Extreme Weather: Envisioning Ontario Agriculture Under Climate Change

Decision Support Tool Development

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2 Oregon State University

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

4 uOttawa

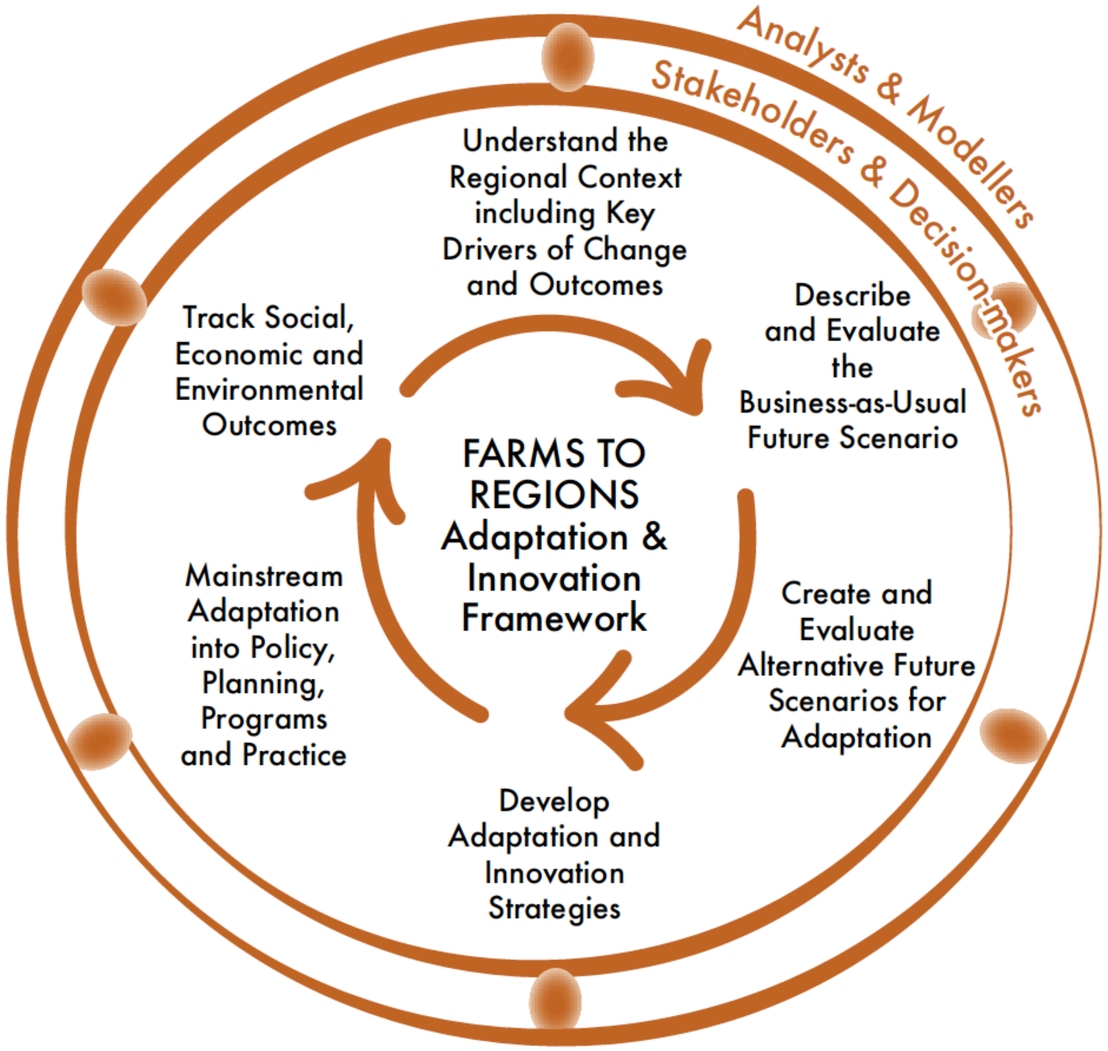
5 IISD International Institute for Sustainable Development; Ontario Ministry of Agriculture, Food and Rural Affairs

What's this project about?

- Farms to Regions (predecessor): concluded 2015
- 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 agriculture
    - 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



