

# Weatherman-ager Managing Weather Risk

Stettler, Alberta

Management of fertility, crop residue, weeds, insects and diseases are all part of good agronomic practice in Prairie Agriculture. However, producers have traditionally reacted to climatic variability rather than managing it. Many producers manage the economic influence of climatic variability through participation in crop and hail insurance, but to date the only agronomic management tools have been in the form of early maturing crops.

The *Weatherman-ager* is a management tool that gives you access to 53 years of weather records. It has been developed to predict the probability of crops reaching maturity based on different seeding dates.

What is physiological maturity?

Physiological maturity is the point at which maximum kernel dry weight is achieved. Physiological maturity coincides with the earliest time a crop could be sprayed with pre-harvest glyphosate or swathed.

Actual harvest date typically occurs 10 to 14 days after physiological maturity date.

How does a probability table work?

The probability tables included in this document depict alternative seeding dates on one axis and physiological maturity date on the other axis.

**The values within the table indicate how many years out of 100 a crop would reach physiological maturity for that seeding date.**

How were the probability tables developed?

Weather data from Environment Canada was analysed from 1945 to 1998 for selected weather stations. Growing Degree Day (GDD) accumulations were then calculated for each station based on a variety of seeding dates.

What is a Growing Degree Day and how is it calculated?

Growing Degree Days are a commonly used method of measuring and displaying heat accumulation and crop heat requirements. An example of the calculation utilized to measure growing degree accumulation for a summer day with a high of 20 Celsius and a low of 10 Celsius would be as follows:

$$\begin{aligned} \text{GDD} &= (20(\text{daily high}) + 10(\text{daily low}) / 2) - 5 \\ &= (30 / 2) - 5 \\ &= 15 - 5 \\ &= 10 \text{ GDD accumulated during our example summer day.} \end{aligned}$$

- \* All temperatures are in degrees Celsius.
- \* Five is subtracted from the average of the daily high and low temperatures, as 5 Celsius is the generally accepted minimum temperature requirement for plant growth and development.

If you have comments or questions please contact a Ducks Unlimited Canada Agriologist at 1-866-479-3825 or Winter Cereals Canada at [info@wintercereals.com](mailto:info@wintercereals.com).



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What are GDD requirements for crops grown in Western Canada?

Research done by Dr. Brian Fowler and Brian Duggan at the University of Saskatchewan has shown little geographic variability in GDD requirements for crops throughout Western Canada. For example, Argentine Canola grown in Vegreville and Lethbridge require approximately the same 1040 GDD to reach physiological maturity. Physiological maturity is determined primarily by heat accumulation; moisture levels only affect physiological maturity under extreme drought conditions.

| Crop             | GDD Requirement |
|------------------|-----------------|
| Flax             | 1200            |
| HRSW             | 1175            |
| Argentine Canola | 1040            |
| Mustard          | 1004            |
| Oats             | 961             |
| Barley           | 850             |
| Polish Canola    | 850             |

GDD requirements shown are for an average of varieties commonly grown in Prairie Canada.

An example of using the *Weatherman-ager* to plan winter wheat seeding would be:

Recommended seeding window for Winter Wheat seeding is Aug. 25 to Sept. 15.

Optimum date for seeding Winter Wheat at Stettler, AB: August 30

To have stubble available following a crop of Barley:

Estimated harvest date: Aug. 20 to 24

Probability of physiological maturity by Aug. 10: 80%

Barley seeding date to achieve winter wheat seeding date: May 10

This table can also be utilized to determine the probability of achieving physiological maturity prior to first fall frost.

An example of using the *Weatherman-ager* to plan spring seeding would be:

Average first fall frost at Stettler, AB. – September 18

Barley seeding date necessary to avoid average first frost date: June 9

**Example: Barley at Stettler, Alberta**

Physiological Maturity Date

|        | 05-Aug | 10-Aug | 15-Aug | 20-Aug | 25-Aug | 30-Aug | 04-Sep | 09-Sep | 14-Sep | 19-Sep |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 01-May | 65     | 93     | 96     | 100    | 100    | 100    | 100    | 100    | 100    | 100    |
| 05-May | 50     | 87     | 96     | 98     | 100    | 100    | 100    | 100    | 100    | 100    |
| 10-May | 41     | 80     | 96     | 96     | 100    | 100    | 100    | 100    | 100    | 100    |
| 15-May | 31     | 65     | 93     | 96     | 98     | 98     | 100    | 100    | 100    | 100    |
| 20-May | 19     | 41     | 81     | 96     | 98     | 98     | 98     | 100    | 100    | 100    |
| 25-May | 11     | 30     | 54     | 91     | 98     | 98     | 98     | 98     | 100    | 100    |
| 30-May | 4      | 15     | 39     | 70     | 93     | 96     | 98     | 98     | 100    | 100    |
| 04-Jun | 2      | 9      | 20     | 46     | 78     | 93     | 98     | 98     | 98     | 98     |
| 09-Jun | 0      | 0      | 9      | 24     | 52     | 78     | 93     | 94     | 98     | 98     |

The *Weatherman-ager* tables were generated using Environment Canada weather station data collected from 1945 to 1998.

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## Stettler, Alberta (3016119)

The table below was generated from Environment Canada weather station data collected from 1945 to 1998.

### Crops:

#### Argentine Canola

##### Physiological Maturity Date

|        | 05-Aug | 10-Aug | 15-Aug | 20-Aug | 25-Aug | 30-Aug | 04-Sep | 09-Sep | 14-Sep | 19-Sep |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 01-May | 7      | 15     | 28     | 48     | 72     | 89     | 94     | 96     | 98     | 100    |
| 05-May | 7      | 13     | 24     | 44     | 67     | 83     | 93     | 96     | 96     | 98     |
| 10-May | 4      | 7      | 19     | 33     | 57     | 76     | 89     | 91     | 94     | 98     |
| 15-May | 4      | 6      | 15     | 26     | 43     | 67     | 83     | 89     | 91     | 94     |
| 20-May | 2      | 4      | 6      | 19     | 31     | 50     | 72     | 83     | 89     | 91     |
| 25-May | 0      | 0      | 4      | 7      | 24     | 37     | 56     | 69     | 81     | 87     |
| 30-May | 0      | 0      | 2      | 4      | 9      | 24     | 43     | 54     | 72     | 81     |
| 04-Jun | 0      | 0      | 0      | 2      | 7      | 13     | 24     | 39     | 52     | 67     |
| 09-Jun | 0      | 0      | 0      | 0      | 2      | 4      | 15     | 22     | 31     | 46     |

#### Flax

##### Physiological Maturity Date

|        | 05-Aug | 10-Aug | 15-Aug | 20-Aug | 25-Aug | 30-Aug | 04-Sep | 09-Sep | 14-Sep | 19-Sep |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 01-May | 0      | 0      | 6      | 9      | 13     | 30     | 37     | 52     | 63     | 74     |
| 05-May | 0      | 0      | 4      | 9      | 13     | 22     | 35     | 43     | 57     | 70     |
| 10-May | 0      | 0      | 2      | 6      | 11     | 22     | 26     | 37     | 46     | 65     |
| 15-May | 0      | 0      | 2      | 4      | 6      | 15     | 22     | 31     | 37     | 44     |
| 20-May | 0      | 0      | 0      | 4      | 4      | 7      | 17     | 24     | 33     | 37     |
| 25-May | 0      | 0      | 0      | 0      | 2      | 6      | 9      | 19     | 24     | 31     |
| 30-May | 0      | 0      | 0      | 0      | 0      | 2      | 6      | 13     | 17     | 22     |
| 04-Jun | 0      | 0      | 0      | 0      | 0      | 0      | 2      | 7      | 11     | 13     |
| 09-Jun | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 2      | 2      | 7      |

#### HRS Wheat

##### Physiological Maturity Date

|        | 05-Aug | 10-Aug | 15-Aug | 20-Aug | 25-Aug | 30-Aug | 04-Sep | 09-Sep | 14-Sep | 19-Sep |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 01-May | 0      | 0      | 7      | 9      | 22     | 33     | 48     | 63     | 80     | 81     |
| 05-May | 0      | 0      | 7      | 9      | 17     | 30     | 39     | 56     | 72     | 74     |
| 10-May | 0      | 0      | 4      | 7      | 13     | 22     | 37     | 39     | 65     | 72     |
| 15-May | 0      | 0      | 4      | 4      | 11     | 19     | 26     | 39     | 44     | 65     |
| 20-May | 0      | 0      | 2      | 4      | 6      | 9      | 22     | 31     | 37     | 46     |
| 25-May | 0      | 0      | 0      | 0      | 4      | 7      | 17     | 20     | 31     | 37     |
| 30-May | 0      | 0      | 0      | 0      | 2      | 4      | 7      | 15     | 22     | 28     |
| 04-Jun | 0      | 0      | 0      | 0      | 0      | 2      | 6      | 9      | 13     | 19     |
| 09-Jun | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 2      | 6      | 11     |

