# Annual Crop Inventory Data Collection

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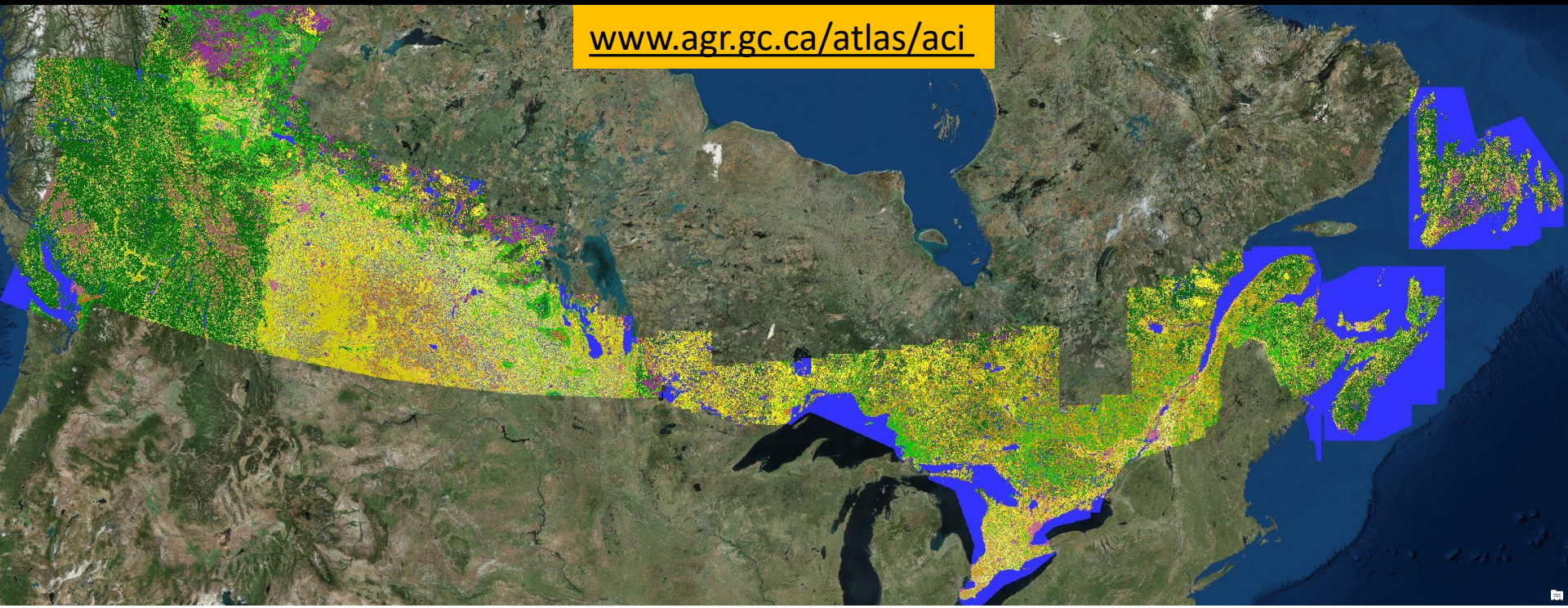
Agriculture and Agri-Food Canada

Agriculture et Agroalimentaire Canada

# 2018 Space-based Crop Inventory Map of Canada




## Data needed to create this map?

# Satellite Data Collection

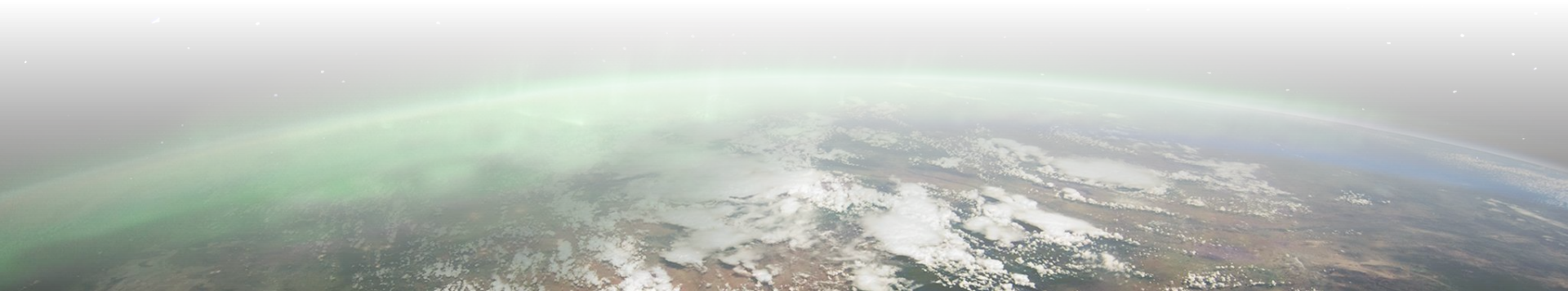
Our systems are robust enough to utilize many different satellite sensors. Previously used satellites include:

**OPTICAL**

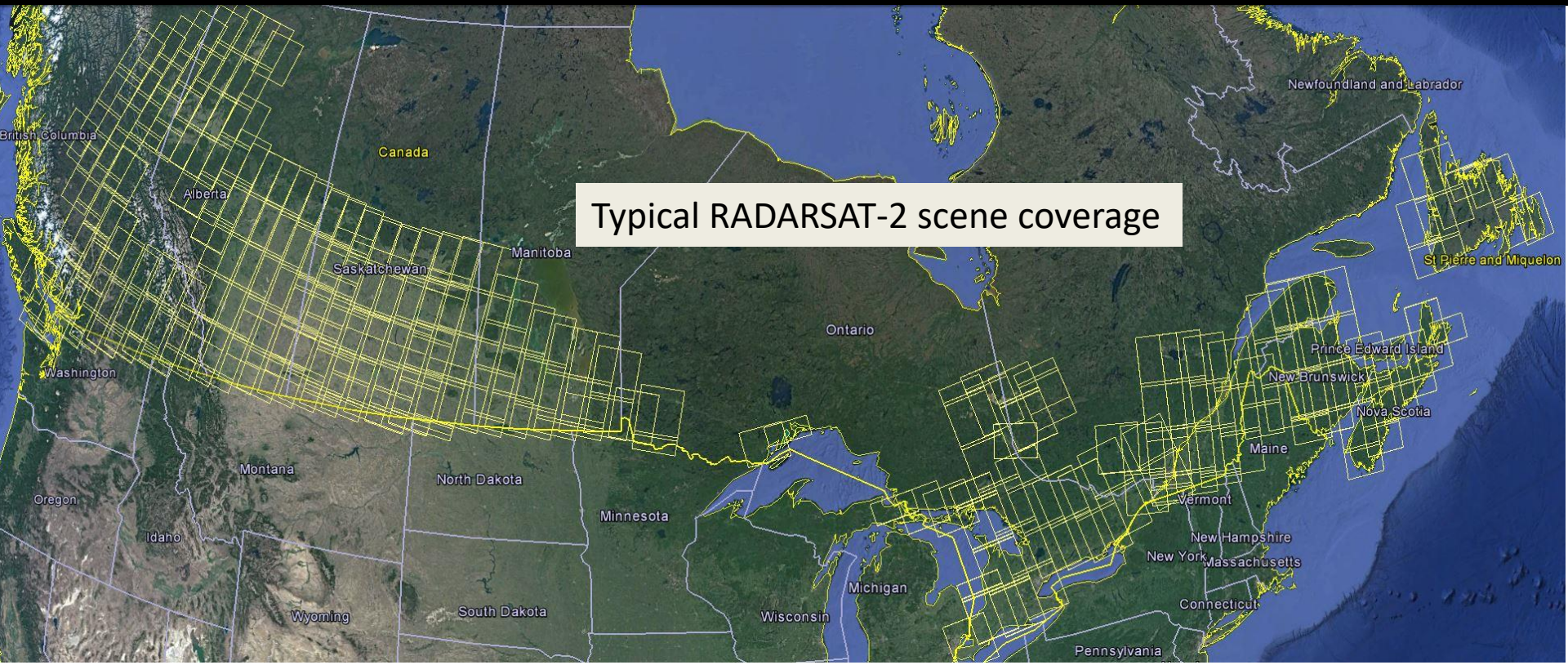
- Landsat-5
- Landsat-8
- Sentinel-2
- Resourcesat-1
- DMC
- SPOT
- Gaofen-1

**RADAR**

- RADARSAT-2
- RCM (2019)



# Satellite Data Collection




2018 Images Used

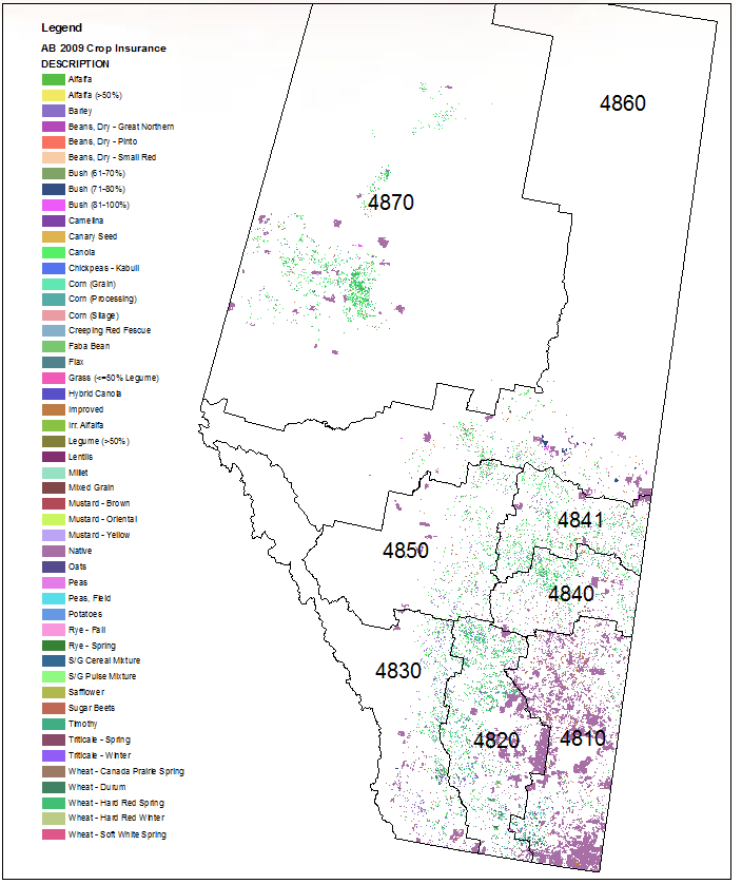
| SATELLITE | IMAGES |
|---|---|
| Landsat-8 | 490 |
| RADARSAT-2 | 300* |
| Sentinel-2 | 695 |

* Ran the system with an average of only 2 dates of coverage. Historically we have used 3 scenes per area. Done to try to speed up the overall process (use less data) & maintain accuracy.

