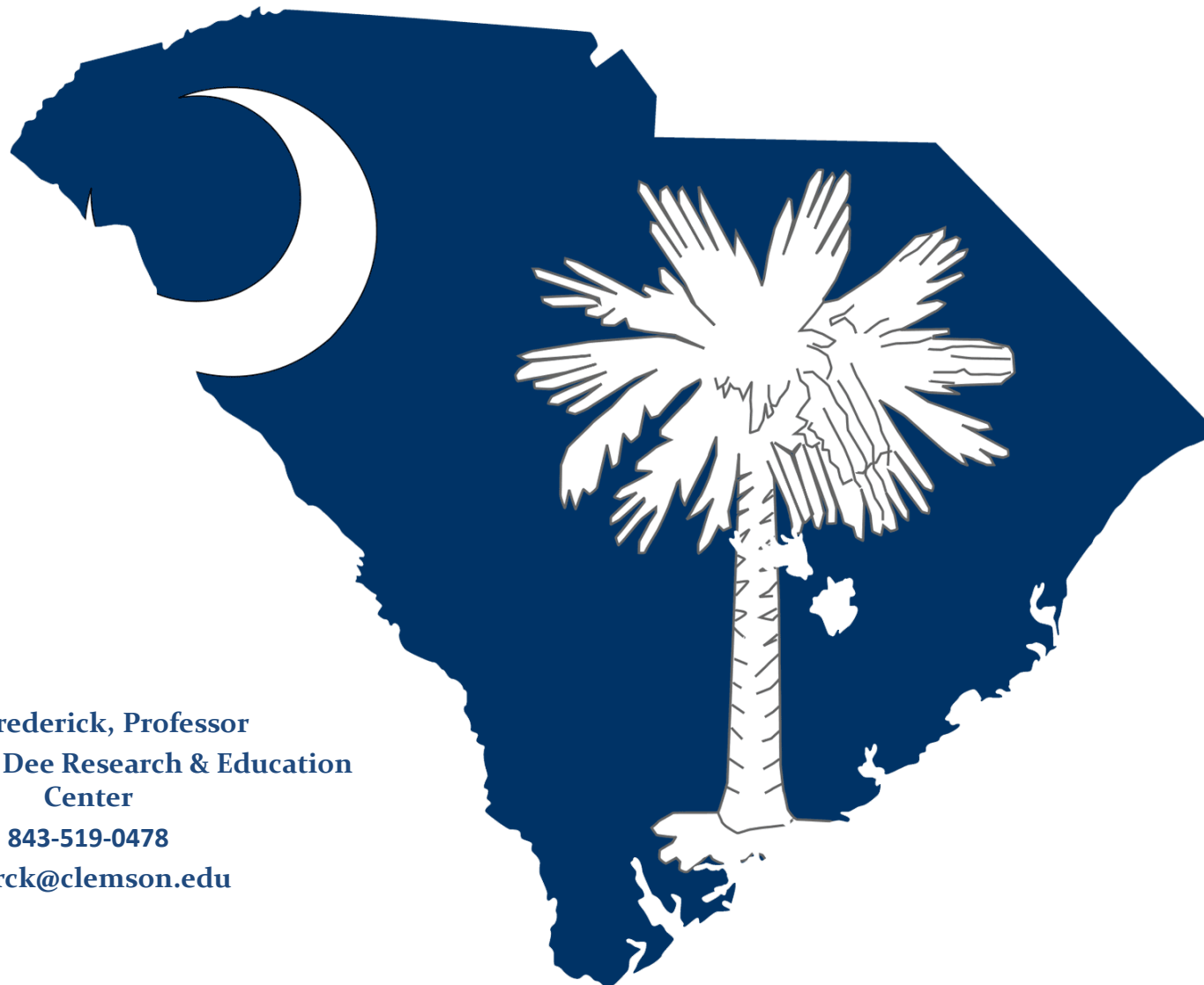


Collaborative Approach to Biomass Resources

Dr. Jim Frederick

Clemson University



Jim Frederick, Professor
Clemson Pee Dee Research & Education
Center

843-519-0478

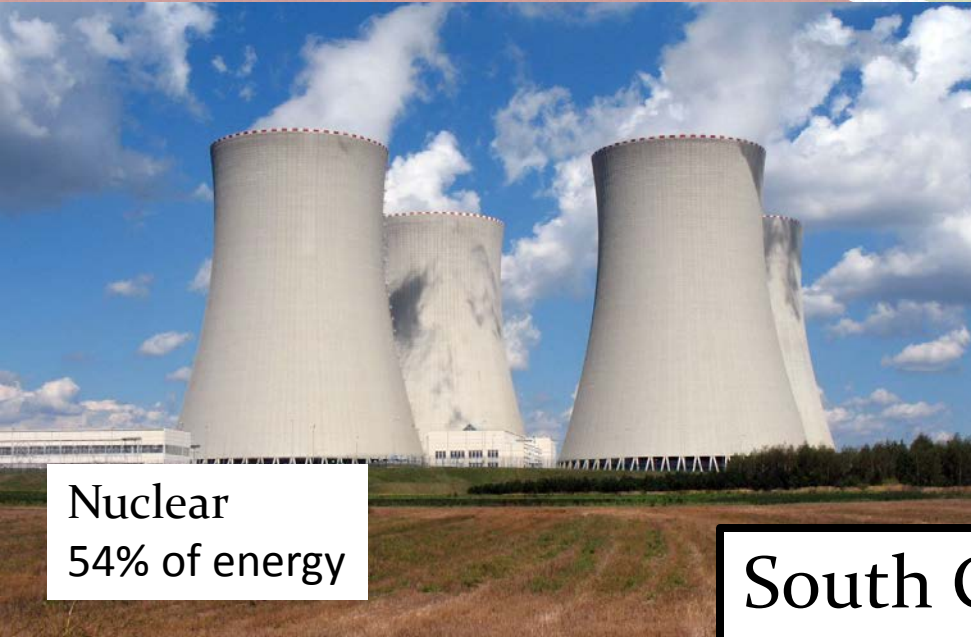
jfrdrck@clemson.edu

SC Sustainable Biomass Stakeholders Committee:

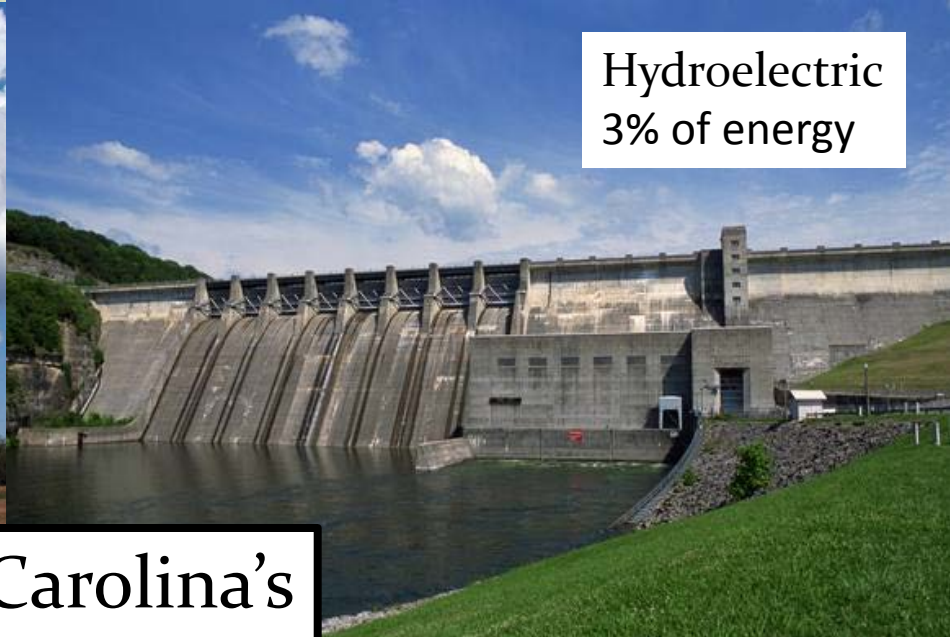
- Liz Kress, Santee Cooper Renewable Energy
- Tim Adams, SC Forestry Commission
- Tom French, Chair, SC Biomass Council
- Patricia Pierce, Capital Consulting Groups
- Crad Jaynes, SC Timber Producers Association
- Erika Myers, Solar Electric Power
- Cam Crawford, SC Forestry Association
- Hamilton Davis, SC Coastal Conservation League
- Bob Kodrzycki, Encompass Biotechnology
- Pamela Martin, Coastal Carolina University
- Art Samberg, North Carolina State University
- Henry Porter, SC Dept. of Health & Environ. Control
- Jim Frederick, Clemson University

*Goal – Determine role of biomass in South Carolina’s energy future.
(SC is in process of developing a new State Energy Plan)*



