Extreme Weather: Envisioning Ontario Agriculture Under Climate Change

Introduction

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2 IISD International Institute for Sustainable Development

CARLETON UNIVERSITY

GLEL GEOMATICS AND LANDSCAPE ECOLOGY RESEARCH LABORATORY

3 Agriculture and Agri-Food Canada / Agriculture et Agroalimentaire Canada

4 uOttawa

5 Ontario MINISTRY OF AGRICULTURE, FOOD AND RURAL AFFAIRS

What's this project about?

- create and deliver information about current and future climate extremes* that will affect Ontario's agriculture sector and rural communities

  - *what do WE mean by extreme? (weather patterns)

- develop a decision support tool to characterize risk and vulnerabilities associated with climate change and extremes in agriculture, allowing users to plan for and mitigate risks by evaluating different adaptation choices

  - spatial scenario development – impacts on crops and livestock*
    - map-based, field-level mapping; expectations
    - data realities: weather stations (time), GCM resolution
    - how to translate what the weather data and climate models tell us into possible impacts to crops and livestock

- use of seasonal, phenology-linked indices with links to specific crops and operations

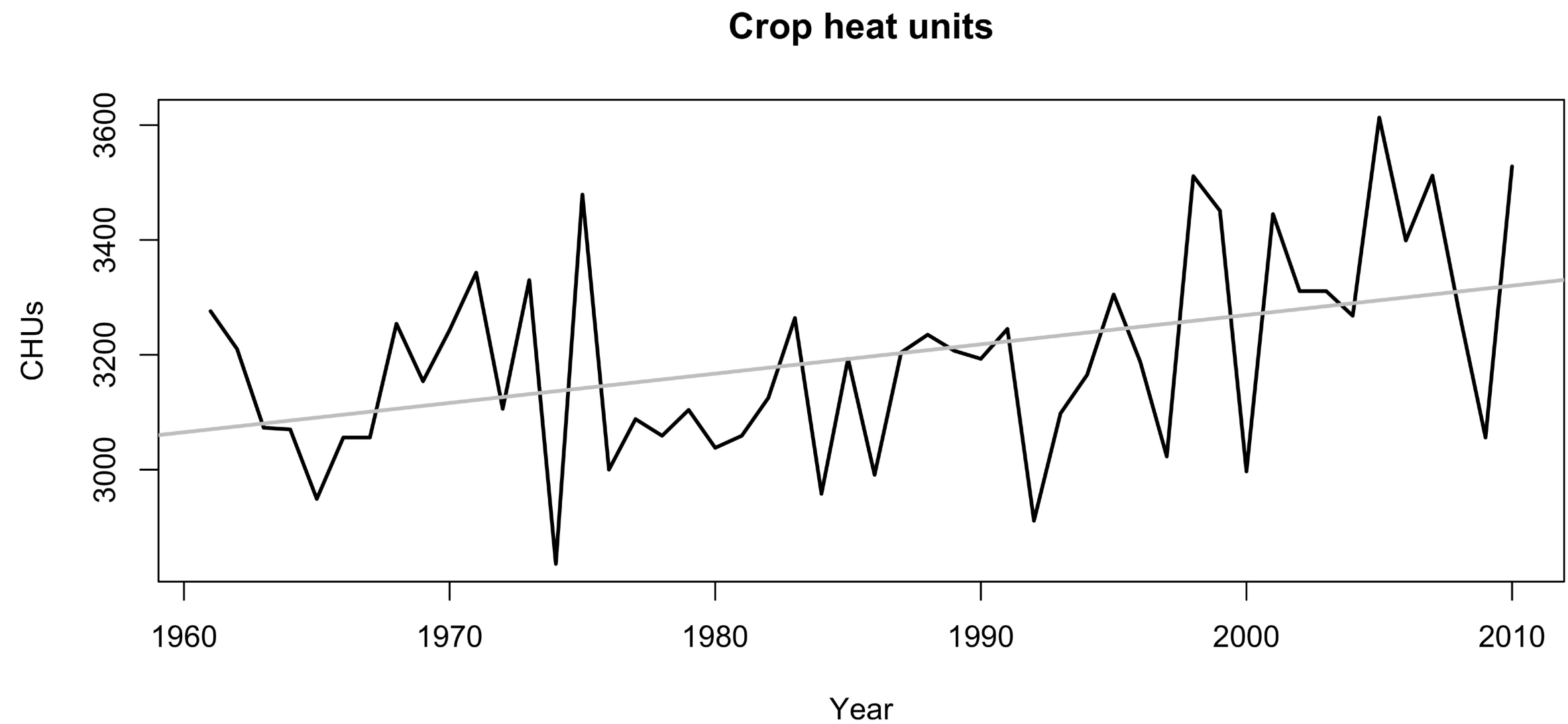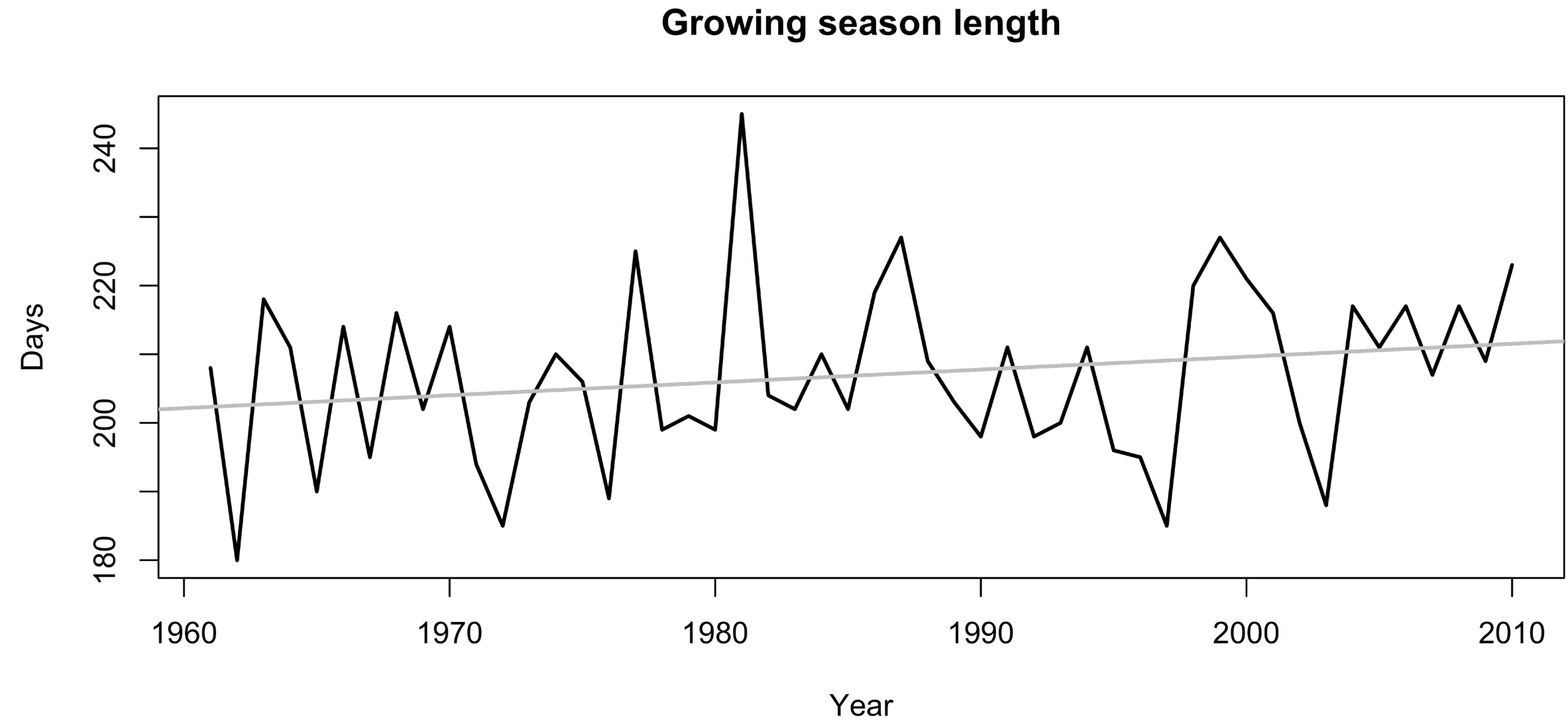Figure 1. Farms to Regions – Adaptation & Innovation Framework
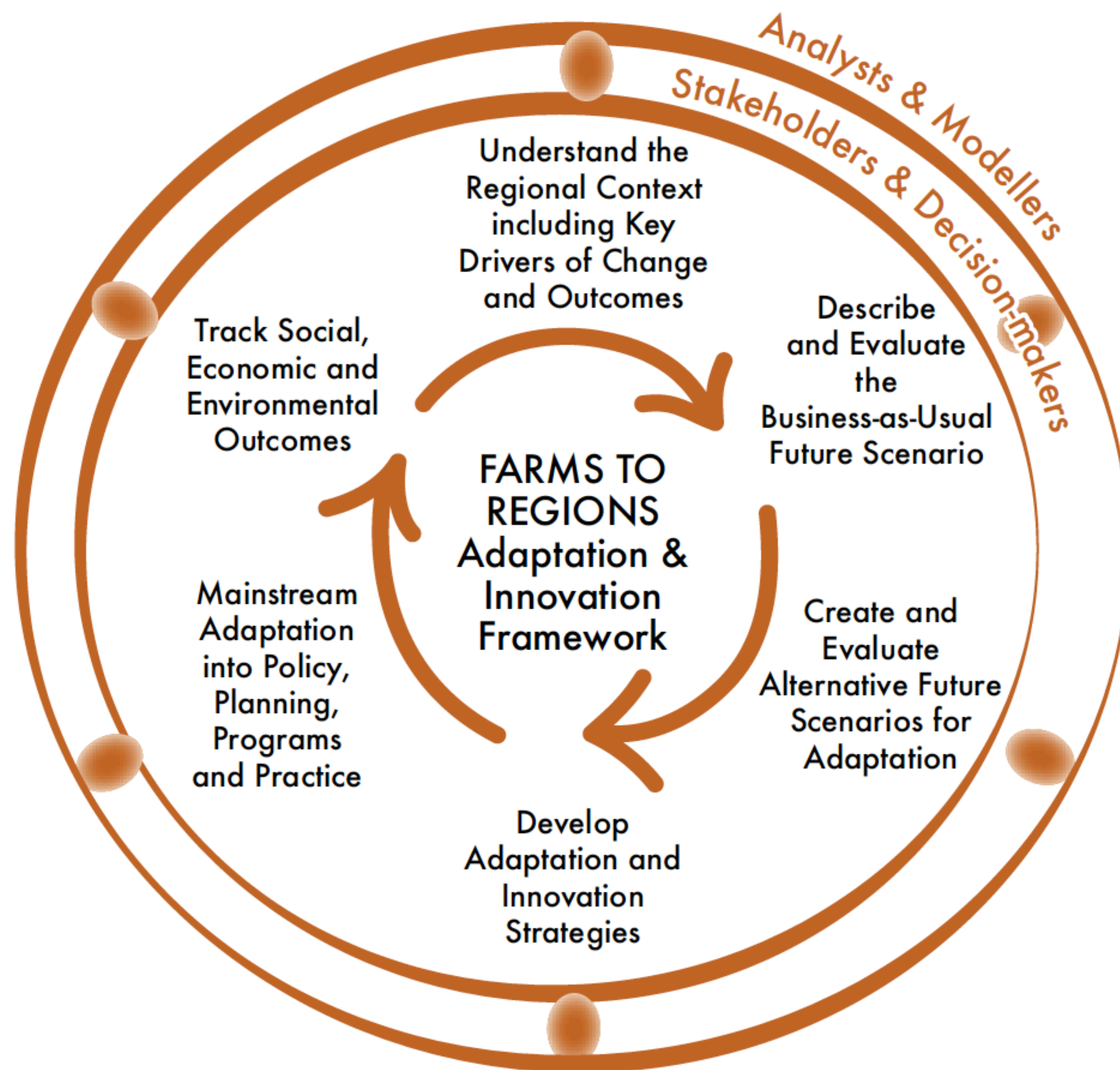
www.carleton.ca/envisionontarioag
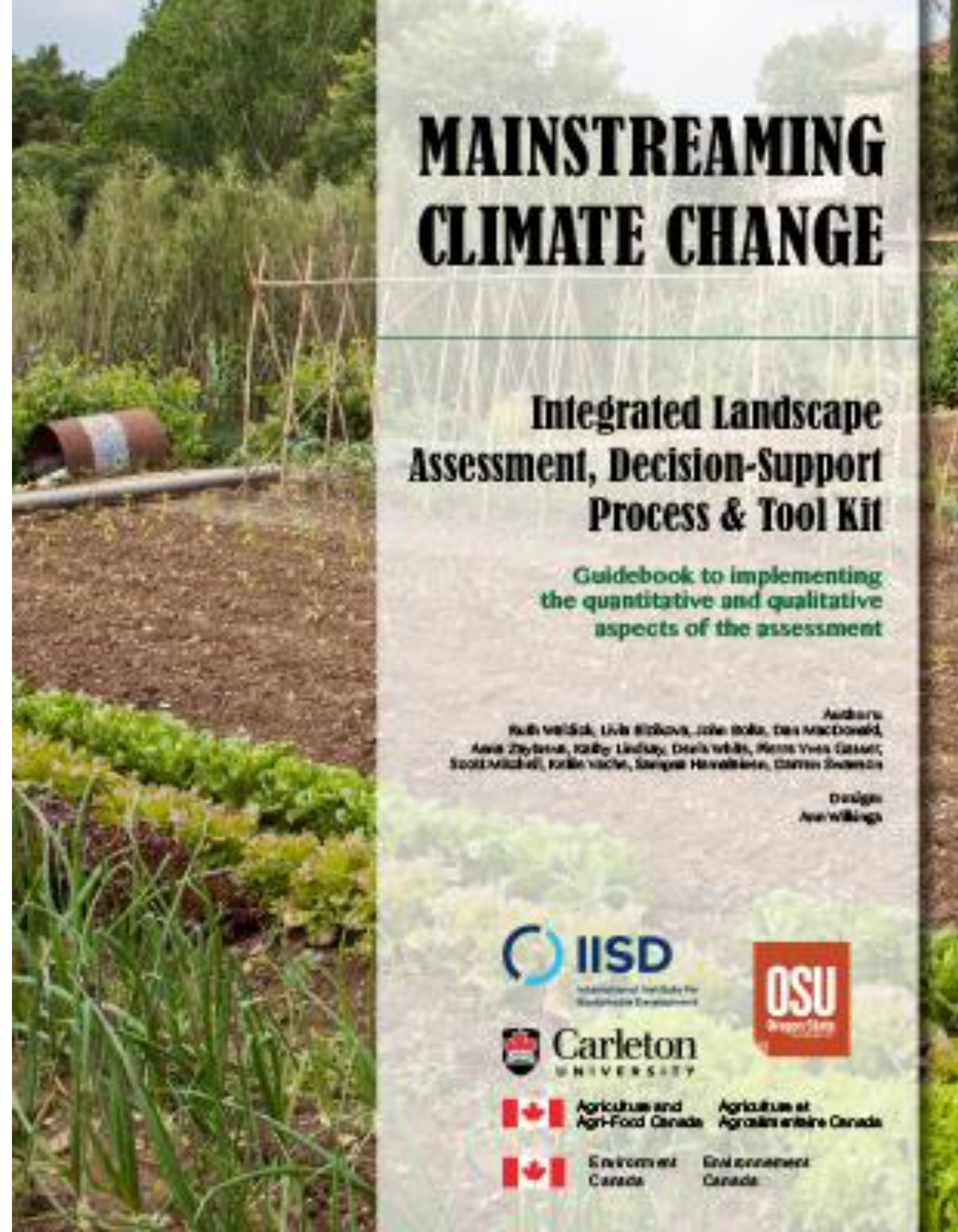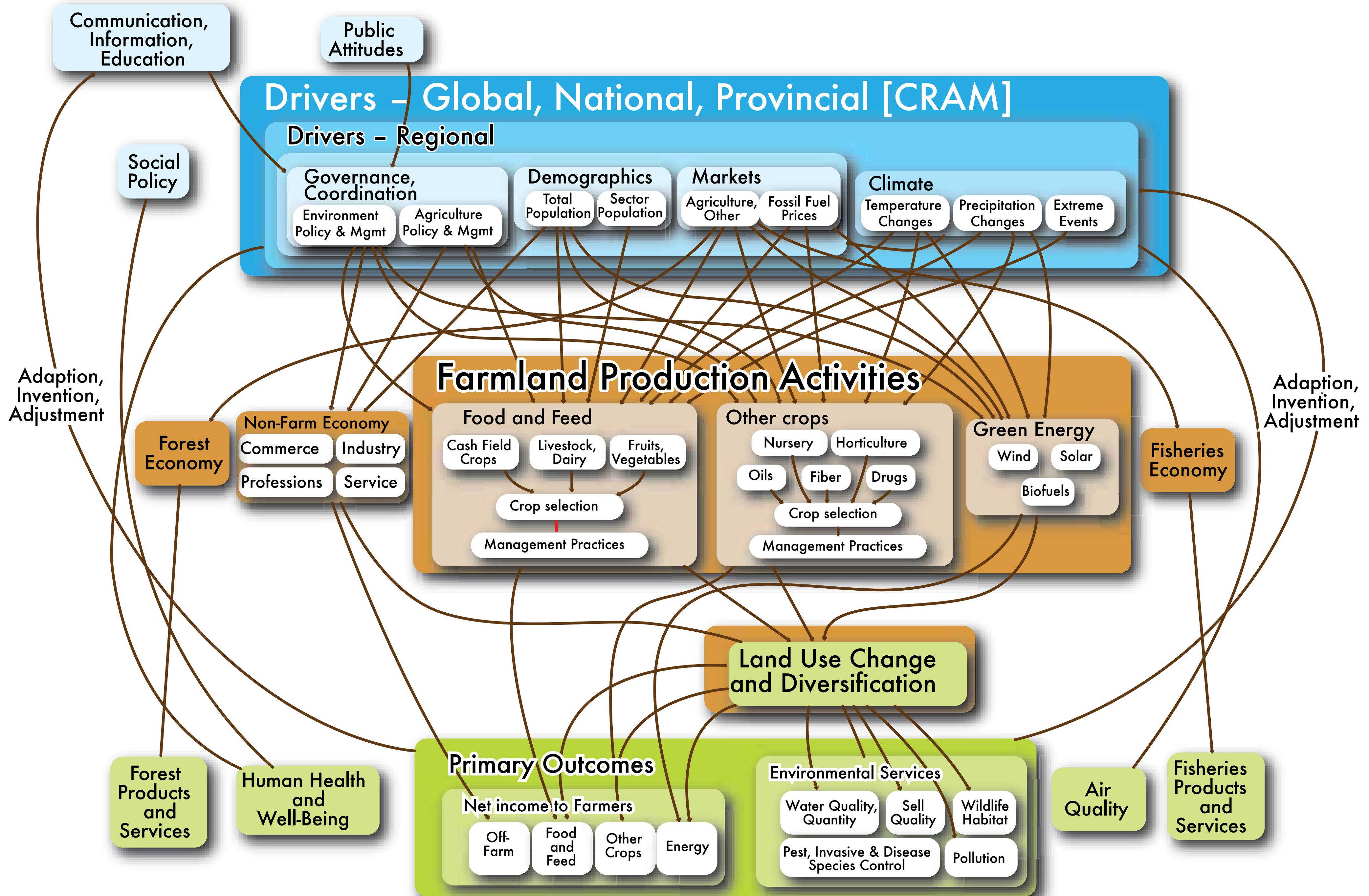
Why extremes? This is NOT the whole story!