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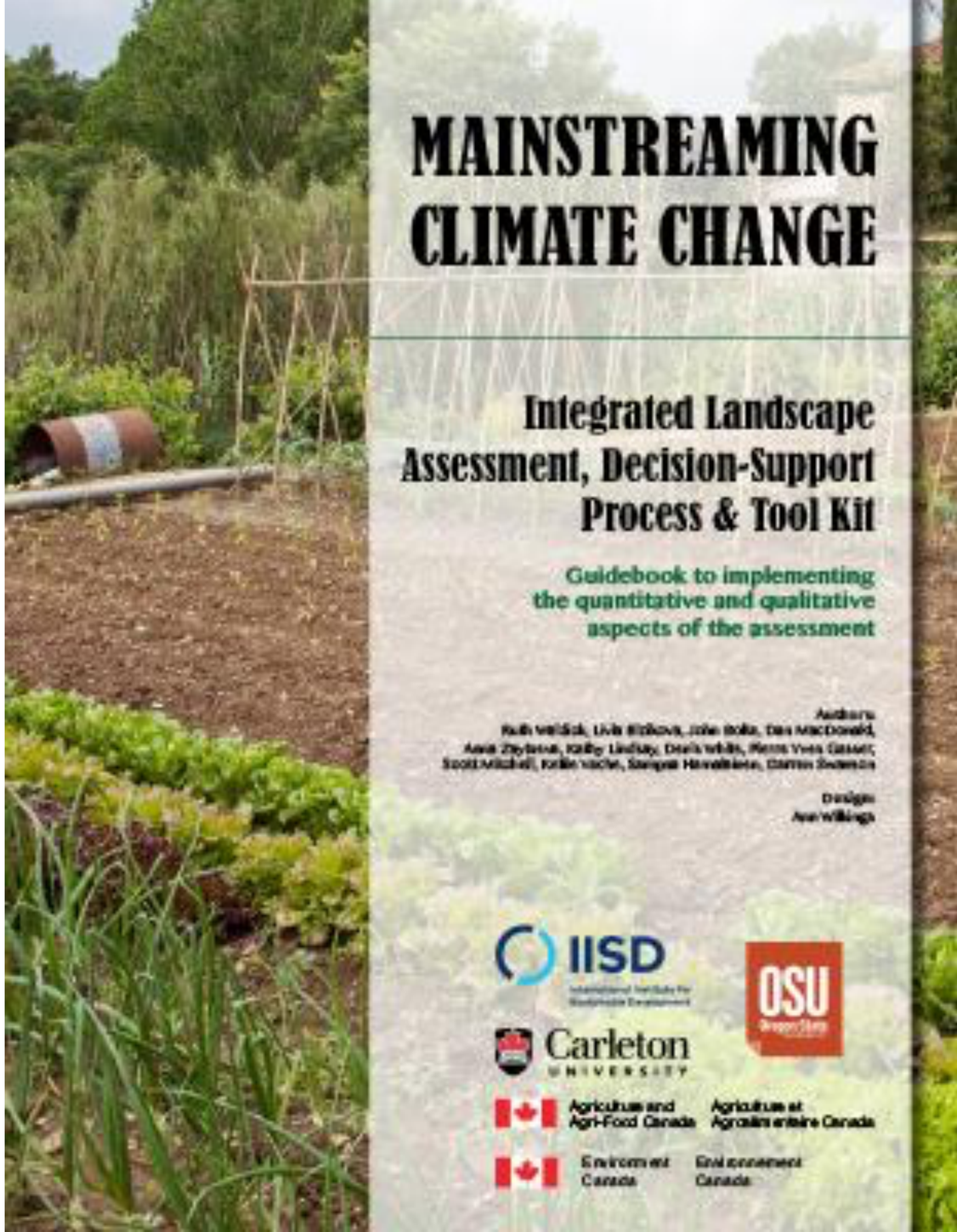

