Overview of Climate and Aboriginal Adaptation in the South Saskatchewan River Basin before the Settlement Period

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"Environmental determinism may be intellectually bankrupt, but climate change is the ignored player on the historical stage." (Brian Fagan, 2000:xv)

Human communities have been adapting to climatic change in the South Saskatchewan River Basin (SSRB) since the retreat of glacial ice from the region more than 11,000 years ago. Climatic change at the end of the last glacial period made human habitation of the region possible. The first group to inhabit the region, the Clovis, occupied the SSRB while the South Saskatchewan River was still draining into Glacial Lake Saskatchewan and most of present day Saskatchewan remained covered by glacial ice (Meyer and Walker 1999:20). From the prehistoric period until the 18th century, climatic stimuli played a central, if not the defining, role in the development of the region's human communities.

The fur trade altered the relationship between aboriginal plains populations and environment as it expand its influence and control over the area. European intrusion was accompanied by the introduction of devastating new diseases, the diffusion of the horse, and predatory aspects of an economic system hitherto unknown by the people of the SSRB. In concert, these factors permanently and adversely affected the established ecological and economic balance in the region.

Although climatic forces occasioned sometimes radical changes within and between aboriginal communities prior to contact, the upheaval resulting from European influences redefined the role of climate upon their communities and changed the trajectory of indigenous history in the area. As aboriginal communities became increasingly tied to the European-based economy and technology, their susceptibility to negative climatic stimuli increased.

By the late 18th century, the convergence of harsh climatic conditions and an increasing reliance on imported goods (including the horse) heightened tribal conflict on the plains and in the woodlands of the SSRB. The 19th century was characterized by this pattern of conflict and the increased commercial exploitation of bison herds in the region. By the end of the 1800s, inter-tribal conflict gave way to European dominance and the bison were all but extinct.

Three detailed working papers will assess the interrelationship between climatic forces and human adaptations before and after the arrival of Old World influences. The first paper will cover the nine centuries prior to the arrival of Europeans in the late 17th century. During the prehistoric period, the relationship between societal change and climatic forces in the SSRB was predictable and linear. During the Neo-Atlantic Climatic Episode, from 900 to 1200 A.D. (Bryson and Wendland 1967:280), the SSRB was characterized by a relatively stable pattern of human occupation. As climatic conditions deteriorated elsewhere in western North America by 1300 A.D., the relative stability

afforded the SSRB, owing to the presence of enormous bison herds, served as a catalyst for large-scale migration to the area from areas surrounding it.

In contrast to the predominant view today of the SSRB as a fragile drought prone environment, after 1300 A.D., the region served as a sanctuary to populations whose economies were not longer sustainable in their home territories (Appendix 1). Although reconstructions indicate that reveal droughts in the SSRB were both more severe and frequent in the past than during the 20th century (Sauchyn et al. 2003: 158), the fact that the region served as a destination for groups from surrounding areas indicates that prehistoric societies who inhabited or migrated to the SSRB were well adapted to arid conditions. The key adaptive strategy to the drought tolerance of prehistoric groups inhabiting the SSRB was their universal reliance on bison hunting as their staple.

The second paper will assess the period of radical transformation during the 18th century. It seeks to explain how aboriginal populations were forced to simultaneously adapt to the presence of Europeans and reconcile their needs with changing economic and climatic realities in the SSRB. The spread of a new fur based economic paradigm changed traditional subsistence patterns as differing communities were gradually integrated into the global market economy. Inter-ethnic rivalries were fuelled by differential access to trade goods of European origin.

The introduction of horses, in particular, provided an unprecedented level of mobility thereby revolutionizing aboriginal life on the plains, unwittingly served to increase the susceptibility of plains people to severe climatic events, particularly winter storms. By the end of the 18th century, the dependence of aboriginal communities upon horses coupled with the unsustainably of the species in the SSRB, served to increase tribal animosities to the brink of all out war.

Although the adaptive capacities of tribal societies in the SSRB to climatic stimuli were diminished through the 18th century, drought still did not present a major threat to their well being. The newly-arrived European traders, however, because of their dependence on travel along the branches of the Saskatchewan River system were susceptible to hydrological drought.

The transportation difficulties experienced by traders during the major drought event in the 1790s illustrate the vulnerability of Europeans to variability in streamflow levels. The invasion of the eastern SSRB by woodland groups who traveled to the plains as participants in the new economy led to the ouster of longstanding residents. With their removal, practices which had been developed to mitigate the effects of severe drought were disregarded and the newly-arrived tribes became increasingly susceptible to adverse dry conditions.

