Using an average figure may mean a 50-50 chance of failure. MAFRI's risk maps provide a better measure of success.

Planning for the weather
not enough versus too much

by Andrew Nadler, Ag-Met Specialist, MAFRI

Farming is a very particular activity. For crops to survive, certain minimum resources must be available — heat, water, and nutrients. Some are easier to regulate than others. Increasing inputs can result in substantial increases in yield, but if there is too much available, problems start to occur. Just as excessive amounts of a certain nutrient will become toxic, so will too much moisture or heat. It certainly holds true in farming that too much of a good thing is bad.

On the Prairies, moisture is often the main limitation to potential yield. Lower rainfall normally translates into lower productivity. Throughout most of the Prairies, moisture is thought of in a similar way that most people think of money — not to be wasted, and saved wherever possible.

We seldom face the dilemma of having too much money — or moisture. The term "pennies from heaven" aptly describes the arrival of a well-timed and a greatly needed rain. In 2005, many areas experienced far too much of a good thing.

The spring started off with great potential. Ample soil moisture reserves could be considered like money in the bank. If there had been near-normal rainfall during the growing season, yields could have been excellent. But moist soils remained wet, which meant soaked and waterlogged seedbeds and crops. Acres that had not been seeded early enough remained fallow because machinery couldn't get on the field. Crops that were seeded and survived were plagued with large drowned-out areas.

Some regions had an exceptionally good season, many areas were devastated. In contrast to normal practices of moisture conservation, soil "de-watering" was encouraged by any means possible.

Of course, there are good years and there are bad years. We hope for the good, but would be foolish not to plan for the bad. But how do we plan for the bad? When weather is the single most uncontrollable production factor, what can be done? We certainly cannot change the weather, so we must adapt to it.

Weather versus climate…

The terms "weather" and "climate" are often used interchangeably. They are in fact quite different. Weather is the current and constantly changing state of the atmosphere — what is happening outside at any given time and place. Climate is a description of the weather's behaviour over a long period of record, thus providing a template of how we might expect the weather to behave. Although climates are not always constant but continuously in flux, we have the advantage of knowing that climate change is a slow process. Climate does not control the weather, but long-term records do provide some insight into the range of conditions that we can expect. This information can be used for planning and adaptation on the farm. Just like engineers must build dams to withstand a stream flow event of a certain magnitude, farmers must design their operations to be able to endure certain extreme conditions that may occur.

An area with a 9 in 10 year CHU value of 2300 would only be expected to fall short of 2300 once in 10 years.

What's normal?

Agro-climatic information is the key to developing a "weather-proof" farming strategy. To assess the likelihood of certain conditions, we look at the past climate record. A simple method is to look at "normal" conditions for an area. For example, refer to the map illustrating "Normal Accumulation of Corn Heat Units." This map provides the 30-year average corn heat unit (CHU) total from May 15 to September 15 for southern Manitoba. Assuming a standard grain corn crop requires 2300 CHU and that seeding occurs around May 15, we can determine the area of southern Manitoba which could theoretically support grain corn. According to the map, the zones include Virden, Neepawa, Gimli and Pinawa.

While maps of "normals" offer a general picture of climate, enabling a comparison of one region to another, the practical information that they offer is limited. A "normal" is simply the average or mean value taken from several years of observations. If we translate the average value into the risk of occurrence or probability, we can expect to achieve this value approximately once every two years.

The zone of 2300 CHU on the map would be expected to reach or exceed 2300 CHU only about half of the time. A success rate of 50 per cent is neither worth striving for, nor is it an acceptable level risk for most producers. The average does not describe the variability or the range of possible conditions. In any operation, it is not the average conditions that will cause the most damage and extensive loss but the extreme events caused by variability.

Risk maps more useful

Maps of agro-climatic risk are valuable tools. In addition to providing averages, these maps present an indication of the variability from the mean by showing the probability of occurrence. For example, the two updated maps of "Seasonal accumulation of corn heat units at a 25% and 10% risk" show the three out of four year and the 9 in 10 year expectation of seasonal CHU respectively.

Continued on next page

Continued from previous page

Unfortunately, it does not necessarily mean that this will only occur every 10 years or that once it has occurred, that it will not happen for another 10 years. It is better to think about this concept as a long-term rate of recurrence. A 3 in 4 year value would fall short about 2 or 3 times in a decade. Agro-climatic maps can be found at www.gov.mb.ca/agriculture/climate/

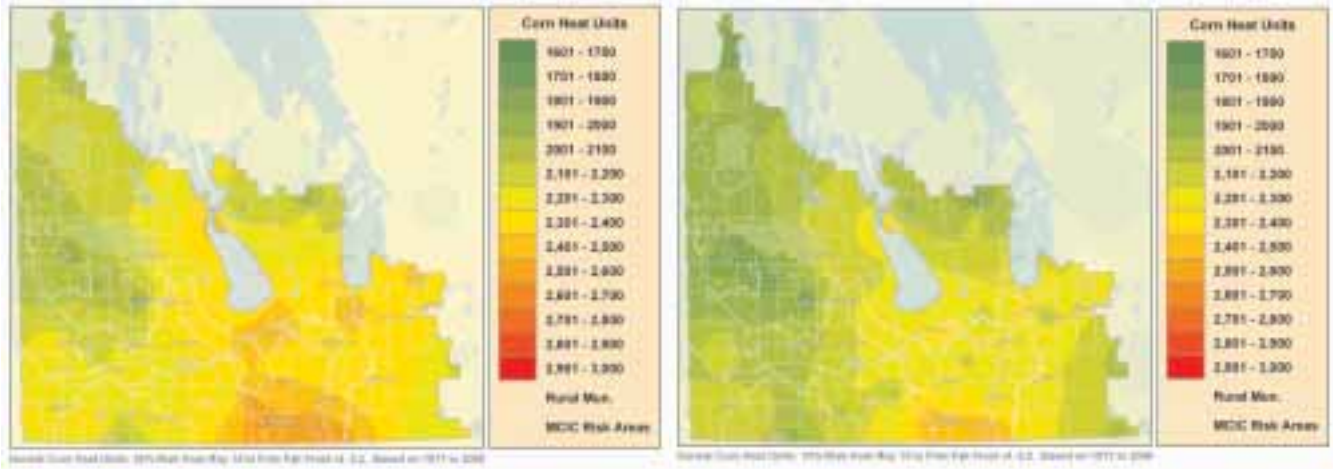
Of course, there is always risk involved in production. As these maps suggest, at a lower risk tolerance, fewer CHU are available within the growing season. At 10% risk and with a seeding date of May 15, grain corn is considered "safe" only in the area surrounding Altona, Winkler, and Morden. Of course, grain corn is grown outside of these areas, but in cooler regions risk may increase.