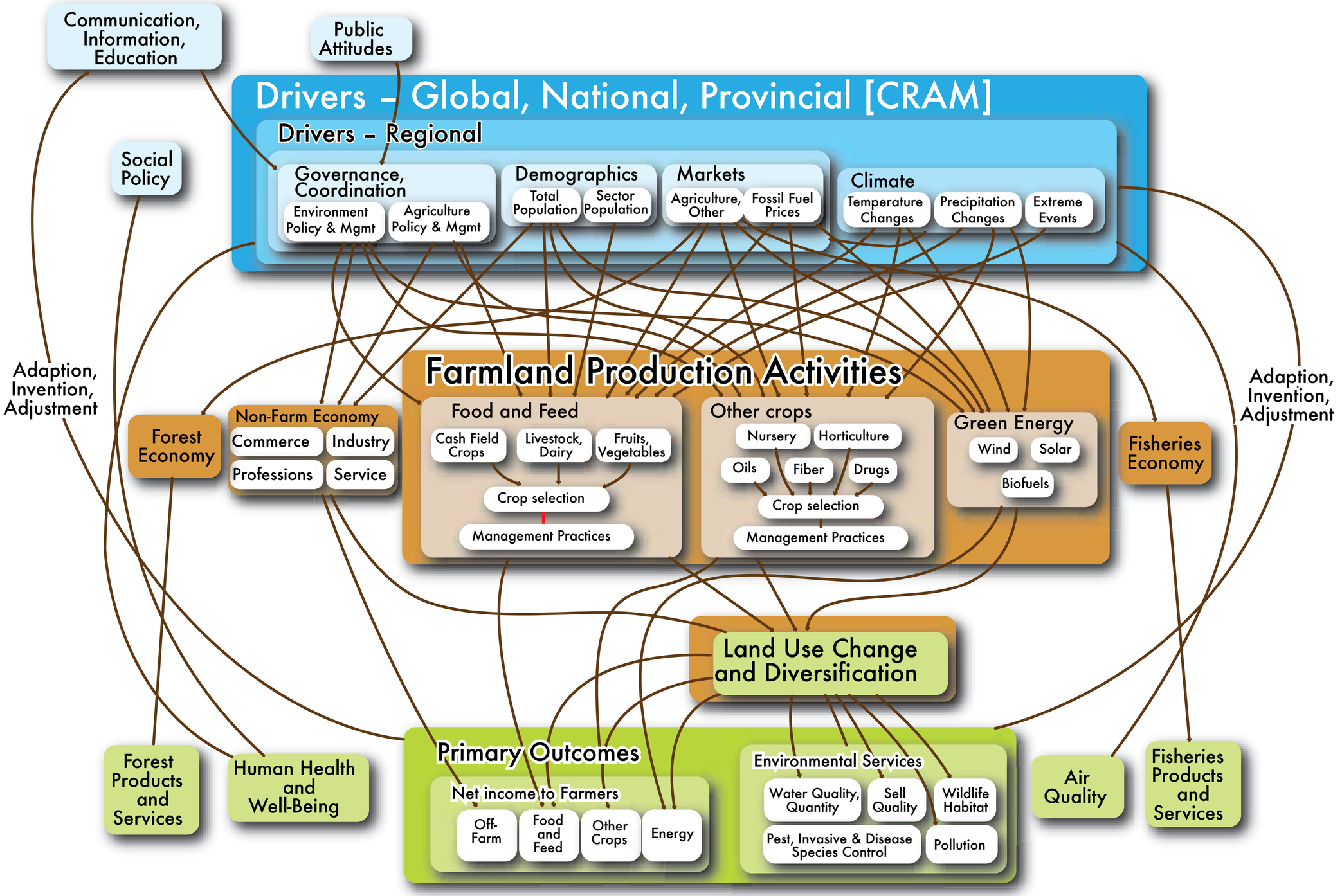

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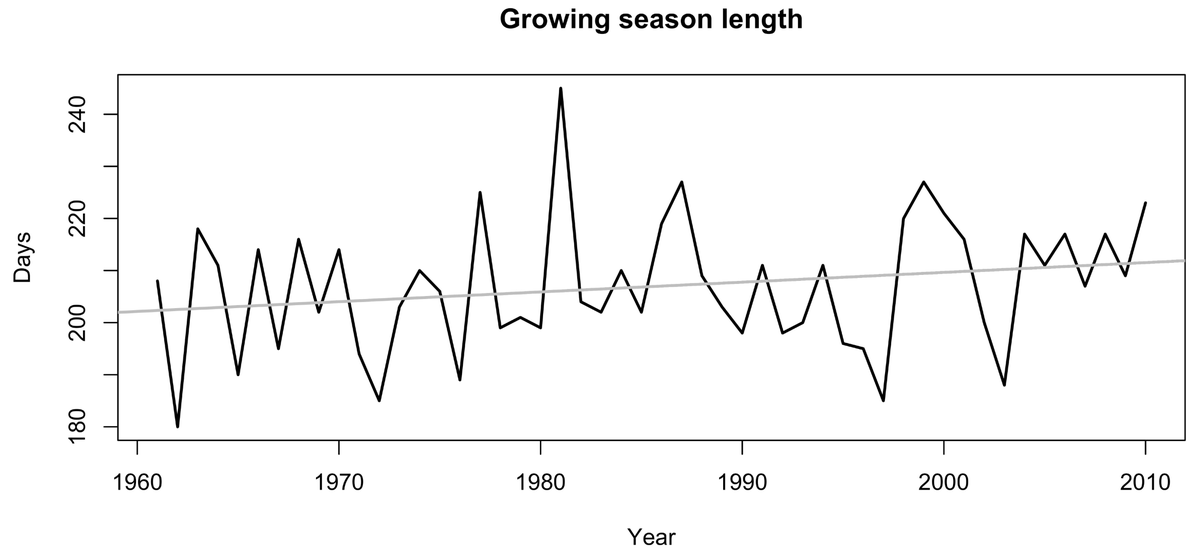
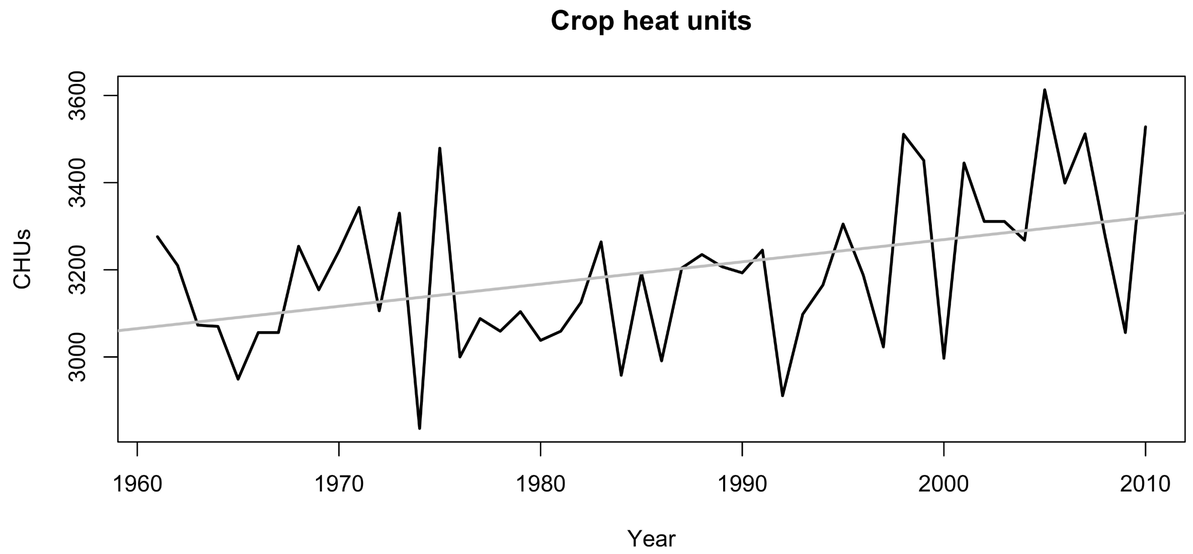
Why extremes? This is NOT the whole story!



