

Cold 'Nuff Fer Ya?

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for
Winning the Prairie Gamble

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1. Introduction

“Our bracing northern winters will preserve us from the effeminacy which naturally steals over the most vigorous races when long under the relaxing influence of tropical or even generally mild and genial skies.”

Anonymous, Toronto Globe 31 March 1869

...prairie folks love weather in its extreme - high winds, hail storms, blizzards - our typical attitude is to say "Bring it on! We can handle it!" (Hainsworth 2002)

I can tell you that some of the busiest days we have in a small town are when there are winter storm warnings out; people use the excuse that they had to stock up on milk and bread "before the storm hits," but everyone knows it's really that they had to prove that they could still get to town even though the roads are in bad shape and visibility is almost zero. (Hainsworth 2002)

Five years in succession now they've been blown out, dried out, hailed out; and it was as if in the face of so blind and uncaring a universe they were trying to assert themselves, to insist upon their own meaning and importance. (Ross 1941:19)

One after another the democrats and buggies rolled away with a whir of wheels like pebbly thunder. From the top of Partridge Hill where the schoolhouse stands we could see the prairie smoking with dust as if it had just been swept by fire. ... The wind struck in hard, clenched little blows; and even as we watched each other the dust formed in veins and wrinkles round our eyes. According to the signs, says Paul, its going to be a dry and windy year all through. (Ross 1941:38)

26 August 1891: Meteorological forecasts were published on the prairies and in the Northwest Territories for the first time. (Christian 2000:août)

Saskatchewan's location in mid-continent dictates its climate and weather. Our mid-latitude situation means we get about 17 hours of sunlight at the summer solstice. On the winter solstice, the other extreme, about 7 1/2 hours of sunshine, are possible. The westerly winds predominate, bringing us a range of air masses: cool wet Pacific air, cold dry Arctic flows, and warm dry North American continental air. When these masses meet, the results can be spectacular at any season, but the most active storms are in spring. We can expect anything from light rain to torrential storms, to heavy snows and blizzards. Extremes of temperature in both summer and winter are a commonplace. Some days it is difficult to know what to wear. Certainly it is often difficult to know when to plant or harvest. Small wonder that we are obsessed with the weather.

2. Weather Obsessions

It's a point of pride to have the best blizzard story or to be able to reminisce over the full-grown canola crop you once had that was bashed back into the black earth with hail stones; the bigger the stones, the better. (Hainsworth 2002)

Weather is an obsession for most people in Saskatchewan. Climatologist Elaine Wheaton deals regularly with questions from the public and from a variety of professionals on weather matters. She and her colleagues at the Saskatchewan Research Council have dealt with enquiries from schools, libraries, news media, businesses and universities to do with agriculture, recreation, law, education, news, wildlife and natural resources, environment, geology, hydrology, engineering, animal and human health and gardening.

The fact that we get all these questions is a reflection on the importance of weather and climate for human activity. Just when I think I may have a grasp of the myriad uses of climate information, a phone call with another surprising question reminds me that I'm only looking at the tip of the iceberg. Because weather and climate affect so many aspects of life, from business to beer drinking, almost any type of request can be expected. (Wheaton '998:142)

Even our radio stations poll the people for weather stories, weather jokes and sayings, and their opinions on our prairie climate. Five of 14 results of a request by CBC Saskatchewan's Morning Edition to write in and complete the opener "Canada's the coolest because..." shown on the Morning Edition website concerned the weather.

Because we have the best toques in the world. - Shelley in Regina
Because our weather leaves us no choice. - Vanessa H.
Canada's the coolest because it allows you to have great variety in your wardrobe.
- Tim G. in Prince Albert
Because we have only two seasons; winter and poor sledding, or winter and road
construction. - Carl Palm in Battleford
...but it's a dry cool. - Bert C.
(CBC Saskatchewan 2002e)

3. Weather measuring tools include (information gathered from a variety of sources)

A thermometer. Thermometers indicate air temperature by measuring the expansion and contraction of matter as it is heated or cooled. Most thermometers are closed glass tubes containing liquids such as mercury or alcohol. When air around the tube heats the liquid, the liquid expands and moves up the tube. A scale that shows the temperature is on, or attached to, the tube. Thermometers may show more than one scale, such as Fahrenheit and Celsius.

A barometer. The barometer, first invented in 1643 in Italy, measures air pressure and may indicate changes 12 to 24 hours in advance. Most barometers today are similar to Torricelli's design. The pressure is shown on dial, and is usually expressed in "inches" or metric kilopascals. These units refer to the height of mercury in early barometers which had a glass column. The mercury rises or falls according to atmospheric pressure in the vicinity. Modern dial type barometers work on expansion of metals sensitive to air pressure. A steady or rising barometric reading of over 30.20 inches, or 102.27 Kp, indicates continued fair weather. A

rapidly falling reading of 29.8 inches, or 100.91Kp, indicates coming stormy weather.

A weather vane. A weather, or wind, vane indicates wind direction by pivoting freely to present the least resistance to wind. The first practical vanes may have been designed as early as 3500 to 4000 years ago in Mesopotamia. Now styles include arrows, banners, silhouettes and full-bodied three-dimensional sculptured ones. (Heidorn 2001)

An anemometer. An anemometer measures wind speed. Three cups catch the wind, which turns a dial attached to the instrument. The dial shows the wind speed.

A rain gauge. A reservoir rain gauge captures liquid precipitation and indicates the amount on a gauge. Snow gauges work similarly.

A psychrometer measures relative humidity in the atmosphere, using the cooling effect of evaporation compared between two thermometers.

Other tools include radar, weather balloons, satellites, lightning sensors, leaf wetness sensors, and wind chill calculators. Weather information is collected and used to create weather maps.

4. Weather lore and weather predicting

As my eyes search the prairie, I feel the summer in spring.

Ojibwa poem "A Song of Spring" (Colombo, ed., 1989)

There are many predictive sayings, many of which have little to do with fact and everything to do with heritage and culture. Others derive from years of close and intuitive observation of natural events and may have as much scientific validity as culture validity. For discussions of historic highs, lows and bizarre weather records, see MJ 3.3.3, below)

A Plethora of Apophthegms!

Here are a few aphorisms which may pertain to this part of the world better than some, gathered from various sources.

When the leaves of trees turn over, it foretells windy conditions and possibly severe weather.

Flowers close up before a storm.

Horses run fast before a violent storm or before windy conditions.

Wolves always howl more before a storm.

Birds on a telephone wire indicate the coming of rain.

Before a storm, cows will lie down and refuse to go out to pasture.

Using Woolly Bears to predict the winter season... Folklore says that if the brown stripe is wider than the black stripes, the winter will be long and harsh.¹

¹"The woolly bear is a fuzzy larva of the tiger moth found in the Midwest and Northeast. According to legend, a person can tell what kind of winter is ahead by observing the woolly bear's coat. If the brown segment between the two black segments is long, the winter will be mild. A narrow brown band means a long, cold winter is ahead. Biologist Charles Curran began studying woolly bears beginning in 1948. For the first three years, the caterpillars had wide brown bands, accurately forecasting three consecutive mild winters. The caterpillars failed the next year. Curran gave up the study in 1955 after finding two groups of caterpillars living near each other that had vastly different predictions for the upcoming winter." (Rozell 1996)

Fish bite best before a rain.
 Mackerel sky, not twenty-four hours dry
 Red sky at night, sailor's delight.
 Red sky in the morning, sailors take warning.
 Dark clouds in the west- stay home and rest
 When bees stay close to the hive, rain is close by.
 When teeth and bones and bunions ache, expect the clouds to fill the lake.
 If deer stay in the swamp then rainy weather can be expected.
 If birds begin to migrate early or if rabbit turn white sooner in the fall, it means that
 winter will come early.

(World 1999; Chisholm 2001; Saskatchewan Education n.d.:7)

5. First Nations Relationship with the Earth

First Nations peoples have always had a close and reverent relationship with the Creator and the gifts that He gave them for their survival. In order actually to survive, they have developed a culture which relies heavily on close observation of their environment. Just two examples suffice to indicate how entrenched these observations were. The months of the Dene year reflect the major natural aspects of the various times of year.² January: Nílts'I sa cho (Big Windy Moon); February: Sa Dúaze (Short Moon); March: Hah sa (Goose Moon- geese return in late March); April: Ts'ëli sa (Frog Moon); May: Èghéze sa (Egg Moon); June: Héz yéhóli sa (Eggs-producing Moon); July: Ècèth sa (Baby Ducks Moon- cannot fly as not fully fledged); August: Bek'ë?idilí sa (Flying Moon- birds now fledged); September: Bëkë'ëhàdi sa (Mating Moon- moose and caribou); October: Elchus'ka ti sa (Reciting Rosary Moon- time of praying for those who have passed away); November: Eyunè dzinë sa (Crazy Moon- in the old days was called Walking with Snowshoes Moon); December: Tëṭṭ'eghë yati sa (Nighttime Praying Moon or Midnight Mass Moon, praying for coming of Christ child). (Holland *et al.* 2003:18)

The Woodland Cree names for the twelve moon cycles of the year also reflect observation of natural happenings at various times of the year. January: Opawuhchukunises (Frost - Exploding Trees Moon: In deep winter, trees burst as their sap freezes. This makes sounds almost like gunshots on cold winter nights); February: Kisesepim (The Great Moon - The coldest and most wind still time of year when hunting is difficult); March: Mikisewipesim (The Eagle Moon - The month when the eagles return); April: Niskipesim (The Goose Moon - The month when the geese return); May: Uthekipesim (The Frog Moon - The month when the frogs come out); June: Opiniyawipesim (The Egg Laying Moon - The month when the birds lay eggs); July: Opuskowipesim (The Moulting Moon - The month when the young birds get their feathers); August: Ohpuhowipesim (The Flying Up Moon - The month when the young birds are trying their new wings and practising flying); September: Onimituhumowipesim (The Mating Moon - The month when the moose are in rut); October: Opimuhumowipesim (The Migrating Moon - The month when birds are migrating); November: Kuskutinowipesim (The Freeze Up Moon -

²This is rather different to our Roman-derived month names, a few of which are nature-based, while others derive from Roman gods, emperors and numbers.

