Short-Rotation Woody Crops In the Southeastern U.S.

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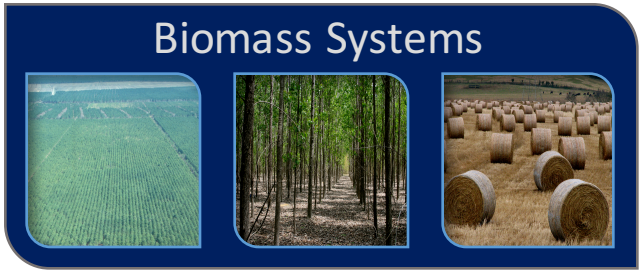
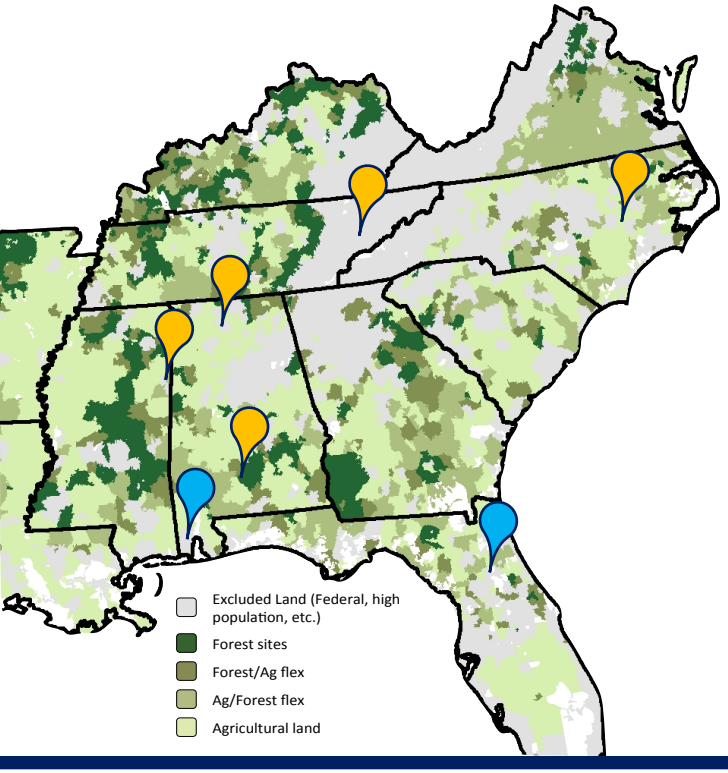
Short-Rotation Woody Crops


Eucalyptus, 2 years

- A hybrid approach introducing agricultural practices to tree production
  - State-of-the-art genetics
  - High planting density
  - Competition control
  - Maximum growth/yield
- Applicable to a number of species in the SE
  - Sweetgum
  - Sycamore
  - Cottonwood/Hybrid Poplar
  - Eucalyptus
  - Southern pine
- Potential As a “Flexible” crop

The IBSS SRWC Trial Network





1

Breaking Barriers

Demonstrate real world solutions to barriers limiting deployment of advanced biofuels in the Southeast.

2

Advanced Metrics

Create, validate, and use new metrics for improved decision-making for regional biorefinery development.

