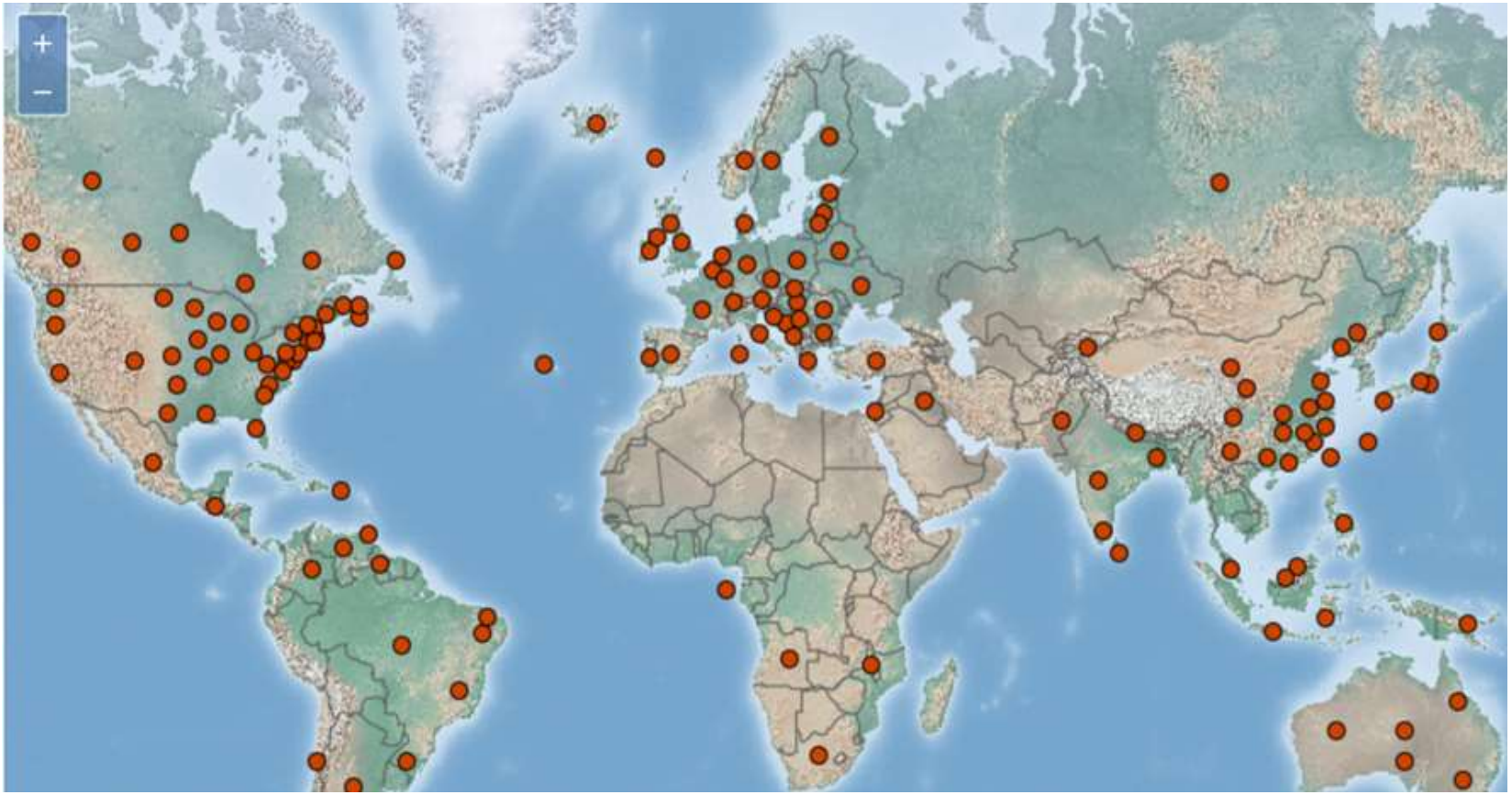
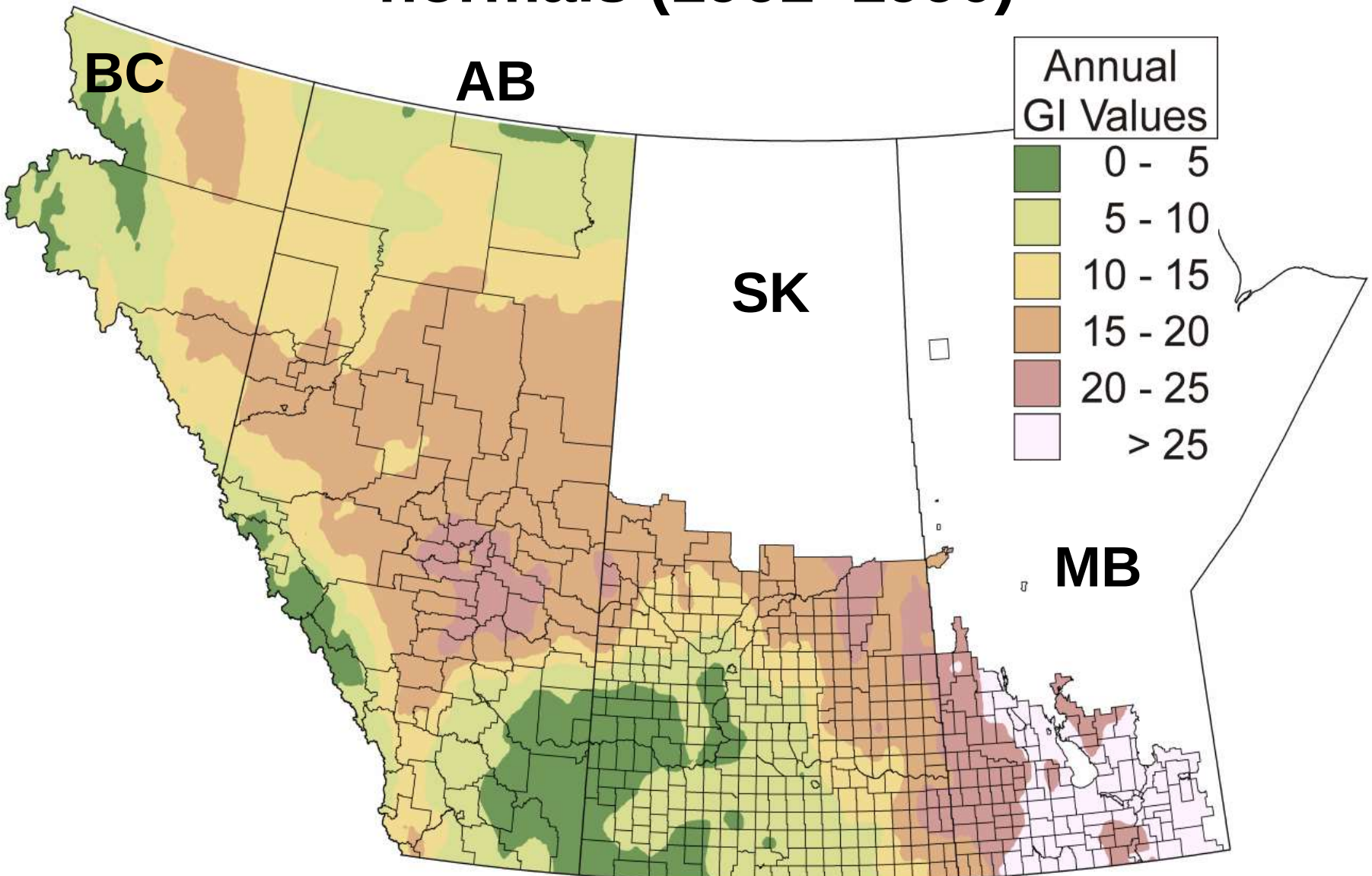
Clubroot: Don’t let this yield robbing disease move into your field