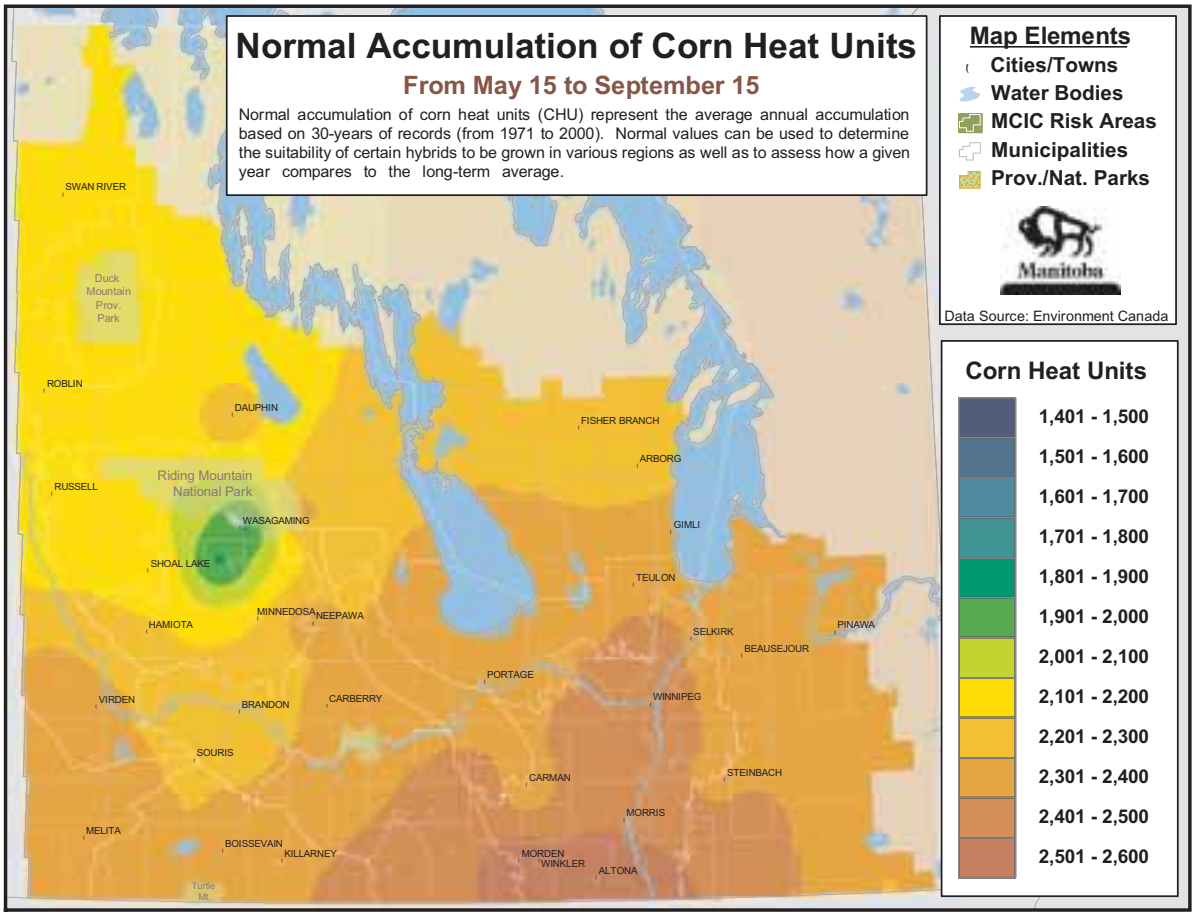
Since producers must deal with year to year variation it is worth gathering information about the extent of agro-climatic risk of their area. This can be used as an effective planning tool to assist in identifying the vulnerabilities within an operation. The threshold of tolerance will vary by region and will be specific to each farm and to each farm operator depending on their level of comfort with risk.