The month when the lakes freeze over); December: Thithikopewipesim (The Frost Moon - A cold, frosty month). (Missinipe Broadcasting Corporation 2001)

Aboriginal traditions relating to weather are still important today.

... they know it, they knew it, they'll tell you how it was going to snow, they used to read bee hives and other things that's the way it was if the bee hives are hanging high, it's going to be deep snow mostly on the ground.

-Albert Gardiner, Métis, Ile-a-la Crosse (Gardiner 1997:2:17:48- 2:18:40)

...we didn't have the modern things, like radios to find out what the weather is when you want to know... But the old people used to know which kind of weather its going to be, they'd look at the moon, grandfather anyway, you see the moon, the way it looks, it'll tell you which way the weather is going to be... you got to have that experience what he had, just like the sun the way it is on the 11th of this month ... I looked at it. Mu-uck-ooo-chin Still it be a nice day for a while, for maybe 3, 4 days and after that... don't know... full moon... a weather change ...

-Albert Gardiner, Métis, Ile-a-la Crosse (Gardiner 1997:2:16:43-2:17:50)

Some First Nations peoples watched animal behaviour for clues to impending weather.

They [the Cree] could tell by the way some animals acted. If coyotes were heard howling at night, it means they feel a storm coming. If the sky is yellow around the sun at sunset it means wind for the next day. Dillon [Cree interviewee]

(Littlepoplar *et al.* 1974:132)

Animal weather predictions, based upon centuries of observation by First Nations people are perhaps the most valid long-term animal weather predictions. (Rozell 1996)

In Alaska, the Koyukon predict the winter's snowfall is predicted by the width of snowshoe hare footprints. Wide footprints in the fall indicate extra-furry hind feet, a sign that heavy snowfalls will follow. The Dene likely use this also. Other groups say that black bears can predict how severe a winter will be in how close to the drafty door of their den they sleep. (Rozell 1996)

While sometimes it seems that First Nations traditional culture might override critical observation, for example,

...the direction a star falls indicates where the wind will be from the next day...

-Bart Dzeylion, Dene (Holland *et al.* 2003:17)

at other times, First Nations observation confirms many predictive sayings of European-based cultures.

...the colour of the dawn predicts the weather, such as a snowfall. ... In the early morning, in winter sometimes, you see a red colour in the sky, just before the sunshine. Then at night lots of snow is coming for sure."

-Bart Dzeylion, Dene (Holland *et al.* 2003:17)

Sometimes you see fog on top of a hill, just on the top. It means it's gonna get

warm - warm weather the next day. (Holland *et al.* 2003:18)

Please see the SICCC weather paper by Lua Young for more on First Nations and weather.

6. Interactive Weather Predicting

Nature's thermometer.

In the evening, count the number of cricket chirps in 14 seconds to get the temperature in his location. However, there are other calculations. Count the number of chirps in 15 seconds, add 37 get the temperature where he is sitting (Weather World 1999; Stalking the Wild n.d.)

Calculate the humidity for yourself.

Get a 12 inch ruler; hold it up in the air, lined up with a jet contrail

Make sure that it's at the beginning or at the end of the contrail

After you have done so, move the measuring stick up the contrail

Count how many ruler lengths there are in the length of the contrail

Multiply by 10 to get the relative humidity.

(eg. If the contrail is 54" long, that is 4 lengths of 12" + ½ length = 4.5 lengths x 10 = 45 = 45% RH) (Weather World 1999)

Another humidity check is to keep watch on the openings and closings of a pine cone: the cone opens in dry weather and closes up in moist weather. (Weather World 1999)

7. Coping and Adapting

Human beings have tried to make themselves and their children comfortable if not cosy during bad weather since animal skins were first cut and assembled into light, flexible garments some forty thousand years ago. We have invented all sorts of remedies to mitigate the discomforts of the heat, the cold, the dry, the wet.

7.1 Clothing

No doubt: winter arrived last night... No delaying bringing out the winterwear ensemble now. I pull out *The Box*; it contains: gloves and mittens; scarves, toques, a balaclava or two, and a single pair of earmuffs. Emergent from the plastic garment bag, the down parka regains prominence in the closet hierarchy, the new *alpha* coat. (Heidorn 2002b)

First Nations peoples have been experts at designing clothing for survival in extreme weather. Tanned animal skins and hides were draped or cut and sewn with bone needles and sinew. Wolverine fur was prized because moisture does not freeze on it, and caribou and beaver in multiple layers have been and still are used. Rabbit fur is excellent as an interior insulation layer. On the prairies, the buffalo coat was prized for its thermal qualities, but was extremely heavy. Buffalo hides were also used as blankets and rugs. Waterfowl down has been important for

generations for stuffing clothing and bedding. Moccasins and *mukluks* were essential footwear in winter, often stuffed with down or worn over strips of rabbit hide wrapped around the feet. Animal hides and fur were also used for hats, gauntlets, mittens, leggings.

With the coming of Europeans to Saskatchewan, clothing and accessories knitted of sheep' wool and goats' hair became ubiquitous. Steel needles, thread, knitting needles, felted wool, and cotton canvas also became available and allowed the manufacture of clothing from a variety of materials. The toque³ appears to have had its origins in French Canada, as part of winter gear of the *voyageurs* and was brought to Saskatchewan early during the fur trade era. The woollen Hudson Bay blanket *capote* was also worn here, both with and without a hood. Woven woollen cloth and blankets were an essential part of any household, made in various thicknesses for the different seasons. Woollen long underwear was worn by many people for the entire winter season. Quilts were made of scraps of shirt, dress and suiting material and stuffed with wool or cotton in various thicknesses. Some women used the typical European fur muff to keep their hands warm.

Earmuffs, invented in 1873 by a Maine teenager, are still used today. A woollen hood covering the entire head and neck, with holes for the eyes, was designed in England for soldiers suffering from the cold during the Crimean War (1854-1856) and was eventually named for the British Army's winter headquarters there. (Heidorn 2002b) They are still popular today, particularly with snowmobilers. Heavy woollen woven cloth was used for winter coats and pants into the 1960s. It is still used today. Wool tends to absorb melted snow, become heavy and eventually chill off. Leather fleece-lined boots and rubber galoshes with metal buckles were used for footwear.

Beeswax and oil impregnated canvas was used to make mackintoshes, hats and tarpaulins to keep off rain. Umbrellas were used for both rain and sun protection. Now there are plastic rain coats and plastic boots.

In recent times, new synthetic materials have been developed which have improved human comfort in extreme weather, with increased thermal qualities and much lighter weights than traditional materials. Windproof fabrics, such as plastic coatings on canvas and nylon and insulating materials such as acrylic padding, Gortex®, Hollofil® and Thinsulate® have revolutionized winter protective clothing and underclothing in recent times. Cotton and polyester fleece, wool and down are still important in winter clothing. The design of winter parkas and ski pants has also evolved, with innovative inner insulative and outer wind blocking layers reminiscent of First Nations traditional clothing, baffles, a variety of zipper materials and designs for controlling body core temperatures and snorkel style hoods. Battery operated and chemically activated hand warmers and electric socks are also available. Velcro® and similar closures, imitating the hooking action of the burdock seed pod, for boots, gloves and jackets are relatively new. Winter protection for babies has evolved from moss bags through woollen bunting bags to

³Also spelled *tuque*, especially in Quebec. "Some etymologists trace the name to the old Spanish word *toca*, a type of soft, close-fitted cap; others give it a Celtic origin, but the respected Québécois historian [Maurice] Séguin considers the word's roots to be French Canadian." (Heidorn 2002b)

Snuglis® and sophisticated insulated bags.

Summer clothing has also evolved, allowing people to be more comfortable in hot weather. No longer do men wear heavy woollen all-body swim suits: they have been replaced by light brightly coloured nylon trunks with pockets. Women's bathing suits have changed similarly in materials. Men now wear short sleeved shirts, something not commonly seen as outwear before the 1940s. Tank tops and shorts for both men and women, cotton-polyester, sandals, plastic flip flops, light running shoes of sophisticated and expensive designs, air conditioned pith helmets, ball caps, cowboy hats, desert style hats with neck protection.

7.2 Home Heating and Cooling

The Plains tepee was a practical, portable shelter made of readily available and recyclable materials. The top vent let smoke and heat out, but could be closed to retain heat and exclude rain and snow. The sloping sides had space around the bottom for heaping buffalo robes and collected grass for winter insulation. More robes were used as rugs and sleeping covers in winter. In warm weather, one side, or all of the skirt, could be lifted up and fastened for increased ventilation. In the northern bush, layers of bark and banks of snow were often heaped on the outside for increased insulation. Firewood was an essential resource.