Warren Ward
Agronomy Specialist
Canola Council of Canada

Clubroot World-Wide Distribution



Annual growth index for projected clubroot development based on long-term climate normals (1961–1990)

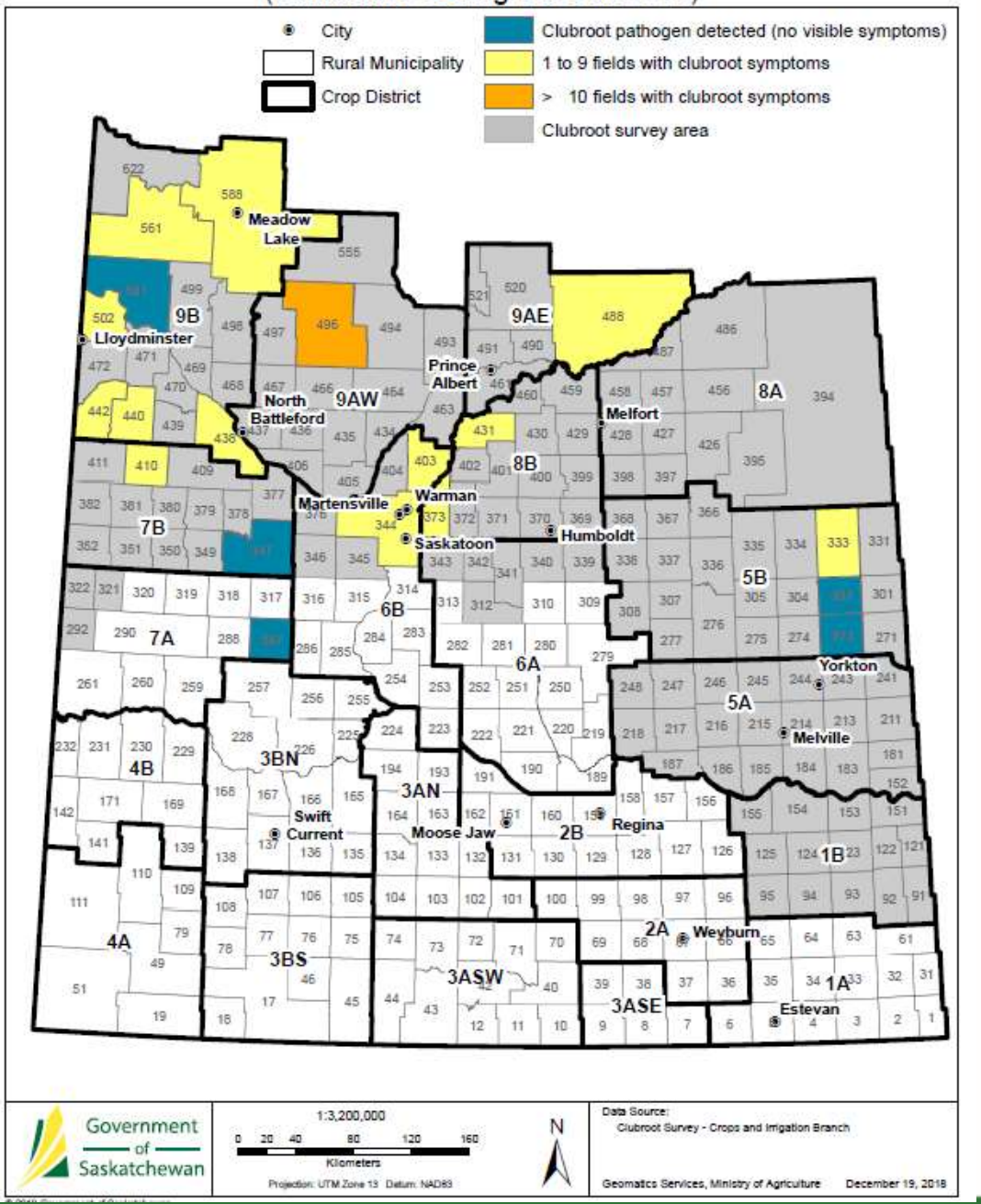


Growth Index Values

- **Describe suitability of locations for species survival and reproduction**
- **Growth Index (GI) values**
  - **0 - 10 = little or no occurrence, not economic**
  - **10 - 20 = limited to low occurrence, generally not economic (limited impact)**
  - **20 - 30 = routinely occurs, economic impact**
  - **>30 = very favourable, chronic economic impact**
  - **Year to year weather fluctuations will impact EI's and potential for development and impact**
    - **E.g. Below versus above average rainfall in June and July**

Clubroot Distribution in Saskatchewan

(cumulative testing 2008 to 2018)



Government of Saskatchewan

saskatchewan.ca

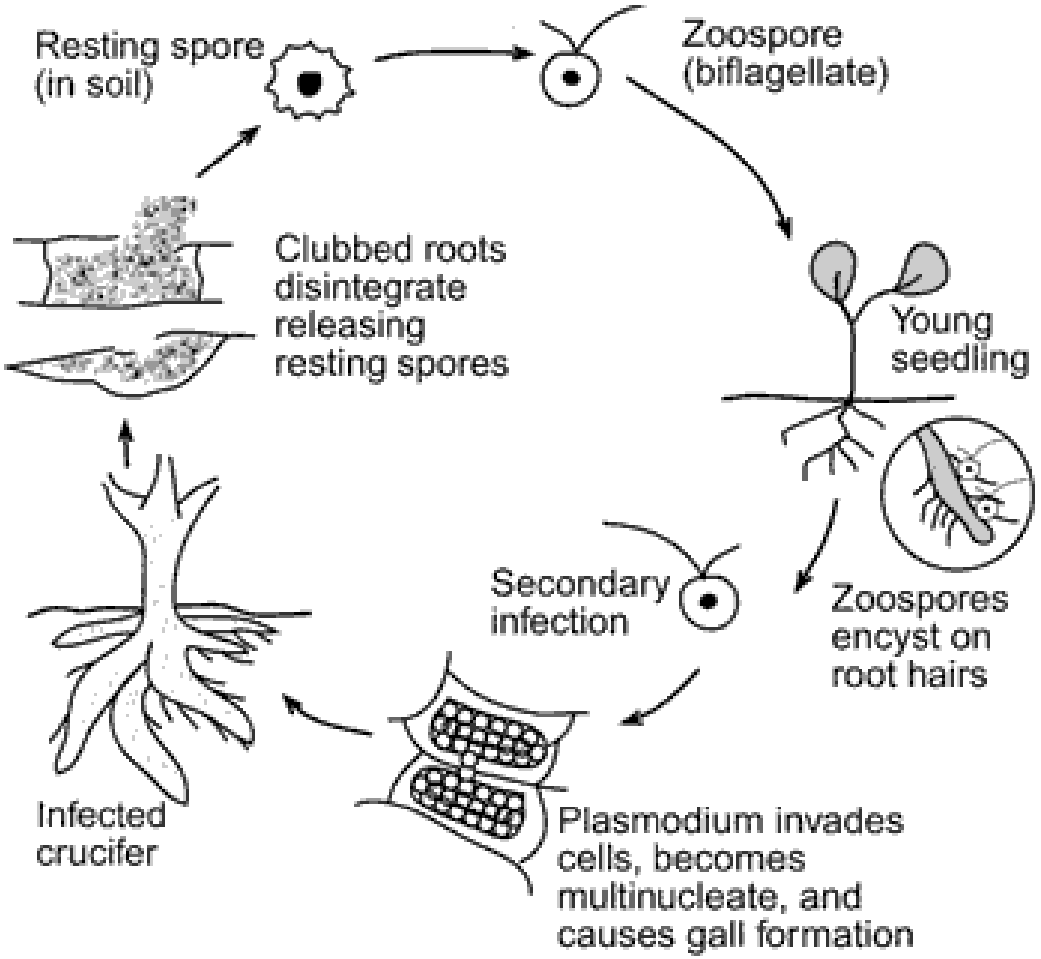
Government of Saskatchewan

Results and learning from 2018

- Visible symptoms of clubroot have been confirmed in 43 commercial canola fields (2017 and 2018).

