



BIOMASS

Ontario Field-scale Agricultural Biomass Project

Niagara Falls, Ontario
February 15, 2010

Project Leads

Comprehensive Project Leader



Proposal Funding/Concept Generation



Role of Partners



Agronomic – Field-scale – *Farmer Experience*



Agronomic – Research – *Qualify & Quantify*



Processing, Aggregations & Logistics



Burn Suitability – *PRICE!*



Funding Partner

Environmental & Project Goal



Purpose-Grown Crops

- Agronomic & Economic
- Aggregation, Processing/Infrastructure
- Potential Energy & Burn Characteristics
- Environmentally Sustainable
- Life-Cycle Analysis

The Project

Transformational

- **New Crops**
 - Miscanthus, Switchgrass, Prairie Grasses
- **New Product**
 - Solid Fuel
- **New Market**
 - Thermal Generating Stations

The Project

Specific Objectives

- **Agronomics of Biomass Production (OSCIA)**
 - OSCIA lead on farm-scale field trials with technical assistance from UofG faculty and students
- **Biomass Densification Studies (OFA)**
 - OPG has insisted that ag-biomass be delivered in a pelletized form that meets their fuel specification standards
 - Likely torrefied, too
 - Other End-Uses



New Crops

Photo: N.Betts 2010

New Crops

Which agricultural biomass crop has the best reputation?

- A) Miscanthus
- B) Switchgrass
- C) Tall grass prairie
- D) Residues (corn cobs, wheat straw, etc.)
- E) Never heard of them before



Ontario Field-scale Agricultural Biomass

*Is biomass economically sustainable,
environmentally preferable to non-renewable fuels?*

Secured **900 acres** across Ontario

Four year study: **2010-2014**

\$1.2 million to farmers



Photo: N.Betts 2010



Agricultural Residues

Challenges

- ▶ moisture content
- ▶ soil carbon effect
- ▶ nutrient removal
- ▶ biomass properties
- ▶ contamination
- ▶ interaction with cropping systems



Purpose-Grown Energy Crops: C4 Perennial grasses

Crops reviewed:

- *Miscanthus*
 - *multiple varieties - namely Amuri/Nagara*
- *Switchgrass*
 - *multiple varieties*
- *Native Polyculture*
 - *various grasses/forbes combinations*

Miscanthus

Miscanthus comprises a group of **more than ten grass species**

Giant Miscanthus is a sterile hybrid, C₄, perennial warm-season grass believed to have *M. sinensis* (a diploid species) and *M. sacchariflorus* (a tetraploid species) as its parents.

Switchgrass

Ontario-native prairie, warm-season bunchgrass, *Panicum virgatum*, provides high ecosystem-value in summer habitat creation; inexpensive to plant (conventional seeding).

Numerous cultivars, each with it's own benefits/challenges. Spatial occurrence of “spring kill” within a location.

Many industrial added-value products possible, including ethanol,



Native Polyculture

Ontario-native prairie, warm-season grass and forbes, providing high ecosystem-value in summer habitat creation.

Numerous combinations, usually including Switchgrass, Indian grass, Cordgrass and Big Bluestem. Spatial occurrence of “spring kill” within a location.

Many industrial added-value products possible, including ethanol,



Other Observations

Fall harvest moisture contents are too high for dry storage: 25-60%

Spring harvest moisture contents were 3-8%

Spring harvest yield reductions of 25- 67%

Growth after second winter much more vigorous

Site Characteristics

- **Side-by-side** comparisons of multiple energy crops
- High **KTT contributions**
 - Field days
 - Social networking
 - Conference presentations
- Consistent **crop management** and adherence to **research protocols**
- **Environmental Farm Plan**
- **Commercial end-use** for product



Photo: N.Betts 2010

QUESTION:

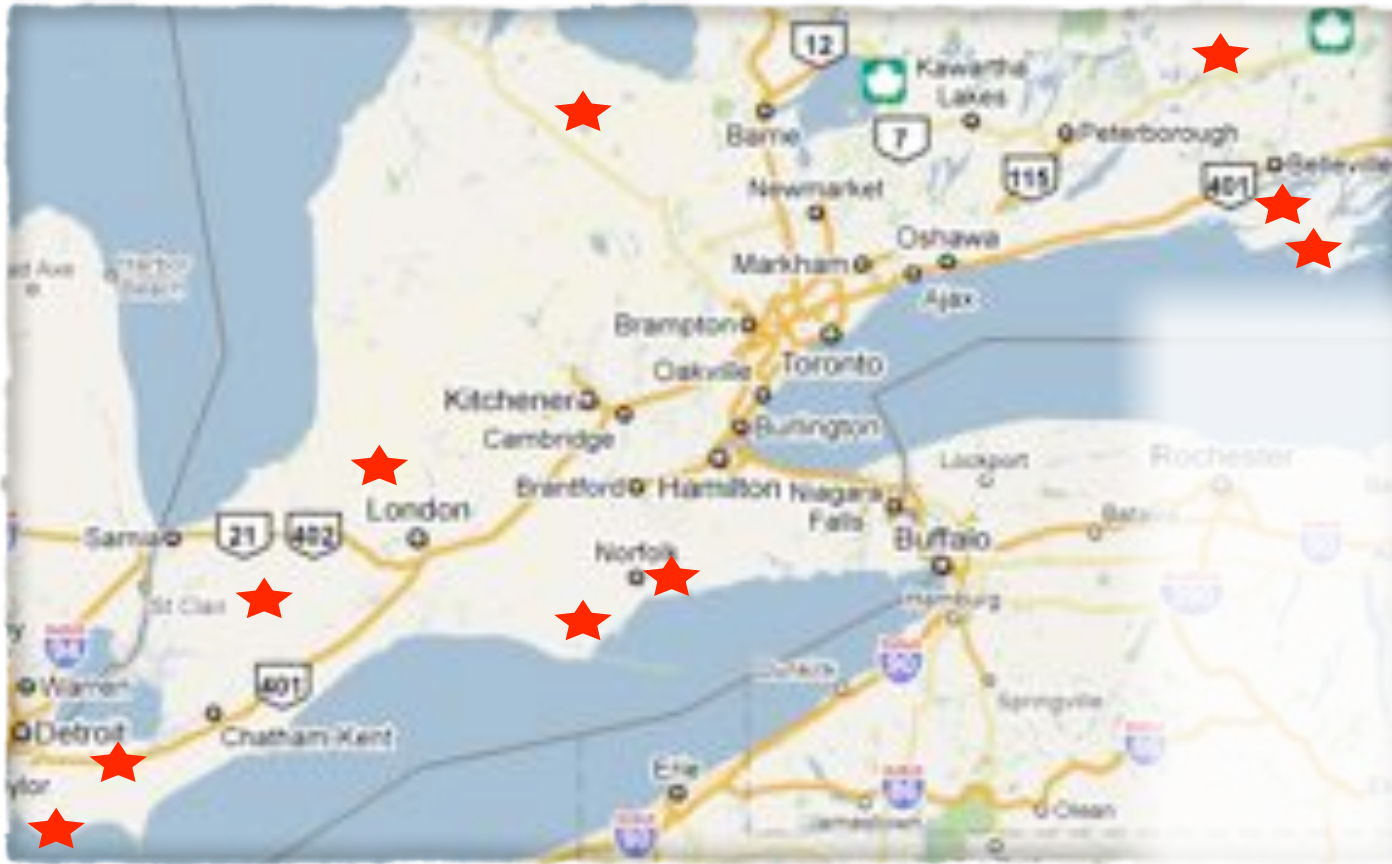
How would you like to learn about biomass crops?