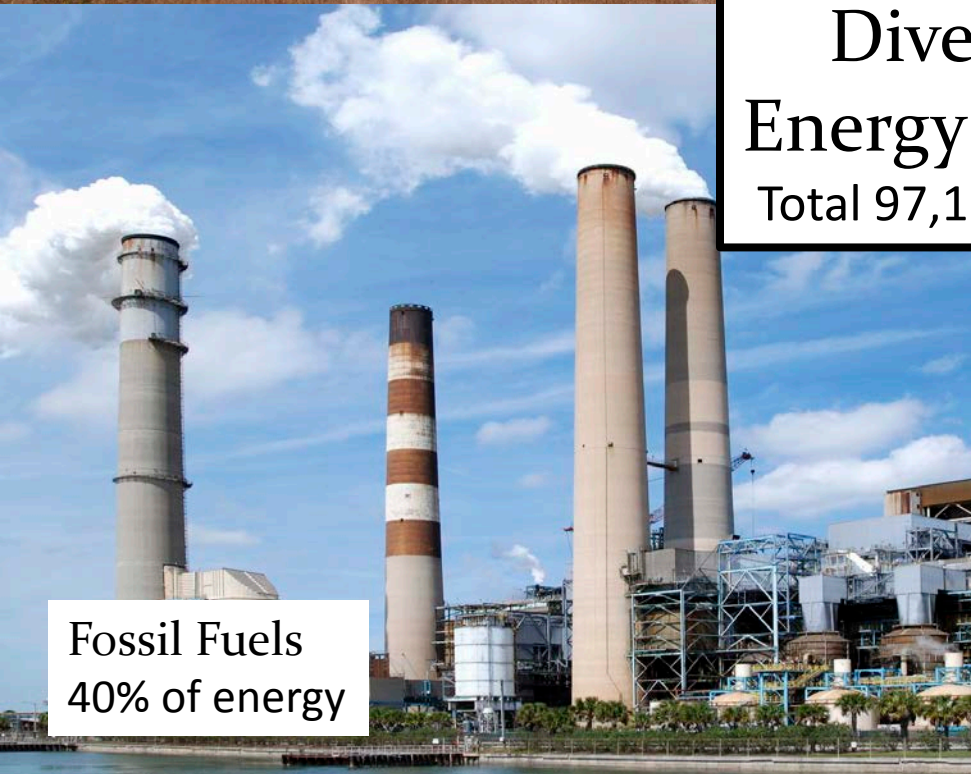


Nuclear
54% of energy



Hydroelectric
3% of energy

South Carolina's
Diversified
Energy Portfolio
Total 97,158,000 MWh



Fossil Fuels
40% of energy



Biomass
2% of energy
NREL – about 7%
Existing industries

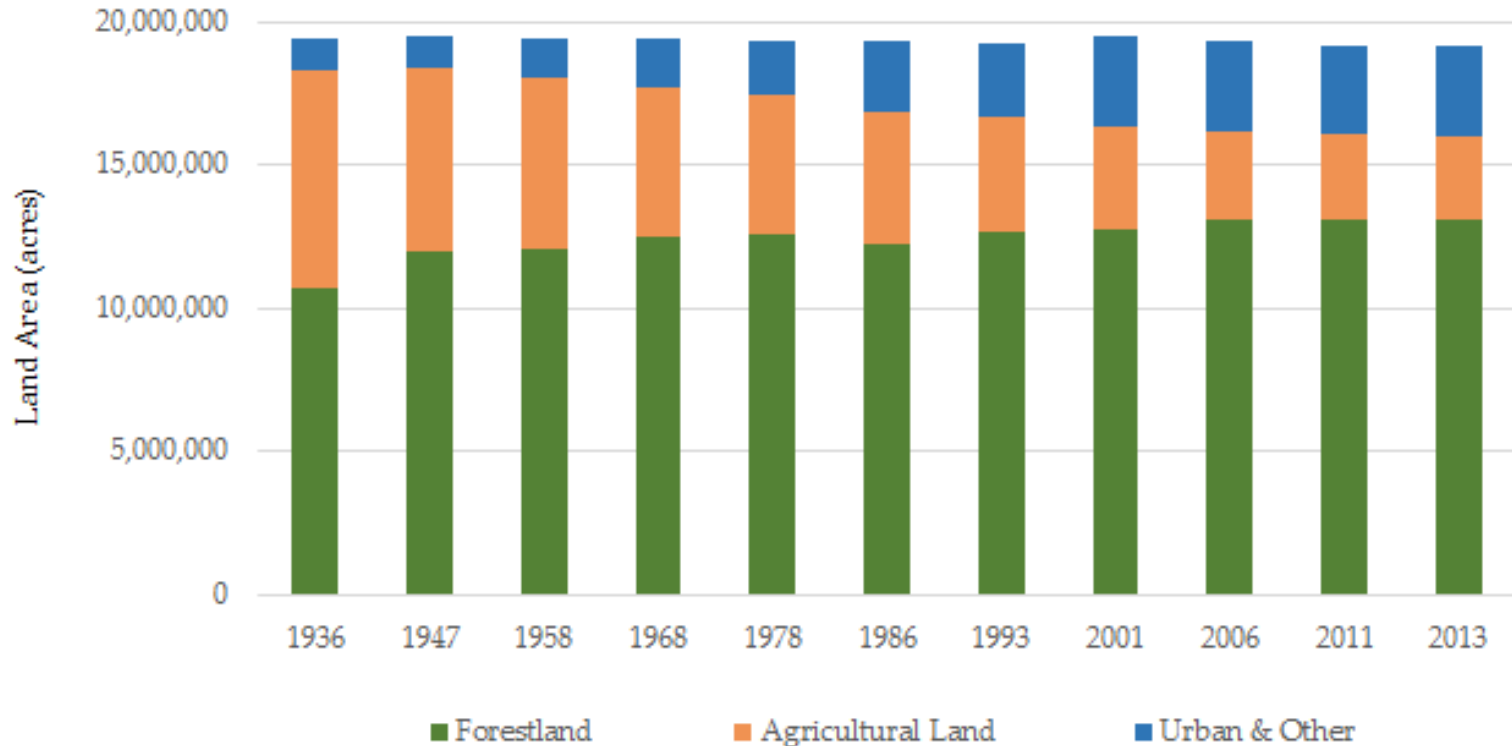


**Biomass – enhance existing rural industries
Forestry and Agriculture Combined:**

- Number 1 industry for revenues
- \$41.7 Billion in revenues per year
- \$8.8 Billion in labor income per year
- 9.1% of SC's economic activity
- 212,000 jobs
- 10.5% of SC's workforce

