Managing Water Scarcity in the Prairie Region: The Role of the IJC in a Changing Climate

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The shared boundary waters of North America span a number of diverse natural regions. While the 1909 International Boundary Waters Treaty (IBWT) created a unified set of governance principles for all boundary waters, this framework treaty has also been adapted and expanded by the member governments and the IJC to meet the unique water governance challenges of each distinctive border region. In the Prairie border region, characterized by scarce and highly variable water supplies, the transboundary rivers have long been an important source of water for agricultural irrigation and the water governance rules developed within the framework of the IBWT clearly reflect this. While international apportionment and management of the St. Mary, Milk and Souris rivers have greatly contributed to Prairie agricultural development, this political economy is also predicated on a water supply that is threatened by global climate change. Many experts predict that the semi-arid Prairies will have to cope with even less water than they have had in the past, threatening the viability of current agricultural patterns and the institutions that have enabled them. Current water supplies are almost fully allocated in the region, and although current institutions have created a relatively stable equilibrium amongst water users, a steep decline in water supplies could throw both into disarray. This paper examines the substantial contributions of the IBWT and IJC to the development of the Prairie political economy over the past century and considers whether

this political economy will persist over the next century as the region faces increasing water scarcity due to global climate change.

The Transboundary Rivers of the Prairie Region

Unlike the other regions of the Canada-US border, the Prairie region is characterized by natural water supplies that are scarce and highly variable. Despite its reputation as one of the world's agricultural breadbaskets, average annual precipitation in the region is only between 300 and 500 mm, and less in some places (Matthews and Morrow Jr. 1985, 38). This makes the Prairies a somewhat marginal area for dryland agriculture, notwithstanding its vast stretches of fertile land. The region's main source of water is found in the few rivers of relatively modest size that transect the Prairie landscape, and farmers have come to rely heavily on these rivers as a source of water for stock watering and agricultural irrigation. Irrigation is by far the largest water use in the region and managing the Prairie rivers to facilitate large-scale irrigation is a pervasive challenge of Prairie water management, though not the only one. Prairie residents must also cope with the high (sometimes wild) variability of river flows. Annually, river flows are usually highest in the spring during the winter melt and lowest in the late summer and fall, but periodic spikes in river flow due to extreme weather events are also prevalent and can result in severe flood damage to riparian properties. In short, Prairie residents have described their rivers as "either mud or flood" reflecting a situation of general scarcity punctuated with occasional flooding events.

Across the Prairie region there are three major rivers that cross the international boundary and are managed by the IJC on an ongoing basis; there are also several smaller creeks that cross the international boundary where the IJC has been involved but has not

developed any river-specific management rules. The three main rivers are the St. Mary, the Milk and the Souris, though the first two are generally treated by the IJC as a single river system since they are hydrologically connected by a diversion canal in northern Montana. As just discussed, the St. Mary, Milk and Souris rivers are all characterized by water scarcity and variability, creating water management challenges that are distinctive from neighbouring river basins in both the east and west. In the west, over the Rocky Mountains, the Columbia is the main transboundary river, and though it has many management challenges, scarcity is not one of them. In the east, the Red River flows through some Prairie lands and has perennial flooding problems, but this area is also more water abundant and has very little irrigated agriculture compared to its western Prairie counterparts. Consequently, the Red's management challenges have been substantially different from those on the St. Mary, Milk and Souris rivers, and it is not included in this study of Prairie rivers.

The westernmost river in the Prairie region is the St. Mary River, which originates in the Rocky Mountains of Glacier National Park in Montana and flows northward into Alberta where it joins with the Oldman River to form the main stem of the South Saskatchewan River. The St. Mary is by far the largest of the transboundary Prairie rivers and has the least variable flow (Halliday and Faveri 2007, 77). The main source of the river is glacial melt in the Rocky Mountains which provides a more dependable and stable river flow compared to other Prairie rivers that have to depend on surface run-off as their main source. The Milk River, for instance, originates as run-off in the Montana foothills and has a much lower average annual flow and much higher flow variability than the St. Mary (Halliday and Faveri 2007, 77). The Milk is also unique because it

starts in Montana and flows into southern Alberta for about 200 km before arching southward to return to Montana. At various points, the St. Mary and the Milk are in close proximity to each other, and, over the first two decades of the 20th century, the US Bureau of Reclamation constructed a canal to connect the St. Mary to the Milk, allowing St. Mary water to be diverted to the Milk in support of irrigation in northern Montana. International controversy over this project was one of the precipitating factors in the negotiation of the IBWT, and the canal has subsequently linked the two rivers both hydrologically and institutionally in an IJC water management regime.