European innovation initially provided aboriginal groups in the SSRB with a temporary period of affluence and expansion. Yet, in the long run, external forces, such as the fur trade economy, and imported goods, especially firearms and horses increased the vulnerability of groups within the SSRB to negative climatic stimuli. As their means of

subsistence changed from traditional hunting patterns to commercial procurement, the peoples of the region found themselves too reliant on the new trade goods and ill-equipped to deal with drastic climactic events.

The third detailed paper charts the shifting fortunes of aboriginal societies from a position of relative affluence and dominance to one of material deprivation and dependence during the 19th century. In the early 1800's, plains societies, particularly the Cree and the Blackfoot, initially profited from their role as commercial hunters supplying meat to the ever-expanding European outposts. For much of the century, economic competition between the Cree and the Blackfoot led to a state of war between the two groups. However, periodic disease episodes, coupled with localized fur depletion and climactic uncertainty adversely affected the ability of both groups to wage successful campaigns.

The economic focus of the HBC, which was followed by the emergence of a new Canadian state, the coming of the railroad, as well as the impact of Métis migration into the region all contributed to the absolute loss of autonomy amongst plains societies. As the century drew to a close, bison herds were at the point of virtual extinction. The demise of the herds was a blow from which the Indians never fully recovered. Ultimately this situation compelled the various tribes to sign treaties, thereby ceding their land to the Crown in exchange for an assortment of promises including agrarian assistance.

The conversion to agriculture was a dismal failure, due in part to climatic conditions and inadequate governmental assistance. As the SSRB was settled by European immigrants, aboriginals became a, subjugated people, forced into a "peasant" mode of farming (Carter 1991) which led to a situation wherein their populations were susceptible to all to the negative effects of climatic stimuli in the region.

Methodology: The "Anatomy of Adaptation" to Climatic Change in the SSRB before European Settlement

The three detailed papers consider the adaptation strategies developed by aboriginal groups in the SSRB using the key elements identified by Smit et al. (2000) in their analysis of human adaptation to climatic variability in, "An Anatomy of Adaptation to Climate Variability". The three critical questions posed in their "anatomy of adaptation" include: "(i) adaptation to what? (ii) who or what adapts? and (iii) how does adaptation occur?" (2000:223).

Although this "anatomy of adaptation" was developed for the analysis of contemporary populations in relation to current climatic stimuli, the three key variables identified by Smit et al. are also applicable to the analysis of adaptation strategies of prehistoric and historic aboriginal populations in the SSRB to climate change. Because of our limited understanding of both climatic variability and human adaptation in the SSRB prior to European contact, discussions surrounding the early centuries of adaptation to climate change in the SSRB are regional in approach. However, with the advent of direct historical observation in the 18th century, the investigation of specific events becomes possible, even to the level of isolated extreme weather events. Once in the region,

European traders, particularly those associated with the Hudson's Bay Company (HBC), kept daily records of post operations, including weather conditions and their effect on the inhabitants of the region.

Adaptation to What?

With regard to "adaptation to what?" the discussion considers the effects of large-scale climatic episodes identified by Bryon and Wentland (1967:280). These periods are analogous to the broadest of the temporal categories of climatic conditions identified by Smit et al. (2000:231). The climatic episodes identified by Bryson and Wendland provide a framework that give us an overall view of the region's various central tendencies; the "normal" climatic conditions that define the periods. The paucity of the scientific and social scientific data for most of the prehistoric period dictates analysis regarding the discussion of adaptation to climatic variability in the SSRB during this time remain regional and general in nature.

Variability on a yearly or decadal level within longer term trends, becomes possible for the last five centuries through the consideration of existing proxy data. Discussions of climatic variability are based on the existing reconstructions from both proxy and historic records.

Significant meteorological drought episodes have been identified from the analysis of tree ring data for at least 500 years (Sauchyn and Skinner 2001, Stahle et al. 2000). Streamflow reconstructions for the branches of the Saskatchewan River have been assembled for the past 1100 years (Case and MacDonald 2003). Historic reconstructions of El Nino (ENSO) events have been included as climatic stimuli on yearly or decadal variability within long term trends (Quinn et al. 1987).

In addition, periods of increased volcanic activity have also been considered in the discussion of climatic phenomena (Briffa et al. 1998; Sigurdson 2000). Although studies have shown that single eruptions may have negligible effects on climate (Skinner 1985), it is posited that clusters of volcanic activity over short time periods may well have a causative effect on drought conditions on the SSRB during the prehistoric and historic period.

