

AGRONOMY OF BIOMASS CROPS: WHAT'S NEXT FOR 2012?



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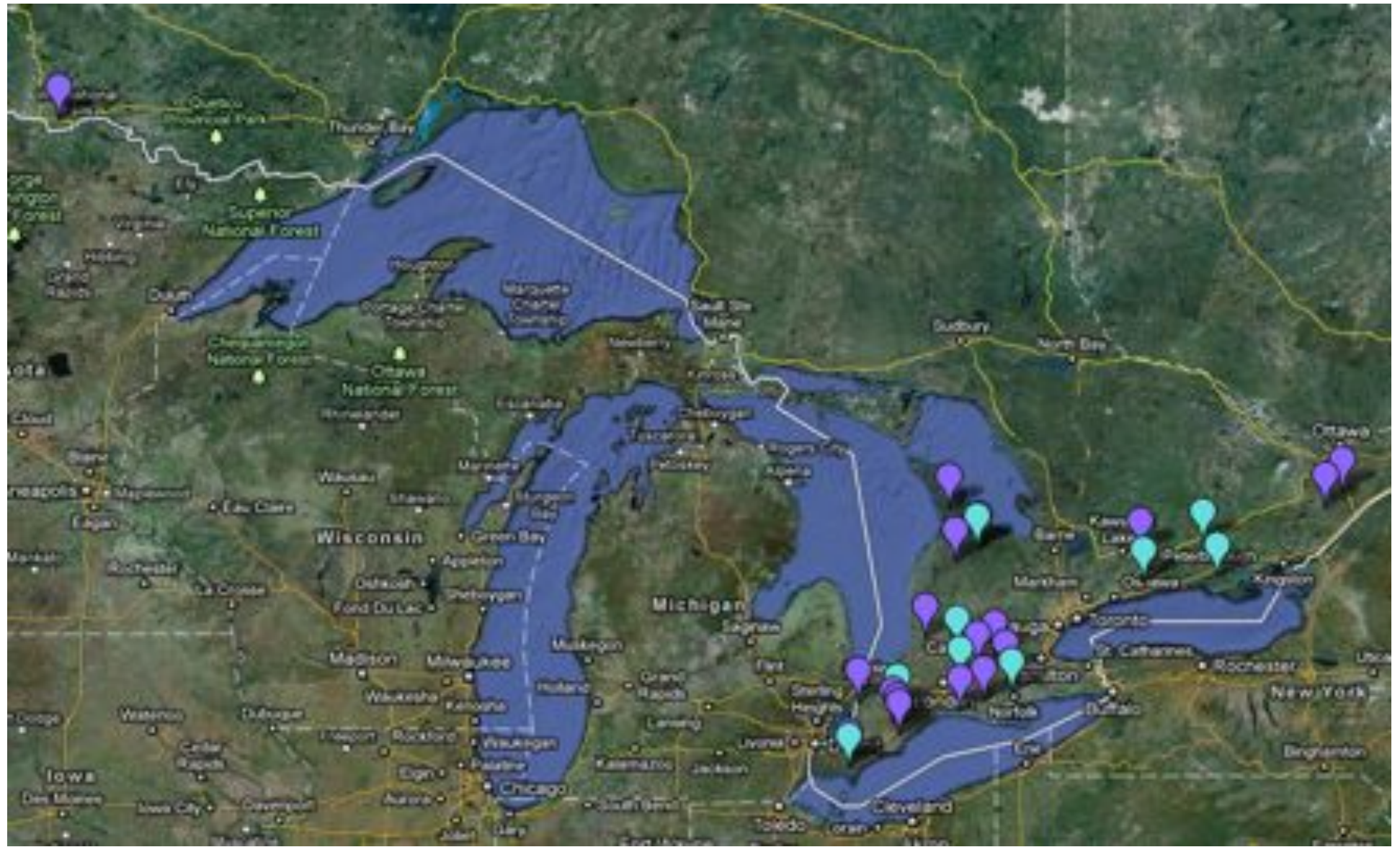


RESEARCH OBJECTIVES

“This project is intended to provide as many answers as possible by looking at different options for the future related to the choice of species (switchgrass, miscanthus, big bluestem, etc); the choice of soil conditions; the optimal times to plant and harvest; the extent to which nitrogen application is needed; pests and diseases to which stands may be susceptible and how to control them; ways to store the harvested crop; extracting nutrients that are undesirable for combustion and returning them to the soil; how to aggregate at least cost; what type of dies to use in pelletizing; and so on.”