Biomass Supply

South Carolina Land Use Trends, 1936 - 2013

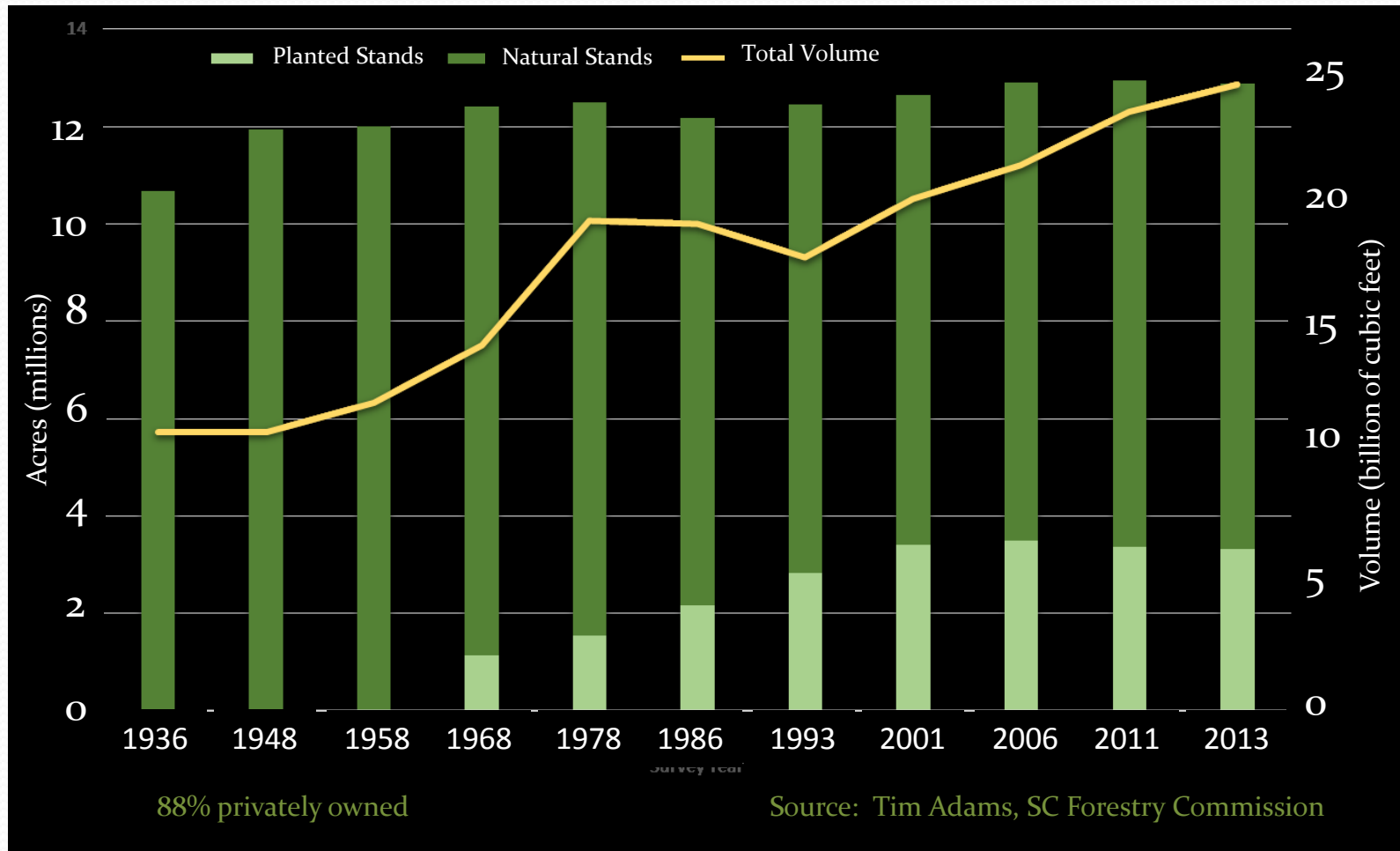


Source: Tim Adams, SC Forestry Commission

Trends: Forest and urban land use increasing while agricultural land use declining.

Agricultural land less than a third of a century ago. Need alternatives.

