



An Overview of the Forest Bioenergy Industry in Georgia

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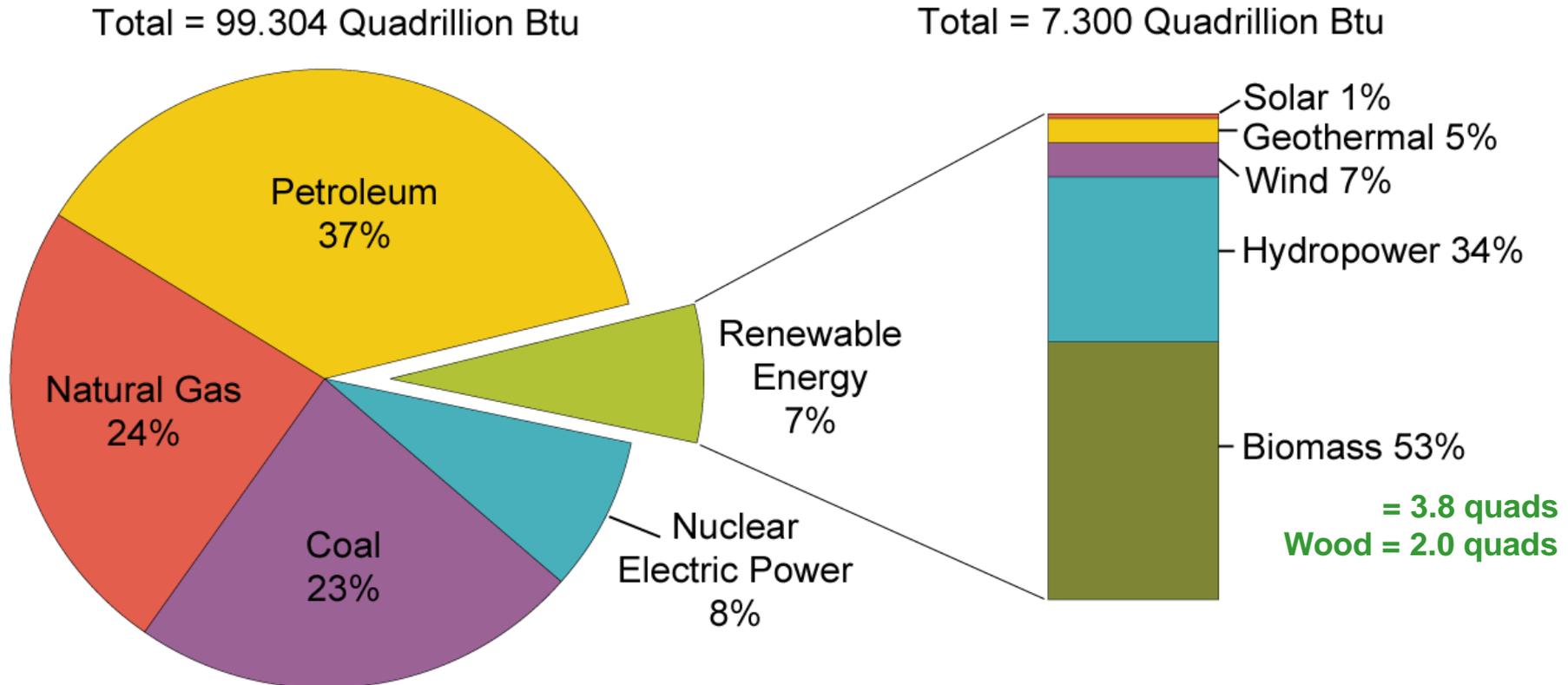


Approach

- The Forest Bioenergy Concept
- Georgia's Forests & Sustainability
- Industry Update

U.S. Energy Overview (2008)

The Role of Renewable Energy in the Nation's Energy Supply, 2008



Note: Sum of components may not equal 100% due to independent rounding.

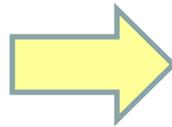
Source: U.S. Energy Information Administration, *Annual Energy Review 2009*, Table 1.3, Primary Energy Consumption by Energy Source, 1949-2008 (June 2009).

The Forest Bioenergy Concept



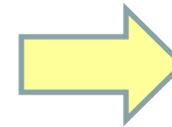
Forests

Logging residues
Hazardous Fuel
Treatments
Low value trees
Mill by-products
Wood Waste
Short Rotation
Woody Crops



Conversion Facility

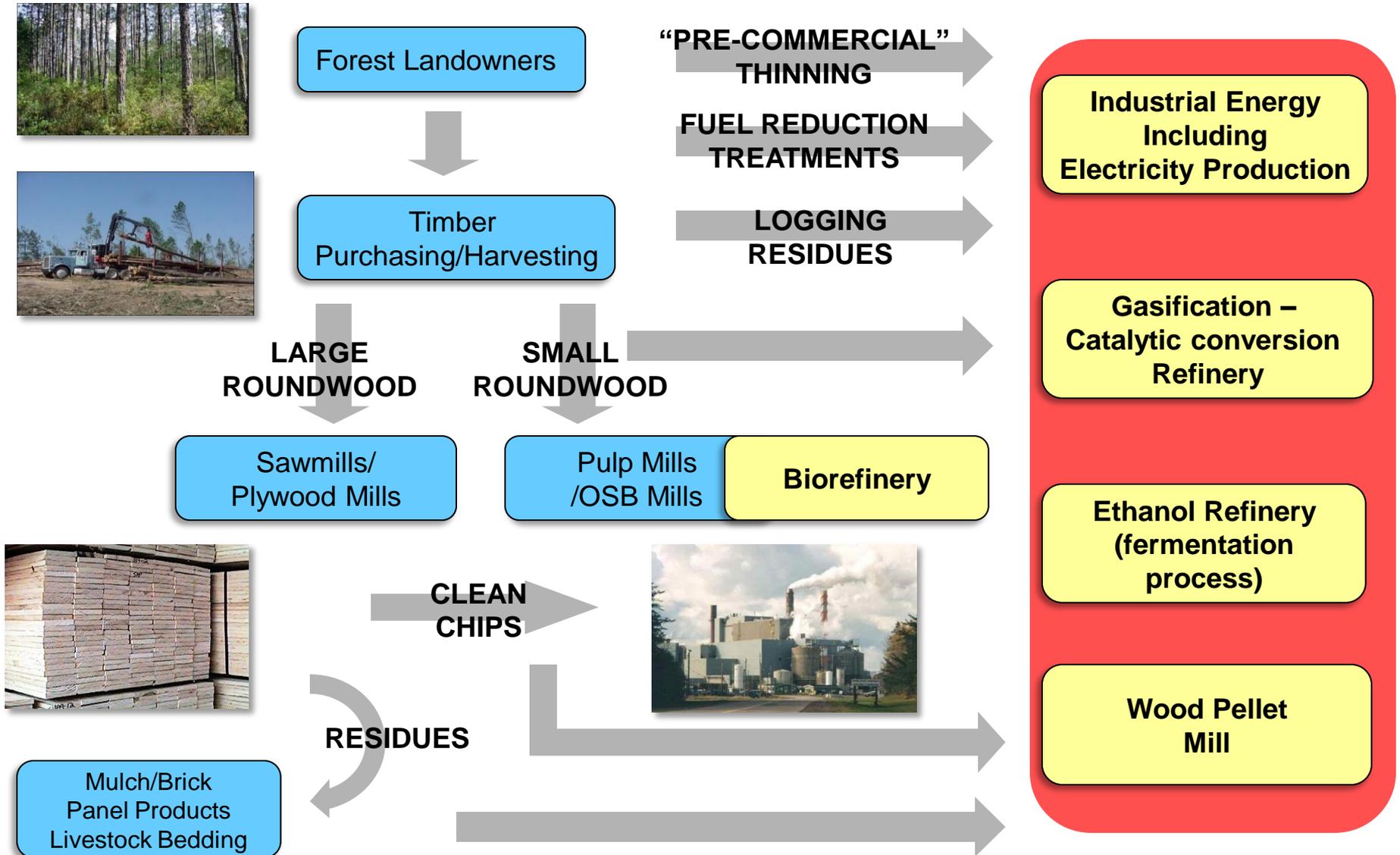
Direct combustion
Co-firing
Gasification
Pyrolysis
Enzymatic Fermentation
Acid Hydrolysis/Fermentation
Gas/liquid Fermentation
Pellets and Briquettes



