

What Diseases Are Lurking?



How Extending Crop Rotations Can [Pay Dividends] Save Money

David Kaminski, Field Crop Pathologist
Manitoba Agriculture and Resource Development
January 23, 2020



Kaminski back in the saddle, again

- Came to Manitoba in 2001 to be Field Crops Pathologist
- Turned over the reins to Holly Derksen in 2008.
- Left public life in 2013. Six years as self-employed arborist – 3DTreeCare
- Signed on as “oldest rookie in MB Agriculture”, April 15, 2019

What's changed?

- A lot!
- In 2001, MB growers were still consumed by the battle against FHB in wheat.
 - Needed EU registration for fungicides
 - Varieties of the time had, at best, Fair resistance to head blight
 - Still developing a predictive risk forecast

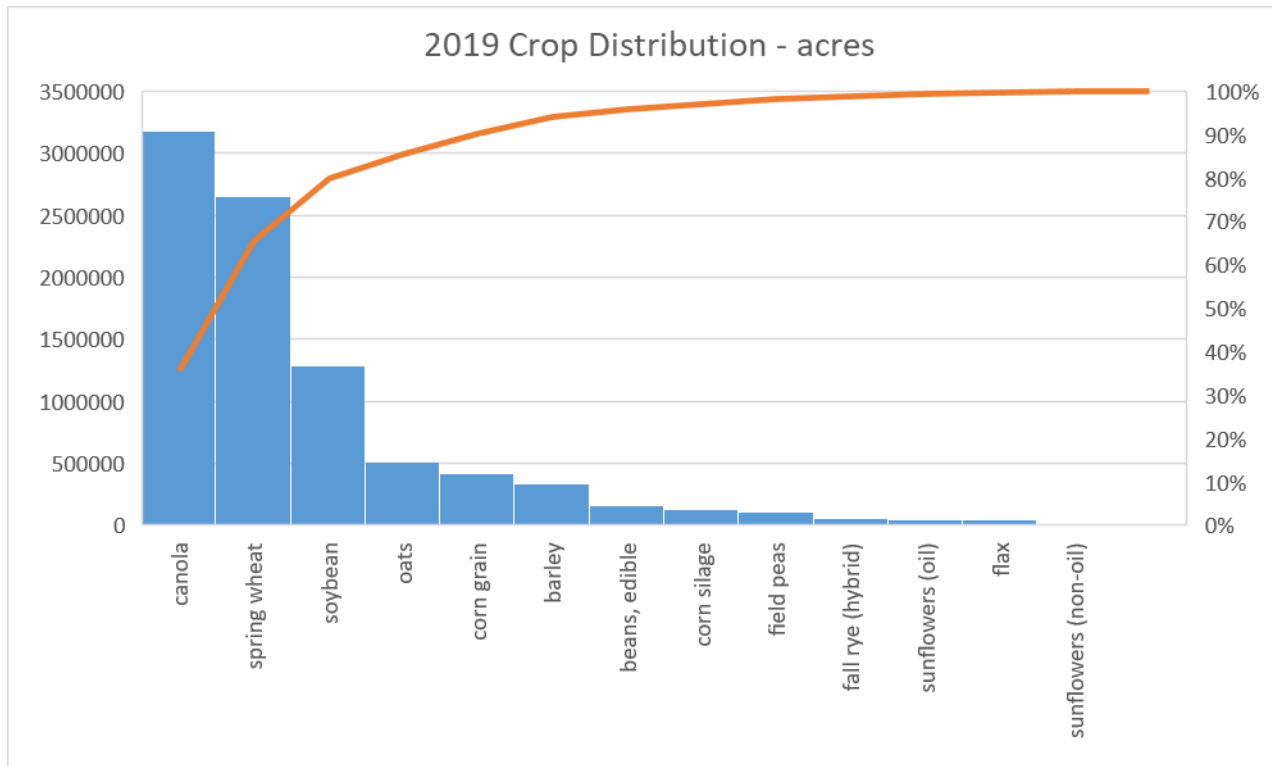


What's else?

- Other major issue of the day was Sclerotinia - stem rot in canola
- Consistently wet years had led to prophylactic use of fungicides.
- Trying to use weather-based risk prediction tools
 - Found to be too dependent on field histories and micro-climatic effects.

Fast forward to 2019

- Very strong reliance on 2-3 crops in rotation

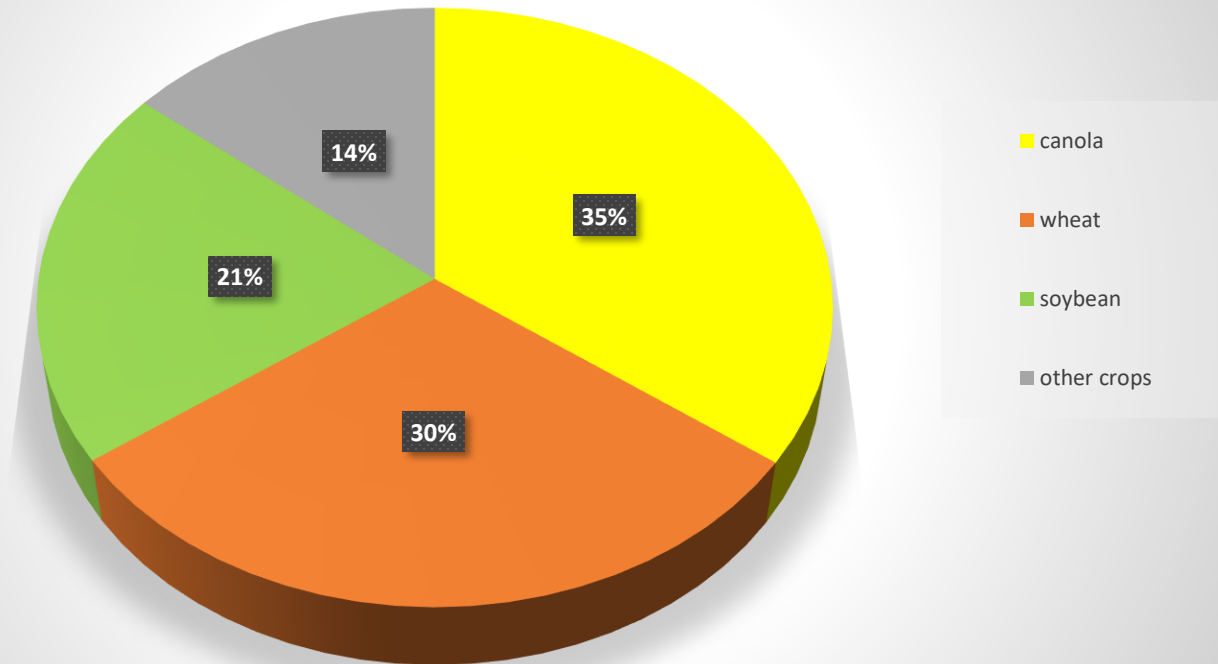


Conclusions

- Over-reliance on a few crops leads to buildup of hard-to-manage (esp. soil-borne) diseases
- A minimum 2-year break between crops generally serves to allow pathogen breakdown
- Adding dis-similar crops to a rotation helps to manage and spread risks from both pests and environmental extremes