Although the Souris River is in the same drainage basin as the St. Mary River – both are part of the Saskatchewan-Nelson Basin that eventually drains into Hudson's Bay – the two rivers are geographically separated.[1] The Souris has its source in southern Saskatchewan and is fed almost entirely from surface run-off. From its source, the Souris runs southward into North Dakota before arching northward and re-entering Canada in southern Manitoba and merging with the Assiniboine River. Due to the inconstancy of its source, the Souris is characterized by flows that are relatively low and highly variable; in fact, the Souris is so erratic that at various times its flow can be reduced to barely a trickle or so swelling that it is bursting its banks (Hood 1994, chapter 1). Governments on both sides of the border have gone to considerable effort and expense to try to bring the basin's flows under some control, and an IJC water management regime has been a key element of this.

While the St. Mary, Milk and Souris rivers have been subject to international management regimes under the auspices of the IJC, there are a variety of other

[1] Interestingly, the Milk River is actually part of the Missouri River system that eventually drains through the Mississippi River into the Gulf of Mexico.

transboundary rivers in the Prairie region that have not. Many of these rivers (or creeks) have simply been too small or too under-utilized to make it worthwhile for politicians to invest the time and political capital necessary to develop management regimes specific to them. In the absence of river-specific management regimes, the general principles of the IBWT have still applied to the use of these rivers, so a substantial level of international order has existed on these rivers anyway. For example, the IJC was involved in resolving international disputes on Sage Creek (shared by Alberta and Montana) and Poplar Creek (shared by Saskatchewan and Montana) in the late 1960s and mid 1970s, respectively (Jordan 1974, 532; Hood 1994, 27-28). The Waterton and Belly rivers, which rise in Montana and flow into Alberta where they eventually join the St. Mary River, are probably the largest rivers in the Prairie region that do not have river-specific management regimes, but this is not for lack of trying. In the 1950s, the IJC was asked to investigate and recommend a regime for these rivers, but the commissioners could not come to agreement and split along national lines, submitting separate reports to their respective governments. This is the only time in the history of the IJC that such a split has occurred, and a subsequent effort to resolve the rift, and develop water management regimes for the Waterton and Belly, has not been undertaken (Willoughby 1981, 37).

Overall, the character of the transboundary rivers in the Prairie region has provided plenty of international management challenges, but also plenty of incentives for productive international cooperation. Neither the US nor Canada is exclusively an upstream or downstream jurisdiction on these rivers, given how they meander back and forth across the international border. For instance, Canada is a downstream jurisdiction on the St. Mary River, but is an upstream jurisdiction on the middle section of the Milk

River and the upper section of the Souris River. These somewhat unusual and off-setting upstream-downstream relationships have created something of a natural balance of power between the two countries: each country knows that if it exploits its upstream advantage to the detriment of the other on one river, it could be subject to similar retaliation on another river (or a different reach of the same river). This has created a much different dynamic than exists, for example, between the US and Mexico where the US is the upstream jurisdiction and has exploited this advantage to full effect (Reisner 1993, 463-465). On the Prairies, the various upstream advantages of the two countries cancel each other out, creating a relative balance of power and relatively comparable incentives for international cooperation.

The Political Economy of the Prairie Transboundary Rivers

Since the first arrival of White 'settlers' in the 19th century, the political economy of the Prairie border region has been fundamentally shaped by the scarcity and variability of water supplies in the region. In many parts of the region, agriculture has been the dominant economic activity and water management has played a crucial role in Prairie agriculture, both in irrigation and stock watering, though the former uses far more water and has a much bigger impact on the environment than the latter. Cities and industries in the region tended to develop along its relatively few major rivers, and as these riparian interests developed, they became subject to severe damage and dislocation from periodic flooding of Prairie rivers. Together, the farmers and riparians shared a fundamental interest in the **control** of Prairie rivers through damming and water storage: riparians wanted control to prevent flooding during high flows and farmers wanted control to store and deliver water during low flows. Apart from this shared interest in water control,

farmers and riparians also generally agreed that most water in the Prairie region should be developed for some kind of **beneficial use**; that is, a use that contributes some kind of economic benefit. Water was regarded as such a scarce and valuable resource that it should not be 'wasted' by leaving it in a stream where it is not utilized.[2] The acceptance of control and beneficial use was almost universal amongst the early interests involved in Western water development. Most often, when water development controversies arose, they were not about whether the Prairie rivers should be controlled and developed for beneficial use, but about how the costs and benefits arising from control and development would be distributed amongst the relevant parties (Worster 1985; Reisner 1993).