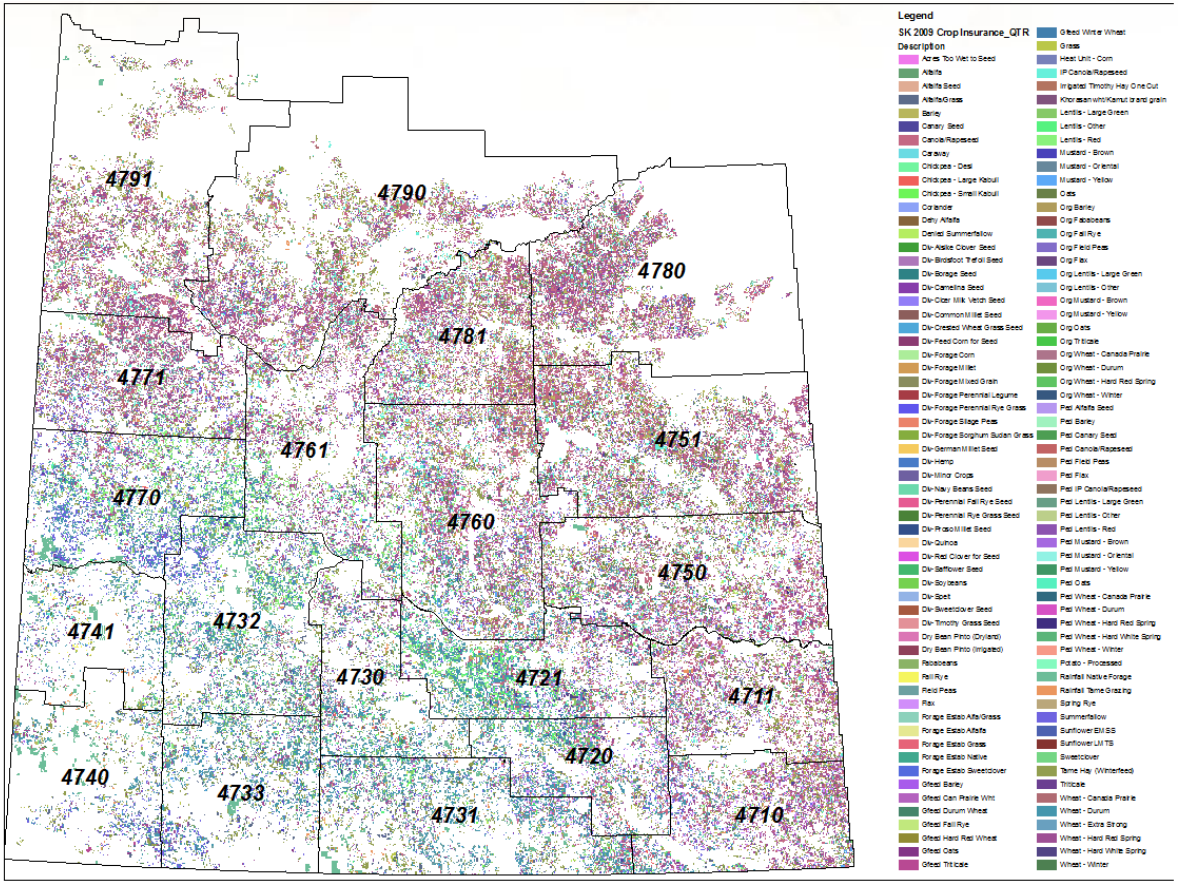
# Ground Truth Data – Crop Insurance

- AAFC has agreements for Crop Insurance data in Alberta, Saskatchewan, Manitoba
- We download Crop Insurance data from Quebec, which is freely available to everyone
- In BC we receive crop data from a provincial Ag group that does rotating regional surveys

Alberta




Saskatchewan




Ministry of Agriculture

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SCIC
SASKATCHEWAN CROP INSURANCE CORPORATION

MASC
Manitoba Agricultural Services Corporation

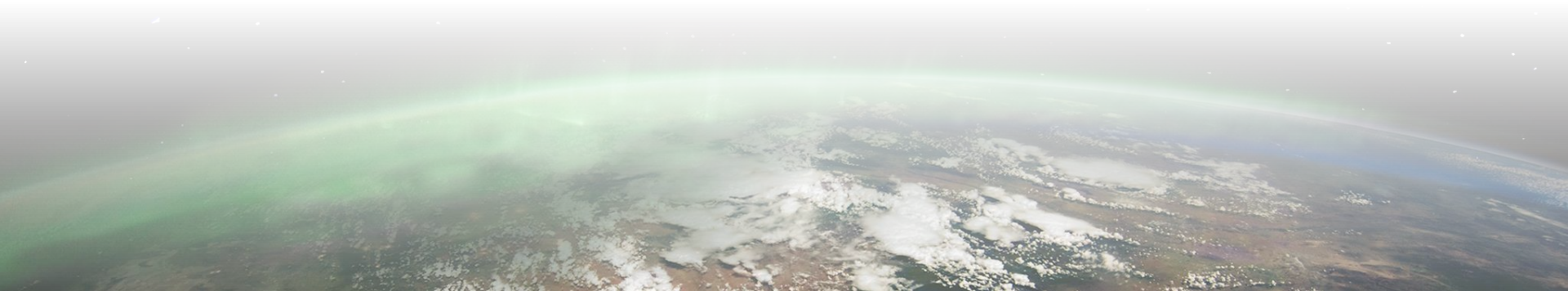
La Financière agricole Québec

# Ground Truth Data – AAFC Collected

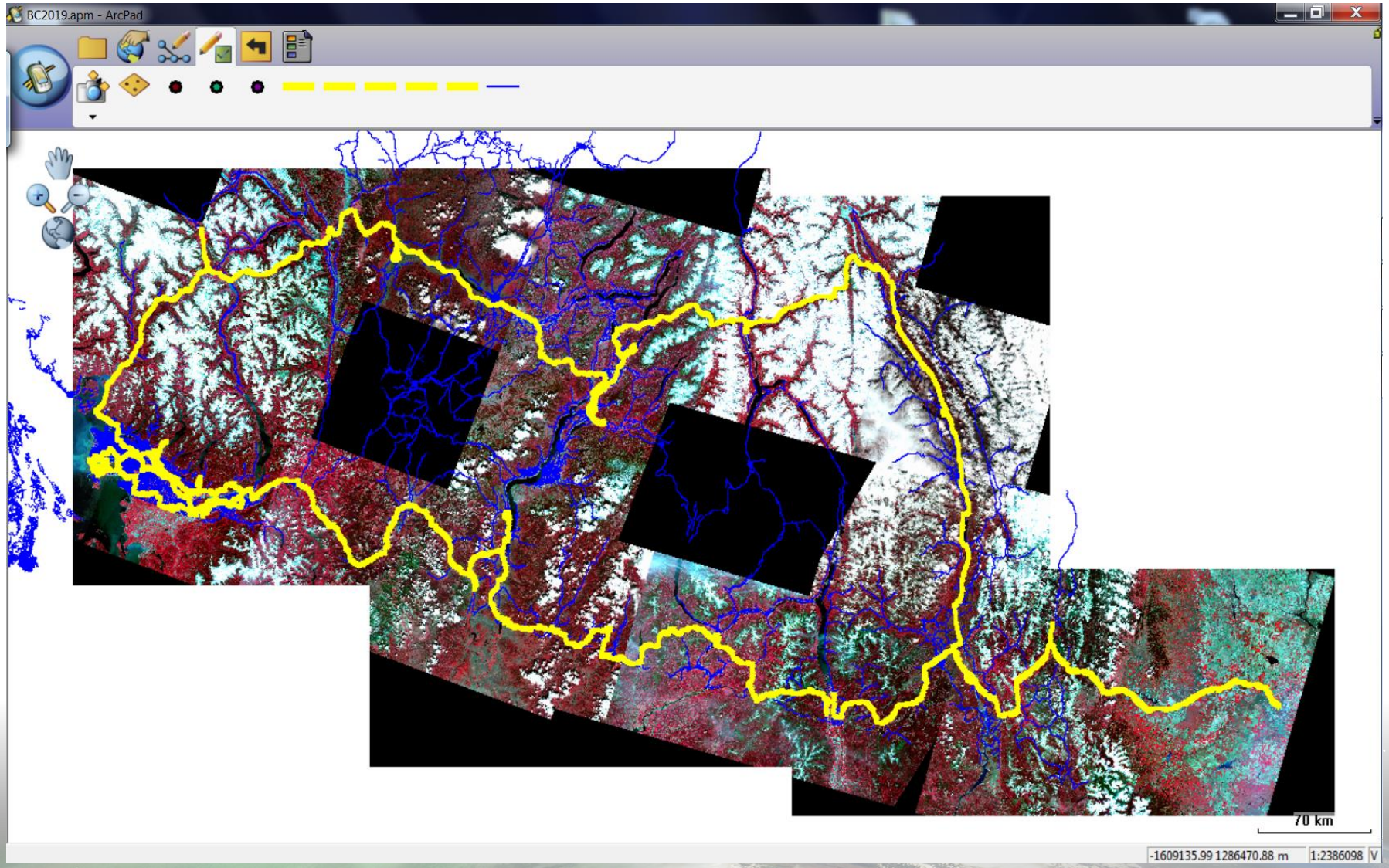
In provinces where we do not receive crop information, we deploy AAFC personnel to gather observation data via “windshield surveys” (driving through the countryside with GPS enabled tablets and data collection software).

Employees from AAFC–Ottawa will (where possible) team up with a local AAFC staff who provide regional expertise.

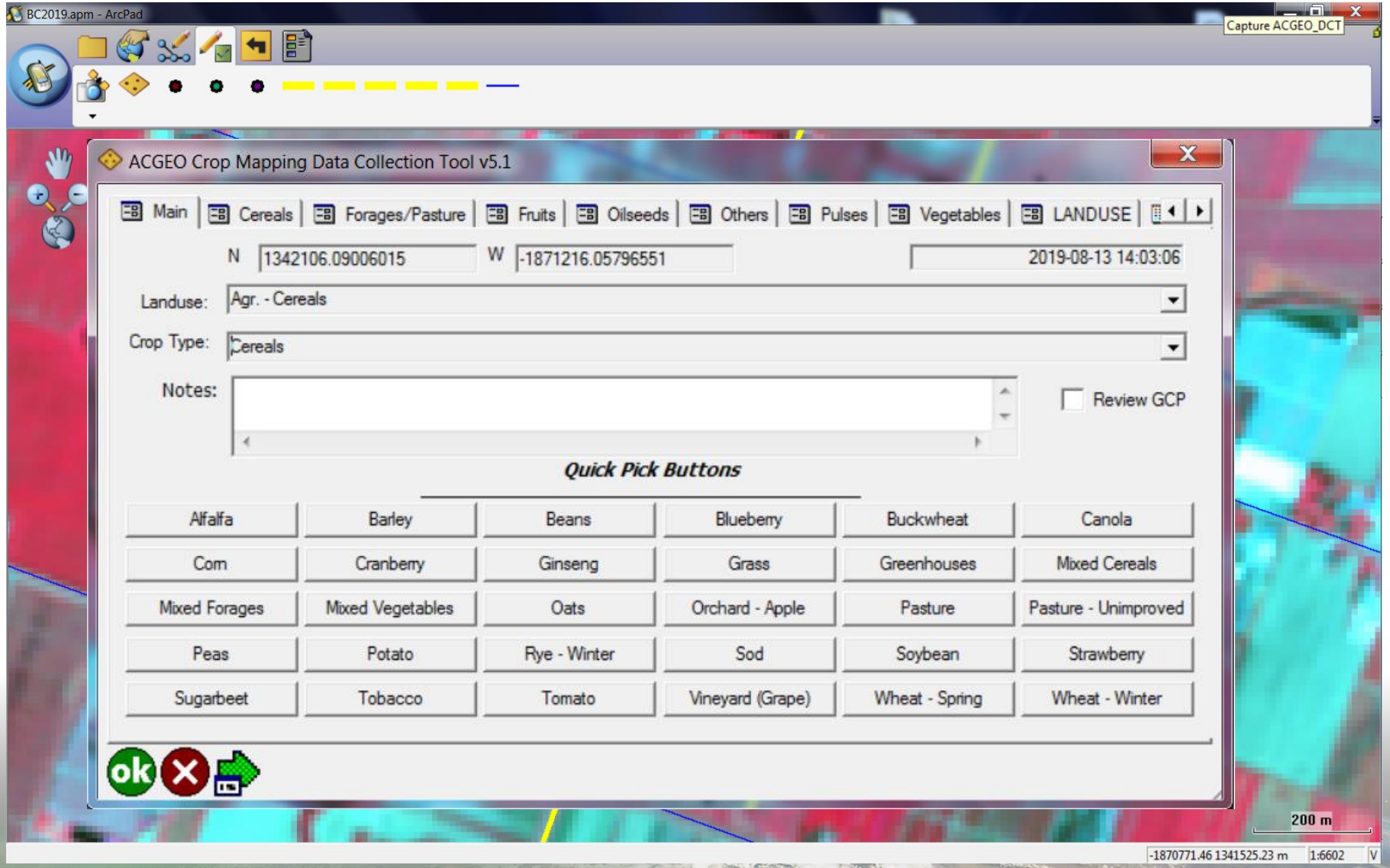
Otherwise teams of 2 AAFC–Ottawa staff will travel together