The early settler's or trapper's cabin was often a leaky affair with little insulation. Underground shelters and sod shacks often offered better thermal protection, but were damp in wet weather. Sometimes there were no windows or oiled paper window covering was used to allow some light penetration inside and some protection from the elements. Then window glass became available and metal screening to exclude insects. In winter, hot bricks, hot coal bed warmers, ceramic and, later, rubber hot water bottles, were sometimes used. The frame house of the first half of the twentieth century usually had little or no insulation in the wall cavities. Sometimes, crumpled newspapers and sawdust were used. Crawl spaces were unheated. Hay bales might be piled up around the lower walls of the house in preparation for winter. The mice liked these shelters. Later, expanded mica, or vermiculite, was used to fill the cavity between wall studs. Okum, a rope-like material impregnated with tar, was used in cavities to exclude drafts. Fireplaces and chimney flues were open to the sky year-round. For many, firewood was still an essential resource. Heat was distributed around the house via stove pipes hung from the ceiling. In some houses, each bedroom had a fireplace. Chimney fires were not unknown. Lightning rods decorated the roofs of houses and barns to protect against strikes in summer storms. Shelterbelts were planted around houses and farm yards for protection for the winds. Summer kitchens reduced the amount of heat buildup in the house from cooking fires. When electricity became available, electric fans were used to cool the air in summer.

Soon central heating became commonplace. Fibreglass, or spun mineral wool, was developed. It is an excellent insulator, available in several thicknesses, for walls and attic floors. Air conditioners became popular to cool indoor air. Attached garages meant that people no longer had to go outdoors to start up the family car. After the 1960s, because of increased heating costs and a concern for increasing consumption of energy, there was a new emphasis on better sealing of house frames, particularly at windows and doors, at sill and top plates. It was realized that retaining and excluding heat within the house, instead of replacing it constantly or cooling it with

air conditioners as in the past, was a better use of resources. A variety of efficient products to exclude the weather or protect against it arose: moveable insulation, weatherstripping for windows and doors, doorsill stop plates, storm windows, window films, attic insulation and ventilation, insulated roofing, vapour barriers, closed cell solid insulation panels, preserved wood basements, double and triple pane windows, argon gas windows, air-to-air heat exchangers, super efficient pulse furnaces. Fireplace doors became common, along with insulated chimneys. Older, tried and true techniques still continue: awnings, tree shade, fans, tin foil on windows. Outdoor cooking in summer, now with barbecues, still reduced heat buildup indoors. Some people have gone back to the log house, the hay bale house; some have equipped themselves with solar and wind powered electrical systems, developed heat pumps or built their shelter into the side of a hill for its thermal equity. Some have built solar ovens.

7.3 Keeping Machinery Going in Extreme Weather

In the old days, starting farm machinery in extreme cold weather was not easy. Steam traction engines had to be handled carefully: a watch fire was necessary in freezing temperatures so that the water on board did not freeze and crack the boiler. Getting up steam was a protected affair, requiring much more fuel than during warm weather. In the teens and twenties, when farm engines were running on a distillate similar to kerosene, difficulties in starting up in cold weather were solved with two tanks: one for gasoline and one for No. 2 distillate. Farmers were prime with the more expensive, more combustible gasoline and, then the engine was warm, switch the feed to distillate. When it came time to shut down, the line was switched back to gasoline, in preparation for the next start. Oil was thick, unlike the synthetics of today. Often, in cold weather, it was removed from the engine while still warm, kept next to the stove indoors overnight, and poured back in the morning. This procedure was also used with aircraft, sometimes in combination with canvas engine shrouds. Cranking a cold engine was somewhat risky: a balky machine could throw back the crank and break a farmer's arm. The Hart Parr Little Devil, which was operated from the rear, could be started in reverse gear and sometimes jumped back and killed the operator. Even with gasoline engines, startup in cold weather could be difficult. Sometimes, bales were arranged around tractors as a windbreak. If possible, machinery was stored in sheds to give them some protection from the elements. While one might be kept warm by a steam traction engine in cold weather, early tractors were open to the elements.

In dry conditions, radiators were exposed and often became choked with grasshoppers and dust. Today, large tractors are enclosed and have heaters and radio communication for safety. Dust is filtered out with air cleaners and air conditioners. In wet conditions, the metal tires with lugs of old traction engines and tractors often mudded up in soggy fields and then would not grip the soil, but would spin. When solid rubber tires came in, they would sometimes crack when frozen. Heavy traction engines were at risk of getting bogged down in wet sloughs. The lighter tractors were easier to pull out of difficult situations. Today's huge machines have wide pneumatic tires with aggressive treads to spread the weight and deal with difficult terrain and conditions.

From the days when the fire was kept in a bucket at the front of the toboggan, to the rug and hot coal foot warmer in the caboose or sleigh, to today's efficient car heaters, seasonal thermostats and heated seats, we have always been interested in being more comfortable in our vehicles,

whether on the farm or in town. Windshield wipers have evolved from hand operated knobs, through vacuum operated automatic models, to multi-speed high tech arms and blades with -40° washer fluid. Block heaters and remote starters allow today's driver to start his car or tractor more easily and even to warm it up before getting in. We now have chains for dealing with snowy roads, windshield scrapers, engine and lock antifreeze, heated garages and equipment sheds, snowploughs⁴,

A variety of solutions to winter transportation were devised in Saskatchewan over the years: track and ski automobile conversions, snow toboggans, snowmobiles, cabs for enclosing cars, snow toboggans and snowmobiles, snowplanes, aircraft skis. These are beyond the scope of this paper. Also not covered here, because we are discussing keeping machinery going, are horse-drawn winter solutions, such as stoves in cabooses, toboggans, sleighs and cutters, snow shovels, salt and ashes, potash.....

8. Weather Extremes

8.1 Weather Extremes- Highs

The wind has blown itself out. The heat when you step outside is dry and deadly like a drill. ... The air is thick and heavy; a twitch comes to my hands to thresh out against it, keep from smothering. I go outside again, but the garden is bare, inert, impaled by the rays of the sun and left to die. (Ross 1941:90)

General

Saskatchewan is a province of temperature extremes, sharing second place with Ontario for the greatest number of consecutive days on which the highest temperature is above 32°C, at 22 days at Chaplin⁵. (Environment Canada)

Maple Creek holds the provincial record for the warmest average annual temperature, at 5.0°C. (Brown 2003a)

Saskatchewan is sunny summer and winter. Estevan takes gold for the greatest average annual sunshine hours in Canada, at 2,537. In 1980, the sun shone for 2701 hours. The least occurs at Cree Lake, with 2,073 average annual sunshine hours. Estevan is also the record holder for the highest annual number of hours with clear skies (zero to one-fifth sky cover), at 2979 hours. (Brown 2003; Natural Resources Canada 2003; Saskatchewan Learning n.d.)

⁴The Morris rotary snowplough was designed by George Morris for a group of Moosomin farmers. It travelled at three miles per hour and could make its way through drifts up to a metre deep, clearing a strip two metres wide at a time and throwing the snow up to 80 m. on either side. A snowblower was also designed and sold in three sizes in Saskatchewan in the 1950s. (Shaw 2000)

⁵British Columbia ranks first with 31 days.

8.1.1 The Dirty Thirties

July 1936 witnessed **Canada's worst heat wave**. For ten days, from southern Saskatchewan to the Ottawa Valley, blistering temperatures were accompanied by high humidity. There were 780 deaths. Forest fires ravaged the bush in the prairies provinces. The surface temperature of the ground exceeded 65°C in places: crops were blackened and asphalt roads softened and buckled. Saskatoon's monthly mean temperature reached 22°C (71.6°F), the **highest in 100 years** of records. Estevan, Grenfell, Surprise, Nashlyn, Maple Creek, Consul, Kamsack and Moosomin all set records of 40°C and over that month. At the same time, precipitation was at its lowest on record at that time. (Phillips 1990; 1993)

The following summer was slightly cooler at Saskatoon. However, in the southwest, the provincial record high temperature, 45.0°C at Midale on Sam Molberg's farm and Yellow Grass, set on the 5th of July 1937, still stands today as the **hottest temperature ever recorded in Canada**.⁶ On that amazingly hot day, Fort Qu'Appelle registered **the second highest provincial temperature**, at 44.4°C. Regina had the **third highest** at 43.9°C, tying with Rosetown, where it had been this hot the day before. Four places achieved Saskatchewan's **fourth highest temperature** in July of 1937 (three on the fifth) and three others tied for the **fifth highest**, all on the fifth of July. Many other heat records were set. (Manning 1983: Table 1; University of Saskatchewan 1999)

8.1.2 The 1961 Heat Wave

A 10-day heat wave began at Regina on 3 June 1961 when the mercury rose to 32° C in the afternoon. In western Canada, the month of June 1961 remains the **hottest and driest month** in history. At the end of June, the region was hit with a devastating drought. High temperatures persisted into August. Maple Creek logged 43.3°C, Willow Creek 42.8°C and Loverna 41.7°C on 5 August. (Manning 1983: Table 1; Christian 2000:juin; Phillips, 1990, 1993)

8.1.3 The 1980s: 1988 was the Worst

The 1980s was the warmest decade in Canada and around the world. (Phillips, 1990, 1993) In Saskatchewan, it started off with a bang. A hot spell 22-23 May 1980 set records of 39°C at Coronach, Parkersview and Penzance. Contributing to the overall average warmth of the decade were unusually **warm winter temperatures**. The 1987 World Tour of Rick Hansen crossed Saskatchewan in mid-February. Hansen was able to cover 100 km a day, under a windless sunny sky in above zero temperatures. Spectators in T-shirts cheered him on. The year before, temperatures stayed between -30 and -40 for a week. (Christian 2000:février) June 1988 was the beginning of a **week-long, record-breaking heatwave** on prairies. Springtime temperatures were the second and third warmest on record for the prairies in 1987 and 1988, at 3.6% and 3.5% above normal levels. On 5 June 1988, Kincaid set at record at 43.5°C. (Environment Canada

⁶The world record, set 22 September 1922 in the shade in Al'azizyah, Libya, is 58° C. Or 136° F. (Brown 2003a)

2001d; Brown 1998; Manning 1983: Table 1).