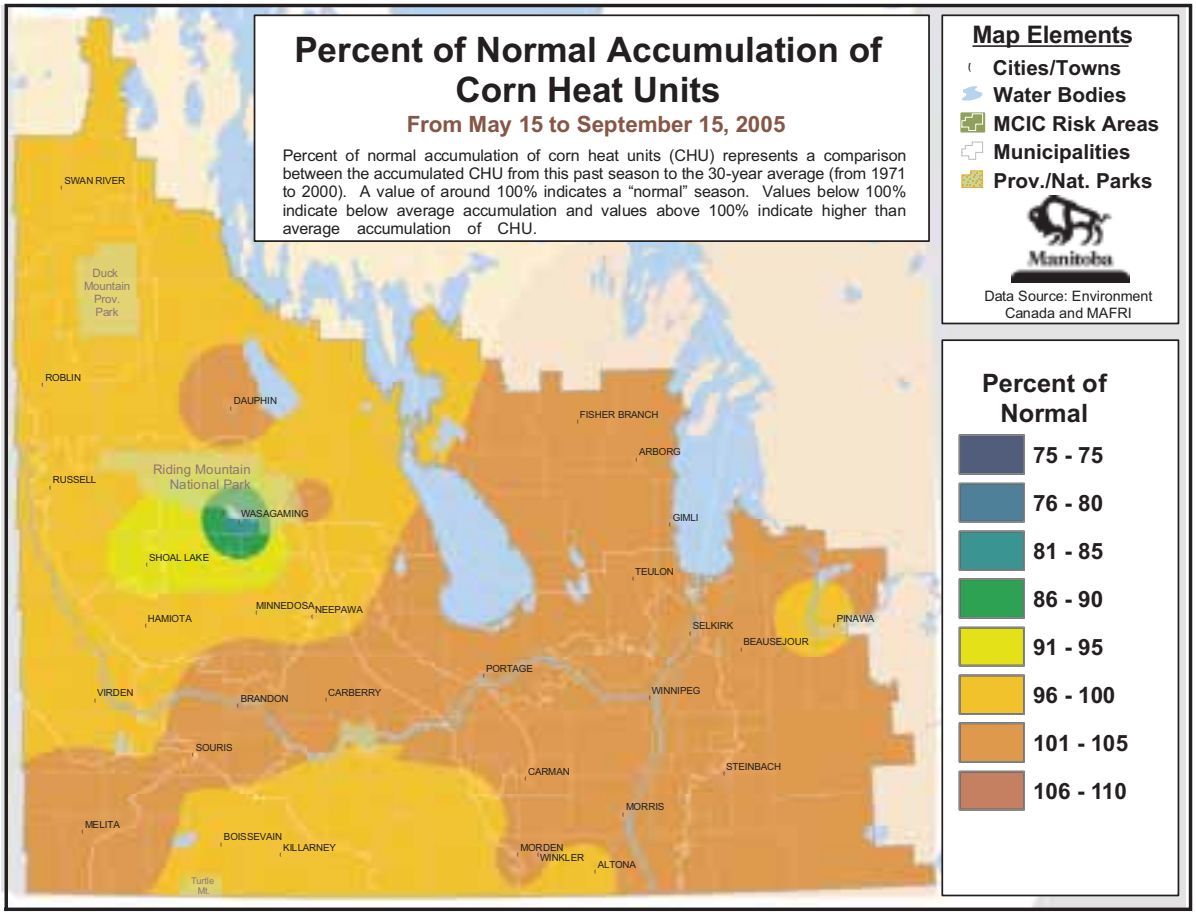
If there are significant risks that exceed the absorptive capacity of the operation, adaptation measures ought to be considered. Some adaptations may include changing crop type or variety, diversification, changing farming methods, and production insurance.

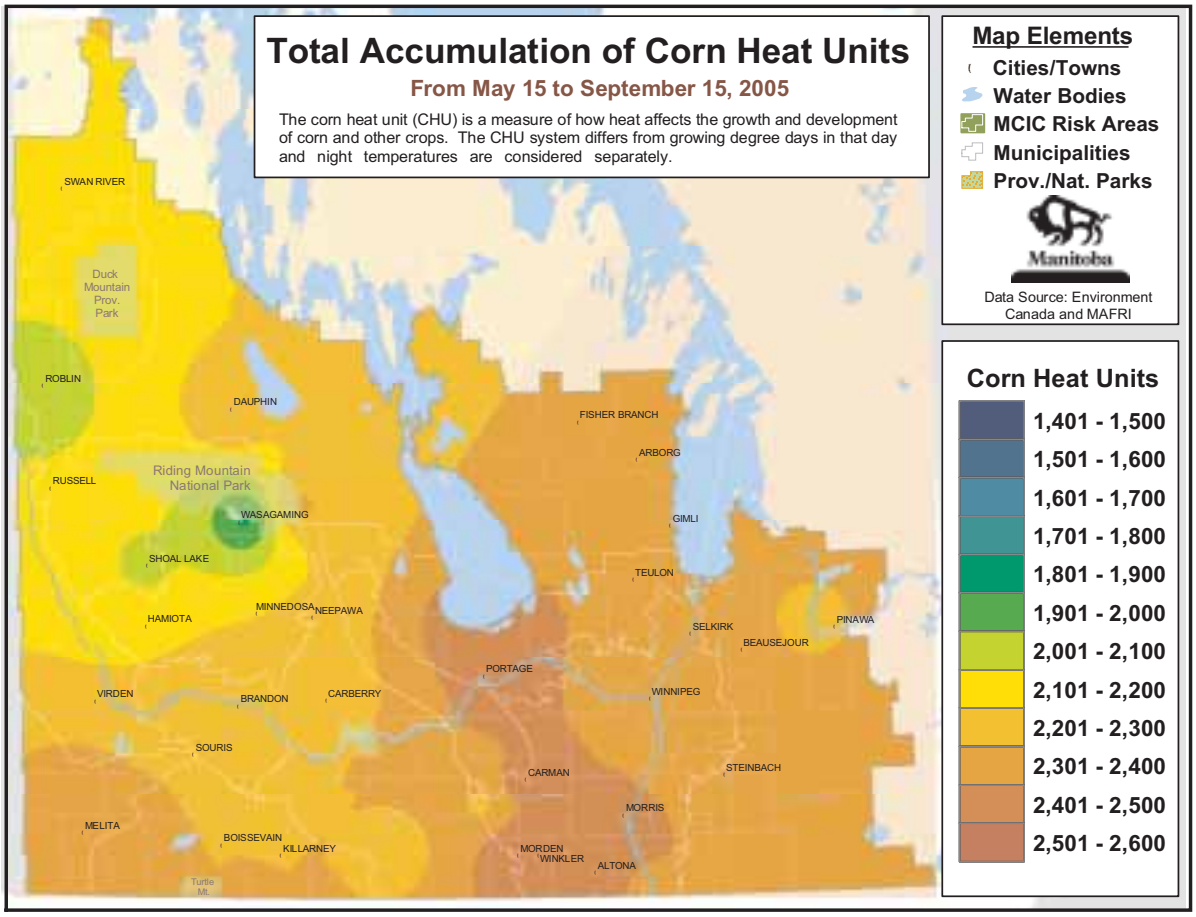
It is therefore necessary that this information be applied to each individual farm and used as a planning tool to increase overall resiliency. Better knowledge of risk will ensure that production is optimized and the chances of failure are minimized.

