

# Trends and transitions between farm types and spatial layout of farm fields

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# What are we interested in modelling?

- Future possible trends in:
  - The number of different types of farming operations
  - The size of farming operations
  - Field size

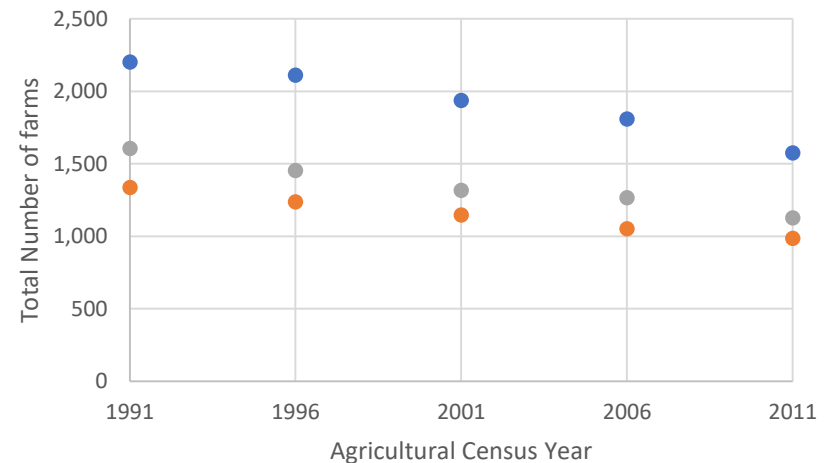
Why is this worth modelling?

# Present Trends in Agriculture:

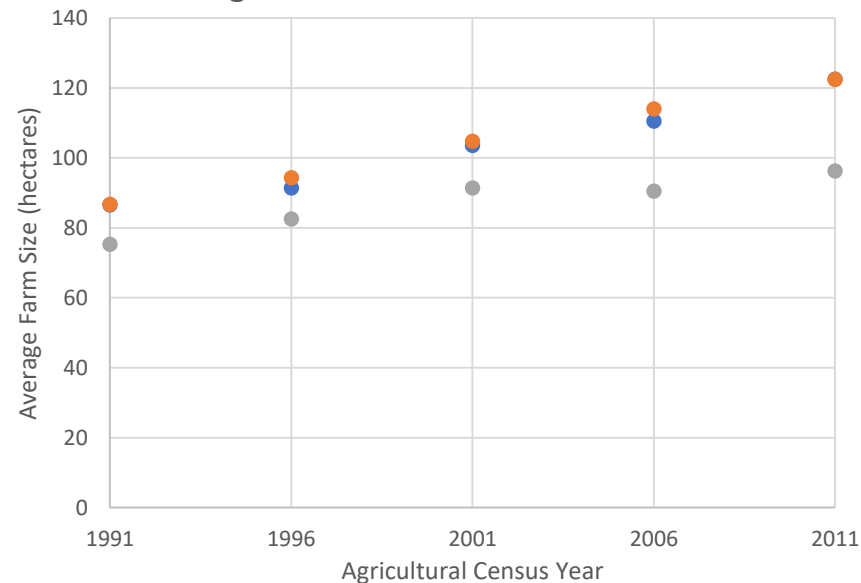
- Every 5 years the number of farms in eastern Ontario decreases by an average of 364
- Average farm size is increasing at a rate of between 5 to 9 ha every 5 years throughout the region
- As a result, we have fewer larger farms

- Stormont, Dundas and Glengarry United Counties
- Prescott and Russell United Counties
- Ottawa-Carleton Regional Municipality

Total Number of Farms in eastern Ontario



Average Farm Size in eastern Ontario



# Farm Type and Size Trends

Farm Types



# What drives farm size trends?

- Economic drivers
  - Uneven accessibility to agricultural support programs
  - Larger farms with greater capital investments are more easily able to acquire and farm more lands
- Market drivers
  - Volatility of market prices for agricultural products
  - changes in the make-up of the types of farming operations
  - Changes in the structure of farm ownership
  - Advances in technology (i.e. mechanical or biological)