Crop mix in Manitoba

Harvested Area in MB, 2018



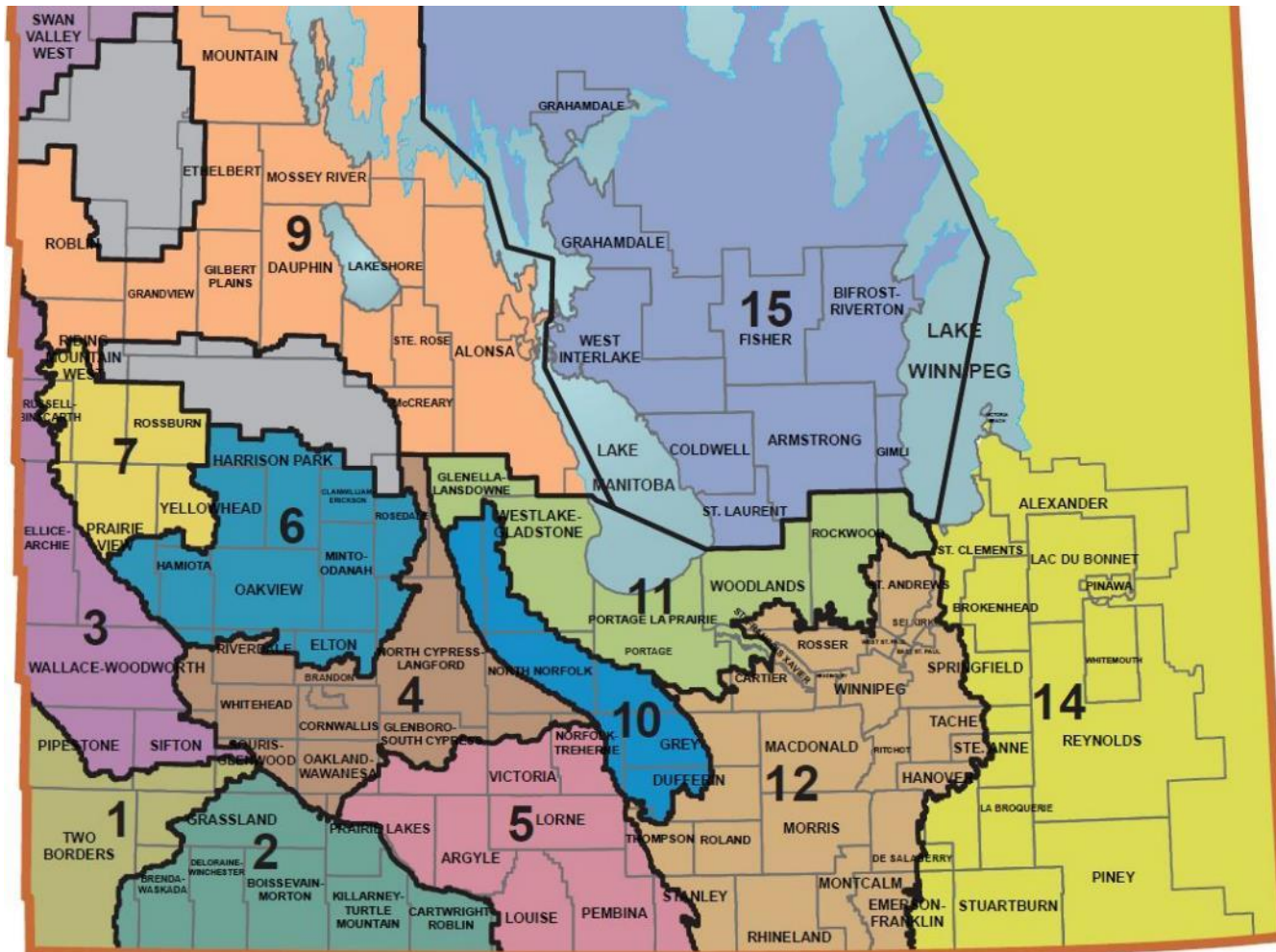
July 1, 2019



July 7, 2019

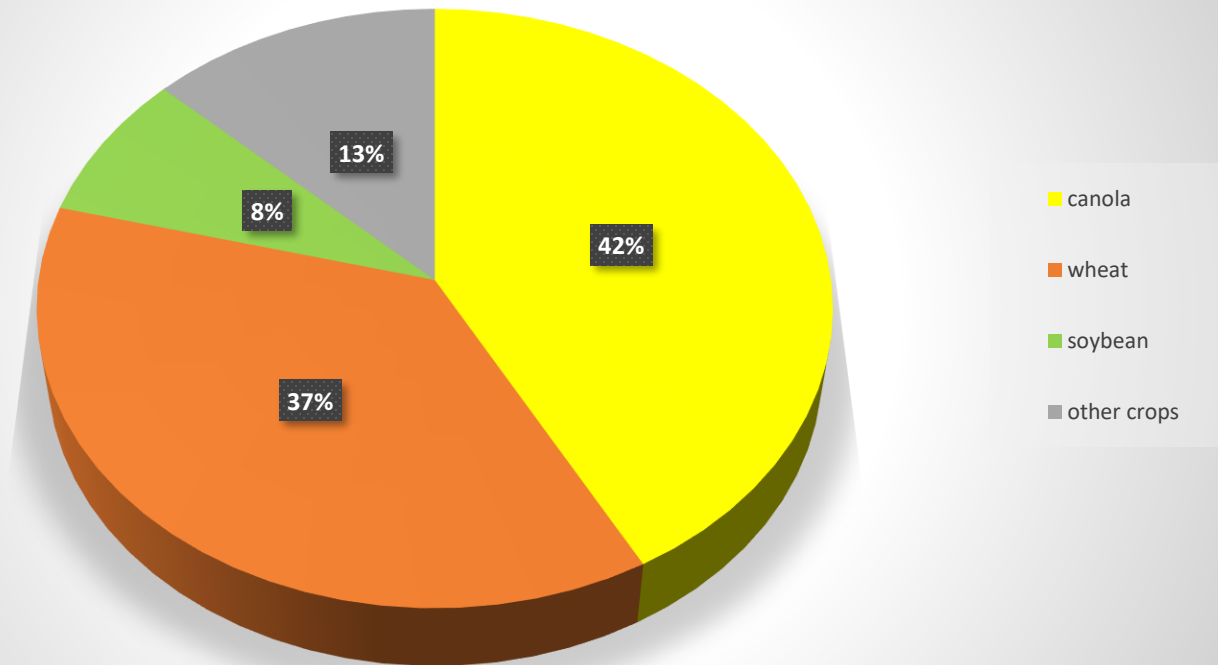


How does your area compare?

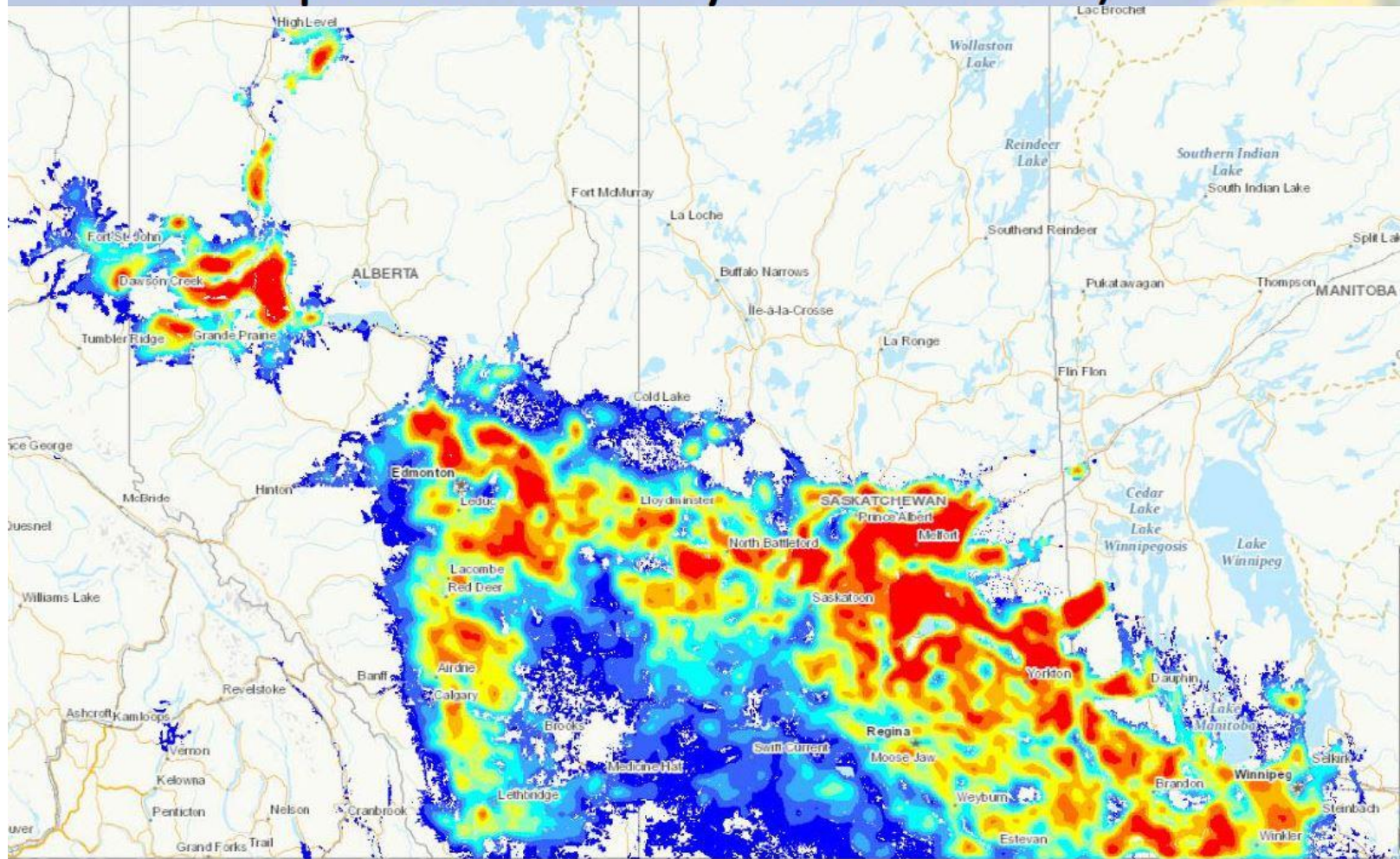


Canola & Wheat dominate

Acreage, RA 3 (5yr ave.)



Canola Frequency on Prairies (2009-16 Spatial Density from AAFC)



Source: Murray Hartman, presentation at Canola Discovery Forum, November 2019



Where are those other crops going?