- A) Field Days
- B) Social Media
- C) Trade Shows
- D) Conferences



Photo: N.Betts 2010

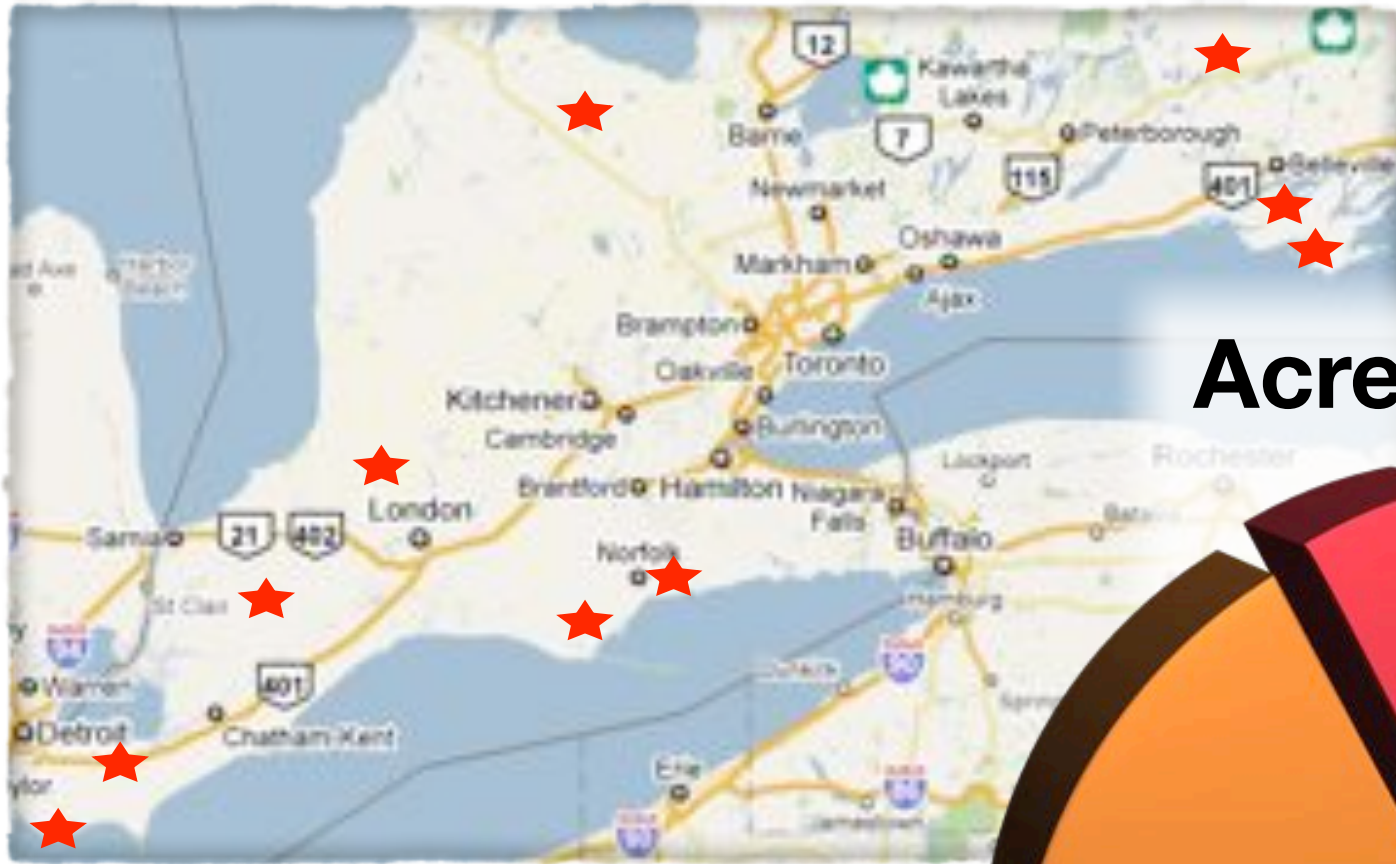
Spring 2010



- Miscanthus
- Switchgrass
- Polyculture
- Big Bluestem
- Indian Grass
- Hemp

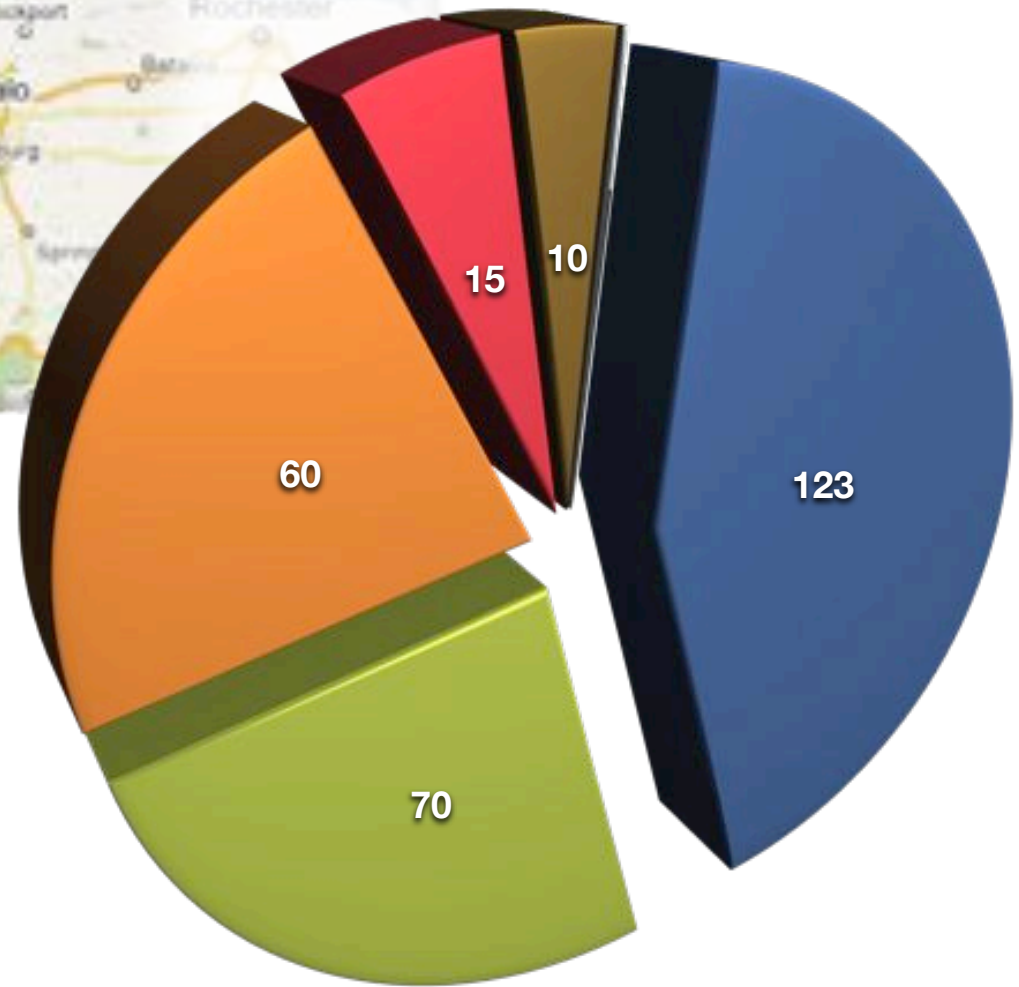


Spring 2010

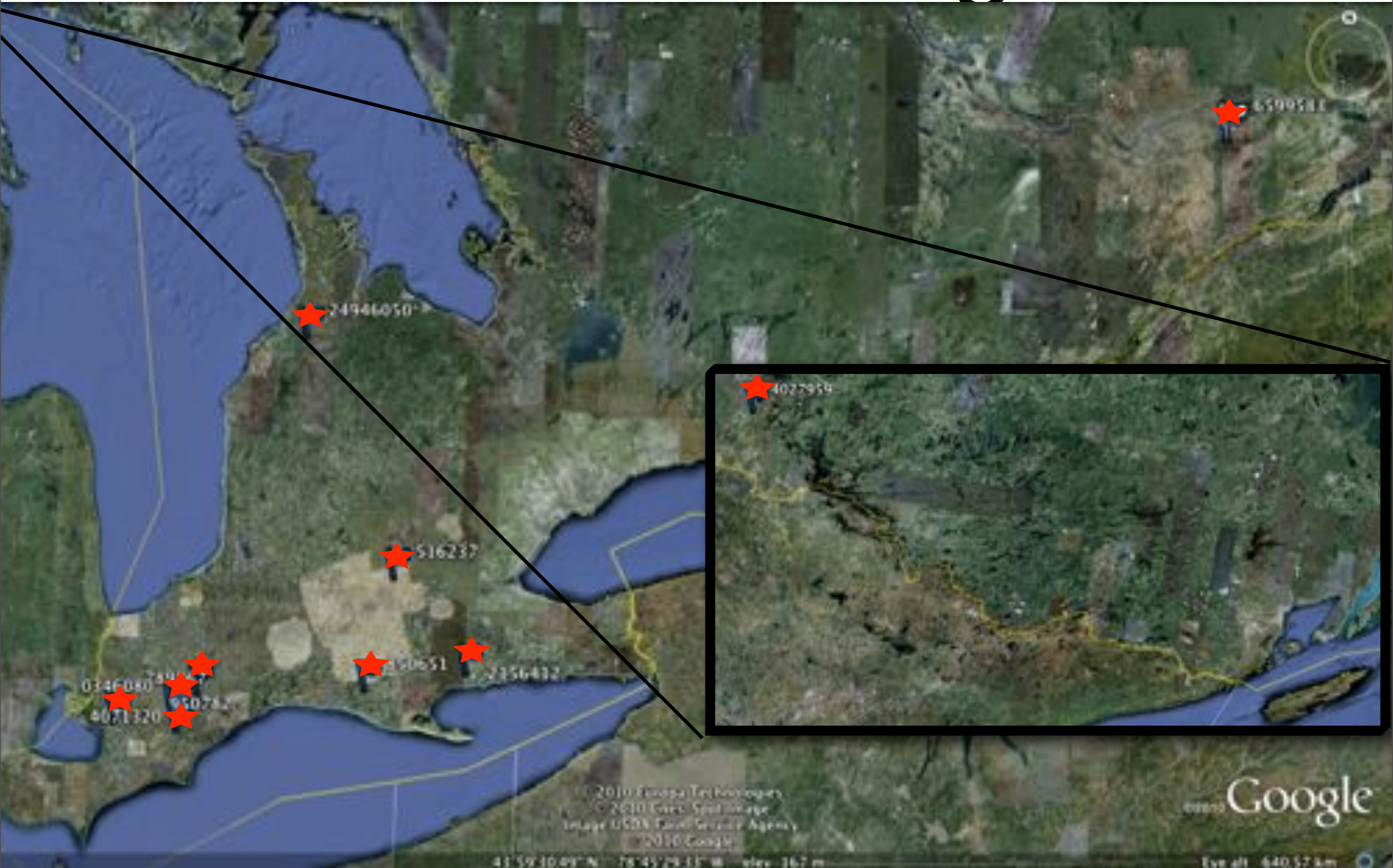


Acres Planted

- Miscanthus
- Switchgrass