# Field sizes are growing

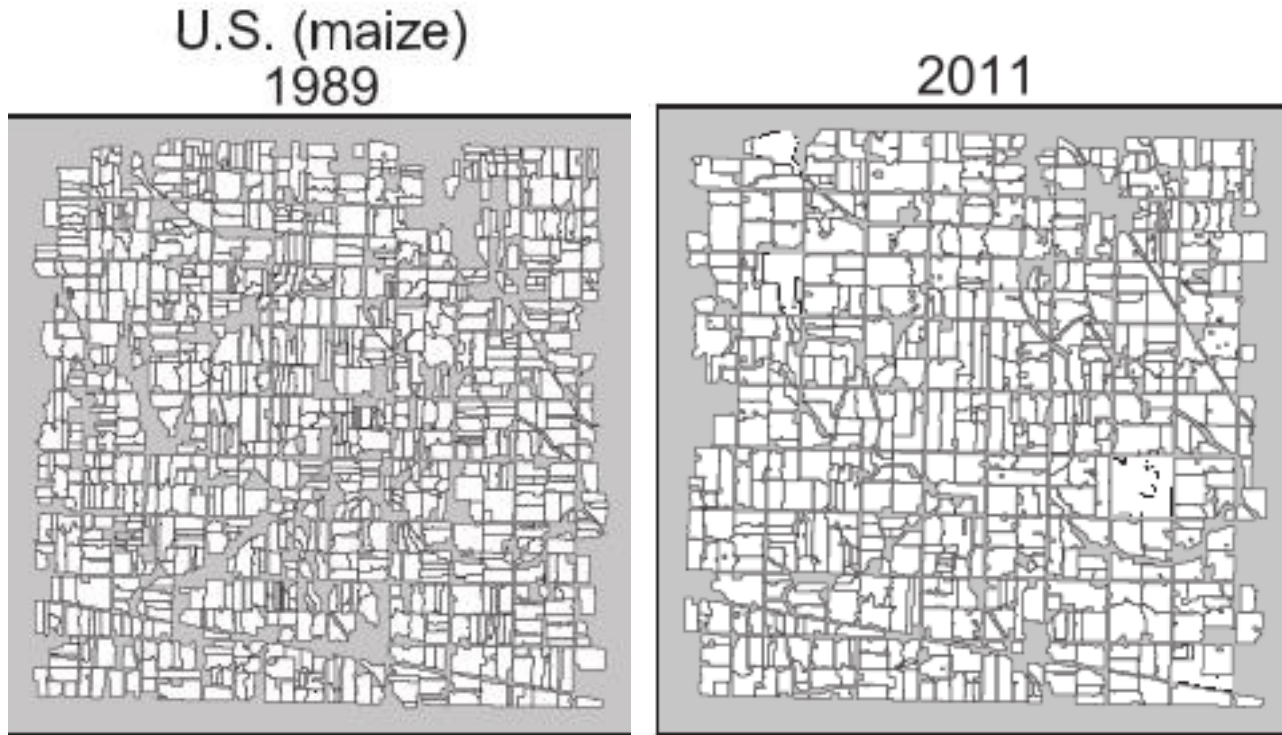


Figure 1. Maps displaying 15km by 15km agricultural landscape showing only corn fields and their size differences between 1989-2011, as extracted from Landsat imagery (White & Roy, 2015).

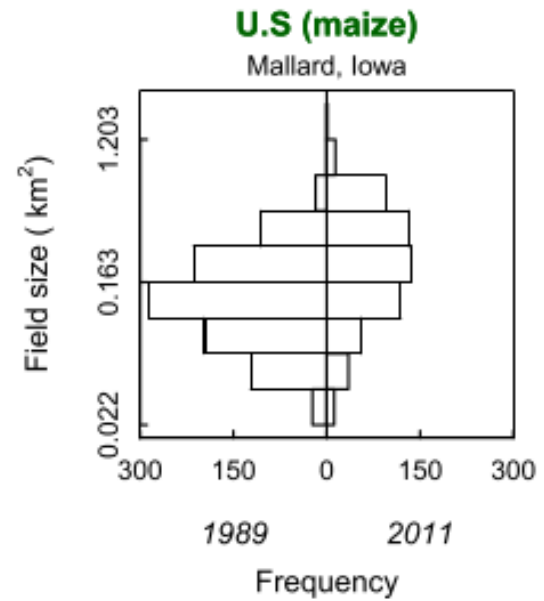


Figure 2. Histogram showing corn field size change from 1989 to 2011 (White & Roy, 2015).