8.1.4 The 2001-2003 Drought

Record-breaking heat hit Saskatchewan in July and only got worse as summer wore on. Some farmers destroyed their stunted grain, a cheaper alternative to harvesting. Others let their cattle graze on what was left of their crops. Some communities, such as Kindersley, declared themselves disaster areas. On 25 Sept 2001, southwesterly winds pumped more hot dry air into the area, raising **temperatures at least 15° above normal**. At least fifteen long standing records were broken. Kindersley, Meadow Lake, North Battleford, Saskatoon, Swift Current, Leader, Maple Creek, Elbow and Rosetown all set records above 30°C. The North Battleford record, at 32.5°C, broke the previous one of 1880. (McGill University 2004; CBC 2001a)

What would it be like for you to take your pay cheque and throw it out of window while you're driving down a street in Saskatoon? I mean the feeling is the same here. You're sunk. You're beat up.

- Dick Staples, Saskatchewan farmer (CBC 2001a)

In September 2002, the Canadian Wheat Board dropped out of world markets, because the continuing drought meant there was not enough wheat to sell to new customers. As well, the Saskatchewan Wheat Pool cut 200 jobs, many at their head office, because of reduced sales and the need to reduce over-capacity. The sale of outdated wooden elevators was also a priority. (CBC 2002d, 2002e)

Warm winds brought **record highs in early January** of 2003, especially in the southwest of the province. This worried farmers and ranchers concerned about the already huge moisture debt. there isn't enough snow yet anywhere in southern Saskatchewan to help recharge soil moisture let alone fill near empty dug-outs and sloughs. Fields in the Gull Lake area were bare of snow, but earlier rainfall there had ensured a supply of grass for grazing in this normally dry part of the province. Moose Jaw fields were also brown. A 50 km/hr chinook blew in from the southwest melting snow in its path and driving up temperatures. Tompkins registered +5°C on 2 January. Swift Current also had temperatures above freezing. On Christmas Day 2003 at noon, thermometers registered 0°C at Tisdale. (CBC 2003; CBC Saskatchewan 2003; Shire 2003,2004)

8.2 Weather Extremes- Lows

There is a saying that old men and old women used to cry in January because the coming month will be very cold and some of them will not survive it.

-Bart Dzeylion, Dene (Holland *et al.* 2003:18)

A. Cold Weather

General

Collins Bay holds the provincial record for the coldest average annual temperature, at -46.°C.

(Brown 2003a)

The frostiest place in Saskatchewan is Stony Rapids, which averages 238 days per year. (Brown 2003a)

Extreme Cold Weather Events in Saskatchewan

8.2.1A The Cold of 1893

The first day of February 1893 saw **Saskatchewan's coldest temperature**: -56.7°C at Prince Albert. Battleford was at -51.7°C and Qu'Appelle at -48.3°C . That night, Saskatoon also set a record at -50°C . Grenfell and Indian Head saw -46.7°C . (Manning 1983: Table 2; Brown 2003a; Christian 2000: février) Henrietta, had seen temperatures of -53°C a month earlier on 2 January 1893. This temperature ties with three other locations and times for third lowest ever. (Manning 1983: Table 2)

8.2.2A Mid-January in 1916

Mid-January 1916 saw record breaking temperatures. On 11 January, Prince and St Walburg tied with two other places and locations for the **third lowest temperature in Saskatchewan**, at -53.9°C . Temperatures at Anglia and Luseland reached -47.8°C . Pense registered -47.2°C and Estevan -46.7°C . The next day, MacDowall was at -51.2°C , Humboldt and Rosthern were at -50.6°C , Muenster was at -48.3° , Halcyonia was at -47.8°C and Chaplin, Wapashoe and Fort Qu'Appelle both saw -47.2°C . (Manning 1983: Table 2)

8.2.3A Five Feet of Frost in 1936

Thermometers fell to -52.2°C at Lac La Ronge, to -50.6°C at Scott and to -49.4°C at Alsask and Glaslyn in February 1936. Nine communities had **temperatures below -46.5°C** . Regina had not been so cold for 27 years. Frost reached a depth of five feet (150 cm.) and many household water connections burst. Early trains were delayed on both lines. It was decided not to ring a gong to warn parents that the weather was too severe to send their children to school, as was being done in Edmonton. The schools superintendent believed that parents were the ones to decide if it were too cold for their children. (Anon. 1936)

8.2.4A January 1966

January of 1966 was very cold. Between the 18th and the 28th, 18 communities set cold records below -46°C , including Stony Rapids at -50.6°C , Cameo and Smoky Burn at -50°C and Goodsoil and Victoire at -48.9°C . Saskatoon set a record of -43.3°C . (Manning 1983: Table 2; Street *et al.* 1997)

8.2.5A The winter of 2004

During the last week of January, Saskatchewan broke its record for natural gas consumption, consuming over 1 million gigajoules of natural gas over a 24 hour period on 28 January. This was more than 8% over the previous record, which had just been set on the fourth of the month.⁷ On that day and the next, Key Lake, Saskatchewan, was **the coldest place on earth**.⁸ Thermometers registered -52.3°C without wind chill. The next day, it was -52.6°C, the fifth lowest temperature ever in Saskatchewan. The Cameco Corporation uranium mine crew were pleased to hear about their situation on the news. Including the wind chill, which made it feel like -60°C, Meadow Lake was **the coldest place in Canada**. Farther south, Regina also broke the record for 28 January with -41.9°C, and Saskatoon reached -44.9°C, setting a new record. (Manning 1983: Table 2; CBC Saskatchewan 2004b; Brown 2003a; Smith 2004)

B. Snowy Weather

To tell you the truth, in California I missed the wildness of the Canadian winter. There is something stirring about a blizzard., something elemental about pitting oneself against driving, stinging snow in below zero temperatures. I often think it accounts for the general peacefulness of the Canadian character, all the aggressive energy has been used up in battling and surviving nature.

- Blanche Howard⁹ (quoted in Brown 2003b:Winter)

"Snowball snow" that packs easily is squeakless. It is the harder crystals of the colder days that produce the shrill fiving of the snow beneath our feet.

-- Edwin Way Teale¹⁰ (quoted in Heidorn 2004)

Of course, no trip through Saskatchewan would be complete without stopping in Kenaston to see the Blizzard Capital of the province. (Goodwin 2000)

General

Collins Bay has Saskatchewan's greatest average annual snowfall at 348.6 mm. (Brown 2003a) The record for the greatest amount snowfall in a single season may be held by Pelly which received 386 cm in 1955-56. (Brun *et al.* 1997: Fig. 2.13)

Very heavy snowfall in a single day has been seen around the province, usually in spring, at Broadview (61 cm. 28 May 1911), Collins Bay (57.4 cm. 3 October 1976), Estevan (61 cm. 26 March 1904), Gull Lake (55 cm. 28 May 1982), Lac la Ronge (61 cm. 24 March 1979), Macoun (56.9 cm. 7 April 1980), Pennant (58 cm. 28 May 1982), **Qu'Appelle (62 cm. 28 March**

⁷Gigajoules are used to measure natural gas; an average house uses about 130 gigajoules of natural gas a year. (CBC Saskatchewan 2004)

⁸The coldest temperature ever recorded on Earth was about -90°C at Vostock, Antarctica, 21 July 1983. (CBC Saskatchewan 2004; Brown 2003a)

⁹novelist and Canadian professor teaching in California.

¹⁰Edwin Way Teale (1899-1980) was a writer and naturalist who has been ranked with Henry David Thoreau, John Muir, and John Burroughs.

1902(the Saskatchewan record), Semans (61 cm. 15 March 1941) and Waskesiu Lake (56 cm. 17 October 1984). (Manning 1987)

The least average annual snowfall in Saskatchewan, 58.0 mm., occurs in Aylesbury. (Brown 2003a)

Hudson Bay holds the Saskatchewan record for the greatest amount of snow on the ground in any month, at 224 cm. (Brown 2003a)

Regina has the most blowing snow in Saskatchewan with an average of 32 days per year. Moose Jaw holds the record for the most blowing snow days in one season: 65 days in 1973-74. (Brown 2003a; Brun *et al.* 1997: Fig. 2.13)

In the far north, the snow cover is present for more than six months of the year. The Lake Athabasca area averages 185 days per year with snow on the ground. On 9 April 1987 central and northern Saskatchewan got a last blast of winter: La Ronge set a record for the most snowfall in a single day with 48 cm. of snow. (Christian 2000:avril; Saskatchewan Learning n.d.)

Most blizzards¹¹ occur in January, in southwestern Saskatchewan¹² and last, on average, 12 hours. Forty-eight hour storms have been known. Swift Current and Regina experience 30 hours of blizzard on average every year, in their average five blizzards of four hours or more in every two year period. The Swift Current area holds the record for the maximum average number of blizzards on the prairies, at 1.6 events. Saskatoon averages six blizzard hours a year, but get only one four hour storm in two years. Blizzards may not be accompanied by great amounts of snowfall, but have high winds which reduce visibility to one kilometre or less and produce intense windchill values. (Natural Disasters n.d.a; Saskatchewan Learning n.d.)

Freezing temperatures, intensified by the wind, have been known to freeze whole livestock herds at a corner of a field or in snow-filled barns, and even in modern days, people who have lost their way home and been frozen to death. (Saskatchewan Learning n.d.)