3

Education & Outreach

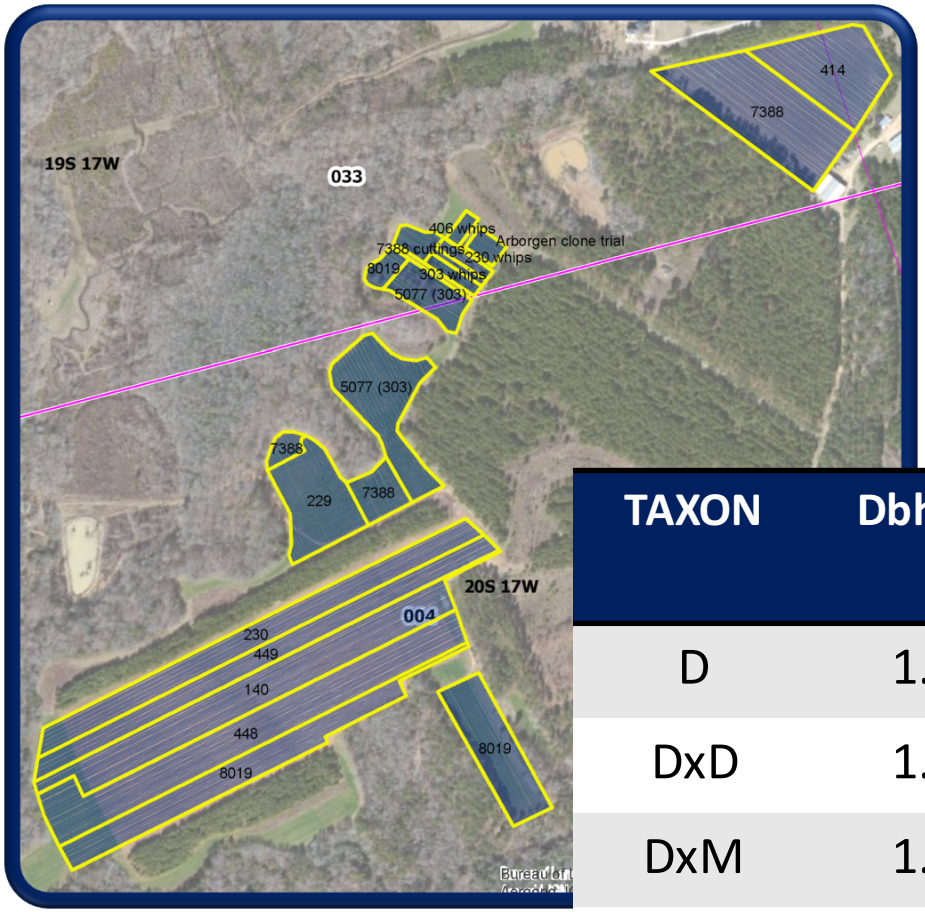
Provide credible and relevant programs to dispense new knowledge for the workforce and stakeholders.

Hybrid Poplar Management Challenges




- Survival impacted by deer browse (not shown).
- Cottonwood leaf beetle found in MS requiring aerial insecticide application (left).
- *Septoria musiva* found at all sites (top).
  - Impact has been low (leaf spot) at most sites.
  - Severe canker leading to topping at ETREC.

Poplar Productivity – Columbus, MS Site

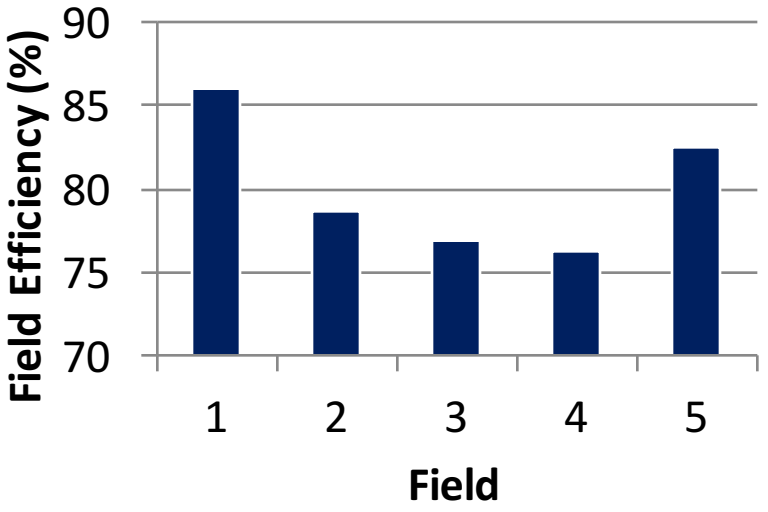


- Significantly higher yield and MAI for hybrids.
- Low survival for cottonwood and *deltoides* clones.
- Difference may reflect improved root development in hybrids.