While control and beneficial use were widely accepted as basic goals of water management in the Prairies, the transboundary nature of some of the most important rivers in the region was a seriously complicating factor. The international border divided agricultural and riparian interests on national grounds, creating national rivalries that threatened to undermine their mutual water development interests. Local water development issues on the transboundary rivers were escalated into international conflicts dominated by the two federal governments, becoming highly politicized in the process. The earliest example of this was the St. Mary's Canal controversy in the early 1900s. At the behest of agricultural interests along the Milk River, the US Bureau of Reclamation investigated in 1902 and received approval from the US Congress in 1905, for the construction of a canal to divert water from the St. Mary River to the Milk. However, the Canadian government protested the canal's construction and, after having its protests

[2] This is reflected in the differing meanings of the term 'conservation' in the Prairies versus the more water-abundant East. In the East, to 'conserve' water is to minimize usage so that much of it is left in the natural environment. In the Prairies, to 'conserve' water is to control, store and use it before it is lost to the environment.

ignored, threatened retaliation by approving its own diversion project that would have diverted water from the Milk River back to the St. Mary within Canadian territory (Simonds 1999). In all of this, the mutual water development interests of farmers and riparians on both sides of the border were swamped by international rivalry and the progress of water development was stalled.

To overcome the international complications of transboundary river development, all parties gradually came to realize that some sort of international management and dispute resolution institution was required. The St. Mary's Canal controversy itself was one of a number of transboundary water disputes which brought the US, Canadian (and British) governments to the negotiating table, eventually resulting in the IBWT in 1909 (Dreisziger 1981). The treaty specifically addressed the management of the St. Mary and Milk rivers in Article VI (discussed further below), creating the first international river management regime in the Prairie region. However, even more important was the creation of an international forum – the IJC – where transboundary river management issues could be investigated, disputes could be settled, and, ultimately, new river management rules could be negotiated (Treaty Between the United States and Great Britain Relating to Boundary Waters, and Questions Arising Between the United States and Canada, 1909). For farmers and riparians on both sides of the border, the creation of the IJC was a major boon because it created a forum in which international rivalries could be contained and their common interests in water control and beneficial use could be recognized and pursued.

Indeed, since the IJC's creation, it has developed river management regimes for the major transboundary Prairie rivers, and the interests of farmers and riparians have

dominated these regimes. International rivalries have persisted, sometimes resulting in awkward political compromises in river management rules, but the dominance of agricultural and riparian interests has become well entrenched within these regimes. This is true of both the St. Mary-Milk river management regime and the Souris river management regime, with three shared regime characteristics reflecting this most clearly:

1. Inter-jurisdictional water apportionments that have allowed governments to plan their water development and grant private entitlements to agricultural and riparian water users.
2. Drought and flood provisions which modify the apportionments to ensure that agricultural and riparian water users will be able to cope with extreme water events.
3. Intergovernmental river management boards that administer the apportionments and head-off disputes.

1. Inter-Jurisdictional Water Apportionments

The St. Mary's Canal controversy in the early 1900s created a substantial degree of water supply uncertainty for irrigators and governments in the St. Mary and Milk basins. This uncertainty was a major barrier to irrigation development because few people wanted to invest in the construction of irrigation systems without assured water supplies. To help remedy this, one of the main features of Article VI of the IBWT was an apportionment of the waters in question:

> …the St. Mary and Milk Rivers and their tributaries… are to be treated as one stream for the purposes of irrigation and power, and the waters thereof shall be apportioned equally between the two countries, but in making such equal apportionment more than half may be taken from one river and less than half from the other by either country so as to afford a more beneficial use to each (Treaty

Between the United States and Great Britain Relating to Boundary Waters, and Questions Arising Between the United States and Canada, 1909).

Article VI also recognized that the United States had a prior appropriation of 500 cubic feet per second (or three-quarters of the natural flow) from the Milk River and that Canada had a prior appropriation of 500 cubic feet per second (or three-quarters of the natural flow) from the St. Mary River, reflecting the areas in each country where large-scale irrigation was planned or had already begun. (Treaty Between the United States and Great Britain Relating to Boundary Waters, and Questions Arising Between the United States and Canada, 1909). In effect, the two countries agreed to share the St. Mary and Milk rivers equitably in aggregate, but provided Alberta with a larger, prioritized share of the St. Mary, and Montana with a larger, prioritized share of the Milk. This trade-off would allow both jurisdictions to accelerate their irrigation development.

While the apportionment in Article VI created enough water supply certainty to facilitate substantial irrigation expansion, disagreements over the interpretation of the apportionment forced the IJC to clarify it shortly after its introduction. The differences in interpretation centred primarily on the locations at which the apportionments should be measured and the protocol for determining how the river would be equally apportioned, after each country's prior appropriation had been met.[3] Starting in 1915, the IJC held a series of hearings on the matter and, in the irrigation seasons of 1918 to 1921, issued

[3]More specifically, the US argued that the apportionment should be measured at the border while Canada argued that it should be measured upstream, near the rivers' sources. This was relevant because an upstream apportionment would have provided Canada with a larger share of waters originating in the US, particularly on the Milk. On the other issue, there was agreement that Canada had a prior appropriation of 500 cubic feet per second on the St. Mary and the US had a prior appropriation of 500 cubic feet per second on the Milk, but there was disagreement on how to operationalize the "equal apportionment" of the waters in excess of these prior appropriations. While Canada felt that all waters in excess of the prior appropriations should be divided equally between the two countries, the US felt that the non-prioritized country should get the next 500 cubic feet per second, then the remaining waters should be divided equally. Native water rights in Montana were also a concern in relation to Article VI, but were not a major issue in the IJC proceedings. (See Halliday & Faveri 2007: 80).