A. Zaytseva M.Sc. Thesis (Carleton University).

Why focus on scenarios & indicators / phenological impacts?

- every climate change model run is a scenario, not a prediction

- those models lack spatial and temporal detail, **but** there is demand for information relevant to locally evaluating levels of risk and potential tradeoffs

- for example, crop modelling typically focuses on yield,
  - usually works best at very local levels; high data needs, assume conditions not changing
  - focusing on **phenological impact** allows us to identify times when crops are particularly vulnerable to climatological events, and assign a typical impact to crop yield; concentrate on relative impacts rather than specific physiological processes

Study area: eastern Ontario

Legend

- planted corn or soybeans
- lakes and rivers
- provincial parks, significant forests and wetlands

Boreal Shield

Mixedwood Plains

Ontario

0 5 10 20 30 40 Kilometers

A. Zaytseva's M.Sc. Thesis (Carleton University).
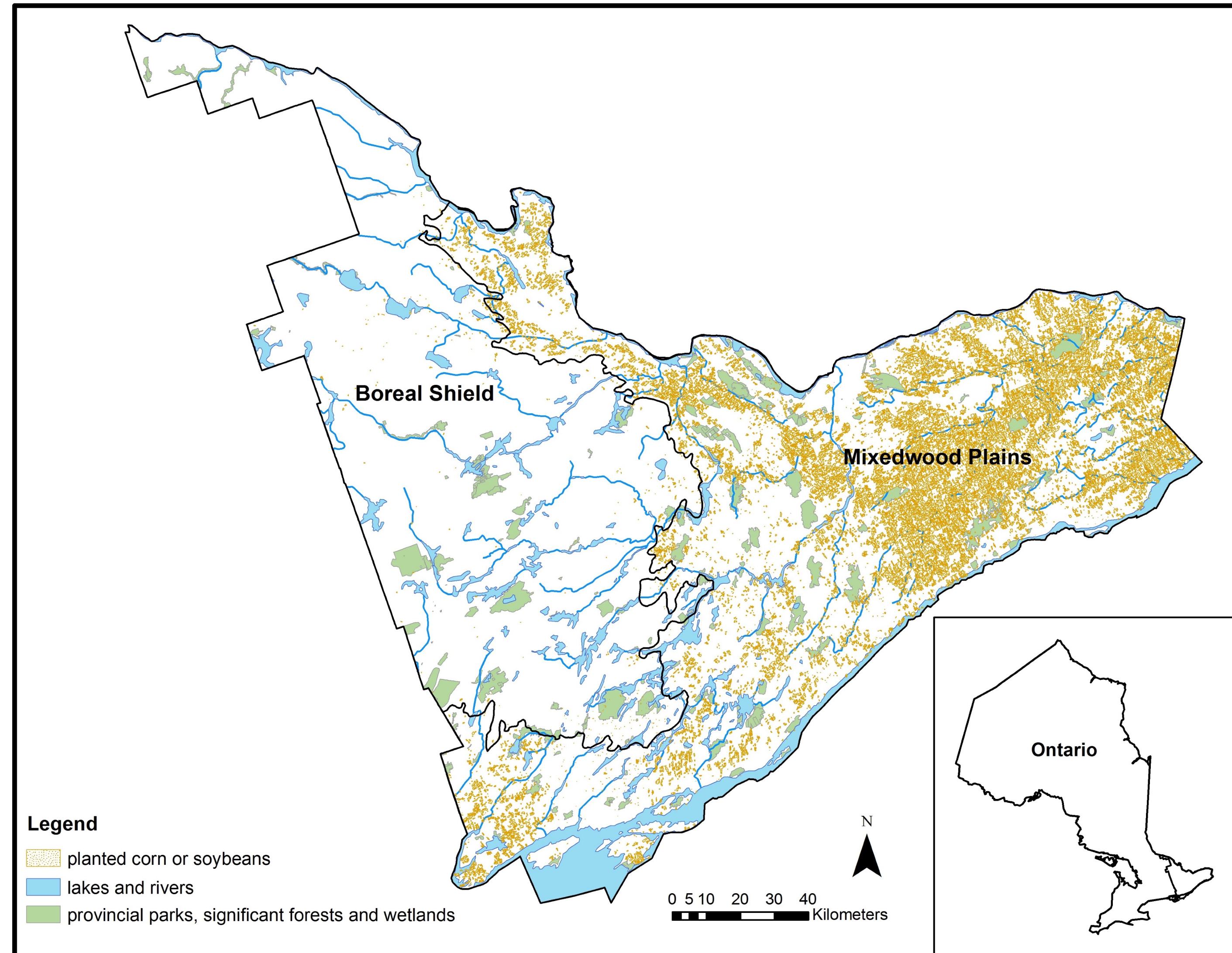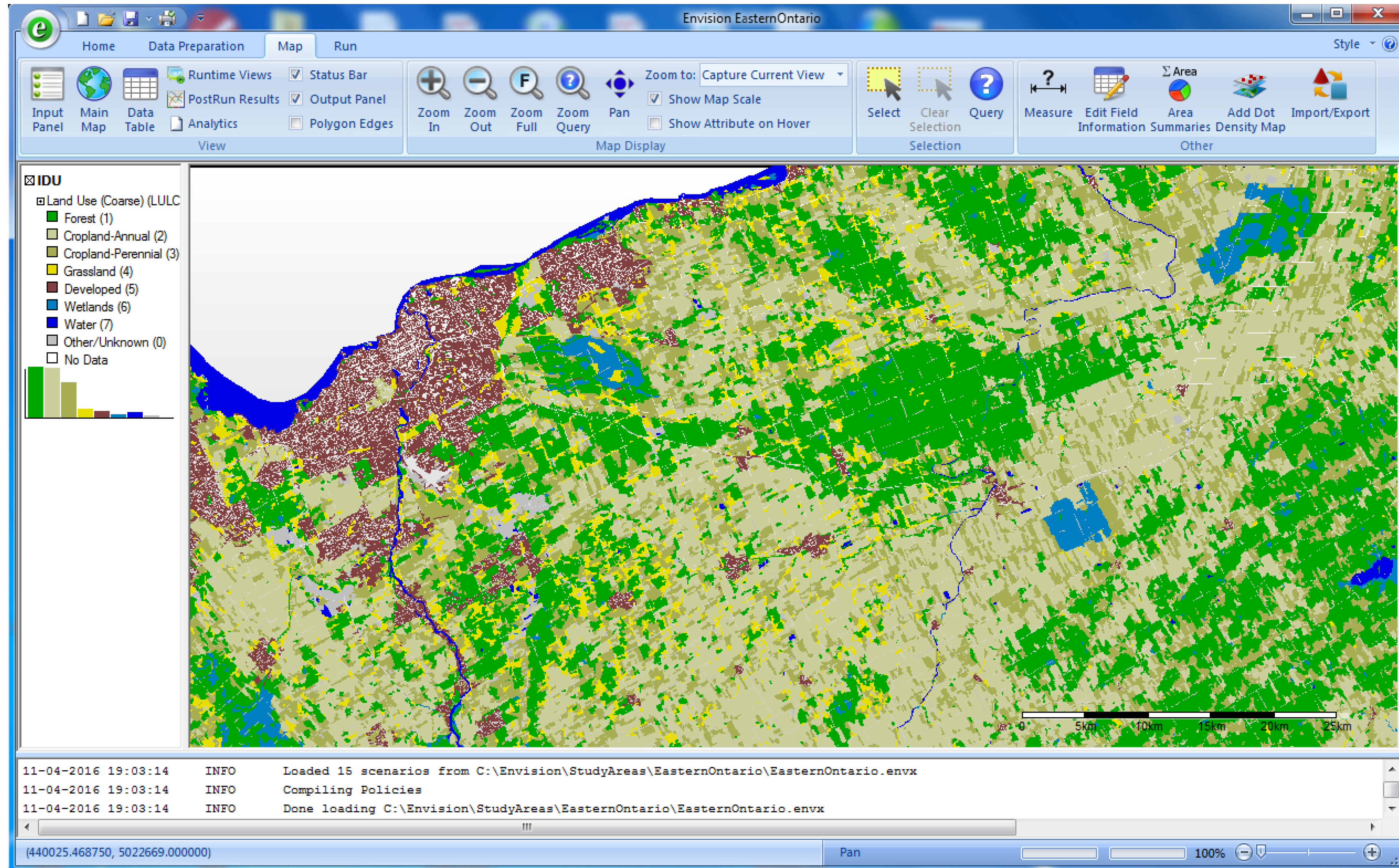
What have we done, how are we sharing?

