

# Preserving Yield: Fending Off Yield Robbers

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Think Wheat  
March 2018



[saskatchewan.ca](http://saskatchewan.ca)

# Where are we at?

- Top 5 yields (all spring wheat) – last 5 years  
– 39.7 to 48.8 bu/ac provincial average
- High yielding varieties
- Good agronomy



## Varieties of Grain Crops 2018

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### Symbols and Abbreviations Used:

§ Variety may not be described in 2019  
 --- Insufficient test data to describe  
 n/a = Not applicable  
 ● Applied for PBR protection at time of printing (UPOV/91)  
 Ⓐ Plant Breeders' Rights (UPOV 78) at time of printing  
 Ⓒ Plant Breeders' Rights (UPOV/91) at time of printing  
 Relative maturity: VE = Very Early, E = Early, M = Medium, L = Late, VL = Very Late  
 Agronomic Rating: VG = Very Good, G = Good, F = Fair, P = Poor, VP = Very Poor  
 Disease Resistance: R = Resistant, MR = Moderately Resistant, I = Intermediate Resistance, MS = Moderately Susceptible, S = Susceptible  
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### Accessing Public Release Varieties

Breeder seed of public release varieties is available to anyone (including farmers and seed growers) for multiplication, increase and marketing. There are no royalties or seed marketing agency fees attached to use or sale of seed produced from Breeder seed of public release varieties. While subsequent seed production may be Pedigreed, this is the buyer's choice and the buyer may increase the seed of public release varieties in any way he/she wishes (only pedigreed seed can be sold by variety name, for most major crop kinds). To purchase Breeder seed of public release varieties, contact the breeding institution listed in the Breeding Institutions and Seed Distributors listings on pages 30-32.

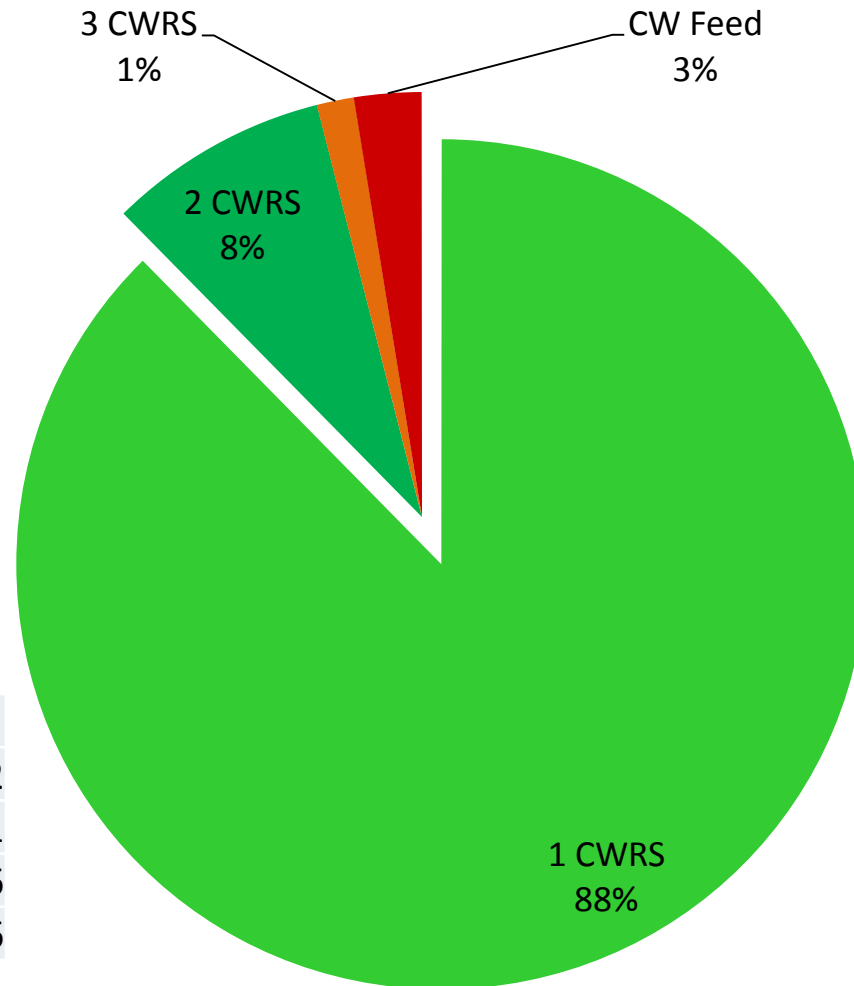
### Legal Disclaimer

This guide is for informational purposes only. The information presented is based on aggregated data and observations, but significant individual variations may occur due to conditions such as farm management practices, climate, soil type and geographical location. While reasonable care was exercised in the preparation of the guide, no guarantees or warranties regarding the accuracy, reliability or completeness of the information are given. This guide may not reflect the newest information available and may not be regularly updated. It is the sole responsibility of the user to evaluate the accuracy and appropriateness of the information.