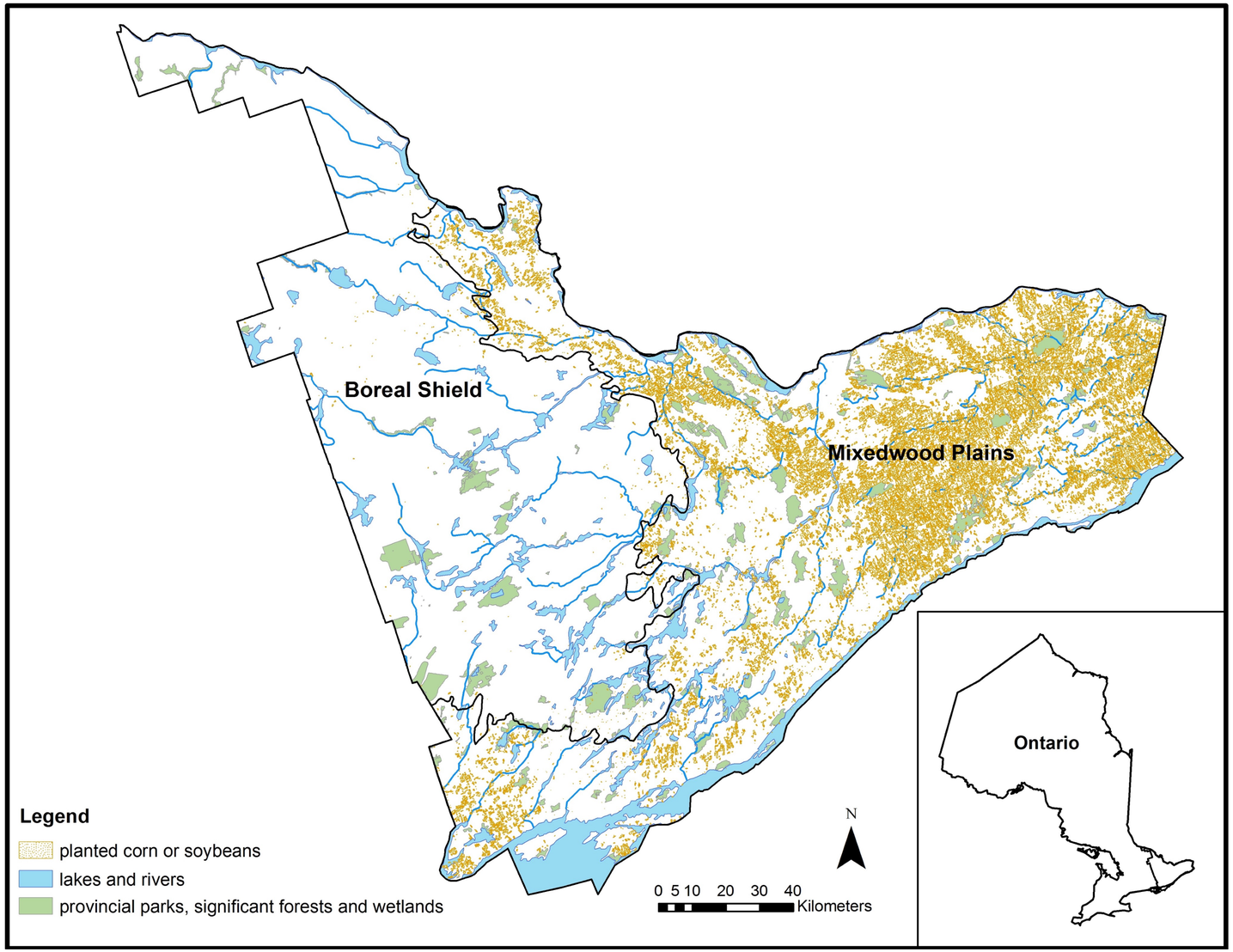


A. Zaytseva M.Sc. Thesis (Carleton University).

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



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

What have we been working on for 3 years?!!

- data needs and shortcomings
  - evaluation, procuring, documenting
- improved farm model (Dan MacDonald)
- creating the database (Sampsa Hamaleinen)
- farm types, sizes; trends, evolution (Tonia Tanner)
- crop-specific indicators (Anna Zaytseva)
- (general resilience indicators (Ruth Waldick, Patricia Larkin, Livia Bizikova; see presentation in previous webinar))
- dissemination

Issues with existing information

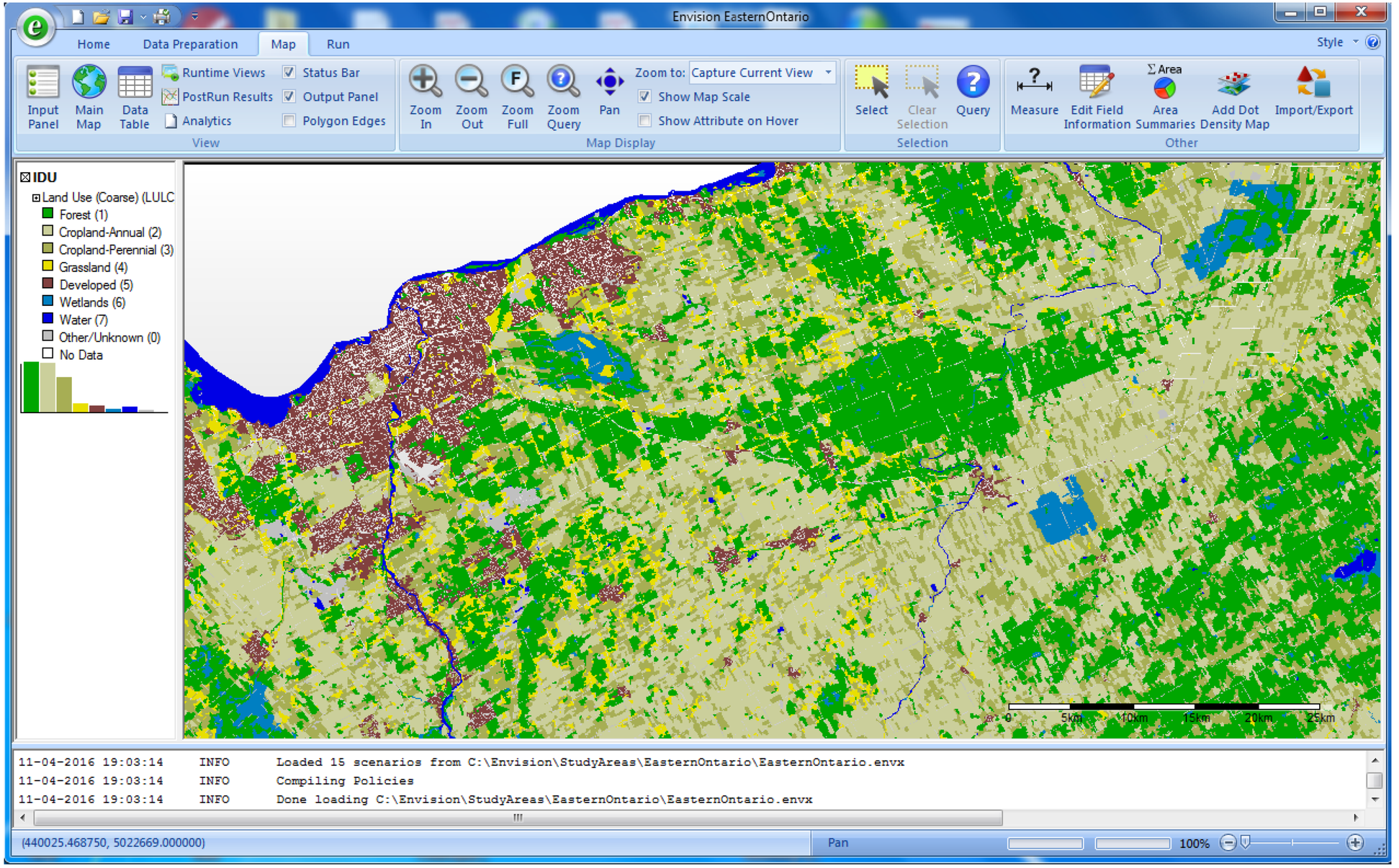
- there are problems using limited weather data, or climate model projections, to characterize extreme weather
  - how extremes usually considered? (climate model variability)
  - spatial-temporal resolution of models ≠ farm-scale / local level planning