Energy Product

Fuels:
ethanol, green diesel, etc.
Industrial heat & steam
Electricity
Synthetic gas
Pellets

Forest and Bioenergy Industry Integration

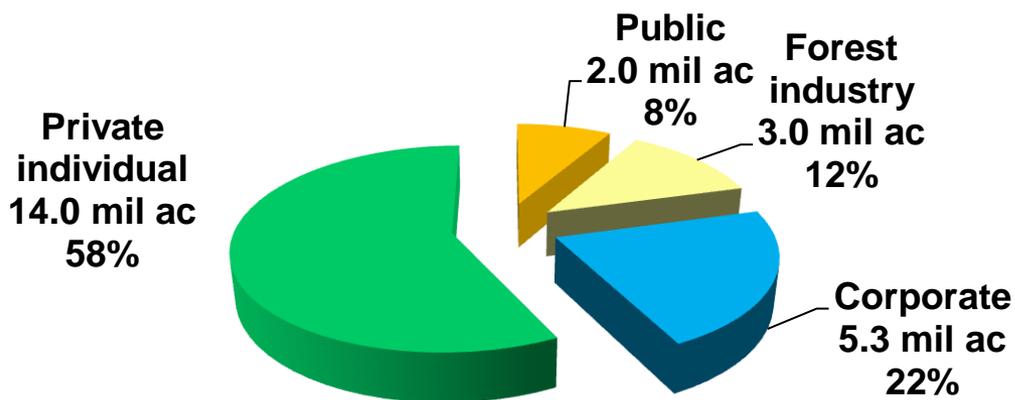
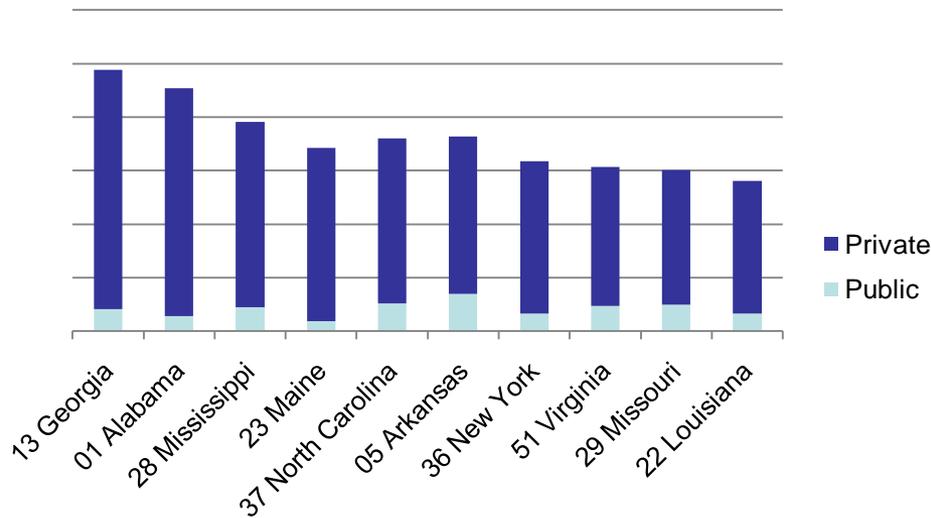
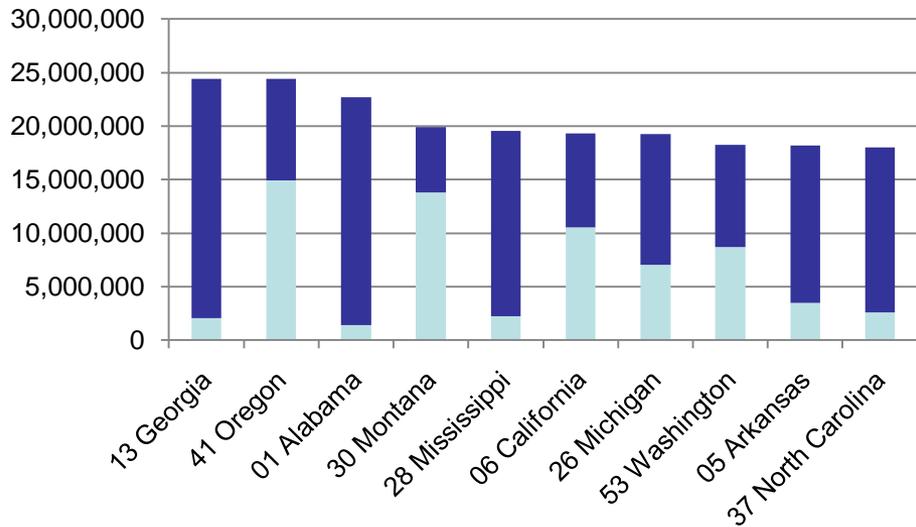


A photograph of a pine forest. The foreground is filled with dense, green undergrowth, including various shrubs and grasses. The middle ground and background consist of numerous tall, slender pine trees with dark, textured bark. The trees are spaced out, creating a sense of depth. The sky is visible through the canopy, appearing as a pale blue. The overall scene is a lush, natural forest environment.