The most frequent blizzard producing storm is the Alberta Low or Alberta Clipper. These usually develop east of the Rockies, over Alberta or western Saskatchewan, as a result of a vigorous short-wave trough in a westerly to northwesterly flow aloft. These lows move quite rapidly (about 65km/hr) in an southeasterly direction towards Manitoba or North Dakota. The Alberta Low storms affect all of the Prairies, but they have their greatest impact on Saskatchewan. The blizzard conditions associated with these systems usually last less than 12 hours. (Natural Disasters n.d.a)

¹¹The noun “blizzard” appears to have originated in the early 1800s as a descriptive term for a severe blow, a cannon blast or a volley of musket fire. The writings of frontiersman Davy Crockett speak of his “taking a blizzard” at a deer and “speaking a blizzard” during a speech at dinner. Canadian weather expert David Phillips mentions that, at about the same date, “blizzer” described a severe wind snow storm in the English Midlands. (Heidorn 2004)

¹²Blizzards are much less common in the north.

Snowy Extremes

When there was a... blizzard... that's when people used to hook up their sleighs and go outside the reserve and steal wood, so they couldn't see their tracks (laughing)... Weather was something you lived with, I guess... daily prayers, you prayed for rain, or give thanks for a nice day...

- Ken Goodwill, Elder, Standing Buffalo First Nation
(SICC 2002:Tape 5 Side 1: ~221-247)

8.2.1B The Blizzard of 1906-1907

One of the worst winters ever known in Saskatchewan happened in 1906-07 when driving blizzards and freezing temperatures made life miserable. The timing was dreadful. That winter, many people were without sufficient supplies of fuel because of seven coal miners' strikes in Alberta in 1906. The effects were so severe in Saskatchewan the next winter that some families were reduced to breaking up their furniture and buildings for fuel. Near Grenfell, some men stopped a train and, when the conductor refused to sell them coal, they chained a log to the train to keep it there and helped themselves, leaving enough in the coal car to get the engine to the next yard where it could refuel.

Each man kept track of the amount of coal he had taken and went into town to report themselves to the authorities, providing their names and offering payment for the coal taken. (The StarPhoenix 2000:43)

Cattle, particularly range cattle in exposed areas in the southwest, were blasted by blizzards and frigid temperatures and up to 70 per cent of them died. Several of the large investor-owned ranching operations, such as the huge 76 Ranch, were driven out, leaving smaller family-owned outfits to take up the slack. They were more flexible and had smaller holdings which could be culled or expanded, depending on environmental conditions. Many moved into the more protected Grasslands area following this dreadful winter. (University of Calgary 1997; Fung 1999:41; The StarPhoenix 2000:43; Yanko 2004)

8.2.2B The Blizzard of 1946-1947: “a deathblow”

Another memorable event was the series of devastating blizzards which hit southern Saskatchewan between 26 January and 8 February, worsening an already snowy winter in which several communities had become isolated. Highways into Regina were blocked with snow for ten days. Railway officials declared the conditions to be the worst in Canadian railway history. One snow drift, near Weyburn, was about five and a half metres deep. On the CNR line at Victoria Plains northeast of Regina, a train with four locomotives and two plows was buried in a snowdrift a kilometre long and eight metres deep. The work train sent out to excavate the train and open up the line was itself buried in drifts, forcing the workers to walk back to Weyburn. The CPR line was not hit so badly, and some passengers and supplies for the eastern part of the

province were routed from Regina through Lanigan.

Households ran low on fuel, food and feed supplies as deliveries were stopped. More than one hundred were on a “first emergency” list. Coal supplies at Regina could not be delivered. Horses could not navigate the streets. People and animals were stranded because roads, railways and fields were choked with drifts. Many people got lost in the zero visibility blizzards. Some were lucky: their horses knew the way home. One farmer outside Moose Jaw cut a hole in his barn roof and climbed down to milk his cows.

The death toll on the prairies from exposure to the weather, accidents and fire was estimated to be 16. Vermilion set a record for low temperature at -47° without wind chill. A tragic fire on the night of 1 February destroyed St Patrick's orphanage in Prince Albert. The residents escaped the burning building in bare feet into -43°C temperatures, but six children and a nun did not survive. (Heidorn 2004; Christian 2000:février; Saskatchewan Learning n.d.; Environment Canada n.d.; Shaw 2001; Fraser 1990:11)

8.2.3B The Blizzard of 1978

Between 5 and 9 Feb 1978, a nasty blizzard rushed into southern Saskatchewan on a Colorado low pressure gradient which created extremely high winds accompanied by only small amounts of precipitation. For four days, howling gusts of up to 100 km/hr whipped up the light snow, piling it into banks as high as the eaves of houses. Many animals died. The weight of snowdrifts endangered greenhouses at Agriculture Canada's Biological Control Section and blocked roads stranded many visitors to the city. Remarkably, while Regina was completely shut down by the storm, there was very little effect at Regina airport. (Christian 2000:janvier; Natural Disasters n.d.a; Agriculture and Agri-Food Canada 2001; Western Christian College n.d.)

8.2.4B The Blizzard of 1984

Winter came early on 16-18 October 1984, when a blizzard with winds between 50 and 80 km/hr brought record amounts of snowfall and near zero visibility to the southern half of Saskatchewan. Saskatoon received 28 cm. of snow and the monthly record was broken in Regina when 42.8 cm. were dumped on the city. (Heidorn 2004: October; Christian 2000:octobre)

8.3 Weather Extremes- Wind and Storms

*Don't know why there's no sun up in the sky
Stormy weather...
Life is bare, gloom and misery everywhere
Stormy weather... (Koehler and Arlen 1933)*

The wind keeps on. When you step outside its strong hot push is like something solid pressed against the face. The sun through the dust looks big and red and close. Bigger, redder, closer every day. You begin to glance at it with a doomed

feeling, that there's no escape. The dust is so thick that sky and earth are just a blur. You can scarcely see the elevators at the end of town. One step beyond, you think, and you'd go plunging into space. (Ross 1941:73)

Included in this section are various manifestations of warm weather storms, including wind, thunderstorms, hail and tornadoes.

General

There average about twenty severe weather events in June and in July.¹³ An average of more than seventy severe weather events are reported each year in Saskatchewan. More deaths are reported annually from lightning than other types of severe weather event. (Saskatchewan Learning n.d.)

Saskatchewan's highest average **wind** speed blows from the west at Swift Current, at 22.9 km/hr. (Brown 2003a)

Perhaps surprisingly, it is the southeast of the province which experiences the greatest average wind energy measured over the long term. This is a broad band on a line between Estevan and Edmonton and averages 300-400 Watt/m² (Watts per square metre). A large area west of Radville between the U.S. border and Truax rates about 1000 W/m² wind energy. In the southwest, the long-term average ranges between 0 - and 200 W/m².. However, there are areas of much higher rating. Just east of the Alberta-Saskatchewan border, on the northeast slopes of the Cypress Hills, slightly west of Gull Lake, there is an area which averages greater than 1000 W/m². This is, not surprisingly, the location of the windfarm project. Another zone east of Val Marie averages 900 and above. (Community for Mesoscale Modelling 2002a, 2002b; Vincent 2001)

The highest hourly sustained wind ever registered in Saskatchewan was 142 km/hr (88.5 mph) at Melfort on 4 October 1976. (Heidorn 2004: October; Saskatchewan Learning n.d.)

Annually in southern Saskatchewan, an average of 15 hours of dust or sand storm reduces sufficient visibility, peaking in April and May when winds are high and fields are bare and often dry. (Saskatchewan Learning n.d.)

Saskatchewan gets about 25 thunderstorm days per year, most of them in the Wynyard area. (Environment Canada)

The greatest number of **thunder** days occurred at Beechy which in 1977 experienced 54. Southeast Saskatchewan gets an average of 25 thunderstorm days per year. They peak at an

¹³A weather event is classified as severe if one of the following is observed: a tornado or waterspout, heavy rainfalls of 50 mm or more in one hour or less or 75 mm or more in three hours or less, rainfalls of a lesser amount which cause damage from flooding or produce serious inconvenience, strong wind gusts of 90 km/h or greater, wind less than 90 km/h but producing significant property damage, hailstones of 20 mm or greater, hail less than 20 mm but causing significant property damage (not including crop damage). (Saskatchewan Learning n.d.)

average seven days or eleven hours in the month of July. (Saskatchewan Learning n.d.)

