Development of Harmonized Clubroot Maps

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April 30th, 2020

UNIVERSITY OF ALBERTA

Government of Saskatchewan
Ministry of Agriculture

Manitoba Agriculture

Alberta Agriculture and Forestry

Objectives

Work conducted as part of **CARP Project** No. 2018.20

Funded by **Alberta Canola**, **SaskCanola**, and the **Manitoba Canola Growers**

Three main objectives:

- Examine the feasibility of a harmonized clubroot map
- Determine what such a map would look like
- Communicate results with stakeholders, including the Clubroot Steering Committee

Clubroot disease in Canada

Well established in Canada by the early 20th century

Isolated reports from home and market gardens in **Alberta and Manitoba starting from 1920s**

Observed for the first time on the **Canadian canola** crop in **1997 in Quebec** (Morasse *et al*. 1997)

> 98% of the harvested hectares of Canadian canola

- **Alberta**

First infested fields identified in **2003**

3353 fields with confirmed clubroot symptoms as of 2019

- **Saskatchewan**

First infested fields identified in **2008**

60 fields with confirmed clubroot symptoms as of 2019

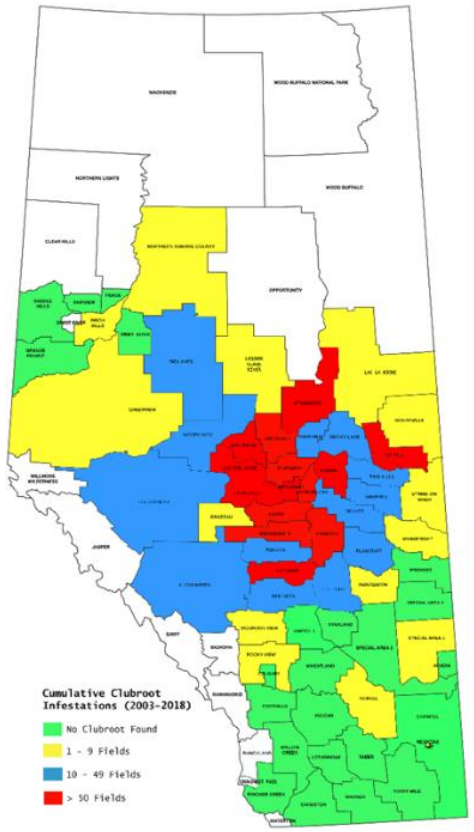
- **Manitoba**

First infested field identified in **2009**

35 fields with confirmed clubroot symptoms as of 2019

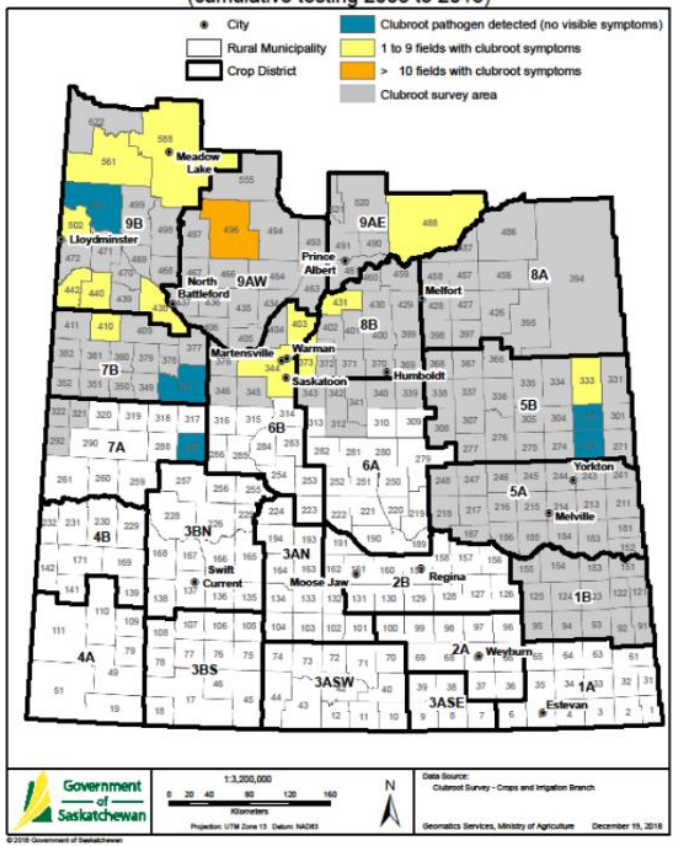
Each province has its rationale for presenting the data

Clubroot distribution in Alberta
(cumulative 2003 to 2018)