Documentary historical evidence from the mid 18th century enhances our understanding of variability and also provides insights into the most narrow temporal category of climactic analysis the effects of isolated extreme climatic events (i.e. severe storms)(Smit et al 2000:231). Although instrumental weather records were not maintained at all HBC posts, descriptive daily accounts of weather were kept (Ball 2003). These records provide invaluable information and include information on precipitation, winds and other localized climactic factors for the century prior to the advent of the governmental instrumental record keeping (Beaudoin 1999:5).

Who or what Adapts?

The second factor in the anatomy of adaptation, "who or what adapts?" presents a challenge with regard to the prehistoric and early historic occupants of the SSRB. The connection between "archaeological" groups and contemporary First Nations is crucial to the understanding the success, or failure, of the long-term adaptive strategies used to cope with climatic stimuli.

There is, as yet, no consensus within the archaeological community regarding the absolute link between archaeologically identified populations, those identified in historic sources, and those present on the SSRB landscape today (Schlesier 1994, Walde 1994). However, among those who successfully coped with changing climatic forces, for example, the modern Blackfoot do have a ancestral lineage that dates back more than a thousand years in the SSRB (Appendix 1).

The first paper considers changes in the pattern of human occupation in the SSRB and adjacent areas from the prehistoric to the early historic periods. Reconstructions of human adaptations in the SSRB region are possible, and become distinctly identifiable, when the data on climactic variability from the scientific literature is incorporated with the existing studies derived from the archaeological and historical records. Cogent analysis using this technique provides us with a clear indication of the nature of the interrelationship between pre-historical plains societies and their climactic realities over a period of several centuries. In particular, environmental changes that were a consequence of climatic forces, particularly from the 14th century onwards are critical to the understanding aboriginal occupation patterns of the SSRB (Appendix 1).

This multi-disciplinary approach and comparison points to the fact that scientific literature on climactic patterns in the SSRB verifies that climactic stimuli was the central force, and the primary determinant, in the historical development and shaping of human occupation patterns in the region prior to European contact.

The second detailed paper considers changes in the historically identified populations in the SSRB in relation to their changing climatic stimuli. Although some gaps remain in the human history of the SSRB to the mid 18th century, overall our understanding of the general historical development of the region is well established.

During the 1700s, demographic shifts in the profile of the SSRB population were primarily attributable to two factors: the gradual shift of woodlands groups to the plains (a process started almost 400 years earlier), and epidemic disease episodes which brought swift and permanent changes to the population of the SSRB and the northern plains. Mortality from epidemic disease, particularly smallpox, virtually annihilated some communities in the region.

In the wake of demographic collapse created by the epidemics, other groups, driven by new economic forces, northeastern resource depletion and the opportunity for expansion in the wake of catastrophic loses suffered by plains population, quickly moved into the woodlands adjacent to the SSRB. With the arrival of these newcomers, longstanding adaptation practices that served to maintain thresholds of climatic viability on the plains

were abandoned as aboriginal societies in the west increasingly sought to meet the requirements of, and benefit from, the fur trade. The result was rapid game depletion, particularly of beaver populations in the plains and parklands, and an increase in long-term vulnerability of aboriginal groups to climatic stimuli.

How Does Adaptation Occur?

The answer to this third question revolves around the historically central activity in the region, namely, the bison hunt. The mode of exploitation used to harvest the species was the key feature of adaptation, and how it altered over time, illustrates the dependency and interrelationship between external forces coupled with climactic realities.

Ecological studies, particularly those of R. Grace Morgan (1979, 1991) have clearly shown that prehistoric populations in the SSRB practiced what must be termed "anticipatory adaptations" (Smit et al. 2000: 239) to their hunting practices with regard to climatic variability. Their ecological knowledge of the vulnerability of the region to drought led to their decision not to exploit beaver populations in river complexes in the SSRB and vicinity. This practice served to buffer indigenous populations from drought, as water levels were maintained by beaver activity in areas they shared with human populations.

A second significant feature of prehistoric populations with regard to climatic stimuli, was the success of non-disruptive hunting practices during the pedestrian, or pre-horse, era. By driving bison into pounds, surrounds or "off jumps" the hunters were able to minimize the frequency of erratic, unpredictable, herd stampedes. As such, herd migration patterns remained intact and the impact of climactic variables were mitigated by the dependable movement of the species.

By adopting non-disruptive hunting strategies prehistoric societies who had limited mobility prior to the introduction of the horse were able to rely on their kill sites while maintaining a significant buffer from the vagaries of climactic variability such as protracted droughts. During the long-term period of climatic deterioration that began in the 13th century, the SSRB and adjacent grasslands served as a refuge to woodland populations who were driven from their home environments through climatically driven habitat degradation (Appendix 1).