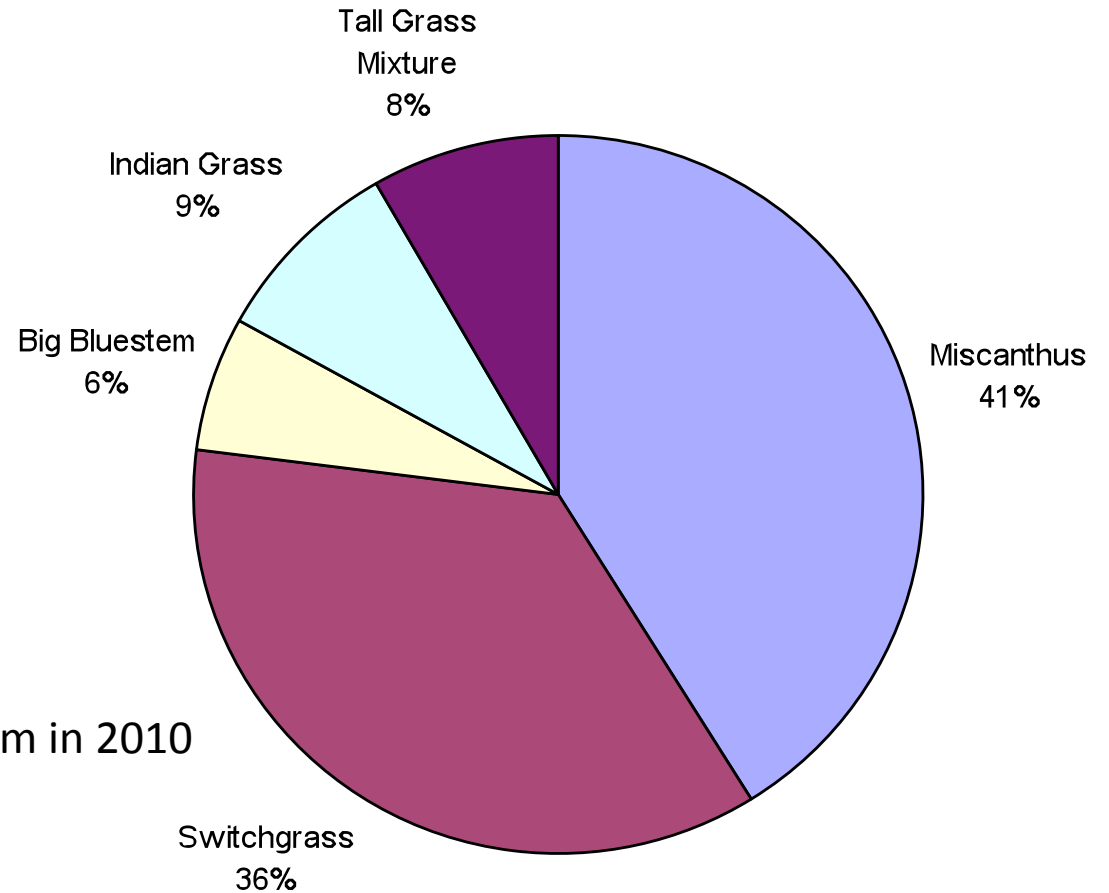
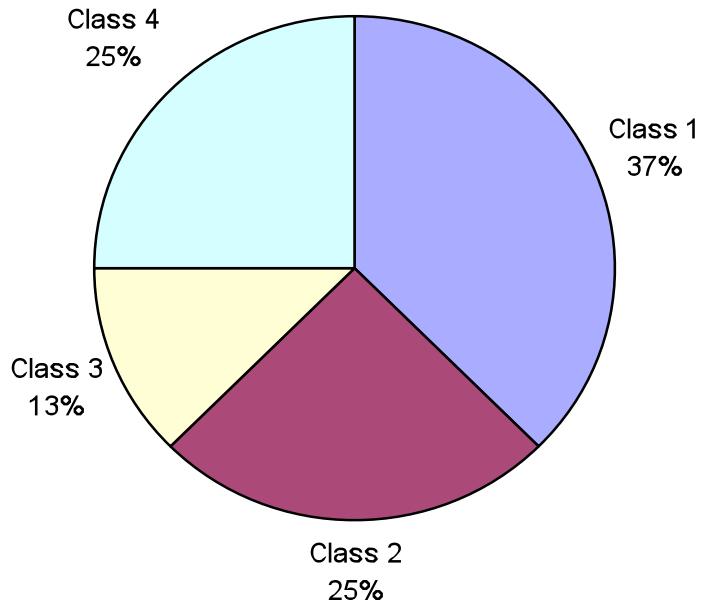
DATA BEING COLLECTED