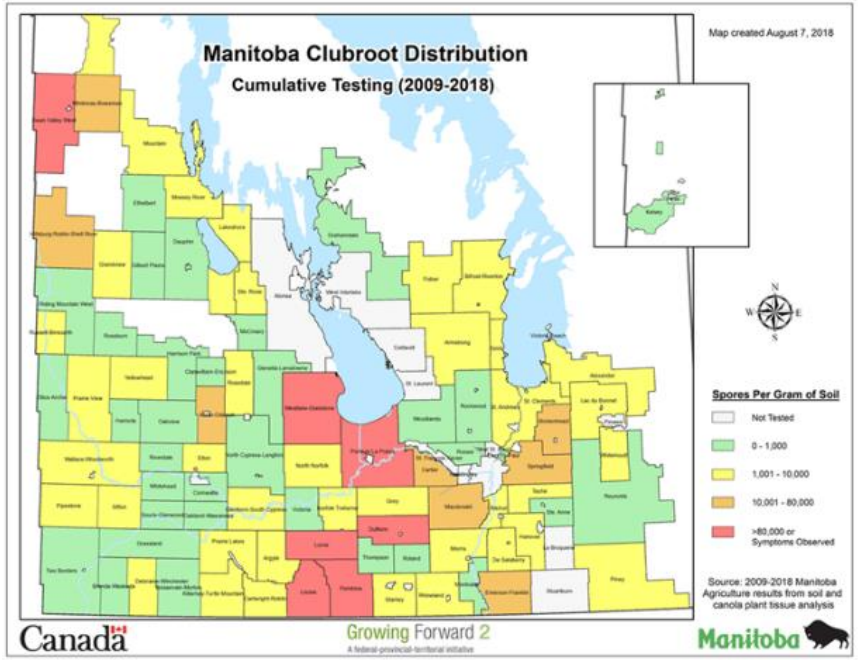


- Number of infested fields with clubroot symptoms

Clubroot Distribution in Saskatchewan
(cumulative testing 2008 to 2018)



- Number of infested fields with clubroot symptoms
- Infested fields without symptoms



- Maximum quantity of spores per gram of soil

What type of data to use for the graphic representation?

Collection of the data over a **large number of fields** should **NOT** be:

- Prohibitively expensive
- Labor intensive
- Time consuming

→ increasingly important consideration as the extent and intensity of the **epidemic grows**

✗ Resting spore detection

✗ Resting spore quantification

✓ Confirmed clubroot infested fields by symptom observation

Any clubroot specific spot in the field ?

Check canola roots at the main entrance

How to create the maps?

This project was started using **ArcGIS**

Switched to use:

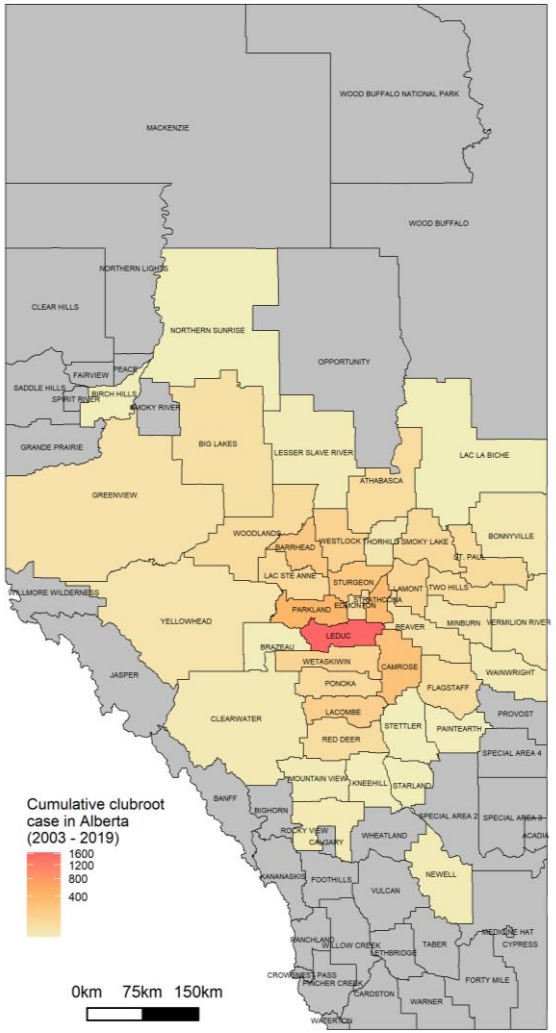
- More **customizable** software
- **Non-proprietary** and **free**

