arrangements, without redundant overlapping costly systems.	Huntjens et al. 2012
		Polycentric governance	Different centres of management and control should exist (as opposed to hierarchical systems).	Ostrom 2010
3	Learning and institutional memory		Past experiences must be remembered, learned from, and routines improved.	Huntjens et al. 2012; Gupta et al. 2010; Armitage 2005; Olsson et al. 2004; Pretty 2003; Dietz et al. 2003; Pretty and Ward 2001
		Participation	Participation by non-state actors	Folke et al. 2005
		Collective choice arrangements	Enhance participation of those involved in making decisions about the system in how to adapt	Huntjens et al. 2012

		Monitor and evaluate	Institutional evaluation processes must monitor and evaluate policy experiences.	Huntjens et al. 2012
4	Trust		Institutional patterns must exist to promote mutual respect and trust so that participants continue to be involved in the process of governance.	
		Open to uncertainty / open to experimentation	Policy experiments allow feedback loops so policy can be changed quickly in response to changed conditions.	Mollenkamp and Kastens 2009
		Constructive conflict resolution	Timely response to problems, careful sequencing, transparency	Huntjens et al. 2012
5	Capacity building	Information Leadership Resources	The informational, human, and social capital must exist within the governance regime to respond appropriately to climate variability, hazards, and extreme events. Leadership must exist to act as a catalyst to change. Appropriate resources (financial, political, human) must be available for this change.	Gupta et al. 2010; Olsson et al. 2004
		Information	Rigorous up-to-date information; sufficient and reliable	Mollenkamp and Kastens 2009
6	Equity	Legitimate Accountable Fair	The governance regime must be perceived as legitimate and accountable, as well as fair in its process and impact, so that there is an equal and fair (re-)distribution of risks, benefits, and costs.	Gupta et al. 2010; Huntjens et al. 2012; Ostrom 2011
7	Political support		Responding to climate change is a long-term policy challenge that requires solid political support for plans longer than election cycles.	Molenkamp and Kastens 2009
8	Clearly defined boundaries		Clarity over who has rights; who has responsibility, capacities, access to resources, and information in times of climate events	Huntjens et al. 2012

Source: Hurlbert and Diaz 2013.

Similarly, water infrastructure programs assist producers in building water-retention facilities and shallow pipelines, which also increase adaptive capacity in times of drought.

Institutional Structure of Water Governance

Water governance in the Prairie provinces involves many actors, including the government (all levels) and civil society organizations. Water in Canada is essentially the mandate of the provinces; however, there are shared jurisdictional roles with the federal government (e.g., transboundary flow, environmental protection) and some delegated function to local municipal governments (e.g., drinking water, land use, environmental protection). Nineteen federal government agencies are involved in water governance issues across Canada (Hurlbert et al. 2009). Environment Canada prescribes national drinking-water standards, monitors interprovincial streamflows, and facilitates the work of the Prairie Provinces Water Board (an agency overseeing the agreement apportioning flows between Alberta, Saskatchewan, and Manitoba). The International Joint Commission administers the Canada-US Boundary Waters Treaty. The number of federal agencies involved in water governance on the Prairies will be reduced as the Agri-Environmental Services Branch (formerly the Prairie Farm Rehabilitation Administration) winds down through government layoffs and program terminations. This institution assisted rural adaptation and water infrastructure development and management in the Canadian Prairies and its dismissal clearly will affect the adaptive capacity of agricultural producers (see Chapters 5, 6, and 8 in this volume).

At the provincial level, each province has an entity responsible for water: in Saskatchewan it is the Water Security Agency, in Alberta it is the ministry of Alberta Environment and Parks, and in Manitoba it is the Manitoba Water Stewardship Division. However, other departments and government organizations also play a role in water. In Saskatchewan and Manitoba, government branches responsible for the environment and health also play a lesser role in relation to water. In Alberta, a 24-member, non-profit Alberta Water Council oversees the province's water strategy and facilitates water disputes between sectors. In Saskatchewan, 19 members of the Saskatchewan Watershed Advisory Committee advise on water issues. All provinces have a host of watershed associations (some

constituted pursuant to legislation, others non-profit) or conservation districts (Manitoba) involved in source water protection planning. Table 2 lists these institutions.

