



Bioenergy Demand in a Market Driven Forest Economy (**U.S. South**)

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My Research Focus

- Bio-economic assessment at a spatial scale and in a time frame that is useful for strategic public and private decision-making
- Focus on economic fundamentals applied to detailed forest resource projections
- Usually take current inventory, growth, and removals as a starting point to model supply over time
- Then look at the impact of various demand scenarios
- Pellet demand scenarios and carbon consequences dominate current research – **biofuels not so much**



OUTLINE

- **Wood Product Definitions**
- **Southern forestland overview**
- **SRTS Model**
- **Growth/Removals vs. Sustainability**
- **Projecting Impact of Age Class Structure**
- **Pellets, Residues, and Sawtimber Linkages**



Wood Products

- Small Trees – “**pulpwood**”, 5”-9” diameter, 10-15 years old, \$6-\$10/ton stumpage prices
 - fiber, energy pellets, pulp, composite or engineered materials
- Medium Trees – “**chip n saw**”, 9”-11” diameter, 15-20 years old, \$10-\$20/ ton
 - fiber and small sawn wood
- Large Trees – “**sawtimber**”, 11+” diameter, 25+ years old, \$25-\$40/ton
 - lumber, plywood
- **Logging Residues** – 20% of pine harvest, 40% of hardwood harvest
- **Mill Residues** – 20%-40% of what goes into a sawmill is available as residue. Mill residues are always fully utilized; I assume that increased mill residue demand translates directly into additional small roundwood demand by displaced consumers.

These are stumpage prices, before logging and transportation which are typically at least \$20/ton

My Thoughts on Logging Residues as an Energy Feedstock

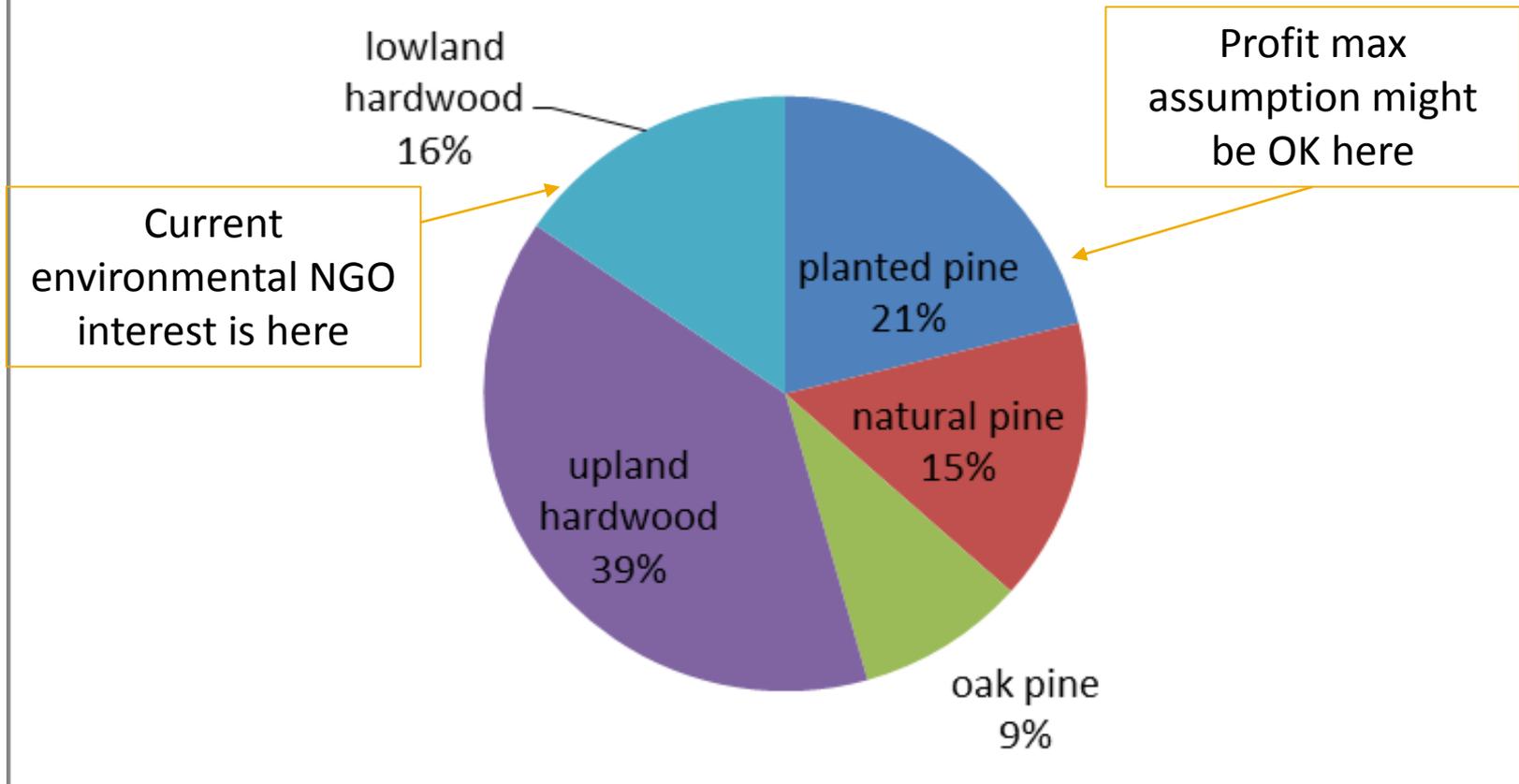
- Logging Residue advantages
 - Clear and easy to understand carbon advantage
 - Reduces competition with traditional industry
 - “Potential” cost advantage
 - Value-added to harvesting operation
- Logging Residue disadvantages
 - Concentrates demand (near high cost roundwood)
 - Significantly expands procurement circle
 - Supply Uncertainty (tail wagging the dog)
 - Limits supply response (can't manage for residues)
 - Apparently not feedstock of choice
 - Subject to business/housing cycle fluctuation

