The summer 2004 that never came to Manitoba

by Andrew Nadler, MAFRI

The 2004 growing season was noted for being the summer that didn't really arrive. All Prairie dwellers tend to feel somewhat cheated after a long cold winter followed by a short cold summer. But most affected was the agriculture sector, which depends entirely on the weather and relies on a certain level of consistency in how this weather behaves. The conditions during the 2004 growing season were certainly unexpected.

It ended as the coldest on record for Manitoba where in some cases, records extend back to the late 19th century. It has been suggested that this could well have been the coldest summer since the last ice age. The second coldest summer on record was in 1992, the year after the massive eruption of Mount Pinatubo in the Philippines. That event released 15 to 20 megatons of sulfur dioxide into the atmosphere. The result was an initial warming then two years of cooling on a global scale from the volcanic particles that blocked sunlight.

The primary cause for the cool temperatures in 2004 is less clear and will likely be the source of investigation for years to come. One of the culprits is the jet stream. With the combination of hotter than normal conditions in coastal British Columbia and a low pressure system that parked itself over Hudson Bay, cold air currents from the Arctic were steadily carried down into southern Manitoba resulting in cooler than normal temperatures. Having just experienced one of the coldest springs on record, the Canadian tundra had plenty of cold air to export south.

The trouble with cool low pressure systems is their instability which makes their behaviour difficult to predict. This was observed countless times as the optimistic five-day forecasts made us all believe that sunny skies and warm temperatures were just around the corner. As those days approached, the one and two-day forecasts often changed to cool and wet.

One of the reasons for this frustration is that computer forecasting models are designed to produce output that favours normal conditions for a given location at that time of year. Therefore, when there is uncertainty, the computers will often forecast temperatures that are within the normal range rather than those well above or well below what is considered normal. In 2004, many of the daily conditions would not have fallen into the normal category.

Just what is normal?

Predictions related to agricultural climates are similar in that they rely on averages or normals to determine what should be expected for a growing season. Normals are most often derived as an average of the past 30 years of record, ending with the last full decade. The most recent set of normals are from 1971 to 2000 which recently replaced the previous 1961 to 1991 period. A 30-year interval is considered sufficient to adequately represent some of the usual variation within a climate without being overly influenced by short-term trends. It is important that the 30-year averaging period be as recent as possible to reflect any gradual changes in the climate at a location.

Normals serve as a valuable tool for calculating the relative extent of a certain observed parameter. This may include how seasonal precipitation compares with the 30-year historic aver-

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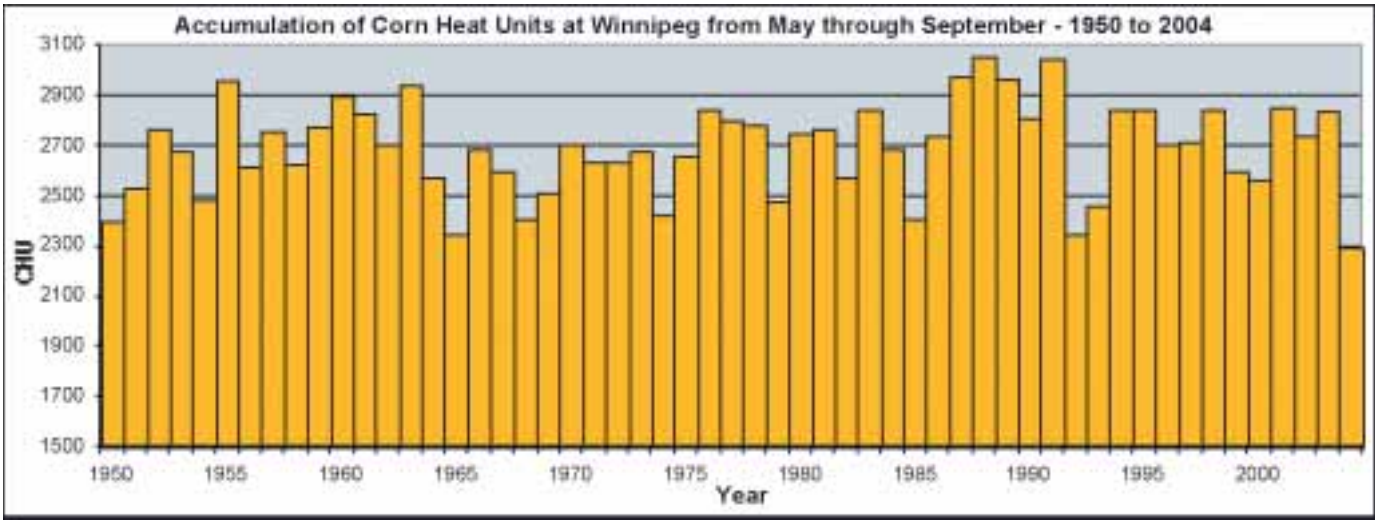

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age, or how the mean temperature deviates from the normal mean temperature. The benefit in presenting a measurement as a per cent or deviation from normal is that it indicates just how abnormal conditions may be. An absolute value, while informative may not be as useful if we don't know what is normal for a certain location and time period.

Historic normals related to temperature and heat are especially important on the Prairies due to their location near the northern fringes of agricultural production. On the Prairies, an insufficient number of frost-free days or a limited accumulation of heat units can often prevent certain crops from reaching maturity prior to fall frost.

Check your heat units

Before planting a new crop, especially warm-season crops, producers should consult a map of normal heat unit accumulations to determine whether a particular variety or hybrid would be suited for the expected available heat in the area. If the corn heat unit (CHU) rating of a certain hybrid is higher than the average CHU accumulation in a region, it would be a good idea to find an alternate hybrid or crop to plant.

With respect to climate normals, an average value is not enough information on which to base a decision. An average is simply the mathematical mean of the historic values. Statistically, there would be a 50 per cent probability that in any given year, the CHU accumulation would be above the average value and the same likelihood of it being below. The average tells us nothing about the sort of variability that occurs from year to year or even within the season.