Biomass Supply

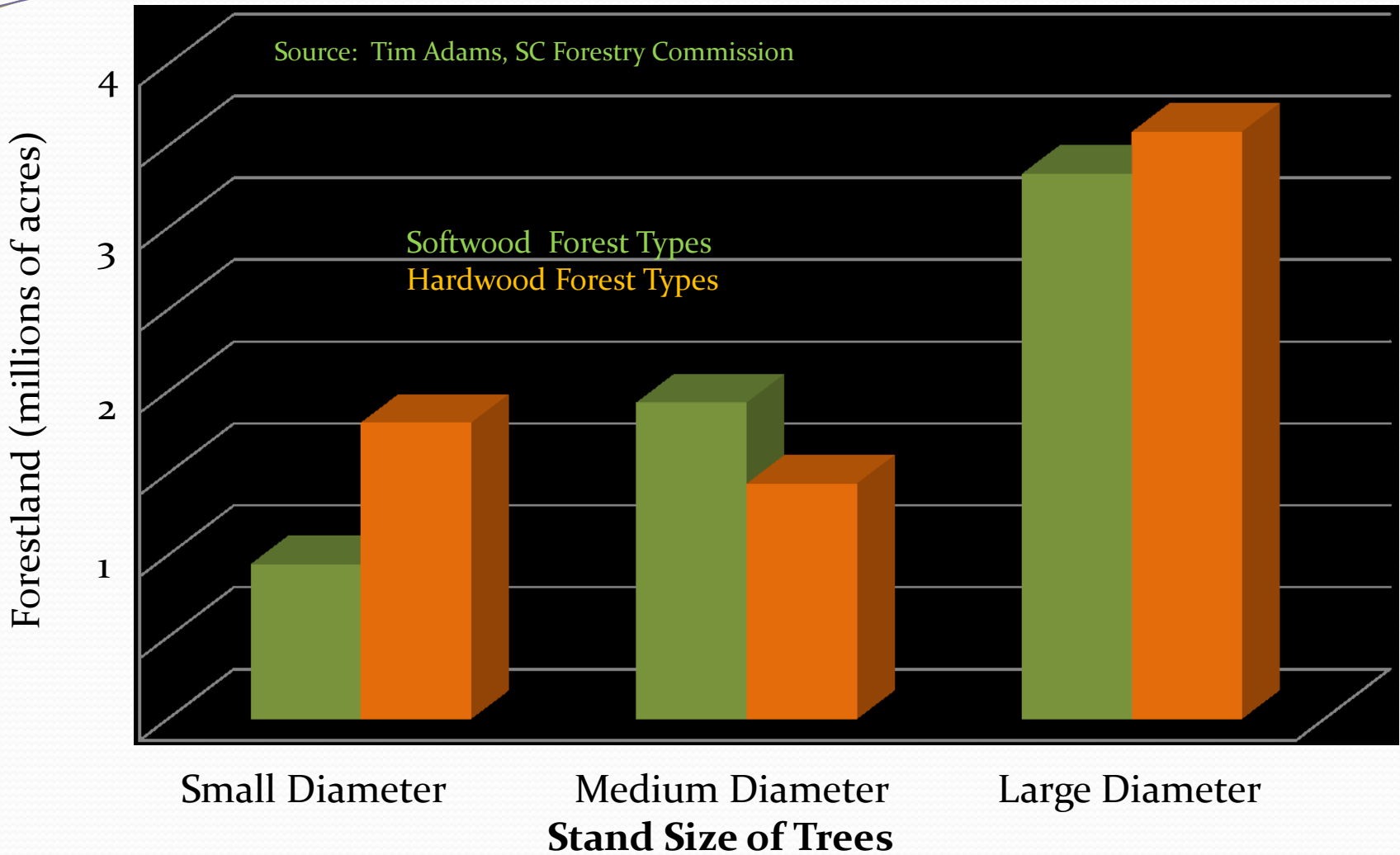


Trends: Natural plus planted forest acres about the same but wood volume increasing.

Both hard and soft wood volumes rising – level off around 2020.

★ Can use more for biomass as long as forest C increasing.

Biomass Supply



Trends: Greatest increase in larger sized trees.

Need better saw timber markets = more mill residues, logging waste.

Biomass Price Affects Supply

Tons of Woody Biomass Available

	<u>At \$20/ton</u>	<u>At \$30/ton</u>
Mill Residues	2,571,000	5,610,000
Logging Residues	600,000	4,530,000
Standing Residues	392,000	3,269,000
Urban Wood	1,252,000	2,081,000
Precommercial Thinnings	--	594,000
Total Tons	4.8 million	16.1 million
MW	437	1342*
MWh	2,874,000 3.5% of SC use	9,640,700 11.8% of SC use