2018 SaskSeed Guide VR1

# Saskatchewan CWRS, CGC Harvest Sample Program, December 20, 2017

n= 2262

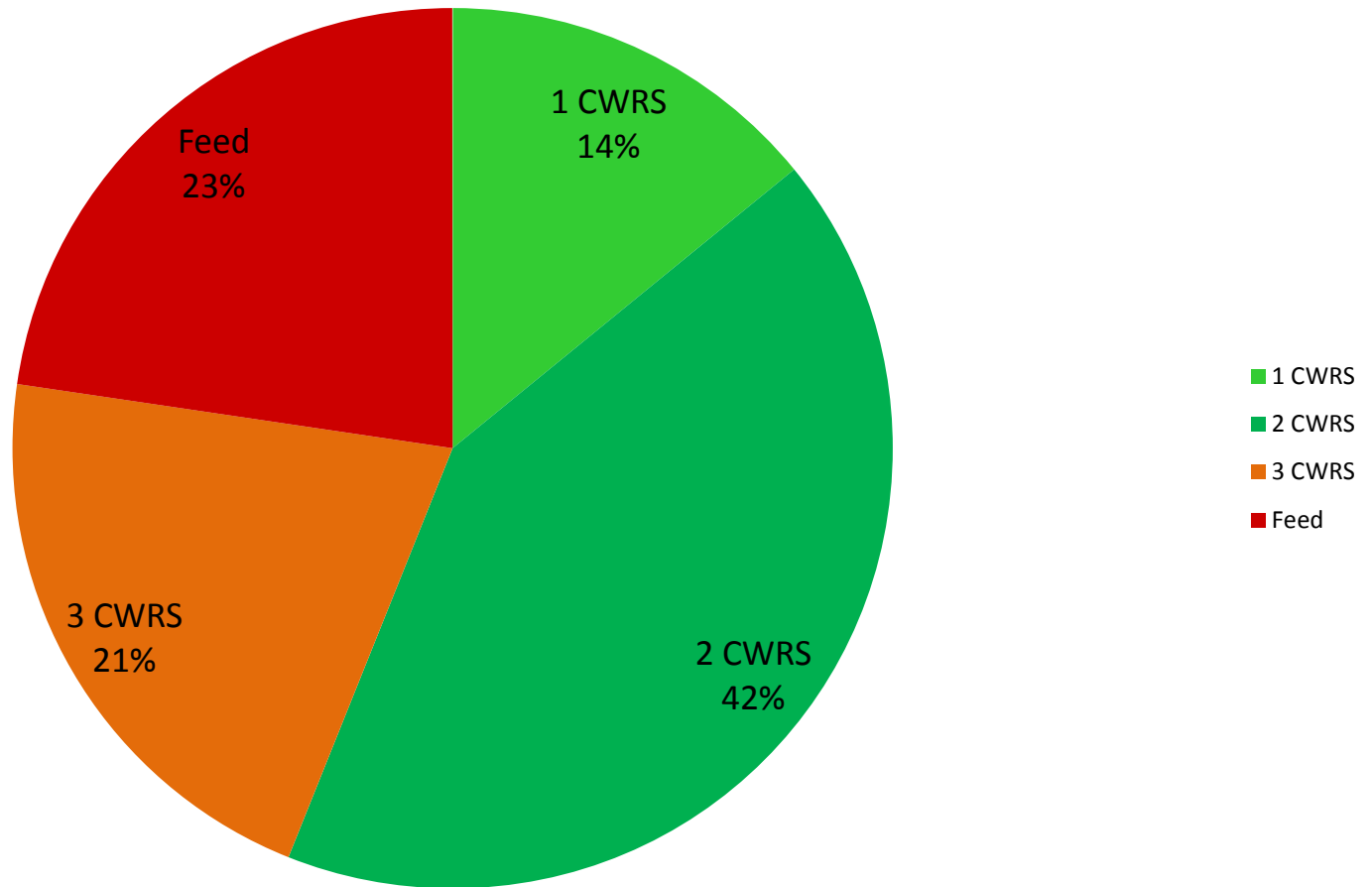


	% Protein
1 CWRS	12.82
2 CWRS	12.11
3 CWRS	12.96
CW Feed	13.36

Source: Canadian Grain Commission

# Saskatchewan CWRS, CGC Harvest Sample Program, Oct 25 2016

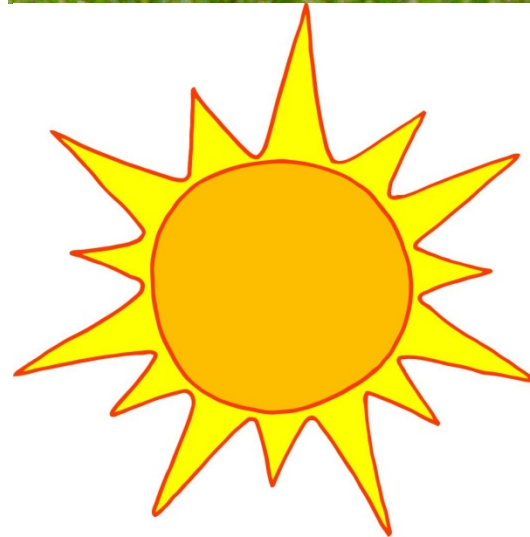
n=1191



Source: Canadian Grain Commission

# Yield Contributors

- Genetics
- Fertility
- Water
- Sun



# Yield Preservation

- Disease
- Insects
- Weeds
- Harvest
- Heat



# Disease



# Seed





# Determining the infection level

- % FDK  $\neq$  % fusarium infection



- Recommend sending all seed to a seed testing lab for germination and disease testing
- Certified seed does not mean disease free

# Disease testing

- Disease test will determine the level of seed borne pathogens (% infection)
- Seed borne disease
  - Seed surface is contaminated by spores or mycelium;
  - Seed is contaminated with pathogen resting structures
  - Internal colonization of seed or embryo infection.



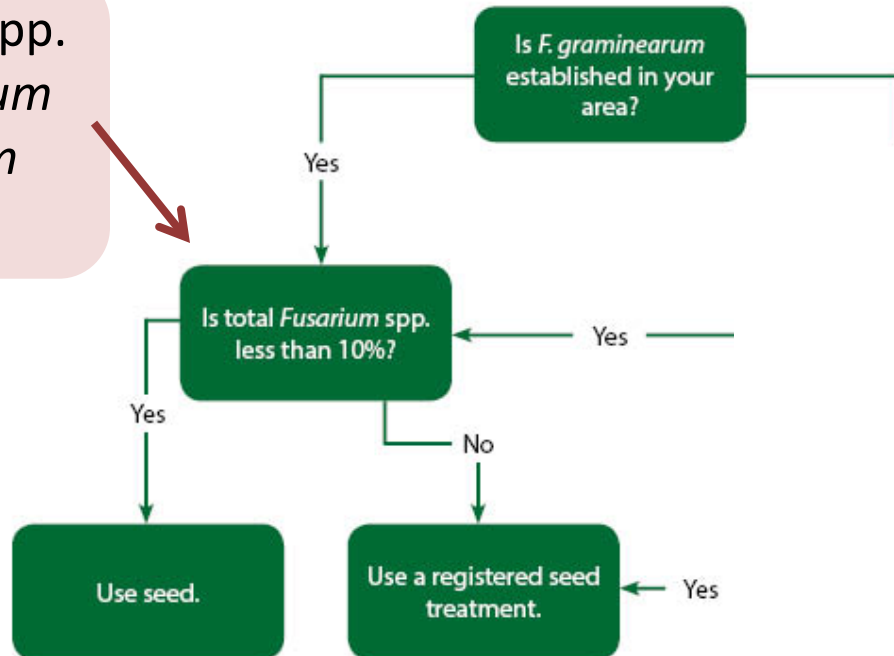
# What does the infection level mean?

- Indicate the per cent of seed tested infected with *Fusarium* spp.
- Indicate the risk of *Fusarium* seedling diseases based on seed borne pathogen levels
- Does not take into account soil-borne pathogen levels which can be influenced by field history



# Is a seed treatment needed?

Total *Fusarium* spp.  
= *F. graminearum*  
+ other *Fusarium*  
spp.



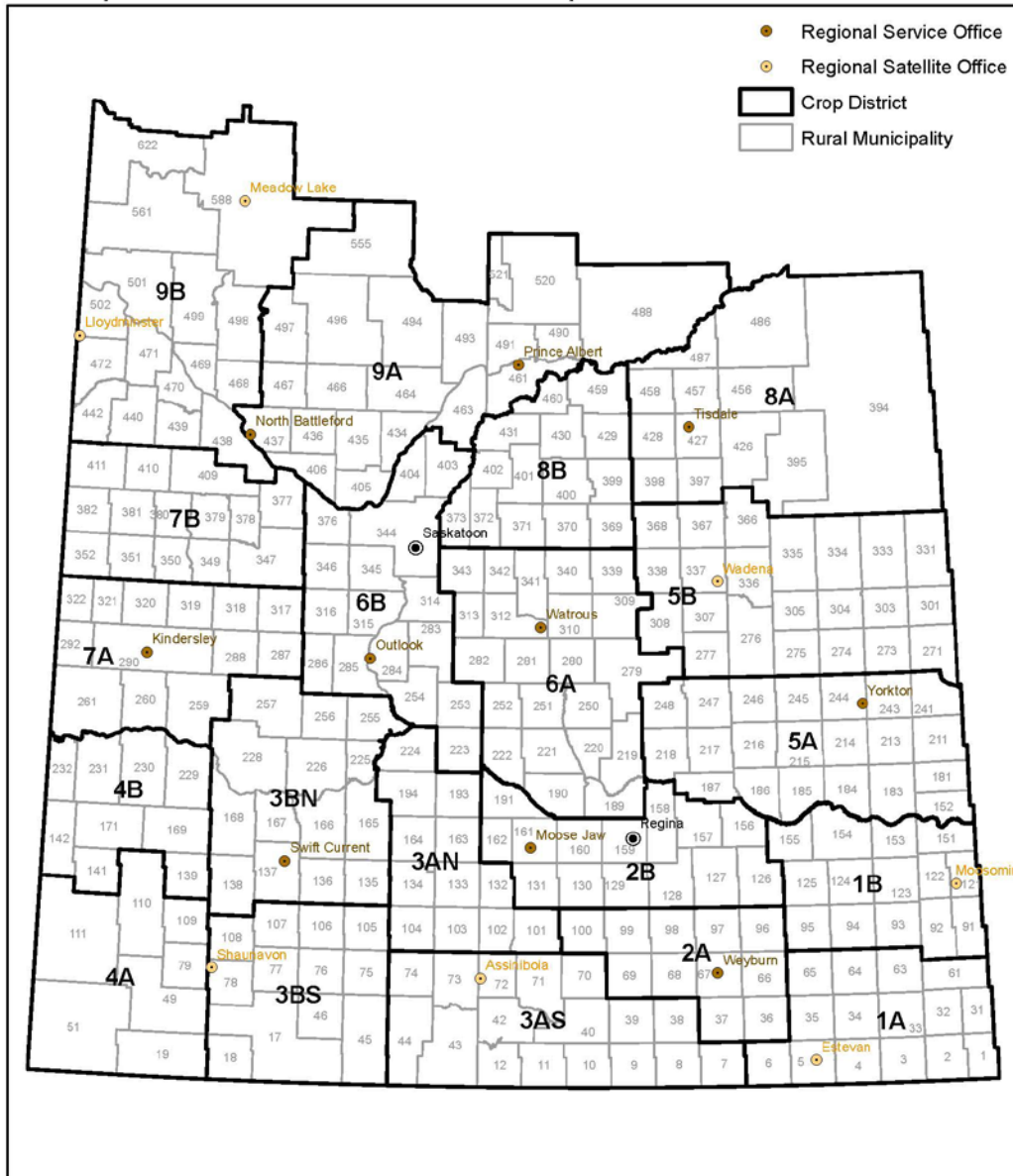
# 2017 seed quality

- Disease levels in 2017 were generally low
- Some variation across the province due to differences in environmental conditions

2017 Interim Seed Quality Report - Wheat					
		<i>F. graminearum</i>		Total Fusarium	
Crop District	# Tests	% PFS	Mean %	% PFS	Mean %
2B	62	91.9	1.2	69.4	2.1
3BN	28	100	0	75	1.2
5A	26	92.3	0.8	57.7	3.5
7B	46	41.3	1.1	0	2.4
8A	23	47.8	1.3	4.3	5.2
8B	31	61.3	1	6.5	4.5
9B	71	53.5	0.8	3.2	4.5
Total/Mean	697	74.9	1.1	25.6	3.2

**ACKNOWLEDGEMENTS:** We would like to acknowledge the cooperation of Lendon Seed, 20/20 Seed Labs Inc., Prairie Diagnostic Seed Lab, and Discovery Seed Labs Ltd. in providing seed testing results thus making this interim report possible. We also wish to acknowledge the support through funding of the Saskatchewan Wheat Development Commission.

