



**GEORGIA
SOUTHERN**
UNIVERSITY

Georgia's large-scale, small-feel research university

Herty Advanced Materials Development Center

Jill P. Stuckey

**GEORGIA HAS THE
BUSIEST AIRPORT IN
THE WORLD !!!!!**



Charles Holmes Herty, Ph.D.

Visionary & Entrepreneur, 1867 - 1938

- President of Synthetic Organic Chemical Manufacturers Association
- President of American Chemical Society
- Played an influential role in establishing the National Institutes of Health
- Herty's work catalyzed the pulp and paper industry in the South and helped revive the region's economy during the Great Depression.
- Professor and football coach at UGA



Herty Advanced Materials Development Center

➤ Clients include global corporations, as well as numerous Fortune 500 companies, focused in a wide range of areas

➤ 120,000 square foot facility

➤ Staff - 64 people

Our Capabilities Include:

➤ Composites for the automobile and aerospace industries

➤ Recycled fibers

And.....



BIOMASS PROCESSING FACILITY

BIOMASS

SIZE REDUCTION

PELLETING

PACKAGING

DRYING

CONDITIONING

COOLING

Chip pile



Belt Dryer



Hammer Mill



Mixing bin



Pelletizer



Pellet Cooler



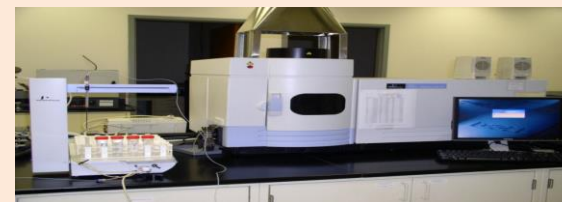
Supersacks



Batch Digester

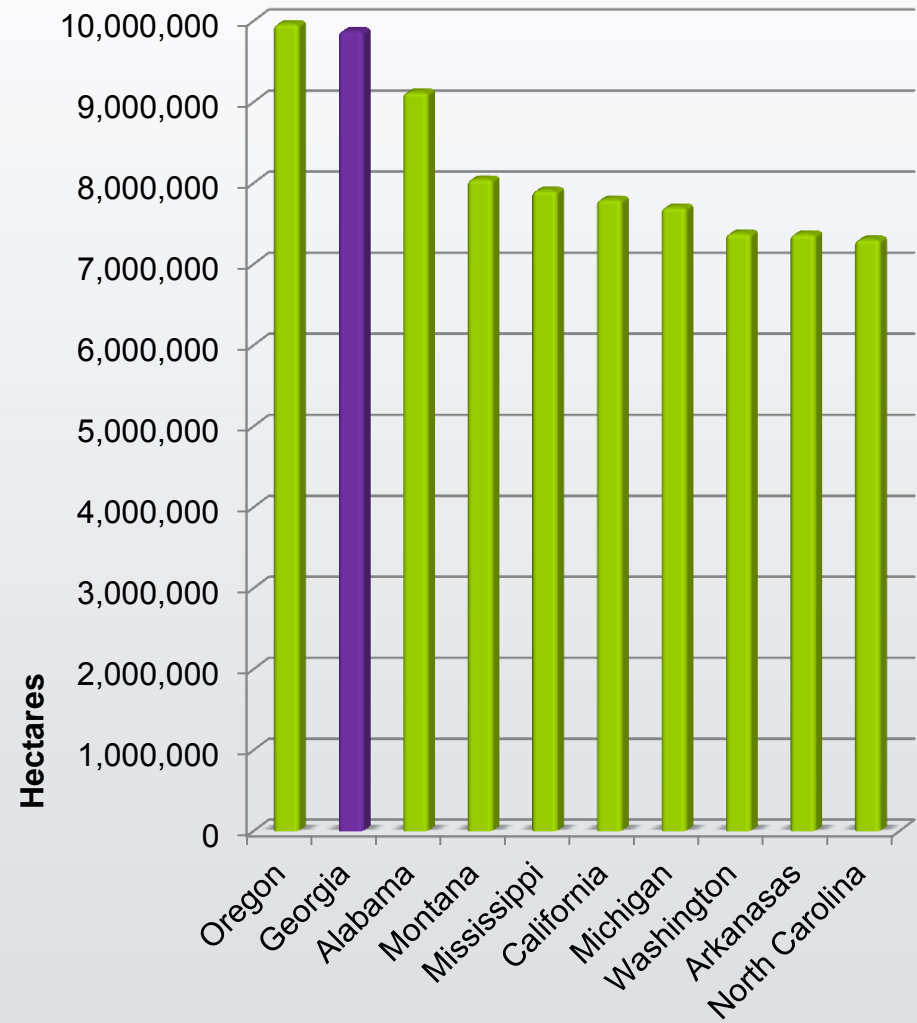
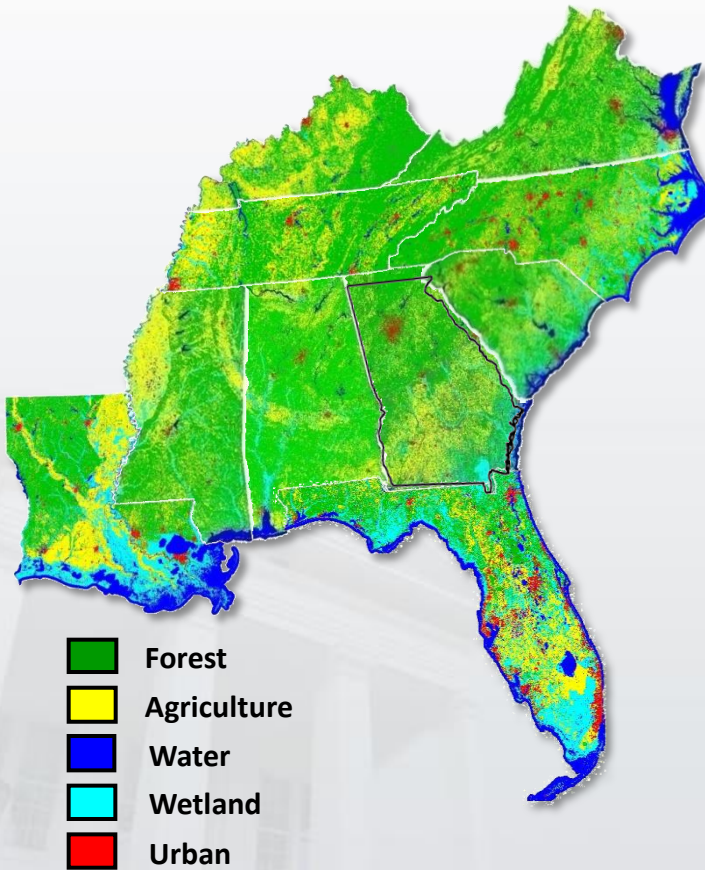
Laboratory Capabilities