Georgia's Forests



Top Ten US States in Total Timberland

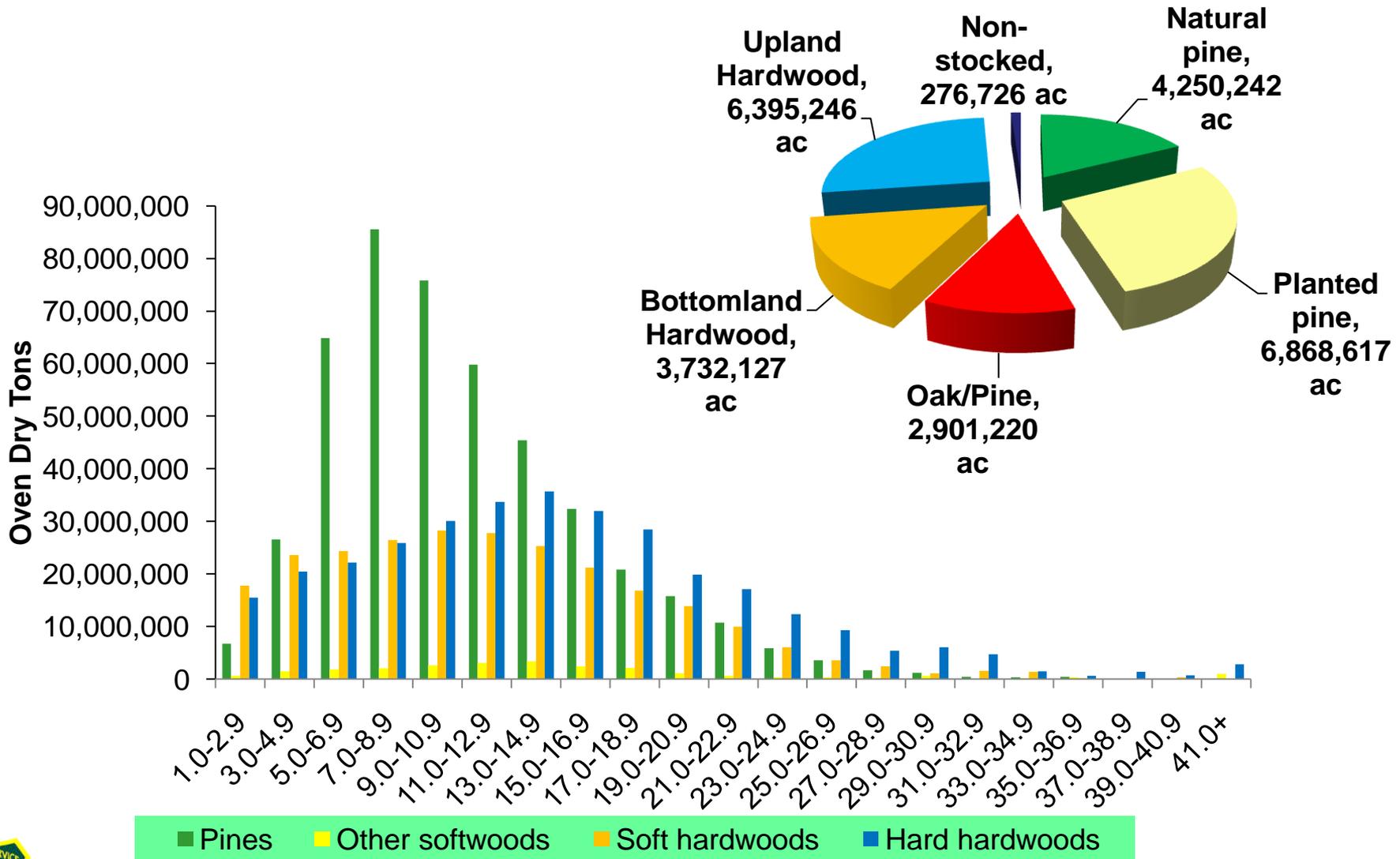


Georgia Timberland Ownership – 24.4 mil ac





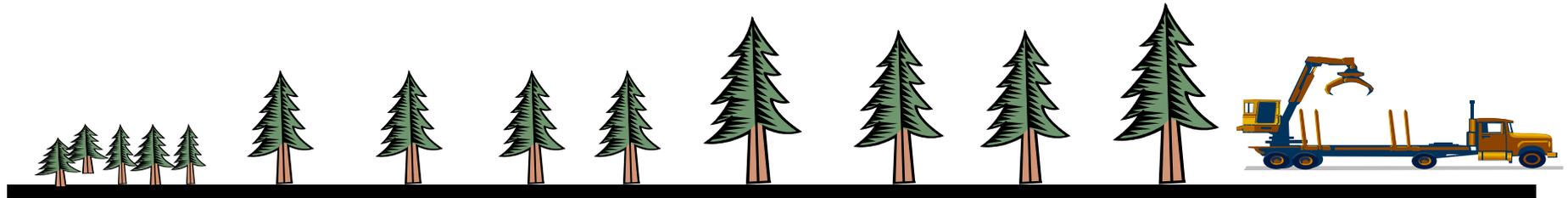
Georgia Timber Types and Biomass in Species Groups



Source: Forest Inventory and Analysis program, US Forest Service, 2008 data



Typical Pine Forest Management



Yr 0.....thin at 15 yrs.....thin at 24 yrs.....harvest at Yr 33

Loblolly pine yield (g tons/ac/yr) on average site:

<u>Product</u>	<u>Amount</u>	<u>Value/ g ton*</u>
Logging residues	.74	\$4
Pulpwood	2.0	\$8 (6)
Small sawtimber	2.1	\$18 (25)
Large sawtimber	1.7	\$29 (40)

Sources: Dickens, et al; Forest Economics papers using GaPPS, Univ. of Georgia; 2004 Bentley, James; Harvest and Utilization Study,2004; Southern Research Station, USFS

* General recent stumpage prices in Georgia (parenthesis indicates prior to economic downturn)

An aerial photograph of a forest. The trees are mostly green, but there are significant patches of brown, dead-looking vegetation interspersed throughout. A small figure of a person is visible in the middle ground, providing a sense of scale to the vastness of the forest.