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## Mustard

Physiological Maturity Date

|        | 05-Aug | 10-Aug | 15-Aug | 20-Aug | 25-Aug | 30-Aug | 04-Sep | 09-Sep | 14-Sep | 19-Sep |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 01-May | 7      | 24     | 39     | 67     | 89     | 94     | 96     | 98     | 100    | 100    |
| 05-May | 7      | 17     | 33     | 57     | 80     | 94     | 96     | 96     | 100    | 100    |
| 10-May | 4      | 17     | 30     | 48     | 72     | 89     | 96     | 96     | 98     | 98     |
| 15-May | 4      | 9      | 20     | 41     | 59     | 83     | 93     | 94     | 98     | 98     |
| 20-May | 4      | 4      | 17     | 30     | 46     | 70     | 85     | 91     | 96     | 98     |
| 25-May | 0      | 4      | 7      | 19     | 30     | 52     | 74     | 83     | 89     | 93     |
| 30-May | 0      | 0      | 4      | 9      | 24     | 41     | 56     | 74     | 85     | 87     |
| 04-Jun | 0      | 0      | 0      | 4      | 9      | 22     | 41     | 50     | 72     | 80     |
| 09-Jun | 0      | 0      | 0      | 0      | 4      | 9      | 22     | 37     | 52     | 63     |

## Oat

Physiological Maturity Date

|        | 05-Aug | 10-Aug | 15-Aug | 20-Aug | 25-Aug | 30-Aug | 04-Sep | 09-Sep | 14-Sep | 19-Sep |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 01-May | 20     | 31     | 65     | 91     | 94     | 96     | 100    | 100    | 100    | 100    |
| 05-May | 17     | 30     | 56     | 87     | 94     | 96     | 98     | 100    | 100    | 100    |
| 10-May | 13     | 20     | 43     | 74     | 89     | 96     | 98     | 100    | 100    | 100    |
| 15-May | 6      | 17     | 33     | 54     | 85     | 94     | 98     | 98     | 98     | 98     |
| 20-May | 4      | 9      | 22     | 43     | 72     | 89     | 94     | 98     | 98     | 98     |
| 25-May | 4      | 4      | 13     | 31     | 50     | 74     | 89     | 93     | 98     | 98     |
| 30-May | 0      | 4      | 7      | 20     | 37     | 54     | 76     | 87     | 93     | 96     |
| 04-Jun | 0      | 0      | 2      | 7      | 22     | 43     | 59     | 78     | 83     | 87     |
| 09-Jun | 0      | 0      | 0      | 2      | 11     | 22     | 43     | 59     | 74     | 85     |

## Polish canola / Barley

Physiological Maturity Date

|        | 05-Aug | 10-Aug | 15-Aug | 20-Aug | 25-Aug | 30-Aug | 04-Sep | 09-Sep | 14-Sep | 19-Sep |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 01-May | 65     | 93     | 96     | 100    | 100    | 100    | 100    | 100    | 100    | 100    |
| 05-May | 50     | 87     | 96     | 98     | 100    | 100    | 100    | 100    | 100    | 100    |
| 10-May | 41     | 80     | 96     | 96     | 100    | 100    | 100    | 100    | 100    | 100    |
| 15-May | 31     | 65     | 93     | 96     | 98     | 98     | 100    | 100    | 100    | 100    |
| 20-May | 19     | 41     | 81     | 96     | 98     | 98     | 98     | 100    | 100    | 100    |
| 25-May | 11     | 30     | 54     | 91     | 98     | 98     | 98     | 98     | 100    | 100    |
| 30-May | 4      | 15     | 39     | 70     | 93     | 96     | 98     | 98     | 100    | 100    |
| 04-Jun | 2      | 9      | 20     | 46     | 78     | 93     | 98     | 98     | 98     | 98     |
| 09-Jun | 0      | 0      | 9      | 24     | 52     | 78     | 93     | 94     | 98     | 98     |

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