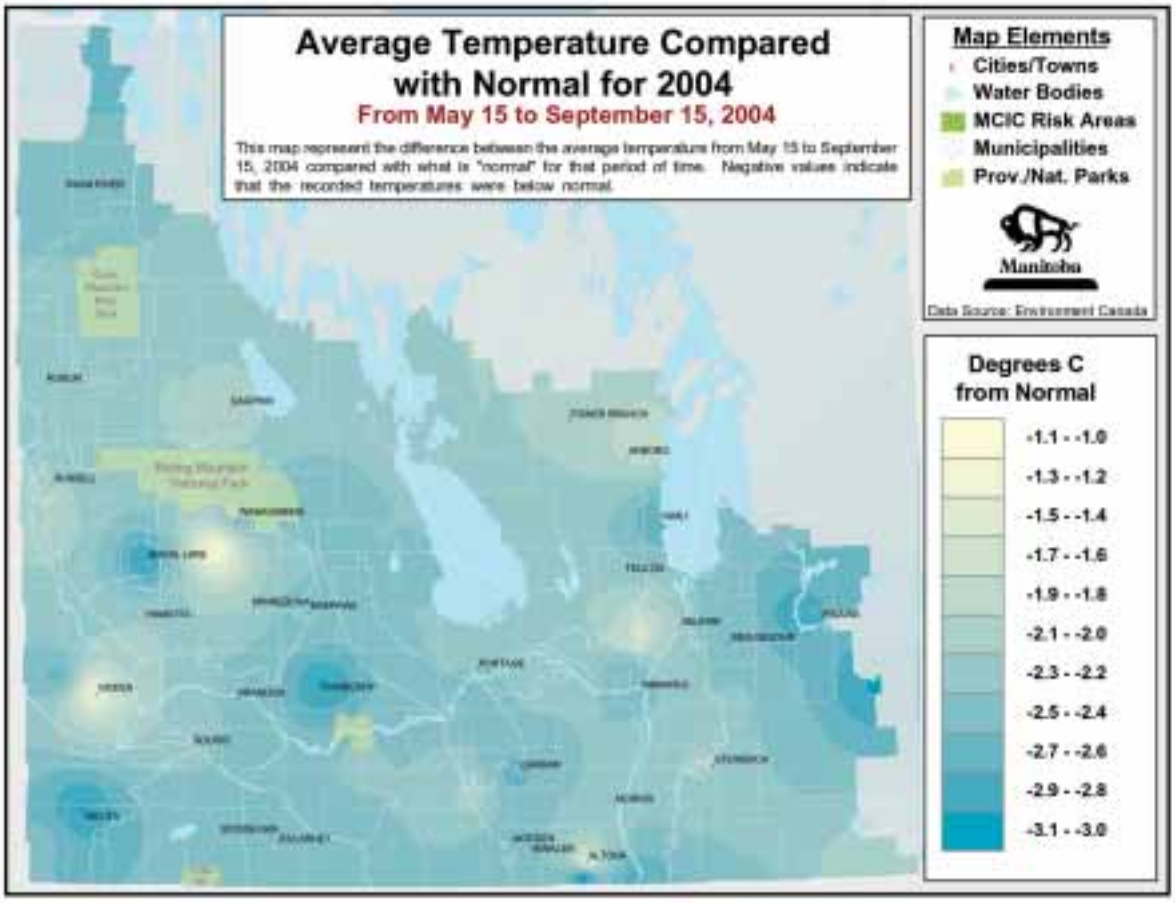
A more detailed analysis of the historic data can provide some insight into how often a growing season can be expected to be near normal and to what extent they deviate from the norm. A probability or risk map can be a useful tool to determine the amount of variability that can be expected. A seasonal CHU map of 25 per cent risk suggests that in one out of four years the seasonal accumulation would be expected to fall below the CHU value indicated. A map of 10 per cent risk indicates that in one out of 10 years the CHU accumulation would be expected to fall below that value.

Can we predict abnormal years?

This type of information can enable producers to adapt their operations based on an acceptable level of risk; however, there are two major limitations to this method. The first is that we never know when the "1 in 10" year or "1 in 50" year event will occur. Although the chances of getting a growing season like this past one may have been lower than "1 in 10" or even "1 in 50," we had no way of knowing that it would hit in 2004. Even the seasonal forecasts painted a picture of a hot and dry summer on the Prairies.

The second limitation is that although we can refer to these events as having a 10 or 20 year return period, this does not mean that such a situation will only occur that often. Every year carries a similar risk so we do not know when a season like 2004 may reoccur. Although highly unlikely, 2005 could be just as cold as 2004 but it probably will not be.

Looking back on 2004, it is difficult to determine what can be learned. Perhaps the value of risk management strategies such as diversification and crop insurance was reinforced. The season



was a sobering reminder that you cannot always rely on the weather, or the weather forecast. Following three very warm years, it seemed as though global warming was beginning to kick in. Worth remembering though, is that as climates change, which they always do, there will be complex interactions taking place that cause unforeseen results.