# Crop Districts and Rural Municipalities in Saskatchewan



# Seed treatments

- Treating seed ensures that the crop gets off to a good start.
- Help poor quality seed
- Help in cool, wet soil where growth is slow
- Seed treatments will not "cure" a poor seed lot that has high proportions of dead, damaged or infested seed.
  - Use caution when looking at disease tests of treated seed  
→ may not reflect reality in the field



# Why treat seed in a dry year?

<b>Warm</b>	<i>C. sativus</i> <i>Fusarium</i> spp.	<i>Fusarium</i> spp. <i>Rhizoctonia</i> spp.	<i>Pythium</i> spp.
	<b>Dry</b>	<b>Moist</b>	<b>Wet</b>
<b>Cold</b>	<i>Rhizoctonia</i> spp.	<i>Fusarium</i> spp. <i>Pythium</i> spp.	<i>Pythium</i> spp. <i>Rhizoctonia</i> spp.



# Seed treatments

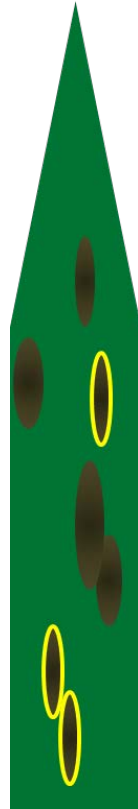
- How to choose?
  - Guide to Crop Protection
  - Systemic or contact
  - Single or dual action
- How to apply?
  - Uniform coverage is crucial
  - Calibrate



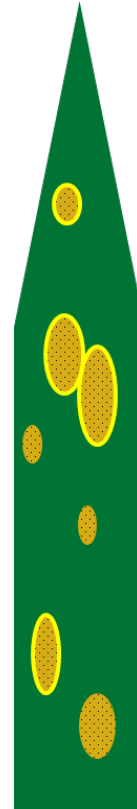
# Cereal leaf diseases



# Cereal Leaf Spots



**Tan spot**



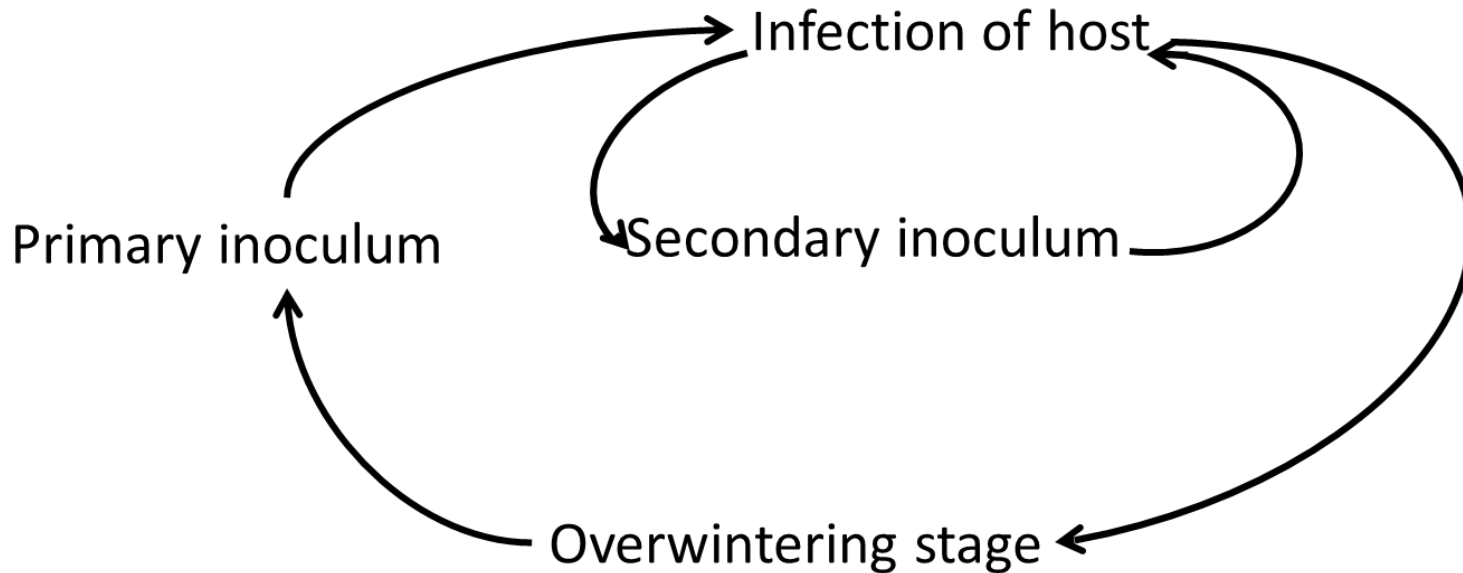
**Septoria**



**Spot blotch**

**Leaf spot complex** – Stangnospora/septoria blotches, spot blotch, tan spot

# Polycyclic diseases



- Develop at an exponential rate
- Multiple spore stages

# Management

- Diverse crop rotation to reduce the amount of inoculum in the field
- Host plant resistance
- Regular scouting
- Foliar fungicides when required
  - Protect the flag and penultimate leaf



# Rusts of cereals

- Microcyclic rusts: short cycle rusts (2 or 3 spore stages) eg. Stripe rust
- Macrocytic rusts: Long cycle rusts (5 spore stages)
  - Often have alternative hosts (eg. Leaf rust)

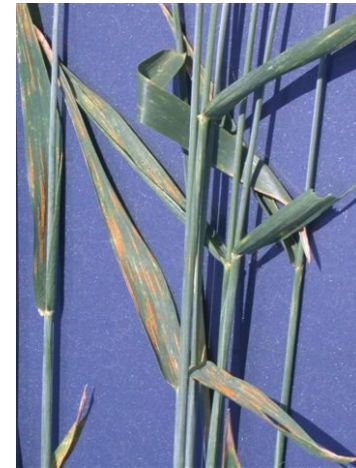


Crown rust of oats

[saskatchewan.ca](http://saskatchewan.ca)



Stem rust



Leaf rust

# Puccinia pathway



## WATCH FOR RUST

Rust can travel into Canada on wind currents originating in the United States. Early and continuous scouting for cereal rusts is important.



# Stripe rust

- Caused by the fungus *Puccinia striiformis* f. sp. *Tritici*
- Typically does not overwinter in Canada
- Heavy infection results in defoliation and shriveling of seed
- Elongate yellow pustules on leaves and stems



Photo courtesy of Joseph Nyachiro



# Stripe rust management

- Grow resistant varieties
- Foliar fungicide application
  - take the resistance rating of the variety into consideration
- Crop rotation will not be effective



Source: AAFC Winnipeg

# Rust

- Cereal Rust Survey
  - 3 day survey in MB and SK.
  - Stripe rust was abundant (basically 100% incidence) and heavy in patches of wild barley in eastern SK and western MB.
  - Potential inoculum for overwintering winter wheat in Canada