provisional Orders specifying the water entitlements of each country (Halliday & Faveri 2007: 81}. The disagreement on Article VI's interpretation was a critical early test of the legitimacy of the IJC, and, for a time, the US government threatened to ignore any settlement of the issue that the IJC might try to impose. However, the Commissioners persevered and engaged local irrigators to determine what apportionment arrangements would suit their needs (Willoughby 1981, 28). In October, 1921, the Commission issued an Order that crafted a judicious apportionment compromise by effectively accepting the American position on the location of apportionment measurement and the Canadian position on the protocol for equal apportionment (International Joint Commission 1921; Halliday and Faveri 2007, 81). Despite some continued protests from the Montana government, who brought the issue before the IJC again in 1928, 1930, 1931 and 1932, these are the apportionment rules that have persisted ever since (Willoughby 1981, 29). Although these rules have fully satisfied no one, they have proven adequate to almost everyone, providing the international stability and security of water supply needed to facilitate irrigation development in the St. Mary and Milk basins.

In the Souris basin, the issue of water apportionment did not arise until the late 1930s, but international apportionment rules were also put in place at the behest of agricultural and riparian water interests. By the late 1930s, North Dakota had undertaken dam construction and irrigation in its portion of the Souris, but Saskatchewan was only beginning its development (*Third Biennial Report of the State Water Conservation Commission and the Twentieth Biennial Report of the State Engineer of North Dakota*, 1942). In 1940, the IJC was asked to recommend an international apportionment for the basin, but, citing inadequate river flow data, the Commission only recommended an

interim apportionment that approximated levels of existing water use (Hood 1994, 14-19). Saskatchewan saw this apportionment as detrimental to its interests, because it effectively froze water development at current levels, to the advantage of North Dakota. Consequently, the Saskatchewan government lobbied for, and attained, a new interim apportionment in 1959 that allowed Saskatchewan and North Dakota to each use fifty percent of the natural flow originating within their respective borders while allowing the other fifty percent to pass to their downstream neighbour (Hood 1994, 16-19; 1959 Interim Measures, 1959). Amendments in 1992 and 2000 have placed a number of conditions on these apportionments (discussed further below), but this basic 50/50 split remains the defining feature of inter-jurisdictional apportionment on the Souris.

Throughout the Prairie region, inter-jurisdictional river apportionments have been important to water development by providing each jurisdiction with enough security of water supply to facilitate the widespread distribution of private water rights. Furthermore, in all five Prairie jurisdictions, beneficial use has been the defining principle of water rights distribution, despite substantial inter-jurisdictional differences in water entitlement systems. In Montana and North Dakota, water rights were distributed primarily through prior appropriation, utilizing the "first in time, first in right" principle. Under the prior appropriation system, anyone who could put a volume of water to beneficial use could claim a right to it, but had to maintain this beneficial use or risk losing this right to a new claimant (Worster 1985, 108; Tarlock 2001). The "first in time, first in right" and beneficial use principles were also adopted in the Canadian Prairies, though ownership of all water in the region was vested in the Crown by the *Northwest Irrigation Act* of 1894. As a result, Canadian water rights claimants had to seek

government permits in order to formalize their claims, in addition to proving beneficial use (Percy 2005). Although all of the Prairie jurisdictions have modified and added to their initial prior appropriation and prior allocation systems – Saskatchewan and Manitoba making the most radical reforms – the principle of beneficial use has been largely preserved throughout the region and remains one of the defining features of the Prairie political economy.

2. Drought and Flood Provisions

An important supplement to the apportionment rules in the St. Mary-Milk and Souris basins have been drought and flood provisions that help to protect riparian and agricultural water users during extreme water events. Apportionment rules contribute greatly to water supply security, but they inherently assume a 'normal' level of water flow that can be divided amongst water users. Yet, because water flows in the Prairie region are highly variable there are many years in which the 'normal' level of supply is not available and water users are subjected to either drought or flooding. Although these extreme water events are periodic, they are threatening to the riparian and agricultural water users of the Prairies because it only takes one drought or one flood to put their livelihoods and property in jeopardy. Consequently, the international apportionment rules in the Prairie region have been supplemented with drought and flood provisions that modify the apportionments in extreme conditions and are designed to allow agricultural and riparian interests to cope with these conditions until 'normal' flows resume. From the perspective of water development, these drought and flood provisions are additionally important because they have reduced the level of risk involved in more marginal

agricultural and riparian water uses, encouraging their development and facilitating the pursuit of beneficial use of the water resources in the region.