2005 and beyond

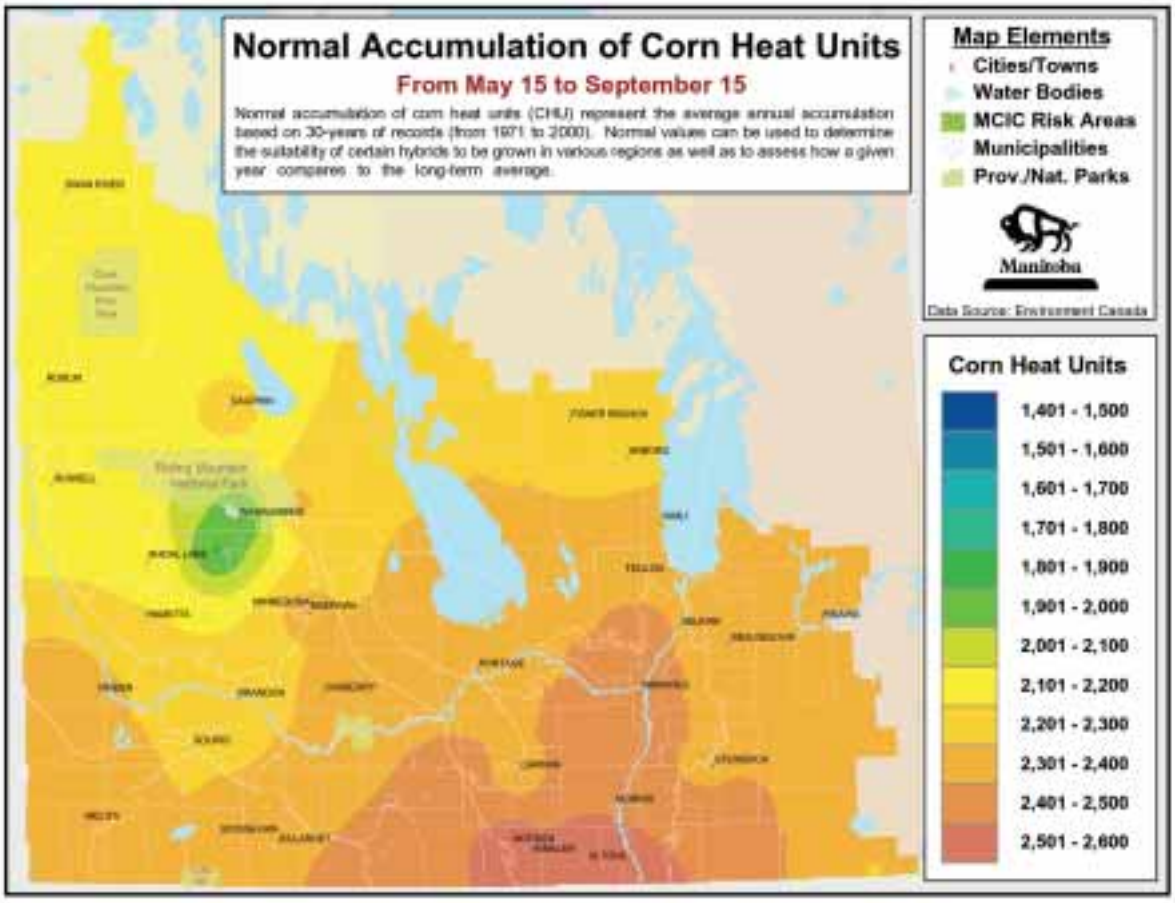
It is time to look ahead to the 2005 growing season as it rapidly approaches. Long-term forecasts tend to be wrong slightly more often then they are correct, so it would not be advisable to base any plans on seasonal predictions of temperature or precipitation. Most areas of Manitoba went into fall freezeup with quite high levels of soil moisture. Some areas, such as northeast of Winnipeg and extending up into the northern Interlake, and parts of the northwest did not receive as much moisture as was seen through most parts of the province. Generally, the water content of the soil in fall will remain relatively constant once the ground freezes as there will be little movement and no water demand through the winter. This is positive in the sense that there will to be a healthy soil moisture reserve for spring seeding and crop development. However, with high amounts of water in the soil, there is very little pore space through which spring melt water may infiltrate. Depending on the nature of the spring melt, this may increase the risk of excess surface runoff. In addition, snowfall accumulations have been higher than normal at several locations as of mid-winter. While there is a slightly higher than normal risk of spring flooding, it should not be cause for panic.

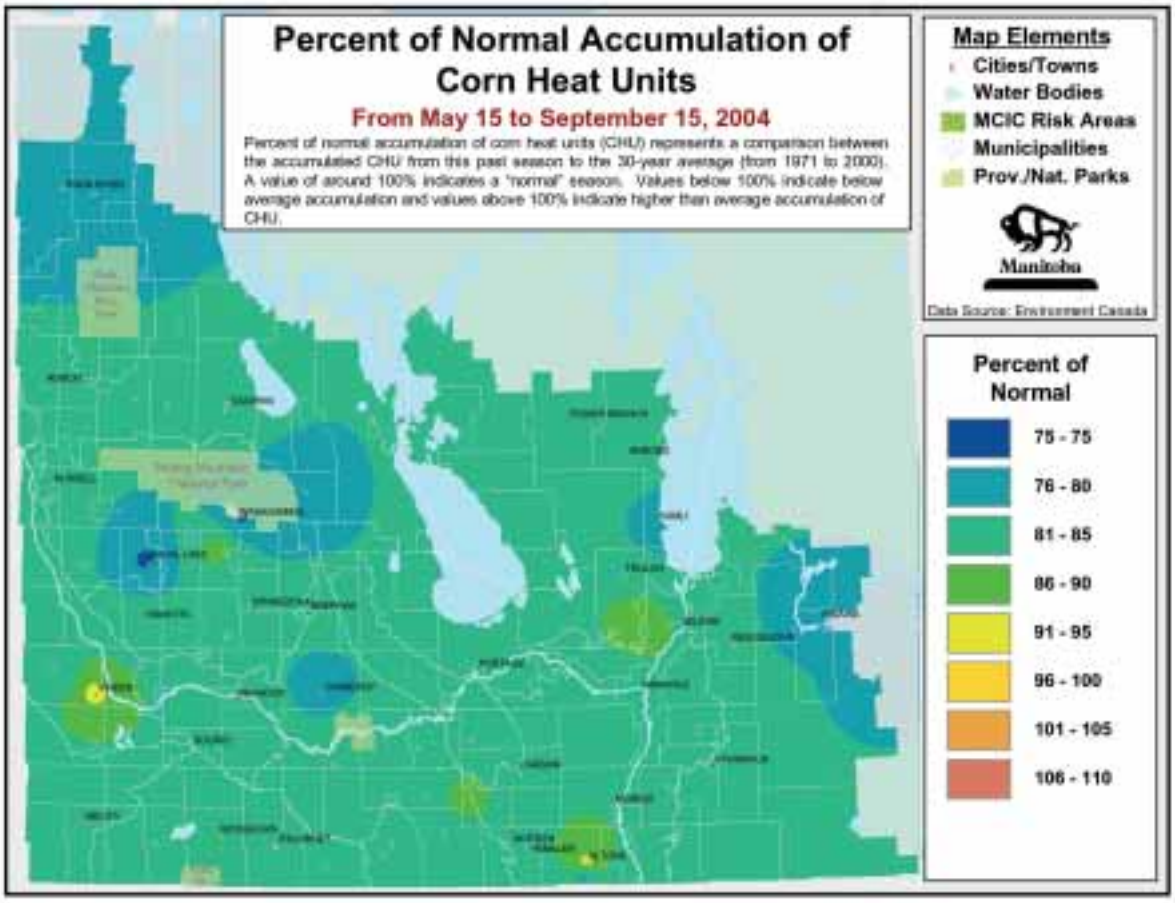
The weather is probably the most talked about subject on the Prairies and for good reason. Those who depend on the weather for their livelihood rely on forecasts, either based on historic normals, computer-generated predictions, or alternative means such as the *Old Farmer's Almanac.* As shown in 2004, sometimes none of the approaches are adequate to foretell what to expect.