Moisture
Ash
Elemental analysis of ash, ICP
Heat value
Particle size distribution
Thermal analysis, TGA and DSC
Extractives
Bulk density









President Jimmy
Carter, DOE
founder,
in his Paulownia
tree field.

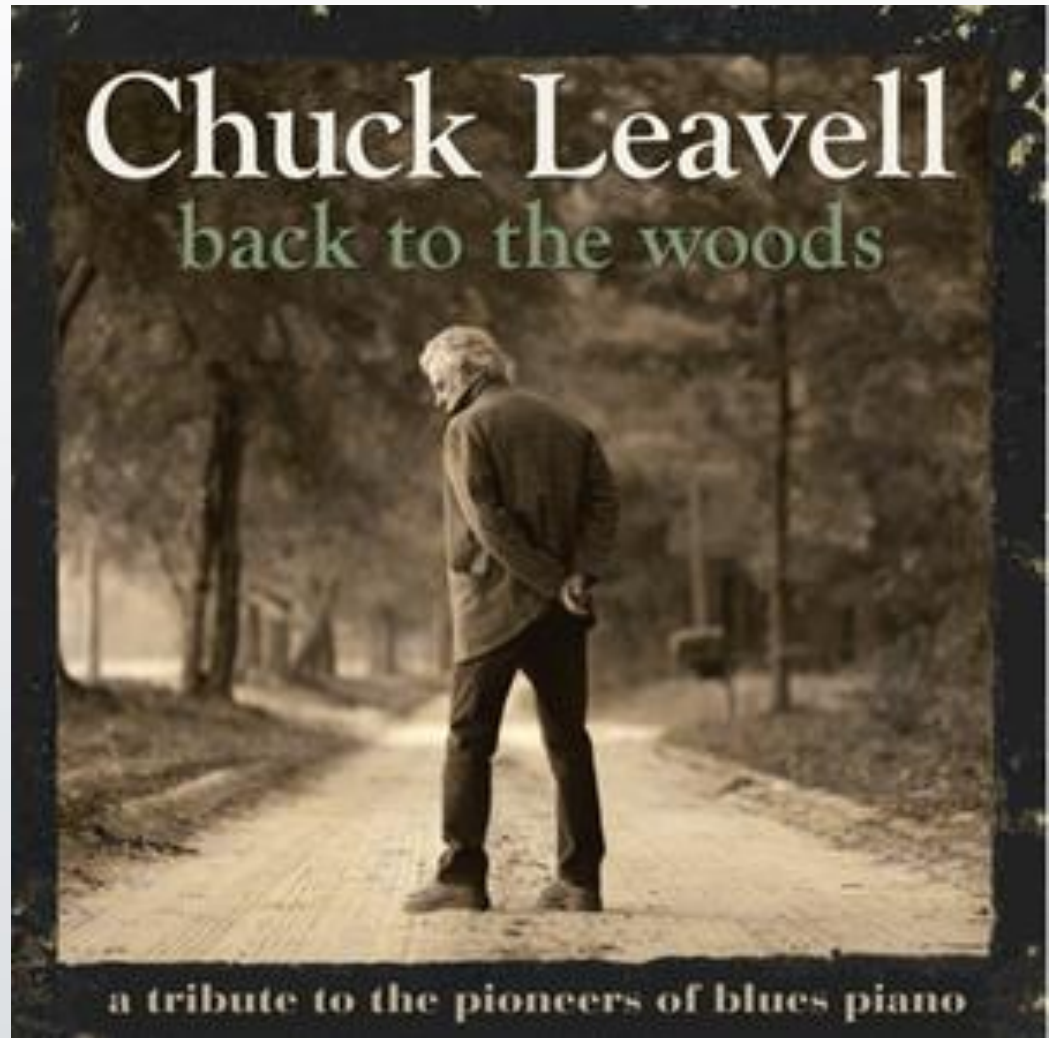


Georgia Wood Removals

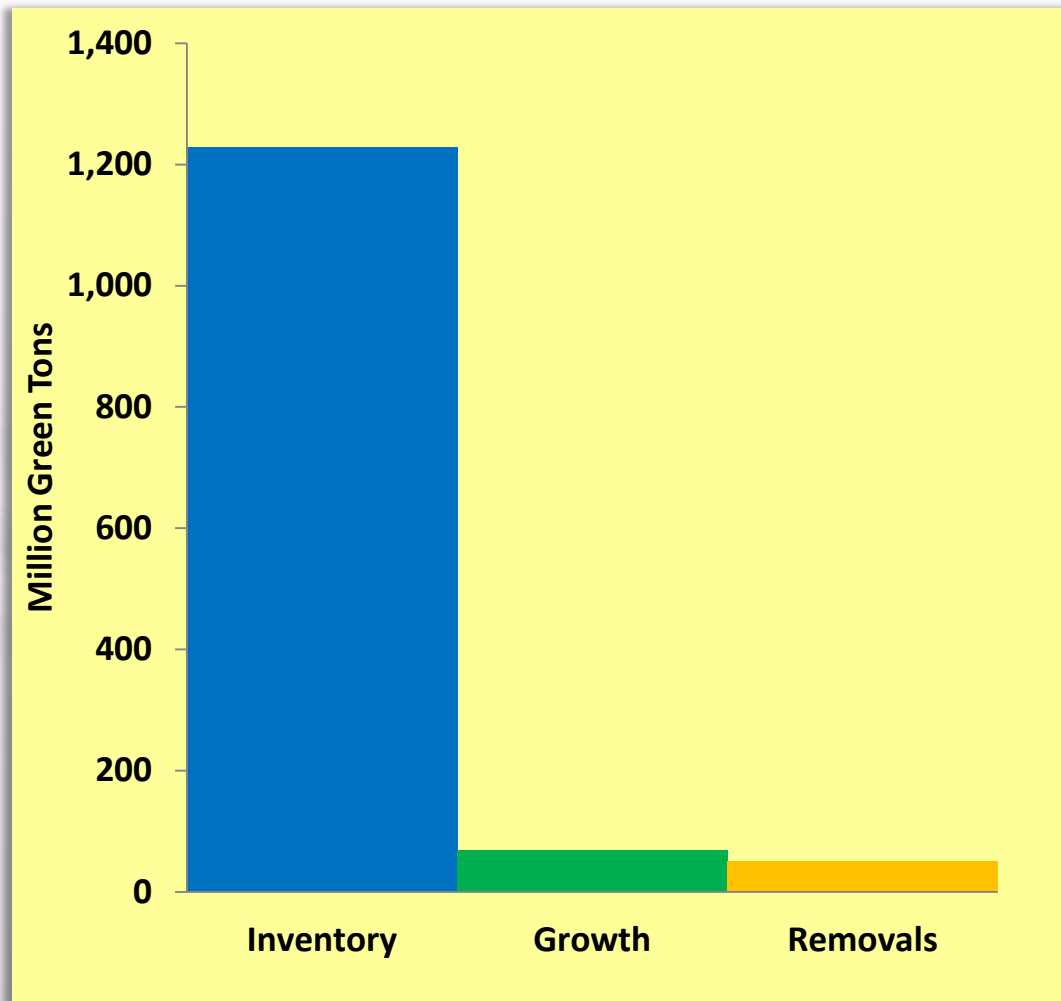
- 1995 – 51.4 million green tons harvested
- 2009 – 39.2 million green tons harvested

12.2 million green tons to get back to where we were...