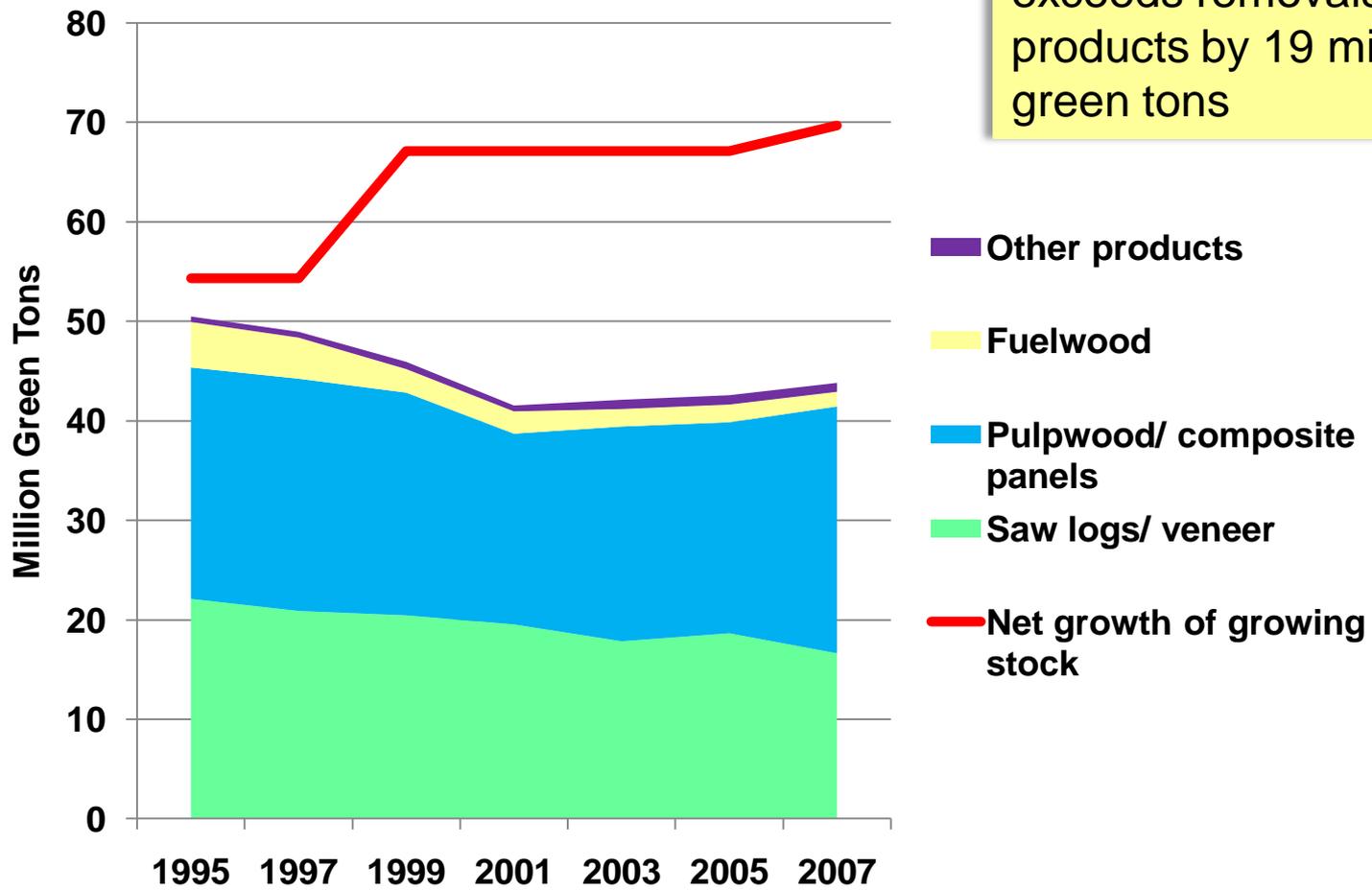
Sustainability of Forest Bioenergy

- **Sustainability: supply**
- **Sustainability: environmental integrity**



Additional Wood Use is Sustainable

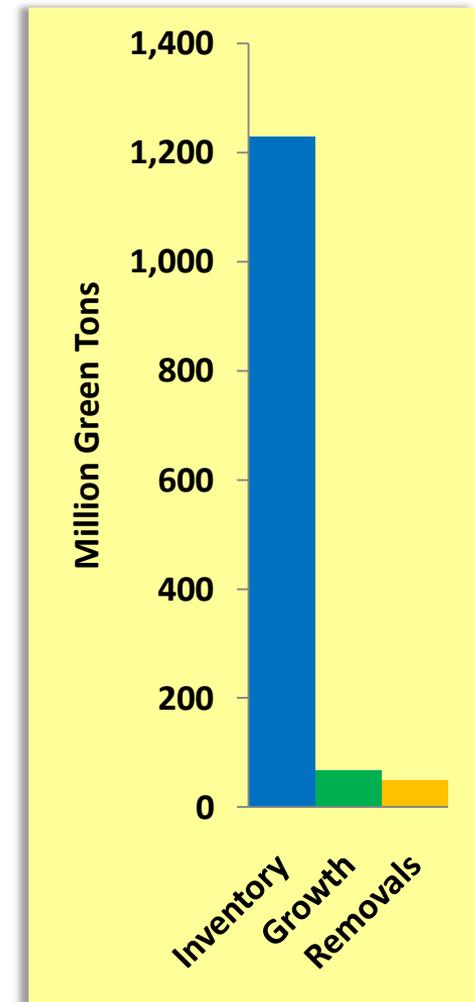
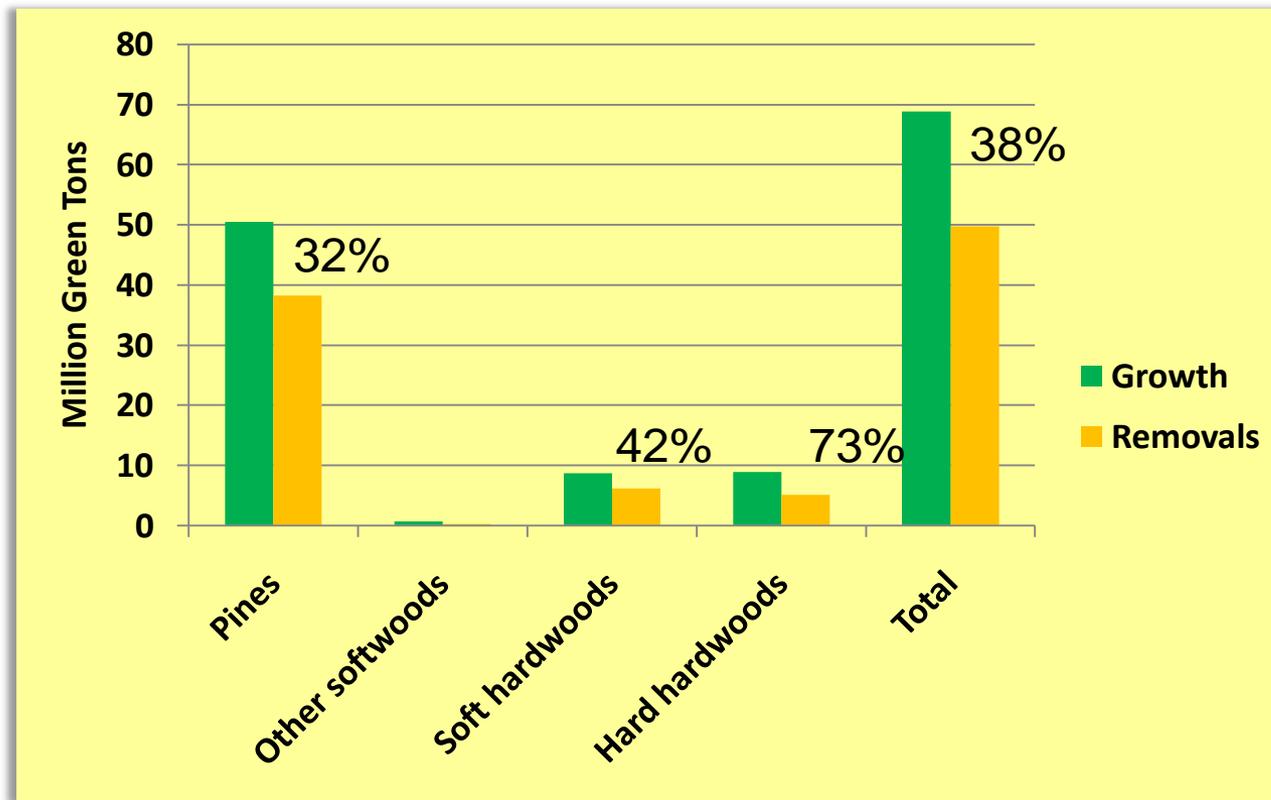
Merchantable wood growth exceeds removals for wood products by 19 million green tons



Source: Forest Inventory and Analysis program and Timber Product Output Reports, Southern Research Station, US Forest Service, 1995-2008; Volume -to-weight conversion using 70 lbs/cubic foot