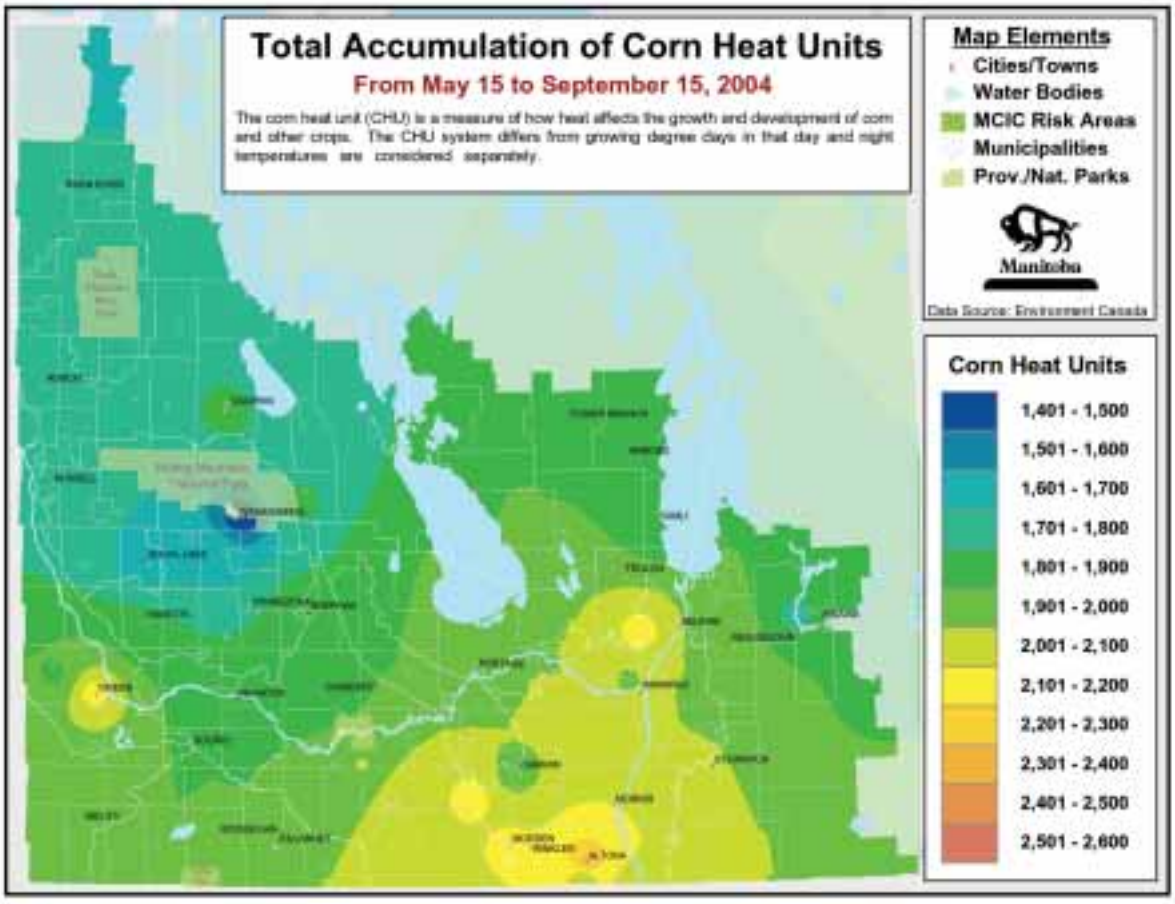
Risk management does not necessarily mean knowing the future, but more importantly, knowing what might happen and the chances that it might occur. This year will certainly bring forth new challenges, none of which will be too great for Manitoba farmers to handle.