These organizations manage day-to-day decisions pertaining to water, including water allocation and decisions impacting water quality. Considerable similarity exists between the provincial organizations (as outlined in Table 2); however, the structure of water law used in each province differs. Table 3 summarizes the major features and differences between the legal institutional structures of water law in the three Prairie provinces.

This table is organized around the "principle" of water management for each province, which has been categorized by the author. Alberta states that the purpose of its water legislation is to support and promote the conservation and management of water balanced with the need to manage and conserve water resources to sustain a healthy environment, and the need for Alberta's economic growth and prosperity (Water Act, R.S.A., c. W-3). The *25 Year Saskatchewan Water Security Plan* states its vision of water as "supporting economic growth, quality of life and environmental well-being" (Water Security Agency 2012: 3). Water is considered a finite resource requiring a long-term perspective managed adaptively through collaborative processes. Although this plan mentions the interests of future generations, the legislation envisions management for economical and efficient use, distribution, and conservation of the water without mention of these future interests (the Saskatchewan Water Security Agency Act). The Manitoba Water Protection Act specifically states in its preamble that an abundant high-quality water supply is essential to sustain life now and in the future and is a "fundamental right of citizens"; the Water Resources Conservation Act states in its preamble that water is to be administered based on the precautionary principle and sustainable water resource management practices and that legislated priority is given to domestic, municipal purposes over agricultural, industrial, irrigation, and other purposes. Because of these principles, the Manitoba legislation has been termed as treating water as "public property." These principles of water governance structure determine the nature of the instruments created by legislation and policy surrounding water covered in the next section.

Table 2. Key provincial and federal government agencies with water mandates

Provinces	
Alberta Environment and Parks / Saskatchewan Water Security Agency / Manitoba Water Stewardship	Responsible for water allocations; licensing; oversight of municipal treatment of drinking water and wastewater; watershed management in partnership with watershed groups; and planning, monitoring, and protection of water quantity and quality in surface water and groundwater systems in the environment. In the 1930s, the federal government transferred responsibility of water resources to the provinces via Natural Resource Transfer Agreements.
Health Ministries	Responsible for protecting public health (e.g., drinking water, wastewater management); acts as decentralized authority to regional health authorities.
Agriculture	Irrigation, drought management; encourages adoption of agricultural best management practices to protect water supplies from agricultural contamination; assistance for on-farm agricultural and domestic water supplies.
Alberta Emergency Management Agency / Saskatchewan Ministry of Government Relations	Coordinates, collaborates, and co-operates with all organizations in prevention, preparedness, and response to disasters
Alberta Drought Management Committee / Saskatchewan Drought and Excess Moisture Committee	Committees monitor, plan for, and provide alerts for drought conditions; committees focus on reporting, monitoring, and response actions
Government of Canada	
Environment Canada	Surveys and monitors water quality and quantity; regulates trans-boundary flow; enforces and protects the aquatic environment; and conducts water and climate research. Environment Canada and provincial ministers of the environment set the Canadian Environmental Quality Guidelines. Guidelines pertinent to water include limits established for the protection of aquatic ecosystems, municipal uses of water (community supplies), recreational uses of water, and agricultural uses of water (Canadian Council of Ministers of the Environment). Environment Canada leads the Prairie Provinces Water Board.

Health Canada	Sets Guidelines for Canadian Drinking Water in partnership with provinces; sets health-based standards for materials in contact with drinking water; assists First Nations with drinking water safety on their lands; provides drinking water guidance to other departments, governments, and citizens; regulates the manufacture and sale of pesticides in the Pest Control Products Act, co-leads the Canadian Environmental Protection Act with Environment Canada
Agriculture and Agri-Food Canada	Encourages adoption of agricultural best management practices to protect water from agricultural contamination; PFRA responsible for applied research and rural water management (water supply/quality, irrigation, climate, drought adaptations)
Natural Resources Canada	Conducts groundwater mapping and monitoring; conducts water and climate research; responsible for climate programs and activities with Environment Canada (e.g., lead for Canada's now defunct Climate Change Secretariat)
Fisheries and Oceans	Responsible for protecting, managing, and controlling inland and marine fisheries; conserving, protecting, and restoring fish populations and fish habitat; preventing and responding to pollution; and regulating navigation
Public Safety Canada	Responsible for disaster planning, recovery, and response
Coordinating water management institutions	
Prairie Provinces Water Board	Federal-provincial board to manage inter-jurisdictional water issues in the Prairie provinces (Alberta, Saskatchewan, and Manitoba); board includes representatives from Environment Canada, Agriculture Canada, Alberta Environment and Parks, Saskatchewan Water Security Agency, and Manitoba Water Stewardship; board addresses inter-provincial water issues (allocations, flows, water quality)
Watershed advisory councils and boards / conservation districts	A variety of watershed councils, conservation districts, and groups exist in each province. Their focus is on water management by landscape boundary (defined as a watershed for surface water and an aquifer for groundwater). Watershed groups involve all water users, local government, and provincial and federal governments, each working to identify and address water management issues unique to each watershed.
Irrigation districts	Irrigation districts in the South Saskatchewan River basin (SSRB) manage water for irrigated agriculture for scale field crops. Because these are large water users, the districts work with provincial agencies to manage water in the SSRB. Irrigation in the SSRB accounts for 90% of consumptive water use in the SSRB.