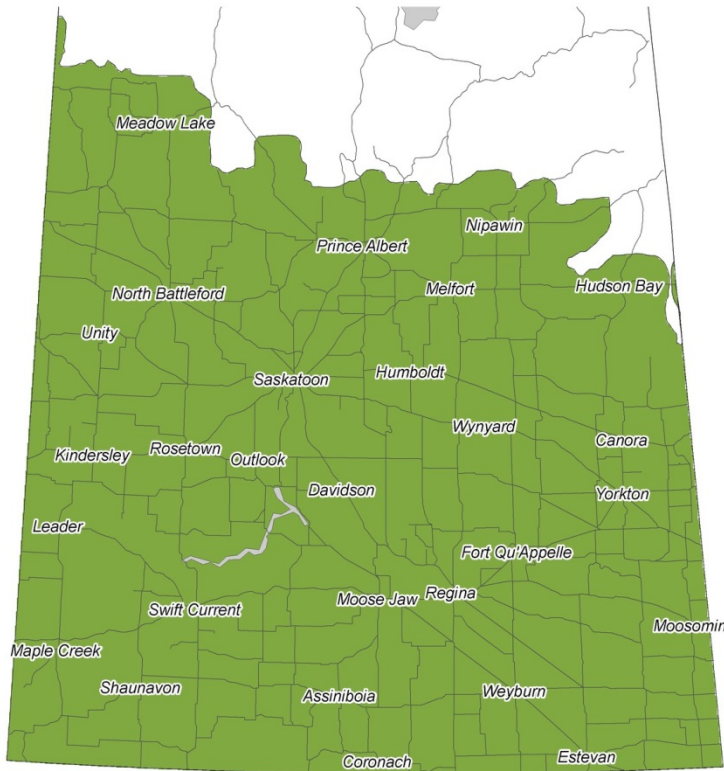
# FHB



# Favourable conditions

## Fusarium Head Blight Risk

Spring Wheat - June 18, 2016

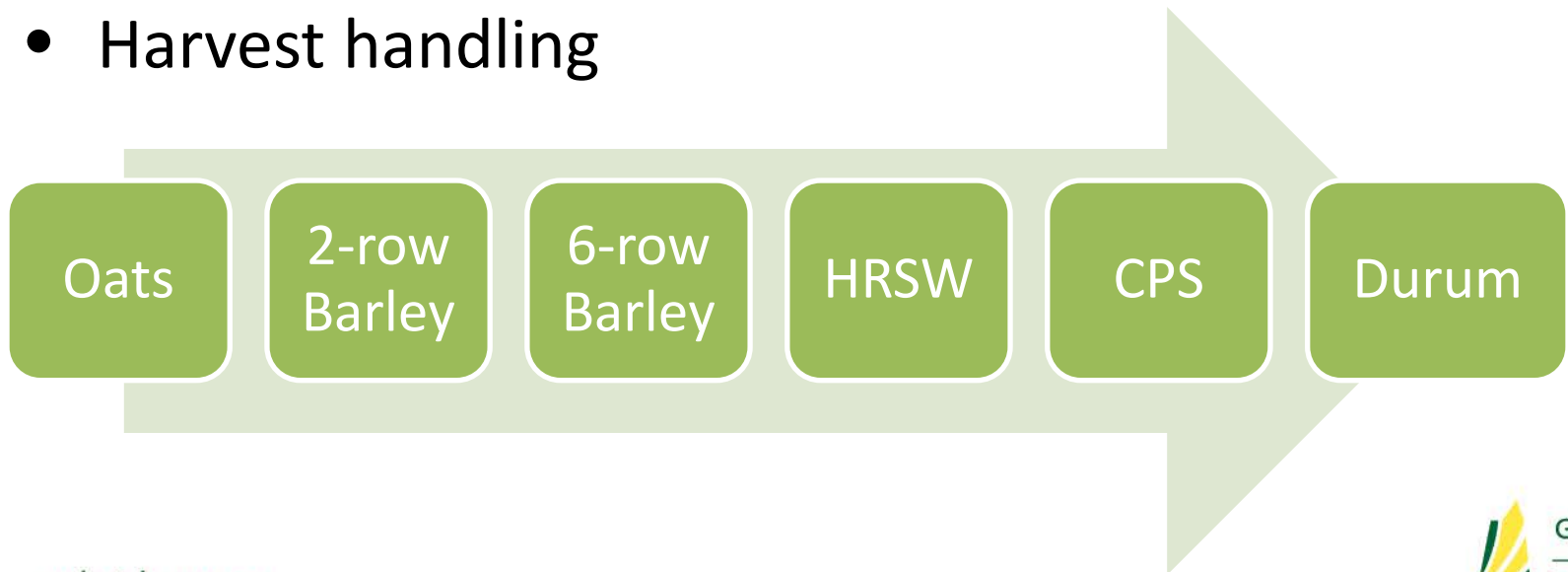


Map created on June 18, 2016.

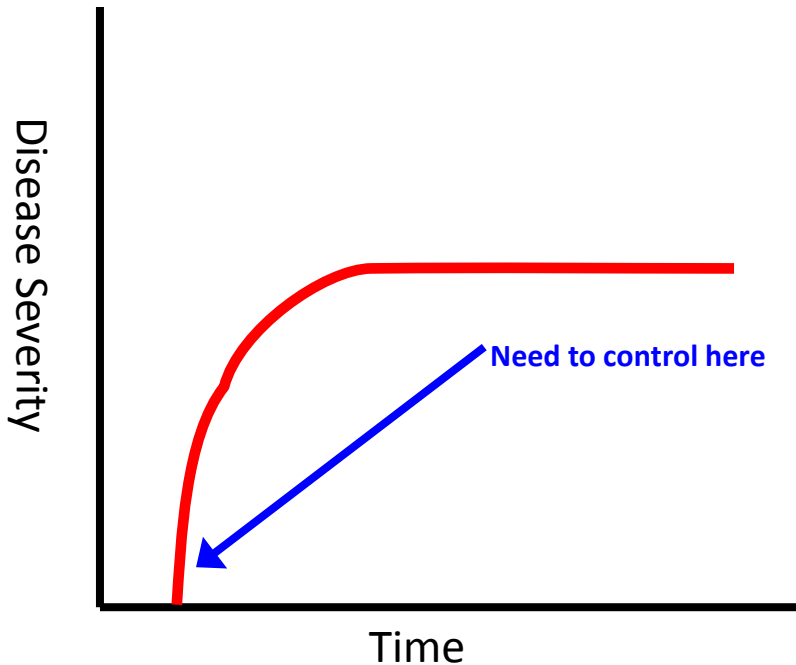
- *Fusarium* sporulation and cereal head infection is favoured by moist, warm conditions during flowering.

# Preventative management strategies

- Host crop / resistant variety selection
- Rotation
- Use risk maps in association with fungicide
- Stubble management
- Harvest handling



# Fusarium head blight



- Mono-cyclic diseases with **only 1 infection cycle per season**
- You need to control it at the start of its infection cycle
  - Too late once you see disease symptoms

## Take-home message:

Instead of scouting for symptoms to determine risk ... you need to scout for the conditions that favour disease.

# Ergot



# Ergot

- Caused by *Claviceps purpurea*
- Corn, rye, forage grasses, wheat and barley are susceptible
- Ergot bodies (sclerotia) from in place of kernels



**Saint Anthony's Fire**



# Ergot

- Favoured under moist conditions
  - Wet, cloudy and cool weather may extend the flowering period



**Honey dew stage**

# Ergot management

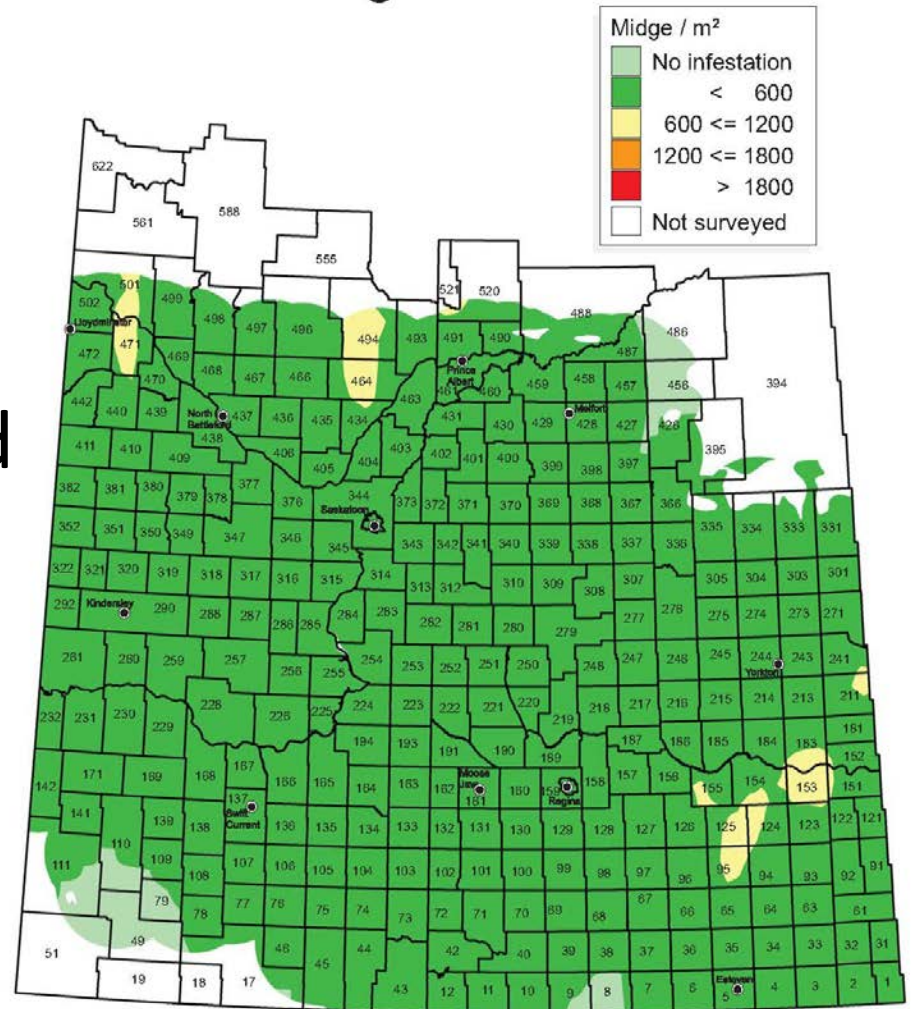
- When ergot levels are high, the headlands can be harvested separately
- Mow headlands or roadways to remove grasses before they flower
- Ensure vigorous and uniform plant stands
  - Good quality seed
  - Use a balanced fertilizer program
  - Copper fertilization when soils are deficient

# Insects



# Wheat Midge Forecast 2018

- 25 mm precip by end of May
- Emergence later and erratic



# Wheat Midge Management

- Conventional spring wheat requires regular monitoring when crop is in a susceptible stage
- Susceptible stage – From when the wheat head becomes visible until the crop flowering (anthesis)
- Susceptibility drops dramatically at the onset of anthesis due to natural resistance from the build-up of ferulic acid



Start of susceptibility



Wheat no longer susceptible

# Midge tolerant wheat

- 2017 – MTW on approximately 1/3 of CWRS wheat acres
- 2018 – available in CWRS, CPSR, CWSWS, CWSP, CWES, CWAD classes.
- VB options available with both midge and FHB tolerance
- Refer to Saskatchewan Seed Guide

<http://www.midgetolerantwheat.ca>

# CWSWS and CWSP



Producers achieve  
**\$36** per acre  
in yield & grade benefits  
based on wheat priced at \$6/lbu