- The clubroot pathogen was detected at low levels in 3 fields without visible clubroot symptoms

Clubroot biology: remains the same (but still complex)



How is clubroot spreading?

Clubroot travels where soil goes……

canolacouncil
OF CANADA

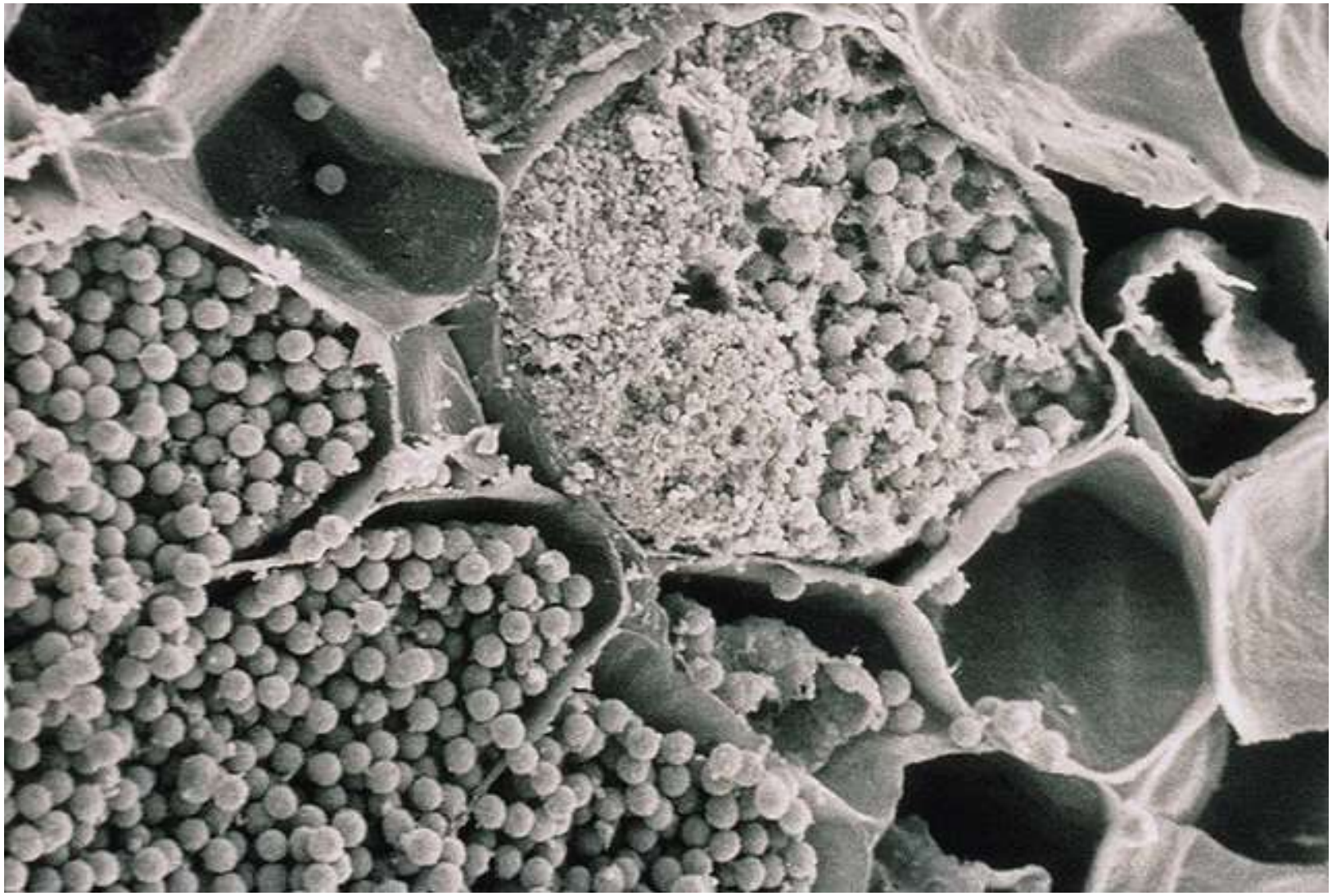
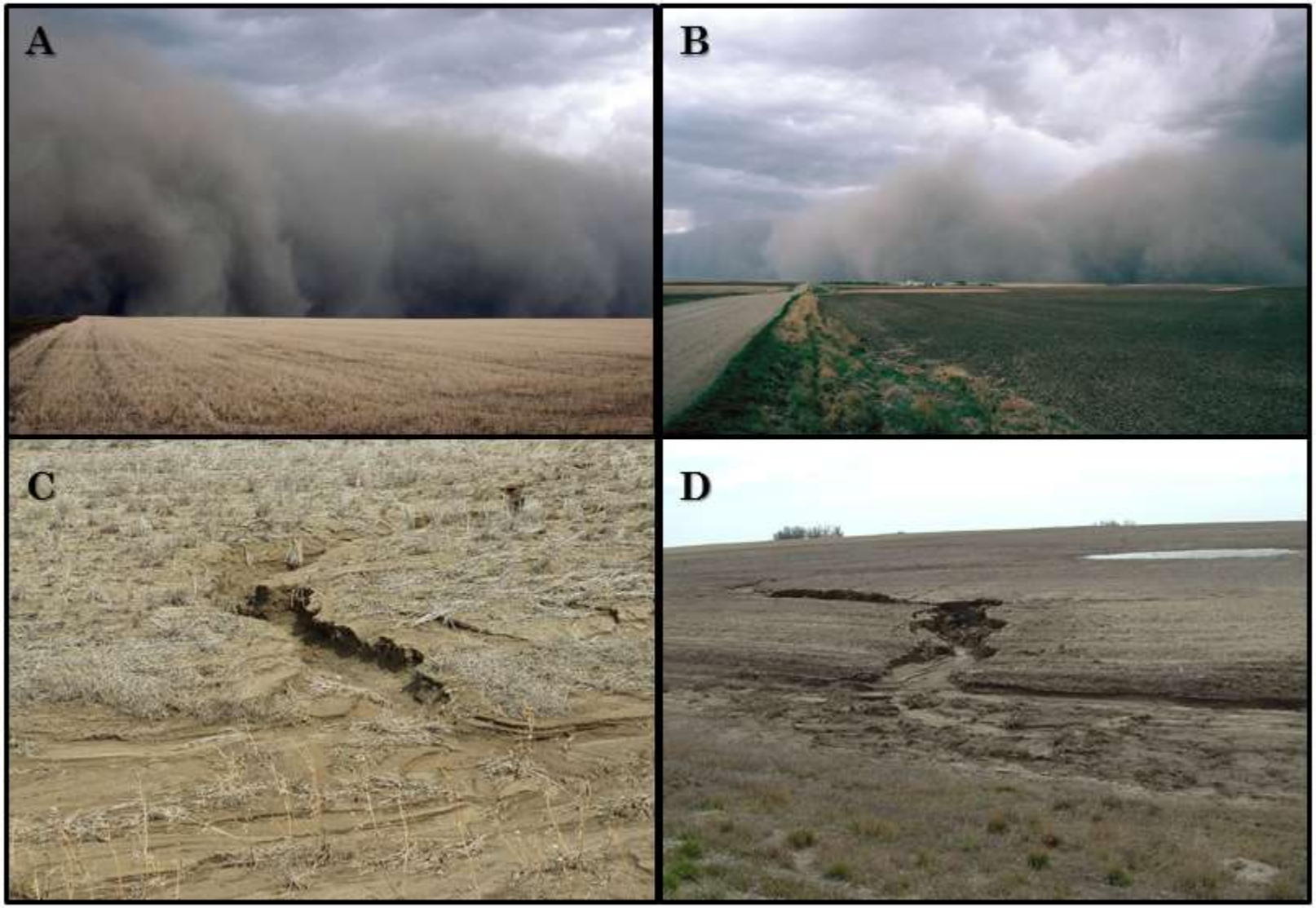


Photo courtesy of Dr. Ron Howard

Water/wind dispersal of *P. brassicae* resting spores



Compiled by BD Gossen

Samples analyzed for dust/spores

- Spore concentrations ranged from 0 to 2.2×10^5 (220,000) resting spores/g soil

- Likely contributes to local spread


HOW MANY SPORES COULD THERE BE ON MY MACHINE?
100 lbs
45,359,200,000 spores
7200 acres

HOW MANY SPORES COULD THERE BE ON MY MACHINE?