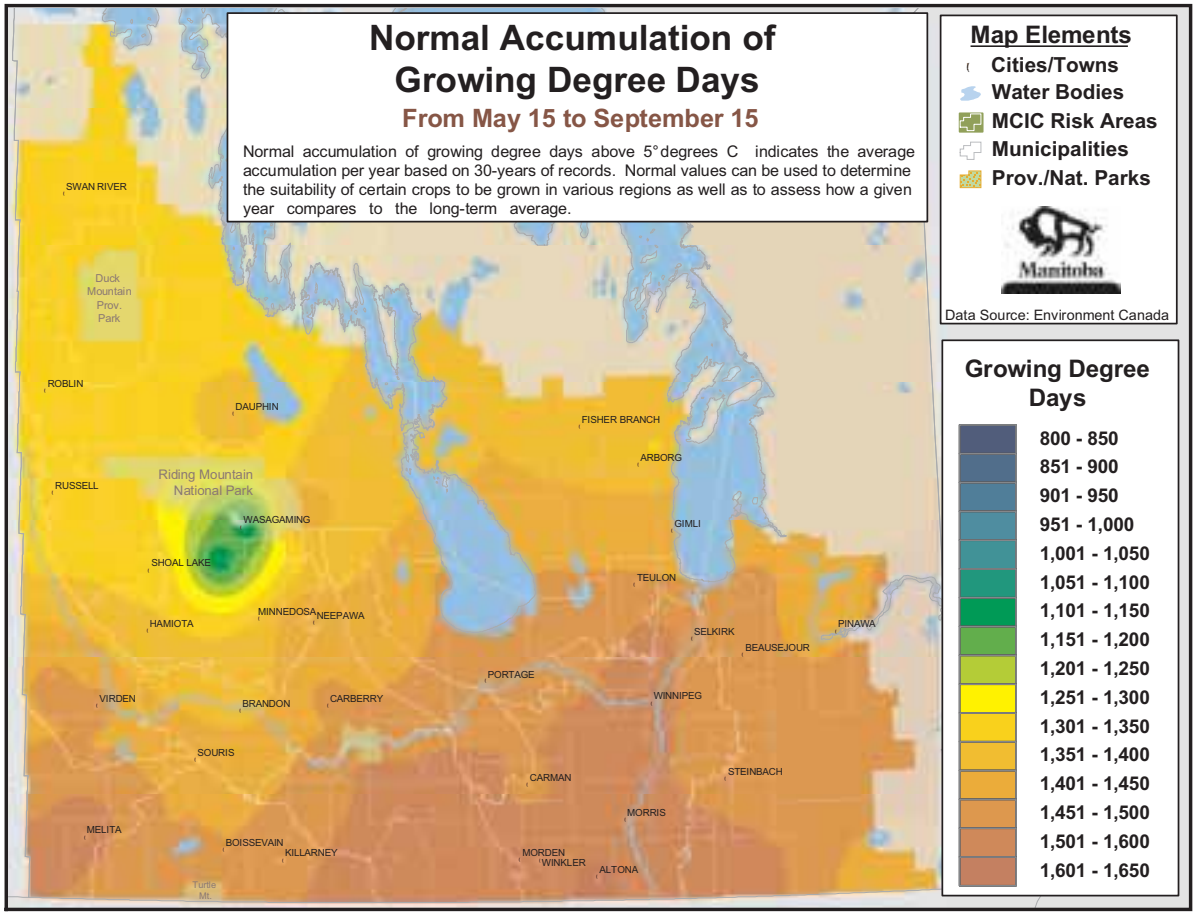
Seasonal accumulation of corn heat units at a 25% and 10% risk.