# Ground Truth Data – AAFC Collected



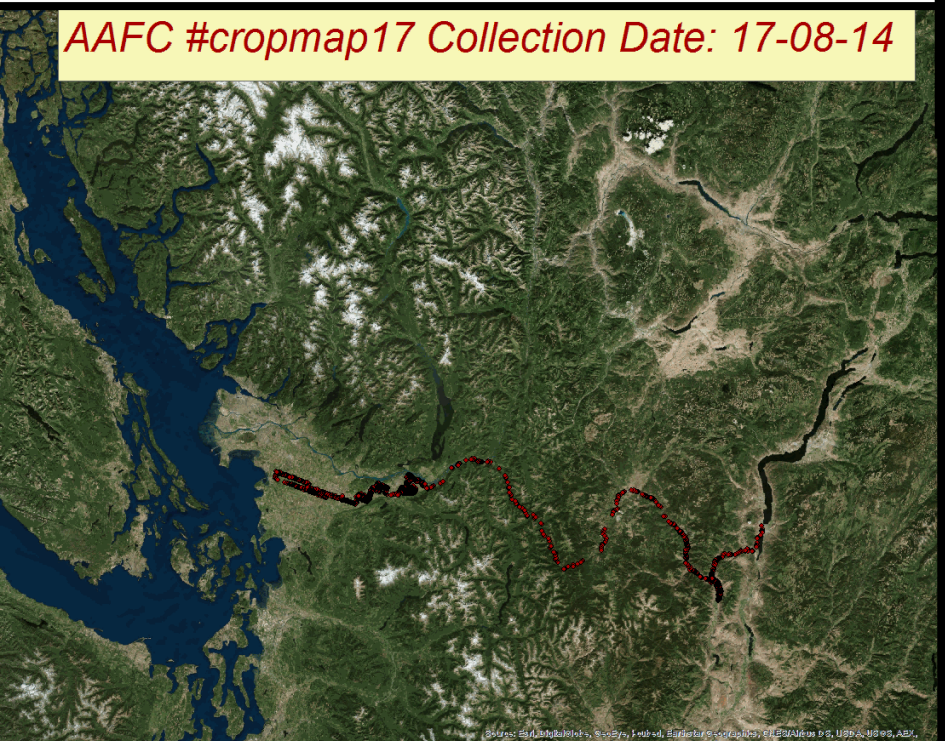
# Ground Truth Data – AAFC Collected

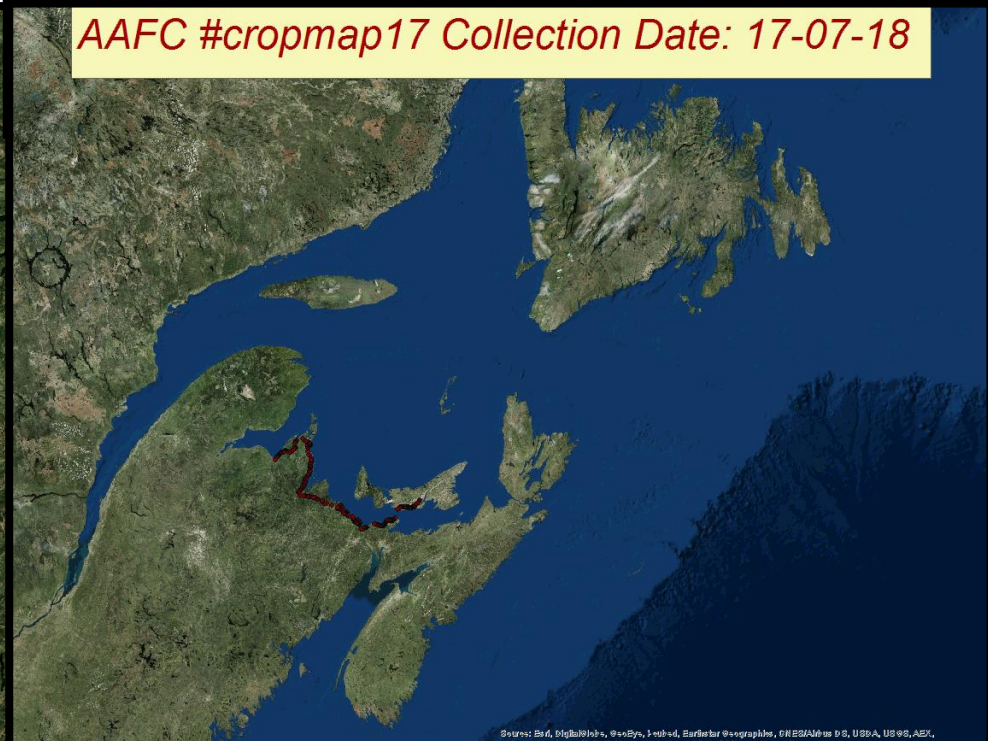


# Ground Truth Data – AAFC Collected

In 2017 AAFC personnel gathered:

90,846 observation points across Canada

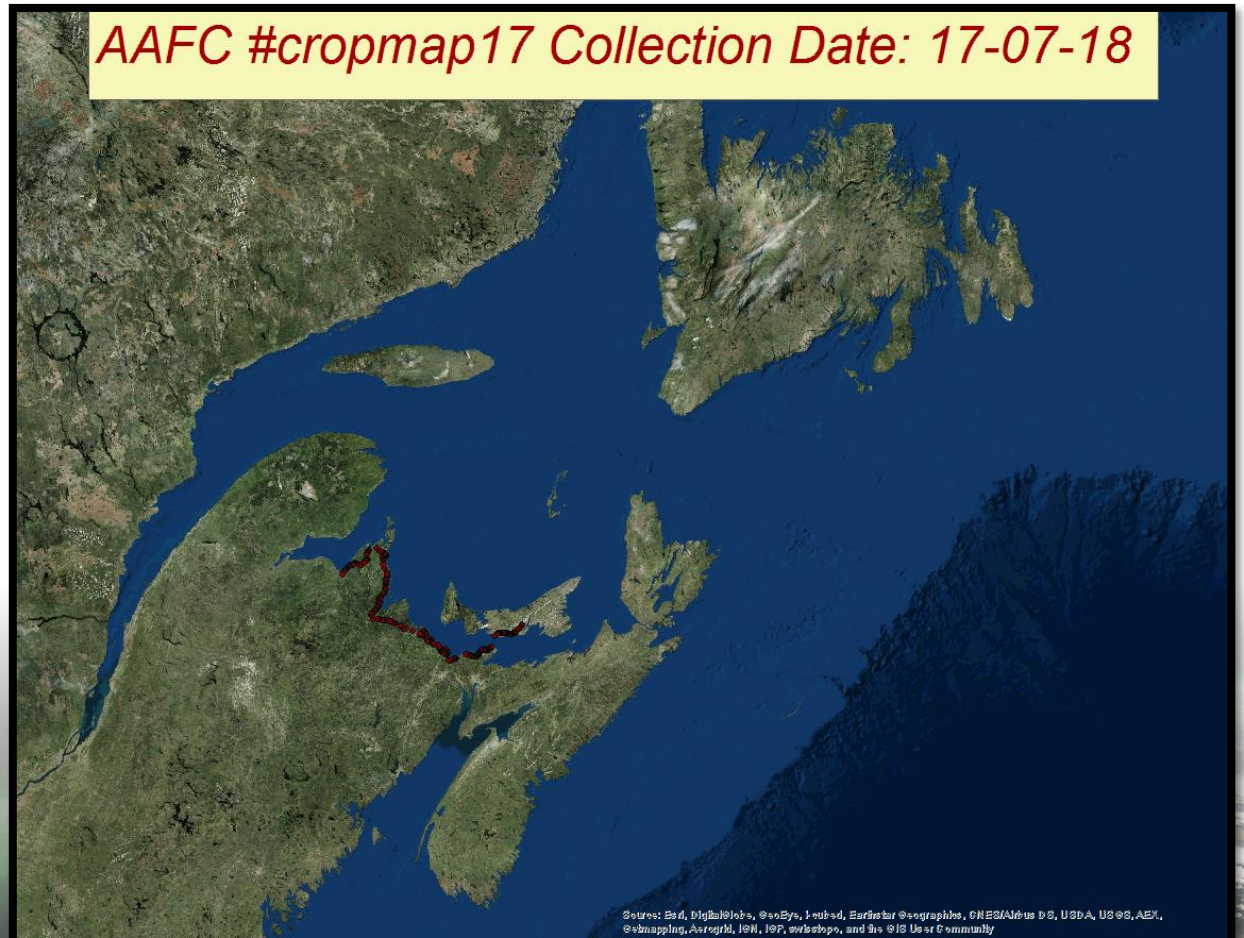



# Ground Truth Data – AAFC Collected

In 2017 AAFC personnel gathered 90,846 observation points across Canada.
22,039 pts came from the Atlantic Provinces.

- New Brunswick: 9,212 pts collected with regional person from AAFC-Moncton
- Nova Scotia: 8,838 pts collected with regional person from AAFC-Kentville
- Prince Edward Island: 3,533 pts collected with regional person from AAFC-Charlottetown
- Newfoundland: 456 pts Collected **solely by** AAFC-St. John's regional person

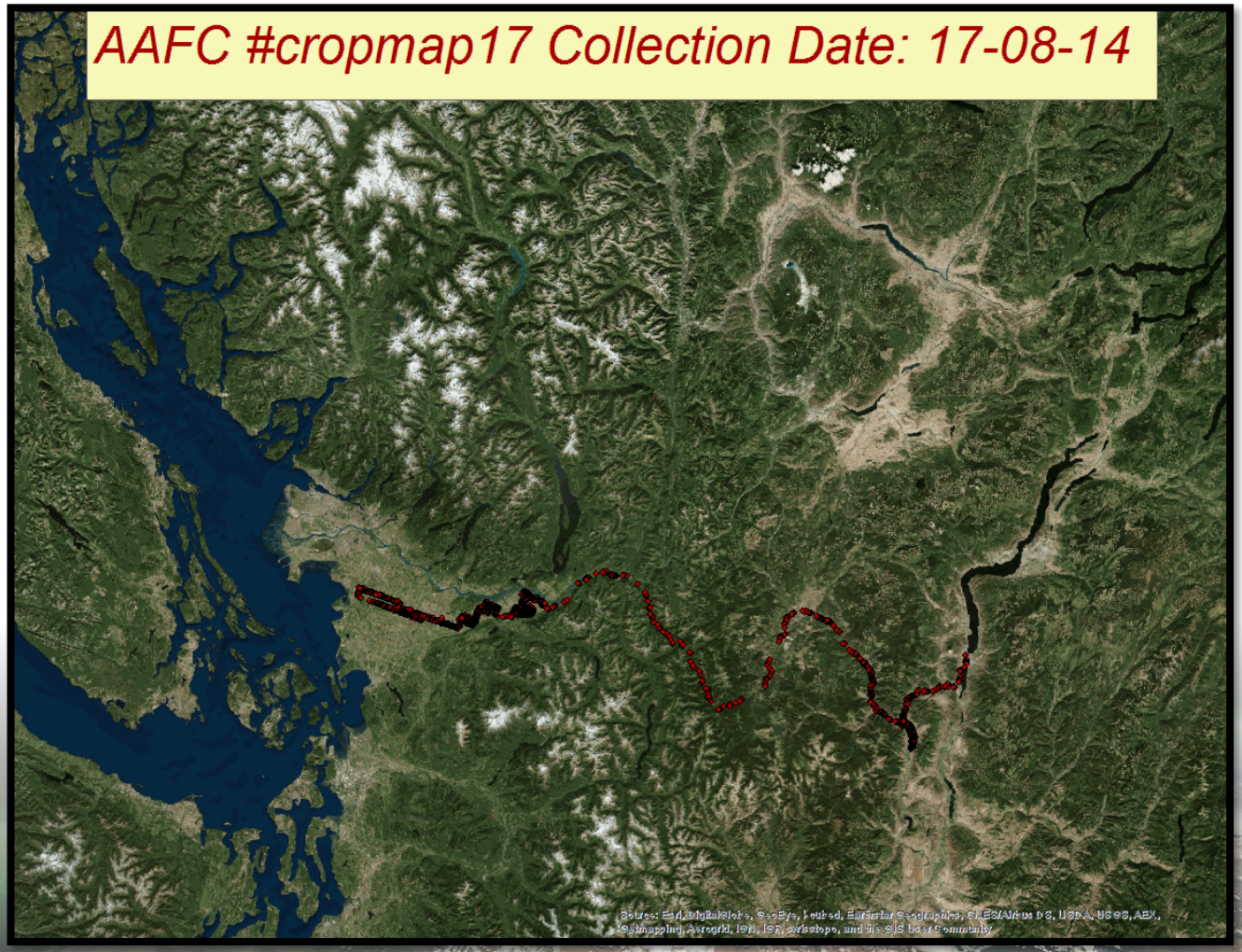



Each trip with a local staff is 5 days of driving plus flying time to and from each province

# Ground Truth Data – AAFC Collected

In 2017 AAFC personnel gathered 90,846 observation points across Canada.
10,400 pts came from British Columbia.