In the St. Mary-Milk Basin, irrigation is the dominant water use and the primary concern of irrigators has been drought protection. In the negotiation of Article VI of the IBWT, it was accepted that the 'normal' natural flow of both rivers was around 666 cubic feet per second during the irrigation season. Canada was given a prior appropriation of 500 cubic feet per second on the St. Mary (three-quarters of its presumed natural flow) and the US was given a prior appropriation of 500 cubic feet per second on the Milk (three quarters of its presumed natural flow) (International Joint Commission 1921). In low flow periods – when flows were less than 666 cubic feet per second – this apportionment created a danger that American interests on the St. Mary and Canadian interests on the Milk could be partly or entirely deprived of water as the two countries exercised their prior appropriations. Although the prior appropriations were designed to protect each country's main irrigation areas in the region, the relatively few who were left at risk by this arrangement quickly voiced their concerns. The result was the inclusion of provisions in the 1921 IJC Order that have brought some drought protection. When flows in either the St. Mary or the Milk drop below the 'normal' level of 666 cubic feet per second, the prior appropriations are transformed from three-quarters of natural flow (500 cubic feet per second) to three-quarters of actual flow (which varies depending on the severity of the drought) (Halliday and Faveri 2007, 81). This means that at least one-quarter of actual river flows always goes to the non-prioritized jurisdiction on each river, helping irrigators in these jurisdictions survive drought periods until 'normal' flows resume.

On the Souris River, flooding is at least as great a concern as drought, and the international apportionment rules have been modified to protect riparian and agricultural interests from both extremes. In terms of flood protection, the most significant development has been the construction of the Rafferty and Alameda dams in southern Saskatchewan during the 1980s and early 1990s. Situated in the upper part of the basin, these dams offer flood protection to parts of southern Saskatchewan and northern North Dakota, and they changed the hydrological context of the existing 50/50 apportionment. Saskatchewan could now lose a significant part of its apportionment through evaporation from the Rafferty and Alameda reservoirs, while doing so for the protection of North Dakota riparians.[4] Accordingly, in 1992, the apportionment rules were modified so that:

> Under certain conditions, a portion of the North Dakota share will be in the form of evaporations from Rafferty and Alameda Reservoirs. During years when these conditions occur, the minimum amount of flow actually passed to North Dakota will be forty percent of the natural flow at the Sherwood Crossing (Interim Measures as Modified in 1992, 1992).

This new 60/40 apportionment is limited to relatively wet years in which there is both an adequate natural flow at the international border (the Sherwood Crossing) and the level of Lake Darling in North Dakota is at a minimum specified level (Interim Measures as Modified in 1992, 1992). In sum, the new flood and drought provisions ensure that: 1) Saskatchewan and North Dakota riparians enjoy the flood protection of the Rafferty and Alameda dams; 2) Saskatchewan has the opportunity to build-up its water storages in relatively wet years when the 60/40 apportionment comes into effect; and, 3) North Dakota irrigators are assured of their traditional fifty percent share of the Souris during

[4] One of the main beneficiaries of the Rafferty and Alameda dams was the city of Minot, North Dakota which had experienced severe flooding throughout its history, including a catastrophic flood in 1969 that bisected the city. North Dakota benefited so much from these dams that the US government contributed over $40 million to their construction. (See Hood 1994, chapter 6.)

relatively dry years, when they need it most. A more intricate set of compromises among the governments and users of the Souris is difficult to imagine.

3. Intergovernmental River Management Boards

While the international apportionments and flood and drought provisions have been fundamental to water development in the Prairie border region, intergovernmental river management boards, in turn, have been crucial to the preservation of these international water management rules. In shared resources like the Prairie transboundary rivers, the management rules themselves constitute a public good that, although highly valued by many, is inherently vulnerable to the free-riding and defection challenges that characterize all public goods (Ostrom 1990, 38-49). These challenges can be particularly acute in an international context where there is no sovereign figure to compel public good contributions and to enforce rule compliance (Heinmiller 2007). In the Prairie region, like most of the other border regions, the IJC's solution to this pubic good problem has been the creation of intergovernmental river management boards with a mandate to administer established river management rules, monitor rule compliance and resolve minor disputes. These boards are binational in membership and often involve representatives from relevant state and provincial governments, building informal inter-jurisdictional networks and trust ties that further circumvent the public good problem. As these boards have taken on many of the day-to-day apportionment implementation tasks, they have become the face of transboundary river management in the Prairie region and one of the guarantors of the established political economy.