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

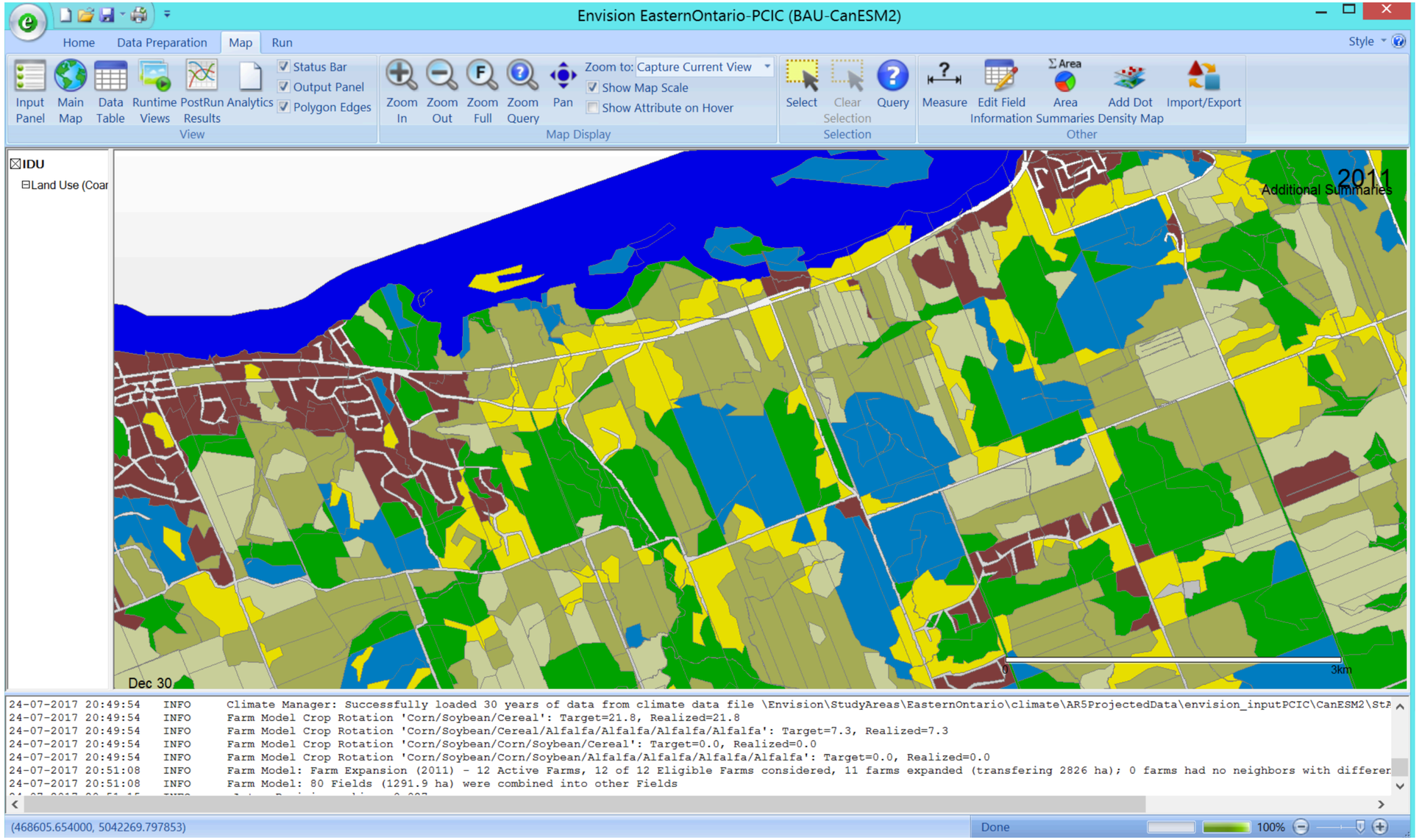
- after the data (and climate model predictions) are “cleaned up” and assigned to different parts of a study region, how do we make sense of them, and make them relevant to agriculture ?