RANK			2018
1	canola	3119.5	35%
2	wheat	2706.0	30%
3	soybean	1841.4	21%
4	oats	401.8	4%
5	corn	351.8	4%
6	barley	236.2	3%
7	dry bean	118.9	1%
8	field pea	78.1	1%
9	sunflower	42.9	0%
10	flax	33.7	0%
		8930	100%

7 Retweets 34 Likes



Simon Ellis @FarmLifeMB · 2d

Replying to @realloudlyndsey

Barley has been the crop we have cut. Used to grow a lot on our farm and still grows a good crop, but not enough demand anymore. We grow it 1 in 5 years now.

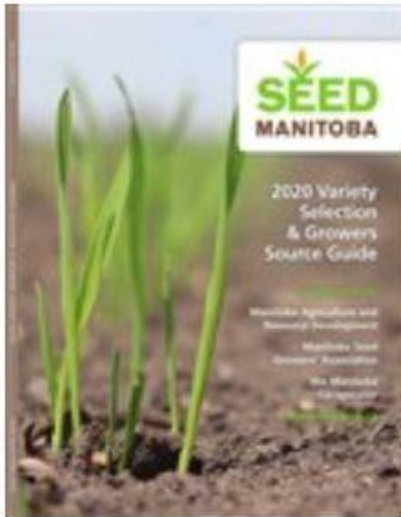


Günter 🌾🇨🇦 @gmjochum · 1d

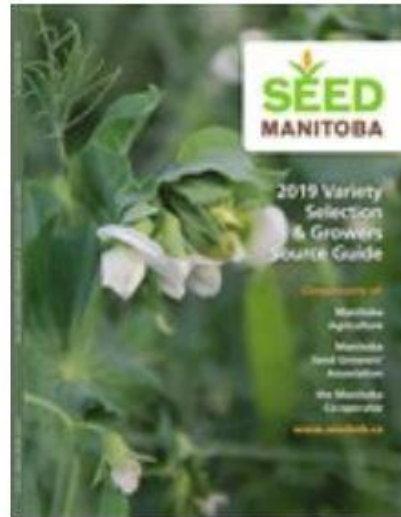
Replying to @realloudlyndsey

Flax, haven't grown it for over 25 yrs. have no desire to grow it. Won't yield well here, coupled with only average price = no return.

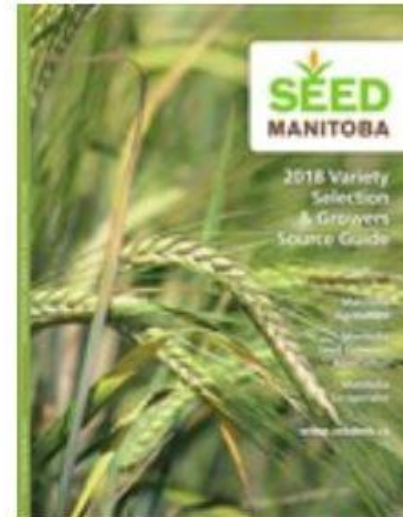




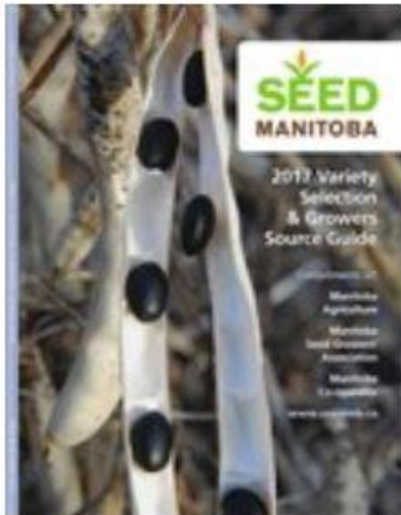
Seed Manitoba 2020



Seed Manitoba 2019



Seed Manitoba 2018



Seed Manitoba 2017



Seed Manitoba 2016



Seed Manitoba 2015

Ways to consider crop type

- Grasses vs. Broadleaves
 - Balanced 46% vs. 54%
- High Residue vs. Low
- Cool Season vs. Warm
 - Skewed 81% vs. 19%
- Herbicide Tolerant vs. Not
- Deep-rooted vs. Shallow
- Are you growing as a commodity or for a specific end use?
- Can you extract more value from what you're already growing?

Varieties planted in Manitoba – 2019

Variety	Category	Acres
CDC Austenson	Food and Feed	76,675
Conlon	Food and Feed	71,946
AAC Synergy	Malting (recommended)	32,764
CDC Copeland	Malting (recommended)	30,400
AC Metcalfe	Malting (recommended)	25,671
Celebration	Malting (other)	19,253
AAC Connect	Malting (recommended)	14,187
Newdale	Malting (other)	13,173
Canmore	Food and Feed	9,795
Total acres		337,775

Choose Less Susceptible Crops/Varieties

Most susceptible



Least susceptible

CWAD

CPS

CWRS

Barley

Oats

Triticale

6 Row

2 Row

CWES

Winter wheat

Category / Variety ¹	Site Years Tested	Yield (bu/acre)	Protein %	Maturity +/- 88 days	Height +/- 89 cm	Test Wt +/- 48.7 lb/bu	Rough or Smooth Awns	Resistance Level:											
								Lodging	Loose Smut	Surface		Netted Net Blotch	Spotted Net Blotch	Spot Blotch	Stem ² Rust	Fusarium ³ Head Blight			
										-borne Smut	Root Rot								
Malting: Acceptance - Recommended																			
AAC Connect (2)☺	35	104	12.5	0	-3	-0.5	R	G	S	R	MS	I	MR	MR	MR	MR	MR	MR	MR
AAC Synergy (2)☺	32	112	12.2	0	-3	-0.4	R	G	S	I	I	MR	R	R	MR	MR	MR	I	I
AC Metcalfe (2)	205	97	12.9	0	0	0	R	F	R	I	I	S	I	I	MR	MR	MR	I	I
CDC Bow (2)☺	44	105	12.1	1	3	0.5	R	G	S	I	MS	S	MR	I	MR	MR	MR	MS	MS
CDC Copeland (2)☺	51	97	12.5	0	5	-0.5	R	F	MS	I	I	I	I	S	MR	MR	MR	I	I
Malting: Other																			
CDC Churchill (2)☺	19	109	12.2	1	-5	-0.2	R	G	MS	MR	—	MR	MR	I	MR	MR	MR	MS	MS
CDC Copper (2)☺	19	105	12.3	1	-5	-0.7	R	G	I	MR	MR	MR	MR	I	I	MR	MR	MS	MS
CDC Fraser (2)☺	32	108	12.1	1	0	-0.7	R	G	R	MR	MS	MR	MR	MR	MR	MR	MR	I	I
AAC Goldman (2)☺	50	105	12.7	1	3	-0.4	R	G	MS	I	S	I	R	I	I	MR	MR	MR	MR
CDC Goldstar (2)☺	14	104	12.4	0	0	0	R	G	I	R	S	I	MR	I	I	MR	MR	MS	MS
CDC Kindersley (2)☺	34	103	12.7	-1	-3	0	R	G	S	R	I	MS	MR	I	MR	MR	MR	I	I
CDC Meredith (2)☺	42	103	12.5	2	-3	-2.1	R	F	R	MR	I	MS	R	MS	MR	MR	MR	I	I
CDC PlatinumStar (2)☺	18	99	12.2	0	3	-0.5	R	F	S	R	S	I	MR	S	I	MR	MR	MR	MR

Cereals diseases – effects of rotation

- Not strong
 - Rusts (blown in)
 - Fusarium head blight (other incl. non-cereal hosts)
- Significant impacts
 - Wheat (Septoria & tan spot)
 - Barley (Net Blotch)
 - Oats (bacterial blight)
 - Corn (Goss' wilt)

Slippery Slope – Pest Buildup

	Fusarium HB	Root Rots	Net Blotch	Goss Wilt	Sclerotinia	Rhizoctonia RR	Fusarium RR	Pasmo	Phytophthora RR	Blackleg	Ascochyta	Aphanomyces	Clubroot
BREAK	2	3+	2	2	3+	3+	3+	3	3+	2	3	3+	3+
Wheat	+++	++											
Oat	+	+											
Barley	+	+++	+++										
Grain Corn	+	+		+++									
Canola					+++	++				+++			+++
Flax					+	++		+++					
Field Pea					+	+					+++	+++	
Soybean					++	+	++		+++				
Sunflower					++++	+							

The most destructive disease affecting annual broadleaf crops in wetter years

- *Sclerotinia sclerotiorum* (Lib.) de Bary
- Causes stem rot, white mold, wilt, head rot
- Infects most broadleaf crops:
 - Canola, pulses and sunflowers



**life cycle /
spore
illustrations]**



How Apothecia Appear

- From sclerotia within 1 – 2 in. of surface
- **When soil is near-saturated** for 7 – 8 days
 - Between field capacity and saturation
 - More likely in heavier textured soils
 - Usually beneath a plant “canopy”
- Over a wide temperature range
 - More likely when it’s cool



Rotational concerns with too much canola

- Blackleg
 - Selection of new pathotypes
 - Sexual spores are a neighborhood issue
 - Inoculum overload

THE WESTERN PRODUCER

[News](#) [Opinions](#) [Markets](#) [Machinery](#) [Livestock](#) [Crops](#) [Farm Living](#) [Video](#) [FarmZilla Classifieds](#) [Subscriptions](#) [Digital Edit](#)