**MIDGE TOLERANT WHEAT**  
Plant · Protect · Preserve

[midgetolerantwheat.ca](http://midgetolerantwheat.ca)

- *Sm1* gene
- AAC Awesome VB, AAC Chiffon VB, AAC Indus VB, AAC Paramount VB and Sadash VB.
- Seed purchased prior to 2018
- Preserve the single gene resistance
- New seed may be needed

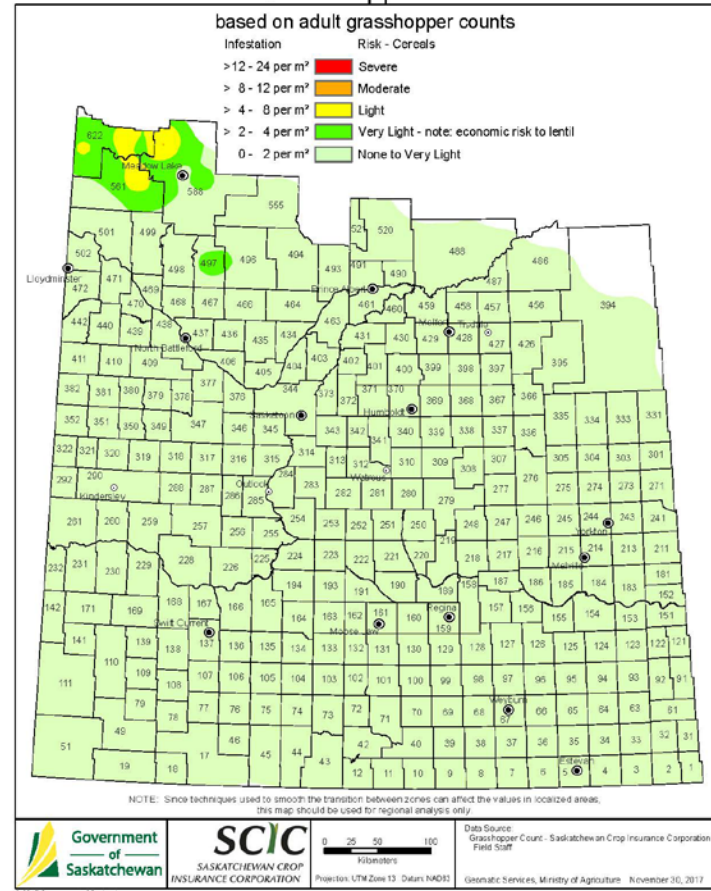
[www.midgetolerantwheat.ca](http://www.midgetolerantwheat.ca)



photo - Dan Johnson

- Low risk for most areas
- Spring and extended fall favourable development and egg-laying
- *Melanoplus bivittatus* (Two-striped) remains most dominant species in Saskatchewan

## 2018 Grasshopper Forecast





# Spur-throated = pest species



Clear-wing grasshopper is a pest species without the spur on its throat



# Non-pest Grasshopper Species



- with knobs on antenna
- adult early in season
- with red, yellow or orange wings
- any seen before May 25
- any that sing loudly while sitting
- any that crackle when they fly

The club-horned grasshopper is often seen in April and May (no problem).

# Cutworms

## Management considerations:

- Species life histories vary
- Significant time spent below ground, not feeding – molting, etc. –
- control with foliar insecticides
- control may take up to 10 days because not all come to the surface to feed each night



# Aphids – life cycle



## APHIDS

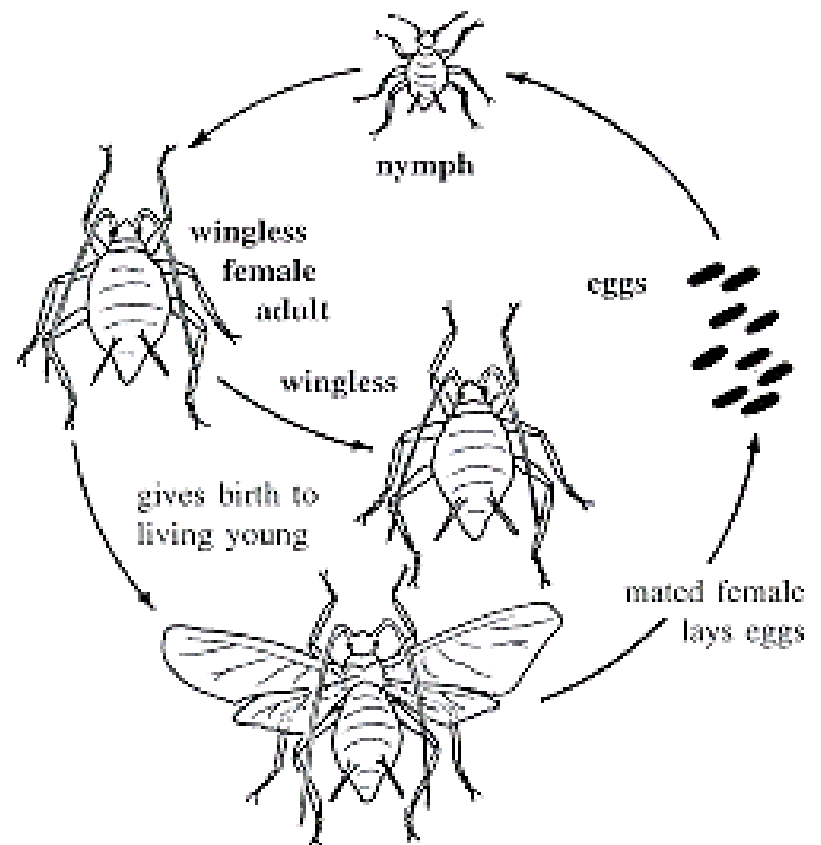


FIGURE 11 Aphid life cycle, 6 to 14 days.



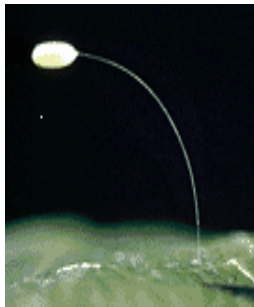
# Aphid predators Ladybird beetle

pupae and larvae



# Green Lacewing

egg



larva



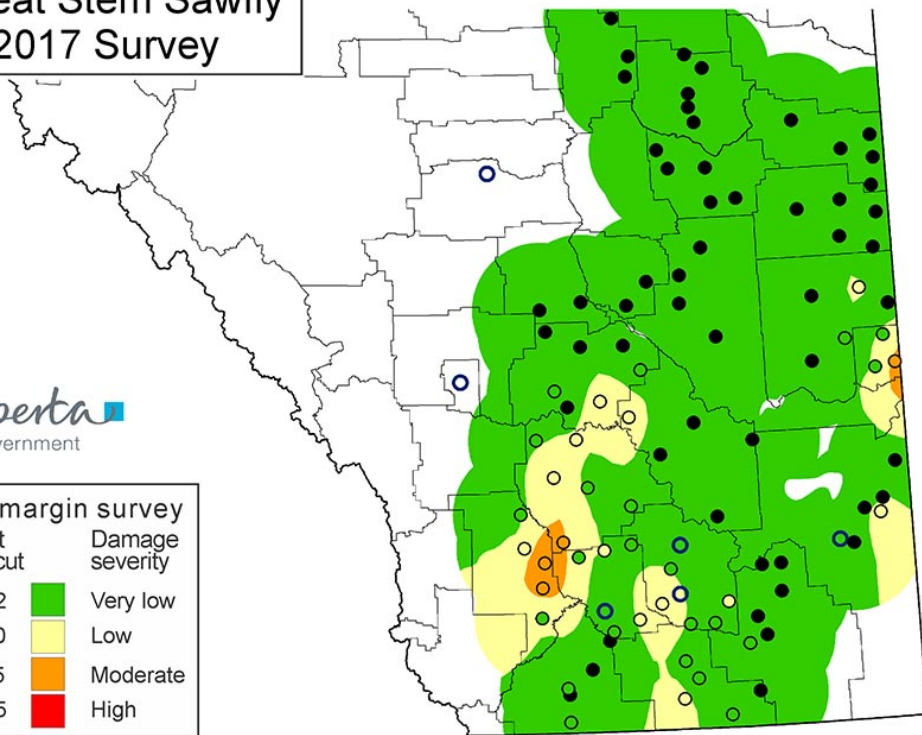
adult



## Wheat Stem Sawfly 2017 Survey

Alberta  
Government

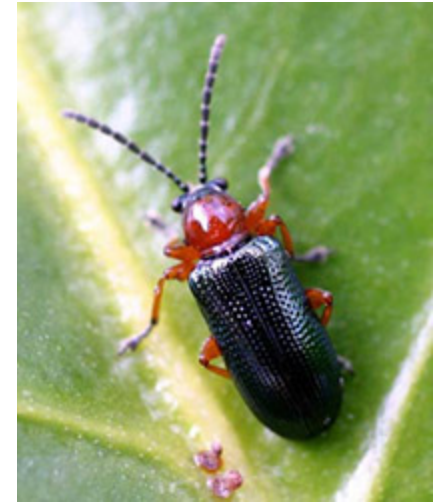
Field margin survey	
Percent stems cut	Damage severity
0 - 2	Very low
2 - 10	Low
10 - 25	Moderate
> 25	High