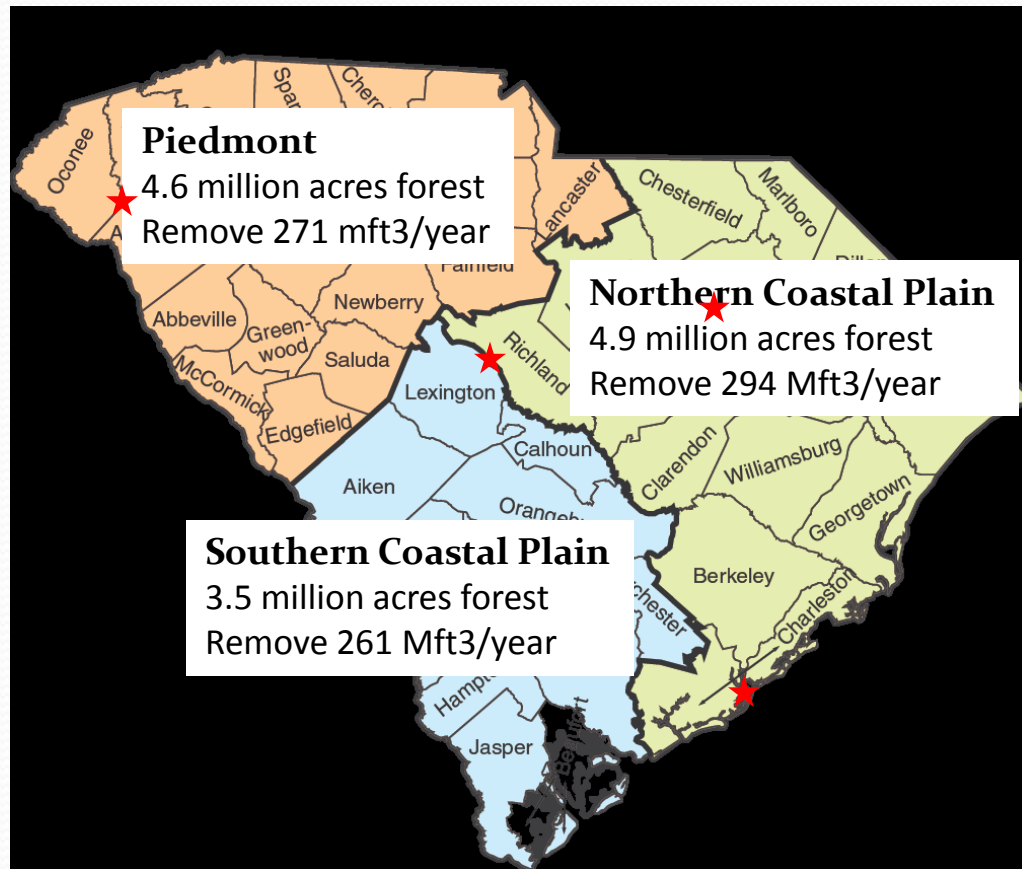
Source:
Tim Adams, SC Forestry Comm.
803-896-8802
tadams@scfc.gov

Trend: Higher the price, the more tonnage that becomes available.

Debate: Increased cost for traditional uses vs higher price for landowner.

*Enough tonnage for 50+ 25MW CHP units; over 1000 jobs.

Biomass Supply



- Trends: Greatest wood volume in Northern Coastal Plain.
- Good state-wide wood supply.
- Most row crop production also in Northern Coastal Plain – sandy soils, frequent drought, acreage decline.
- Bioenergy crops would not be competing with food crops.

Giant Reed (*Arundo domax*)



4-6 tons/acre

Energy Crops (dry tons)

- Do well on marginal land
- Rural jobs beyond construction
- Almost C neutral
- Soil and wildlife benefits
- Drought tolerant
- Low input
- Fast growth
- Invasive vs non-invasive

Sugarcane/Energy cane



Not enough cold tolerance

Manure

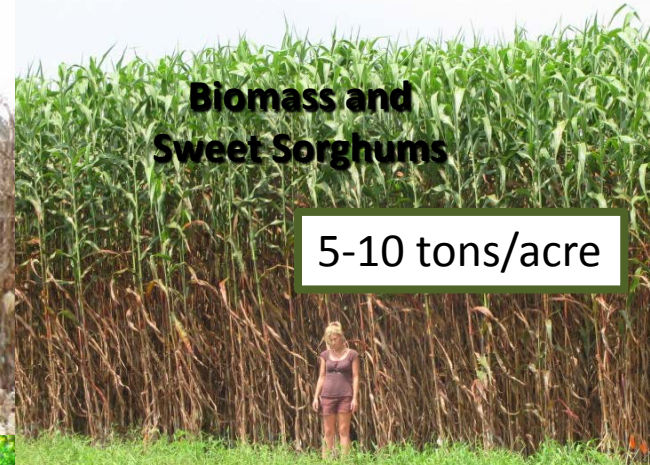


Crop Residues



2 – 2.5 tons/acre

Biomass and Sweet Sorghums



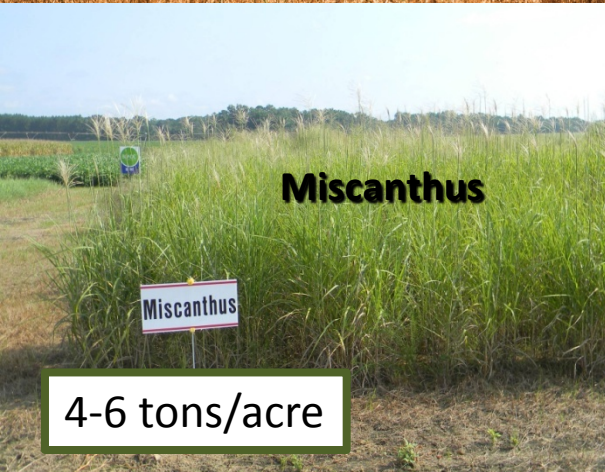
5-10 tons/acre

Fast Growing Hardwood Trees



5 - 9 tons/acre

Miscanthus



4-6 tons/acre

Switchgrass



3-6 tons/acre

I. Woody Biomass - residues and waste wood.

II. Bioenergy Crops:

Purposely Grown Trees – good solid and liquid biofuel use.

Annual Grasses – use as needed, risk reducer.

Perennial Grasses – longer term investment, liquid fuels.