FREE NEWSLETTER SIGNUP

FREE! | GLACIER FARMMEDIA MEMBERSHIP. BEGIN SAVING NOW

YOUR READING LIST

Measuring blackleg's impact on profitability
Jan 24, 2019 NEWS

Blackleg resistance may be breaking down in Alberta
Jan 24, 2019 NEWS

Alberta receives bertha armyworm warning
Jan 24, 2019 NEWS

Global outlook predicts fewer dairy farms
Jan 24, 2019 LIVESTOCK

Prince Rupert optimistic about ag handlings
Jan 24, 2019 NEWS




By Robin Booker

Published: January 24, 2019

News

[f](#)
[t](#)
[v](#)
[x](#)

Measuring blackleg's impact on profitability

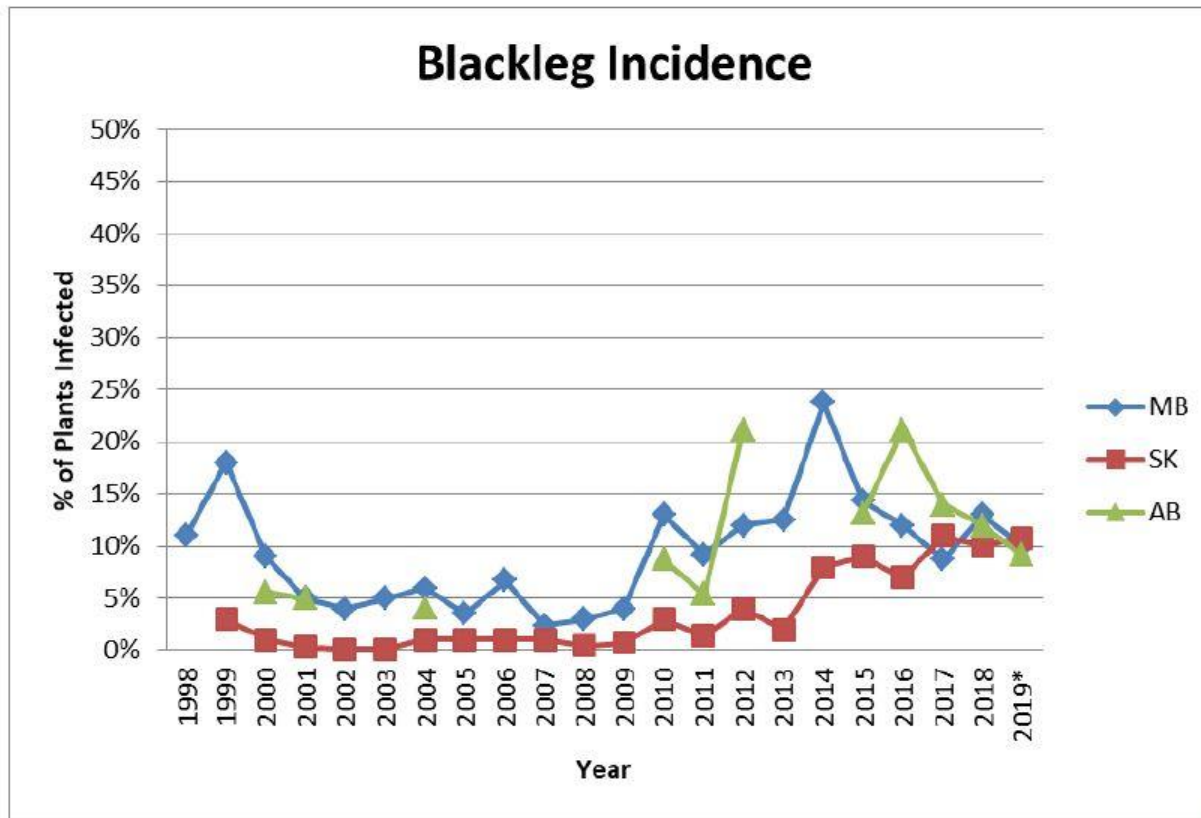



Blackleg may not be the most yield-robbing fungus that prairie canola producers face, but it is certainly a concern.

"Growers shouldn't assume that blackleg doesn't have a repercussion for their overall profitability," said Clint Jurke of the Canola Council of Canada.

2019 Blackleg Disease Survey Results

preliminary data



Incidence: MB-10%; SK-11%; AB – 9%

Completed by Provincial Governments

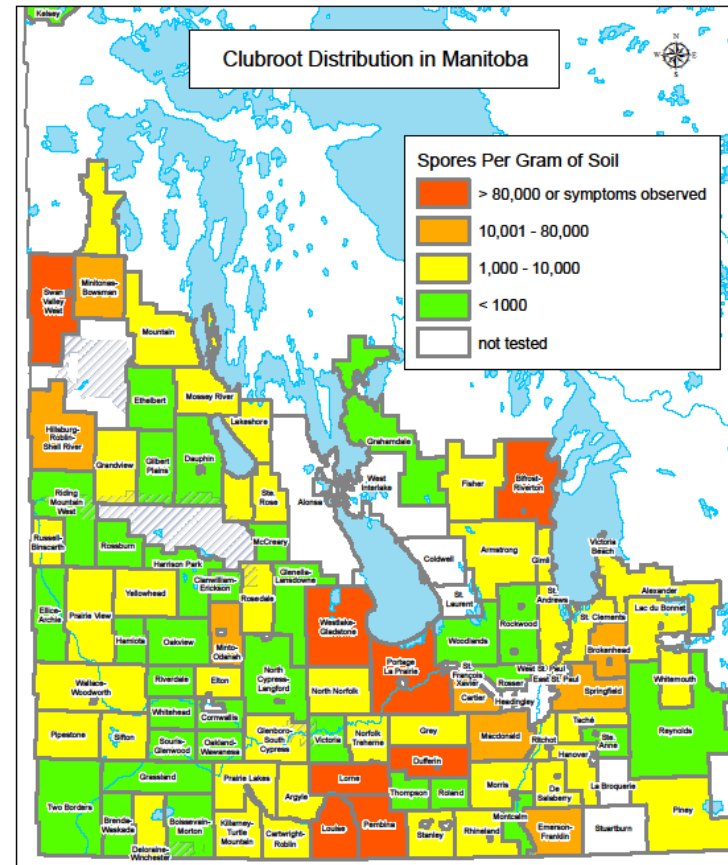
Source: Canola Council of Canada

New concern for canola - clubroot



Rotational concerns with too much canola

- Clubroot
 - Expansion of an emerging disease
 - Long-lived resting spores require longer break
 - Inoculum movement through wind and water



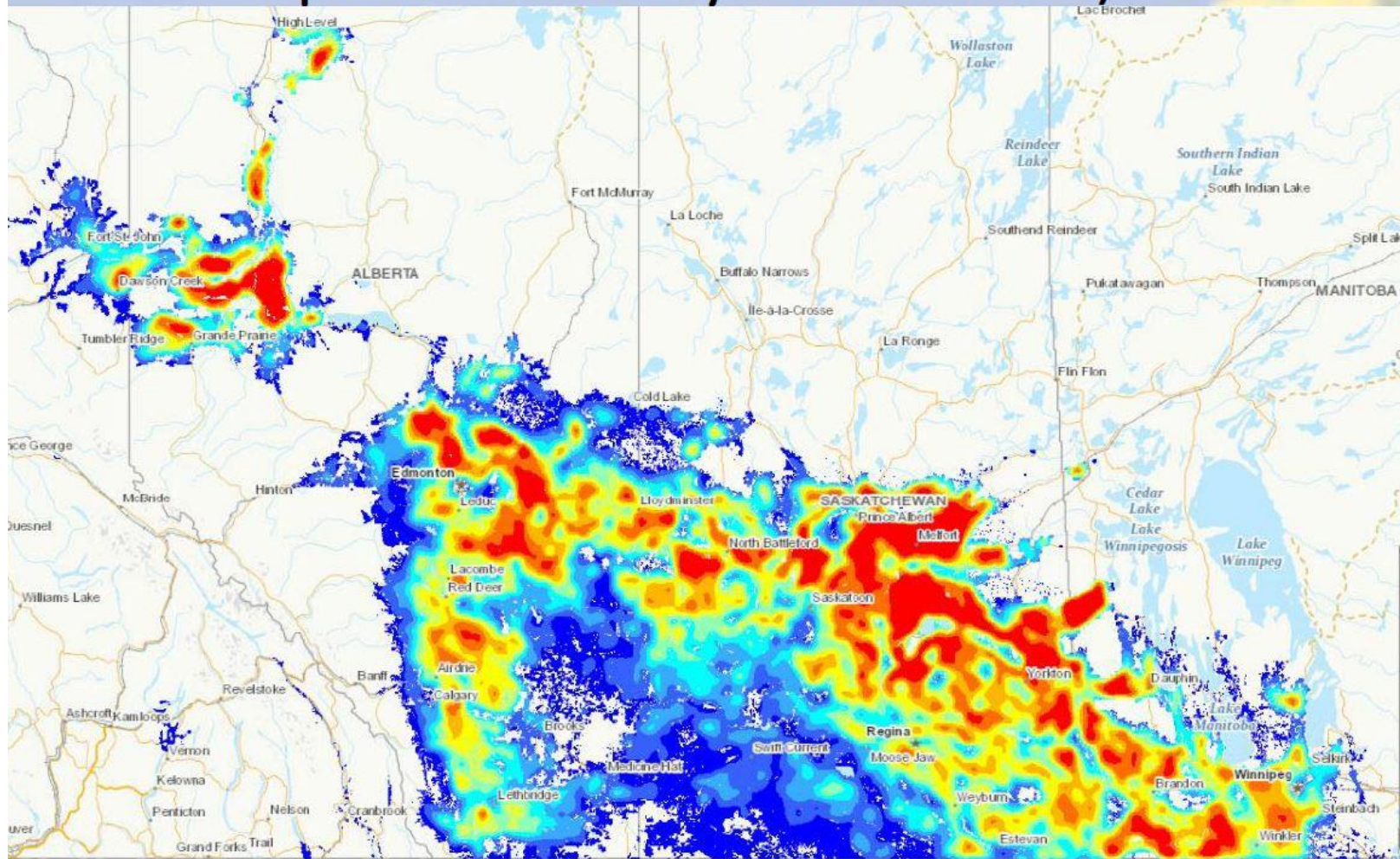
Author: Les Mitchell
 Date: September 12 2019
 Source: MB Ag analysis (2009-2019)