Growth and Removals of Merchantable Trees





Georgia Statewide Forest Biomass Availability Estimates - 2009

Forest Biomass Source	Annual Recovery Estimate (US Green Tons)
Logging Residues and Understory Trees (65% recovery rate)	11,718,900
"Pre-commercial" receiving treatment	927,773
Land Use Change (recovery rate)	2,751,938
Urban Wood Waste	2,873,646
Total	18,272,257

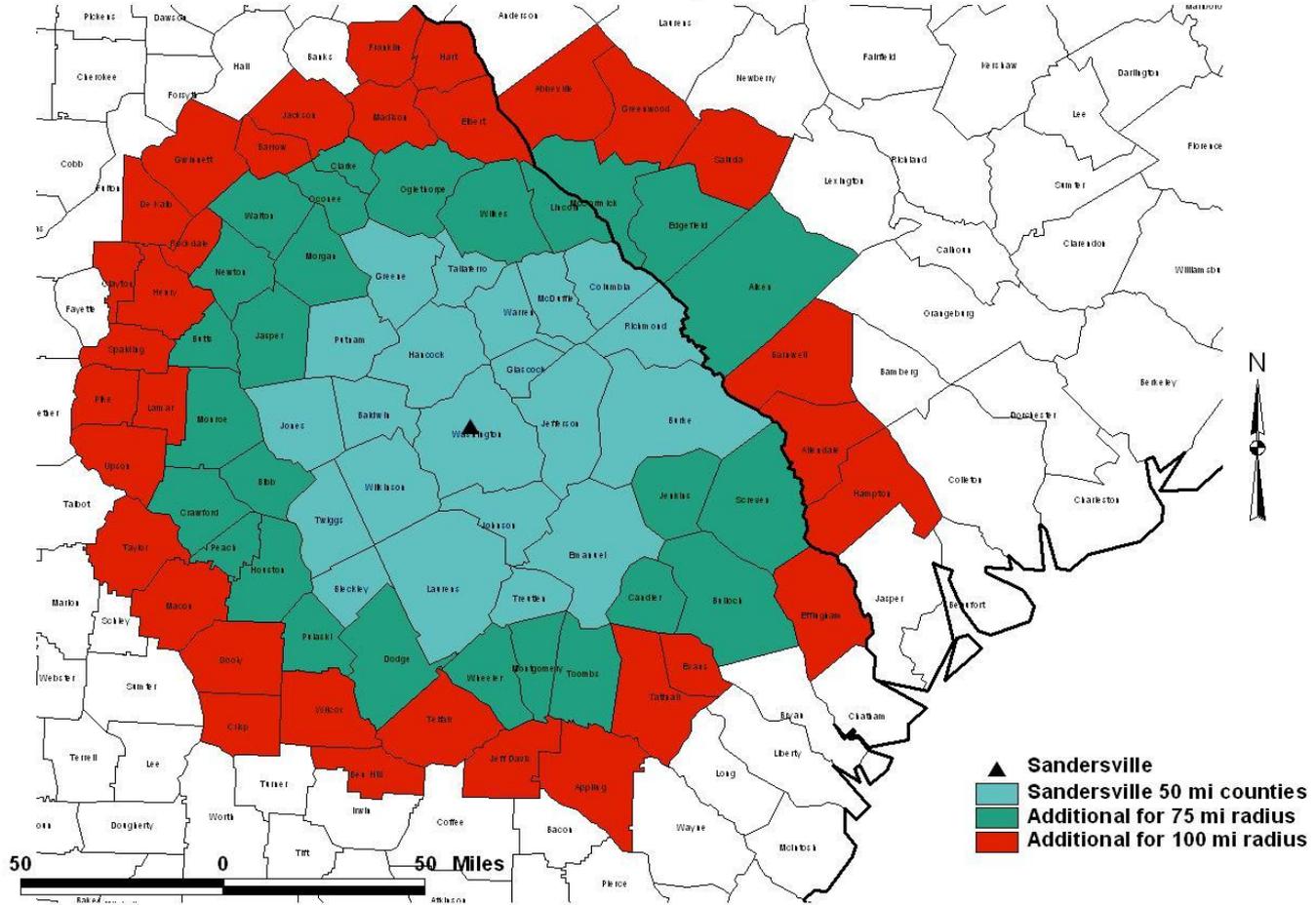
**Expected need:
10 – 12 million green tons in 5 years**