Chuck
Leavell,
Keyboardist
for the
Rolling
Stones.



Forest Inventory

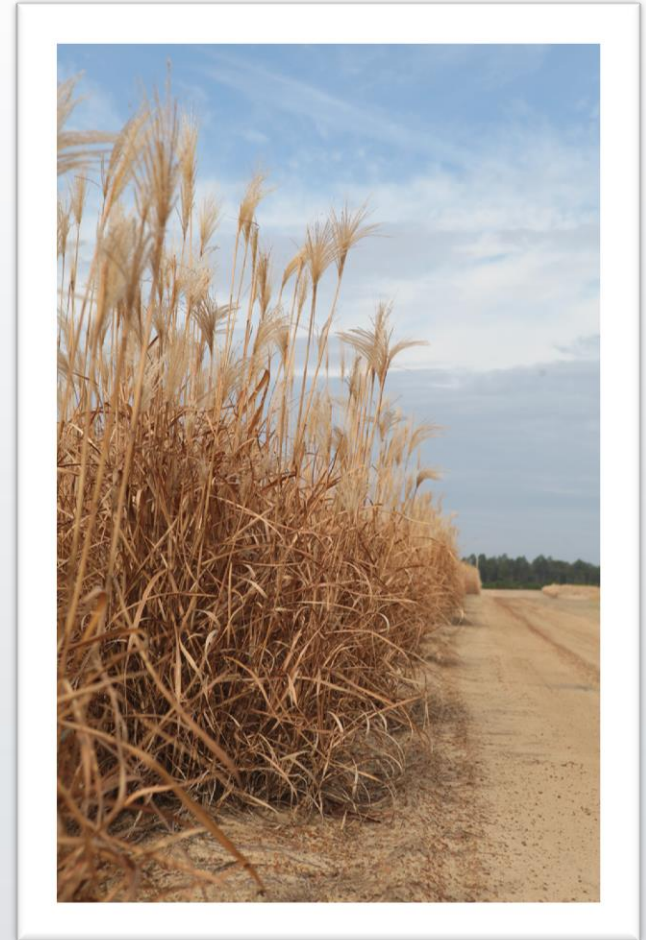


Yesterday...



Giant Miscanthus

- **Herbaceous, Deciduous, Perennial**
- **Rhizomes rather than seed**
- **11 - 25 Dry tons/acre/year**
- **Height up to 15 feet**
- **Low environmental inputs**
- **Alternative non-food use for marginal Land**
- **Drought tolerant, crowds out weeds**
- **Carbon neutral**



Sister Jill's Crystal Ball

Pellets

Drop In Fuels

Electricity

Chemicals

Pharmaceutical

Ethanol





Some Facts About LanzaTech

- Owner of a Georgia facility – Freedom Pines Biorefinery
- Has a patented process using microbes to convert waste gas containing CO or CO₂ or synthetic gas generated from any biomass resource into low carbon fuels and chemicals
- Winner of a 2013 Observer Ethical Award, Green Oscar, for their partnership with Virgin Atlantic to commercialize sustainable low carbon aviation biofuels.
- March 2013, Virgin Atlantic and LanzaTech won the Sustainable Biofuels Award presented by World Biofuels Markets.

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CEO Fred Smith is very active on energy security and believes that new technologies and fuels offer a way out of dependence on oil in the transportation sector

FedEx and Alternative Fuels

- Has more than 650 aircraft, relying on about 1 to 1.25 billion gallons of petroleum-based jet fuel a year with no scalable solution yet for aviation and freight segments
- Wants to reduce aircraft emissions intensity 30% by 2020
- One goal is to obtain 30% of jet fuel from alternative fuels by 2030

What FedEx Looks For in Alternative Fuels:

- **Scalability** – Technologies exist to extract energy from everything, but work remains to produce enough fuel to power FedEx jets.
- **Logistics** – The ability to move the fuel from where it's produced to airports all over the world.
- **Economics** – The alternative fuel has to be competitive with the petroleum products that are out there today.



CEO Fred Smith is very active on energy security and believes that new technologies and fuels offer a way out of dependence on oil in the transportation sector

Economics

- Cost of the end product must be competitive over the long-term with petroleum-based fuels.
- Reviewing business plans with potential suppliers to identify paths to stable pricing.
- Lack of capital investments has put a damper on growth and cost parity; investments from DOD, DOE and USDA have been making a difference as this market emerges from the laboratory and demonstration plants to production scale

Up Next for FedEx

- Recent agreement inked for alternative-blend aviation fuel
- FedEx and The Nature Conservancy developing long-haul biofuel roadmap

So What's Next?

- Well, if you're looking for biomass, we have it!
- If you're looking for processing of feedstock, we can do it!
- If you need technical validation of your process, we got it covered!



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