- Support was provided by AAFC-Summerland

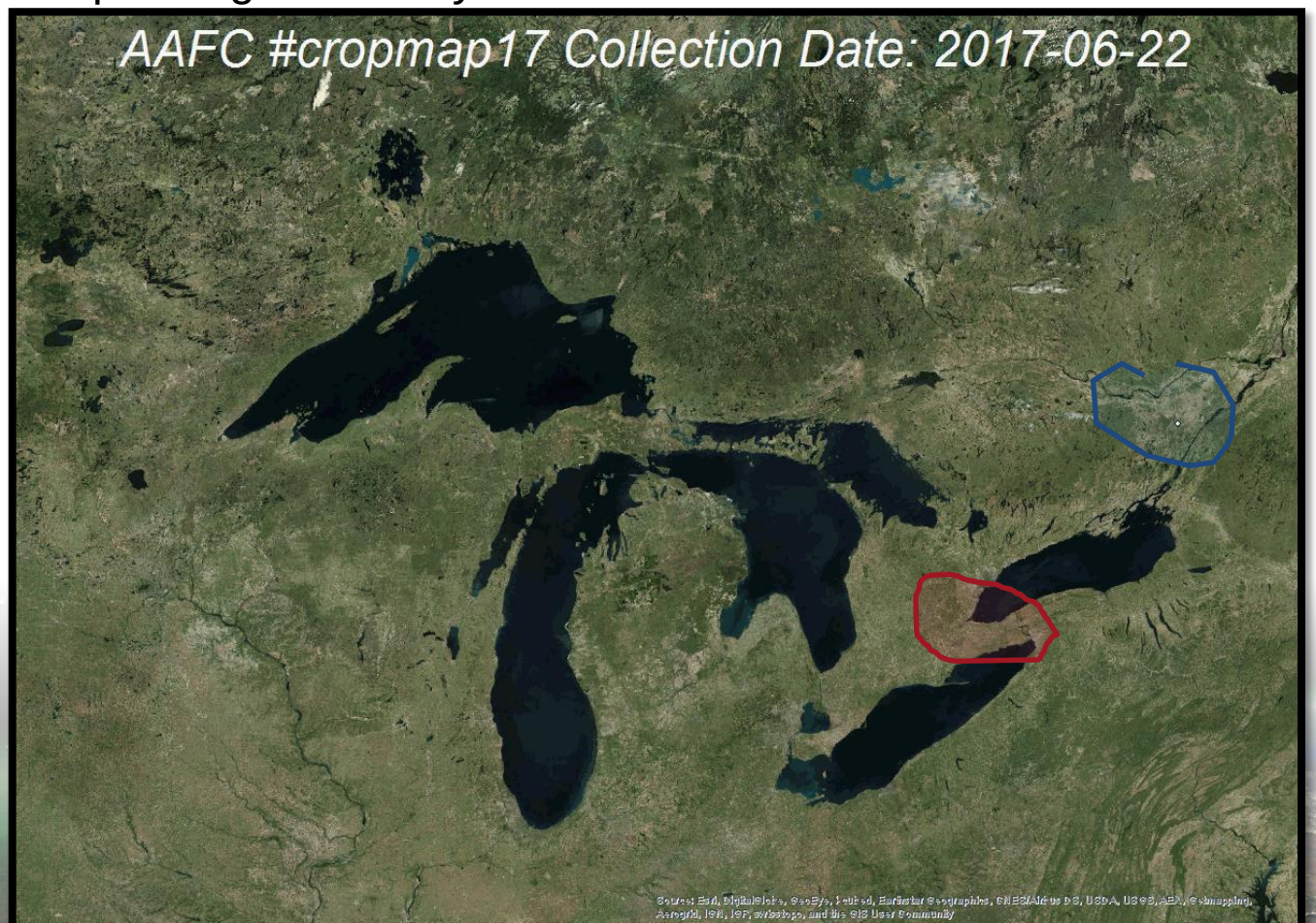



Trip is for 5 days of data collection plus additional time to fly to and from the province

# Ground Truth Data – AAFC Collected

In 2017 AAFC personnel gathered 90,846 observation points across Canada.
58,407 pts came from Ontario.

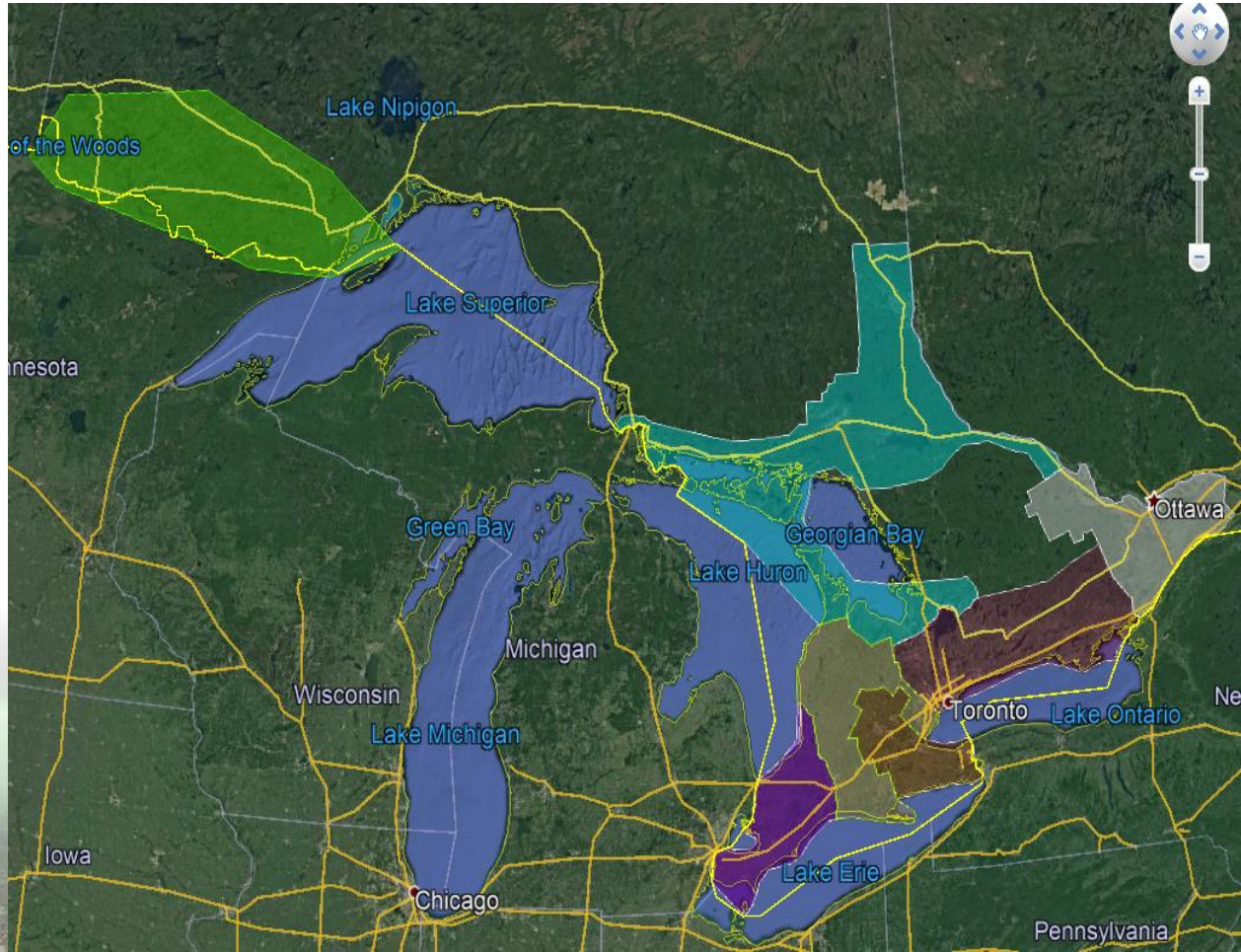
- Some points in red area provided by AAFC-Guelph (7,792 pts)
- Some points in blue area provided by Ontario Ministry of Agriculture (2,399 pts)
- All other points gathered by AAFC-Ottawa staff



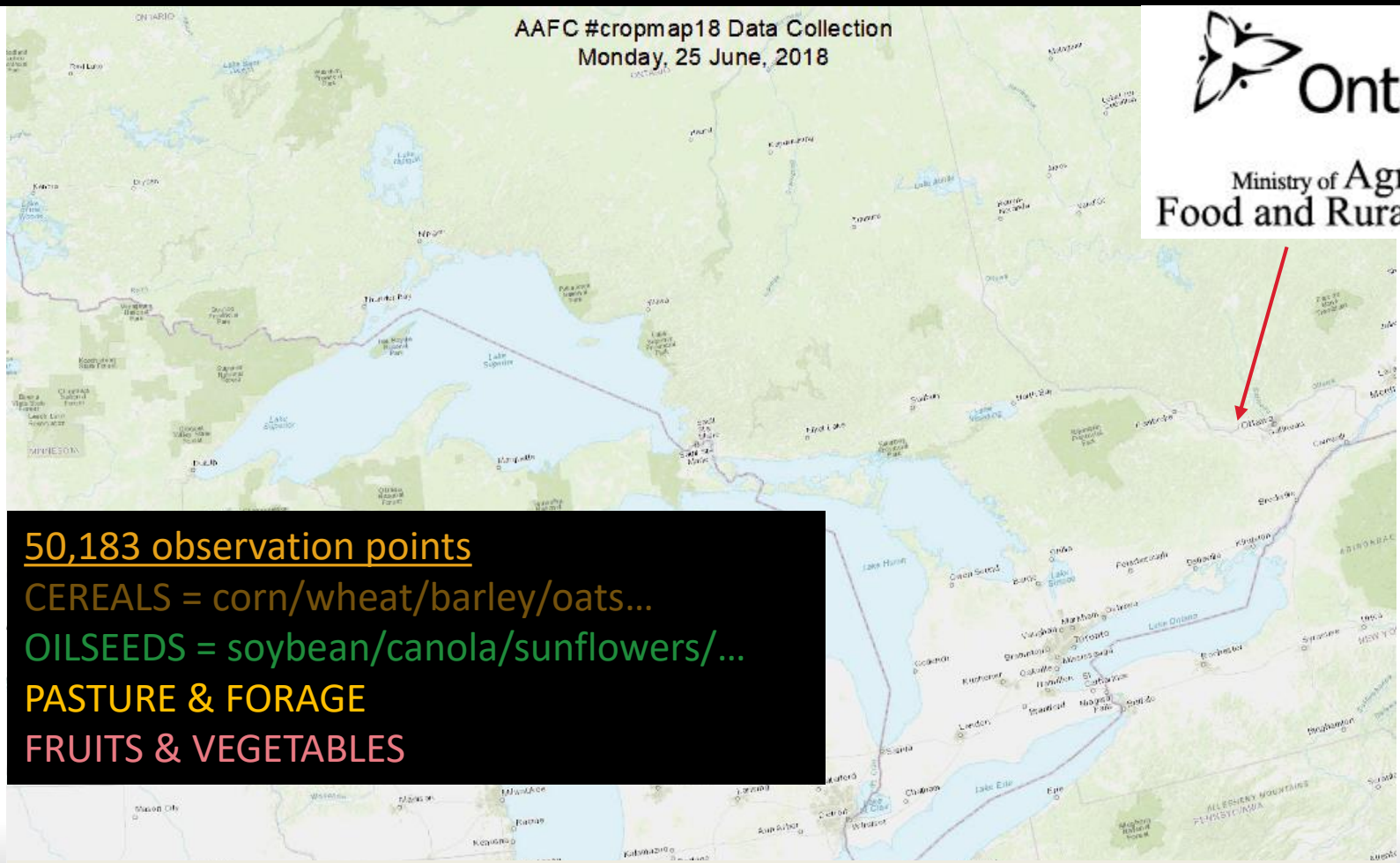
# Ground Truth Data – AAFC Collected

Ontario breakdown of travel for 2017:

- Team of 2 – 6 days of work, done as individual day-trips from the office
- Team of 2 – 3 days of driving, 2 half days of flying
- Team of 2 – 5 days of driving
- Team of 2 – 5 days of driving
- Team of 2 – 5 days of driving
- Team of 2 – 5 days of driving
- Team of 4 – 3 days of driving
  (AAFC-Guelph)



# 2018 Data Collection in Ontario




Ontario

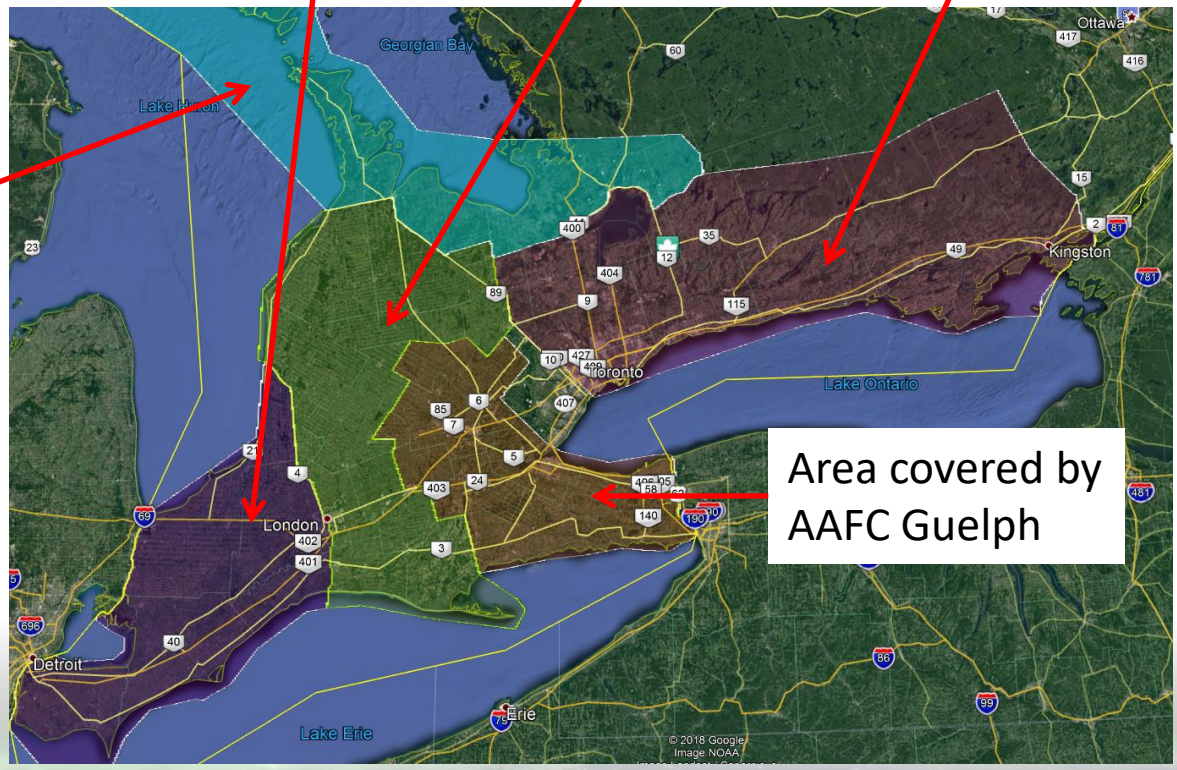
Ministry of Agriculture, Food and Rural Affairs

A look at 2018 data collection in Ontario, colour coded to crop family types
The major groups are listed in the legend above.
Note the early start by our provincial helpers from OMAFRA.
New surveying routes were created for 2018 across the southern part of the province, but the number of people & days remained the same

# 2018 Data Collection in Ontario

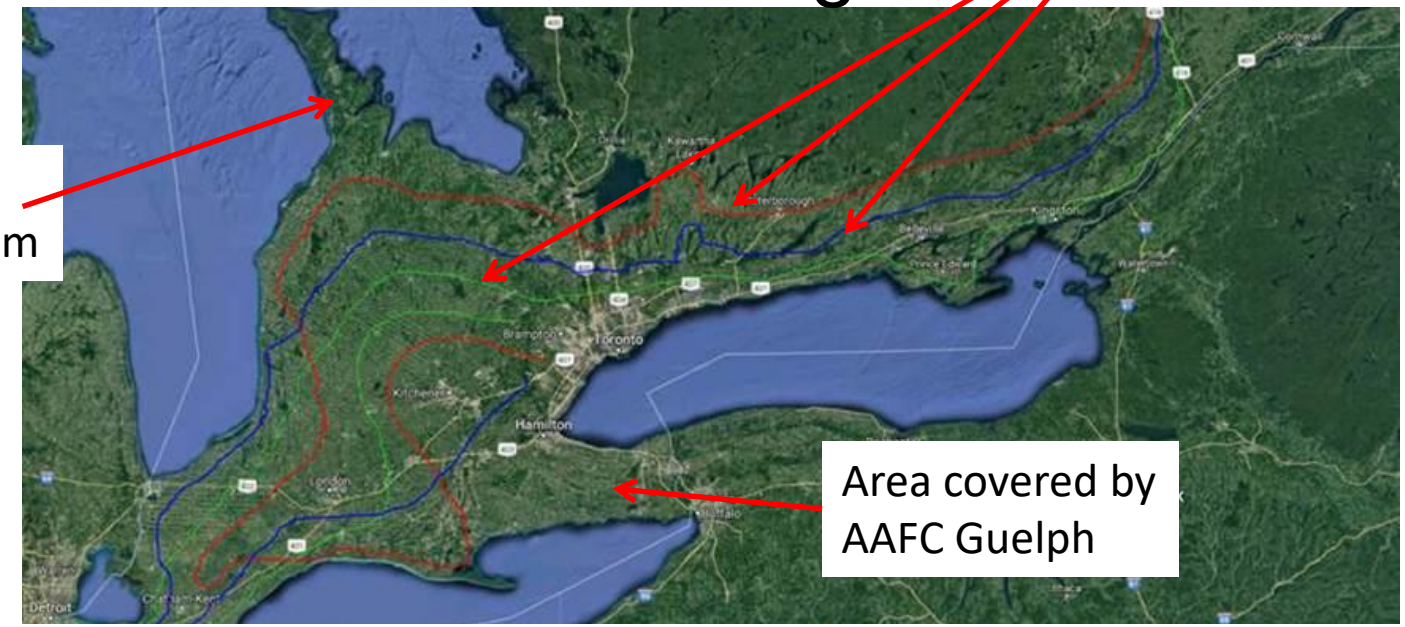
- Instead of our traditional breakdown of SON in to 3 regions (SON-West, SON-East, CON)

Area covered by Northern ON team



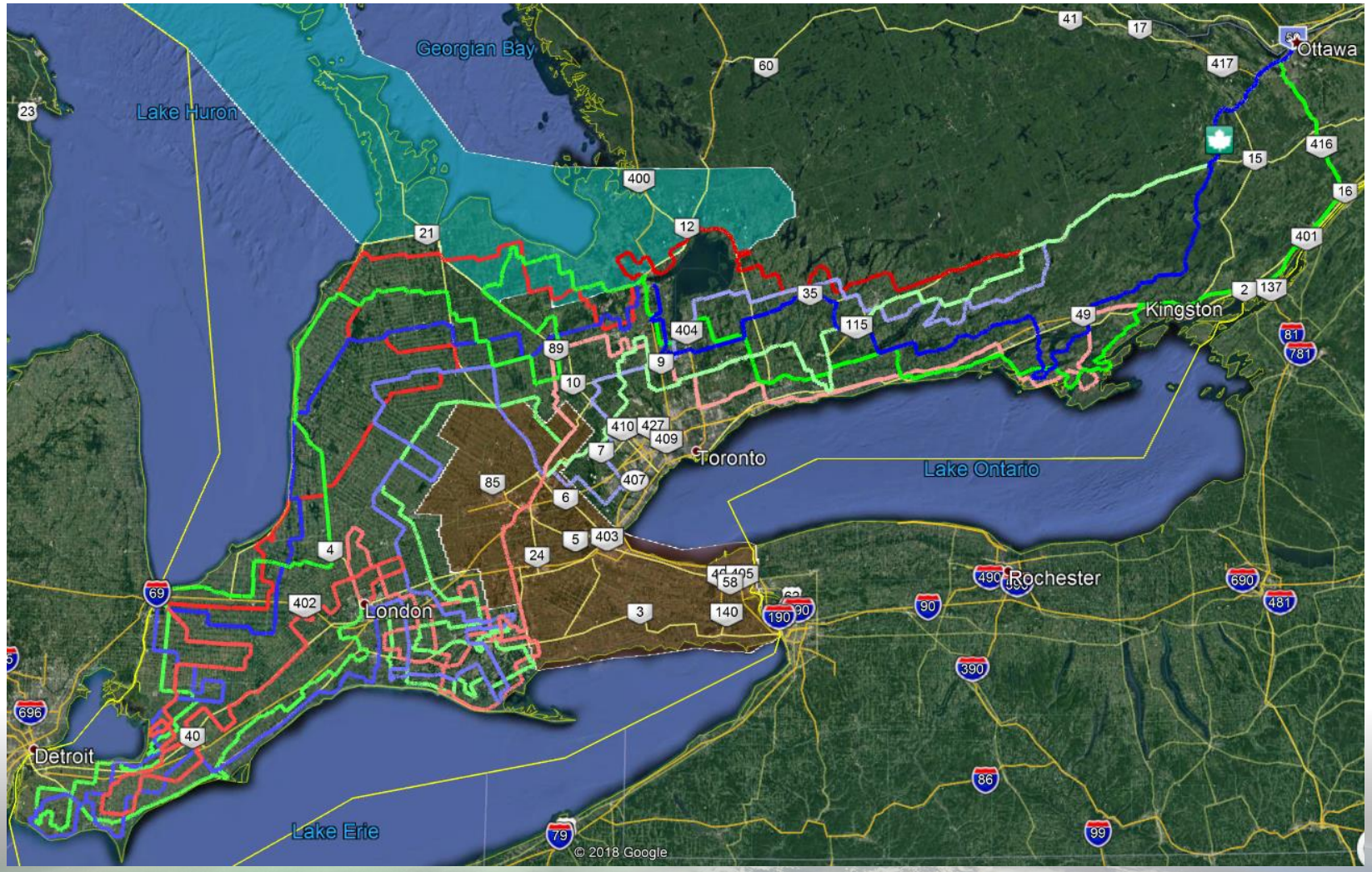
# 2018 Data Collection in Ontario

- Design a new method where all 3 teams travel in each of those 3 regions



# 2018 Data Collection in Ontario

## 2018 Route




- 3 teams (Red, Green, Blue) - coloured lines get paler each day to help distinguish daily routes
- Overnight stays in Barrie, Sarnia, London, Guelph

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# 2018 Data Collection in Ontario