Merchantable Tree Growth above Removals	19,113,044
Mill Residues	14,610,000



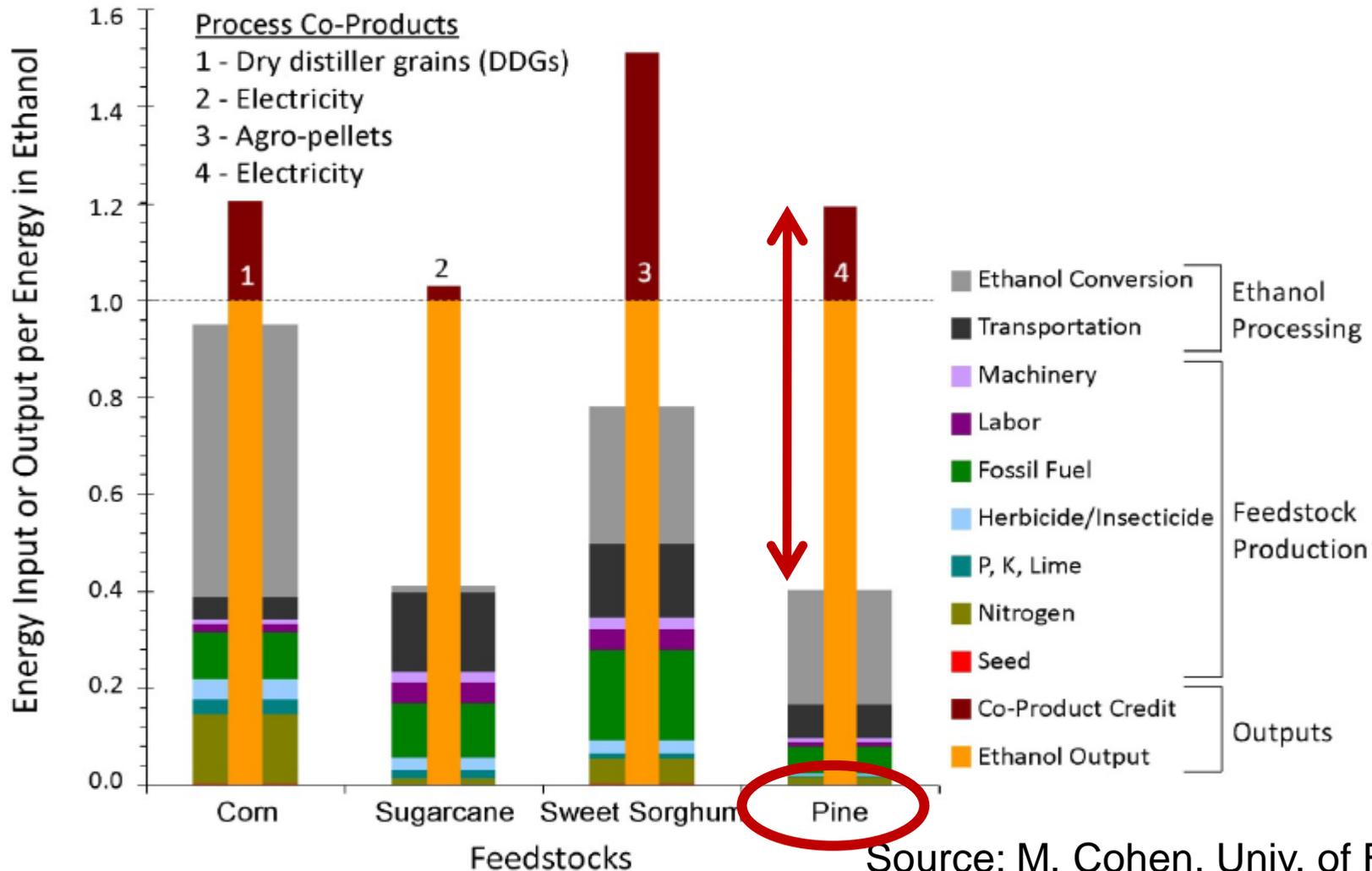
Local Sustainability is the Key

Forestry Biomass Procurement Area Sandersville, Georgia



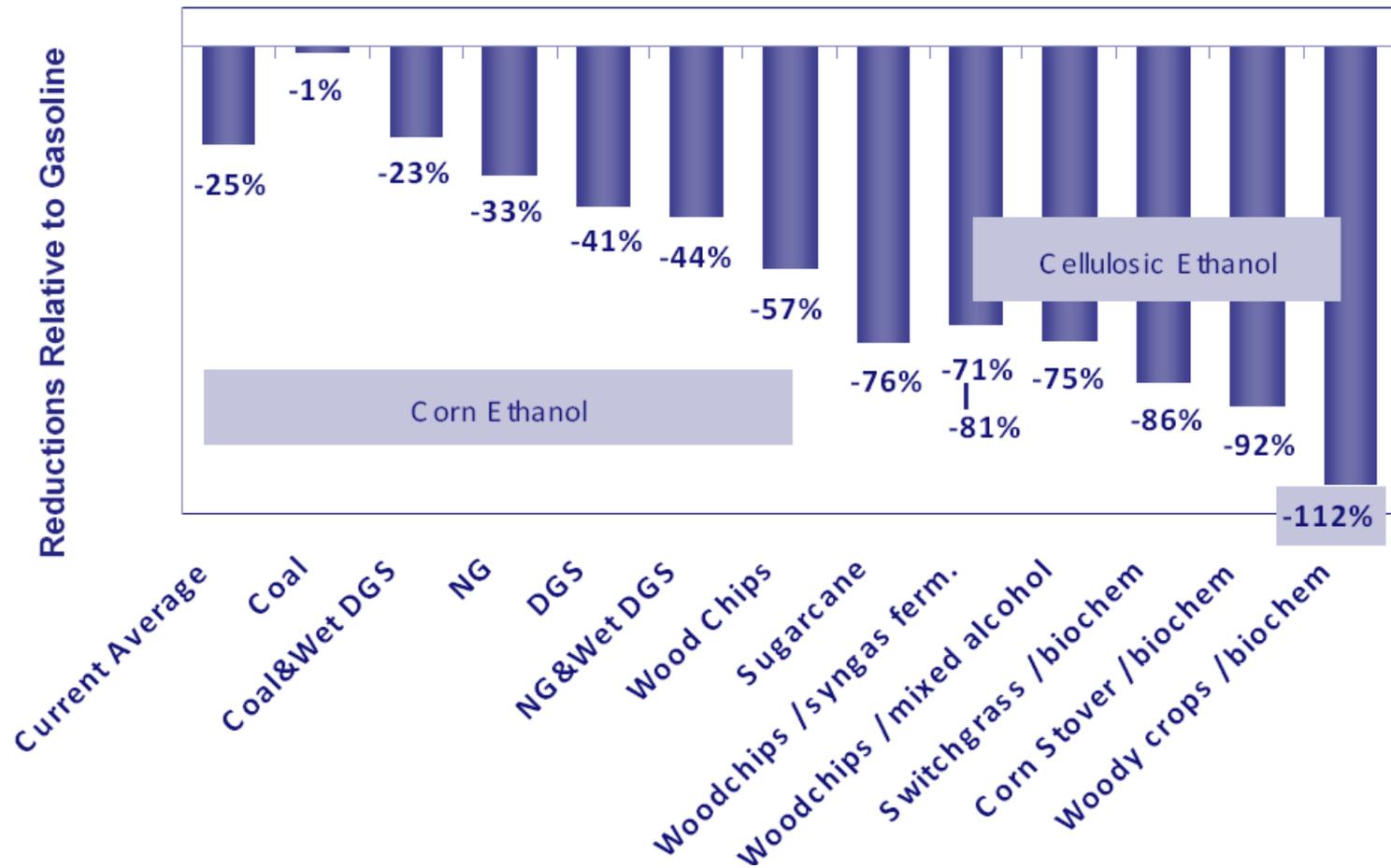
Sustainability – Environment

Energy Balance of Cellulosic Ethanol: Studies predict from 3:1 to 10:1



Sustainability – Environment

GHG Reduction with Biofuels



Source: M. Wu, Argonne National Lab

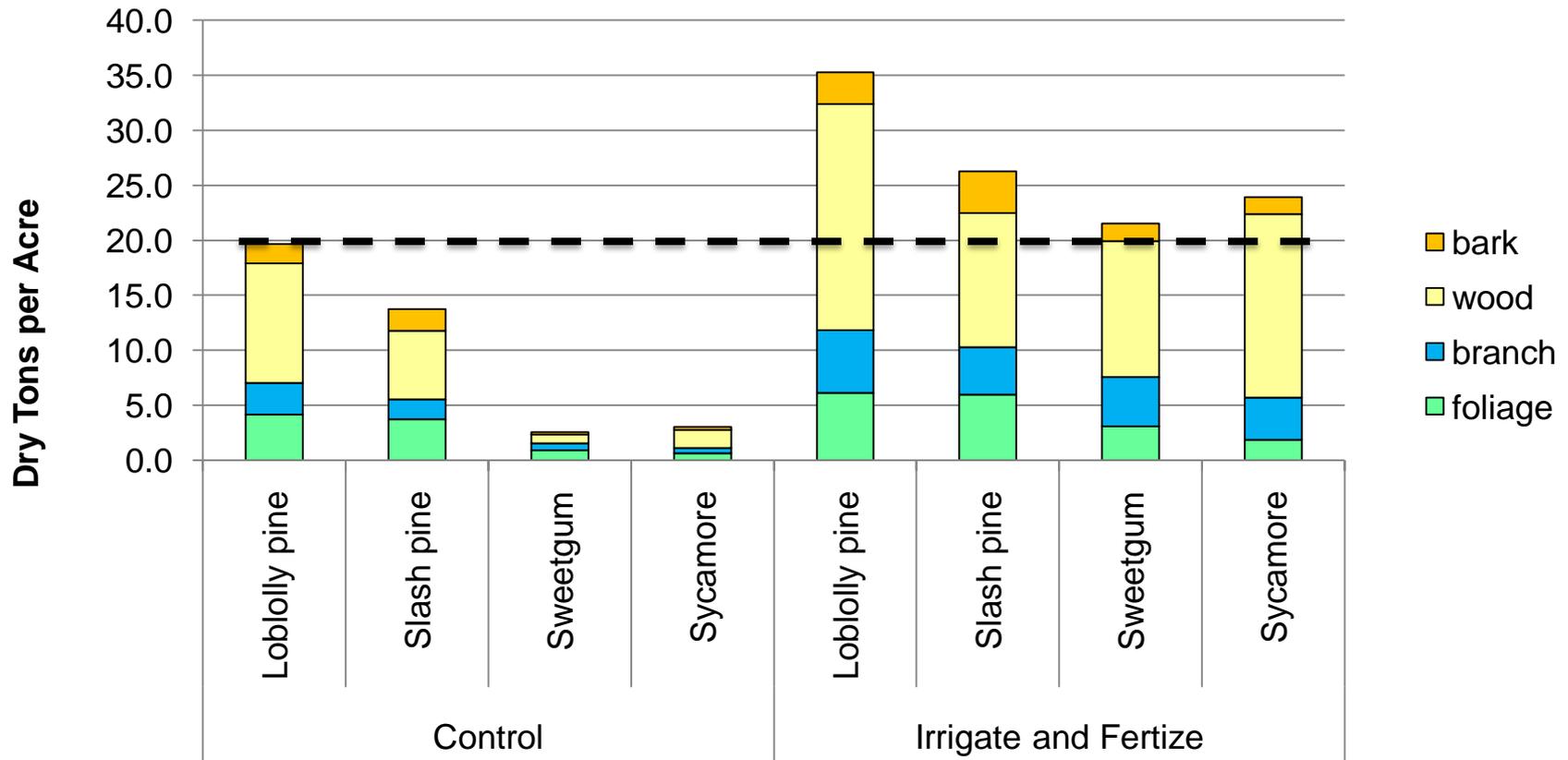


Sustainability – Environment

- Georgia BMP's for Forestry
 - Biomass Harvesting Principles in draft form
 - Water quality
 - Soil productivity
 - Forest health
 - Wildlife and biodiversity
- Land use conversion
 - Ag vs. forests
 - Exotic species
- Beneficial management tool