600 lbs

271,500,000,000 spores

42,000 acres

YES! The dirt on your machine is a significant risk

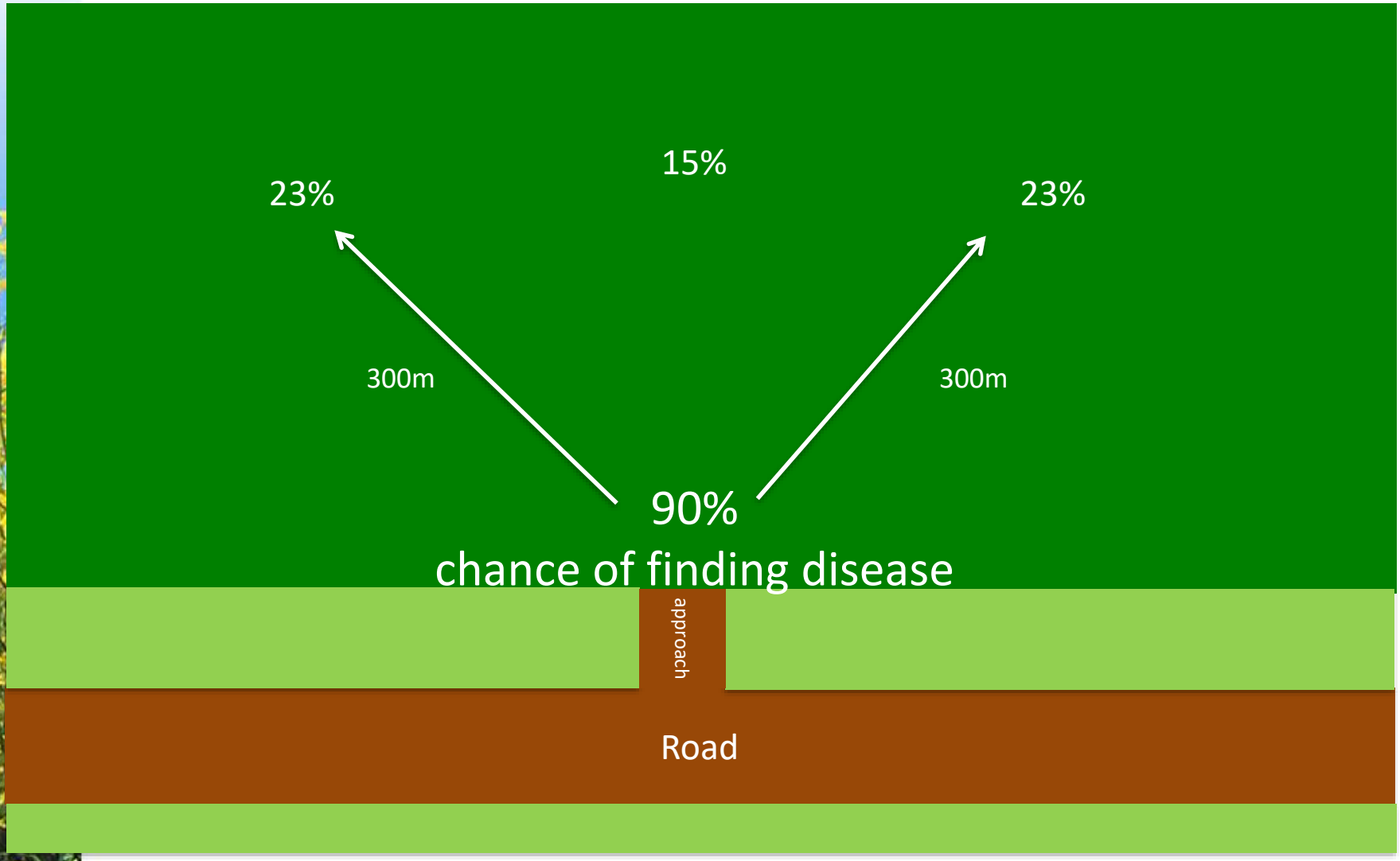

SALFORD

canolacouncil
OF CANADA

Clubroot ID

Clubroot Scouting

Entrances and Exits…



Farm Yard Entrance

canolacouncil OF CANADA

Near Grain Bins

canolacouncil
OF CANADA

Near Power Lines, Oil and Gas Activity

canolacouncil
OF CANADA

Low Areas

canolacouncil
OF CANADA

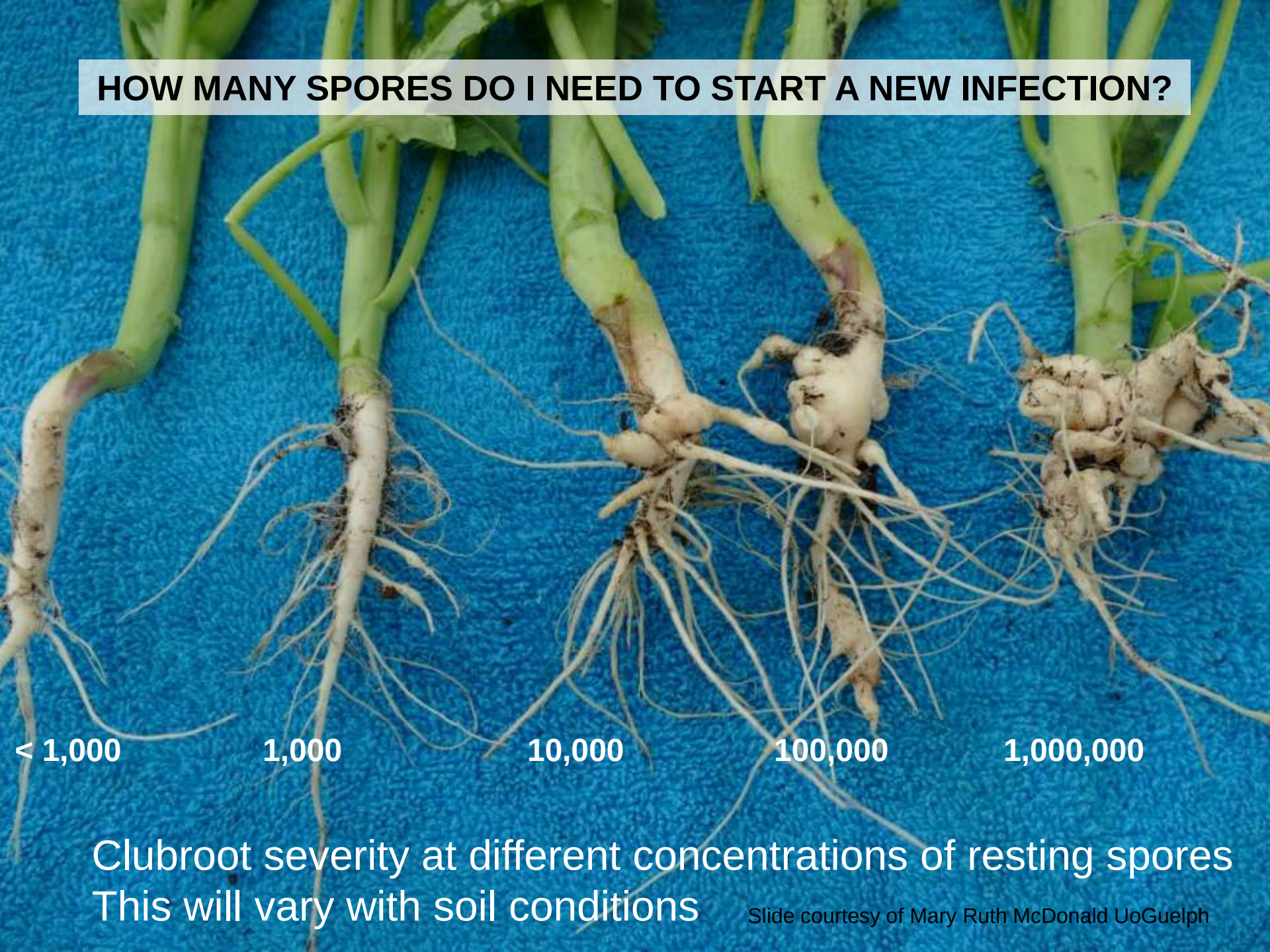
Clubroot Control

canolacouncil OF CANADA

Clubroot Control