1:2,300,000 0 45 90 180 Kilometers

History of Clubroot in Manitoba

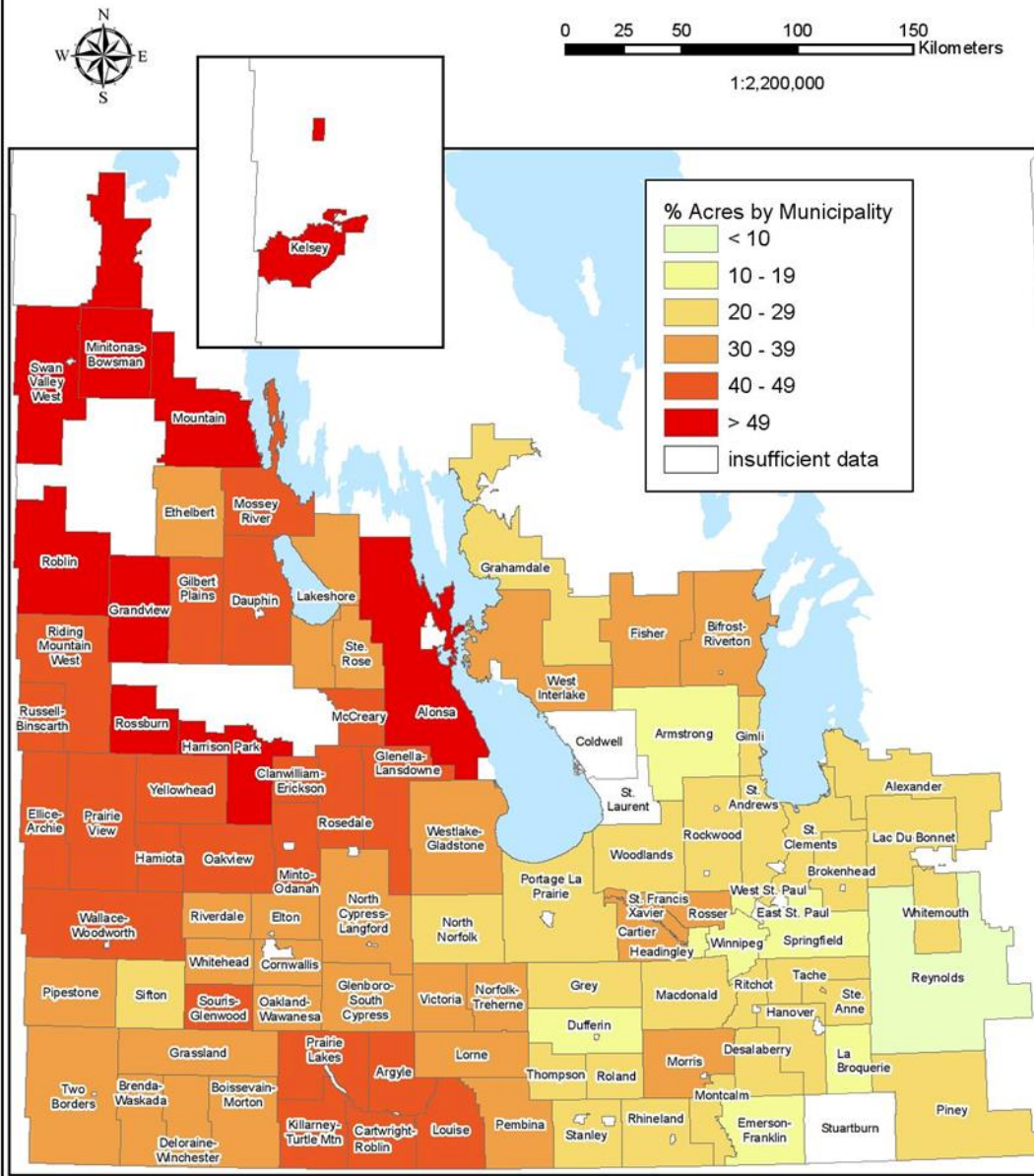
- Vegetable crops – reports dating back to 1925
- 2005: Low severity symptoms observed in field
 - All testing came back inconclusive
- 2011: Started detecting *Plasmodiophora brassicae* var. Woronin DNA in soil samples
- 2013: First case of clubroot symptoms in field in canola in MB
- 2017: Formal township survey concluded
- 2019: Confirmation of resistance-breaking pathotype 3A in MB

Canola Frequency on Prairies (2009-16 Spatial Density from AAFC)



Source: Murray Hartman, presentation at Canola Discovery Forum, November 2019

Canola as a Percent of Total Acres (2018)



- Potential high-risk areas for developing clubroot
- More frequent canola crops in an area = greater risk of clubroot spore increase and infection
- >40% canola acres in a year means susceptible crop, and lots of it

Just because your RM is not **RED** on the clubroot map, doesn't mean you are not at a higher risk for finding it

Source: MASC crop data: Canola acres as a percentage of available arable acres (2008-2013 average).
 Author: Les Mitchell
 Date: January 26, 2019



Scouting

- Look for areas that are stressed or prematurely ripening
- Check field approaches, corners, low spots, water runs and near yards and shelterbelts
- Dig up (not just pull) plants from these areas and compare to healthy portions of field
- Clubroot dev. is favoured by moist, warm soils



SOURCE: MANITOBA AGRICULTURE, 2013

It 's all about the numbers

- Soils in Alberta can have 10 million or 100 million resting spores per gram
- A 90% reduction could still leave a million spores

Keep the numbers as low as possible!