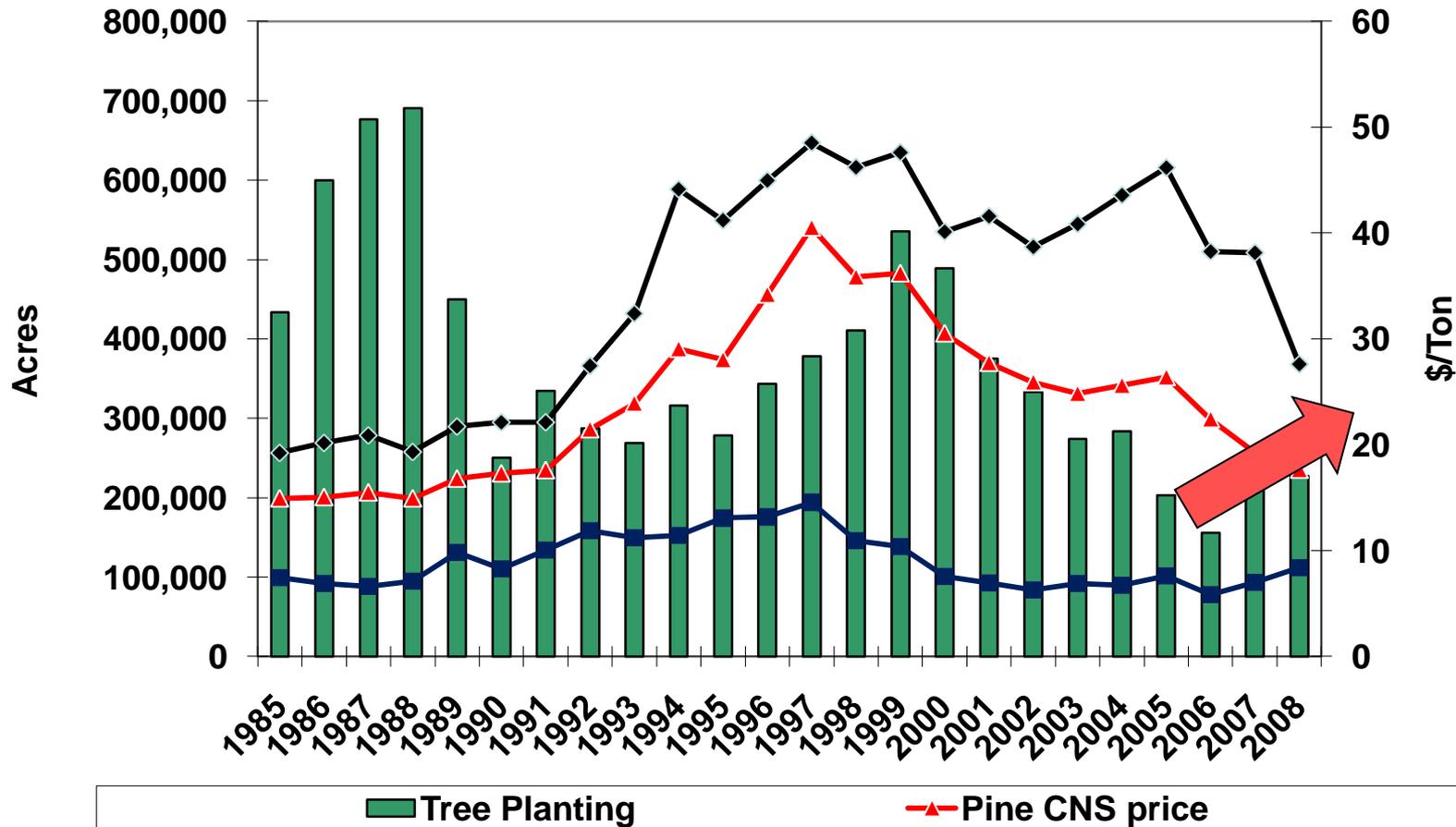
Sustainability – Environment

Biomass Production 6 years After Planting – Fertigation Study



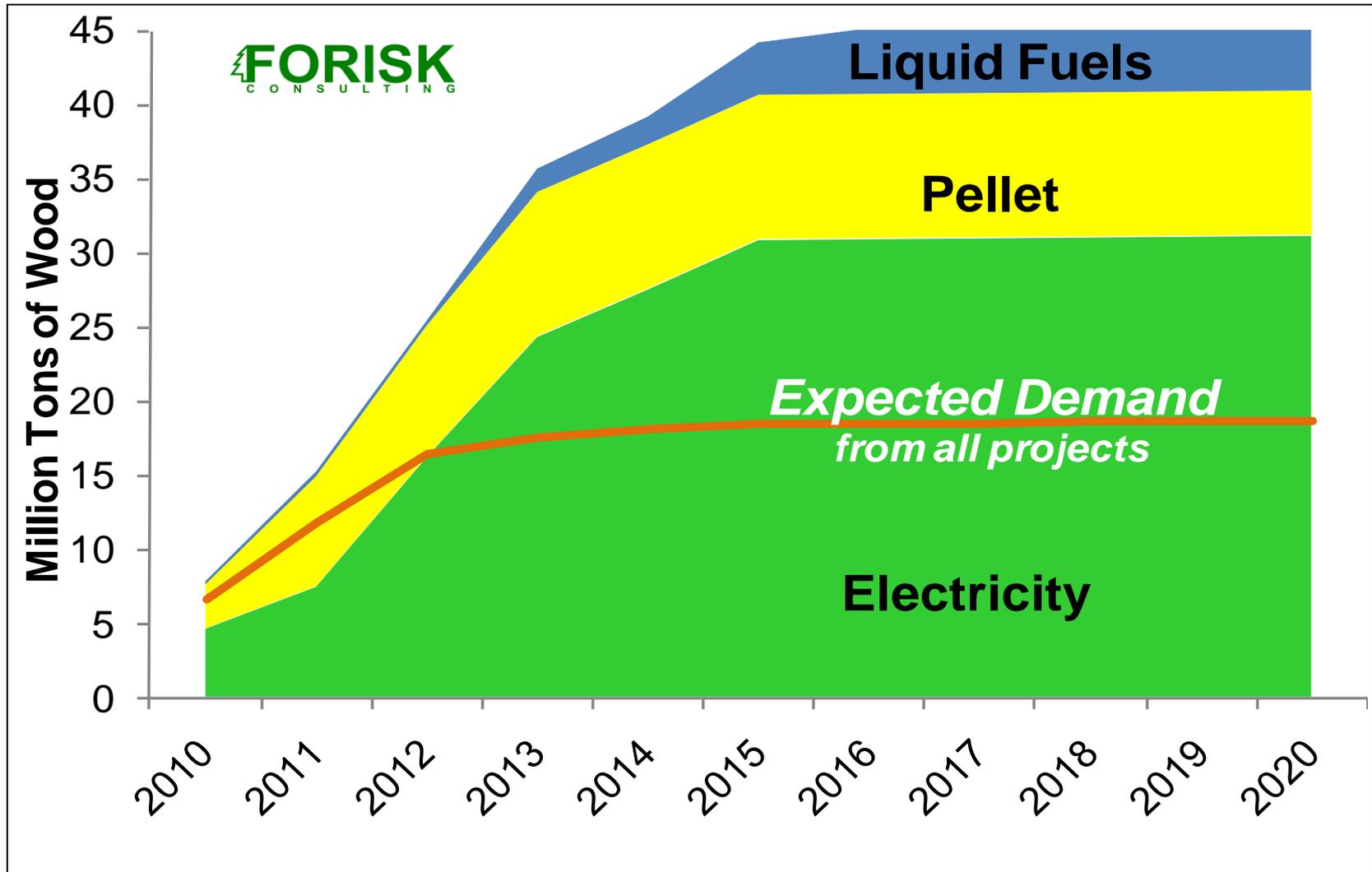
Source: William R. Cobb a, Rodney E. Will b,*, Richard F. Daniels c, Marshall A. Jacobson; *Aboveground biomass and nitrogen in four short-rotation woody crop species growing with different water and nutrient availabilities*; 2008

Markets Impact Forest Retention





Proposed and Anticipated Bioenergy Growth Across the South - Forisk



Source: Mendel, Brooks; Forisk February, 2010



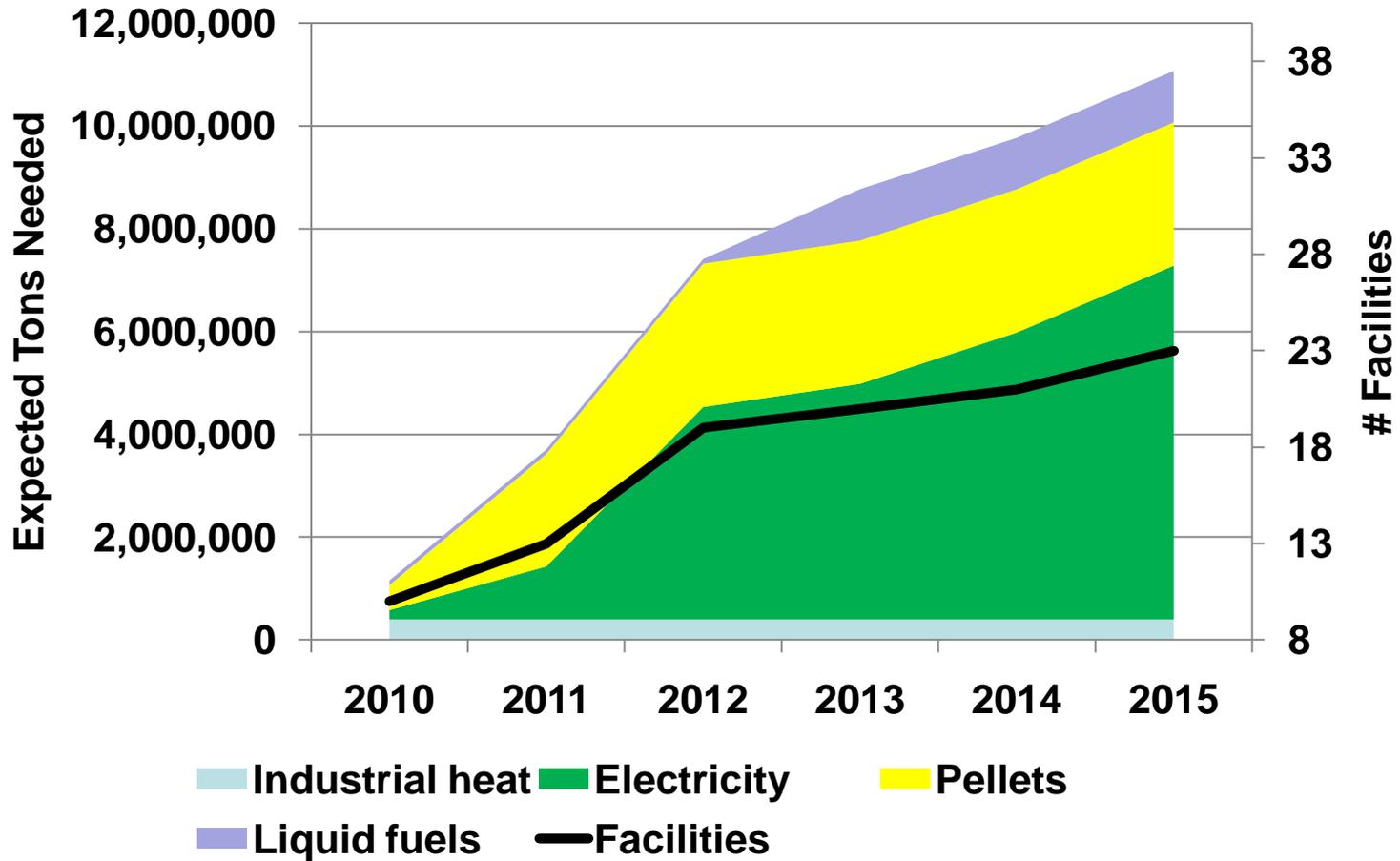
Proposed and Anticipated Bioenergy Growth Across the South - Forisk