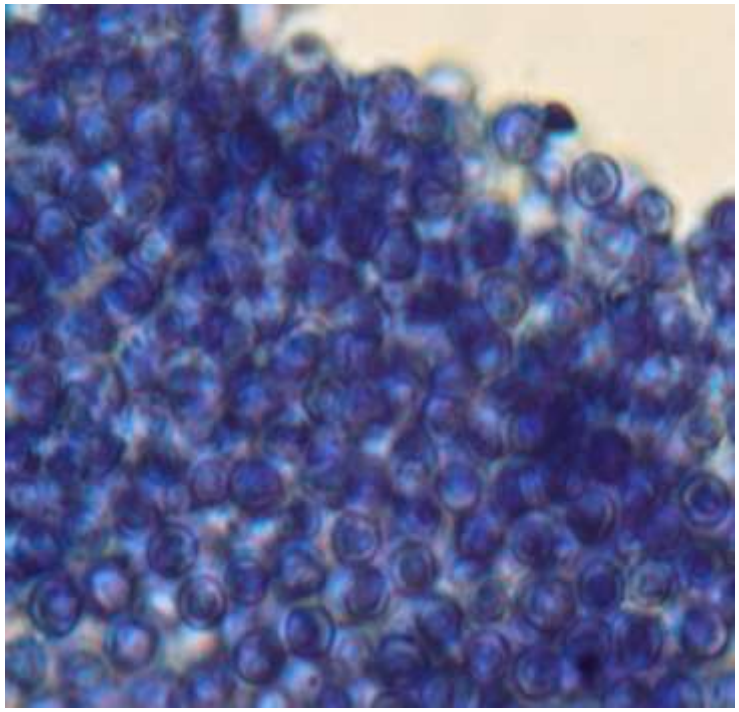
1. Prevent Spore Buildup
2. Reduce Spore movement
3. Scout!

HOW MANY SPORES DO I NEED TO START A NEW INFECTION?



Clubroot severity at different concentrations of resting spores
This will vary with soil conditions

Slide courtesy of Mary Ruth McDonald UoGuelph



- As galls mature, begin to decay

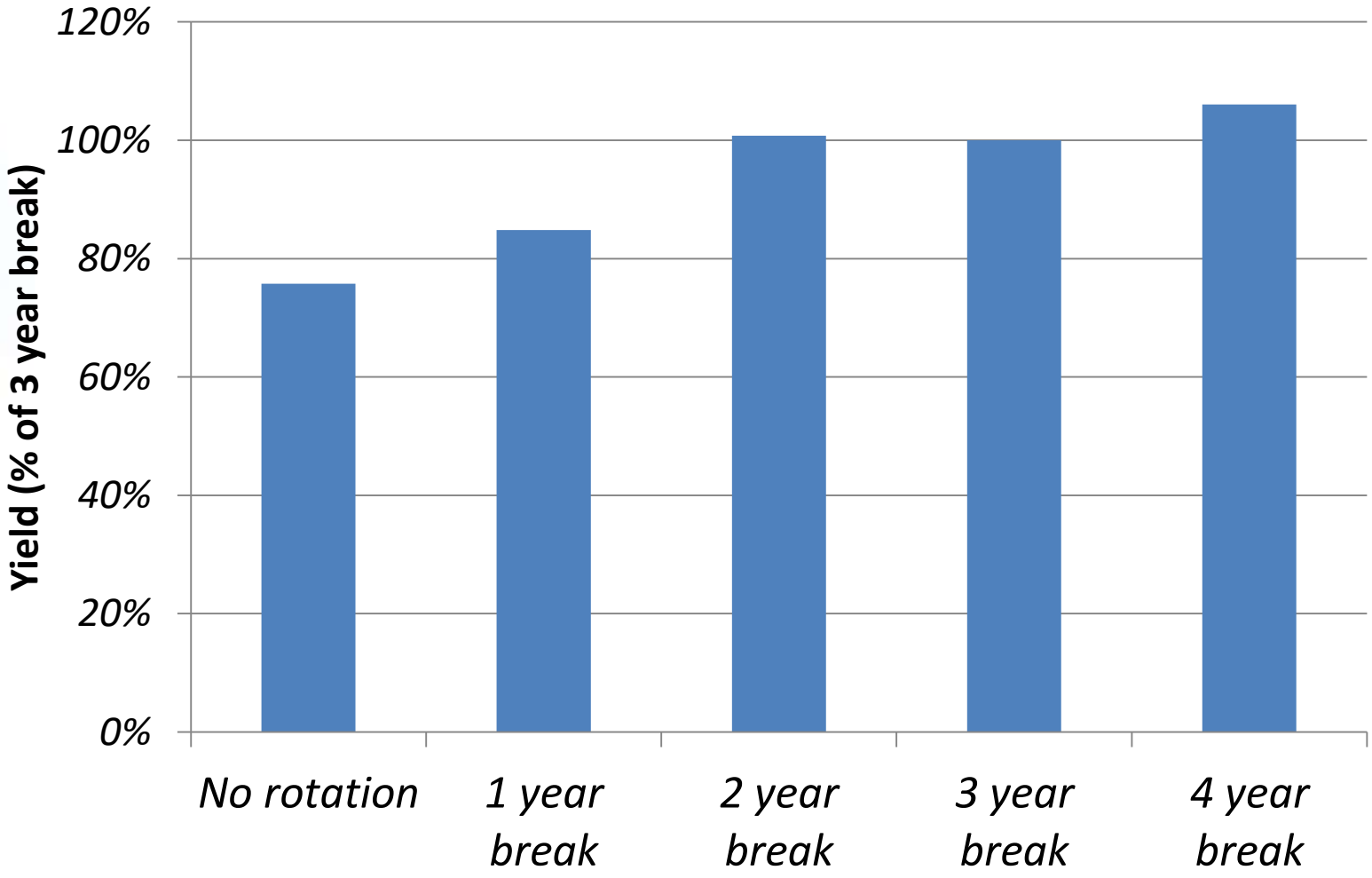
- Decaying galls become soft/mushy, brownish in color

Root galls can release up to 800×10^6 spores/g gall x 20 g/gall in a mature plant
(up to 16 billion spores per plant)