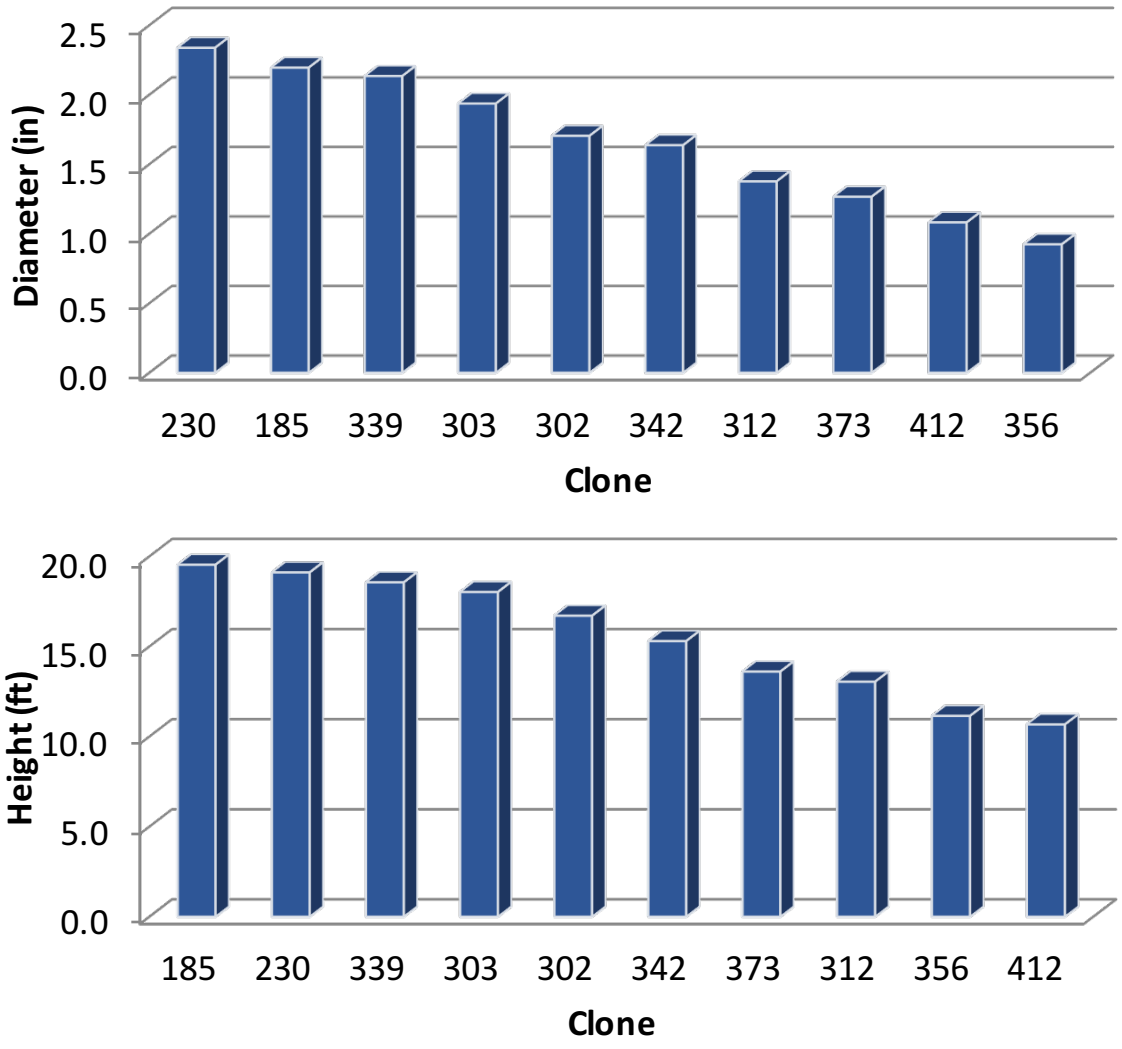
TAXON	Dbh (in)	Height (ft)	Survival (%)	MAI (BDT/ac)
D	1.03	13.65	61.7	2.5
DxD	1.07	12.32	50.7	2.6
DxM	1.30	17.67	72.4	3.4
TxD	1.37	18.22	80.7	3.8

Improved Poplar Harvest Operations

- Case-New Holland Forage Harvester
- 9.7 % idling in-field
  - Mechanical 13.3%
  - Metal sensor and adjustment 16.41%
  - Human interruption 43.63%
  - Fuel 33.16%