- DISSEMINATE

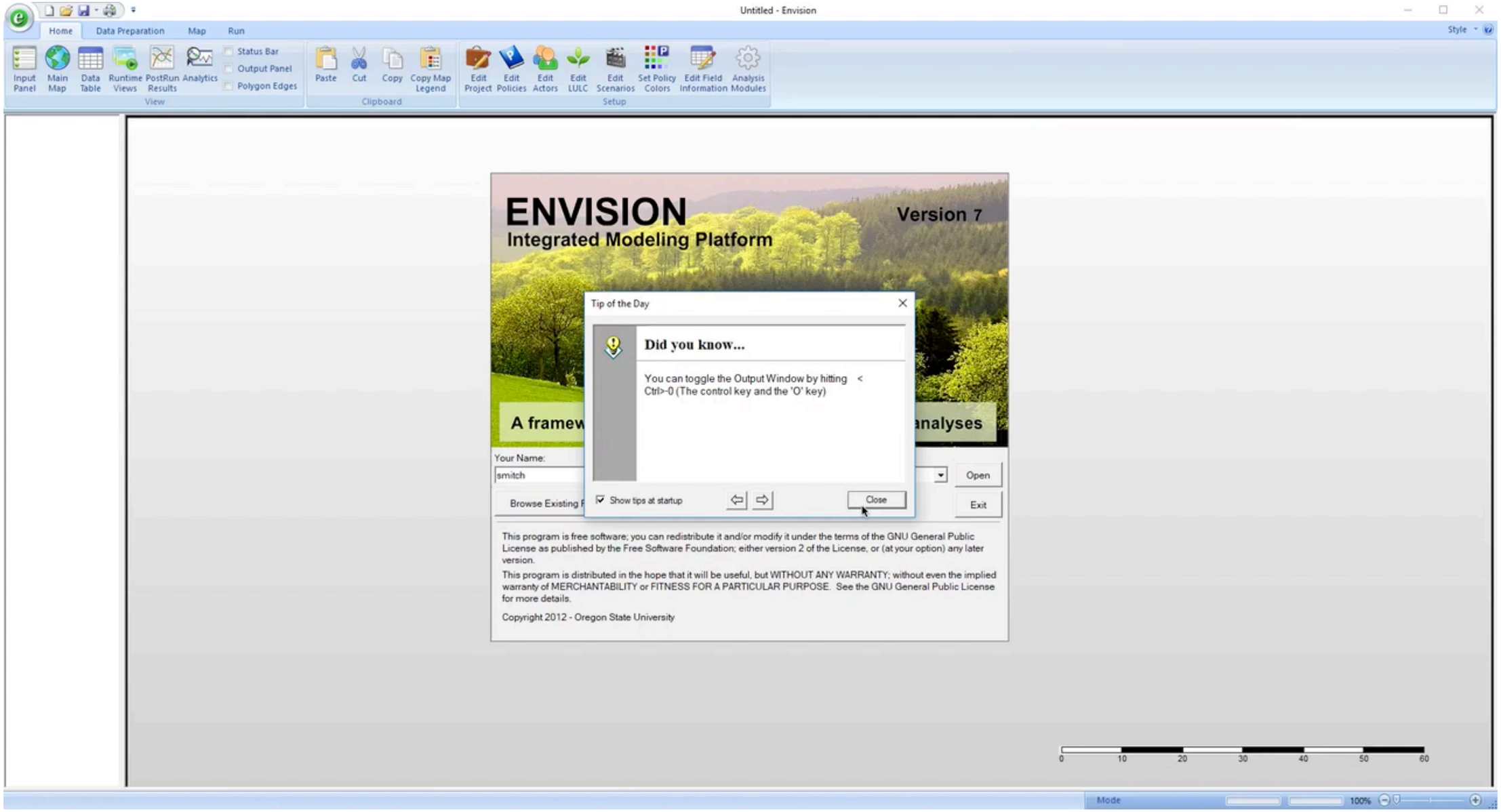
Envision (scenario exploration framework)



Integrated Decision Units (IDUs)