- data needs and shortcomings
  - evaluation, procuring, documenting
- improved farm model (Dan MacDonald)
- farm types, sizes; trends, evolution (Tonia Tanner)
- crop-specific indicators (Anna Zaytseva)
- general resilience indicators (Livia Bizikova)
- dissemination

Issues with existing information

- there are problems using limited weather data, or climate model projections, to characterize extreme weather
  - how extremes usually considered? (climate model variability)
  - spatial-temporal resolution of models ≠ farm-scale / local level planning

- many "challenges" making sense of existing data, dealing with gaps, figuring out which datasets are relevant to what locations

- after the data (and climate model predictions) are "cleaned up" and assigned to different parts of a study region, how do we make sense of them, and make them relevant to agriculture ?

- DISSEMINATE

Envision (scenario exploration framework)

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"Scenario-based risk assessment decision support modelling tools for regional climate change and climate extremes, impacts and adaptation in agricultural watersheds" is a project funded by the Ontario Ministry of Agriculture, Food, and Rural Affairs' New Directions Research Program. One of our main objectives is to provide a clearing-house for information and resources that are useful for evaluating climate change in Ontario, starting with our pilot program in eastern Ontario.

Agenda

Time	Agenda Item
9:00 – 9:10	**Welcome and introductions**
9:10 – 9:30	**Session 1: Scenario-based planning tool development in eastern Ontario** (Scott Mitchell, Carleton University) ▪ Project history, overview and objectives ▪ The Envision platform: why we chose it ▪ Question pause
9:30 – 10:30	**Session 2: Eastern Ontario farm dynamics** ▪ Assembling fields into farms; patterns and trends in seasonal farm operations (Dan MacDonald, AAFC) ▪ Farm evolution: trends and transitions between farm types and spatial layout of farm fields (Tonia Tanner, Carleton University)
10:30 – 10:40	**Coffee break**
10:40 – 11:40	**Session 3: Crop-specific and general resilience indicators** ▪ Extreme weather impacts on eastern Ontario crops: historical trends and future scenarios (Anna Zaytseva, Carleton University) ▪ General resilience indicators (Livia Bizikova, IISD)
11:40 – 12:00	**Session 4: Summary and future directions** ▪ Closing remarks: ongoing work, future plans and partnerships ▪ Comments and questions