S.F. Hwang

Prevent Spore Build Up

Crop rotation with clubroot on yield



Peng, AAFC, 2015

Clubroot Resistance

Clubroot Resistant Varieties in 2019

Proven (Nutrien)
- PV 581GC
- PV 591GCS
- PV 585GC **

BrettYoung
- 6076 CR**
- 6090 RR
- 4187 RR

Pioneer/Brevant (Corteva)
- 45H29
- 45H33
- 45CM36 **
- 45H37
- 45CM39 **
- 45CS40
- D3155C
- 1024 RR
- 1026 RR
- 1028 RR
- 2028 CL

Invigor (BASF)
- L135C
- L241C
- L234PC**
- L255PC
- L258HPC

Victory (Cargill)
- V 14-1
- V 12-3

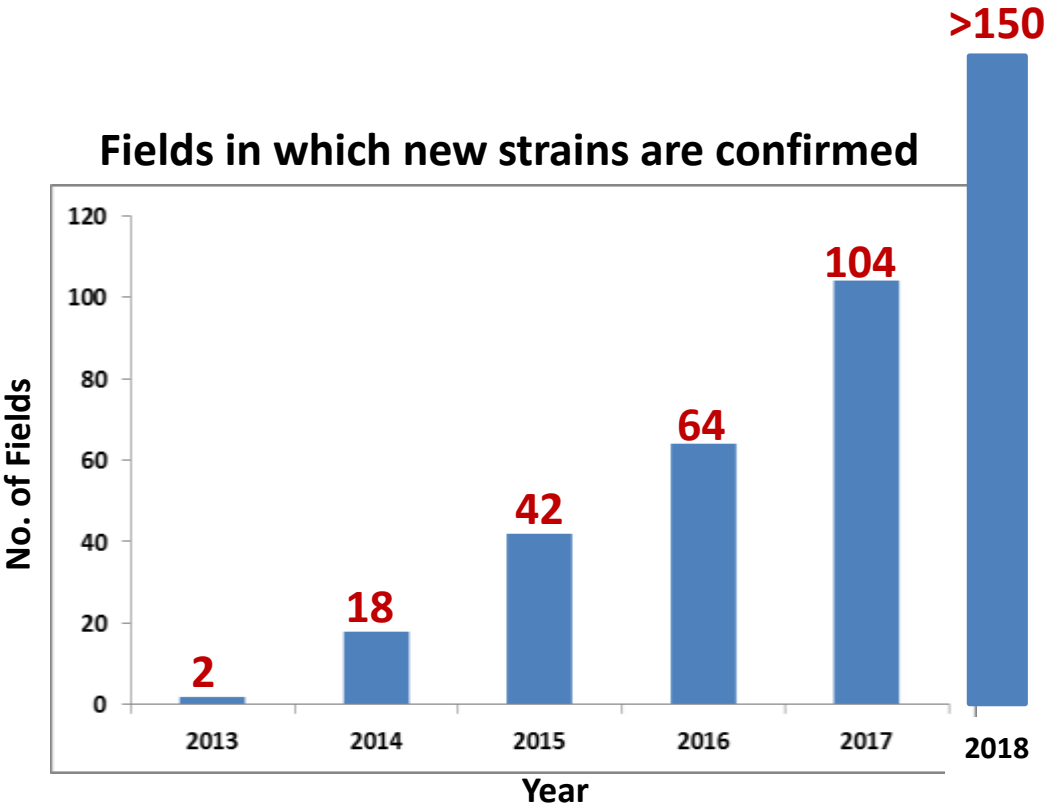
Dekalb (Bayer)
- 75-42 CR
- DKTF 94 CR

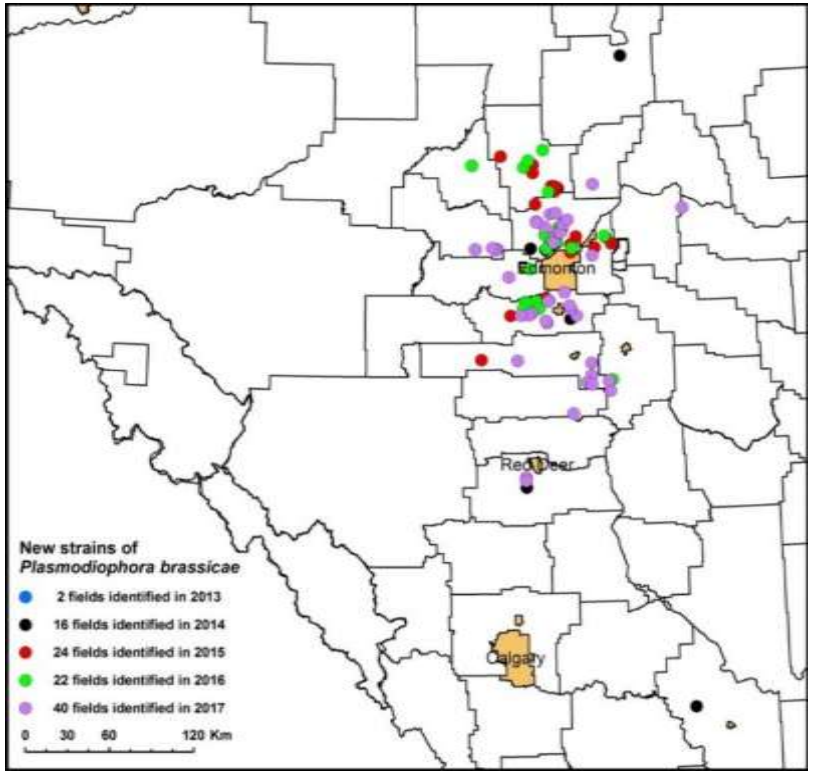
Canterra
- CS2000
- CS2600 CR-T

** = contains a new clubroot resistance trait

Clubroot Resistance Erosion

Increase in fields with resistance not working





Strelkov et al. unpublished

Samples tested from SK & MB do not appear to overcome resistance

Implications

- Emergence of new strains able to overcome resistance highlights continued vulnerability
- Loss of resistance would represent loss of most effective clubroot management tool
- Resistance stewardship is very important
  - Need longer rotations out of canola, especially where clubroot is an issue!

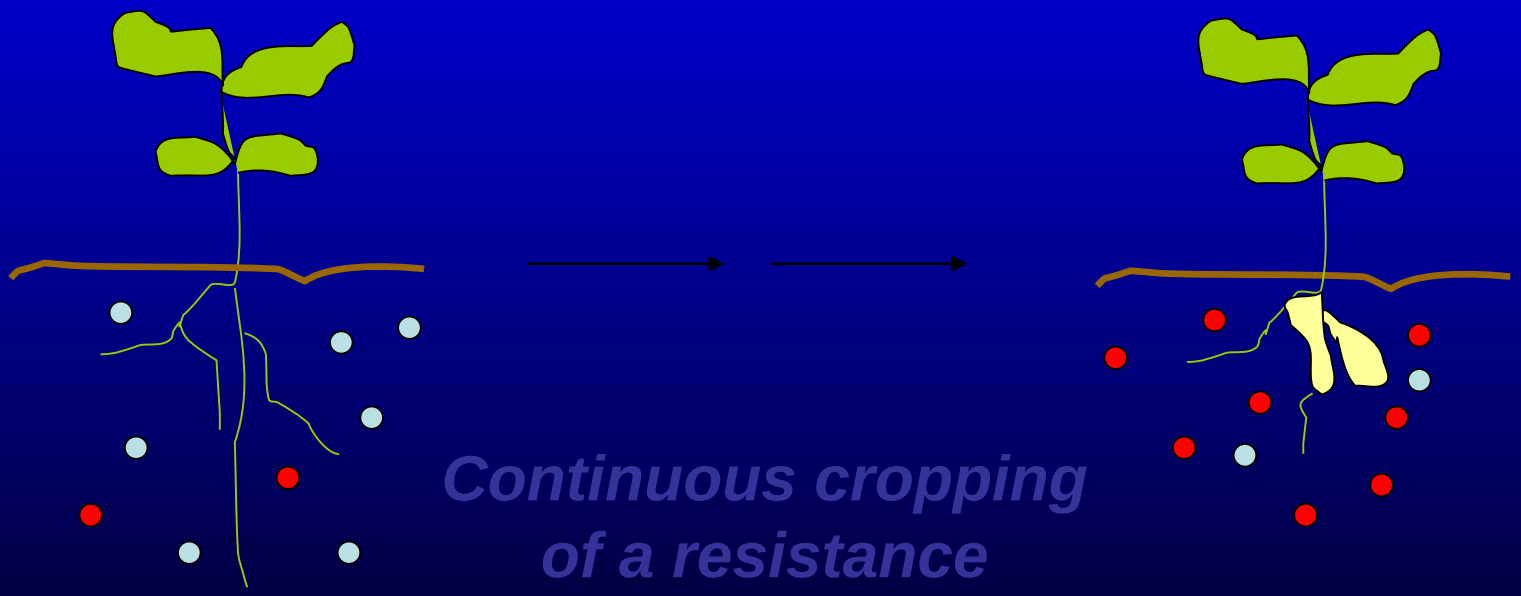
Canadian Clubroot Differential (CCD) Pathotype Classifications