< 1,000

1,000

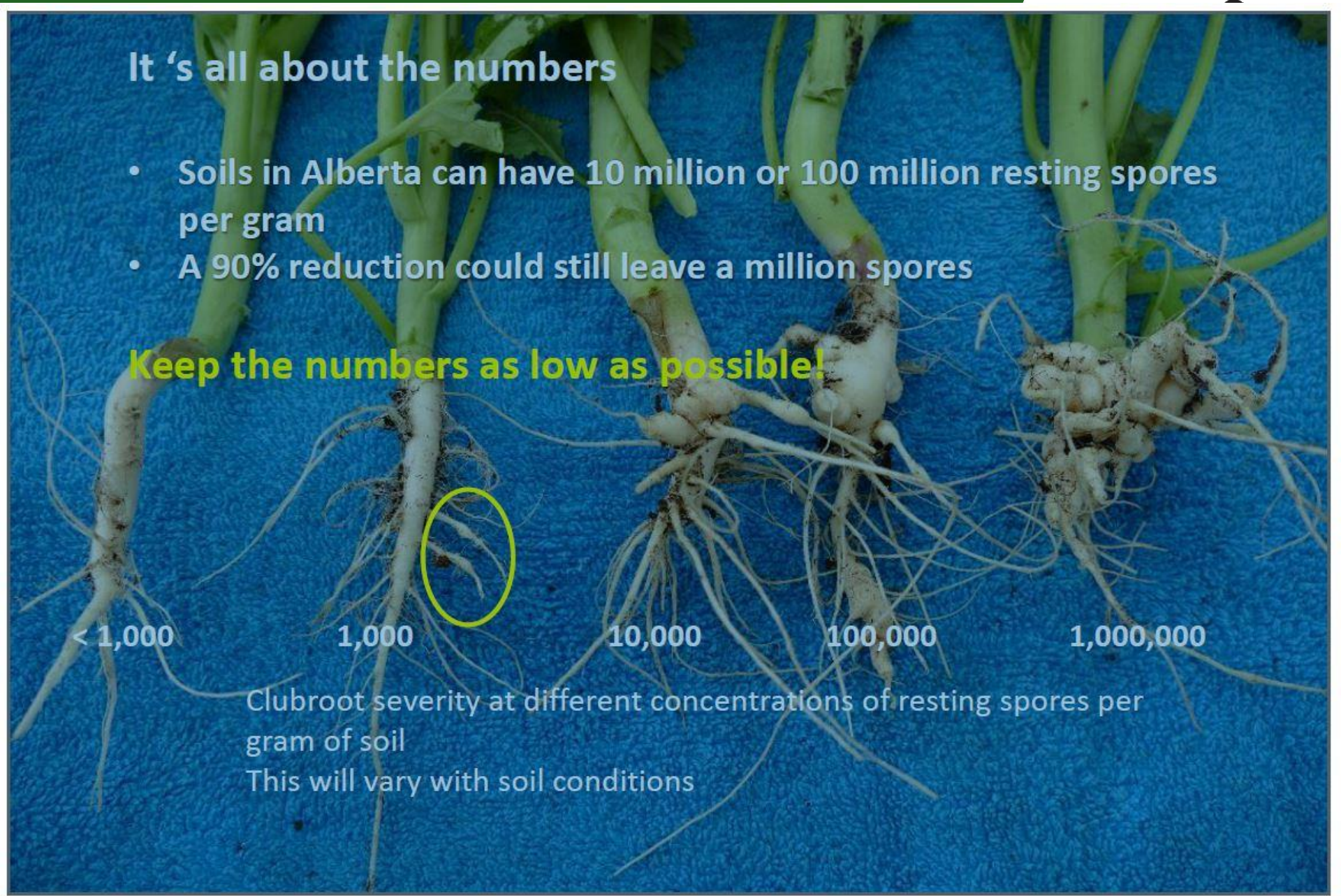
10,000

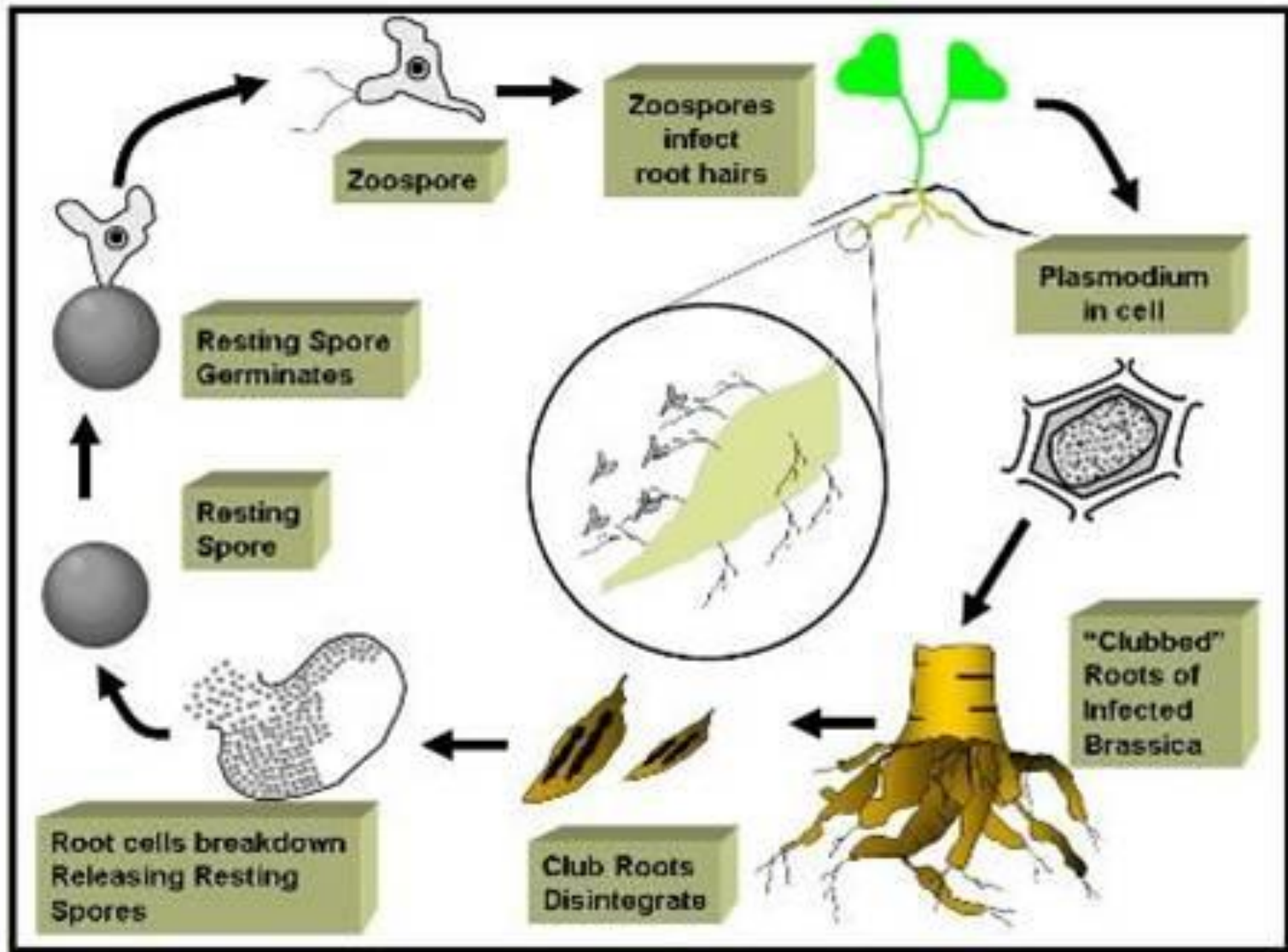
100,000

1,000,000

Clubroot severity at different concentrations of resting spores per gram of soil

This will vary with soil conditions





Top canola varieties and disease ratings

canola			clubroot	blackleg
L233P (LT)	1407989	44%		R
L255PC (LT)	371835	12%	R	R
L252 (LT)	306110	10%		R
L234PC (LT)	83952	3%	R	R
L230 (LT)	72719	2%		R
46H75 (ST)	58582	2%		R
P501L (LT)	54068	2%	R	R
75-65 RR (RT)	53420	2%		R
1026 RR (RT)	50634	2%	R	R
45CM39 (RT)	41954	1%	R	R

R-rated Hybrids

- 10 LL
- 2 CL
- 42 Total

Commercially available in 2020

O
I
L
S
E
D
C
R
O
P
S

CLUBROOT RESISTANT CANOLA VARIETY LISTING

Company	Hybrid	Herbicide Tolerance ¹	Clubroot Resistance		Blackleg Resistance	Pod Shatter Tolerance
			Resistance Rating	Resistance Generation ²		
BASF - InVigor	L241C	LL	R	1	R	
BASF - InVigor	L234PC	LL	R	2	R	
BASF - InVigor	L255PC	LL	R	1	R	Yes
BASF - InVigor	L258HPC	LL	R	1	R	Yes
BASF - InVigor	LR344PC	LL/TF	R	1	R	Yes
BASF - InVigor	L345PC	LL	R	1	R	Yes
BASF - InVigor	L352C	LL	R	1	R	
BrettYoung	4187 RR	RR	R	1	R	
BrettYoung	6076 CR	RR	R	2	R	
BrettYoung	6090 CR	RR	R	1	R	Yes
BrettYoung	BY 5105 CL	CL	R	1	R	
BrettYoung	BY 6204 TF	TF	R	1	R	
BrettYoung	BY 6207 TF	TF	R	2	R	
BREVANT seeds	1024 RR	RR	R	1	R	
BREVANT seeds	1026 RR	RR	R	1	R	
BREVANT seeds	1028 RR	RR	R	1	R	
BREVANT seeds	2028 CL	CL	R	1	R	
BREVANT seeds	B3010M	LL	R	2	R	Yes
BREVANT seeds	B3011	LL	R	1	R	
BREVANT seeds	D3155C	RR	R	1	R	
Cargill - VICTORY	V12-3	RR	R	1	R	
Cargill - VICTORY	V14-1	RR	R	1	R	
Cargill - VICTORY	V24-1	RR	R	1	R	
Cargill - VICTORY	V25-1T	TF	R	1	R	
Canterra Seeds	CS2000	RR	R	1	R	
Canterra Seeds	CS2600 CR-T	TF	R	2	R	Yes
DEKALB	75-42 CR	RR	R	1	R	
DEKALB	DKTF 94 CR	TF	R	1	R	
DEKALB	DKTF 98 CR	TF	R	1	R	
Pioneer Hi-Bred	45CM39	RR	R	2	R	Yes
Pioneer Hi-Bred	45CS40	RR	R	1	R	
Pioneer Hi-Bred	45H33	RR	R	1	R	
Pioneer Hi-Bred	45H37	RR	R	1	R	
Pioneer Hi-Bred	P501L	LL	R	1	R	
Nutrien Ag Solutions	PV 580 GC	RR	R	1	R	
Nutrien Ag Solutions	PV 581 GC	RR	R	1	R	
Nutrien Ag Solutions	PV 585 GC	RR	R	1	R	
Nutrien Ag Solutions	PV 591 GCS	RR	R	1	R	
Nutrien Ag Solutions	PV 680 LC	LL	R	1	R	
Nutrien Ag Solutions	PV 780 TC	TF	R	1	R	
WinField United Canada	CP19R1C	RR	R	1	R	
WinField United Canada	CP20R3C	RR	R	2	R	

¹ Herbicide tolerance trait, LL = Liberty Link, RR = Roundup Ready, TF = TruFlex Roundup Ready, CL = Clearfield Herbicide System

² Second-generation clubroot genetic resistance may demonstrate an enhanced resistance to certain clubroot pathotypes.