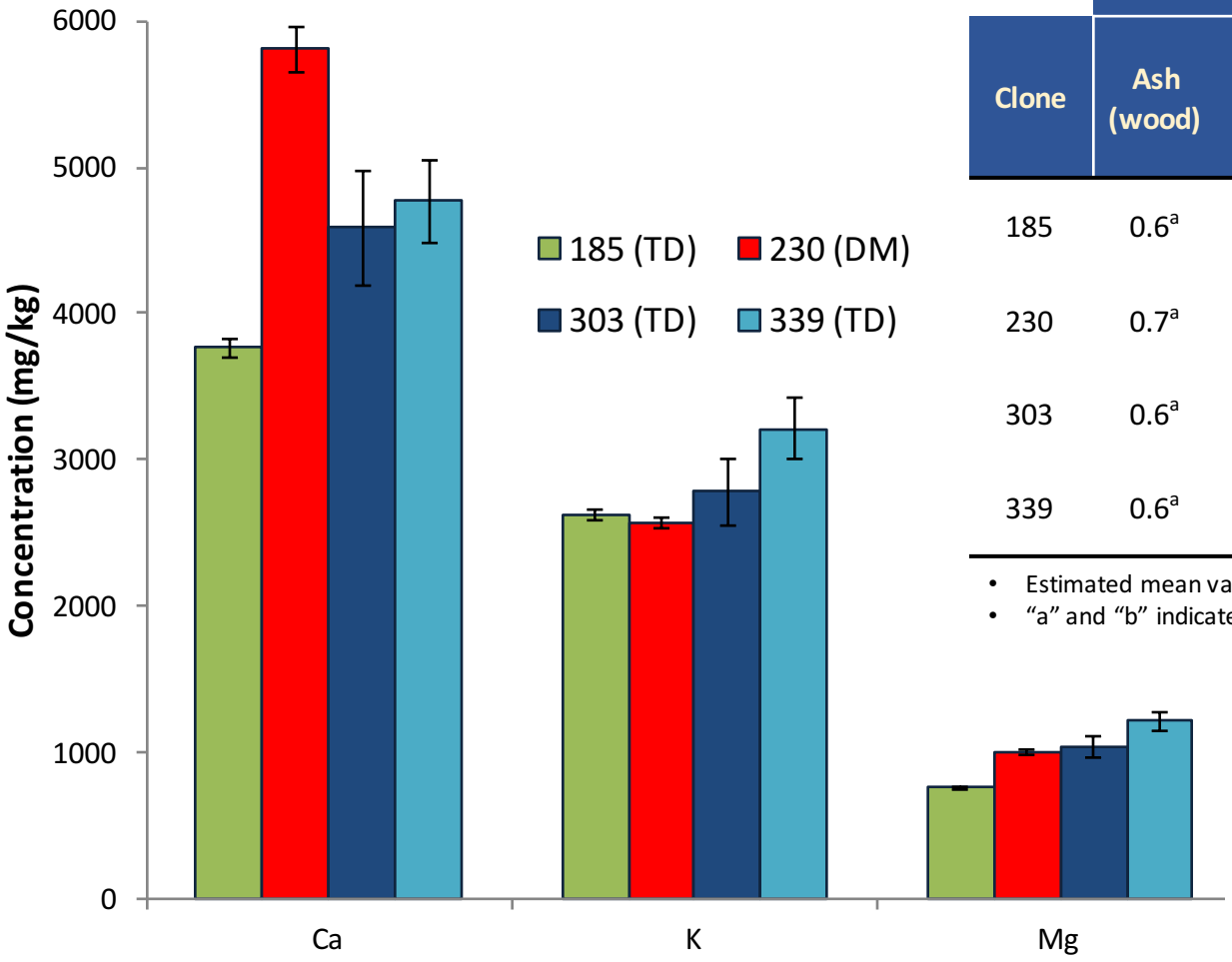


Poplar Productivity – ETREC Site



- 4 trials established in TN (2011), AL (2011-2012) and MS (2014).
- Varieties from trichocarpa, maximowiczii and deltoides crossed with deltoides.
- Replicated plots of 622, 1089 and 1452 trees/acre (7x-, 4x- and 3x10 ft).
- Wide range of growth for the 10 clones located at the Tennessee site:
  - Diameter from 0.8 to 2.3 inches
  - Height from 10 to 18 feet

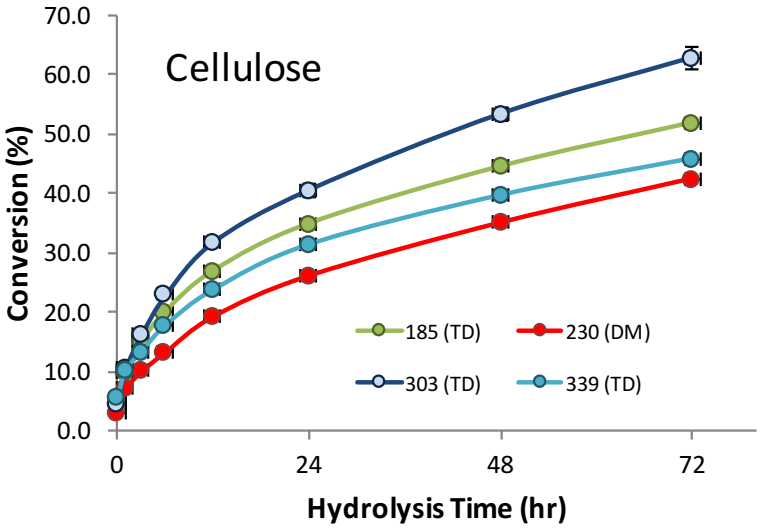
POPLAR PROPERTIES – CHEMICAL COMPOSITION