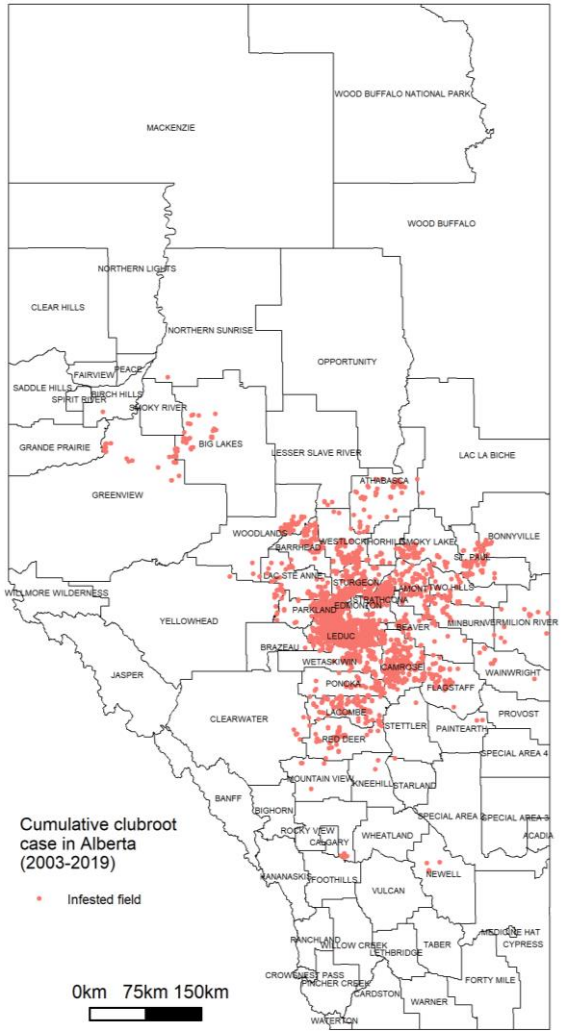
Three type of maps were created:

Static maps

- Made for paper publication
- ggplot2 package

Static maps


Cumulative clubroot case in Alberta (2003 - 2019)
1600
1200
800
400
0km 75km 150km


Cumulative clubroot case in Alberta (2003-2019)
Infested field
0km 75km 150km

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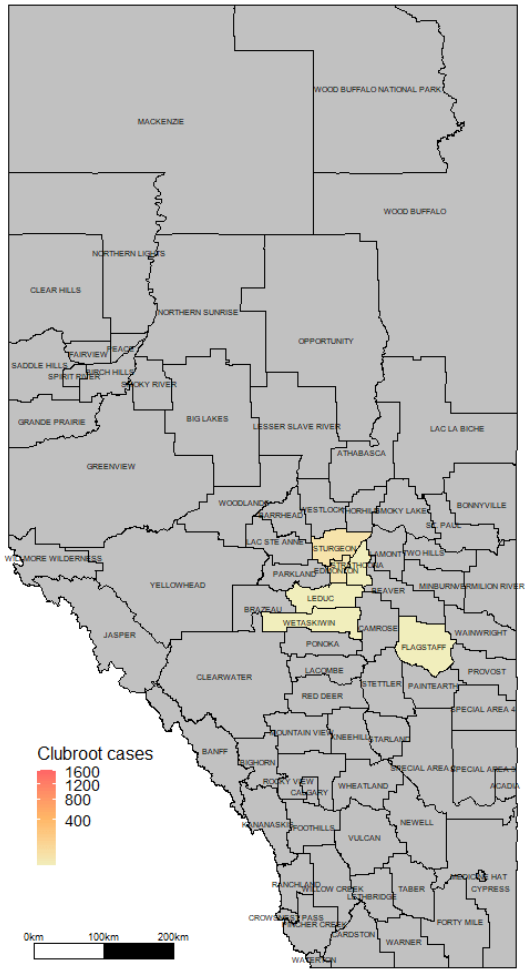
Animated maps