- Grass establishment measurements
 - Seeded Grasses: plant density, biomass harvest weight (minimum 4- x 0.5m²/ treatment)
 - Miscanthus: culm length, basal circumference, biomass harvest weight (minimum 4x 5m down – 2 rows/treatment)
- Winter survival
- Yields (in co-operation with grower)
- Moisture (fall and spring)
- Ground cover/weed pressure
- **Grower surveys (successes/failures, comments, ideas)****





2010 SITES -BREAKDOWN

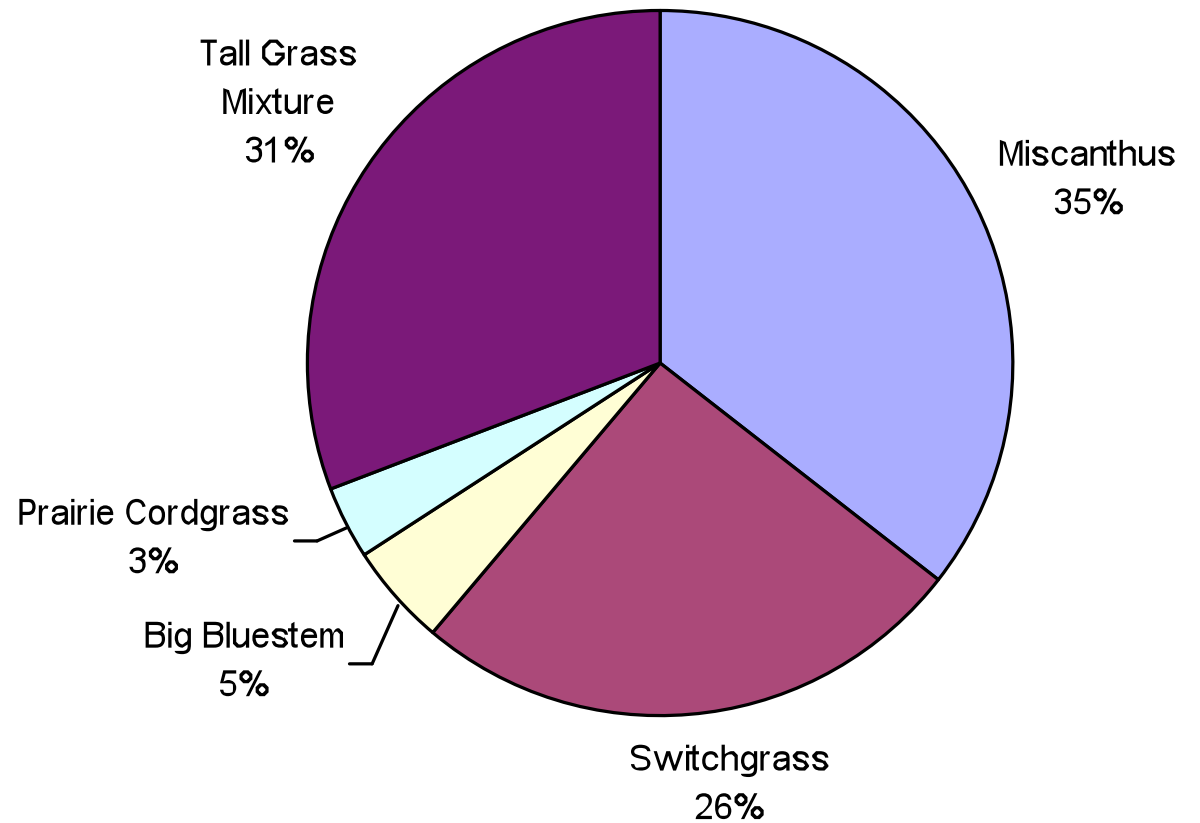
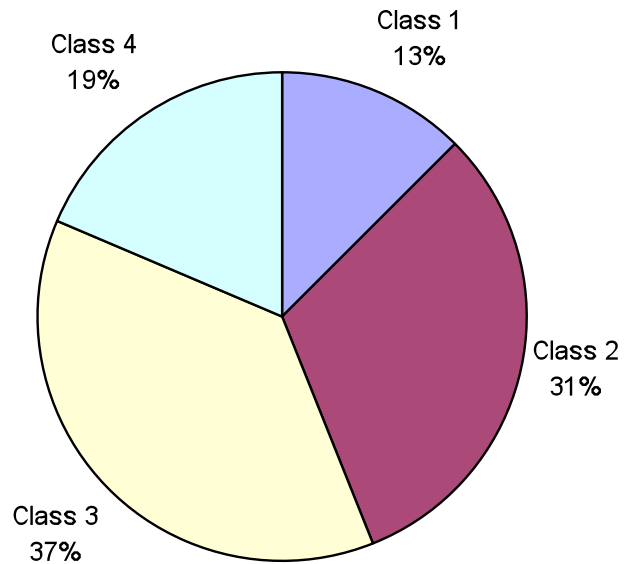