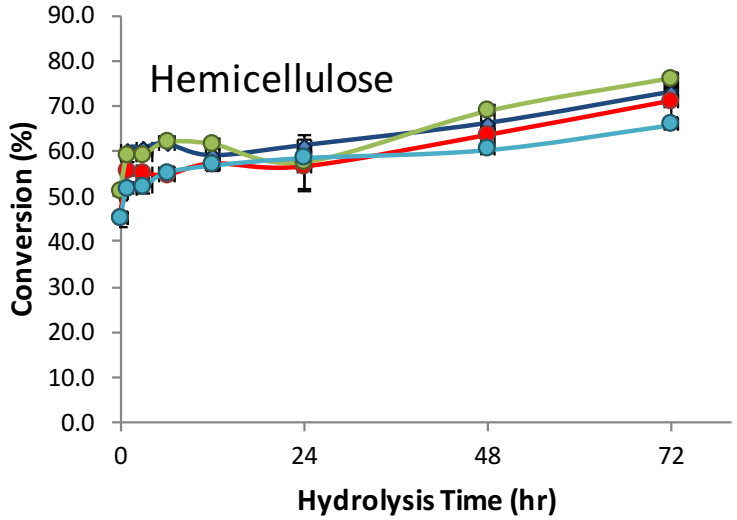


Clone	Chemical composition (% dry basis)				
	Ash (wood)	Extractives	Cellulose	Hemi-cellulose	Total Lignin
185	0.6[a]	6.7[b]	40.9[c]	19.9[a]	26.0[a]
230	0.7[a]	7.0[b]	43.2[a]	18.4[c]	25.7[a]
303	0.6[a]	7.0[b]	41.7[b]	19.3[b]	25.3[a]
339	0.6[a]	8.6[a]	39.5[d]	18.2[d]	26.8[a]

- Estimated mean values are shown based on Least Significant Difference
- "a" and "b" indicate statistical differences at $p < 0.05$.

Enzymatic Hydrolysis of Sugars

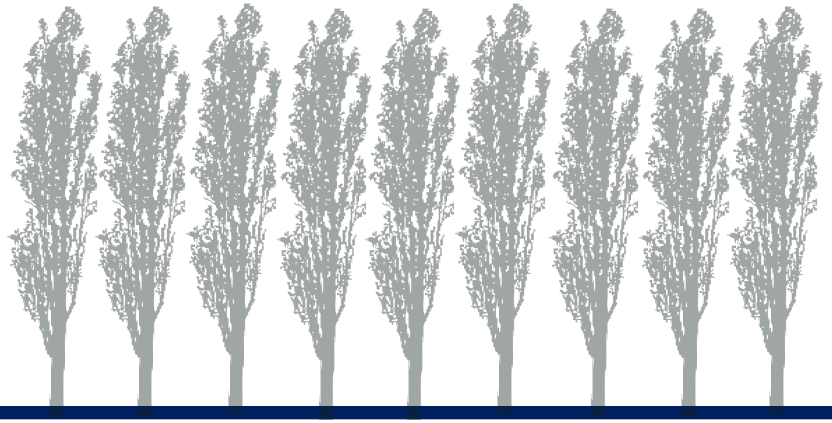




- Top 4 biomass producing clones (ETREC) selected for assessment.
- Difference in cellulose conversion of ca. 20% at 72 hrs.
- Highest carbohydrate source has lowest sugar release.
- Conversion of C5 sugars similar for all samples.

Closing Thoughts

- Short-rotation woody crops offer favorable performance as an energy crop in the Southeast's portfolio.
- Genetic diversity promises continued gains in productivity and desirable physical traits.
- Need to more completely understand properties impacting process performance (wood structure/morphology).
- The prospect of supplying feedstock for diverse markets is particularly appealing.
- Improved resistance to disease (e.g., *Septoria*) is needed to expand poplar production in the region.



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