- Made for slide presentation
- ggplot2 and ganimate packages

Animated maps

Clubroot case in Alberta by county

Year: 2005



Clubroot case in Alberta

Year: 2005

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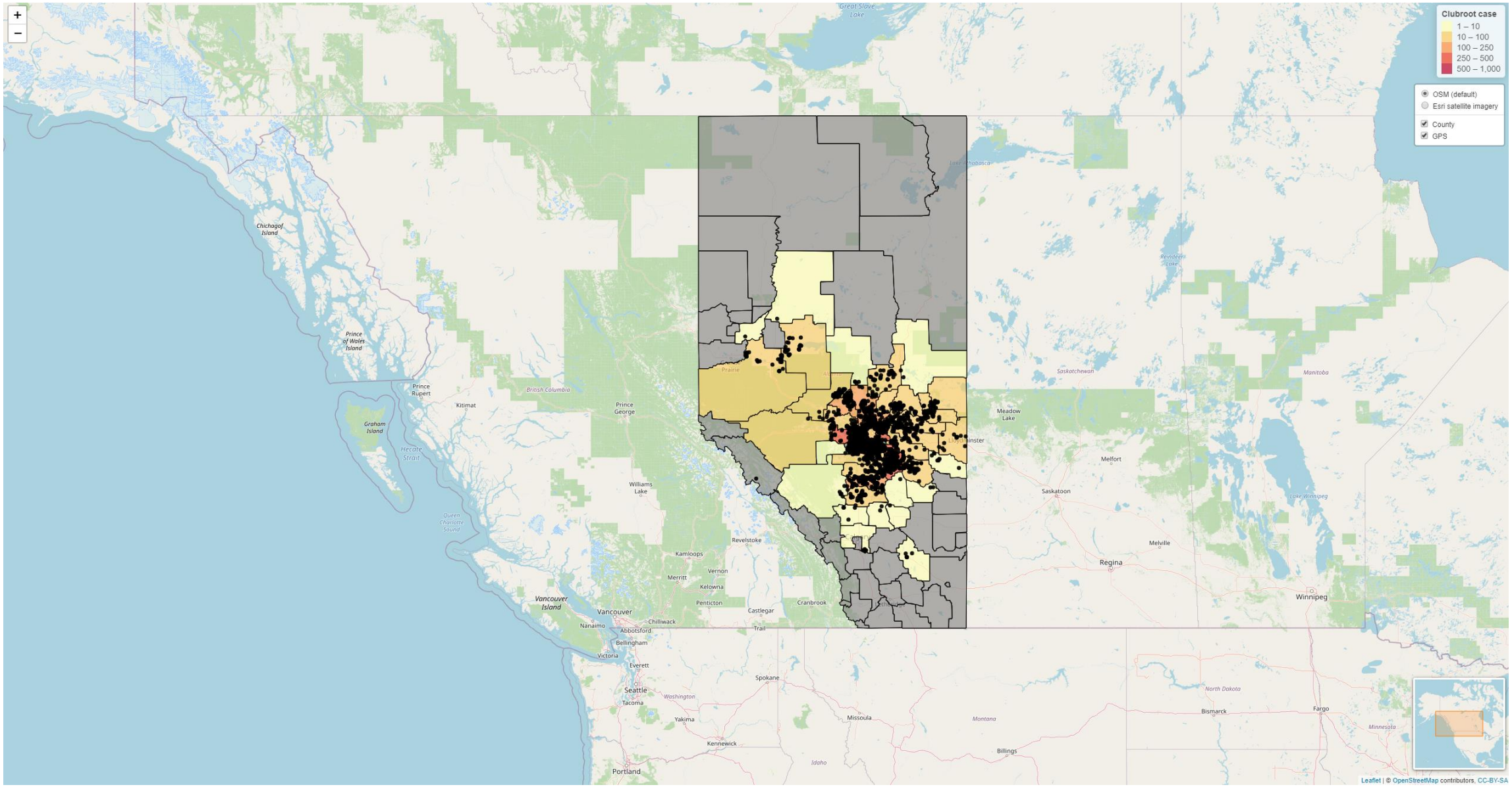
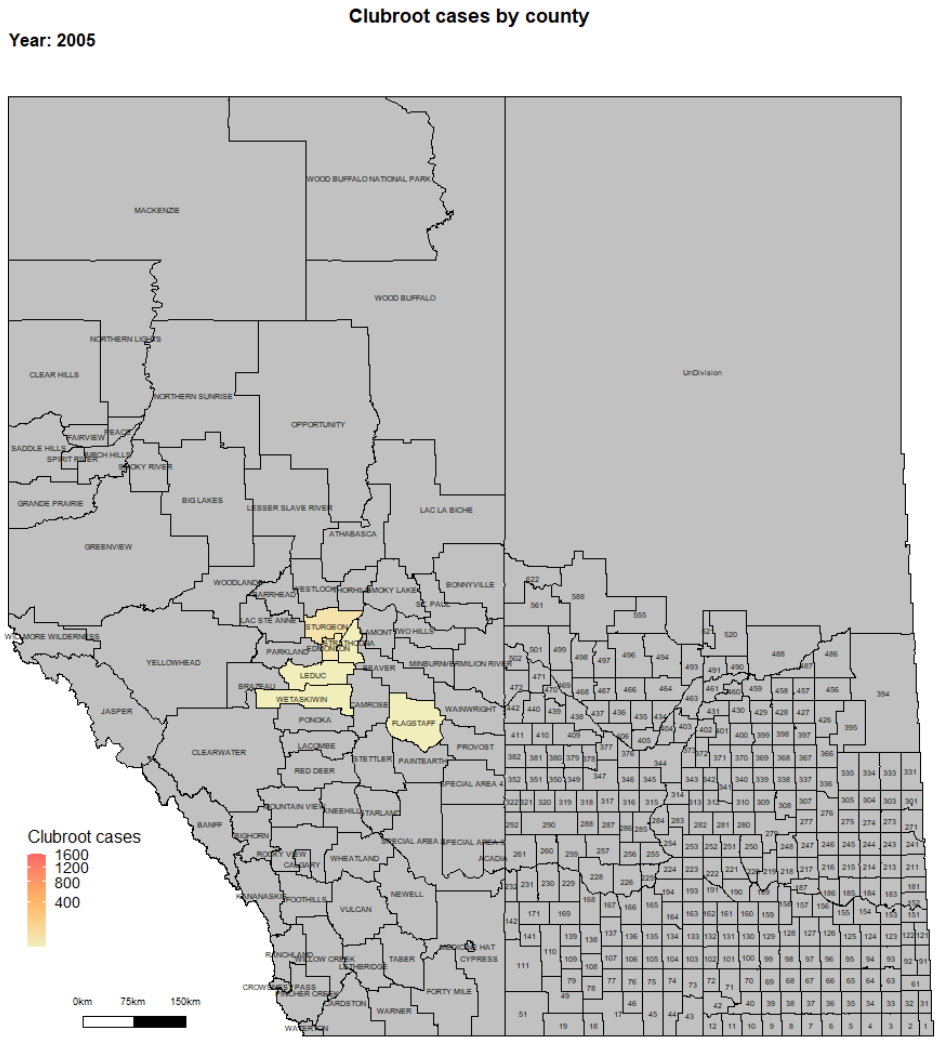
Interactive maps