- Not just Lillian
- CDC Adamant VB, CDC Hughes VB, CDC Landmark VB
- AAC Concord

# Cereal Leaf Beetle

- Found in SW Sask in 2008
- longitudinal feeding between the leaf veins
- Insecticides or biocontrol
- Very few observations of pest



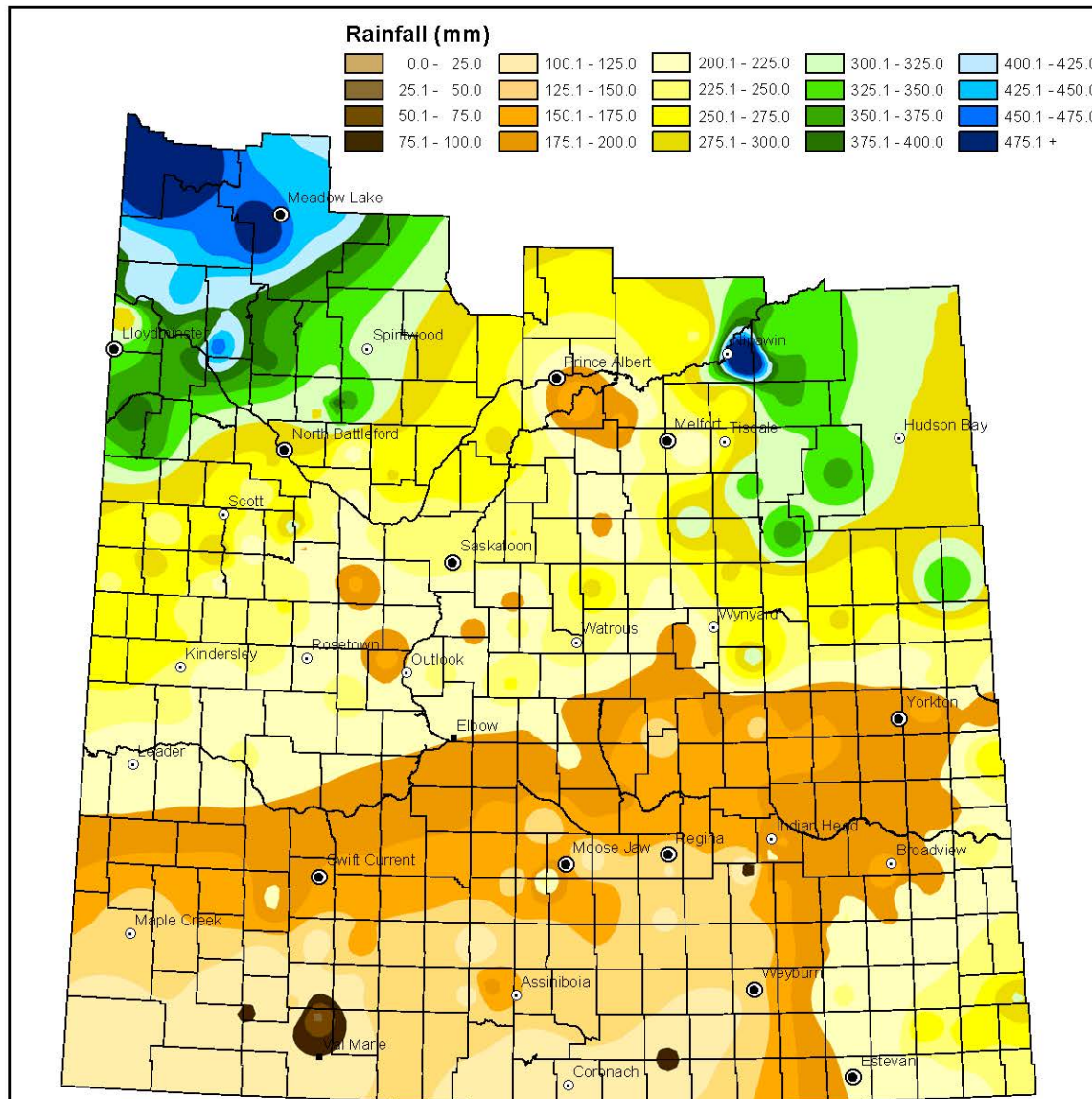
# Weeds





# Cumulative Rainfall

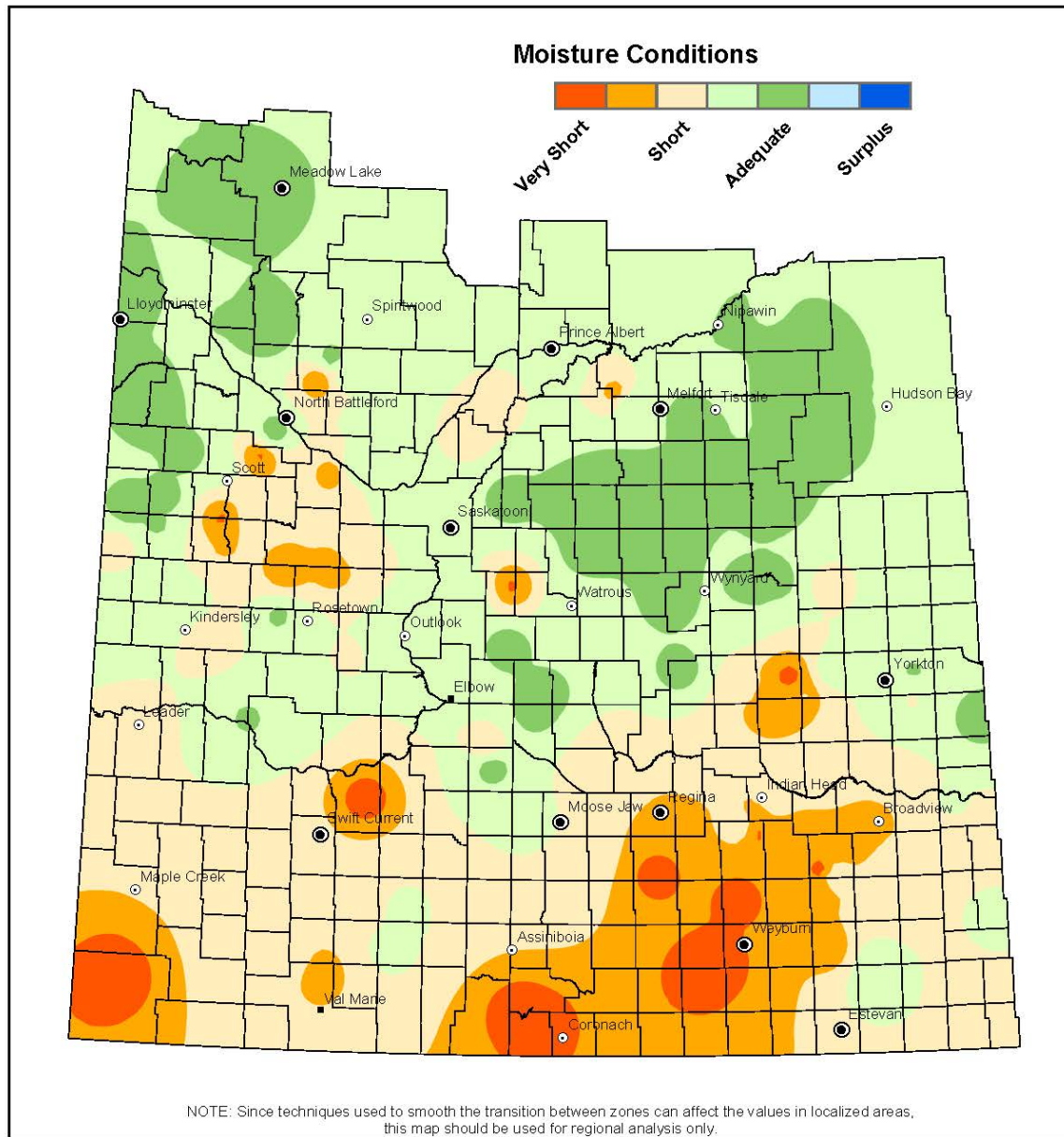
from April 1 to October 23, 2017



NOTE: Since techniques used to smooth the transition between zones can affect the values in localized areas, this map should be used for regional analysis only.