Table 3. Institutional legal water structures of the Prairie provinces

Province / principle under which water is managed	Alberta	Saskatchewan	Manitoba
Principle	Most beneficial use	Common property	Public property, future generations, and precautionary principle included
Allocation of water rights	Statutory legislated model	Licensed interests allocated by the Water Security Agency on conditions considered appropriate	Statutory legislated priorities
Priorities	First-in-time, first-in-right principles	No statutory priority scheme	Order of priority: domestic, municipal, agricultural, industrial, irrigation, and then other purposes
Water market	Transfers of water independent of land allowed	None	None

Water Instruments

Within the context of laws, regulations, and policy, specific policy instruments are used to influence behaviour and effect a certain response (Anderson 2010: 242). Although many types of instruments exist (Gupta et al. 2013: 45; Baldwin et al. 2011; McManus 2009), this chapter focuses on market or economic interests—the property interest of water. Instruments can be classified into four categories: regulatory, economic and market-based, suasive, and management (Gupta et al. 2013: 45). Although this classification is not ideal because there is much overlap and potential for errors in deciding on a classification, examples of these instruments in the case of water (and drought specifically) are listed in Table 4.

Table 4. Classification and description of instruments

Instrument	Description	Example
Regulatory	Adopted by the state authority; binding; determining what is permitted and what is illegal, including sanctions for non-compliance; without a market component (McManus 2009; Baldwin et al. 2011)	Holdback for minimum river flow requirements on water transfers Water licences with terms and conditions
Economic / market-based	Encourage behaviour through market signals rather than explicit directives (Stavins 2003)	Tradable water rights Water tariffs
Suasive	Measures that internalize environmental awareness and responsibility into individual decision making through persuasion (OECD 1994) Public and private information, research, and public awareness	Public participation in watershed planning Drinking water quality reports and alerts Drought prediction and alerts
Management	Includes mostly self-management by private actors but could be hybrid management processes	Local watershed governance Source water protection plans Irrigation association constitutions

Source: Adapted from Gupta 2013: 45.

There are three major instrumental contexts relating to the bundle of property rights associated with water; these contexts concern whether water is privately owned (as a saleable interest as in Alberta or Chile [Bauer 1998]), is public property (freely available to all), or is common property (owned by the water users). In the Prairie provinces, because the Crown owns all water and because water rights are allocated by licence, this property ownership distinction is not applicable; however, the property distinction is illustrative, as parallels can be seen in the characteristics of bundles of water rights received by way of water licence. Based on the three models of property rights (see Table 3), the three instrument models are as follows:

- Government agency management, generally associated with water regarded as public property: Government defers its authority for managing water to an agency, which assumes authority for directing who receives water rights in accordance with bureaucratic policies and procedures. In Canada, water is owned by the State (or Crown), and interests are allocated by licence. Often a first-in-time, first-in-right priority scheme applies (Hurlbert 2008). This model is implemented through water licences with terms and conditions, or regulatory instruments.

- User-based management, generally associated with water regarded as common property: Water users, or those with licence or rights to water, join together and coordinate their actions in managing water resources. Decision making is collective among users. Irrigation associations are an example of this type of ownership; another example is co-managed water resources (Plummer 2009). This model is an example of the use of management instruments to manage water (i.e., water is managed by private actors).

- Market, generally associated with water owned as private property: Water is allocated and reallocated through private transactions. Users can trade water rights through short-term or long-term agreements or temporary or permanent transfers, reallocating rights in response to prices (Bruns and Meinzen-Dick 1995). This model is an example of an economic or market-based instrument.