# Quantifying field size change in eastern Ontario



2012



2015



# Consolidation of fields



2011

Number of fields: 10

Average field size:

1.81 ha



2015

Number of fields: 1

Average field size:

19.56 ha





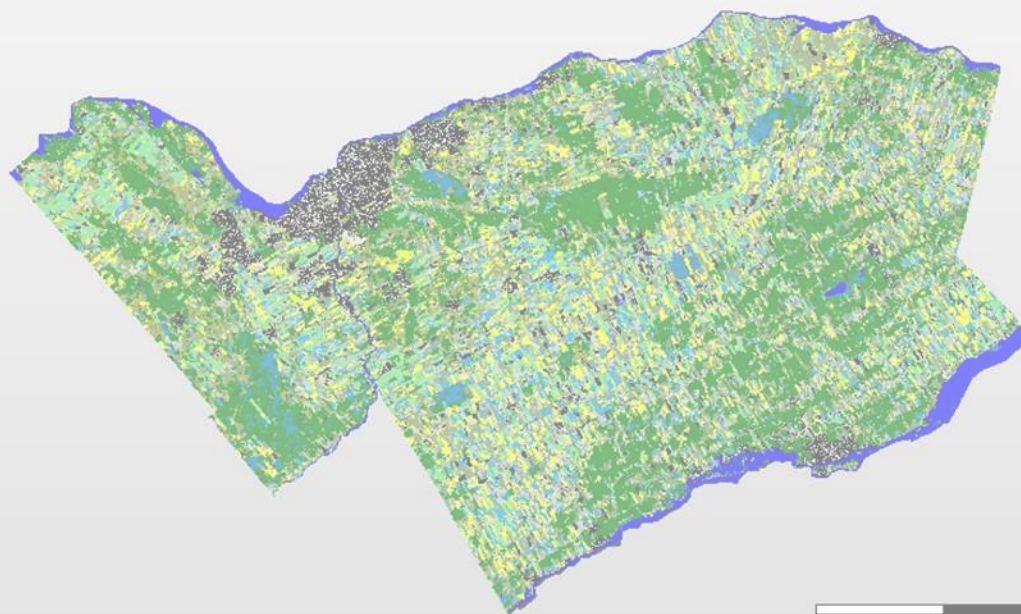
# What drives field size trends?

- Shifts in land management practices
  - Some benefits offered by small fields are made obsolete by more intensive practices
- Conversion of non-crop lands
  - Repurposing “unproductive land”
- Increased efficiency of farm machinery



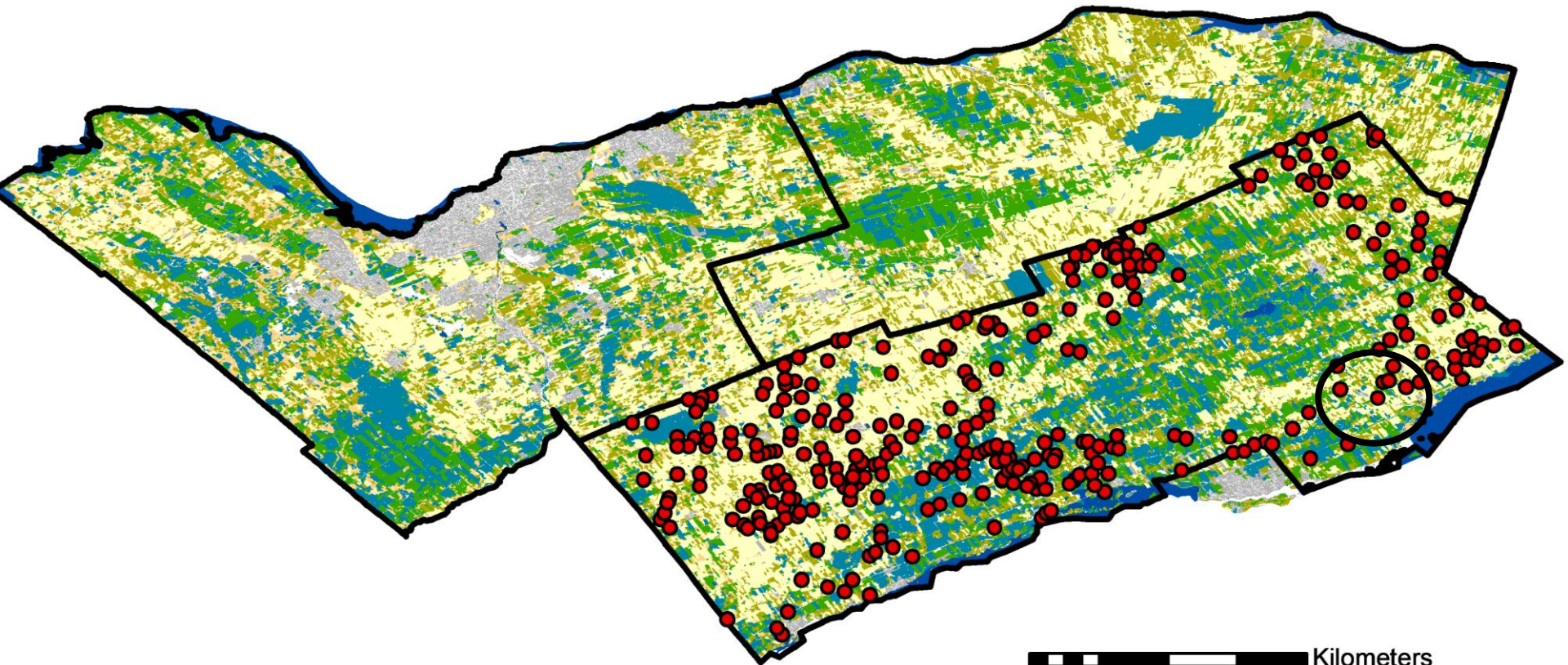
Software interface showing simulation controls. The 'Scenario to Run' section is set to 'BAU-CCSM4' with 'No Constraints (run e...)' selected. The 'Starting Year' is 2011 and 'Run for (years)' is 20. The 'Export Options' section includes 'Export IDU Coverage' (checked), 'Export Model Outputs' (checked), and 'Export Delta Array' (unchecked). The 'Export Interval (yrs)' is set to 1. Other options include 'Video Recorders', 'View Delta List', 'Export Delta List', and 'Export Model Results'.