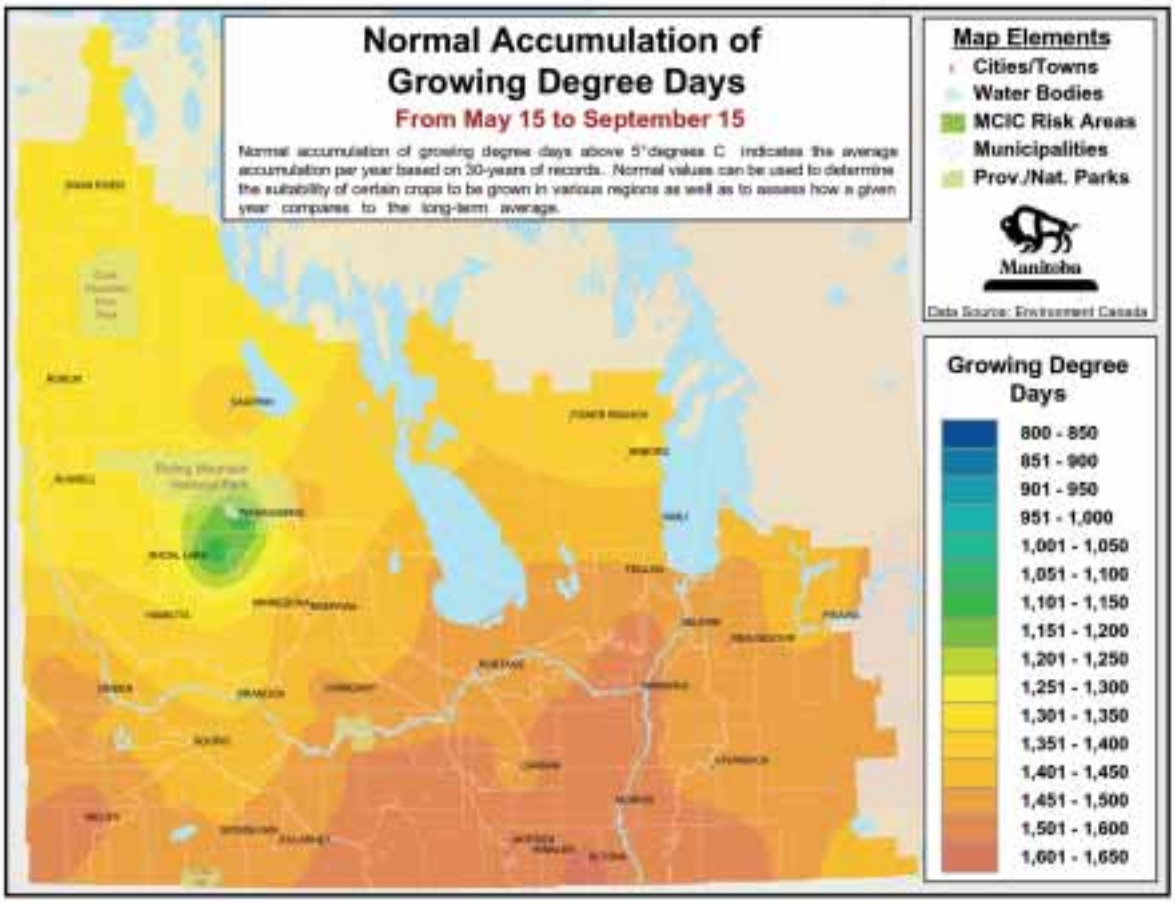
	Precipitation	
Location	**Since Nov. 1, 2004**	**Percent of Normal**
Brandon	65.5 mm	149
Portage	80.6 mm	135
Winnipeg	72.0 mm	139
Gimli	112.2 mm	171
Carman	85.0 mm	145
Morden	75.7 mm	136
Emerson	72.5 mm	104
Dauphin	48.0 mm	90
Steinbach	72.3 mm	131
Melita	54.5 mm	98
Carberry	55.3 mm	105
Roblin	39.8 mm	88
The Pas	67.5 mm	120

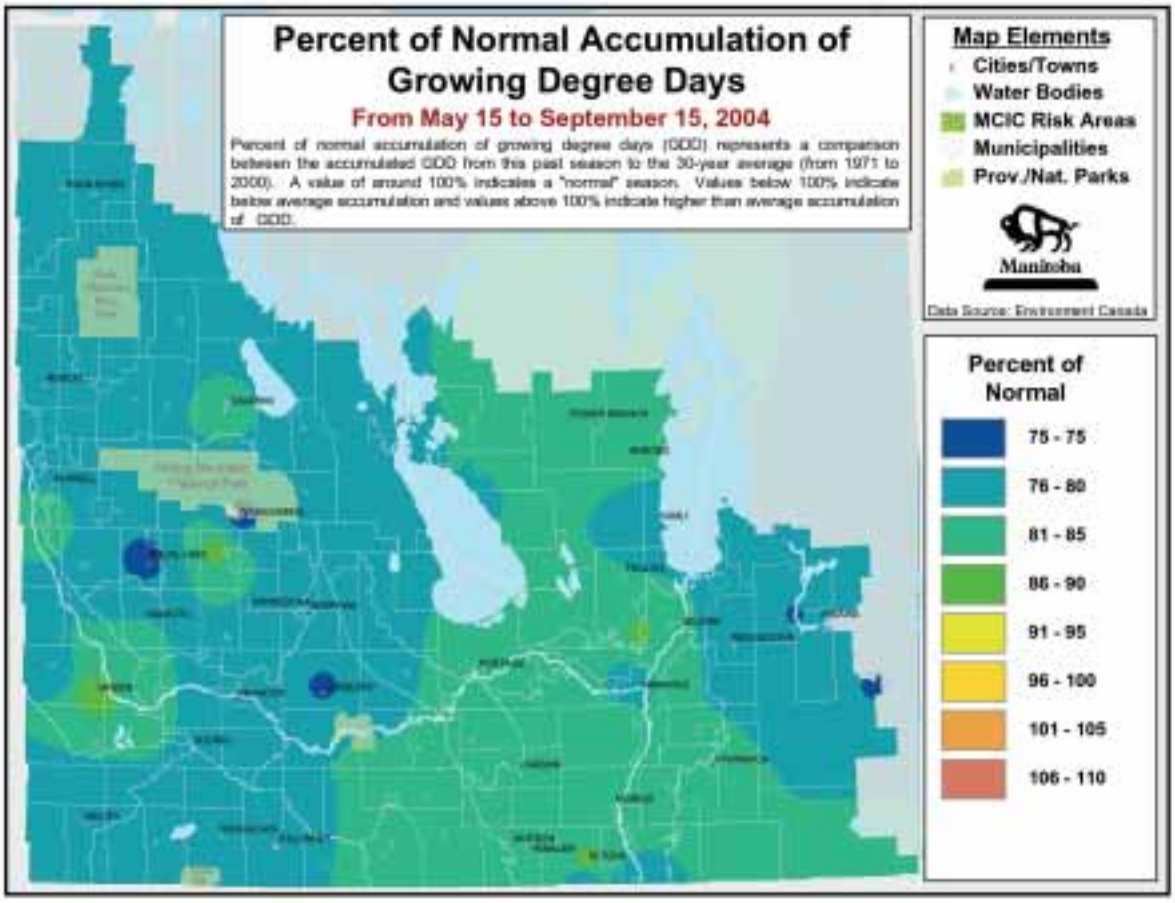
Accumulation and percent of normal snowfall as of January 20, 2005