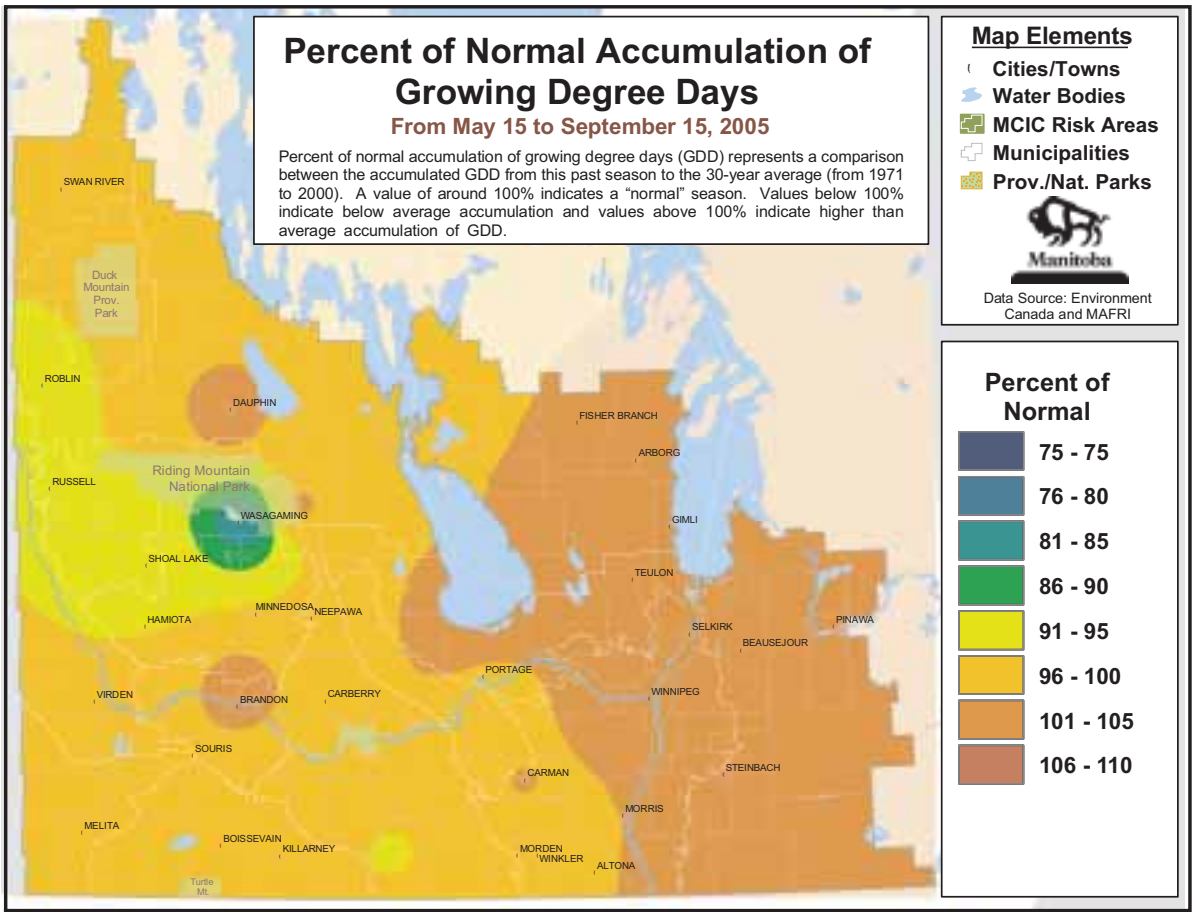


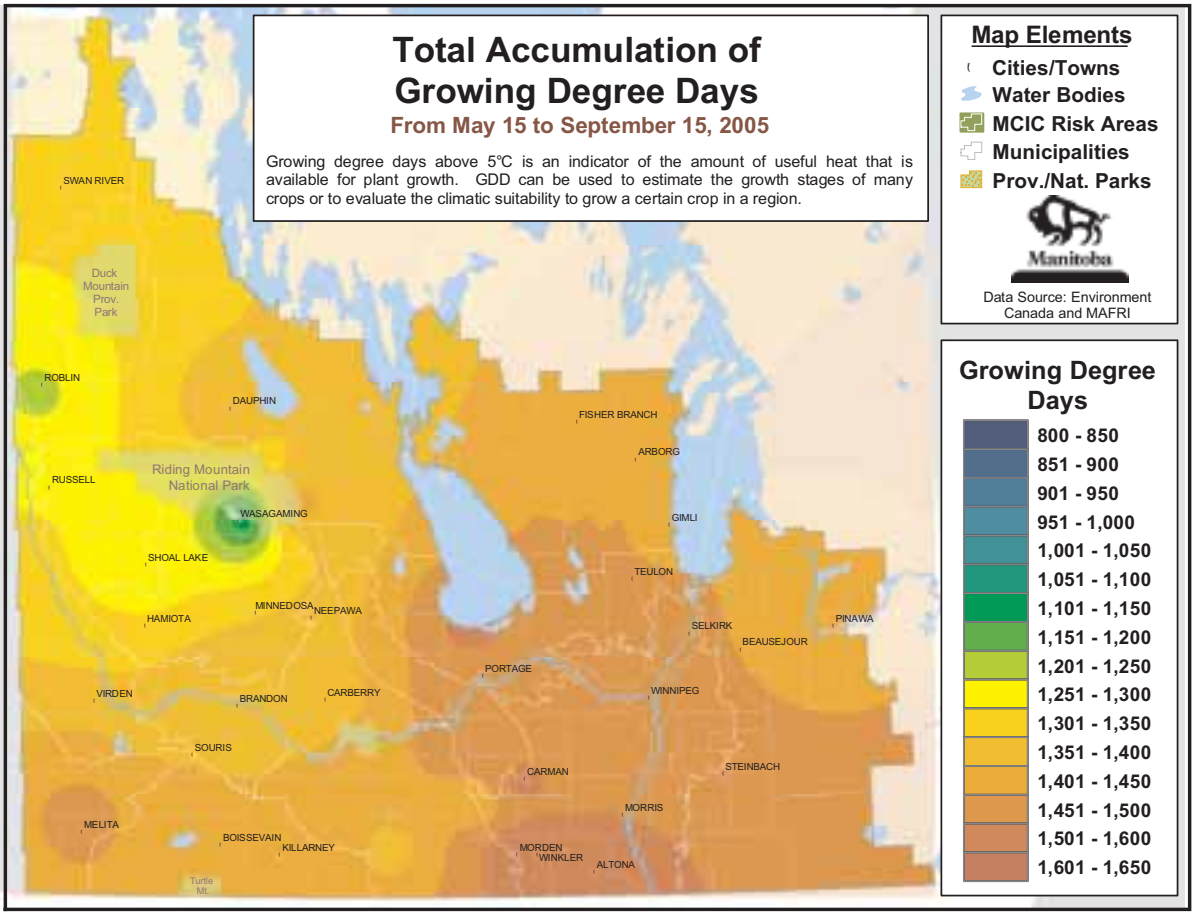


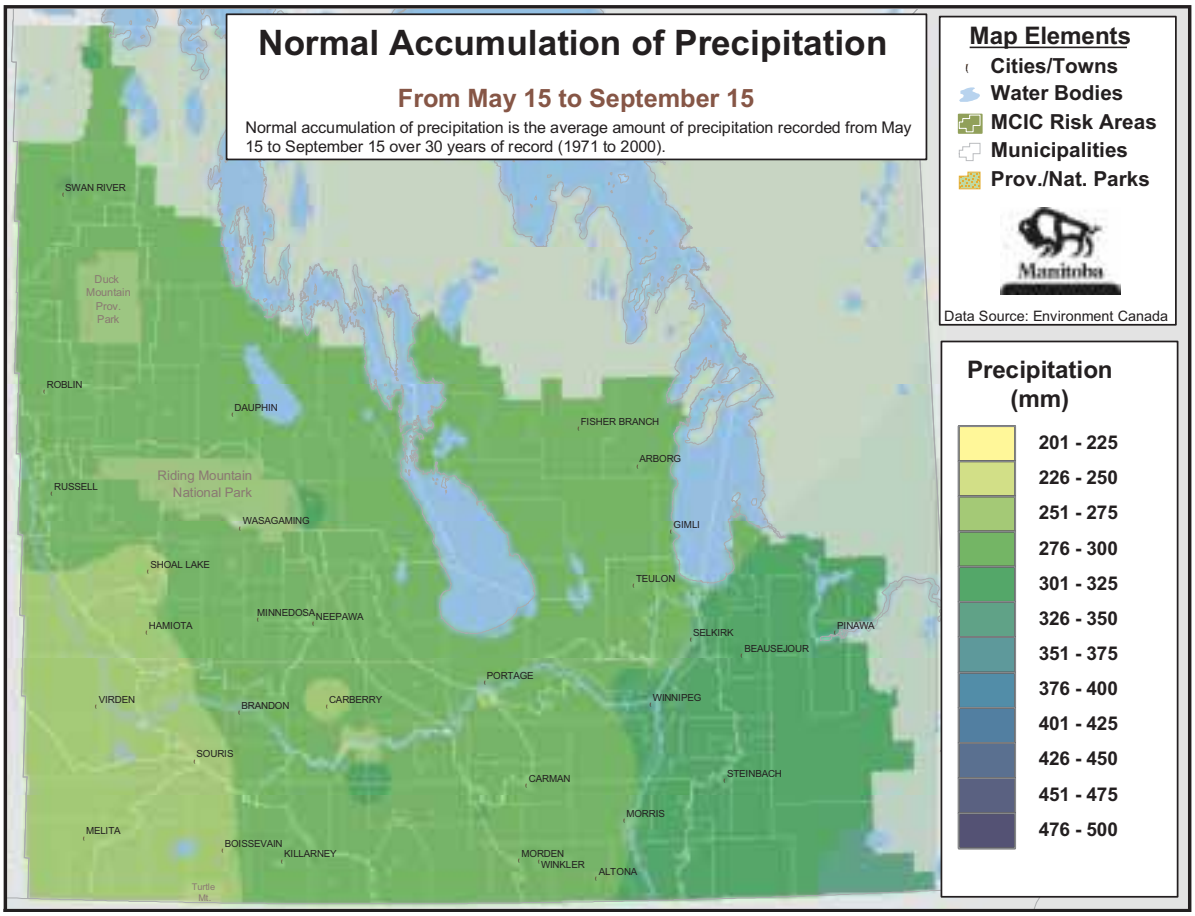

Percent of Normal Accumulation of Corn Heat Units
From May 15 to September 15, 2005
Percent of normal accumulation of corn heat units (CHU) represents a comparison between the accumulated CHU from this past season to the 30-year average (from 1971 to 2000). A value of around 100% indicates a "normal" 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 and MAFRI
Percent of Normal
75 - 75
76 - 80
81 - 85
86 - 90
91 - 95
96 - 100
101 - 105
106 - 110
SWAN RIVER
Duck Mountain Prov. Park
ROBLIN
DAUPHIN
FISHER BRANCH
ARBORG
RUSSELL
Riding Mountain National Park
WASAGAMING
GIMLI
SHOAL LAKE
TEULON
MINNEDOSA
NEEPAWA
HAMIOTA
SELKIRK
PINAWA
BEAUSEJOUR
PORTAGE
VIRDEN
BRANDON
CARBERRY
WINNIPEG
SOURIS
CARMAN
STEINBACH
MORRIS
MELITA
BOISSEVAIN
KILLARNEY
MORDEN
WINKLER
ALTONA
Turtle Mt.