- 8 established sites added to program in 2010
- 325 ac of established field
- CHU's ranged from 2600-4300

2010 SITES- VARIETIES PLANTED

	Acres
Miscanthus:	
Giganteus	67.75
Nagara	35.75
Illinois	35
Switchgrass:	
Cave-in-Rock	108.6
Sunburst	3.9
Native	2.25
Big Bluestem:	
Prairie View	2
Native	17.25
Indian Grass:	
Native	27.75
Tall Grass Mixture:	
Native	25
Cave-in-Rock and Prairie View	1.5
Total Acreage	326.75

2011 SITES -BREAKDOWN



- 19 sites planted in 2011
- 470 ac planted
- CHU's ranged from 2500-4300

2011 SITES- VARIETIES PLANTED

	Acres
Miscanthus:	
Nagara	98.29
Amuri	10
Switchgrass:	
Cave-in-Rock	46
Forestburg	5
Tecumseh	6
Kanlow	1
Native	20
Big Bluestem:	
Native	15
Prairie Cordgrass:	
Native	10
Tall Grass Mixture	
Native	94
Total Acreage	305.29*

* Acreage only reported for survey respondents to date

WHAT HAVE WE LEARNED SO FAR?

- Field Preparation
- Establishment
- Weed Control
- Harvesting
 - Equipment requirements
 - Yield
- N Fertility

FIELD PREPARATION

- Soybean stubble is preferred
 - Eliminate need for tillage
 - Lowers weed pressure
- ~50% of primary tillage was performed the fall prior to planting
 - followed with secondary tillage using tandem discs in the spring
- The rest was done prior to planting between May and July.
- Discing was most common form of primary tillage.
- Burndown herbicides were almost all used the spring prior to planting

ESTABLISHMENT

- Majority of planting took place in May with some done in late April, one in June and one in July
- Majority of miscanthus planted by rhizome
 - 5000-16000/ac with rhizomes
 - 7200-11200/ac with transplants
 - carousel planter, vegetable planter and a specialized rhizome planter
- Seeding rates varied by variety but ranged between 5-12 lbs/ac
 - broadcast grass seeder and no-till drill

WEED CONTROL

- Inter row cultivation not worth the effort in weed control
- A few growers used paper compost/cardboard slurry or wheat straw to help with weed control and soil moisture
- Weed control methods used: mechanical cutting, 2,4-D post-emergence, atrazine, PAR III, Banvel and Dual.
 - Varying results
 - Application timing is key

HARVESTING EQUIPMENT



YIELDS

	Europe	US Midwest	Ontario Research Trials	OSCIA Biomass Program
Miscanthus	6-30 t ha ⁻¹	22 t ha ⁻¹	12-18 t ha ⁻¹	3-6 t ha ^{-1*}
Switchgrass		10 t ha ⁻¹	5-10 t ha ⁻¹	7-8 t ha ⁻¹
Tall Grass Prairie			2-10 t ha ^{-1**}	7-8 t ha ⁻¹

*Not fully established 2nd and 3rd year yields

** Big Bluestem



FERTILITY

- No one applied fertilizer in the first year
- Some growers applied P and K
- One 3rd year field was fertilized with 60 lbs/acre of N
- Mushroom compost was added in one case to add nutrients
- Only a few established sites interested in fertility



WHAT WE DON'T KNOW- RESEARCH GAPS

- Planting Timing
- Seed Quality
- Variety Differences
- Grass Weed Control
- Filling in after Poor Establishment

PLANTING TIMING





SEED QUALITY

- Greater availability of seed in past few years
- Quality does vary
 - Germination
 - Pure live seed (PLS)
- Varieties available:
 - Cave-in-Rock
 - Shelter
 - Sunburst
 - Kanlow
 - Pathfinder
 - Carthage
 - Shawnee
 - Forestburg