The St. Mary-Milk was one of the first shared basins to have an IJC-created river management body, but its organizational design was somewhat atypical of the many river

boards that followed it. Its origins can be traced to Article VI of the IBWT which allowed the IJC to direct a designated reclamation officer from the US and a designated irrigation officer from Canada to work cooperatively in the measurement and apportionment of the St. Mary-Milk waters (Treaty Between the United States and Great Britain Relating to Boundary Waters, and Questions Arising Between the United States and Canada, 1909). The responsibilities of these officers were further expanded and elaborated in the 1921 IJC Order, though a formal IJC board was not created (International Joint Commission 1921). To this day, the organization remains known as the "Accredited Officers" though, functionally, its role in rule administration and dispute resolution is at least as important – if not more so – as the more formalized IJC boards in other transboundary basins. In their administrative activities, the Accredited Officers are guided by the "Administrative Measures" which "…form the basis for calculating the natural flow and determining each jurisdiction's performance in meeting the specifications of the Order" (Halliday and Faveri 2007, 85). While the Administrative Measures provide a common protocol for apportionment implementation, they also allow the Accredited Officers some latitude to resolve minor issues before they become major ones. For instance, apportionment deficits in one balancing period[5] are usually made up in the next balancing period, though "…this practice has been varied to enhance beneficial use of water in both countries" (Halliday and Faveri 2007, 87). In this manner, the Accredited Officers have been successful in implementing the apportionment rules in sometimes difficult circumstances while maintaining the fundamental integrity of the rules themselves.

[5] Balancing period refers to the duration of time over which water diversions are measured and accounted to ensure they are in compliance with the apportionment rules. In the St. Mary-Milk, the standard balancing period is 15 or 16 days. (See Halliday & Faveri 2007: 85-87).

In the Souris Basin, IJC river management boards have played an equally important role in that basin's political economy. The first such board was created in 1948 and was known as the International Souris-Red Rivers Engineering Board. This board was mandated "… to report on the use and apportionment of the waters within the Souris, Red, Poplar and Big Muddy river basins and to develop plans of mutual advantage for these waters" (International Joint Commission 2007). However, once a universally accepted apportionment of the Souris was reached in 1958, the activities of this board were somewhat eclipsed by the new International Souris River Board of Control, which had responsibility for monitoring the apportionment's implementation. The two boards coexisted for a number of decades until 2002 when all international administrative responsibilities for the Souris were consolidated in the new International Souris River Board. The current board has ten members, five Canadian and five American, including representatives from the Saskatchewan, Manitoba and North Dakota governments (International Joint Commission 2007). In its various manifestations, these boards have played a key role in allowing the governments and users of the Souris to put these scarce and highly variable waters to beneficial use. The Souris' interim apportionment rules, for example, establish that flow releases from Canadian dams should be scheduled to approximate natural flow patterns and to allow for "beneficial use" in North Dakota. The Souris River Board is then tasked with the application of these general principles and the reconciliation of any contradictions between them (Interim Measures as Modified in 1992, 1992). Thus far, it has proven quite adept at this task and the fundamental integrity of the Souris apportionment has been maintained.

Overall, the international river management regimes for the St. Mary-Milk and Souris basins have clearly reflected and advanced the interests of farmers and riparians, who were dominant in the Prairie political economy at the time of their creation and for decades afterward. While the IJC river management regimes, and the various state and provincial water entitlement regimes interlinked with them, institutionalized the objectives of control and beneficial use in Prairie water management, the underlying social consensus supporting these objectives eventually began to erode. As the Prairie political economy has evolved, new interests have emerged who do not value control and beneficial use in the same way as irrigators and riparians. Many of these new interests, which include Aboriginals, environmentalists and recreational fishers and boaters amongst others, value the Prairie rivers in their natural state and substantially reject that control and beneficial use should be the primary objectives of Prairie water management. Since the late 1960s, this group of interests has steadily gained in size, organization and political influence, staunchly resisting, if not always successfully, attempts to expand control and beneficial use through further dam construction. The substantial and protracted resistance to the construction of the Garrison Diversion in North Dakota, the Oldman Dam in Alberta and the Rafferty and Alameda dams in Saskatchewan are vivid illustrations of this (Reisner 1993, 187-93; Glenn 1999; Hood 1994).

In order for Aboriginals, environmentalists and recreationalists to pursue their interests in Prairie water management, they have been forced to challenge an institutionally entrenched status quo defended by powerful vested interests. Not surprisingly, major reforms have been relatively rare, and, when reforms have occurred, they have generally been in the form of 'add-ons' to existing institutions. In other words,

some minimum streamflows have been established and fish and wildlife protections have been introduced, but they have been added to institutions still fundamentally designed to achieve control and beneficial use. The accommodation of recent environmental protection measures with longstanding rules geared toward control and beneficial use remains awkward and incomplete within most Prairie water institutions, including the transboundary river management regimes. In the Souris Basin, for example, amendments in 2000 now provide greater consideration and protection for the water needs of important fish and wildlife refuges in North Dakota, but the essential elements of the apportionment remain unaltered and "beneficial use" remains one of the guiding principles for flow releases (December 2000 Amendment to the Agreement Between Canada and the United States for the Water Supply and Flood Control of the Souris River Basin, 2000).