- Polyculture
- Big Bluestem
- Indian Grass
- Hemp



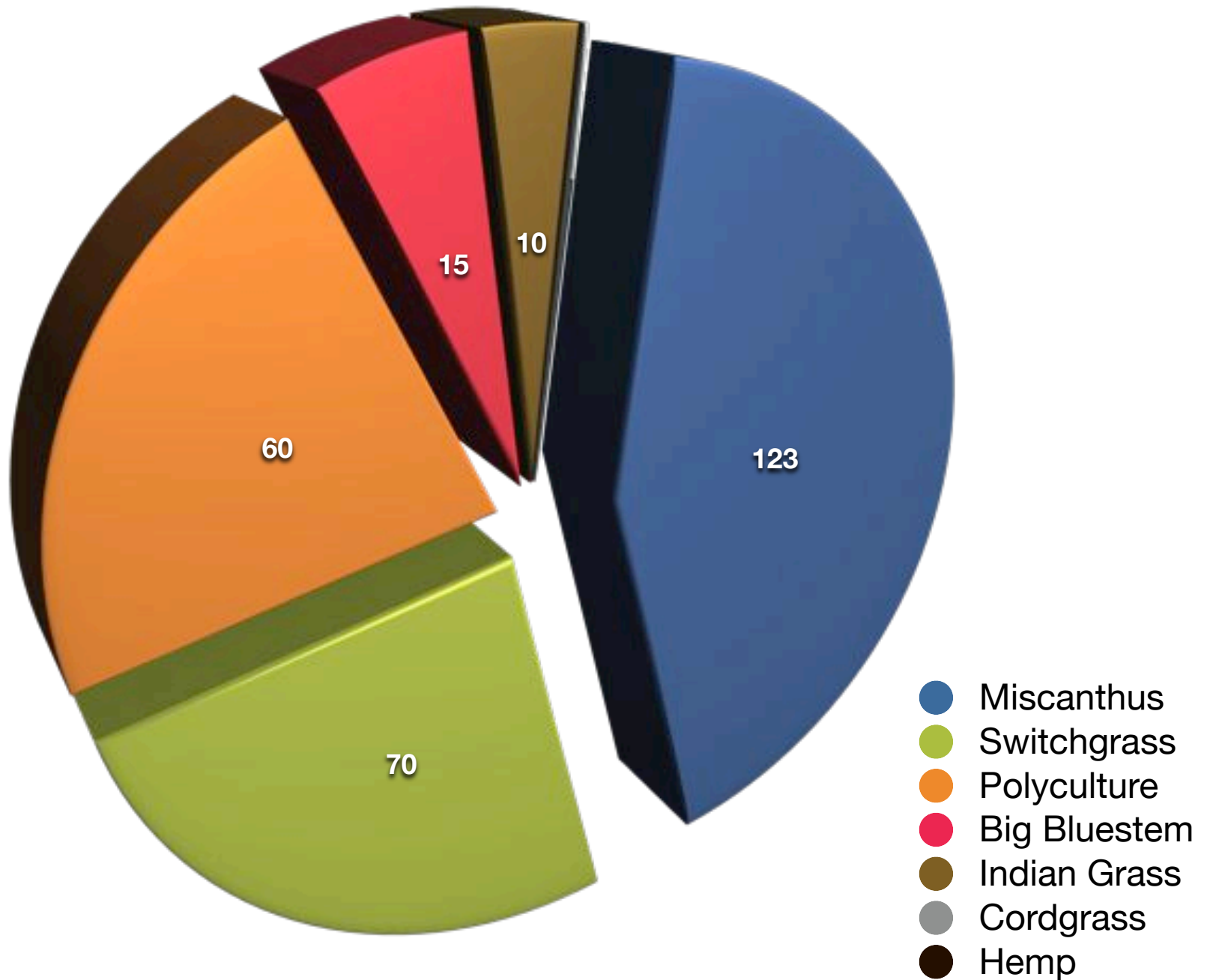
2011 Plantings



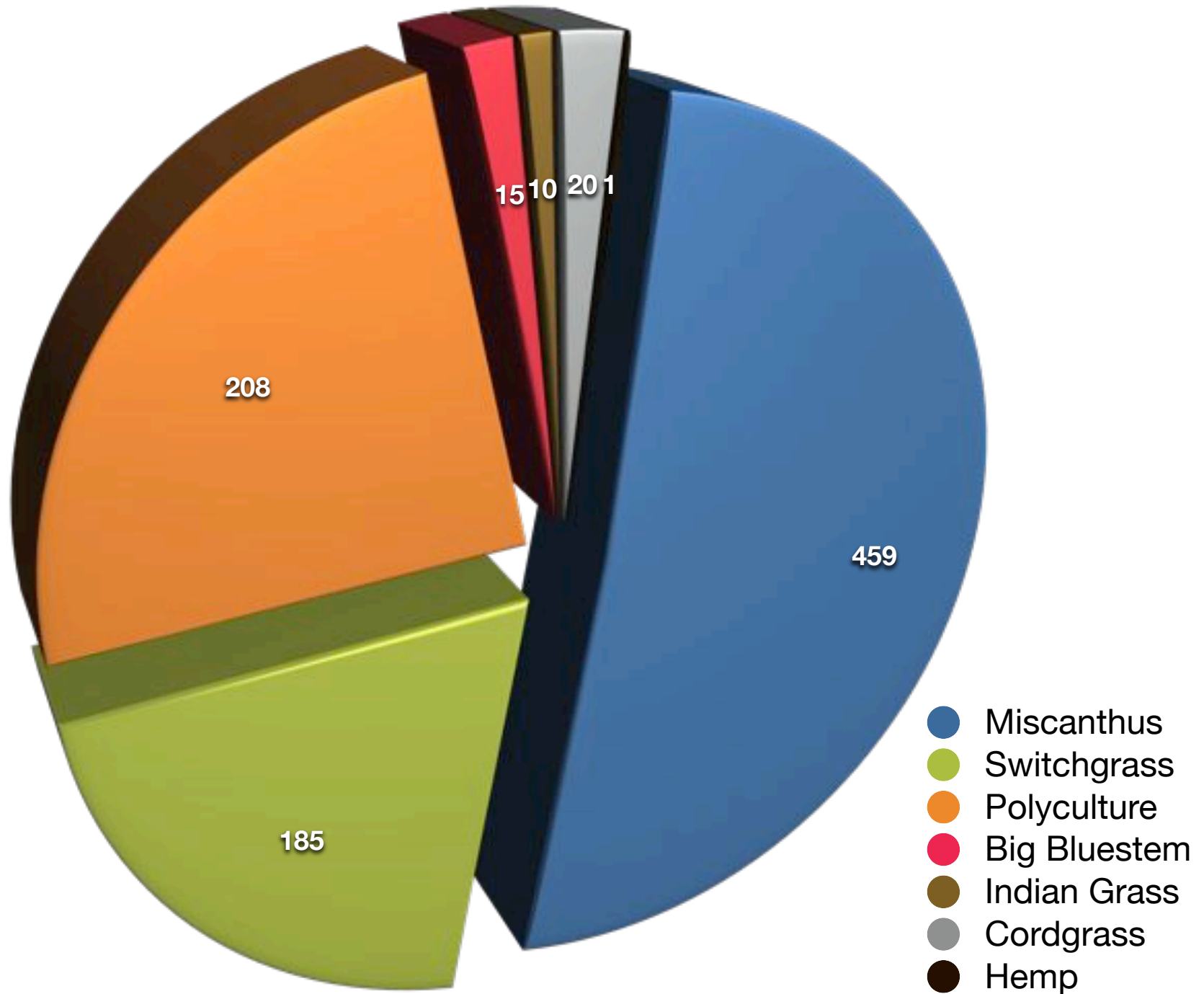
	County	Crop	Acres	Total Acres
2010	Essex	Miscanthus (3 varieties)	200.0	200
	Kent	Miscanthus (2 var), Switchgrass (2 var), Polyculture	57.0	257
	Wellington	Miscanthus (propagation stock)	140.0	397
	Norfolk	Native Polyculture/Miscanthus	49.6	447
	Grey	Switchgrass	26.4	473
	Perth	Miscanthus	10.0	483
	Hastings	Switchgrass, Miscanthus, Hemp	0.8	484
	Lambton	Bluestem, Indian grass, Switchgrass	46.7	531
	Prince Edward	Switchgrass, Miscanthus	76.0	607
2011 (A)	Grey	Switchgrass (3 varieties)	11.0	618
	Oxford	Switchgrass, Miscanthus	24.0	642
	Dundas	Switchgrass	35.0	677
	Elgin	Polyculture	19.0	696
2011 (B)	Kent	<i>Switchgrass, Indian/Switchgrass, Polyculture</i>	<i>78.0</i>	<i>774</i>
	Norfolk	<i>Polyculture, Miscanthus (propagation)</i>	<i>50.0</i>	<i>824</i>
	Rainy River	<i>Miscanthus (2 varieties)</i>	<i>21.5</i>	<i>845</i>
	Oxford	<i>Miscanthus, Switchgrass, Polyculture</i>	<i>30.0</i>	<i>875</i>
	Huron	TBA	25.0	900