# Cropland Topsoil Moisture Conditions

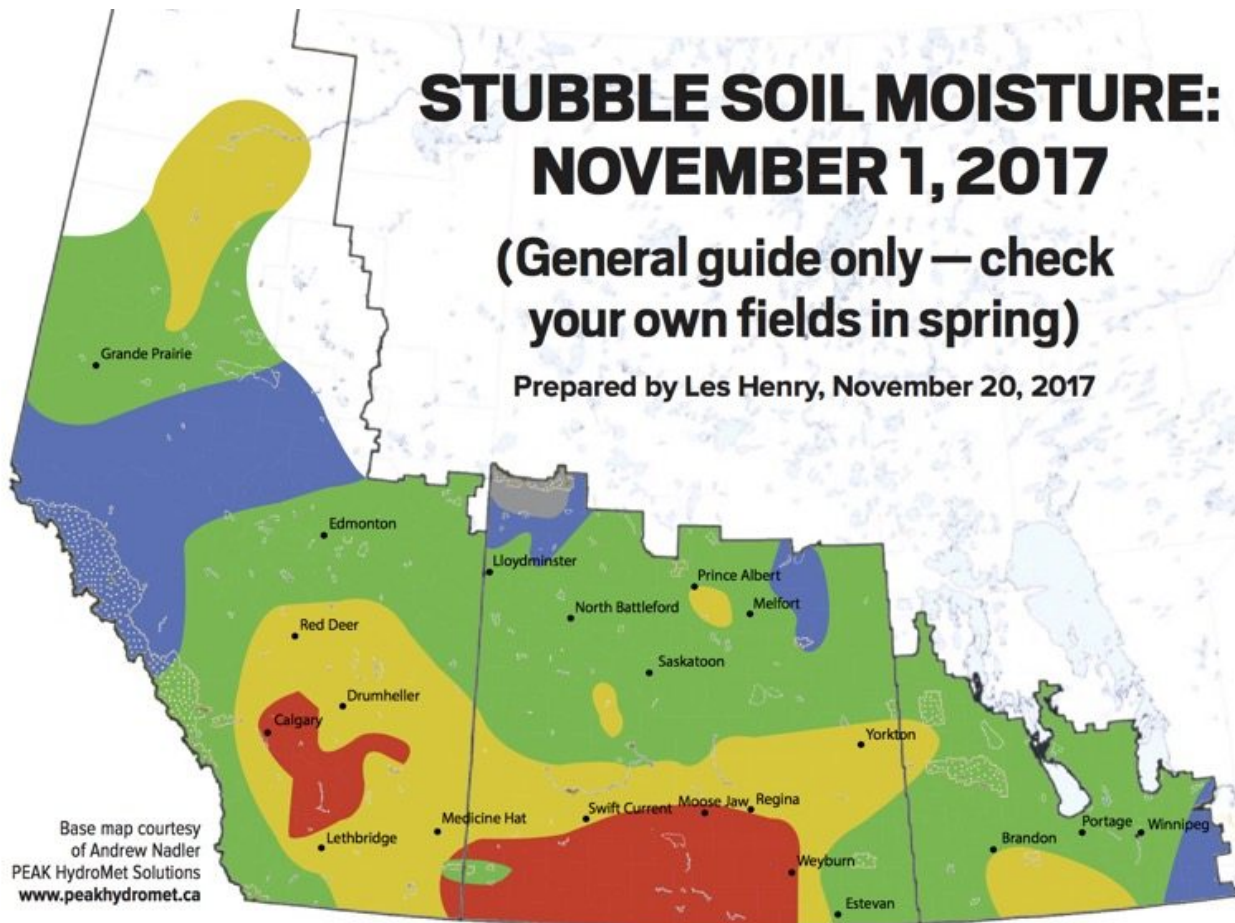
October 23, 2017



# STUBBLE SOIL MOISTURE: NOVEMBER 1, 2017

(General guide only — check  
your own fields in spring)

Prepared by Les Henry, November 20, 2017



Base map courtesy  
of Andrew Nadler  
PEAK HydroMet Solutions  
[www.peakhydromet.ca](http://www.peakhydromet.ca)

## VERY DRY

Stubble has essentially no  
moisture storage below 6 inches

## DRY

Sandy Soils Wet to 12-24"  
Medium Soils Wet to 6-18"  
Heavy Soils Wet to 6-12"  
(About 1 to 2 inches of available water)

## MOIST

Sandy Soils Wet to 24-48"  
Medium Soils Wet to 18-30"  
Heavy Soils Wet to 12-24"  
(About 2 to 4 inches of available water)  
Will include local areas  
with no dry layer

## WET

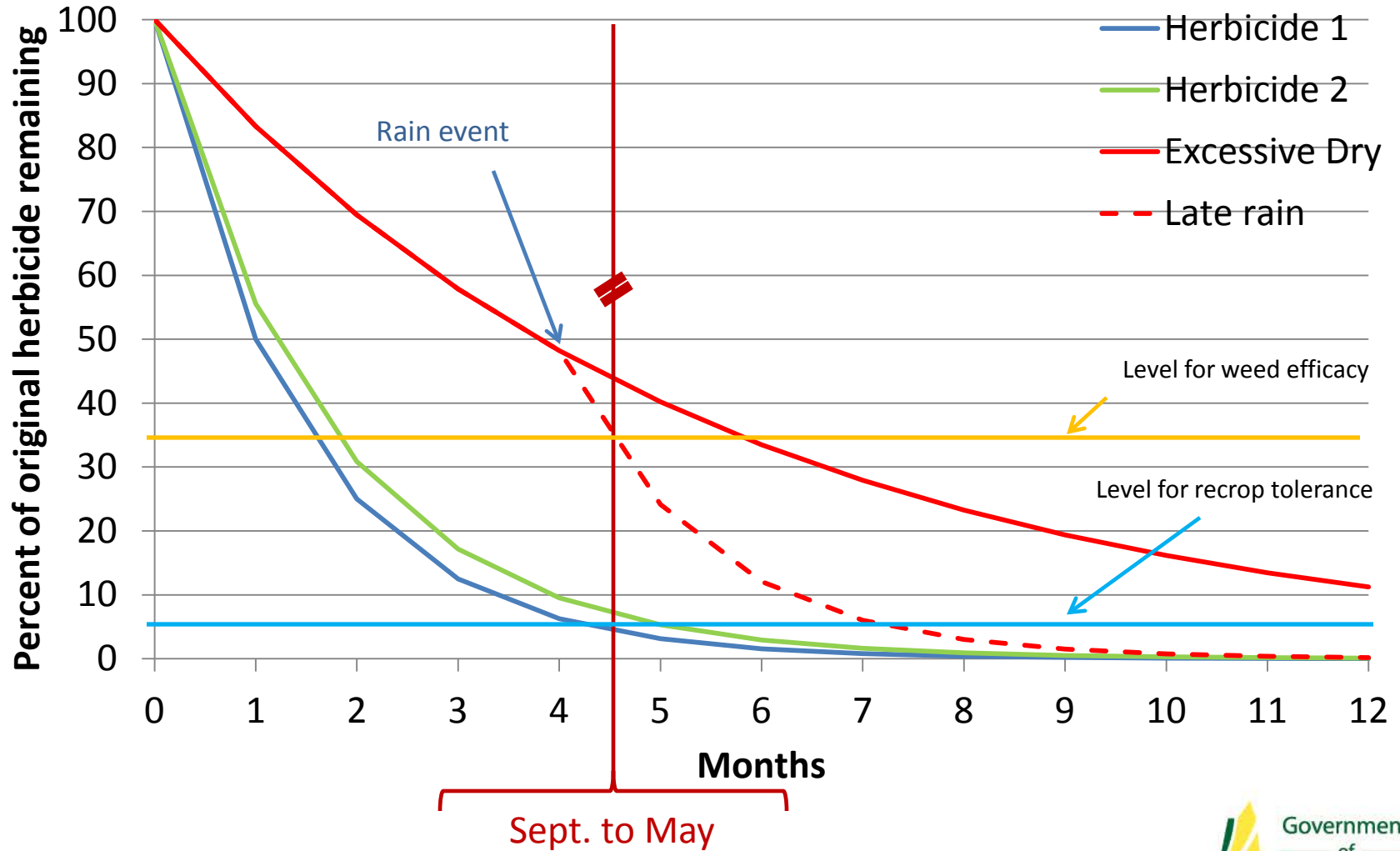
No dry layer in sandy,  
medium or heavy soils  
(Sandy = 4, Medium = 6, Heavy = 8  
inches of available water)  
Will include local areas of Super Wet