# Farm Model: Expansion Transition and Retirement



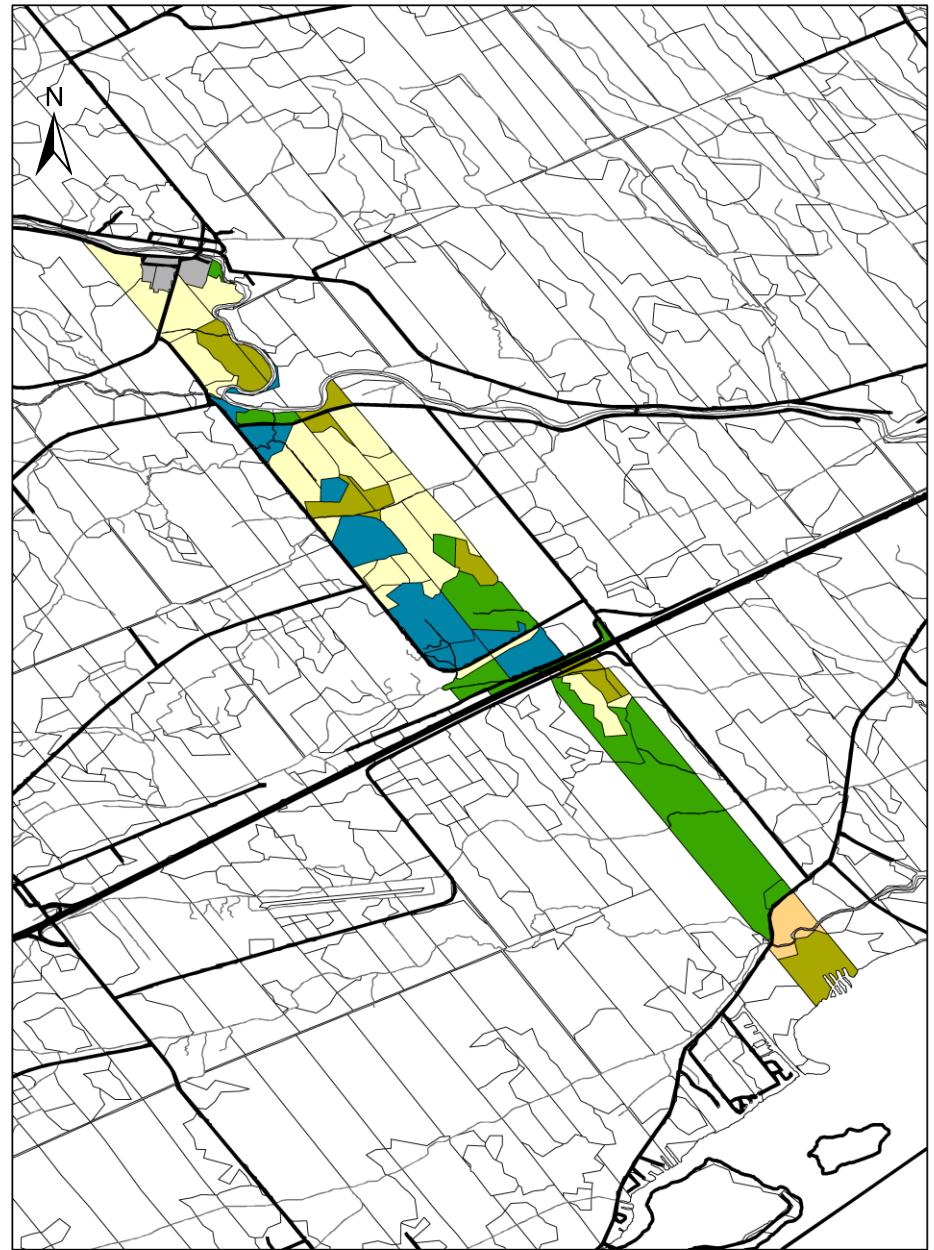
0 20km 40km 60km 80km 100km

# Field Crop Grain Expansion Event



0 5 10 20 30 40 Kilometers

# Model Year: 2015



## Legend

	1	Forest	14
	2	Cropland-Annual	23