Overall, the defining feature of the current Prairie political economy is the ongoing process of accommodation between the institutionalized water management goals of control and full use, and the more recent water management goals of environmental protection and preservation. Thus far, this process has been political, conflictual, and incremental, and its outcomes will shape the Prairie political economy for the next century or more. The ecological context of this process has also changed significantly in recent years as the onset of global climate change has become widely recognized and scientists have begun to workout exactly how climate change is likely to impact the Prairie region.

Prairie Transboundary Waters and Climate Change

Given the longstanding and continuing predominance of control and beneficial use in Prairie water management, many Prairie rivers have now reached a point of **full allocation**. At full allocation, regulators have judged that a river can support no additional consumptive use and, in some cases, the issuance of new water entitlements has been frozen. Among the Prairie transboundary rivers, full allocation has already been reached in the Alberta portions of the Belly, Waterton and St. Mary rivers, where "applications for any new allocation licences are no longer being accepted…" by the Alberta government (Alberta Environment 2003, 5). A similar situation exists on the Milk River, which the Montana government considers closed to further development. While full allocation was the long-term water management goal of many irrigators and water development enthusiasts in the Prairies, a state of full allocation has proven somewhat precarious for both water users and governments.

The first problem with full allocation has been the creation of institutionalized periods of water shortage. When full allocation is reached on rivers with variable water flows, as is the case in the Prairies, the inevitable result is shortages during low flow periods. For instance, the Alberta government reports that water shortages are evident on the St. Mary River on average in one of ten years, and the Montana government reports that shortages are evident on the Milk River on average in six of ten years (Halliday and Faveri 2007, 84). Politically, these persistent and recurring periods of shortage are significant because they disproportionately impact low priority entitlement holders, creating systematically disadvantaged groups who may eventually challenge and destabilize the existing water management institutions. This is true both domestically

and internationally, and there is already evidence of substantial international discontent with the IJC river management regime for the St. Mary-Milk due, in large part, to recurring water shortages. In 2003, Montana Governor Judy Martz began a campaign to have the IJC re-evaluate its 1921 Order for the St. Mary-Milk claiming that "…the Order does not equally divide the waters of the two river basins, that circumstances today are different than before 1921, and that improvements are required to the administrative procedures that implement the Order" (Halliday and Faveri 2007, 82). In response, the IJC held public hearings on the matter in July, 2004, receiving substantial public input from a wide variety of individuals and interest groups, though no major changes to the Order or the Administrative Measures have yet been forthcoming (Halliday and Faveri 2007, 82-87).

The second problem with full allocation is environmental degradation. Recurring water shortages are a fact of life under of full allocation, and these shortages not only impact low priority entitlement holders, they also negatively impact the environment, which, very often, is the lowest priority water use of all. Prolonged water shortages can significantly damage riverine environments, destroying fish, fowl and wildlife habitat, as well as increasing the concentration of water pollutants. Dam storages and releases can be used to mitigate low flow periods, but most dams are operated to meet the demands of irrigators and riparians, creating water flow patterns that are much different than would exist in natural state. Furthermore, the interruption and manipulation of natural flows creates its own set of environmental problems, including river channelization, interrupted fish spawning and loss of native flora and fauna, so even efforts to mitigate recurring water shortages come at a substantial environmental cost. The environmental damage

wrought by full allocation in the Prairie transboundary rivers is evident in recent assessments by the US Environmental Protection Agency (EPA), summarized below in Table 1. Of the 23 river branches in the St. Mary-Milk and Souris basins assessed by the EPA in 2004, nine were designated as 'good,' six were designated as 'threatened,' and eight were designated as already 'impaired' (Environmental Protection Agency 2004; Environmental Protection Agency 2004). Between the two basins, the St. Mary-Milk was judged to be in worse environmental shape than the Souris Basin, which is not surprising given the higher level of irrigation development in the St. Mary-Milk and the state of full allocation that exists in much of this basin.

Table 1 – EPA Assessments of Environmental Health for Major Prairie Transboundary Rivers (2004)[6]

River	Number of River Branches	Good Branches	Threatened Branches	Impaired Branches	Branches Not Assessed
St. Mary River	1	0	0	1	0
Upper Milk	3	1	0	1	1
Lower Milk	6	0	0	3	3
Upper Souris	17	5	3	1	8
Lower Souris	23	3	3	2	15
TOTALS	50	9	6	8	27

Source: (Environmental Protection Agency 2004; Environmental Protection Agency 2004)

[6] In the EPA assessments, 'impaired' river branches have water quality conditions that do not support one (or more) water uses, 'threatened' river branches have water quality that supports all existing water uses but is in decline, and 'good' river branches fully support all existing water uses. The EPA assessments are based on data provided by the state governments. (See EPA 2004a; EPA 2004b)