Sometimes these instruments are used in combination. Alberta has led the provinces in developing a water market where transfer of water rights is allowed in accordance with an approved water management plan or by Cabinet order in the absence of such a plan. These transfers are possible only within six districts. However, water continues to be owned by the Crown; a licence is granted to property owners in respect of a parcel of land and then transferred with the land. It is possible to transfer a water interest. For example, Alberta's water management plan for the South

Saskatchewan River basin allows the director to consider applications to transfer water allocations within the basin (Alberta Environment and Parks 2015). This market-based management model used by Alberta is not a true laissez-faire market with vendors and purchasers conducting transactions purely based on market rules; a certain amount of oversight is retained in the review of these transactions, and, as such, the predictability of a market model is reduced somewhat (Hurlbert 2009a). This market model aligns with the principle of most beneficial use (outlined in the structure of water governance above). In Manitoba and Saskatchewan, the government agency management model is used, with the government allocating licences and determining priorities. All three provinces have employed a degree of user-based water management with the development of source water protection plans by local watershed committees. The persuasiveness of these plans and the permanence of this activity have yet to be determined.

Analysis

The provincial structures of water governance, with a specific focus on the property rights of water, are analyzed in this section in relation to the institutional design principles of adaptive governance. This analysis is carried out based on the characteristics of the provincial water governance structures described in Tables 3 and 4. This section discusses the economic or market instruments used in Alberta, but this description is perhaps overgeneralized. The Alberta water governance structure predominantly uses regulatory or government agency management instruments, but also makes considerable use of water management instruments (e.g., source water protection planning by irrigation associations and local watershed groups). Although Saskatchewan does not have tradable water interests, it uses government agency management instruments, but also makes considerable use of management instruments (e.g., source water protection planning by local watershed groups and irrigation associations).

Manitoba's system has been characterized as using a government agency regulatory instrument and user-based management approach because it embraces both source water protection planning and principles of future sustainability. This assessment is summarized in Table 5.

Table 5. Assessment of institutional principles in each province

			Alberta (economic)	Saskatchewan (government)	Manitoba (government / user)
	Institutional design principle of adaptive governance	*Related principles/ sub-principles*			
1	Responsiveness	Robust and flexible process	Market instruments provide poor response to social conditions. Remainder of Alberta's water governance structure is similar to that of Saskatchewan and Manitoba.	Government agency has legislative ability to respond in timely fashion.	Government agency has legislative ability to respond in timely fashion. User groups are context specific.
2	Variety of problem frames	Multi-level – redundancy Polycentric governance	Concerns with federal government withdrawal from water governance	Concerns with federal government withdrawal from water governance	Concerns with federal government withdrawal from water governance
3	Learning and institutional memory	Participation Collective choice arrangement	Not applicable because market instruments operate in real time.		

4	Trust	Open to uncertainty Constructive conflict resolution	Trust – beyond the scope of the paper Poor access to justice—court remedies after a drought are slow and expensive	Ability to provide timely response in legislation	
5	Capacity building	Information Leadership Resources	Further research required	Further research required	Further research required
6	Equity	Legitimate Accountable Fair	Further research required	Further research required	Further research required
7	Political support		Present	Present	Present
8	Clearly defined boundaries		Interjurisdictional issues unclear in face of increasing drought		

Responsiveness

A tradable water interest, or market instrument, responds to the terms and conditions created within the market and the regulation of that market. The Alberta market model was developed specifically to more efficiently allocate and price water. The statutory provisions allowing transfer are touted by some researchers, and the Alberta government, as advancing the goals of efficient allocation of water interests and conservation in encouraging the transfer of surplus interests. This process is also described as creating a non-regulatory method of reducing wasteful use by creating an incentive to save water and transfer its marginal value for compensation (Percy 2004). Many would argue this market instrument does not capture the community value of water, nor does it facilitate political and ethical considerations in allocation decisions. The risk of the market instrument is that impacts on third parties not directly involved in a market transaction are neglected, and third parties have difficulty enforcing their interests in a court of law. These characteristics make the market instrument in relation to water property rights not as responsive as a system whereby governments and all users can hear and determine water issues. It should be kept in mind that only a small fraction of Alberta's water governance structure entails tradable water interests.