How to manage clubroot

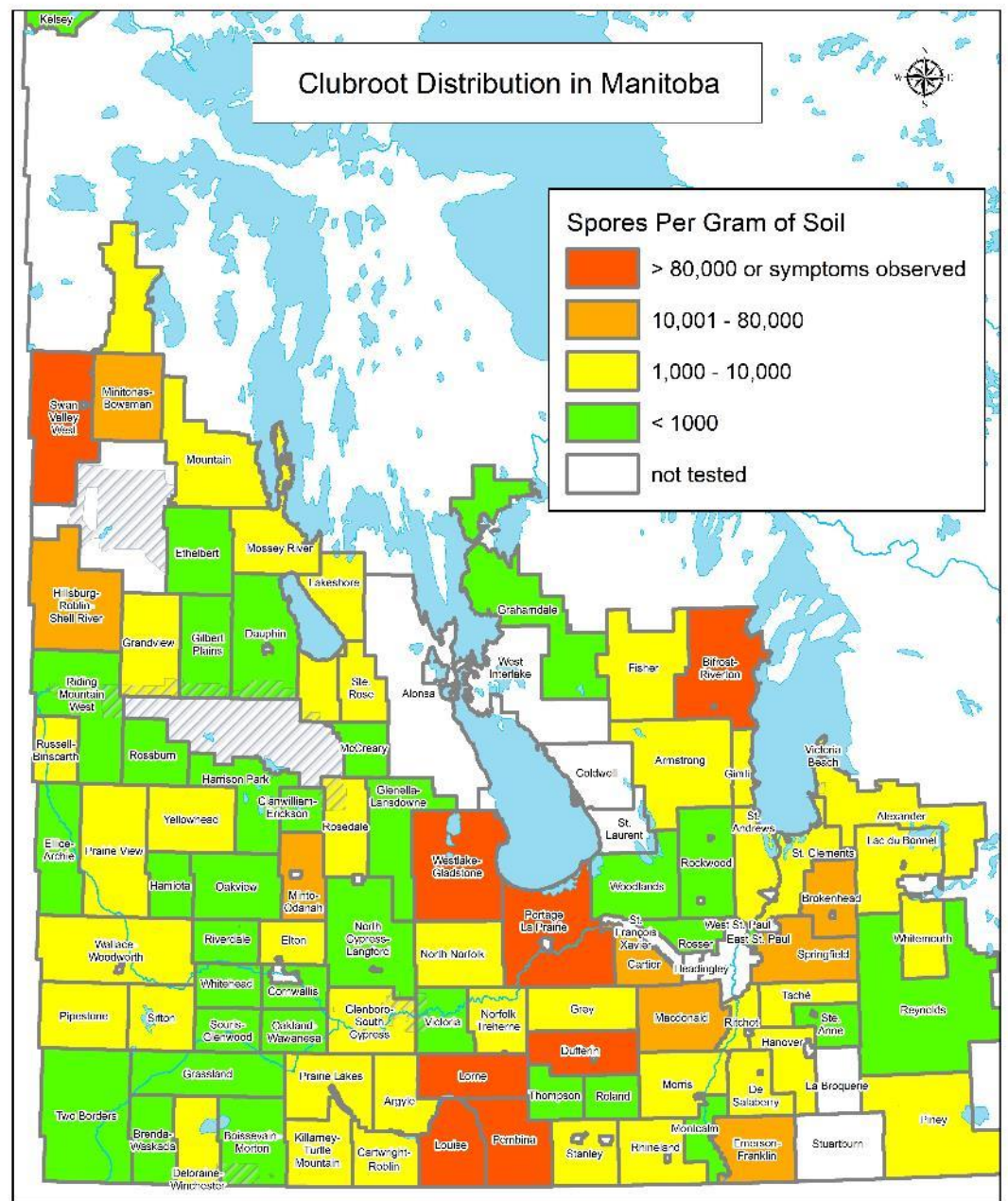
- Rotation, rotation, rotation
 - Scout for disease & pathogen
 - Stop movement of resting spores
 - Stop spore increase
 - Employ patch management
 - Use CR varieties if your area has higher spore loads or fields with symptoms



Sanitation & Biosecurity

- Regulating entry to your fields
- Requiring booties or cleaning footwear with bleach
- Staging field operations to reduce soil transfer
 - e.g. Till field when drier, preventing clods sticking on equipment
 - Do field work last on infected field, then clean equipment

Current status



Author: Les Mitchell
 Date: September 12 2019
 Source: MB Ag analysis (2009-2019)

1:2,300,000

0 45 90 180 Kilometers

Another “slow building” soil-borne disease

- Soybean Cyst Nematode (SCN) – won’t see aboveground symptoms until levels have built for a number of years.
- Cysts on roots are tiny and not likely to be visualized unless roots are washed carefully
- The pest survives as eggs in encysted (dead) females and can move with the soil by water & wind