The worst area on the prairies for **hail** is the “hailstorm alley” in the lee of the Rockies. This includes the southernmost part of Saskatchewan, east of Cypress Hills, areas which experience four to six major hail events annually. Most hailstorms happen between noon and six o’clock from May to July. Hail reduces Saskatchewan crop production, on average, by about 3% annually. The most hail days experienced in Saskatchewan is at Estevan, which averages two days per year. (Natural Disasters n.d.b; Paul n.d.); Brown 2003a)

Canada has the second highest number of **tornadoes**, after the United States. Russia is third. On average, the Atmospheric Environment Service of Environment Canada says, about 80 tornadoes are reported every year in Canada, about one third of them in Ontario. They cause two deaths and 20 injuries. In Saskatchewan, there have been an average 17 confirmed tornadoes per year since 1984. Southeastern Saskatchewan is the most active region, although tornadoes have been sighted as far north as Deschambault Lake, east of La Ronge. June and July are the preferred months for tornado activity and four o’clock to seven pm is the most common time period. (Saskatchewan Learning n.d; Hunt 1999; Natural Disasters n.d.d; Environment Canada 2004a)

...they're not as frequent in the prairies but they tend to have a different type of storm. They... have what we call air-mass thunderstorms that seem to pop up randomly, anywhere. And they're isolated and they can get *really* big. (Hunt 1999)

Tornado strength is measured by the Fujita scale.¹⁴ Although no F5 tornadoes have ever been officially recorded in Canada, recent research suggests that two may have happened in Saskatchewan. Despite assurances by Environment Canada that the odds of dying from a tornado are 12 million to one, more than 80 people have been killed and several hundred injured by tornadoes in Saskatchewan since 1905. Improvements in forecasting and public awareness have reduced deaths to three and injuries to 60 since 1945. (Environment Canada 2002a, 2004a; Paul n.d.:1)

Windy Weather Events in Saskatchewan

8.3.1 The Black Blizzards of the Great Depression

The dust storms which began in 1931 remain an icon of the Dirty Thirties. The soil was so dry and so finely broken up by years of ploughing that it was extremely vulnerable to the hot dry winds of the 1930s. Black Blizzards flew across the province, picking up the dusty earth and piling it up against buildings and fences. Ditches were filled, roads obliterated, and visibility reduced. On one day in January 1931, a month when Saskatchewan is accustomed to blowing

¹⁴The Fujita scale is used to quantify the strength of tornadoes. The Fujita Scale was first proposed by Dr. Tetsuya Fujita in 1971. It is used by meteorologists to estimate the speed of winds after a tornado by studying the damage caused by the tornado to structures. The scale ranges from F-0 (Light Damage: Chimneys are damaged, tree branches are broken, shallow-rooted trees are toppled) to .F-5 (Incredible Damage: Strong frame houses are lifted from foundations, reinforced concrete structures are damaged, automobile-sized debris be-comes airborne, trees are completely debarked). (Environment Canada 2002a; FEMA 2002)

snow, it was impossible to see across the street in Moose Jaw at 1 p.m. because of blowing dust. Similarly, familiar faces were impossible to recognize on Saskatoon's 25th Street Bridge on dusty days in 1932. In November of 1933 Black Blizzards blew prairie dust all the way to the Atlantic coast where it was brought to earth as black rain in New York State and brown rain in Vermont. (Hoffman 1997; Christian 2000:novembre; Chisholm 2001)

During one [golf] tournament in the 30s, the woman refereeing the final match wore goggles to protect her eyes from the blowing dust and had to look for tracks made by rolling balls to locate them in drifts of topsoil near fences on the course.

(Above Par Communications 2004)

In the rural dust bowls, towels and sheets were stuffed around windows and under doors to try to keep the dust from invading drafty houses.

8.3.2 The Great Winds of April 1981

On 6 April 1981, southern Saskatchewan was hit with wind gusts of 110 km/hr (67 mph). Schools were closed and power lines were knocked down. Topsoil was torn off farmers' fields: one local farmer called it the worst dust storm in 20 years in the area. (Heidorn 2004: April)

8.3.3 The Winds of 1996

Mid-July of 1966 saw a series of storm ravage Saskatchewan. Winds of more than 100 km/hr caused wide-spread destruction in the Saskatoon area, collapsing houses and tossing grain bins around. Power lines were broken. Ironically, the disaster movie Twister was playing at the Sundown Drive-In Theatre outside Saskatoon at the time and the screen was destroyed by the winds. Saskatchewan Government Insurance dealt with about 2440 insurance claims for damage, especially in the rural communities of Warman, Hague and Osler. There was rain and hail associated with these storms, but it was the wind did the most damage to farms, grain bins and urban trees and roofs. (StarPhoenix 2000:58; SGI 1996)

8.3.4 Thunderstorms and Hail Events in Saskatchewan

Storm up north in P.A. was 275 miles long. Beginning in Hodgeville district 45 miles South-West of Moose Jaw the wind & hail storm ripped northeastward to the Wroxton & Tonkin area N.E. of Yorkton hammering an estimated 650,000 acres of crops. Property damage is estimated at \$4,000,000. It toppled power poles, stripped trees & deluged drought-threatened lands with rain. Buildings were blown down, & the Bethune-Disley area was hard hit. (Bladon 1957:17 July)

8.3.4.1 Canada's Largest Hailstone at Cédoux

On 27 August 1973, a violent thunderstorm was accompanied by high winds and golfball sized hail in southern Saskatchewan. There was some 10 million dollars in damage. One hailstone of 290 gr (10.23 oz) and 114 mm in diameter fell at Cédoux. The Gavel stone's mass at the time of impact is estimated to have been 450 grams, the largest hailstone officially registered in Canada.¹⁵ (Christian 2000; Wojtiw and Lozoski 1975; Environment Canada 2004a)

8.3.4.2 Raging Thunderstorms on 3 June 1976

On 3 June a violent thunderstorm was born in southwest Saskatchewan. It travelled north, gaining strength as it hit Swift Current and continued north to Davidson and Watrous, destroying crops, trees and buildings on its way. Hurricane force winds toppled power line pylons: Plunkett was without power for 20 hours. Broadview was pummelled by hailstones 8 cm. in diameter. Mobile homes were destroyed. A broad sweep of storms swept through central Saskatchewan, inflicting six million dollars in damages. At Guernsey, dozens of farm buildings were flattened and heavy damage done to the headframe and other buildings at Alwinal Potash of Canada Ltd. CBK radio transmitter antenna at Watrous was felled. (Humboldt Journal 1976; Christian 2000:juin)

8.3.4.3 July 1989 Hailstorm in Southeastern Saskatchewan

A short-lived but fierce storm drove through southeastern Saskatchewan, inflicting a great deal of damage on 8 July 1989. Tremendous winds and hail tore eastwards through the Montmartre-Glenavon-Kipling area at 80 km/hr. Although the storm lasted only about two hours, and precipitation, amounting to about 25 mm., lasted only a half hour at any one location, the damage was afterwards estimated at nine million dollars, due mostly to hail. Crops were pulverized by golf ball sized hailstones and mobile homes smashed by the winds. Buildings and cars were also damaged. At the hamlet of Peebles, the general store and local rink were blown three kilometres away into the bush. The Pool elevator winch was destroyed. (Environment Canada 2002a, 2004a; Meteorological Service of Canada 2002; Paul n.d.:1)

8.3.5 Tornado Events in Saskatchewan

8.3.5.1. Canada's Worst Tornado: The Regina Cyclone of 1912

In the north end of the city...people were running to and fro screaming and looking for those of their friends and relatives that had been lost in the confusion.

-George E. Duis, Grand Forks, North Dakota

The only thing it could be likened to is hell let loose. -John F. Martman, Toronto
(quoted in Daily Phoenix 1912:1)

¹⁵In comparison, the largest hailstone in the U.S. weighed in at 757 grams (1.67 lbs). The Heaviest in the world landed on 1 May 1986 at Guangxi, China, and weighed 5 kg. (Ahrens, 1994; Wheaton 1998:72)

Canada's worst and most famous tornado killed 28¹⁶ people in Regina on 30 June 1912, the most ever for a Canadian tornado. The cyclone began life some 18 km. south of Regina, passed quickly through the city, and ground its way north about 12 km before blowing itself out. This tornado was probably an F5 on the Fujita scale, categorized as "Incredible Damage".

Bricks, lumber and even whole roofs were being blown past the hotel as if they were so many matches. A wagon which was standing in front of the hotel was blown completely on top of the heavy draught horse which was attached to it and the tow were carried down the street. A fence brought them to a stop and when the storm was over it was found that the horse was not injured, although the wagon was smashed to tinder.

-E. H. Davis, Vancouver (quoted in Daily Phoenix 1912:5)

Hundreds of people were injured. The next day, Dominion Day, the extent of the devastation was almost unbelievable to the survivors: some 500 buildings destroyed or damaged and at least 2500 left homeless. One man described the swath of destruction: from most of the business section to the northern city limits every building was almost completely destroyed.

The force of the storm is almost unbelievable. House were levelled, churches demolished, great warehouses overturned—some houses have piece of timber driven clean through the roofs. The north end district which is thickly populated by foreigners has been swept absolutely clean. Nothing is left of whole blocks but the foundations.... (Daily Phoenix 1912:2)

Cars were twisted up and "tossed around like so many feathers". Overall, property damage topped four million dollars. The protracted cleanup involved the whole population. (Paul n.d.:1; Environment Canada 2002a, 2004a; CBC Saskatchewan 2002f; Daily Phoenix 1912:1-2,5; Heidorn 2004; Christian 2000:juin)

8.3.5.2. The 1944 Tornadoes at Kamsack and Lebret

On Dominion Day, 1 July 1, 1944 a vicious tornado touched down at the small Francophone community of Lebret and killed four people. Only five weeks later, on 9 August, a funnel cloud formed five kilometres south of Kamsack and tore into town, cutting a six foot wide swath of destruction along six streets. The "Kamsack Cyclone" may have been an F5 tornado on the Fujita scale. Almost 75%, some 400, of Kamsack's residences were destroyed and three people were killed. Also wrecked were the local synagogue and one hundred businesses. Damage was estimated at two million dollars. Rebuilding was begun immediately with the help of returning veterans. Post-war optimism in Kamsack was so high that the town invested further resources to extend municipal services, pavements and sidewalks, and business boomed in "The Garden of Saskatchewan". (Environment Canada 2002a; Christian 2000:août; Town of Kamsack 2003; IAJGS 2001)

8.3.5.3 The Tornadoes of 4 July 1996

¹⁶Some reports suggest that up to 30 people died.