	3	Cropland-Perennial	14
	4	Shrub/Grassland	3
	5	Developed	4
	6	Wetlands	13
	7	Water	0

Kilometers  
0 0.226 0.45 0.9 1.35 1.8

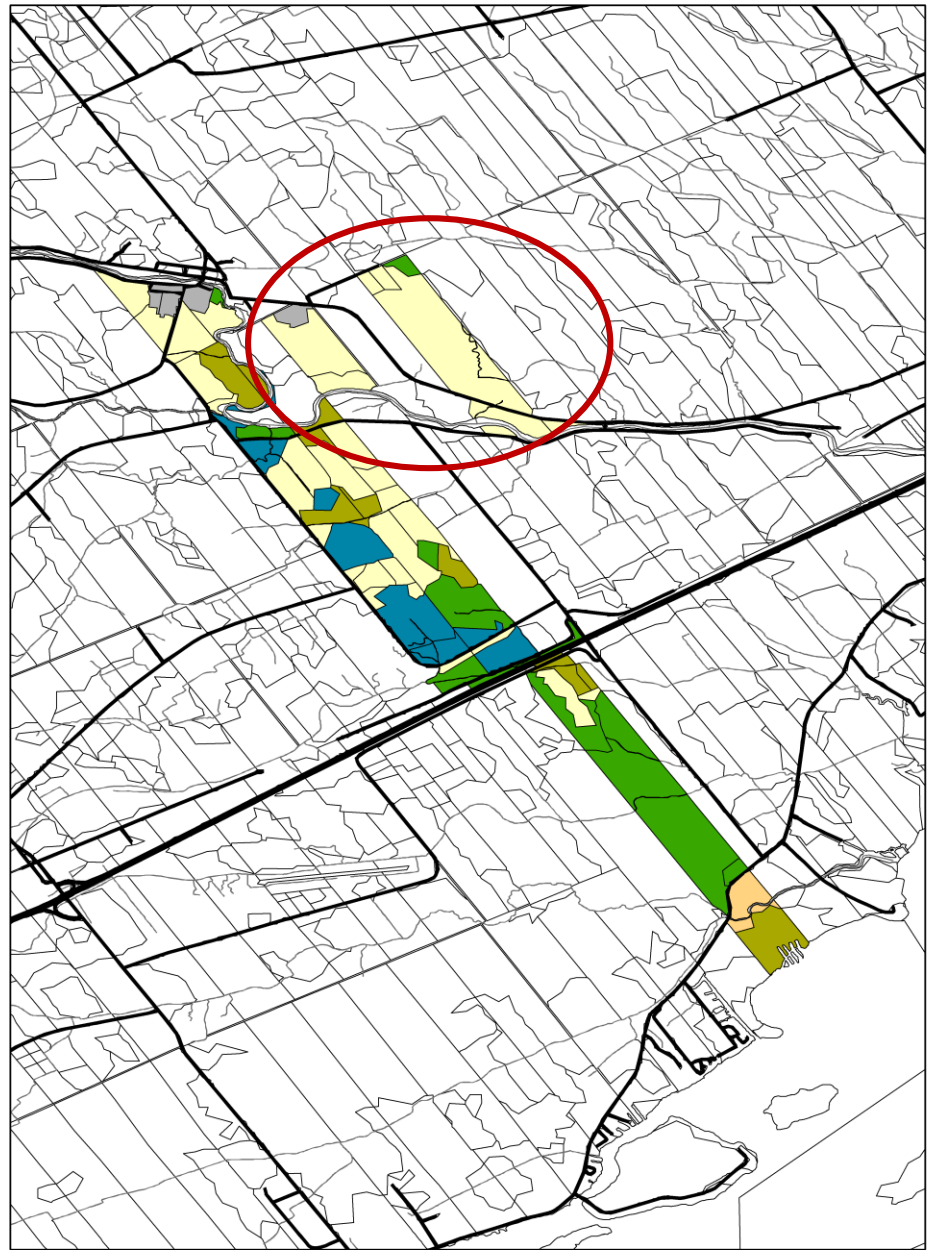


0 1.25 2.5 5 7.5 10 Kilometers

Model Year: 2015