- Made for website
- Leaflet package

Interactive map



Example of a harmonized map



The occurrence of clubroot in Alberta and Saskatchewan

There is **no technical limitation** to create a harmonized map

The main limitation becomes the **inability** of different parties **to share data**

Next steps

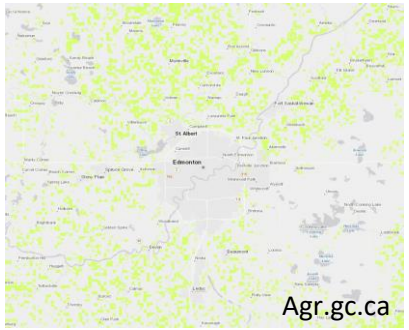
1. **Continue to improve the maps:**

- Add supplementary information (Pathotype, Resistance breaking isolate …)
- Develop more interactive map (increase the number of selectable data)

Shiny
by RStudio

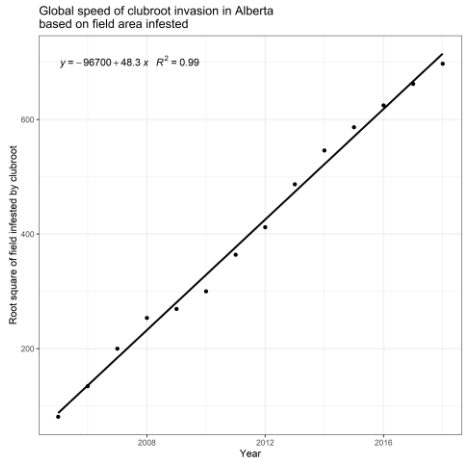
2**. Combine clubroot data with complementary data:**

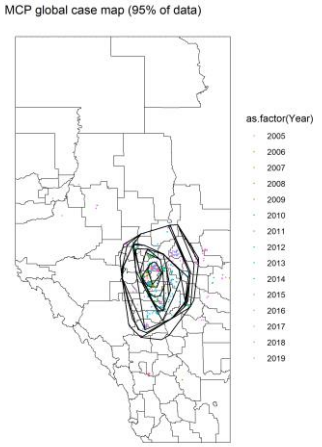
- Crop rotation for each field (2009 – 2018)
- Meteorological or pedological data



3. **Modeling using the clubroot data:**

- Infested field area
- Minimum convex polygon (MCP)





Acknowledgements

Victor Manolii, University of Alberta

Agricultural Fieldmen, County and Municipal Staff

Funders:

Canola Growers via the Canola Agronomic Research Program (CARP) administered by the Canola Coucnil of Canada

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