However, studies of water governance that have focused on how the institutional context of the regulatory tools of government have managed water structures in Alberta and Saskatchewan have concluded that challenges in relation to responsiveness exist. One study concluded that improvements are needed to increase the efficacy and effectiveness of organizations and processes of water governance, as much fragmentation impedes setting clear policy objectives and implementing, assessing, monitoring, and evaluating policy (Hurlbert et al. 2009: 123; see also Bakker 2007). Further, there is limited institutional coordination and integration, which is a result of management rigidity (Hurlbert and Diaz, 2013). To improve responsiveness, a robust channel of communication between local communities and water governance organizations is needed (Hurlbert et al. 2009: 124).

An abundance of academic literature concludes that management instruments effected by local watershed governance and participatory resource co-governance (such as that practised by irrigation associations) are more responsive (e.g., Hickey and Mohan 2004; Brooks 2002). More

research is needed to determine conclusively which structures respond in more timely and appropriate manners. It would appear that a market instrument might allow timely response to certain economic interests, whereas water user conflicts in relation to scarcity of water in times of drought might be best addressed in a timelier manner by regulatory government agency tools or user-based management tools.

Variety of problem frames

The multitude of government agencies involved in water management results in a variety of problem frames in relation to water issues. In the Canadian constitution, water is not treated as a single topic assigned to one level of government (federal versus provincial). The provincial government has powers that relate to water, including property (generally including water in its definition).[1] The federal government also has certain powers in relation to water, albeit historically somewhat more limited than the provinces.[2] Limits would include powers in relation to water allocation to facilitate navigation and in relation to water quality and quantity to maintain and preserve fish populations and their habitat. The federal government takes control of water once it crosses an interprovincial or international boundary, in accordance with the federal head of power relating to interprovincial works and undertakings (Kennett 1991). Often overlap exists and both levels of government share jurisdiction in relation to certain aspects.

Although the multitude of water organizations existing at each level of government would appear to give rise to the possibility of a variety of problem frames, this is not the case in practice. When the federal government developed a Federal Water Policy in 1987, it was not fully supported with the necessary resources and never fully implemented (Hurlbert and Cokal, 2009). Although there have been numerous calls for a renewed Canadian water strategy (e.g., Barlow 2011), a comprehensive strategy has not been formulated and does not appear on the federal government's agenda. As a result, water is increasingly governed provincially. In addition, the federal government has withdrawn from many water governance activities it had historically been involved in, such as irrigation infrastructure (see Chapter 6 by Warren on irrigation in this volume) and community pastures. This withdrawal has negatively impacted the variety of problem

frames in relation to water as well as the polycentric nature of Canadian water governance.

In the event of future water shortages, the lack of a federal water mandate could also have significant implications if interprovincial conflicts arise. The current Master Agreement on Apportionment between Canada, Alberta, Saskatchewan, and Manitoba contains a strict formula for sharing water.[3] In the event of severe water shortage, the lack of drinking water for Saskatchewan residents will be inconsequential, as the formula is the only mechanism of allocation. This strict formula was developed partly as a response to disagreement between Saskatchewan and Alberta on what developments should occur and to a mandate change several decades ago. This historical impasse should not be forgotten as water shortages loom on the horizon. Research confirms that having response mechanisms in place is important in addressing issues and potential conflicts (Adger 2003).

The addition of a tradable water interest adds an important economic tool for capturing surplus water and creating financial incentives to conserve and realize efficiencies in relation to water allocations. More research is required to ascertain if these market instruments solve these problems in relation to fully allocated watersheds. A tradable market water instrument allows only the considerations built into the legislated regulatory fabric of the market to be reflected in the problem frame. Many issues could arise if and when shortages of water are so severe—as is in the case of extreme drought—that the traded water interests cannot be met within Alberta while honouring the historic water agreement between Canada, Alberta, Saskatchewan, and Manitoba.

Learning and institutional memory

The market instrument—the tradable water interest—responds to current conditions at the time it is used. As such, any learning and institutional memory would relate to the actors participating in the market. At present, trades of these interests are sparse, and details such as this require further research. Studies have been conducted on the institutional context of water governance in relation to learning and institutional memory in the Prairie provinces—the regulatory instrument or government agency–based water management (Diaz et al. 2009)—and some of the findings detailed below arise from this work.

The Prairie provinces have been managing the water resource since its transfer to them by the federal government in the 1930s. One of the biggest challenges facing all three provinces is the aging workforce and the retirement of key personnel who have the institutional memory of managing this resource. It will become increasingly important to develop strategies to document this knowledge, transfer it through mentorship to the emerging younger workforce, and maintain access to the retiring workforce through novel retention arrangements.