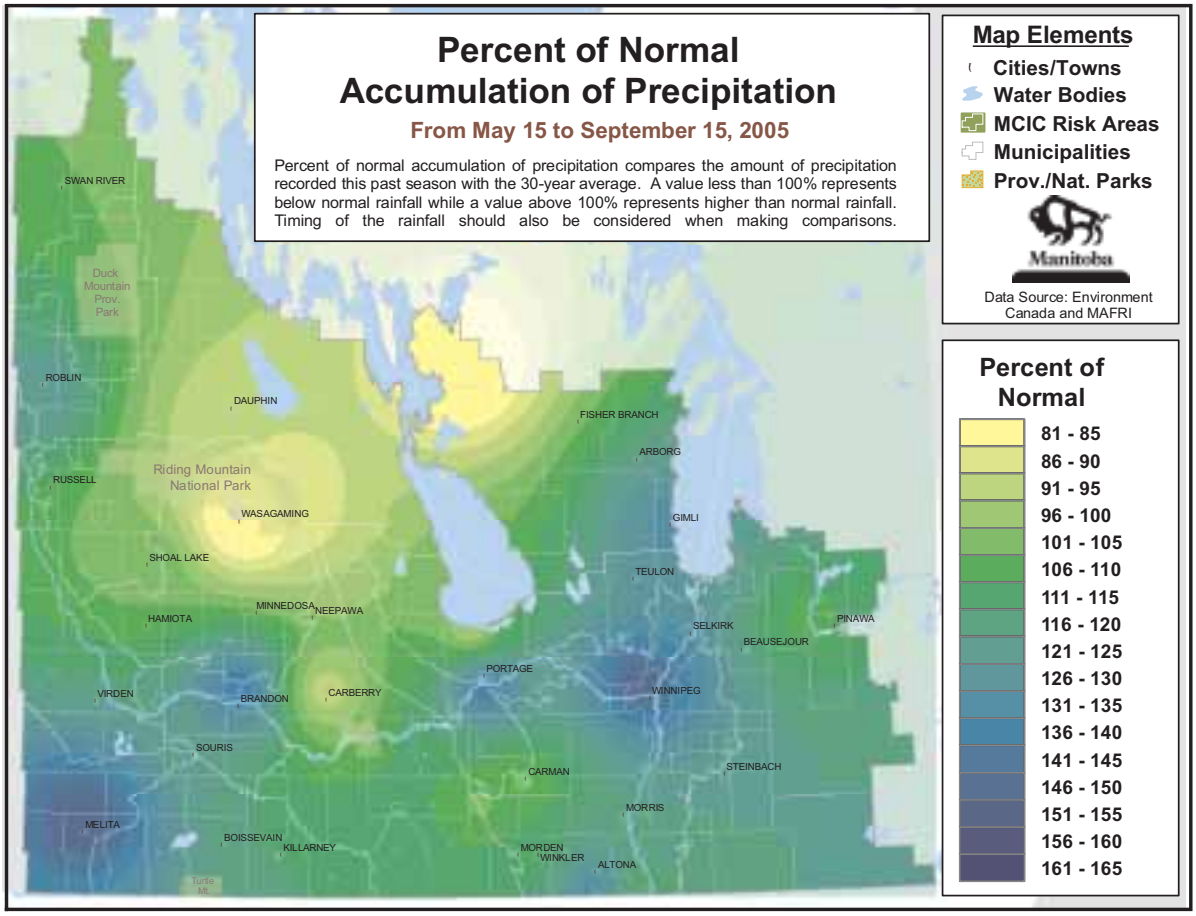

Total Accumulation of Corn Heat Units
From May 15 to September 15, 2005
The corn heat unit (CHU) is a measure of how heat affects the growth and development of corn and other crops. The CHU system differs from growing degree days in that day and night temperatures are considered separately.
Map Elements
Cities/Towns
Water Bodies
MCIC Risk Areas
Municipalities
Prov./Nat. Parks
Manitoba
Data Source: Environment Canada and MAFRI
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
SWAN RIVER
Duck Mountain Prov. Park
ROBLIN
DAUPHIN
FISHER BRANCH
ARBORG
RUSSELL
Riding Mountain National Park
WASAGAMING
GIMLI
SHOAL LAKE
TEULON
MINNEDOSA
NEEPAWA
HAMIOTA
SELKIRK
PINAWA
BEAUSEJOUR
PORTAGE
VIRDEN
BRANDON
CARBERRY
WINNIPEG
SOURIS
CARMAN
STEINBACH
MORRIS
MELITA
BOISSEVAIN
KILLARNEY
MORDEN
WINKLER
ALTONA
Turtle Mt.