**Legend**

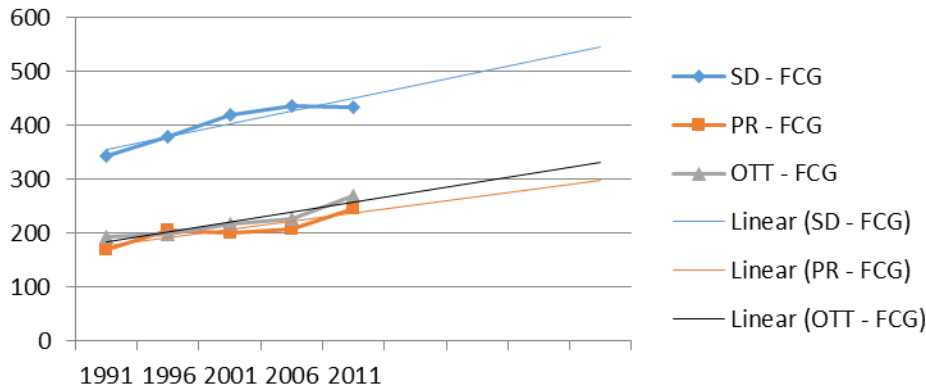
	1	Forest	15
	2	Cropland-Annual	34
	3	Cropland-Perennial	14
	4	Shrub/Grassland	3
	5	Developed	5
	6	Wetlands	13
	7	Water	0



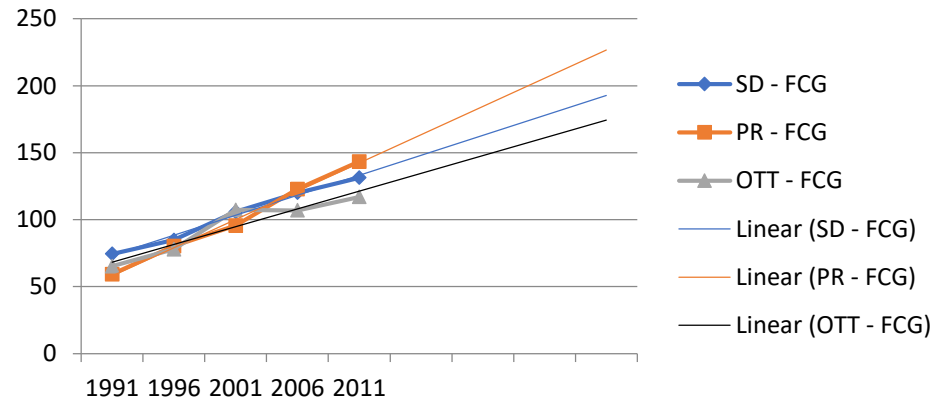
0 0.35 0.7 1.4 2.1 2.8 3.5 4.2 Kilometers