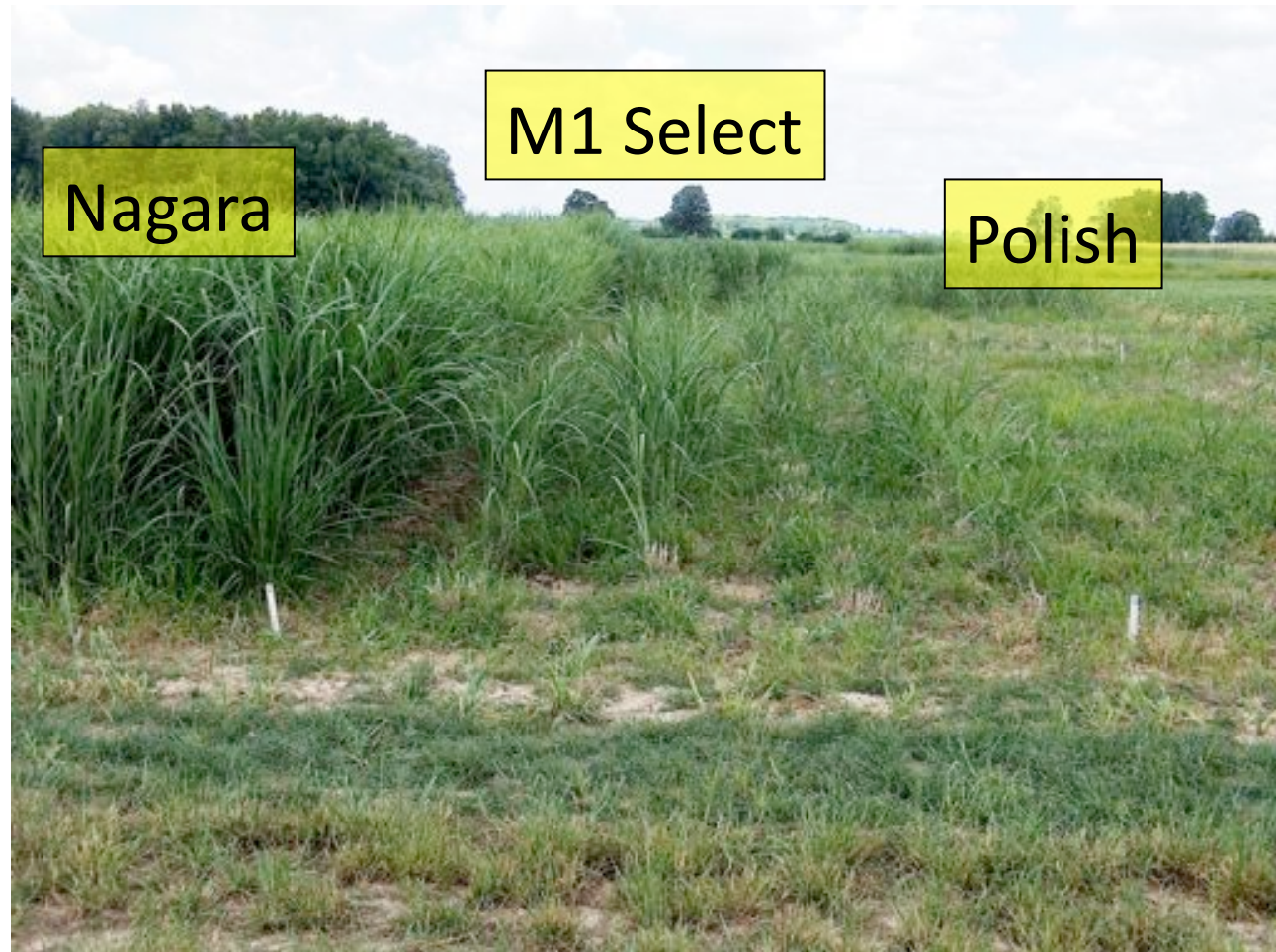
VS.



VARIETY DIFFERENCES

- 3 species and 1 interspecific hybrid of most interest
 - *M. sinensis* (n=19, 2x=38), bunch grass
 - *M. sacchariflorus* var. *lutarioriparius* (2x=38)
 - Cultivated in China for paper, strongly rhizomatous
 - *M. sacchariflorus*
 - China (2x=38), Japan (4x=76, allotetraploid), rhizomatous
 - *M. ×giganteus* (3x=57): *M. sacchariflorus*/*M. sinensis*
 - Propagation by rhizome

**Elora – Established
June 2008, images
taken June 2009**



LODGING OF DIFFERENT SPECIES



CONTROLLING GRASSES IN GRASSES

- Very hard to control during establishment
- Field preparation (packing, burndown, etc) most important
- Quinclorac has broad weed control both pre and post on switchgrass, big bluestem and prairie cordgrass
 - Only registered in the US- no signs of coming to eastern Ontario market

MANAGING POOR ESTABLISHMENT



- Is it economical to re-seed?
- Split existing miscanthus plants or buy new rhizomes?



ACKNOWLEDGEMENTS

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