Alberta has a long history of water policy, strategy, and planning through its Water for Life initiative. Manitoba's history relates to its drainage and conservation district management. Saskatchewan's first water strategy was issued in 2012, but one Crown corporation has been tasked with water management in Saskatchewan for decades. The relatively recent use of the management instrument—local watershed-source protection planning—should facilitate the transfer of knowledge of water governance between these local watershed groups and the water users (i.e., the public and other stakeholders) interacting with these groups.

This process will provide an additional strategy to transfer knowledge and retain past learnings to address the issue of pending civil-servant retirements.

The federal government's lack of involvement in water and water strategy since 1987 leaves an important gap in jurisdictional strategy, which potentially hinders long-term learning and institutional memory. The Prairie Provinces Water Board's mandate relates to implementing a historic water sharing arrangement. Particularly given anticipated future drought, the absence of a long-term national plan limits the possibility of a flexible institutional governance environment able to identify social needs and problems in relation to impending climate change, balance competing interests, and execute and implement solutions. As a result, drought or extreme climate events will be addressed in a reactive manner, instead of using a flexible, proactive policy response, which would stimulate learning.

Trust

The market instrument—the tradable water interest—creates a market for the transfer of water interests. If market rules are clear and transparent, those able to access the market will in all likelihood have a degree of trust in the market. However, the broader institutional structure of water

governance in this context is arguably different. Those without access to water interests would in all likelihood not experience the same trust. Further research defining and exploring trust and the perspectives of participants in water governance is needed. Previous studies have expressed some scepticism as to how trustful participants might be of market and government contexts concerning water governance, specifically in relation to the resolution of conflicts over water (e.g., Hurlbert and Diaz 2013).

The increasing spectre of water shortages is expected to amplify potential conflicts among current water rights holders. The current institutional context appears not well situated to respond to these conflicts. The Saskatchewan and Manitoba system appears situated within a government review and reconciliation framework; Alberta's within a court and litigation–based framework. Albeit the former may be more conducive to timely resolution of conflict with less expense, both systems are in need of improved access to justice. Failure to provide this access may erode trust and ultimately legitimacy.

Capacity Building

It is difficult to postulate how the market instrument—the tradable water interest—might impact information, leadership, and resource capacity. Research methods teasing out insights in this regard also raise many challenges in relation to both choice of method and implications of results. However, the following case study uncovered in previous research studies is informative.

The Institutional Adaptation to Climate Change Project (http://www.parc.ca/mcri) uncovered a case study wherein Alberta's water transfer provisions—or market instruments—were used in the 2001 drought, but this case also illustrated the usefulness of user associations—or management instruments. Usually during years of water shortages, regional staff of Alberta Environment had to advise junior licensees (or last-in-time licensees) that they needed to shut down their pumps and were being cut off. In the St. Mary's River in 2001, there was a severe water shortage, which was going to allow only six or seven licences to operate. Stop orders would have had to be issued on 500 to 600 licences, which could have dried up the river. Sharing provisions that were put into the Water Act between 1993 and 1996 allowed two licences to share water back and forth (if physically possible), as long as no other licensee complained that it hurt their right.

Irrigation districts sent out letters to their licensees and held meetings to discuss water shortages. A smaller percentage of water allocation for each licence was agreed on (approximately 60%). However, because irrigators and other users of water could not meet their agricultural or business needs with this smaller allocation of water, novel arrangements were made. Farmers transferred their allocation to other farmers in exchange for agreed-upon consideration, which allowed at least one farmer to irrigate and grow a crop that year. Approximately 70 licensees did not agree to the sharing arrangement and received stop orders (Hurlbert 2009b, 2009c; see also Chapter 11 by Corkal et al. in this volume).

This case study illustrates an important finding. Although institutional contexts are often portrayed as mutually exclusive totalities (as illustrated above in the characterization of the three Prairie provinces' water governance structures), the reality is that the Prairie provinces use a combination of institutional contexts and thus a combination of instruments that embrace these concepts. How these instruments are employed and accessed, and therefore how they operate in conjunction with one another, warrants further consideration and study.