If full allocation has placed the Prairie political economy in a precarious position due to recurring water shortages and environmental degradation, this political economy may become completely untenable in the context of global climate change. Most climate change models predict that precipitation patterns will change and that overall river flows will decline in the Prairie region as global warming accelerates. For instance, higher winter temperatures are predicted to cause more winter precipitation to fall as rain rather than snow which is highly problematic for farmers because much of the water will run-off during the winter months when it can not be used, rather than staying around as snowpack and feeding the Prairie rivers during the spring melt. There is also concern that some of the Prairie rivers which have their sources in the Rocky Mountains, such as the St. Mary, will experience a long-term decline in river flows due to melting glaciers and reduced winter snows. Furthermore, higher summer temperatures, while increasing the potential growing season, will also increase evaporation rates, creating more demand for water just at the time when available water supplies are likely to be in decline (Bruce et al. 2003, 19-28; Barnett, Adam and Lettenmair 2005, 305). In short, the median water supply on the Prairies is expected to decline significantly as a result of climate change, and the current state of full allocation may become a future state of severe **over-allocation**, even with no further growth in water allocations. In such a state, water shortages and environmental degradation could become so deleterious that rivalries for Prairie water would intensify, water management institutions would lose their legitimacy, and the current Prairie political economy could collapse under its own weight.

The emerging question for Prairie water management, then, is whether the current political economy can be adapted to the changing climate, and the adaptation of the IJC

river management regimes will be a crucial element of this. As argued above, the IJC river management regimes have provided an institutional foundation upon which the governments of the region have undertaken extensive water development. If adaptation to climate change is to take place in a cooperative and comprehensive manner, then reform of the IJC river management regimes for the St. Mary-Milk and Souris basins will be crucial. Nascent pressures for such reform have already been evident in Montana's recent insistence on a review of the 1921 IJC Order. Nevertheless, the growing need for reform does not guarantee it, and there are many political hurdles that any major international reform effort will have to overcome.

The obstacles facing most institutional reforms have been effectively summarized by Paul Pierson as coordination problems, veto points, asset specificity and positive feedback; all of these will be factors in any effort to reform the IJC water management regimes for the Prairie rivers (Pierson 2004, 142-153). The current IJC river management regimes constitute institutional equilibria and major coordination problems are involved in finding alternative equilibria that are minimally acceptable to the actors involved, while still addressing the imperatives of climate change. Finding these alternative equilibria is particularly difficult considering that institutional reforms will have to be geared towards rollbacks in water use, creating some 'losers' among existing water users who are likely to resist any such reform vociferously. Furthermore, the institutional reform process is characterized by multiple veto points in the IJC, the US government, and the Canadian government, providing plenty of opportunities for those disaffected by a proposed reform to block it. Also, it is important to remember that massive public and private investment has gone into the irrigation and water management

infrastructure on the Prairies, creating very valuable and specific assets, some of which would become stranded and useless as a result of institutional reforms that rollback water use. The farmers and riparians who benefit from this infrastructure, the public servants who maintain and manage it, and the politicians who have built careers on its construction, all receive substantial positive feedback from its continued existence. Evidence of permanently reduced water supplies would have to be substantial and compelling, at the very least, for these actors to alter their calculus and accept some rollbacks in water use. In sum, it seems that there would be major attitudinal obstacles to the reform of the IJC river management regimes, and, even if these attitudes were changed, a gauntlet of coordination problems and veto points would have to be overcome before any major institutional reform could be introduced. The challenges of institutional adaptation to a changing climate seem daunting, indeed.

Conclusion

Almost a century after the creation of the IBWT, the IJC and its international river management regimes in the Prairie region are entering a period of challenge and uncertainty. For decades, these regimes have been an integral part of the Prairie political economy, serving the interests of farmers and riparians and facilitating water control and beneficial use on a massive scale. The resulting full allocation on many Prairie rivers has more recently revealed some of the vulnerabilities of this political economy, particularly the problems of recurring water shortages and environmental degradation. While these problems threaten to undermine the political economy under current climatic conditions, a warming climate presents unprecedented challenges that threaten to completely overwhelm it.

In the next few decades, the major challenge facing the IJC and its partner governments in the Prairie region will be the adaptation of the international river management regimes to the imperatives of a changing climate. However, the challenges involved with reforming these regimes are formidable considering the vested interests that benefit from the current regimes and the considerable number of veto points involved in the reform process. The fact that the existing regimes have undergone relatively few reforms since their creation, despite the emergence of the environmentalist movement and various new water users who have pressured for reform, is evidence of how 'sticky' these institutions have been in the past. While all institutions are valued for their durability, this same durability can seriously undermine institutional legitimacy when change is needed, and it will be up to the partner governments in the Prairie to figure out how to resolve this institutional paradox if the IJC is to continue to have a meaningful role in the management of the Prairie transboundary rivers over the next century.

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