## Benefits

- Eliminates risk of losing data in any one region due to an unforeseen circumstance (vehicle trouble, data corruption, hardware issues)
- Less turns and more straight driving
- Crossing of routes allows for more cross-checking of data
- Can send multiple teams in to areas of high diversity or unique crop types

# 2018 Data Collection in Ontario

## 2018 Route – Daily Drive Times

| | Team | | |
|---|---|---|---|
| | **Red** | **Green** | **Blue** |
| **Day1** | 7h48m | 8h18m | 8h22m |
| **Day2** | 7h56m | 8h21m | 7h53m |
| **Day3** | 7h47m | 7h46m | 7h39m |
| **Day4** | 7h50m | 7h36m | 7h52m |
| **Day5** | 8h13m | 8h07m | 8h14m |

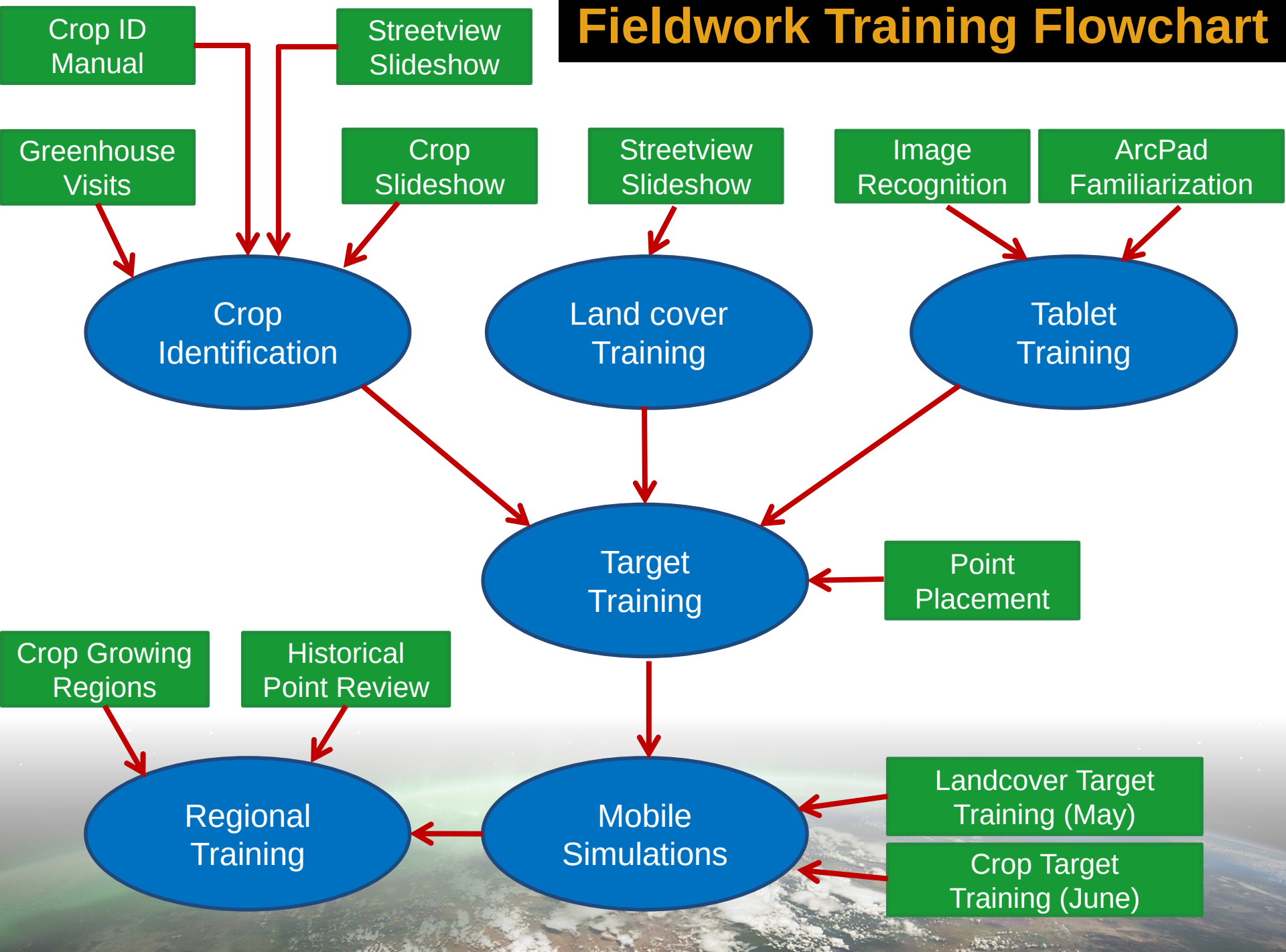
- Based on Google Map times
- Tried to make daily trips around 8 hours in length
- Routes have plenty of room for expansion (extra data collected, more areas visited) without adding additional stress to any team (avg day in 2017 was >12hrs)

# Fieldwork Training

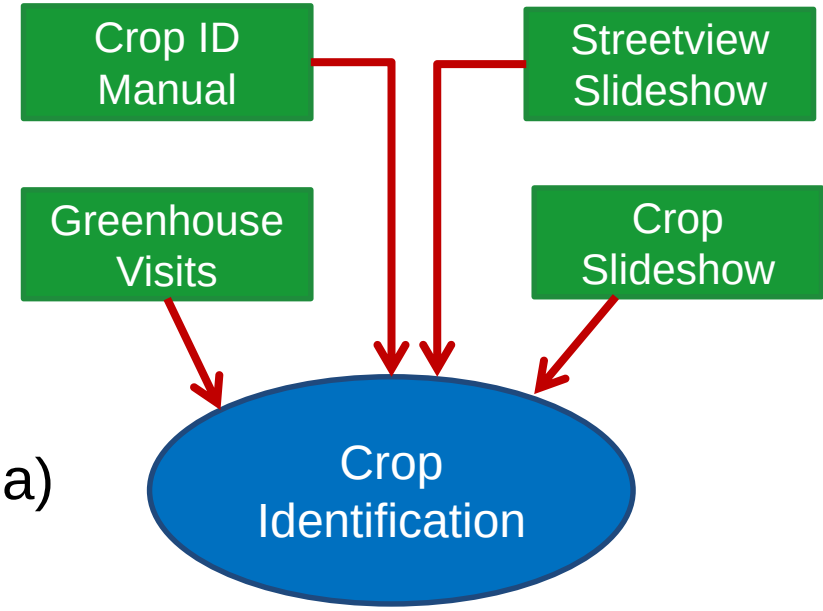
To gather all these points a thorough training system was devised to help a new staff or students become familiar with our data collection methods.

https://twitter.com/LeanderCampbell/status/887652010857771009/video/1

# Fieldwork Training Flowchart

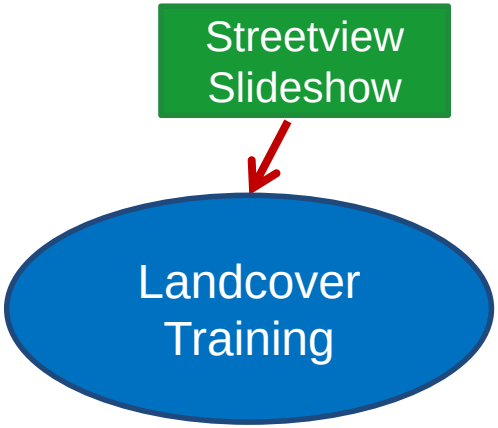


# Crop Identification




- Visit Greenhouses
  - Bi-weekly trips next door to watch crops in various stages of growth (mainly corn, soy, wheat, oats, canola)
- Crop Manual ID
  - Reviewing the training manual to familiarize the diversity of crops in Canada
- Streetview Slideshow
  - Using Google Maps. “Drive” specific paths and ID crops in field (focus on specialty crops)
- Crop Slideshow
  - A “rapid” slideshow of crop photos taken by the EO team, where users will need to quickly ID what they have seen

# Landcover Training




- Streetview Slideshow
  - Again using Google Maps. “Drive” specific paths to ID various landcover types

# Landcover Training

Streetview Slideshow

Landcover Training

3. "Drive" in Streetview the following route:
   a. Start - 9730 County Rd 91 ON
   b. Finish - 794588 Grey Rd 31 - Simcoe Rd 95 Singhampton, ON

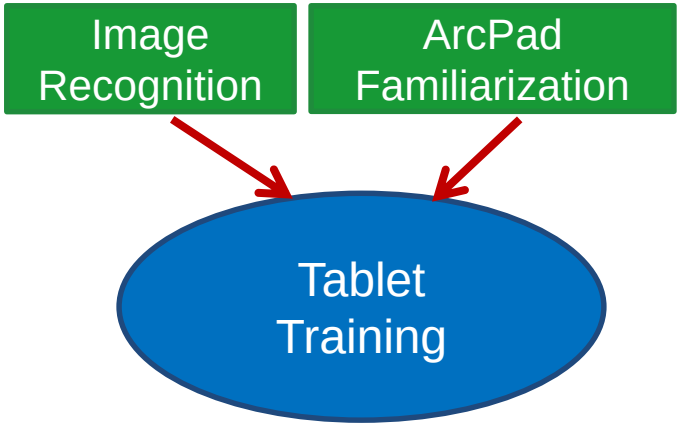
Mark down the various land cover types you pass on the satellite image.


LEFTSIDE OF ROAD

RIGHTSIDE OF ROAD


4. What type of forest are you in when you travel to: 286043 Proton Artemesia Townline Ontario ?

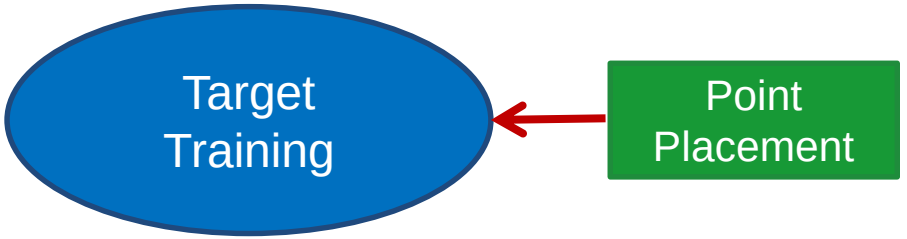
# Tablet Training




- Image Recognition
  - Reviewing background imagery to become accustomed to what they are seeing

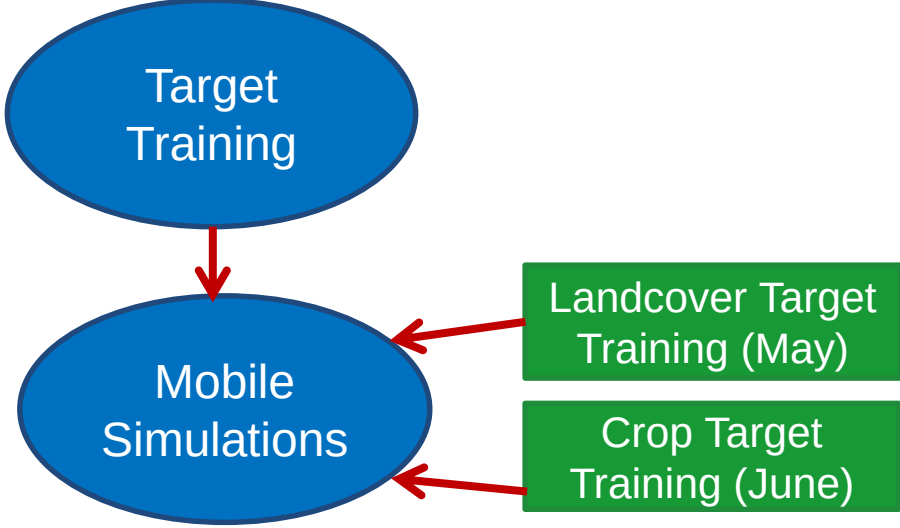
- ArcPad Familiarization
  - Spending time learning the different functions of the software (how to delete pts, load layers…)
  - Read through the Help files that were created

# Target Training



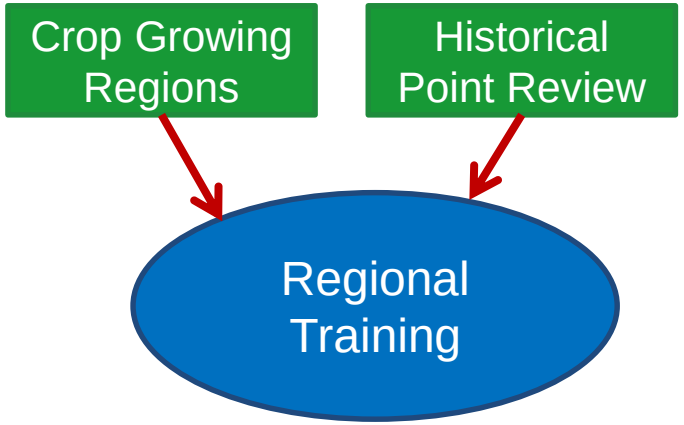

- Point Placement
  - Work on being able to correctly position data on top of background imagery.
    - Will be a static identification of targets in the office. (Within this background image find: 10 water features, 6 barns, 7 forest classes, 2 golf courses, etc…)

# Mobile Simulations




- Landcover Target Training (May)
  - Take the trainee on a known route where they will be asked to collect only Landcover data. Will be judged on correct identifications, positional accuracies, and volume of points.
- Crop Target Training (June)
  - Take the trainee on a known route where they will be asked to collect only Crop data. Will be judged on correct identifications, positional accuracies, and volume of points.