Differential Host	Reaction																
ECD 02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ECD 05	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
ECD 06	+	+	+	+	+	+	-	+	+	-	-	-	+	+	-	+	-
ECD 08	+	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+
ECD 09	+	+	+	+	+	+	-	+	+	-	-	-	+	+	+	+	-
ECD 10 W	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ECD 11 BS	-	+	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-
ECD 13 JQ	+	+	-	+	-	+	-	+	-	-	-	-	+	-	+	-	-
Brutor	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Laurentian	+	+	-	+	+	+	-	+	-	+	-	-	-	+	+	+	-
Mendel	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+
Westar	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
45H29	+	+	+	+	+	-	+	-	-	+	+	-	-	-	+	+	+
Pathotype designations																	
CCD	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	X
Williams	3	2	5	3	8	2	5	3	5	8	5	5	6	8	3	8	5
Somé et al.	P2	P2	P2	P2	P2	P2	P3	P2	P2	P3	P3	P3	P2	P2	P3	P2	P3

Each unique virulence pattern on the hosts of the CCD Set assigned a different letter to designate each pathotype

Resistance Management

- Pathogen populations can adapt in response to selection pressure



Continuous cropping of a resistance source

S.F. Hwang

Stinkweed

- Stinkweed and Shep. Purse

Prevent the movement of spores between & within fields and contain patch(es)

Image credit: Azara Effects

Minimum Tillage

Clean Inputs

Three steps in equipment sanitization:

1. Rough cleaning (90-95%)

canolacouncil OF CANADA

2. Washing with pressurized water or cleaning with compressed air (95-99%)

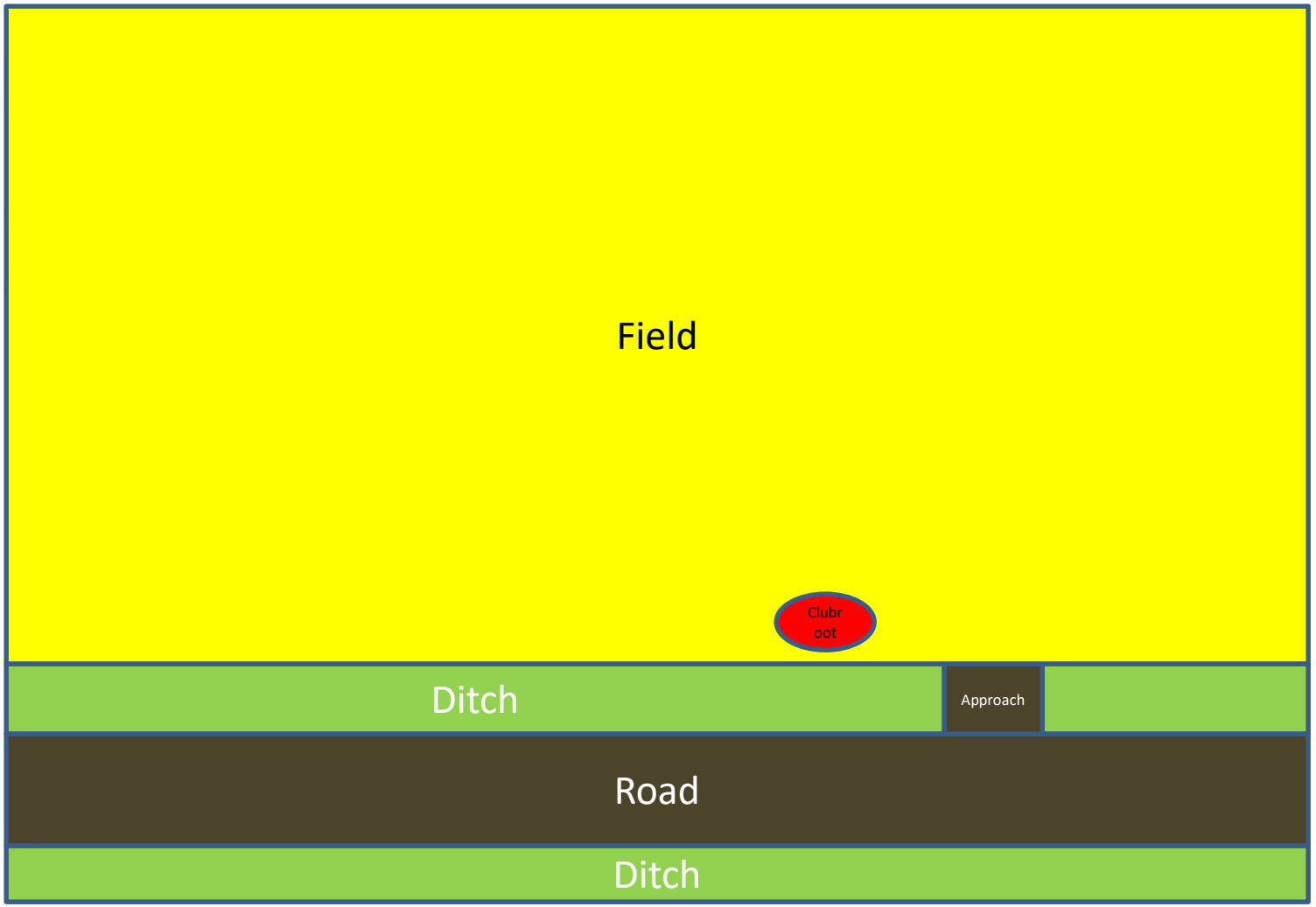
3. Mist on disinfectant (bleach) (99% to 99.9%)