# When do expansions stop, in a given year?

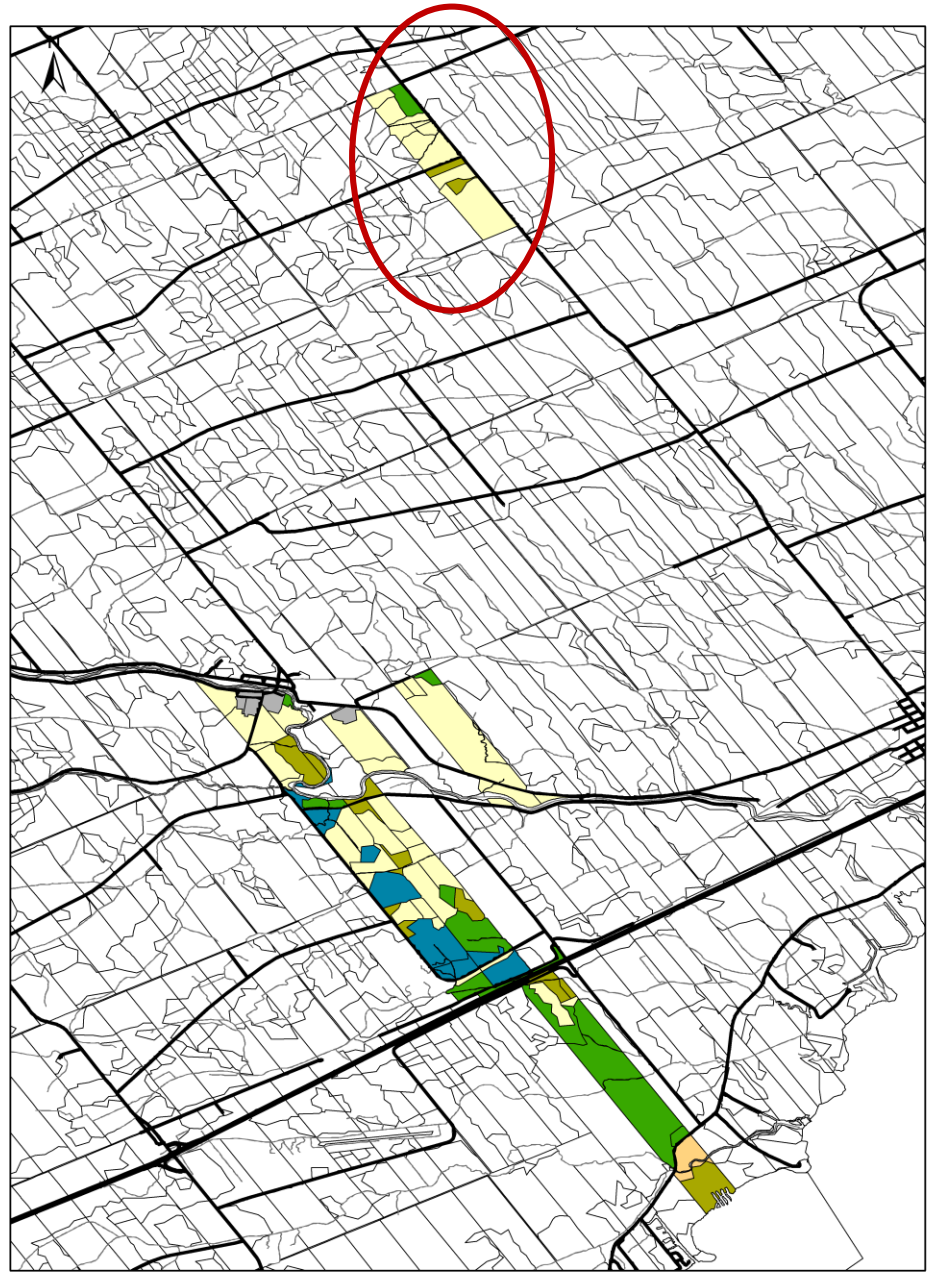
## Total Number of Field Crop Grain - Farms reporting



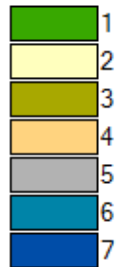
## Average Farm Size (ha) - Field Crop Grain



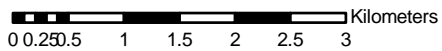
Model Year: 2020



**Legend**



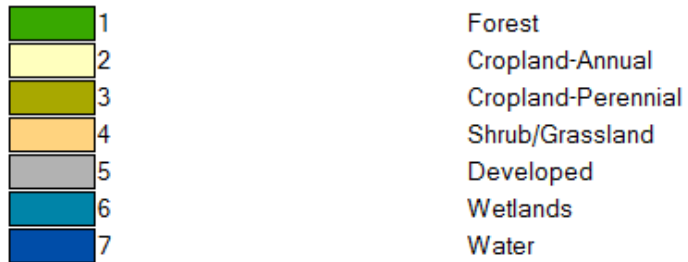
Forest	16
Cropland-Annual	44
Cropland-Perennial	16
Shrub/Grassland	3
Developed	5
Wetlands	13
Water	0