On 4 July 1996, at least eight tornadoes were born in severe thunderstorms in the Saskatoon-Maymont-Osler region. Winds of 140 km/h and hail the size of golf balls produced \$15 million in property damage. Violent plow winds and softball sized hail destroyed power lines in what developed into an F3 tornado at Maymont. Power lines were destroyed in the Maymont area by an F3 tornado, homes and property in the Osler area were damaged by tornadoes, wind and hail, while Saskatoon experienced severe winds which damaged many trees and properties, particularly in the east end. Winds gusts of 120 km/h and 141 km/h were measured by meteorological instruments in the Saskatoon area (Saskatoon airport and Kernan Farms respectively). (ICLR 1996; Environment Canada 2002a)

8.3.6 Weather Extremes- Water

This section concerns rainfall and flooding. Overall precipitation, however, is included in the *General* part.

General

The greatest average annual precipitation in Saskatchewan occurs at Brabant Lake, which receives an average 530.1 mm. (Brown 2003a)

The greatest precipitation recorded in Saskatchewan in any one year was at Kamsack, which received 916.0 mm. in 1921. (Manning 1983: Table 5; Environment Canada 1983)

The record amount of moisture in Saskatchewan for the springtime period from January to the end of June is 312.7 mm. recorded in 1911.

Lac la Ronge holds the record for the most precipitation in any one month in Saskatchewan, with 297.4 mm. in June of 1970. (See fn 1)

The record for the greatest amount of rain on any one day in Saskatchewan is held by Willmar, with 178.6 mm.¹⁷ which fell on 30 July 1984. Indian Head is second at 167.6 mm. set on 15 June 1897. (Manning 1987) Vanguard holds the record for the most precipitation on any three days, with some 375 mm. on 30 June - 2 July 2000. (Saunderson 2001; Environment Canada 2000c)

Collins Bay holds the record for the greatest number of fog days: 61 days in 1980. The greatest number of fog days in a year, on average, also occurs at Collins Bay: 37 days. (Brown 2003a)

The record in Saskatchewan for the longest wet period is held by Whitesand Dam, where it was wet for 180 days in 1978. (Saskatchewan Learning n.d.)

¹⁷This record is based on pre-1986 records, but may still hold.

8.3.6.1. The Floods of 1952

Due to rapid spring thawing, in 1952 Saskatchewan had **serious floods in many parts** of the province. The area of most severe flooding stretched 290 miles (467 km.) from Moosomin to Prince Albert. Most of Eastend's residents were forced to evacuate due to flooding of the town and the dam there was seriously damaged. Some families were relocated through PFRA programs.

The 380 m. (1,214.5 ft) Saskatchewan Landing bridge, 30 miles north of Swift Current, was built with six concrete approach spans and three steel spans, had eight piers and nine arches and cost one million dollars. Ironically, at the official opening of the bridge on 20 June 1951, Tommy Douglas dedicated it for the use of "our children and our children's children." Less than a year later, a huge ice jam caused by an usually quick spring breakup threatened the bridge.

Men, women, and children rushed to the scene in plush cars, jalopies, and even on horseback to watch the struggle of the bridge against nature. Soon the scene started to resemble an afternoon country picnic rather than a potential disaster. (Innvista n.d.)

Twice army engineers attempted to break up the jam with dynamite ten miles east of the bridge, without success. Finally, in the early morning of 6 April 1952, the river began to gain momentum and the ice floe stacked up against the bridge.

Then, in a period of five seconds, to everyone's horror, the bridge collapsed. The end came with startling suddenness. The ice actually rose up to the bridge, finally lifting it off the piers and dumping the steel structure into the river. To this day, the original Landing Bridge lies at the bottom of Lake Diefenbaker. (Innvista n.d.)

After the collapse, travellers were once again forced to use ferry service until a new bridge reopened in early June of 1953. (Innvista n.d.)

8.3.6.2. Canada's Most Intense Rainstorm at Buffalo Gap in 1961

After abundant fall rains and winter snows 180% above normal in some areas, a rapid spring melt caused many floods in low areas of southern Saskatchewan in April and May 1961. Seeding was delayed by two to three weeks. Then, on 30 May 1961, a storm dumped more than 250 mm (10 inches) of rain in less than an hour at Buffalo Gap in south-central Saskatchewan, setting a record as the most **intensive rainfall in Canadian history**.

"Hopscotching across the south for the second successive night, a series of violent thunder storms Tuesday ... washed away rail and highway grades... flooding hundreds of acres of farmlands." (The Leader-Post 31 May 1961)

Heavy hail, extreme winds and tons of water flooded and eroded fields, denuded pastures, washed out roads. In some areas, the bark was stripped from trees and paint driven off grain elevator walls. (see personal account in Appendix 2)

Several residents described unusual colours associated with the black storm cloud as "greenish," "pinkish" and "brownish." There was a huge dust cloud ahead of the main storm cloud, and in almost every case this was described as appearing south of the observer, no matter where the point of observation was located in relation to the approaching storm. In some parts of the storm area, heavy hail occurred which remained in drifts several days later. (Environment Canada 2000a)

Even 100 km away from the locus of the most intense rain, total precipitation measured more than 75 mm. In some places. Hail the size of small eggs rained down and was swept by intense winds into drifts as high as four metres in some places. Almost unbelievably, no deaths and few injuries were reported. What is truly bizarre is that this storm happened in what was the driest year on record in the rest of southern Saskatchewan. (Environment Canada 2000a, 2002a; Saskatchewan Learning n.d; Christian 2000:avril, mai.)

8.3.6.3 Flooding in 1973-1974

Throughout Saskatchewan, the winter of 1973-1974 was characterized by near-record snowfall and few periods of above zero temperatures. As a result, there was little ablation of the total snow cover and with the spring thaw, several areas reported extensive flooding. Farms and grazing land were inundated and high water levels damaged roads and bridges along the Carrot River and Red Deer River. Pierceland and Green Lake on the Beaver River were threatened by widespread flooding.

Another hot spot was the Qu'Appelle Basin where several centres required intensive flood fighting. On 18-19 April, the Moose Jaw River, Thunder Creek and Spring Creek, which merge in Moose Jaw, also spilled over and cut the city in half. Several bridges and dams were seriously damaged and essential services disrupted. Some 60 blocks in Moose Jaw were flooded, 480 homes inundated, and 1400 people had to be evacuated.

The next day, Regina's Wascana Creek, which is a tributary of the Qu'Appelle River, overflowed its banks, threatening houses in low-lying areas near the creek. The city quickly constructed dykes and some 85 families were evacuated.

The Moose Jaw River and Wascana Creek merge with the main body of the Qu'Appelle River above Lumsden and when their waters combined with the already turbulent overburden of the Qu'Appelle on 25 April, the resulting flows of 436 cubic metres per second on the Lumsden part of the river smashed the previous record of a mere 187 m³/sec set in 1969. The crisis situation required emergency measures: massive high dykes were built along 5.6 km. of the river's length to hold back the waters and protect Lumsden from serious damage. (Environment Canada 2000a)

8.3.6.4 The Vanguard Flood of 2000: One of Canada's largest rainfalls

Emergencies cannot be planned, but responses can be planned.

-Dorothy Saunderson, mayor of Vanguard (Saunderson 2001:24)

Environment Canada now calls the 3 July 2000 storms at Vanguard the **most intense rain storm** ever on the prairies.¹⁸ In just over eight hours nearly 375 mm of rain fell on normally dry Vanguard. That amounts to two-thirds of a billion m³ of water. Normal mean annual precipitation was 360 mm. This storm made No. 7 in the list of top ten weather stories for the year. Cloud-to-ground lightning strikes were more than what that area might experience over two years. Visibility was reduced to a foot or less during the onset. Roads and rail lines were impassable and some people had to be rescued from their homes by boat.

The force of the water crushed cars and farm implements, swept away grain bins and soaked large bales. Stranded residents had to be rescued by boat, which rapidly became the carrier of choice on the main street in Vanguard. The flash flood also carried away herds of cattle and drowned dozens of deer and antelope. Some further irony, when millions of litres of contaminated water submerged the water-treatment plant and backed up into homes and businesses, officials had to ship in bottled water from Swift Current. (Environment Canada 2000c)

The mayor was particularly concerned for the safety of seniors and families in distress.

The rain was like a snow storm during a blizzard... One family that... was evacuated... had five children under the age of six in the house. (Saunderson 2001:22)

The Council declared a local state of emergency: by candle light, because the building was under four feet of water and the electricity had had to be shut off. More than one million dollars in damage was done to buildings, crops, cars, grain elevators and farm machinery in Vanguard and the surrounding farmland. Crops rotted in waterlogged fields. The contents of the local abattoir, hundreds of pounds of rotting meat, and household perishables were disposed of in a large pit and limed.. The Prairie Farm Rehabilitation Administration, in partnership with Saskatchewan Public Health and Sask Water, co-ordinated in cleaning up the water supply. (Scott 2000; CBC Saskatchewan 2001; Environment Canada 2000c, 2002a; Saunderson 2001:22-24)

8.3.6.5 In the Midst of Drought, We are in Mud: 2002

The “**worst growing season in recorded history**” was No. 1 on Environment Canada’s list of top ten weather stories for 2002. In one of the worst droughts on record, the problem was not just the lack of moisture: Saskatchewan suffered through an icy spring, a blistering summer, grasshoppers, mid-summer snow and harvest rains. Right in the middle of harvest, in August and September, heavy rain combined with freezing temperatures to ruin the harvest. In many areas, crops lying wet in the fields sprouted, rendering them useless except for animal feed. What marketable grain and oil seed crops was left was devalued because of staining or bleaching by the

¹⁸I am not sure why EC calls this the most intense storm. At Buffalo Gap, 257 mm fell in about an hour. At Vanguard about 375 mm fell in over 8 hours. I have plumped for Buffalo Gap as the most intense.