Acres Planted



Total Acres Planted





New Products

Photo: Howden-Thompson, 2010



Photo: Howden Thompson, 2010

Aggregation Projects

- Global **literature review** of background studies for the development of an innovative agricultural biomass chain
- An **economic impact assessment** of commercially grown biomass in Ontario and market potentials
- Review and **study of nutrient extraction** from agricultural biomass and recycling to farm
- Life cycle **analysis of the supply chain**



Photo: Howden-Thompson, 2010

New Markets



Bio-Energy

Ag-residues

Dedicated Crops

Combustion-focus



Eco-Blaze



Brandelle Biomass



Photo: N.Betts 2010



I y.o. miscanthus

Photo: N.Betts 2010



1 y.o. miscanthus



3 y.o. miscanthus

Photo: N.Betts 2010

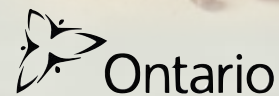


Impact of Tillage on Total and Soluble Phosphorus Losses

RESEARCH BY IVAN O'HALLARAN, UNIVERSITY OF GUELPH



Soluble Phosphorus



Crop Profile for Wheat in Canada

- Update to AAFC Crop Profile for Wheat in Canada, 2005
 - Information on **crop production and pest management**
 - **Baseline information** in support of Risk Reduction Strategies, PMC Minor Use pesticide submissions, and other uses.
- Separate profile for **Winter Wheat and Spring Wheat**
- To be **released June, 2011**