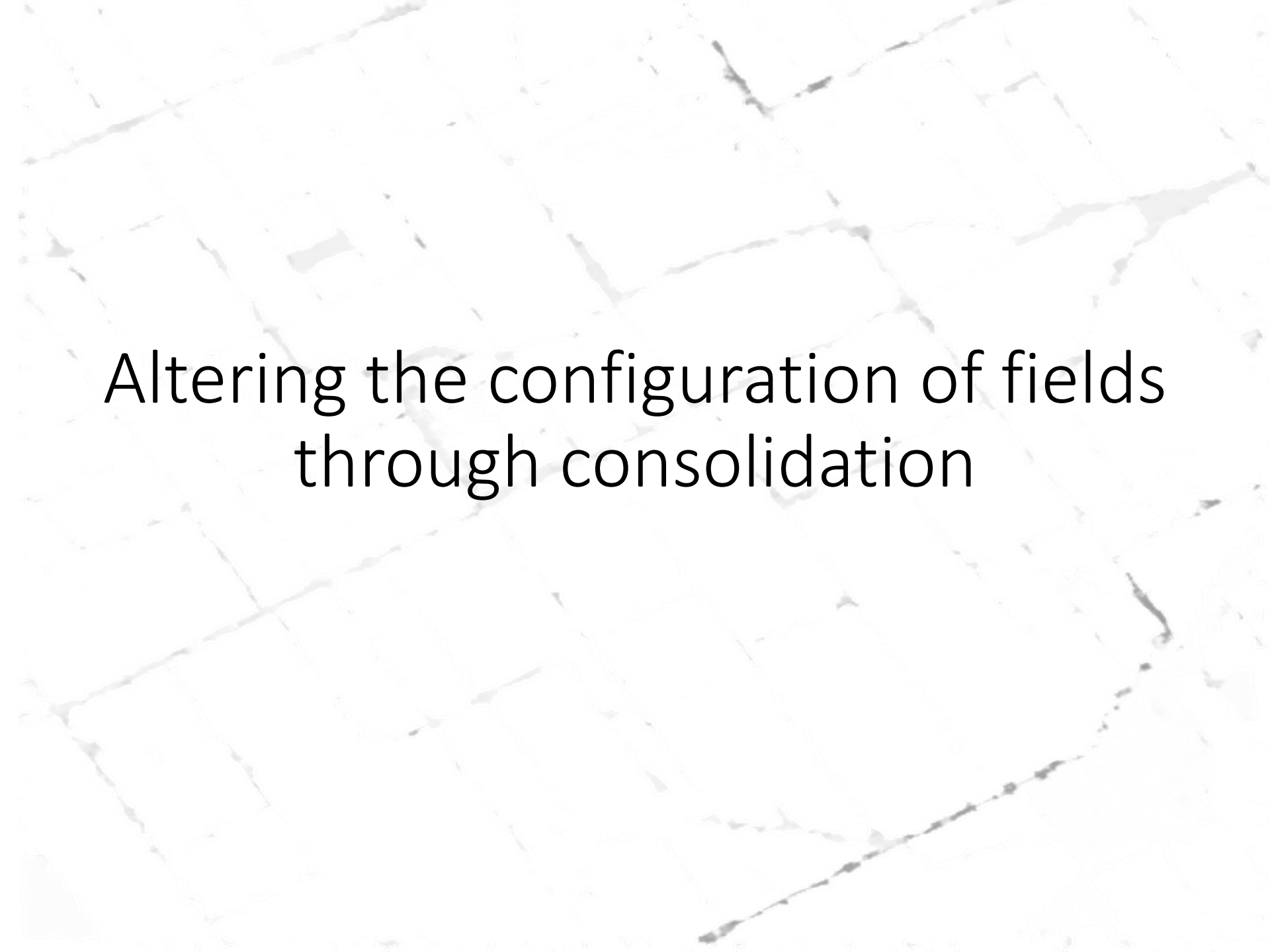


Model Year: 2028

**Legend**



# Farm Transition and Farm Retirement

The background of the slide is a light-colored, marbled paper with a pattern of irregular, vein-like shapes in shades of grey and white. The text is centered on this background.

Altering the configuration of fields  
through consolidation

# Legend

## LULC\_B

- Alfalfa
- Corn
- Fallow
- Other Cereals
- Pasture
- Soybeans
- Developed-Urban/Undifferentiated
- Built-pervious
- Swamp
- Wetland/Undifferentiate
- Coniferous
- Broadleaf



0 0.3 0.6 1.2 1.8 2.4 Kilometers

# Future Work

- Results to analyze:
  - the distribution of field sizes by crop type
  - the abundance and diversity of crop types
- Future iterations might consider:
  - Farmer typologies
  - The effect that distance from farm headquarters affects crop planting decisions