The relationship between climatic variability and societal response within indigenous communities in the SSRB was permanently altered in the18th century. Almost every aspect of aboriginal existence underwent significant upheaval during the 1700s. Because the changes were largely driven by external forces, the adaptation modes embraced by tribal groups to manage the new reality of the plains often included the abandonment of longstanding strategies which had allowed them to successfully cope with climactic stimuli in the past.

By the mid 18th century, societies in the SSRB were increasingly vulnerable to climatic forces. The new fur-centered economy which Europeans brought with them led to the

immigration of new groups into the SSRB for the purpose of trade during what is known as the "middleman" period in the fur trade literature. These groups largely abandoned traditional subsistence practices and reoriented their economic strategies toward trade with Europeans.

As the "middleman trade" expanded into the plains from the east, horses made their way to the SSRB and the northern plains via aboriginal trade networks from the American Southwest. As equestrianism spread through plains societies, fundamental changes occurred with regard to the bison hunt. As chase hunting increased, non-disruptive strategies such as pound hunting, declined. While the innovation temporarily augmented the success of hunts, the stampedes that resulted from mounted hunting made the movement of bison herds increasingly erratic and unpredictable. The resulting scarcity of the staple was to prove devastating to every community on the plains.

Conflict between those groups in the northeast part of the SSRB who had easy access to firearms, and those in the southern portion of the region who had a reliable supply of horses became a determinant factor in the history of the area. As plains groups incorporated the fur trade, horses, or eventually both, into their production strategies, the coping range of their practices to climatic stimuli was severely diminished. The participation of northern groups in the fur trade led to the abandonment of their centuries old cycle of traveling from sheltered areas to the grasslands in search of food (Morgan 1979).

Profit, mainly in the form of European goods, became the primary motivation for those involved in the trade of beaver or of bison. On the southern margins of the SSRB, the adoption of an equestrian culture, in addition to changing hunt patterns, also signaled a shift in plains military strategy by the mid 18th century. Groups that possessed horses had a temporary tactical advantage over their horseless adversaries.

Unfortunately, those who adopted equestrianism in the SSRB and the northern plains, became increasingly vulnerable to extreme weather, particularly the winter storms that accompanied the severe temperatures of the late 18th and early 19th centuries. Though horses quickly became central to SSRB societies they were to prove an unsustainable resource that required almost a continual supply of new stock (Rinn 1975). This forced groups on the northern plains to regularly encroach on their southwestern neighbours in order to renew their horse herds. Conflict over horses, guns, and access to bison herds became the defining characteristic of plains life in the 19th century.

As bison numbers dwindled in the 19th century, aboriginal communities in the SSRB and the northern Great Plains faced ever-increasing food scarcity. The cycle of violence associated with the equestrian bison hunt ended only with the disappearance of the buffalo, followed by the subjugation of plains communities to the burgeoning Canadian state in the late 19th century. Although Blackfoot communities secured reserves in the Alberta portion of the SSRB, the predominantly Cree population of the Saskatchewan was relocated from the SSRB in anticipation of European settlement. Severe climatic conditions, particularly drought coupled with inadequate assistance from Canadian

authorities precipitated a long decline among many First Nations from which they have yet to fully recover.

For more than a thousand years prior to the arrival of European influence, human populations in the SSRB based their existence on the pursuit of bison. During that time, subsistence practices were not only stable but were probably considered so secure in the face of climatic variability that the region served as a destination for groups displaced from their home territories because of climatically-driven habitat decline. This was particularly the case between the 14th and 17th centuries.

By the 18th century, the fur trade, the horse, disease, and the gun all served to undermine the predominance of climatic variability as the key factor in cultural adaptation within the SSRB. In their efforts to deal with the emergent and dominant European presence and the new tools of "progress" aboriginal groups unwittingly increased their vulnerability to negative climatic variability.

By the 19th century, the societies of the SSRB were brought to the brink of disaster, with the bison all but extinct, tribal leaders did what they could to assist their people in the conversion to agriculture as a new subsistence strategy. Dominion authorities saw aboriginal people as a hindrance to the successful agrarian settlement of the west by European immigrants.

Coercive measures imposed on reserve communities by the 1880s diminished their coping range to climatic stimuli further still. While the effects of severe climatic stimuli such as drought among immigrant farmers is well documented, most notably in the histories of the 1930s Dust Bowl, the effect of those events on the most susceptible population in the west, the aboriginal groups confined to their reserves remains largely unrecognized.