rain. Frost hit in mid-September, followed by frequent rains and snow at the beginning of October. Much of the harvest never did dry and was left in the fields to freeze and rot or was turned under, if farmers were able to operate their heavy equipment in the soggy fields. (Environment Canada 2002c; Statistics Canada 2002)

8.3.7 Weather Extremes- Drought

General

As we look back over the last one hundred years, it is apparent that there have been several periods of serious drought in Saskatchewan. However, recent studies of white spruce and lodgepole pine trees in the western Cypress Hills area show evidence of droughts in pre-settlement times that were much more severe and long lasting than the worst of 20th century dry spells. The driest 12 month period shown in the 400 year tree-ring record was August 1793 to July 1794. (University of Regina 1998)

More recently, the Palliser Triangle in the southern parts of Alberta, Saskatchewan, and Manitoba, has suffered major multi-year droughts in the 1890s, 1930s, 1980s and 2000s. The end of a drought may take years to happen. "A few days with precipitation is not sufficient to terminate a severe drought. To bring the levels of soil moisture, ground water, lakes and rivers back to normal, prolonged, above-average precipitation is necessary. Environmental and socio-economic sectors hurt by the drought may take longer to recover." (Brun *et al.* 1997:2.3.1)

The area of least average annual precipitation in Saskatchewan is Nashlyn, which averages 287.9 mm. (Brown 2003a)

The Chaplin area set the record for the least precipitation in any year in the province, 73.4 mm., in 1893.¹⁹ (Manning 1983: Table 6) This contrasts with the record holder for the greatest amount of precipitation in any year: Kamsack at 916 mm. in 1921. (Manning 1983: Table 5)

Regina holds the Canadian record for the most dust storms in one year, at 19 in 1981. Moose Jaw is second, with 14 that same year. Yorkton and Swift Current each had 12 that year and the latter 16 in 1988. (Wheaton 1998:20-21)

Extreme Dry Weather

8.3.7.1 The Dry Thirties

The drought of the 1930s, which contributed to the Great Depression, was described at the time as "the most serious emergency Canada has ever known."

(CBC 2001a)

¹⁹I am not sure if this record still holds. It held until about 1983, but the droughts of the late 1980s and 2001-2003 may require a recalculation.

The Dirty Thirties (~1929 - 1938) is often considered to be the **most significant drought** in Saskatchewan.²⁰ The years of 1936 to 1938 were very difficult. In 1936, 12,831 Saskatchewan farms were abandoned. Dust storms lasting for days made life miserable, and **Canada's highest temperature** was registered at Midale and Yellowgrass. On July 5th 1937 the temperature rose to 45°C. Old Wives Lake, south of Moose Jaw, dried up and high winds coated the area with alkali dust. Fife Lake, near the Montana border, also evaporated and tons of buffalo bones were exposed. The drought extended as far north as the parkland and plagues of grasshoppers, army worms and equine encephalitis vied with the dust and depressed grain markets.

...it is hard to imagine the plague of grasshoppers, the dust storms, the brassy hot sun and the winds. Day after day, the sky gave no sign of clouds other than the shine of grasshopper wings by the millions high in the sky. . . . On the golf course, carried by the wind, they became projectiles striking like bullets penetrating any opening in clothing. . . . All forms of green growth were consumed -- trees, grass and weeds as well as crops. Combating hoppers on the golf course meant covering greens with topsoil, exposing only a six foot circle with the hole in the middle and changing the position of the hole when the grass was consumed. Putting became a rapid stroke taken after clearing a path to the hole. Long putts required extra haste. With the grasshoppers came the dust. . . . The slowly desiccated fairways gave up their prairie wool reluctantly to the drouth, heat and wind. Blades of grass were here and there, but there also were cracks so wide that they caught thousands of balls.

- Dr Ben Reid, Wascana Golf Club historian
(quoted in Above Par Communications 2004)

The number of bushels per acre, normally between 14 and 17, was the lowest ever in the province, some 2.5 bushels in the worst year of 1937. The average over the decade was 10 bushels. The price of wheat, which fell to 35 cents per bushel in 1932, averaged 60 cents for the decade. Net income was a negative number between 1932 and 1937. (Environment Canada 2002a; Manning 1983: Table 1, University of Saskatchewan 2003; Hoffman 1997)

8.3.7.2 The Drought of 1961

In western Canada, the month of June 1961 remains the **hottest and driest month** in history. At the end of June, the region was hit with a devastating drought and blistering temperatures which persisted into August. This drought dramatically increased demands for water development projects. Very little precipitation was received at Melville (167 mm.), Merryflat (167.8 mm.), Alsask (177.8 mm.), Hazenmore (181.9 mm.), Broadview (183.4 mm/) and Indian Head (187.5 mm.). Remarkably, on 30 May a huge thunderstorm dropped 250 millimetres of rain in less than an hour on Buffalo Gap, during the driest year on record at the time.(Manning 1983: Table 1, Table 6; Christian 2000:juin; Phillips, 1990, 1993; PFRA 2003; Environment Canada 2002a)

²⁰The droughts of the late 1980s and 2001-2003 were also significant.

8.3.7.3 The Dry Decade of the 1980s

The decade of the 1980s was the **driest on the prairies since the 1930s**. Moose Jaw received only 2% of its normal precipitation in May of 1980. The years 1984-1985 saw low snowfall and above normal temperatures which brought infestations of grasshoppers and many grass fires to southern Saskatchewan. Dry pastures became infested with grasshoppers and cattle and other livestock were badly stressed.

In 1988, another very dry year again devastated crops and pastures. Farmers were forced to haul water. Government emergency drought programs for livestock, greenfeed and water supplies, delivered by the PFRA, were essential in some areas. The Saskatoon area set a record that year when a mere 83 mm. of precipitation were received. Federal and provincial crop insurance and special drought assistance payouts soared. Even with this support, Saskatchewan had net farm losses of 78% and many left the farming sector. The droughts of the 1980s extended northward into the northwest forests, reducing harvesting and killing seedlings. Tent caterpillars and spruce budworms flourished. Forest fires threatened lives. The drought raised the amount of energy used in the province dramatically. (Environment Canada 1997; Christian 2000: mai, août; PFRA 2003)

8.3.7.4 The 2001-2003 Drought

The long drought period of 2001-2003 was a record-breaking event in Saskatchewan history, **worse in some areas than the 1930s**. There had been no significant amount of winter precipitation in 29 years. On the contrary, between 1990 and 2001, there had been seven warmer than normal winters and ten drier than normal winters. In 2001, grain output fell by 50% from 2000, and a record number of crop insurance claims, totalling about \$400 million, were filed due to crop loss and damage. In May 2001, the Saskatoon area endured the **driest five month period**, January to May, on record since the late 1880s, including the drought of the 1930s. Total precipitation amounted to only 34.1 mm. By the end of June, only 72.4 mm. had been received, about 40% of the normal 172.1 mm. Winds were intense and caused significant damage to crops and fields. The Saskatoon area had its driest year on record in 2001, with 159.7 mm of precipitation or 46% of its normal amount. Observations date back to 1892. Saskatchewan's fall of 2001 was the driest in 100 years. On a positive note, golfers enjoyed an expanded season. (Environment Canada 2004b; Robinson 2002a, 2001b; StarPhoenix 2000:64; CBC 2001; Pratt 2003)

Continuing the pattern of the previous year, the **worst growing season in recorded history** was at the top of Environment Canada's list of 2002 weather stories. At the beginning of spring, the west was drier than any time in the last 100 years.

Farmers needed 60% more precipitation than usual before the start of the growing season just to replenish water supplies. What they got was a 60% decrease in precipitation. As winter changed to spring, the relentless dryness in the south moved northward to grip the middle Prairies. The most affected area was the central rectangle between Edmonton, Calgary, Moose Jaw and Saskatoon. Dugouts and ponds dried out or, at best, hit a quarter full. In Saskatoon, June's precipitation was down 56% and marked the eighteenth consecutive month with below-normal precipitation. The extremely dry conditions and record cold in April and May 2002 delayed seeding and slowed crop growth all year.. (Environment Canada 2002c)

Saskatoon suffered its second driest spring in over 97 years in 2002. Clouds of grasshoppers were one result. The **entire province was affected**. In the north, forest fires forced residents to flee and threatened fire fighters. Southern regions also fought blazes. By July, the far north was under control but the parkland was still threatened. Despite some rain in June and July, the drought was so severe that it made little effect, especially in central and western Saskatchewan. Kindersley and Swift Current suffered similarly. A review of headers from the "Estimates of Principal Field Crops" published in Statistics Canada's The Daily tells the tale: "Barley takes another hit", "Field pea production withers", "Oat production worsens", "Canola production cut from 2001" and "Wheat production down from 2001". Many farmers did not bother to harvest what was left of their crops. The remains of grain the mid-September frost missed was eaten up by cattle, grasshoppers and migratory birds. The **grasshopper infestation was widely spread** and counts of 100 insects per square metre were registered in at least one Saskatchewan district. (Environment Canada 2002c; CBC Saskatchewan 2002a, 2002b, 2002c, 2002d, 2002g, 2003; Statistics Canada 2002; Kennedy 2002)

Farmers were in grave difficulties and increasingly resorted to crop insurance. Farmer Ken Nodge said that his fields were usually covered in snow in late February, but in 2002 they were dry and brown. "You may as well define it as the snow we didn't get yesterday, Nodge said. "I don't mean to spread panic, but we're in crisis." Ranchers were also devastated. With between 60 and 90% of grazing lands affected by drought, grazed down to the roots, and dugouts dry, ranchers sold off much of their livestock, sending prices tumbling. More than 25 rural municipalities declared themselves **drought disaster areas**. (CBC 2002a, 2002b, 2002c)

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