# Regional Training




- Crop Growing Regions
  - Familiarize the student with the types of crops grown in their assigned fieldwork region.
    - Use Bahram's Spatial Density maps along with other internal (our knowledge) or external (provincial maps) to prepare the student on what to expect and where.
  - Historical Point Review
    - Have the student look at past data collection years to see which minor crops have been spotted by us in previous years and to see where to expect them.

# Tablet Information

The following section shows what software and help files are currently on our field ta

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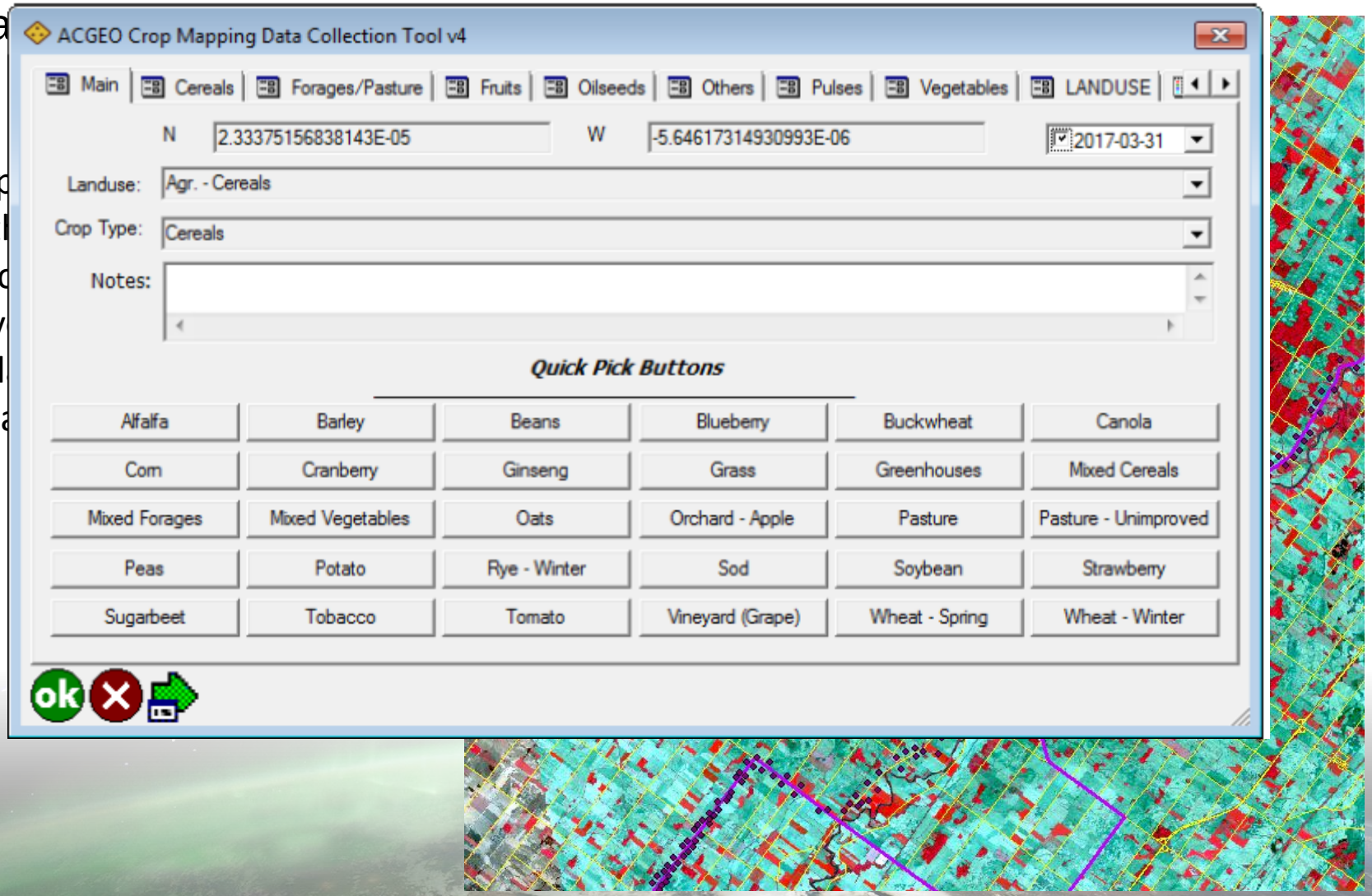

# Tablet Info[illegible] Identification Book

As seen previously[illegible] cation Book
is uploaded to eac[illegible] for over 100
crop types, plus ac[illegible] n field
scenarios are enc[illegible]

***Lentils***

It is a bushy and herbaceous plant that can reach 60-75 cm (24-30 in) high. The stems are hairy, slender and many-branched. The leaves are compound, ending in a tendril or bristle. The 5 to 16 leaflets are opposite, oblong to elliptical. The flowers vary in colour from white to bluish-purple and are 2-5 cm (0.75-2 in) long. The fruits are small, laterally compressed pods that contain 2-3 seeds.

# Tablet Information – Visual Crop Guide

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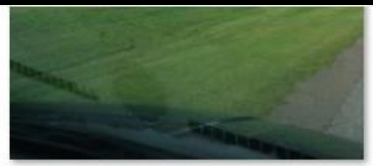

Tobacco (5).jpg


Tobacco (6).jpg


tobacco (7).JPG


tobacco (8).JPG

bers


tobacco (9).JPG


tobacco (10).JPG


tobacco (11).JPG


tobacco (12).JPG


Broccoli (1)


li (10).JPG


tobacco (14).JPG


tobacco (15).JPG


tobacco (16).JPG


tobacco (17).JPG


broccoli (11)


li (20).JPG


broccoli (21)


li young
).JPG


broccoli yo
(3).JPG


tobacco field.JPG


tobacco young (1).JPG


tobacco young (2).JPG


tobacco young (3).JPG

Kale 9/11/2018 1:32 PM File folder

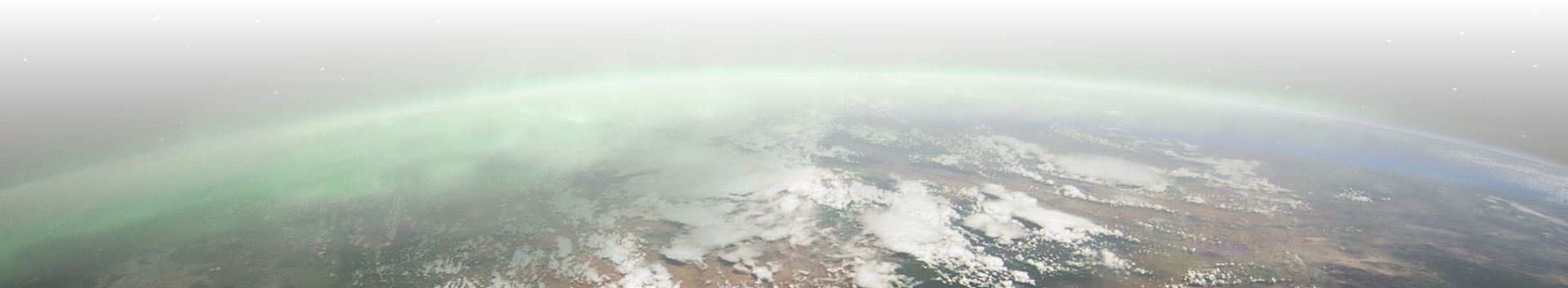
# Field Work - Issues

Recurrent Issues:

- Finding local staff;
- Sampling error;
- Field planification;
- Equipment.

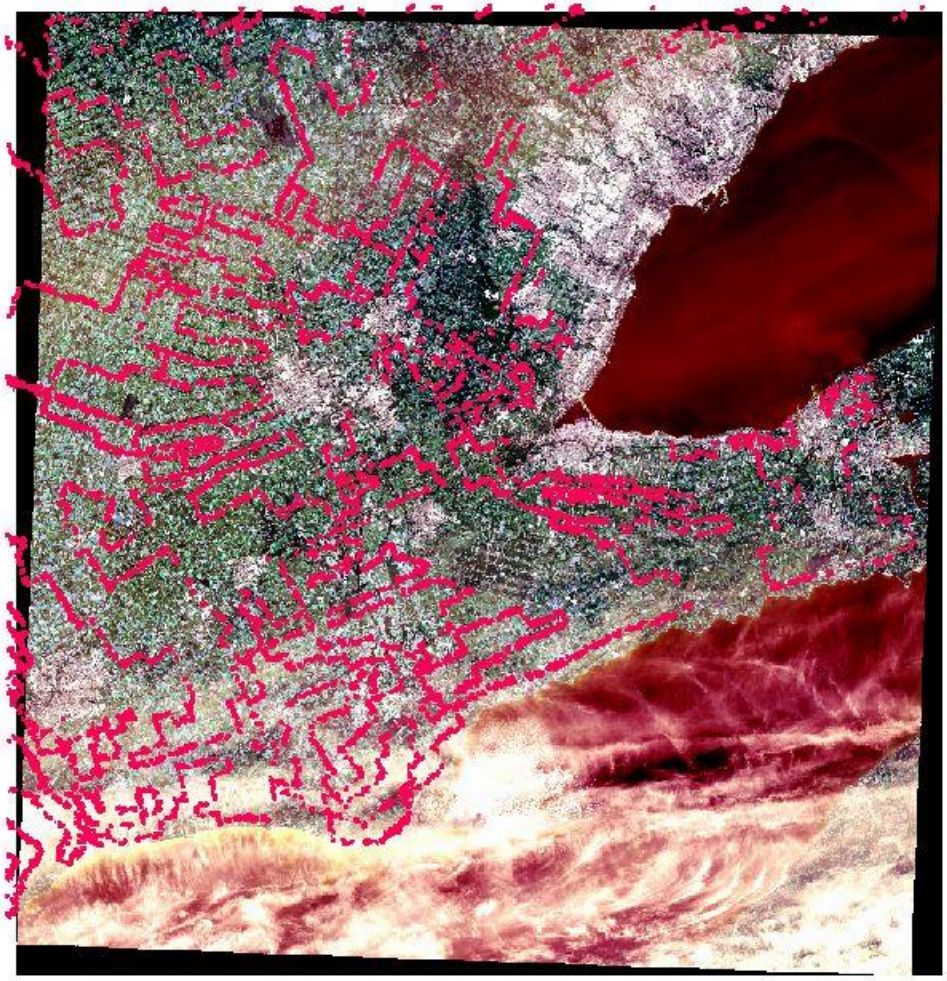
New approaches for field work:

- Voice recognition;
- Camera (Similar to Street View).