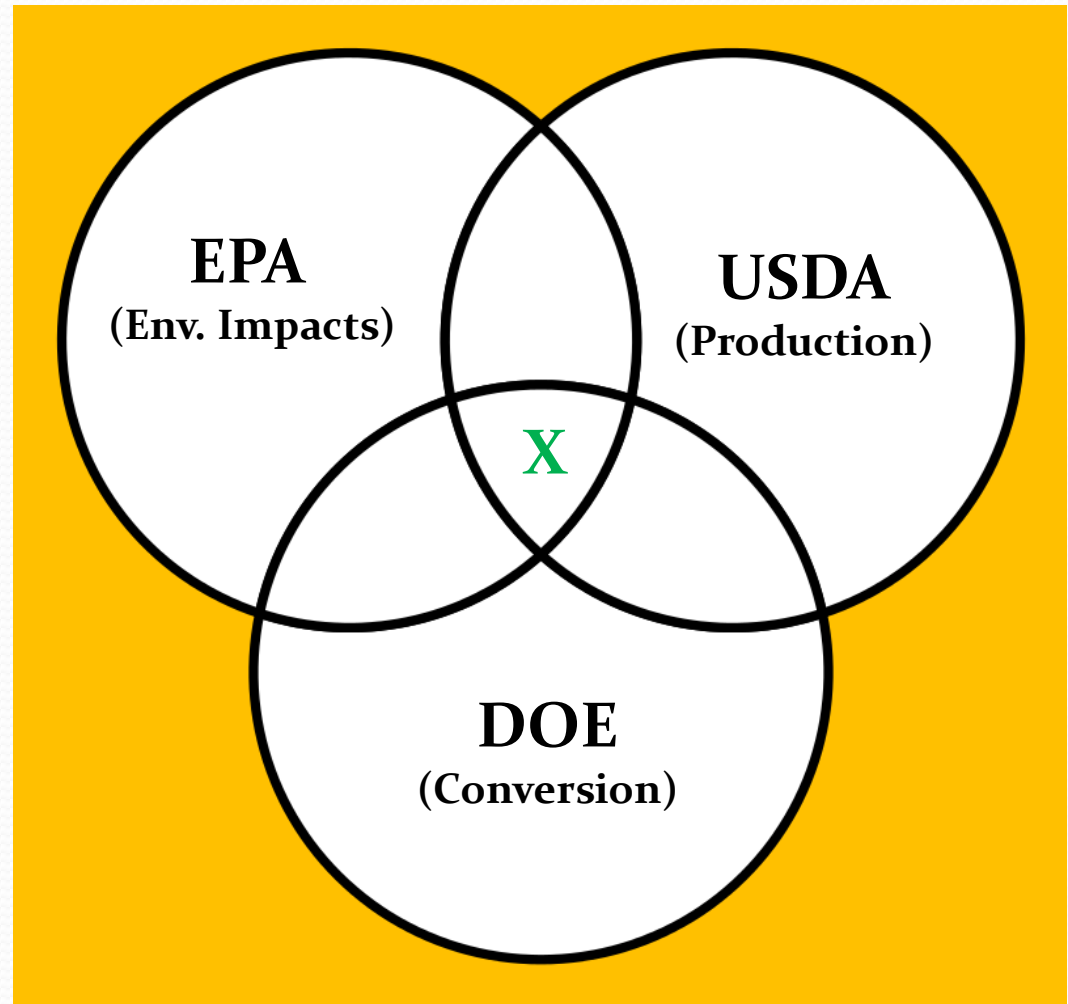
Crop Residues – minimal in SC.

Manures – concentrated like in NC.

Others in future?

Use: fallow land, marginal ag land, certain sites being remediated.

Sustainable Biomass



Coal - \$40/ton

Biomass must compete directly or receive financial incentives



Biomass Sustainability -Private versus Public Certification

Forest Best Management Practices:

- Streamside management zones
- Stream crossings
- Forest road construction
- Timber harvesting
- Site Preparation
- Reforestation
- Prescribed burning
- Pesticide application
- Fertilization
- Minor drainage
- Endangered Species Act
- Wildlife management
- Good start, more to go!

Similar for bioenergy crops – soil, water, biodiversity protection. Use no till, pest scouting, set backs, labels, CU crop recommendations.

Use forestry BMPs as start for certification of woody biomass.

Harvesting BMP Compliance has been over 90% in SC – **Education!**





Sustainability for water, soil, air, and biodiversity:

- Financial Incentives – government programs
- Law – follow labels
- State-Wide Biomass Certification Program - use BMPs.
- Voluntary Basis – good stewards of land