Equity

As with many of the other indicia of adaptive governance, it is difficult to assess the equity in relation to water governance instruments without appropriate primary social science research. Perceptions of participants in the institutional water governance context on legitimacy and accountability would be particularly germane. However, failing this, the case of Chile, where tradable water property interests are the sole water instrument in relation to water property interests, sheds some light on the use of one sole instrument. In Chile, a Water Code established a market for water rights, where water rights are treated as any commodity, so they could be sold, rented, and transferred to other people. The government has a very limited role in administering water transactions and water conflicts, since they are defined as issues to be resolved between private individuals. Given that water resources are fully allocated in some areas, many local communities and small, medium, or poor farmers may be without water rights and without the means to purchase them (Reyes et al. 2009; Bauer 1998: 67).

The adoption of a neo-liberal Water Code—where water is considered a privately owned commodity—has been an imposition of a top-down

system that has not only limited the capacity of governance to establish adaptive water strategies at the regional level but also has imposed a process of competition in a context characterized by an unequal distribution of power (Galaz 2003), resulting in an adaptive capacity to water scarcities that is concentrated in a small number of large producers with the ability to more easily obtain access to water rights. This situation has resulted in inequitable water governance structure in times of drought.

Political Support

The selection of water instruments predominantly used by the Prairie provinces would appear to have little relationship to a province's support for climate change action. Although the market-based beneficial-use water governance structure of Alberta places considerable onus on individuals to make informed decisions in relation to risks such as climate change, the Alberta government has had a climate change strategy for some time. The Climate Change and Emissions Management Act (2003) was a precursor to Alberta's Climate Change Strategy (2008) and focused on risks and vulnerabilities to water. In addition to establishing a carbon offset market and providing consumer rebates in relation to energy efficient products, two programs were also introduced, a greenhouse gas reporting program and a greenhouse gas reduction program. These relate to the establishment of a greenhouse gas limit. In 2003, Alberta also created its Water for Life strategy focusing on issues of quantity, quality, and conservation of water, which has continuously been reviewed and revised (AWC n.d., 2009, 2007, 2005) The strategy initiated three important activities: 1) planning for future management of water via the provincial Climate Change Adaptation Strategy; 2) developing land-use frameworks; and 3) watershed planning through local watershed groups. All of these activities are important for adaptation to climate change.

In Saskatchewan, a previous New Democrat Party government issued an *Energy and Climate Change Plan*, which was a cross-governmental vision in response to climate change and the development of a province-wide climate change adaptation strategy that included working with research organizations and supporting critical local research on climate change and adaptation (Government of Saskatchewan 2007). Currently, climate legislation relating to mitigation remains on the legislative agenda but is yet to be proclaimed. However, the *25 Year Saskatchewan Water*

Security Plan (Water Security Agency 2012) states that work with research partners on climate change impacts will continue to identify possibilities for adaptation.

In Manitoba, climate change considerations are acknowledged within legislation and the climate change strategy document *Adapting to Climate Change: Preparing for the Future* (2015). At the legislative level, climate change is acknowledged in the Water Resources Act. In its preamble, the Act states the following:

> In light of the fact that future domestic needs and the potential effects of climate change are unknown, such a scheme should be based on the precautionary principle and on sustainable water resource management practices. (n.p.)

In its climate change plans, the Government of Manitoba discusses actions implemented to date and future directions. Actions-to-date relating to climate change adaptation include developing integrated watershed management plans, revising flood protection plans, expanding Manitoba's hydrometric network, introducing incentive-based programs, and developing research relating to land-use planning (Government of Manitoba 2008: 47). The document addresses sector-based climate change adaptation. For example, within the agricultural sector, "climate friendly" best management practices are recommended, such as "improved handling, treatment, storage and application of manure to reduce CH_4 and N_2O emissions" (Government of Manitoba 2008: 3). Within the energy sector, the Manitoba government emphasizes minimizing reliance on fossil fuels and maximizing energy efficiency through programming (Government of Manitoba 2008: 4). The role of municipalities in promoting adaptive practices is also discussed through the idea of "climate friendly planning."

A challenge in the Prairie provinces' water governance structures in recent years relates to the long-term and comprehensive consideration of climate change adaptation within the water governance agenda (Hurlbert et al. 2009). Although some inroads have been made by each province, it would appear that a considerable opportunity exists for expanding policy in this area.