DEMO



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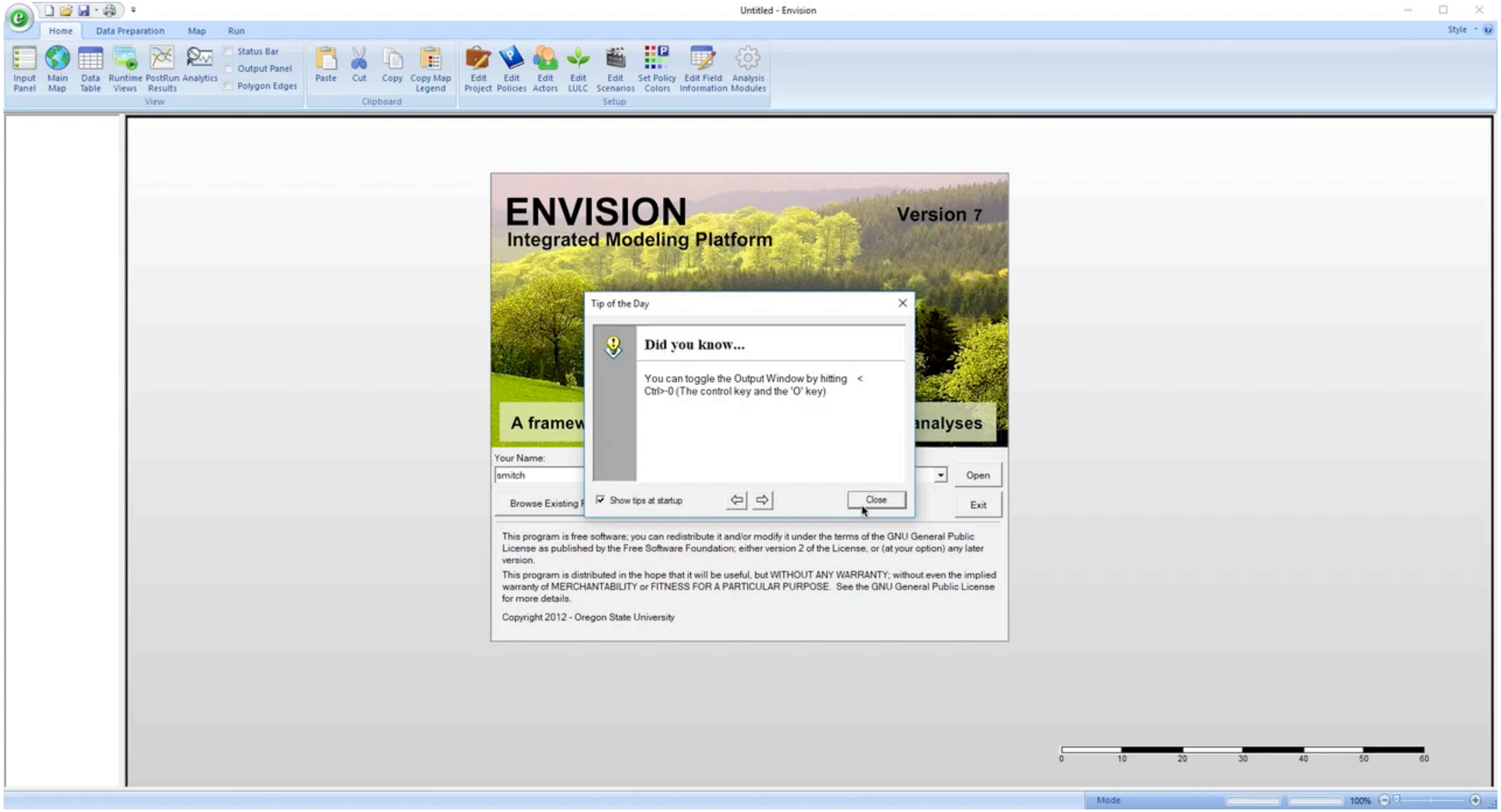
DEMO



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EasternOntario.xml | EasternOntario.envx

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237
238     <!-- note: the following are from FarmTypesLUT.xlsx -->
239     <!-- 'id' is the internal code used for this type (stored in [FARMTYPE] field).  See FarmModel.h for values -->
240     <!-- 'code' is a 1-3 character field used to autopopulate the [FarmType] column from the [FT_Extents] field -->
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242     <!-- expand_types: farm types that this farm typs can expand into -->
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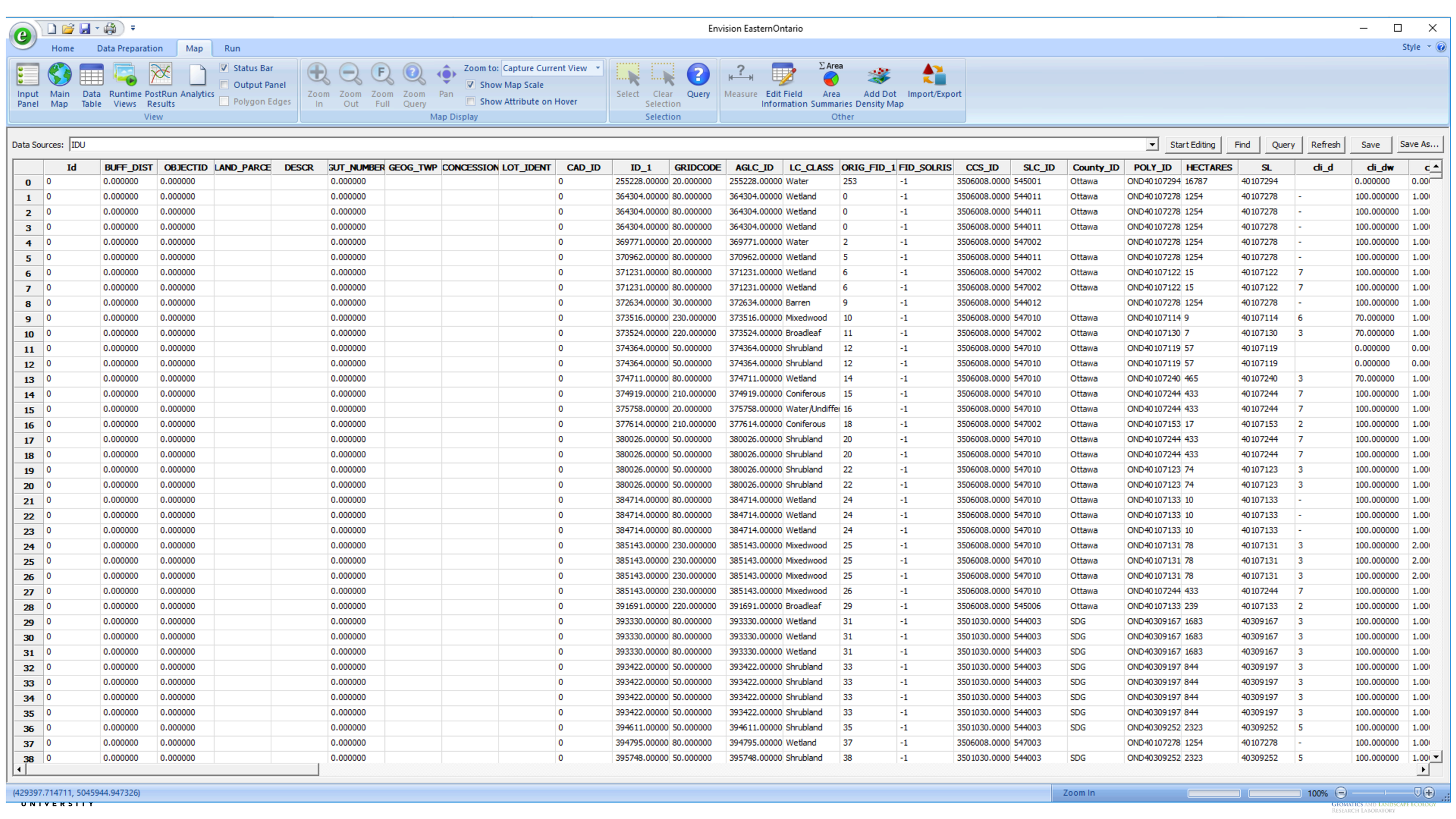
The “rich” data