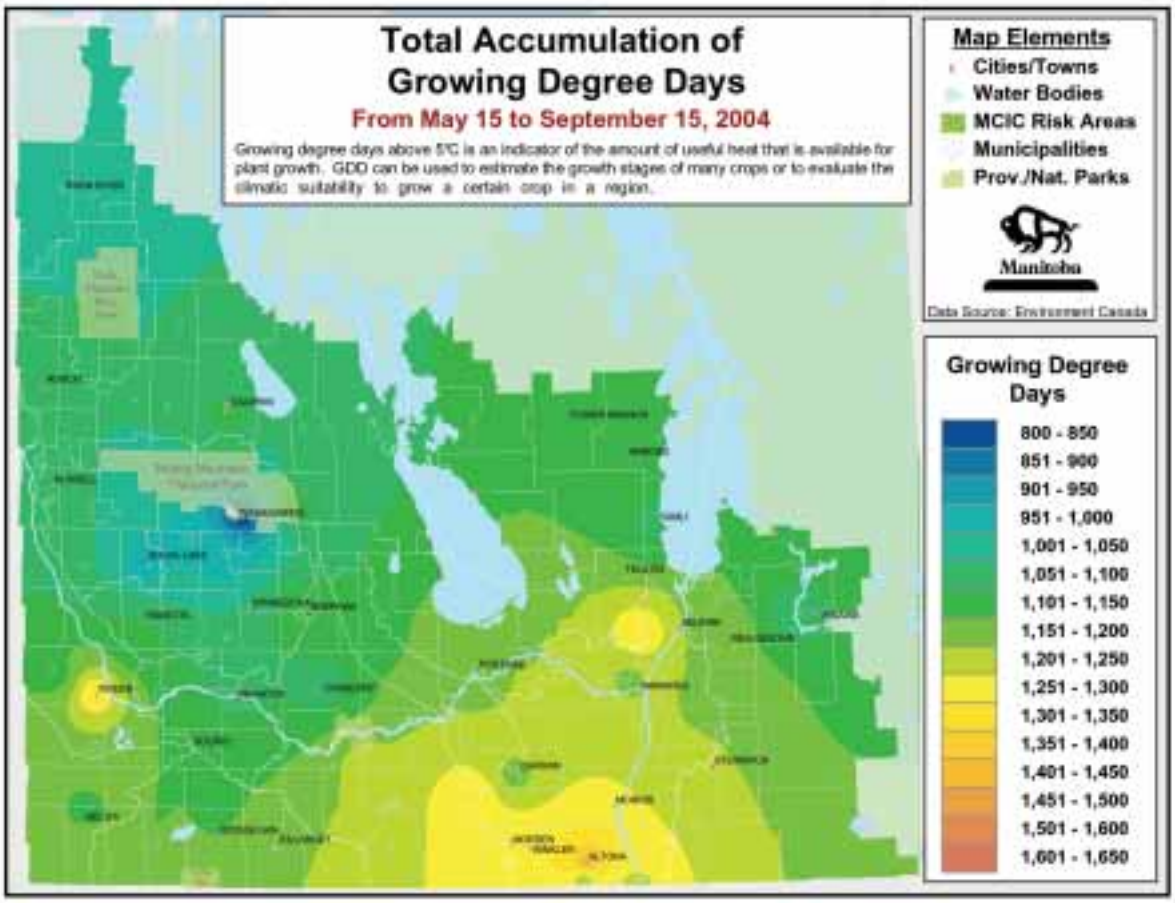



Percent of Normal Accumulation of Corn Heat Units
From May 15 to September 15, 2004
Percent of normal accumulation of corn heat units (CHU) represents a comparison between the accumulated CHU from this past season to the 30-year average (from 1971 to 2000). A value of around 100% indicates a "normal" season. Values below 100% indicate below average accumulation and values above 100% indicate higher than average accumulation of CHU.
Map Elements
Cities/Towns
Water Bodies
MCIC Risk Areas
Municipalities
Prov./Nat. Parks
Manitoba
Data Source: Environment Canada
Percent of Normal
75 - 75
76 - 80
81 - 85
86 - 90
91 - 95
96 - 100
101 - 105
106 - 110


Total Accumulation of Corn Heat Units
From May 15 to September 15, 2004
The corn heat unit (CHU) is a measure of how heat affects the growth and development of corn and other crops. The CHU system differs from growing degree days in that day and night temperatures are considered separately.
Map Elements
Cities/Towns
Water Bodies
MCIC Risk Areas
Municipalities
Prov./Nat. Parks
Manitoba
Data Source: Environment Canada
Corn Heat Units
1,401 - 1,500
1,501 - 1,600
1,601 - 1,700
1,701 - 1,800
1,801 - 1,900
1,901 - 2,000
2,001 - 2,100
2,101 - 2,200
2,201 - 2,300
2,301 - 2,400
2,401 - 2,500
2,501 - 2,600


Normal Accumulation of Growing Degree Days
From May 15 to September 15
Normal accumulation of growing degree days above 5°degrees C indicates the average accumulation per year based on 30-years of records. Normal values can be used to determine the suitability of certain crops to be grown in various regions as well as to assess how a given year compares to the long-term average.
Map Elements
Cities/Towns
Water Bodies
MCIC Risk Areas
Municipalities
Prov./Nat. Parks
Manitoba
Data Source: Environment Canada
Growing Degree Days
800 - 850
851 - 900
901 - 950
951 - 1,000
1,001 - 1,050
1,051 - 1,100
1,101 - 1,150
1,151 - 1,200
1,201 - 1,250
1,251 - 1,300
1,301 - 1,350
1,351 - 1,400
1,401 - 1,450
1,451 - 1,500
1,501 - 1,600
1,601 - 1,650


Percent of Normal Accumulation of Growing Degree Days
From May 15 to September 15, 2004
Percent of normal accumulation of growing degree days (GDD) represents a comparison between the accumulated GDD from this past season to the 30-year average (from 1971 to 2000). A value of around 100% indicates a "normal" season. Values below 100% indicate below average accumulation and values above 100% indicate higher than average accumulation of GDD.
Map Elements
Cities/Towns
Water Bodies
MCIC Risk Areas
Municipalities
Prov./Nat. Parks
Manitoba
Data Source: Environment Canada
Percent of Normal
75 - 75
76 - 80
81 - 85
86 - 90
91 - 95
96 - 100
101 - 105
106 - 110