**Reducing Data Sampling; Preliminary results**

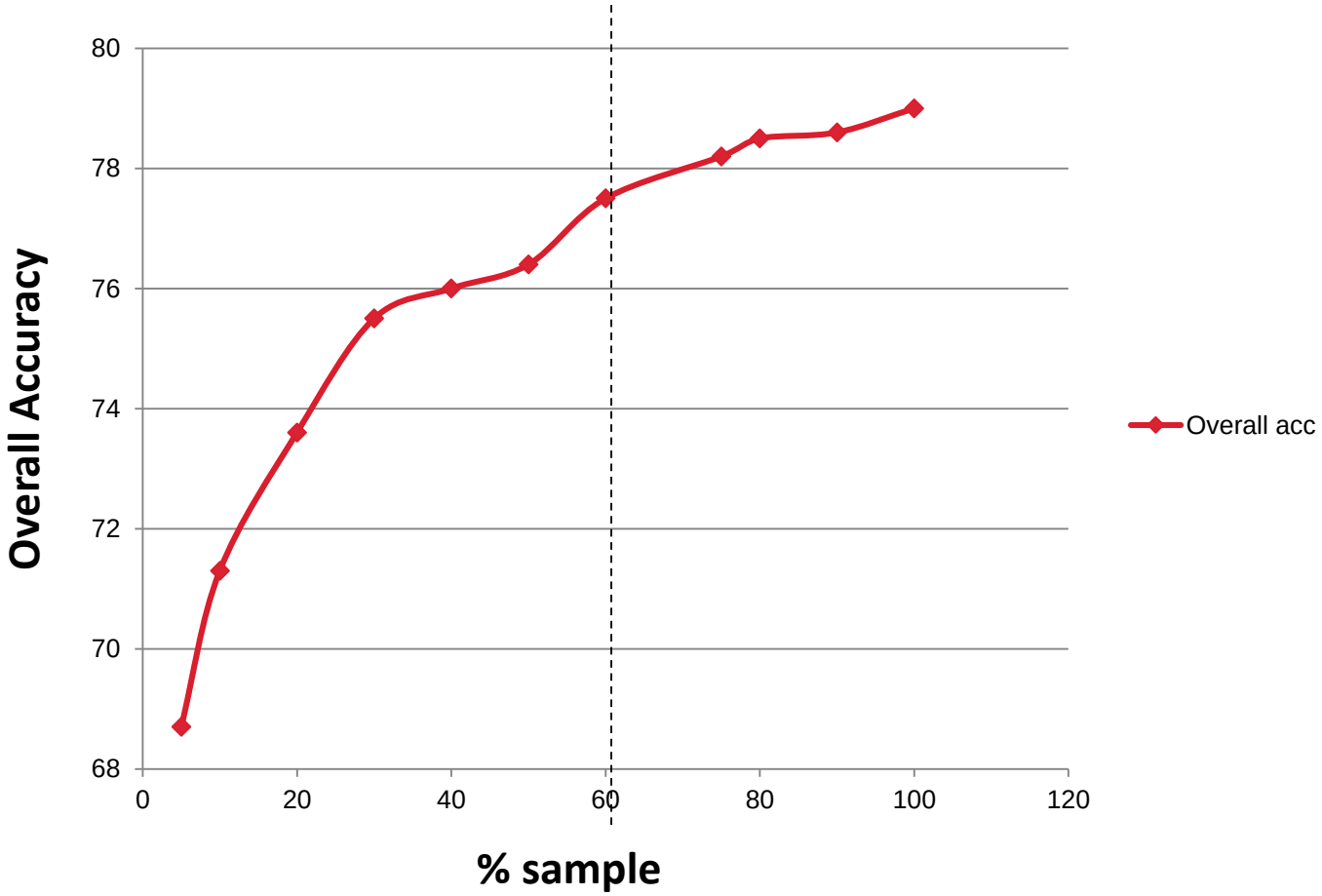
By how much can we reduce ground sampling?



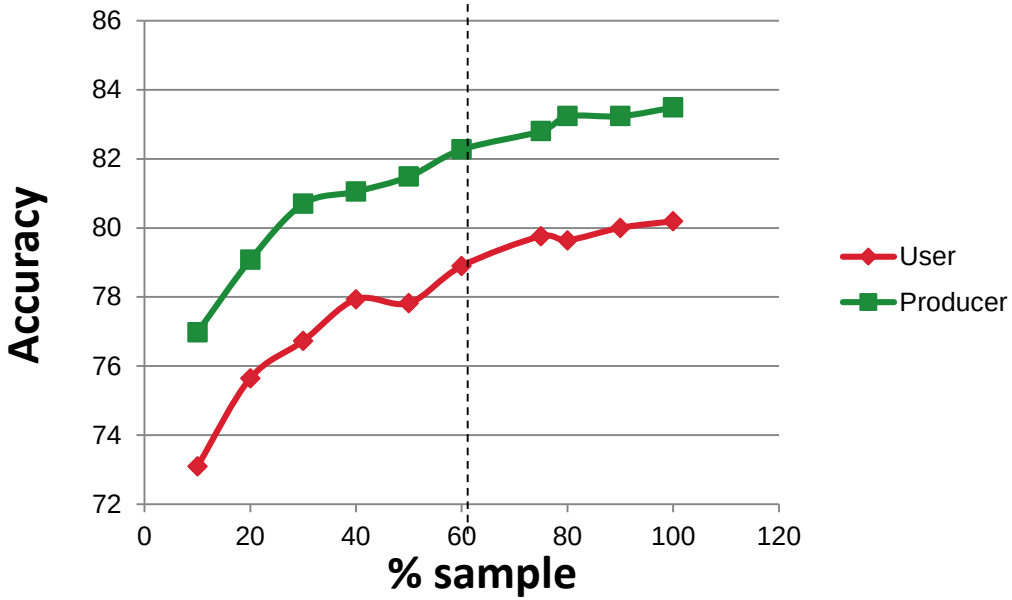
16 700 samples

## Reducing Data Sampling; Preliminary results

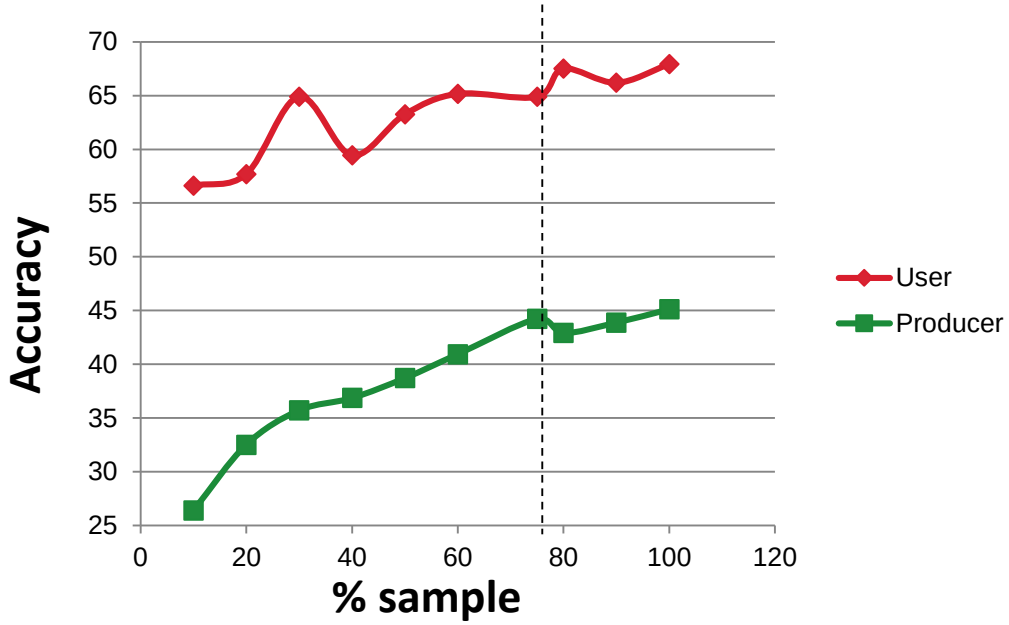
- Sample field data at: 5%, 10%, 20%, 30%, … , 100%
- Classify with new sampled datasets
- Measure accuracy

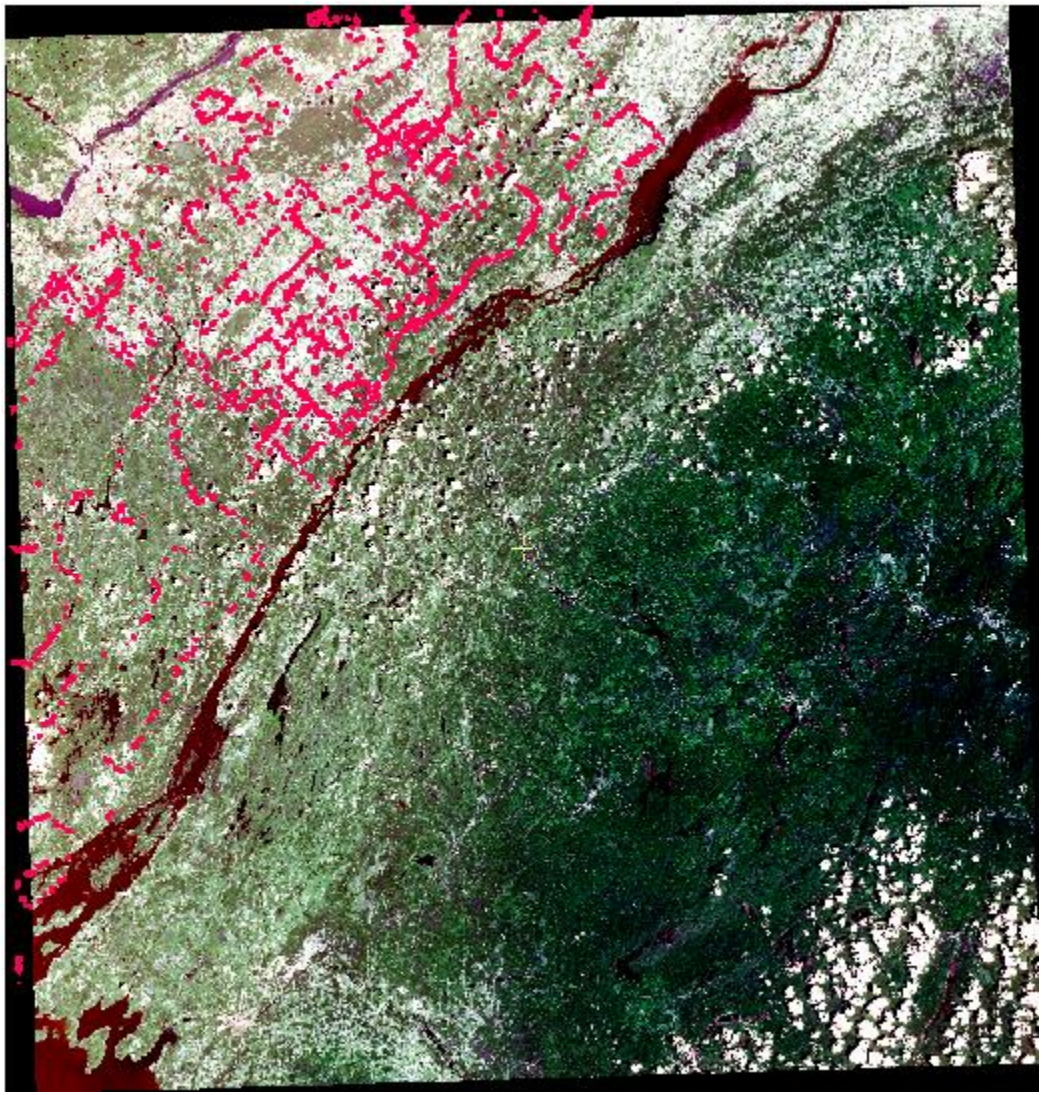


- **Major classes: hay/pasture, wheat, corn, soybeans**




- **Minor classes**





**6 700 samples**

**100% Sampling: 85.4%**
**50% Sampling: 84.3%**
**5% Sampling: 81.1%**

# Thanks!

## Questions / Comments?

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