- Attribute tables
- Model outputs
- Custom scripting to extract information



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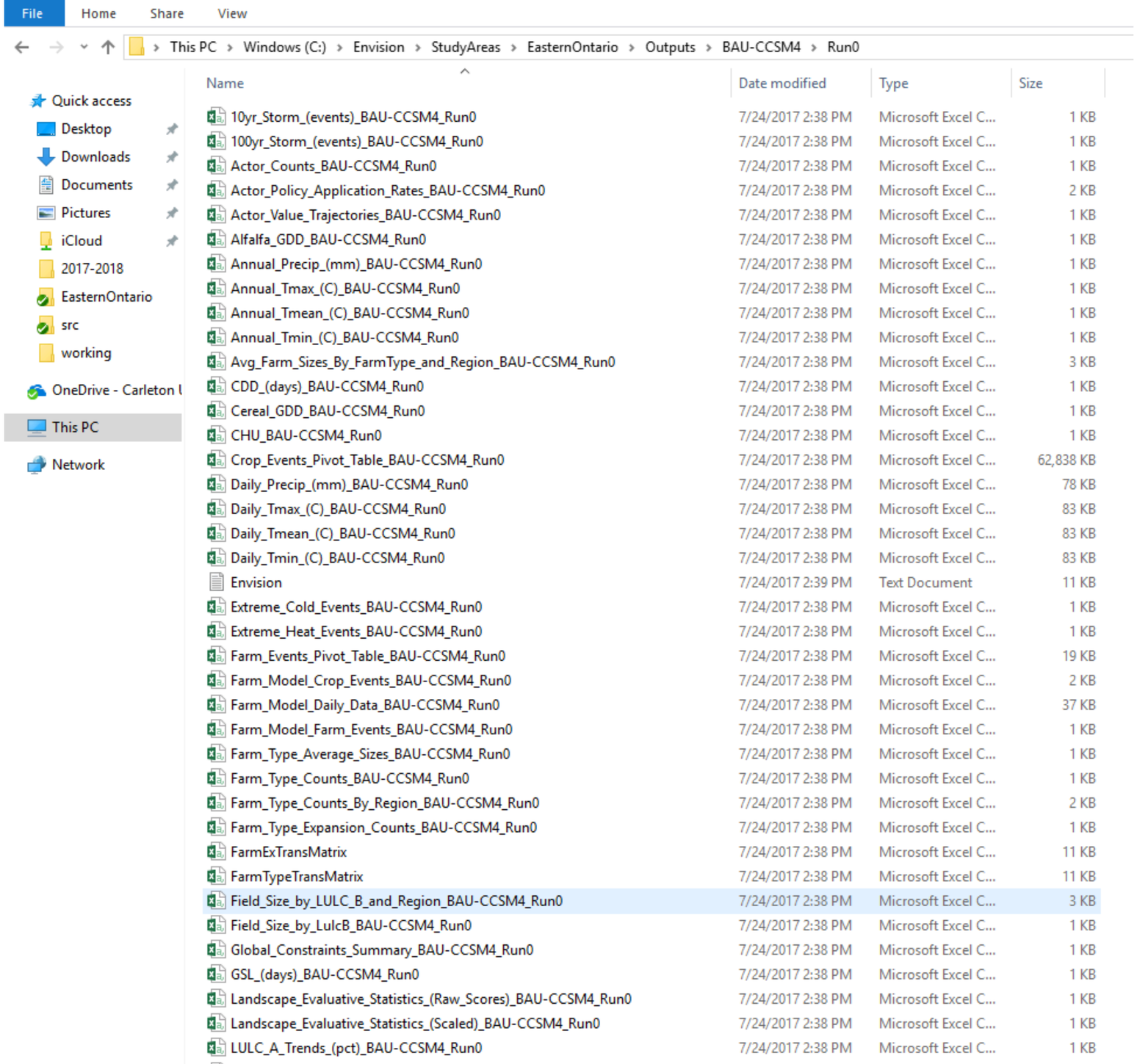

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The “rich” data

- Attribute tables
- Model outputs
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ABOUT

NEWS

CONTACT

“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
10:00 – 10:15	**Welcome and introductions** ▪ Project history, overview and objectives (Scott Mitchell, Carleton University)
10:15 – 12:00	**Session 1: Envision modeling platform: overview and technical requirements** ▪ Presentation (Scott Mitchell, Carleton University) ▪ Presentation (Sampsa Hamalainen, AAFC) ▪ Presentation (Dan Macdonald, AAFC) ▪ Model run demonstrations
12:00 – 13:00	**Lunch break**
13:00 – 14:00	**Session 2: Development of eastern Ontario farm model: farm dynamics and crop-specific extreme events** ▪ Presentation (Tonia Tanner, Carleton University) ▪ Presentation (Anna Zaytseva, Carleton University) ▪ Model run demonstrations
14:00 – 14:30	**Session 3: Future directions** ▪ Future and potential partnerships ▪ Closing remarks