This includes
boots/tools/vehicles/other

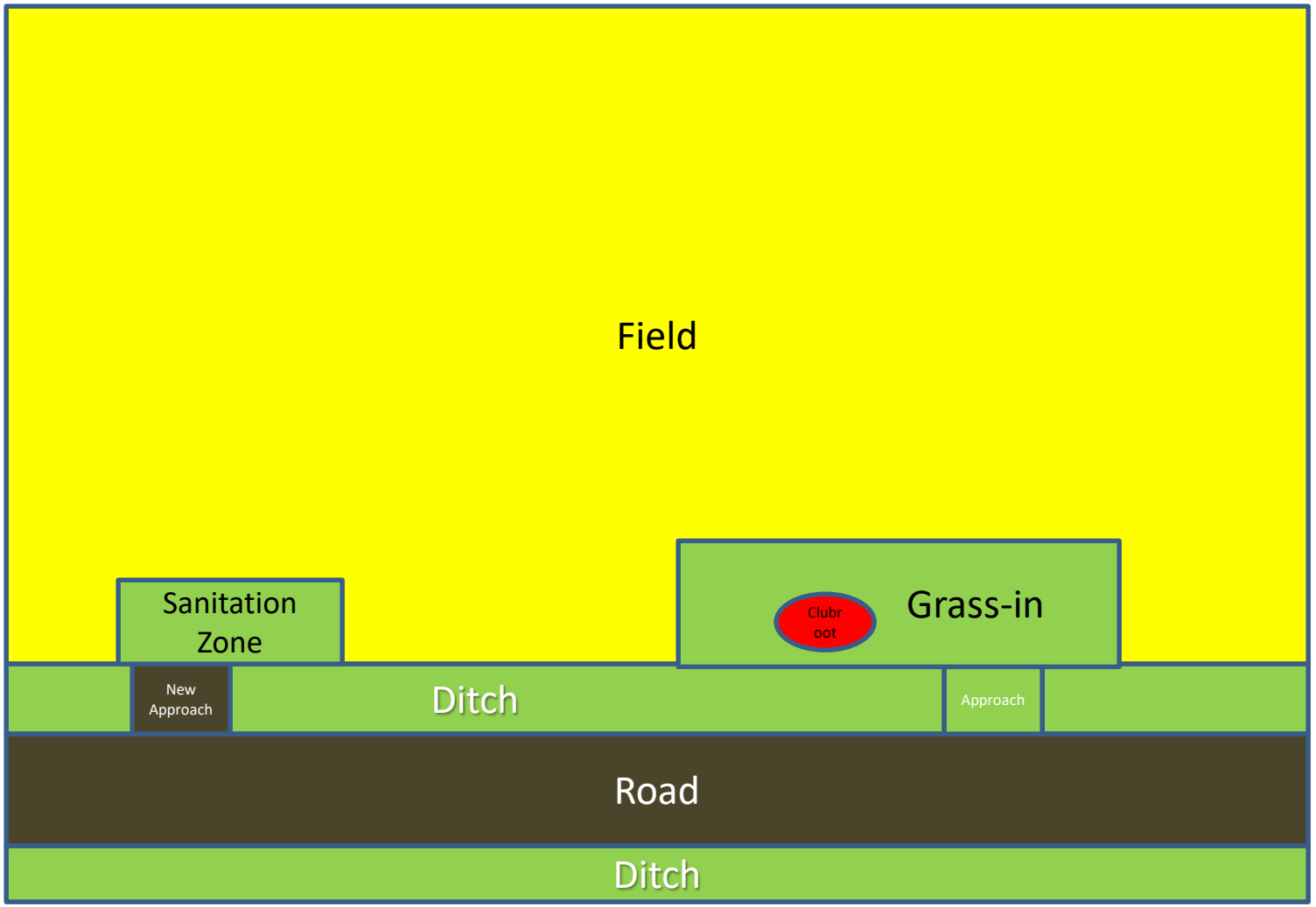
‘Gospel’ Recipe for Clubroot Patches

- Identify and mark infested area
  - Symptomatic plants / spores in soil samples
  - Mark x2 affected area (at least!)
- Initial treatment
  - Fumigate and cover, or lime to ≥ pH 7.2
  - Seed to sod-forming grass (perennial rye)
  - Control weeds
- Evaluation and termination
  - Use soil sampling to monitor spore concentration
  - When no longer detectable, break sod

Manage Your Patch!



Manage Your Patch!



Soil Testing For Clubroot

- PCR – It's either POSITIVE (+) or NEGATIVE (-)
  - What does that mean? How bad is it and where is it?
  - Labs have varying thresholds for reporting a (+)
  - A (+) result may not always cause plant symptoms
    - Environment, pH, # of spores present, etc

- qPCR – a quantitative test, which counts the number of spores per gram of soil
  - How do you interpret the results from such a difficult procedure (sample reliability, storage before analysis, lab extraction technique, lab DNA amplification technique, etc)
  - How was the sample taken
    - If a composite sample from many sites it isn't really telling you much
    - Good for tracking the # of spores in a GPS'd location (e.g. when the # of spores is low enough to take the area out of grass or resume with canola production)

canolacouncil OF CANADA

Take Home Message:

- Scout your fields
  - Find it early
- We have to start lengthening those crop rotation
- Start using clubroot resistant varieties
- **‘Don’t do nothing!’**

52nd 2025 KEEP IT COMING

AB Hwys | Cozi | Prairie Terminals | EV | Canola Diagnostic T... | Canola Pathology | WARC | Torii Gate Kit | 2013 International Cl... | Clubroot

Home | Contact | Search

clubroot.ca

Your comprehensive source for clubroot information.

Home | About Clubroot | Identify Clubroot | Control Clubroot | Affected Regions | Regulation | Research | Resources | What's New

About *Clubroot*

To learn more about clubroot basics, check out this page.

- Clubroot overview
- Disease cycle
- Environmental factors

Control *Clubroot*

Bookmark this page for up-to-date information on preventiing and managing clubroot.

- Prevent clubroot
- Manage Clubroot
- Stewardship

Identify *Clubroot*

Look here for information on clubroot identification in canola

- Videos on scouting
- Identification
- Testing

What's *New*

Look here for the latest updates on clubroot.

- What's New?
- Updated Cumulative Clubroot Infestations in Alberta
- 2013 International Clubroot Workshop Presentations
- View the new clubroot video, the best clubroot video ever made!

Clubroot *Questions?*

Do you have questions about clubroot? Ask a Canola Council of Canada Agronomic Specialist today.

Fields marked with a ** are required.

** Email:

Phone:

** Question:

Send Question Now

Sign Up for *Email Updates*

Join our mailing list to receive important news and event updates.


SEARCH
CANOLA ENCYCLOPEDIA
TOOLS & RESOURCES
RESEARCH HUB
CANOLA COUNCIL OF CANADA
CANOLAWATCH
FREE, UNBIASED, TIMELY AND RESEARCH FOCUSED
SIGN UP
ASK A QUESTION
KEY TOPICS
PLANT ESTABLISHMENT
FERTILITY
DISEASES
INSECTS
WEEDS
HARVEST & STORAGE
WELCOME TO CANOLAWATCH
Canola can face many threats in the first few weeks after emergence, including flea beetles. Keep scouting!
SIGN UP
Let us help you get the most relevant info by telling us where you're from and what you do.
ASK A QUESTION
Keep the conversation going. Ask a follow up question to an article, ask something new, or give us your feedback.
LATEST ISSUE | JUNE 3, 2015 - ISSUE 12
JUNE 3 QUIZ — FLEA BEETLES
Four questions to test your flea beetle management...
READ MORE
LOTS OF RESEEDING
These canola plants are recovering 72 hours after a heavy frost. During the frost, the closest weather station to this field indicated -4C at 4 a.m. and temperature did not get above 0C until 9 a.m. Photo...
READ MORE
IN-CROP WEED MANAGEMENT AFTER A FROST
Wait for signs that canola plants have started regrowing before spraying after a frost. After a light frost, spraying could resume when the following conditions are met:—A minimum of one night,...

canolacouncil OF CANADA

Coming Event!

- 2019 Combine College
  - Where: Evraz Place, Regina
  - When: March 12, 2019
  - Learn about managing harvest losses, combine optimizing from major manufacturers, grading, harvest aids!
- Register at:
- https://www.saskcanola.com/news/combine-college-2019

52 2025 KEEP IT COMING

Thank You!

Warren Ward
Agronomy Specialist, Eastern Sask
Canola Council of Canada
(306) 621-0630
wardw@canolacaouncil.org
@WardCCC

KEEP IT COMING