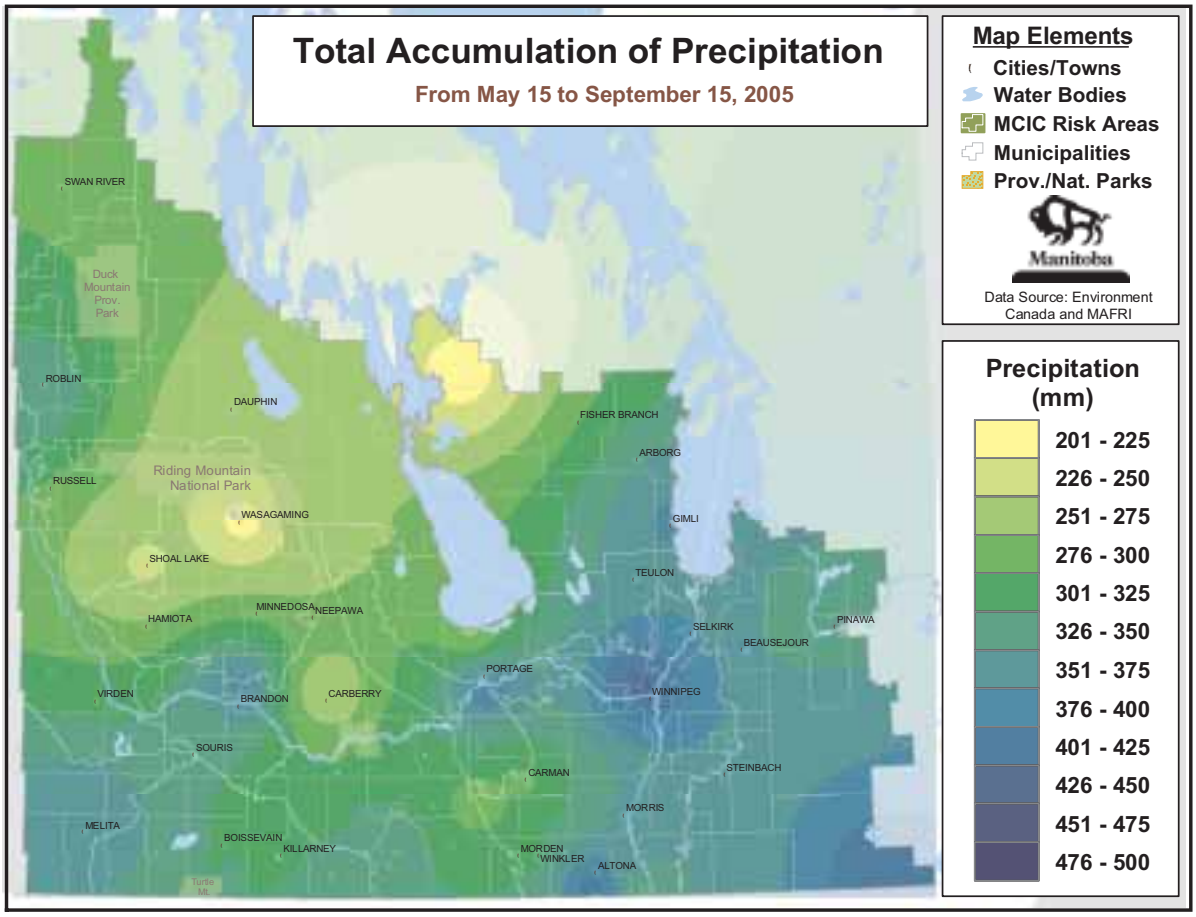

Normal Accumulation of Growing Degree Days
From May 15 to September 15
Normal accumulation of growing degree days above 5° degrees C indicates the average accumulation per year based on 30-years of records. Normal values can be used to determine the suitability of certain crops to be grown in various 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
SWAN RIVER
Duck Mountain Prov. Park
ROBLIN
DAUPHIN
FISHER BRANCH
ARBORG
RUSSELL
Riding Mountain National Park
WASAGAMING
GIMLI
SHOAL LAKE
TEULON
MINNEDOSA
NEEPAWA
HAMIOTA
SELKIRK
PINAWA
BEAUSEJOUR
PORTAGE
VIRDEN
BRANDON
CARBERRY
WINNIPEG
SOURIS
CARMAN
STEINBACH
MORRIS
MELITA
BOISSEVAIN
KILLARNEY
MORDEN
WINKLER
ALTONA
Turtle Mt.


Percent of Normal Accumulation of Growing Degree Days
From May 15 to September 15, 2005
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 and MAFRI
Percent of Normal
75 - 75
76 - 80
81 - 85
86 - 90
91 - 95
96 - 100
101 - 105
106 - 110
SWAN RIVER
Duck Mountain Prov. Park
ROBLIN
DAUPHIN
FISHER BRANCH
ARBORG
RUSSELL
Riding Mountain National Park
WASAGAMING
GIMLI
SHOAL LAKE
TEULON
MINNEDOSA
NEEPAWA
HAMIOTA
SELKIRK
PINAWA
BEAUSEJOUR
PORTAGE
VIRDEN
BRANDON
CARBERRY
WINNIPEG
SOURIS
CARMAN
STEINBACH
MORRIS
MELITA
BOISSEVAIN
KILLARNEY
MORDEN
WINKLER
ALTONA
Turtle Mt.


Total Accumulation of Growing Degree Days
From May 15 to September 15, 2005
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 and MAFRI
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
SWAN RIVER
Duck Mountain Prov. Park
ROBLIN
DAUPHIN
FISHER BRANCH
ARBORG
RUSSELL
Riding Mountain National Park
WASAGAMING
GIMLI
SHOAL LAKE
TEULON
MINNEDOSA
NEEPAWA
HAMIOTA
SELKIRK
PINAWA
BEAUSEJOUR
PORTAGE
VIRDEN
BRANDON
CARBERRY
WINNIPEG
SOURIS
CARMAN
STEINBACH
MORRIS
MELITA
BOISSEVAIN
KILLARNEY
MORDEN
WINKLER
ALTONA
Turtle Mt.


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
SWAN RIVER
Duck Mountain Prov. Park
ROBLIN
DAUPHIN
FISHER BRANCH
ARBORG
RUSSELL
Riding Mountain National Park
WASAGAMING
GIMLI
SHOAL LAKE
TEULON
MINNEDOSA
NEEPAWA
HAMIOTA
SELKIRK
PINAWA
BEAUSEJOUR
PORTAGE
VIRDEN
BRANDON
CARBERRY
WINNIPEG
SOURIS
CARMAN
STEINBACH
MORRIS
MELITA
BOISSEVAIN
KILLARNEY
MORDEN
WINKLER
ALTONA
Turtle Mt.


Percent of Normal Accumulation of Precipitation
From May 15 to September 15, 2005
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 and MAFRI
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
SWAN RIVER
Duck Mountain Prov. Park
ROBLIN
DAUPHIN
FISHER BRANCH
ARBORG
RUSSELL
Riding Mountain National Park
WASAGAMING
GIMLI
SHOAL LAKE
TEULON
MINNEDOSA
NEEPAWA
HAMIOTA
SELKIRK
PINAWA
BEAUSEJOUR
PORTAGE
VIRDEN
BRANDON
CARBERRY
WINNIPEG
SOURIS
CARMAN
STEINBACH
MORRIS
MELITA
BOISSEVAIN
KILLARNEY
MORDEN
WINKLER
ALTONA
Turtle Mt.


Total Accumulation of Precipitation
From May 15 to September 15, 2005
Map Elements
Cities/Towns
Water Bodies
MCIC Risk Areas
Municipalities
Prov./Nat. Parks
Manitoba
Data Source: Environment Canada and MAFRI
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
SWAN RIVER
Duck Mountain Prov. Park
ROBLIN
DAUPHIN
FISHER BRANCH
ARBORG
RUSSELL
Riding Mountain National Park
WASAGAMING
GIMLI
SHOAL LAKE
TEULON
MINNEDOSA
NEEPAWA
HAMIOTA
SELKIRK
PINAWA
BEAUSEJOUR
PORTAGE
VIRDEN
BRANDON
CARBERRY
WINNIPEG
SOURIS
CARMAN
STEINBACH
MORRIS
MELITA
BOISSEVAIN
KILLARNEY
MORDEN
WINKLER
ALTONA
Turtle Mt.