Clearly defined boundaries

User-based management instruments can result in sandbox politics and can fail to provide clearly defined boundaries with respect to water interests, resolution of uncertain water relations, and water strategies into the future. This is due to the participatory, iterative nature of user-based management processes. However, use of this form of instrument of governance, in combination with other approaches, such as that of government agency management and perhaps a well-constructed and limited market instrument, can be highly beneficial. The key is establishing clear conditions of market instruments, well-conceived government management back stops, and functions within the water governance structure that facilitate success of user-based management instruments. Currently, employment of user-based management instruments in relation to source water protection planning and day-to-day management of irrigation districts has proven highly successful.

Market-based instruments in relation to water governance must be as clearly defined and transparent to the public as the mechanisms within the legislative, regulatory, and policy foundation establishing them. In Alberta, use of this instrument and fulfillment of these institutional principles require further research. Because its use has been relatively infrequent, the urgency of this research is reduced.

Bakker and Cook (2011) have concluded that there is an urgent need to establish clear roles for all of the various actors involved in water governance and coordinate their activities to avoid increasing balkanization of water management. As provincial strategies such as Alberta and Saskatchewan's become increasingly known and embraced by the public, it is anticipated that the need for involvement will be met. In recent years, the provinces have embarked on important initiatives to identify and coordinate actors involved in governance; however, further attention is warranted. Some uncertainty exists in relation to jurisdictional matters (such as First Nations' interests) and interprovincial issues, which may arise in the face of increasing water shortages and the federal government's withdrawal from involvement in water governance. Establishing and supporting local watershed groups are important components of comprehensive water planning and management, as in the geographical space of the watershed all actors, all levels of government, and all issues come together. This geographical space is the site of integrated watershed management. Although

these groups embody the user-based management principle, they hold an important place within the water governance structure by helping to make boundaries clear, real, and understood by local people.

Conclusion

This analysis has illustrated some of the considerations pertinent to regulatory instruments (government-allocated water licence interests), user management instruments (local watershed groups and irrigation associations), and market instruments (transferable water interests) in the context of climate change and expected increasing variability in climate, specifically drought. An institutional context of water governance structure whereby multiple water instruments operate has been used because water property interests in Canada are best described as a bundle of entitlements effected through a combination of management, regulatory, and market instruments.

On their face, market instruments appear to respond poorly to all peoples' interests, reflect only economic problem frames, and exclude individuals who are without tradable interests. As a result, market instruments scored lower in relation to the institutional design principles of adaptive governance (trust, capacity building, and equity). However, positive examples of adaptation emerge when analyzing the use of market instruments in combination with regulatory instruments and management instruments. These cases, of course, are illustrative only; more research using different methods is required to provide additional evidence.

Assessments of water governance structures in the Prairie provinces have concluded that more effort is required to define institutional boundaries, communicate roles of water organizations, and coordinate among water organizations. The federal government's absence from the water policy field is worrisome given the prospects of increasing climate variability and drought in the future. As the impacts of future climate change add strain on water resources and the incidents of drought increase, more work will be required on comprehensive sectoral adaptation to leverage and optimize the initial work that has been done to date. Using an institutional framework and the institutional principles of adaptive governance in this preparation would help reduce vulnerabilities of individuals and communities.

NOTES

1 These headings include publicly owned lands, mines, minerals and royalties, property and civil rights, local works and undertakings, and natural resources. which include the right to make laws in relation to the development, conservation, and management of non-renewable natural resources and forestry resources in the province. It is through the first heading "lands" that the provincial jurisdiction to water primarily resides. In traditional Canadian common law, water rights transferred with the land with which it was associated. "Land" is defined as "every species of ground, soil or earth whatsoever, as meadows, pastures, woods, moors, waters, marshes, furs and heath" Jowitt (1959: 1053).

2 These include federal lands (national parks, Indian reserves), trade and commerce, navigation and shipping, seacoast and inland fisheries, works for the general advantage of Canada, entering into treaties, and matters not specifically assigned to the provinces (s. 91 of the Constitution Act, 1982). The federal government is responsible for ensuring the safety of drinking water within areas of federal jurisdiction, such as national parks and Indian reserves, and water quality in respect of inter-jurisdictional waters (Canada Water Act, R.S.C. 1985, c. C-11).

3 Water is shared such that 50% of flows must be passed to Saskatchewan, which in turn must pass the same proportion to Manitoba (Prairie Provinces Water Board, *The 1969 Master Agreement on Apportionment and Bylaws, Rules and Procedures*).

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