State	No. Projects Announced	100% Total Annual Demand from Bioenergy Projects by 2020, tons	Currently Available Technology Screen, Annual tons	Status Screen ⁽¹⁾ , Annual tons	Current Annual Pulpwood and Direct Chip Demand ⁽²⁾ , tons	% Incremental Demand Compared to Current Demand ⁽³⁾
AL	6	2,845,460	1,725,460	525,460	21,423,812	2%
AR	7	1,820,000	1,820,000	940,000	8,573,981	11%
FL	19	9,923,125	8,870,625	4,665,625	8,705,699	54%
GA	34	15,630,800	14,430,000	5,810,000	24,257,201	24%
LA	4	3,300,000	3,300,000	800,000	13,262,866	6%
MS	8	2,563,625	1,026,000	226,000	8,759,543	3%
NC	12	2,284,000	2,284,000	1,086,000	6,435,524	17%
SC	10	2,199,800	2,199,800	1,349,800	11,476,759	12%
TN	6	1,350,000	70,000	70,000	N/A	N/A
TX	9	2,862,440	2,825,000	1,725,000	8,659,235	20%
VA	14	2,207,300	2,207,300	1,505,000	10,607,987	N/A
Total	129	46,986,550	40,758,185	18,702,885	122,162,607	15%

Source: Mendel, Brooks; Forisk February, 2010



Proposed and Anticipated Bioenergy Growth in Georgia - GFC





Project Updates

Range Fuels – *begin June 2010*

Georgia Power Plant Mitchell – *awaiting EPA*

Oglethorpe Power Company - *permitting*

Rollcast Energy - *permitting*

Multitrade Corp. – Northstar -*operating*

Decker -*permitting*

Yellow Pine – *permitting and finance*

Sterling Planet – *permitting*

BG and E - *permitting*

Fram Renewable Fuels - *operating*

Briar Creek Pellets - *operating*

Woodland Alternative Fuels - *finance*

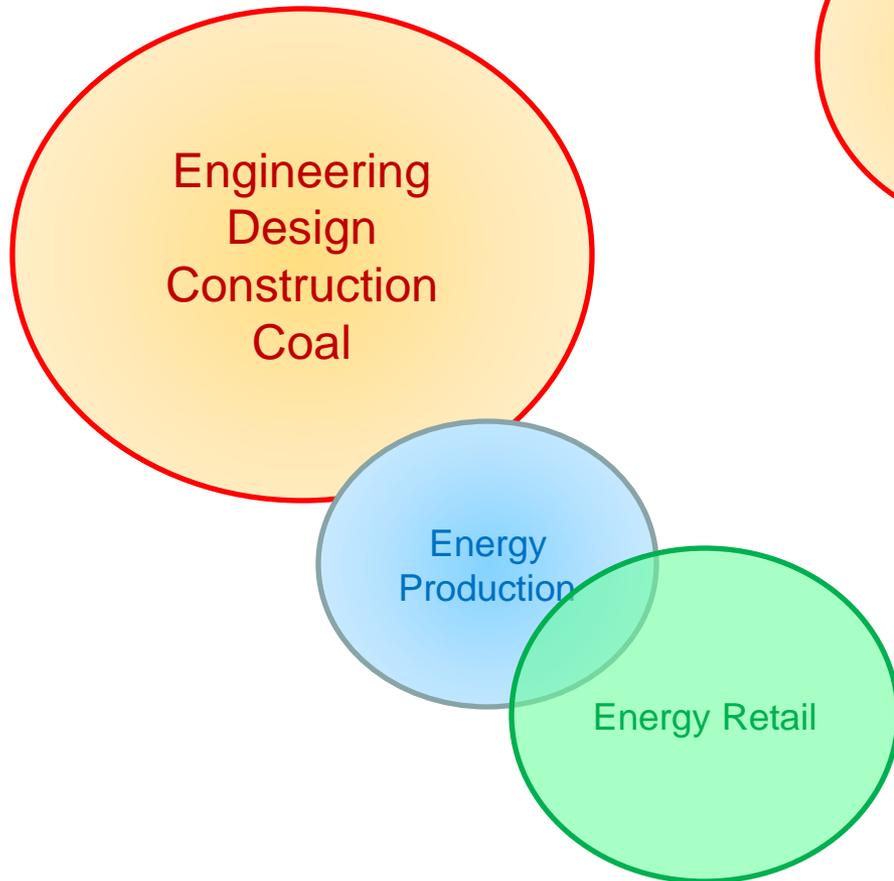
RWE Innogy – permitting –*groundbreaking*

United Biomass - *operating*

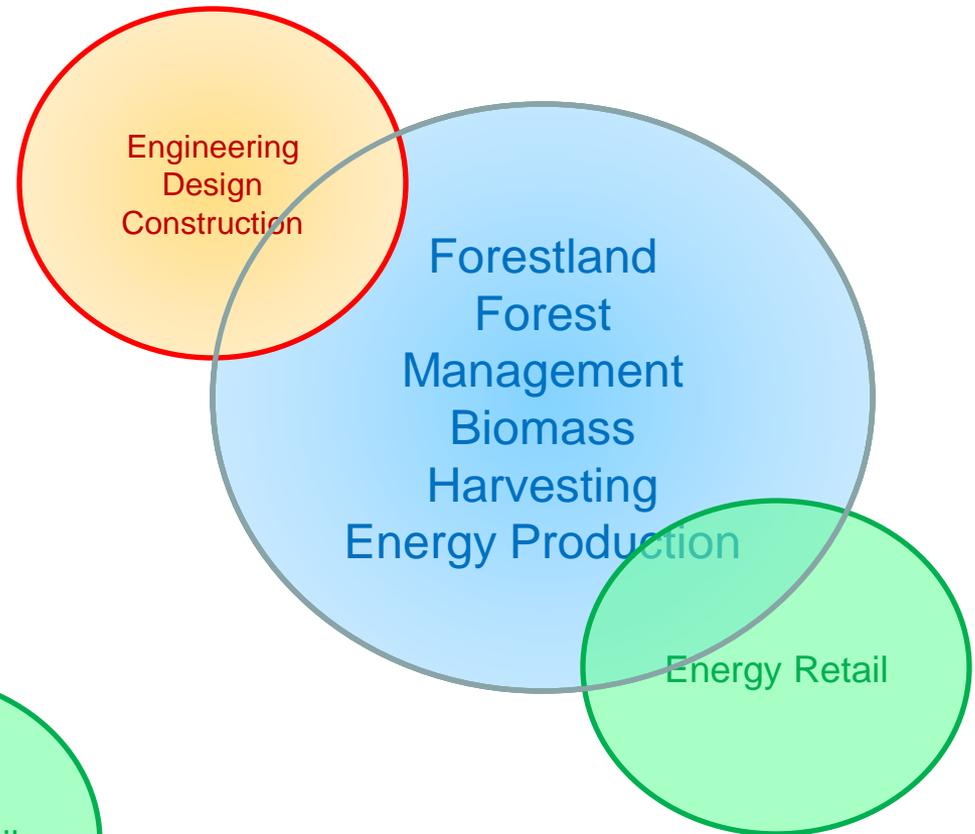


Keeping \$ in the Local Community

Imported Fossil Fuel Energy



Biomass Energy





Summary

- Georgia's forests have the potential to produce energy from forest residues and lower-value trees
- Bioenergy is part of the forest industry when pursued in the forest landscape
- Forest resource markets result in more forests
- Forestry BMP's can be applied to biomass harvesting
- The bioenergy industry is growing in Georgia



Questions and Discussion



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