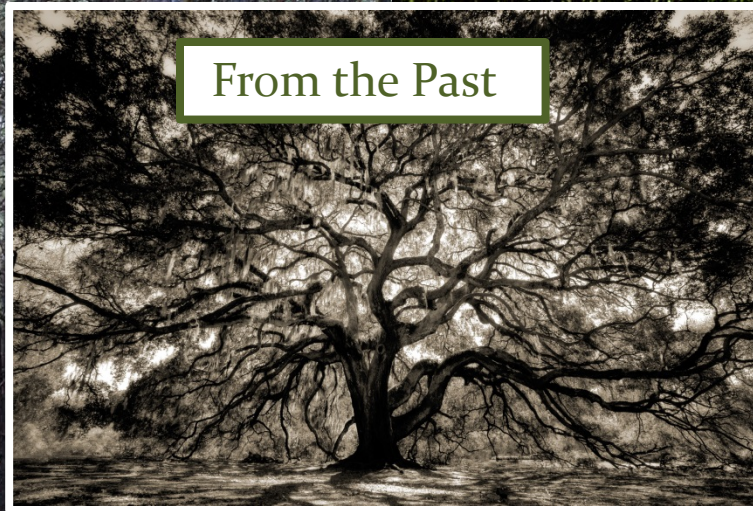
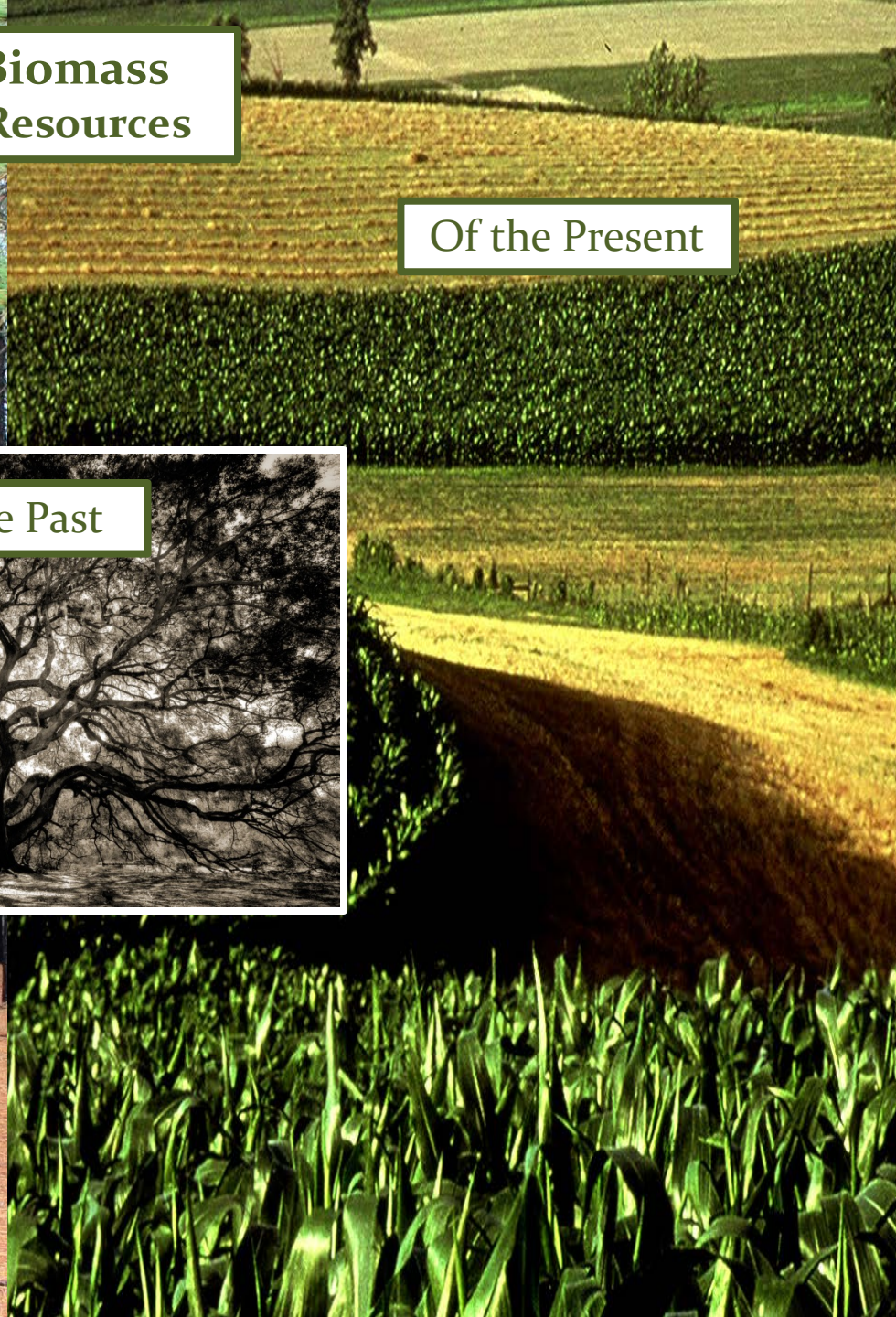
Need all 4!

Sustainable Biomass Preserving Our Resources

Of the Present

From the Past

For the Future



Tracking:

- Currently done for higher value commodities – cotton, tobacco, vegetables.
- Could be done on a per land parcel basis for bioenergy crops.
- Additional expense.



Conclusions:

- SC - Diverse portfolio of feedstocks (reduced risk).
- Woody biomass initially, bioenergy crops complement.
- Price will be driver- which feedstocks, quality and amount.
- Potentially meet 10 – 15% of State's electricity requirements.
- Sustainability certification process achievable.
- Some co-firing possible with coal and natural gas.
- Combined Heat and Power facilities – place where biomass located. Don't need large quantities of biomass. Thus, better for energy crops. Ideally use multiple feedstocks.
- Benefits to EJ Communities – Community Biomass.
- Game changers – government programs, new technologies, and new uses (bio-products/chemicals).

Questions?