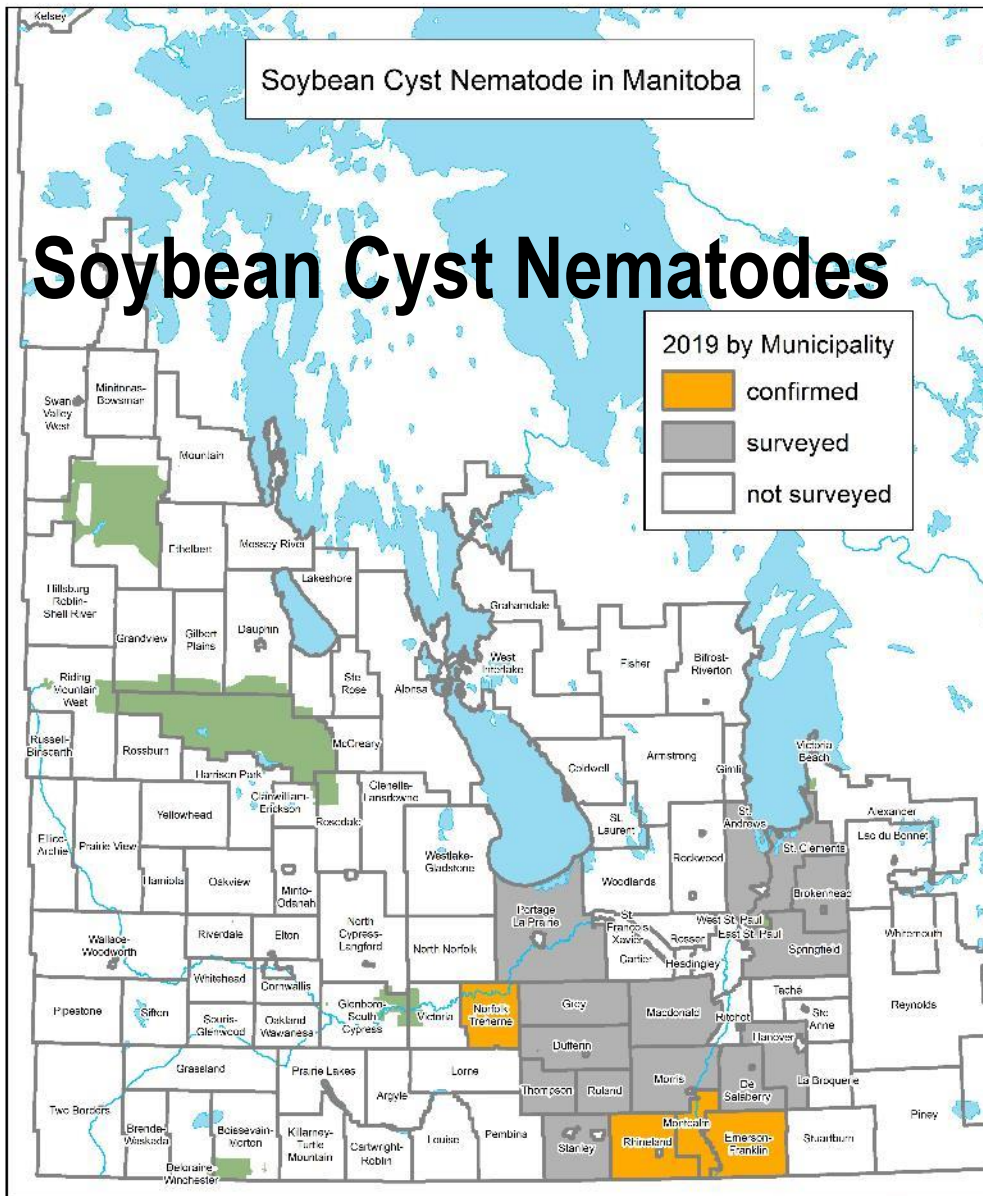
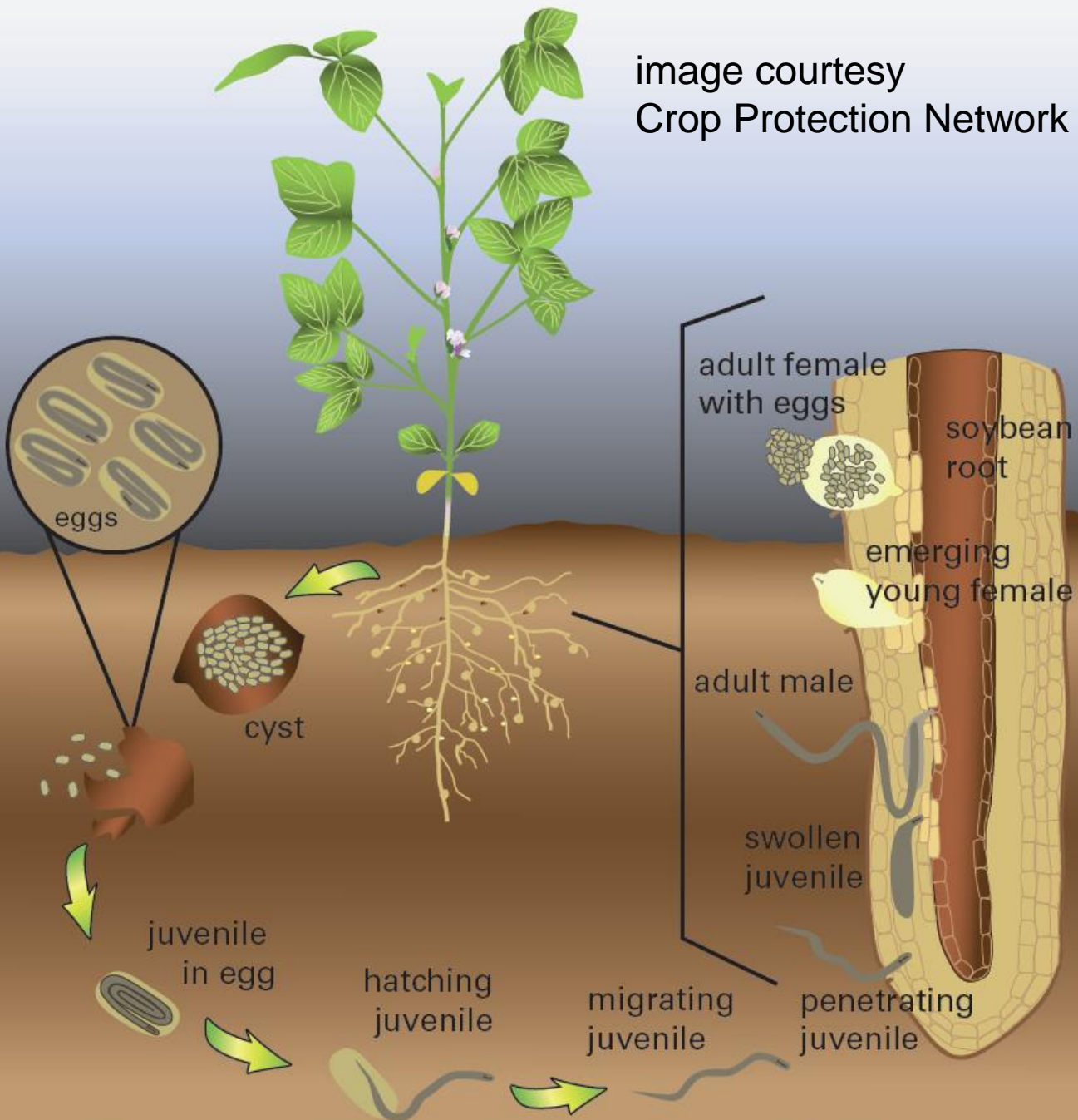
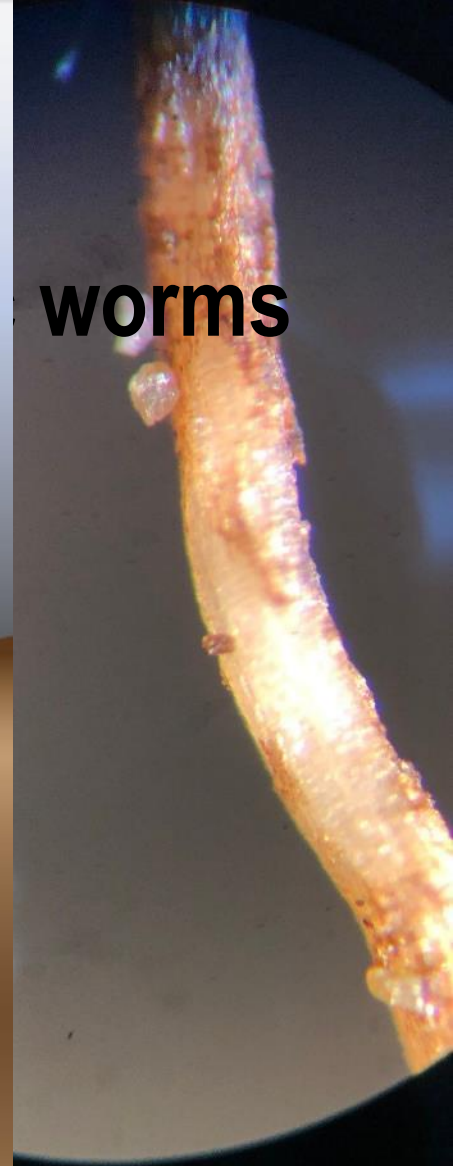


image courtesy
Crop Protection Network



worms



*Life stages not all illustrated at the same magnification

Both these pests (clubroot and SCN) will establish where rotation is “too tight”

- But can go undetected until such time as they require lengthy breaks to allow breakdown of the pest
- Resistant genotypes are already available but may need to be rotated as well to prevent overcoming resistance.

Assumptions: Crop Sequence Yields

Previous Crop	Crop Planted								
	Spring Wheat	Oat	Barley	Canola	Flax	Field Pea	Soybean	Sunflower	Grain Corn
Sp Wheat	85	94	95	102	104	103	102	103	96
Oat	91	79	78	95	92	93	100	102	99
Barley	88	90	82	100	102	91	100	96	92
Canola	100	101	103	87	86	98	100	92	99
Flax	96	90	107	103	83	91	98	88	85
Field Pea	102	110	106	104	148	-	95	-	98
Soybean	107	108	107	103	107	90	93	103	103
Sunflower	102	102	106	90	99	85	93	82	97
Grain Corn	98	110	94	110	-	90	101	115	88
<i>Yield/ac</i>	<i>50 bu</i>	<i>101 bu</i>	<i>65 bu</i>	<i>36 bu</i>	<i>21 bu</i>	<i>38 bu</i>	<i>35 bu</i>	<i>1607 lb</i>	<i>121 bu</i>

Source: Yield response of Manitoba crops sown on large (>120 acre) fields of various previous crop (stubble) in rotation 2010-2016 (MASC)

Conclusions

- Over-reliance on a few crops leads to buildup of hard-to-manage (esp. soil-borne) diseases
- A minimum 2-year break between crops generally serves to allow pathogen breakdown
- Adding dis-similar crops to a rotation helps to manage and spread risks from both pests and environmental extremes

Crop Diagnostic School 2020

plan for Crop Diagnostic School 2020						trifluralin possible									
canola	wheat	soybean	gr.corn/sl.corn	oats	barley	ed.beans	fld.pea	sun(no/o)	faba	flax	buck.w	canary	mustard		
0.93L/ac liquid trifluralin 135 #/ac N	120 #/ac N as NH ₄ NO ₃	0.93L/ac	row		70 #/ac N			row							
						0.93L/ac							0.93L/ac		
			1	2	3	4	5	6	7	8	9	10	11	12	13

Please join the conversation with Manitoba Agriculture

- Subscribe to our [newsletter](#)
- Follow us on Twitter: twitter.com/MBGovAg
- Visit our website: Manitoba.ca/agriculture
- Call our general inquiries line 1-844-769-6224
- View our videos on YouTube:
youtube.com/ManitobaAgriculture

Slippery Slope – Pest Buildup

	Fusarium HB	Root Rots	Net Blotch	Goss Wilt	Sclerotinia	Rhizoctonia RR	Fusarium RR	Pasmo	Phytophthora RR	Blackleg	Ascochyta	Aphanomyces	Clubroot
BREAK	2	3+	2	2	3+	3+	3+	3	3+	2	3	3+	3+
Wheat	+++	++											
Oat	+	+											
Barley	+	+++	+++										
Grain Corn	+	+		+++									
Canola					+++	++				+++			+++
Flax					+	++		+++					
Field Pea					+	+					+++	+++	
Soybean					++	+	++		+++				
Sunflower					++++	+							