Total Accumulation of Growing Degree Days
From May 15 to September 15, 2004
Growing degree days above 5°C is an indicator of the amount of useful heat that is available for plant growth. GDD can be used to estimate the growth stages of many crops or to evaluate the climatic suitability to grow a certain crop in a region.
Map Elements
Cities/Towns
Water Bodies
MCIC Risk Areas
Municipalities
Prov./Nat. Parks
Manitoba
Data Source: Environment Canada
Growing Degree Days
800 - 850
851 - 900
901 - 950
951 - 1,000
1,001 - 1,050
1,051 - 1,100
1,101 - 1,150
1,151 - 1,200
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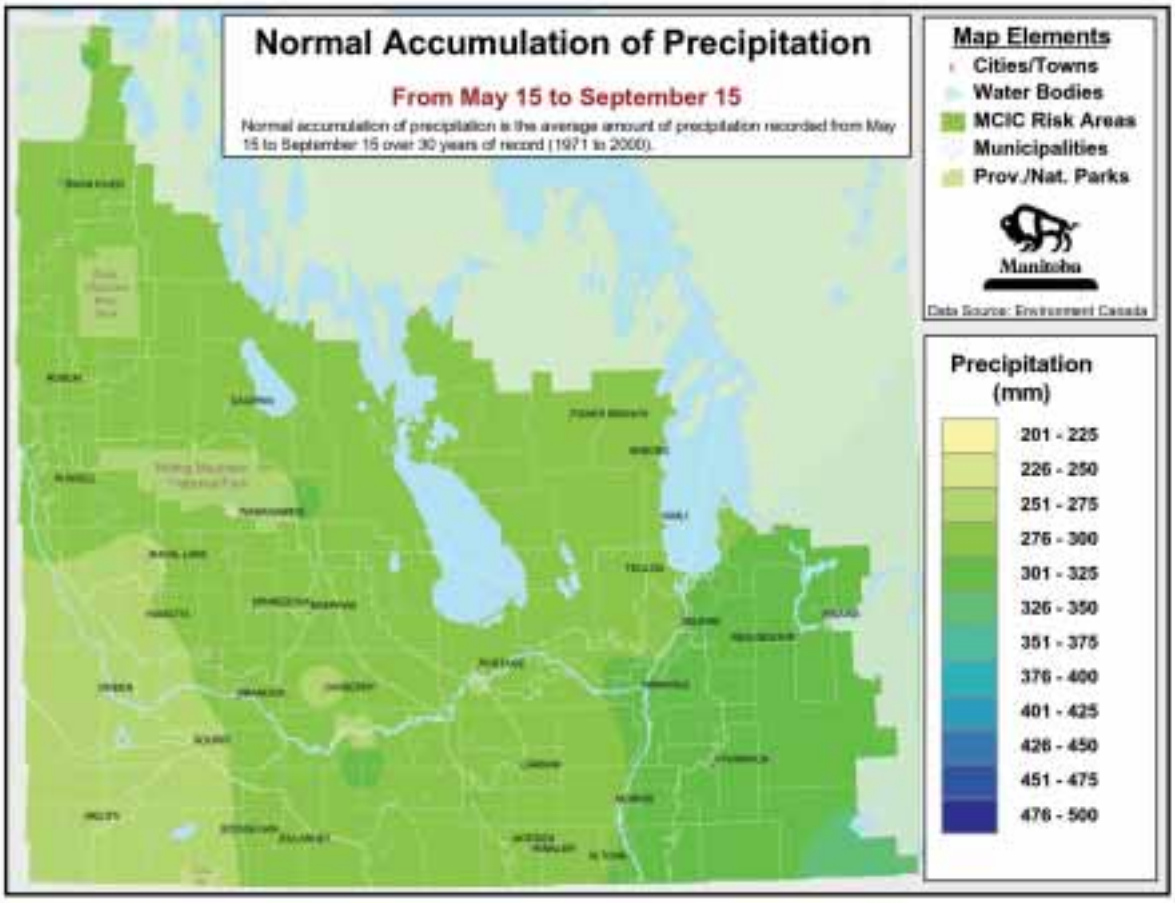
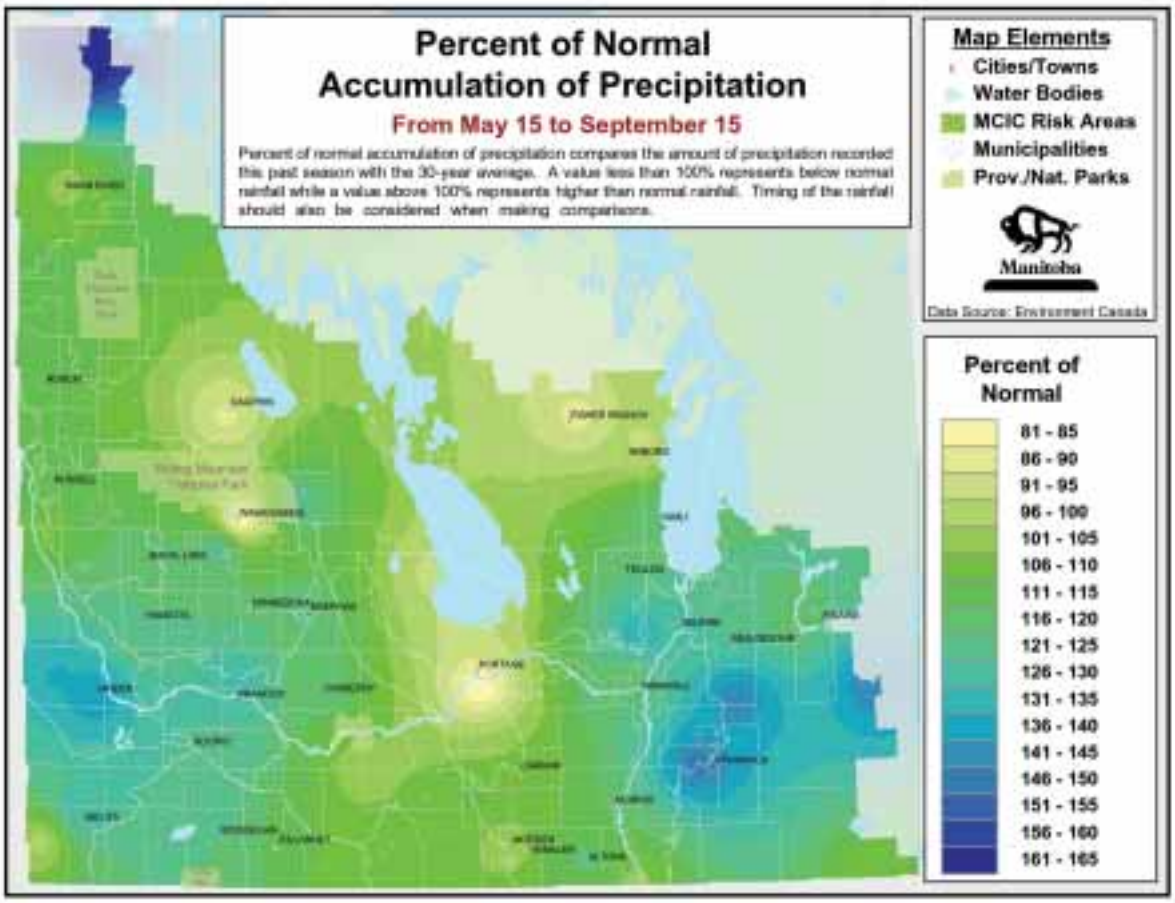
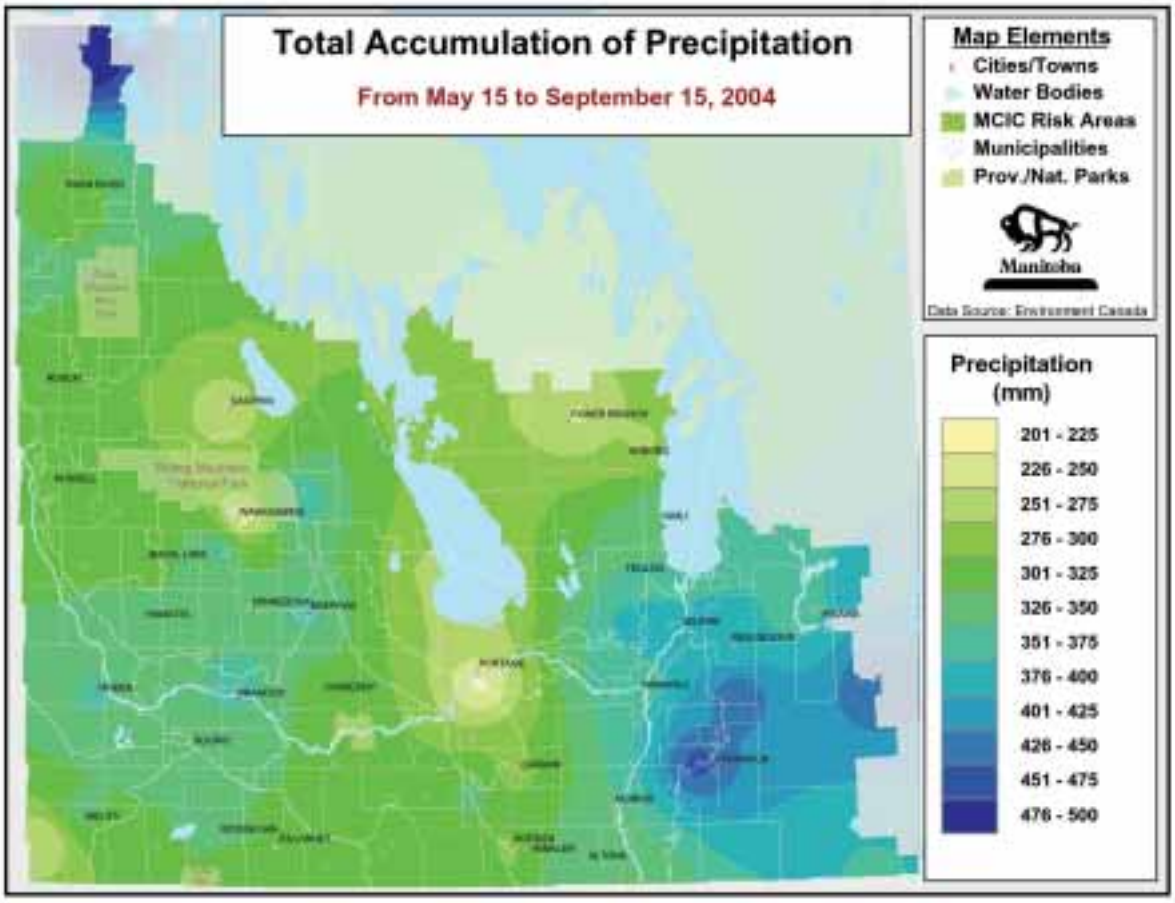