## SUPER WET

Excess rain — water table  
rise might occur

Source: Grainews

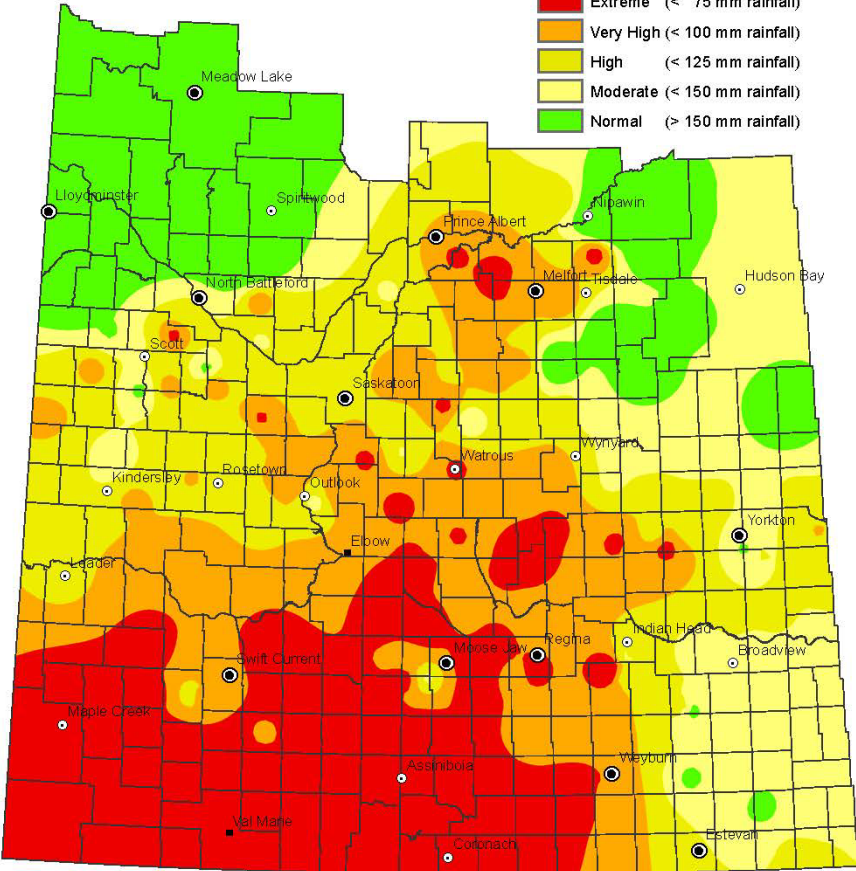
# Herbicide Half-Life



# Risk of Greater than expected Herbicide Carryover in 2018

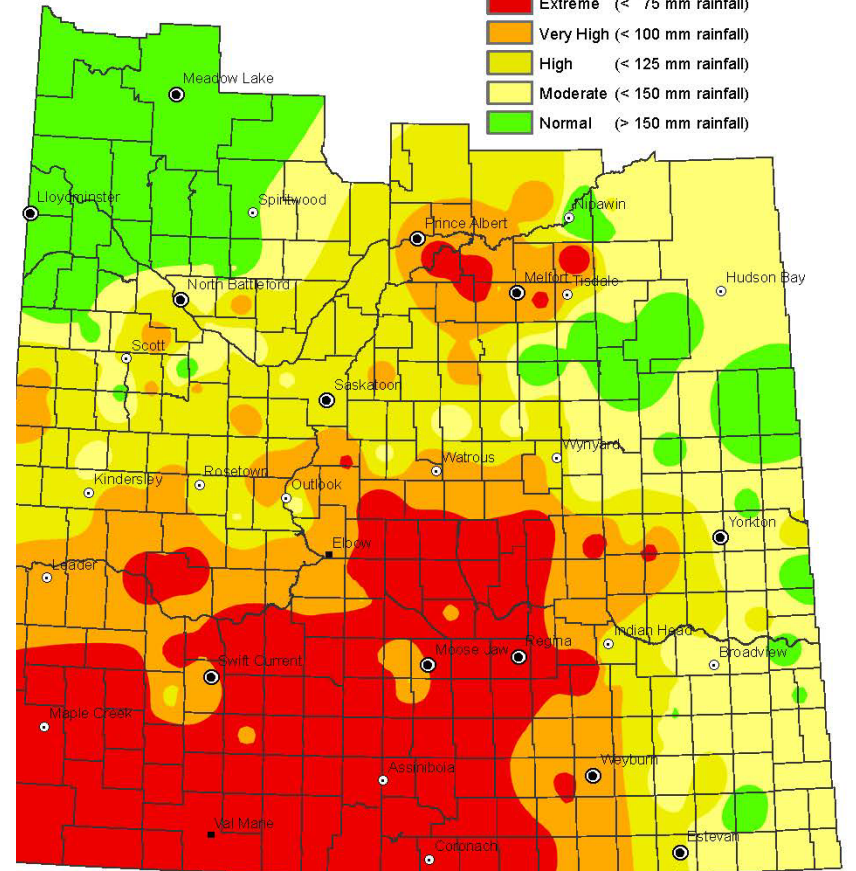
**Herbicide Carryover Risk Level**  
Based on rainfall from May 30 to August 28, 2017

- Extreme (< 75 mm rainfall)
- Very High (< 100 mm rainfall)
- High (< 125 mm rainfall)
- Moderate (< 150 mm rainfall)
- Normal (> 150 mm rainfall)



**Herbicide Carryover Risk Level**  
Based on rainfall from June 13 to September 18, 2017

- Extreme (< 75 mm rainfall)
- Very High (< 100 mm rainfall)
- High (< 125 mm rainfall)
- Moderate (< 150 mm rainfall)
- Normal (> 150 mm rainfall)



### Re-cropping Restrictions for Residual Herbicides:

Figures listed are the number of cropping seasons before each crop can be grown ("1" means that the crop can be grown the year following application). For plant-back restrictions less than one season; the delay is indicated with a "d" for number of days or with "mths" for the number of months. A blank space means that there are no recommendations given on the product label and a field bioassay is recommended by many product manufacturers to determine if these crops are safe to plant. A field bioassay is a strip of a test crop that covers an area of the field that is representative of the field variation and should include an untreated area.

PRODUCT	Alfalfa	Barley	Canaryseed	Clearfield canola	Non-Clearfield canola	Fababeans	Field corn	Dry beans	Field Peas	Flax	Forage grasses	Lentils	Mustard <sup>1</sup>	Oats	Potatoes	Rye	Soybeans	Sunflowers	Wheat (durum)	Wheat (spring)	Wheat (winter)
2,4-D*	1	1	1	1	1		1	1	1	1	1	1		1		1			1	1	1
Accent	10 mths	10 mths		10 mths	10 mths		10 mths										10 mths			1	4 mths
Altitude FX2		1		1	1				1	1		1	2	1				1		1	3 mths
Amitrol 240		1d	1	1d	1d		10d*	10d*	5d*	1		1	1	1			6d	1	1d	1d	1d
AAtrex, Primextra II Magnum						1*	1		1*	1*											
Ares		1	1	1	2		1		1	2		1		1				2	2	1	
Authority / Authority Charge	1	1		1	1	0	1		0	0		2	0				0	0	1	1	1
Authority Supreme							1		0								0	1	1	1	1

# How will this effect my crop in 2018

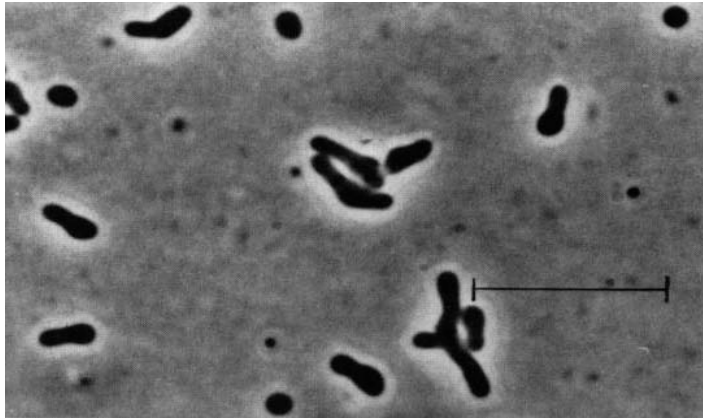
- There is a high risk of unexpected herbicide carryover in the areas west of Weyburn and south of a line roughly from Watrous through Kindersley
- Many other areas of the province (yellow) may have low enough rainfall to impact specific herbicide with longer half-lives (take longer to break down)
- Many of the new “soil active” products have little experience with drought in western Canada
- Follow crop choices after residual products should be very conservative and select the safest crop to avoid injury.

# Herbicide Persistence

Persistence of Herbicides affected by several factors:

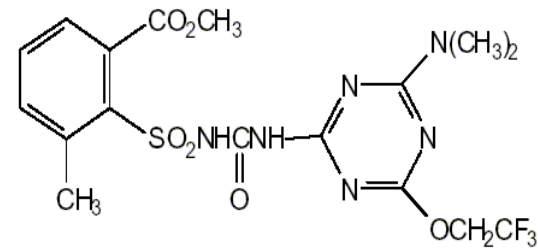
## Microbial activity

- major route of decay of most products
- Requires soil moisture



## Chemical Hydrolysis

- plays important part in decay of Groups 2 & 5
- Requires soil water for chemical activity to take place



H<sub>2</sub>O



- several herbicides for which there are “extreme dry condition” rules, that generally add another year to the delay needed for sensitive crops for each year of extreme dry experienced.
- several new herbicides, typically of the soil active types, have not seen use under a drier cycle in western Canada
  - The company may have experience in the USA however that will help them guide growers

# Take home

- Good agronomy is a good start for pest management.
  - It starts with rotation
- Variety selection is important. More than yield.
- Know your pests
- Plan for the conditions you have

# Prairie Pest Monitoring Network Blog



Home | About Us | Risk Maps | Weekly Updates | Monitoring Protocols | Pest Insects | Research | Cutworm Field Guide  
Insect of the Week | Beneficials

<http://prairiepestmonitoring.blogspot.ca/>

<http://www.saskatchewan.ca/agriculture> (reorganized and new look)

[www.publications.gc.ca](http://www.publications.gc.ca)

- “Field Crop and Forage Pests and their Natural Enemies in Western Canada”

# Acknowledgements

- Barb Ziesman, Provincial Specialist, Plant Disease
- Clark Brenzil, Provincial Specialist, Weed Control
- Jim Tansey, Provincial Specialist, Insect and Vertebrate Pest Management

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