Canada 



Upcoming Workshops

Local Soil Workshops

Regional Smartphone
Seminars



Local Soil Workshops

Focus on **fertility, maximizing results, fertilization**

Space is limited - **contact your RCC**

Scheduled Workshops

Mount Forest: February 16 1:00-4:00pm

Avonmore: February 23, 1:00-3:00pm

Woodstock: March 14, 1:30-4:00pm

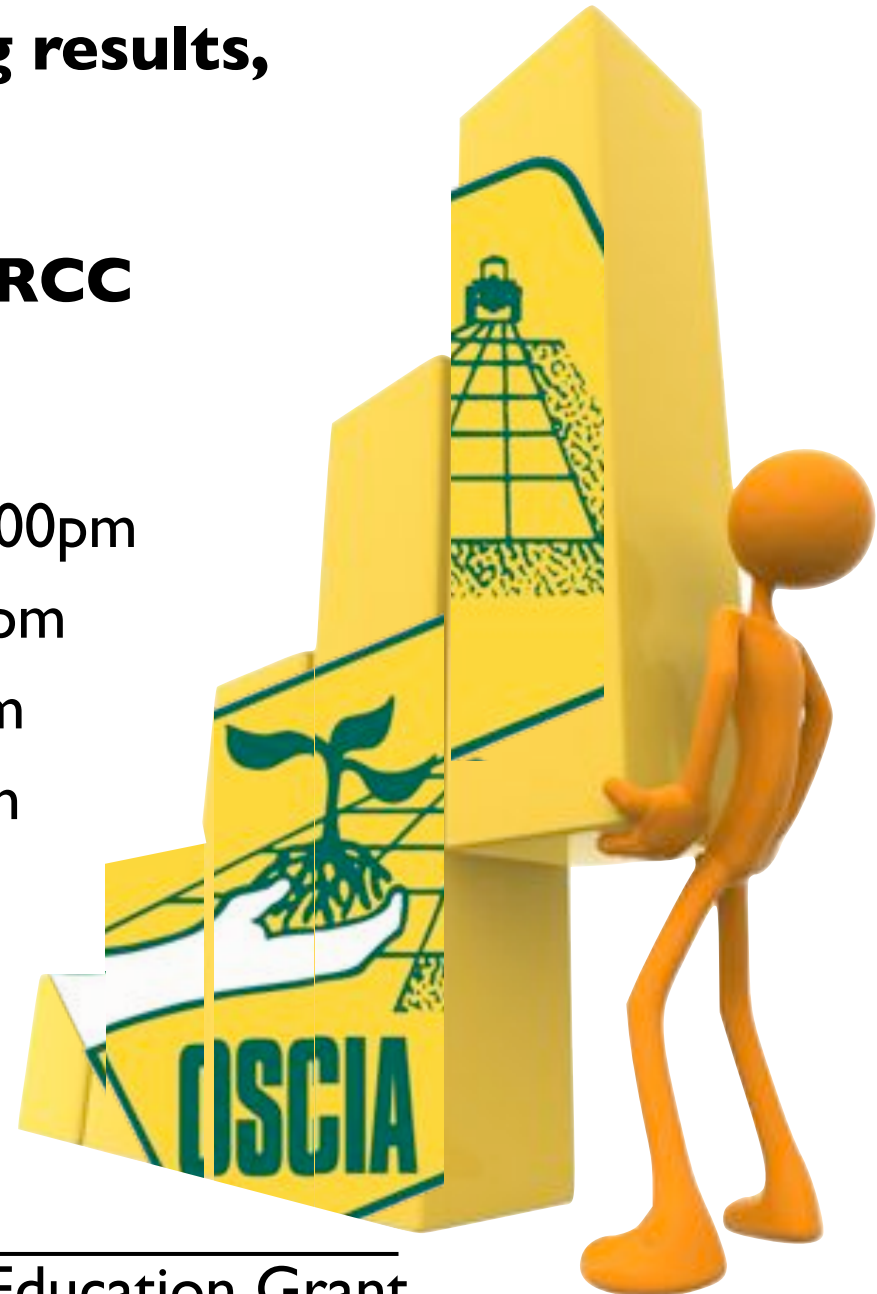
St Thomas: March 14, 7:00-10:00pm

Kerwood: March 15, 9:00-12:00pm

Clinton: March 15, 2:00-5:00pm

Markdale: March 16, 1:30-4:30pm

Listowel: March 16, 1:30-4:30pm



Funded, in part, by OSCIA Education Grant

Smartphone Seminars

Learn how to use your **Smartphone** to make you a **Smarter Farmer**

Smartphones have transformed many industries
- Agriculture is one of them.

Workshop Seminars will take place in
March (*pending funding*)

Tentative Workshop Locations:

Grey-Bruce, Huron, Perth,
Wellington, Oxford, Middlesex,
Elgin, Chatham-Kent, Norfolk,
Brant, Wentworth, and one location in
Eastern Ontario





Photo: N.Betts 2010