Normal Accumulation of Precipitation
From May 15 to September 15
Normal accumulation of precipitation is the average amount of precipitation recorded from May 15 to September 15 over 30 years of record (1971 to 2000).
Map Elements
Cities/Towns
Water Bodies
MCIC Risk Areas
Municipalities
Prov./Nat. Parks
Manitoba
Data Source: Environment Canada
Precipitation (mm)
201 - 225
226 - 250
251 - 275
276 - 300
301 - 325
326 - 350
351 - 375
376 - 400
401 - 425
426 - 450
451 - 475
476 - 500


Percent of Normal
Accumulation of Precipitation
From May 15 to September 15
Percent of normal accumulation of precipitation compares the amount of precipitation recorded this past season with the 30-year average. A value less than 100% represents below normal rainfall while a value above 100% represents higher than normal rainfall. Timing of the rainfall should also be considered when making comparisons.
Map Elements
Cities/Towns
Water Bodies
MCIC Risk Areas
Municipalities
Prov./Nat. Parks
Manitoba
Data Source: Environment Canada
Percent of Normal
81 - 85
86 - 90
91 - 95
96 - 100
101 - 105
106 - 110
111 - 115
116 - 120
121 - 125
126 - 130
131 - 135
136 - 140
141 - 145
146 - 150
151 - 155
156 - 160
161 - 165


Total Accumulation of Precipitation
From May 15 to September 15, 2004
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