Key Points

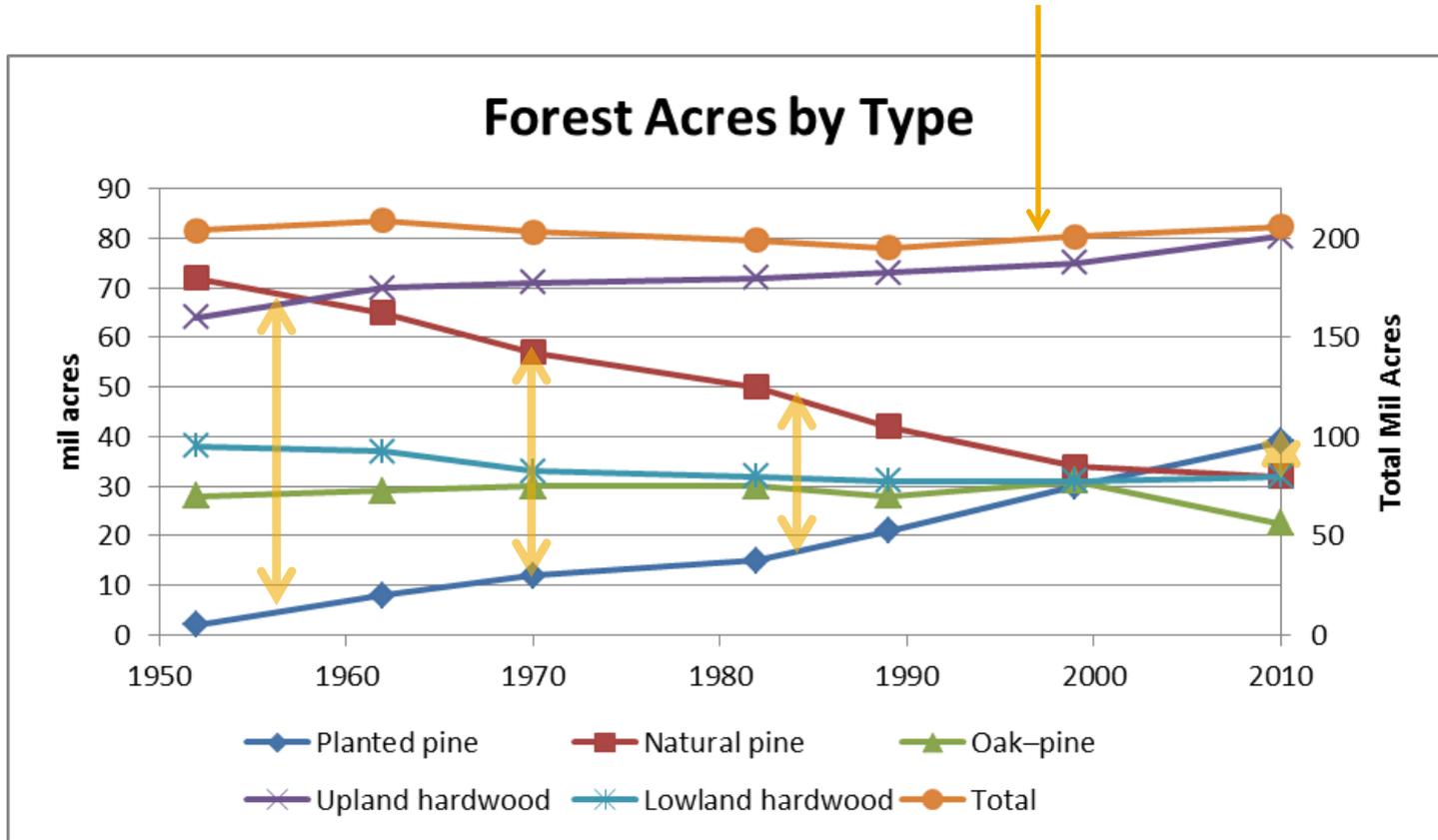
- **Points I'll try to make in the next few minutes**
 - Both short- and long-run forest carbon impacts of wood energy are driven by market responses to increased demand – mainly linked to housing
 - Relevant markets include timber products, ag crops, and land
 - Resource sustainability w.r.t. demand shocks is not a problem but the adjustment period could be interesting, especially if policy-based demand is seen as unsustainable

WHAT DOES A DYNAMIC TIMBERLAND BASE LOOK LIKE IN A MARKET ECONOMY?

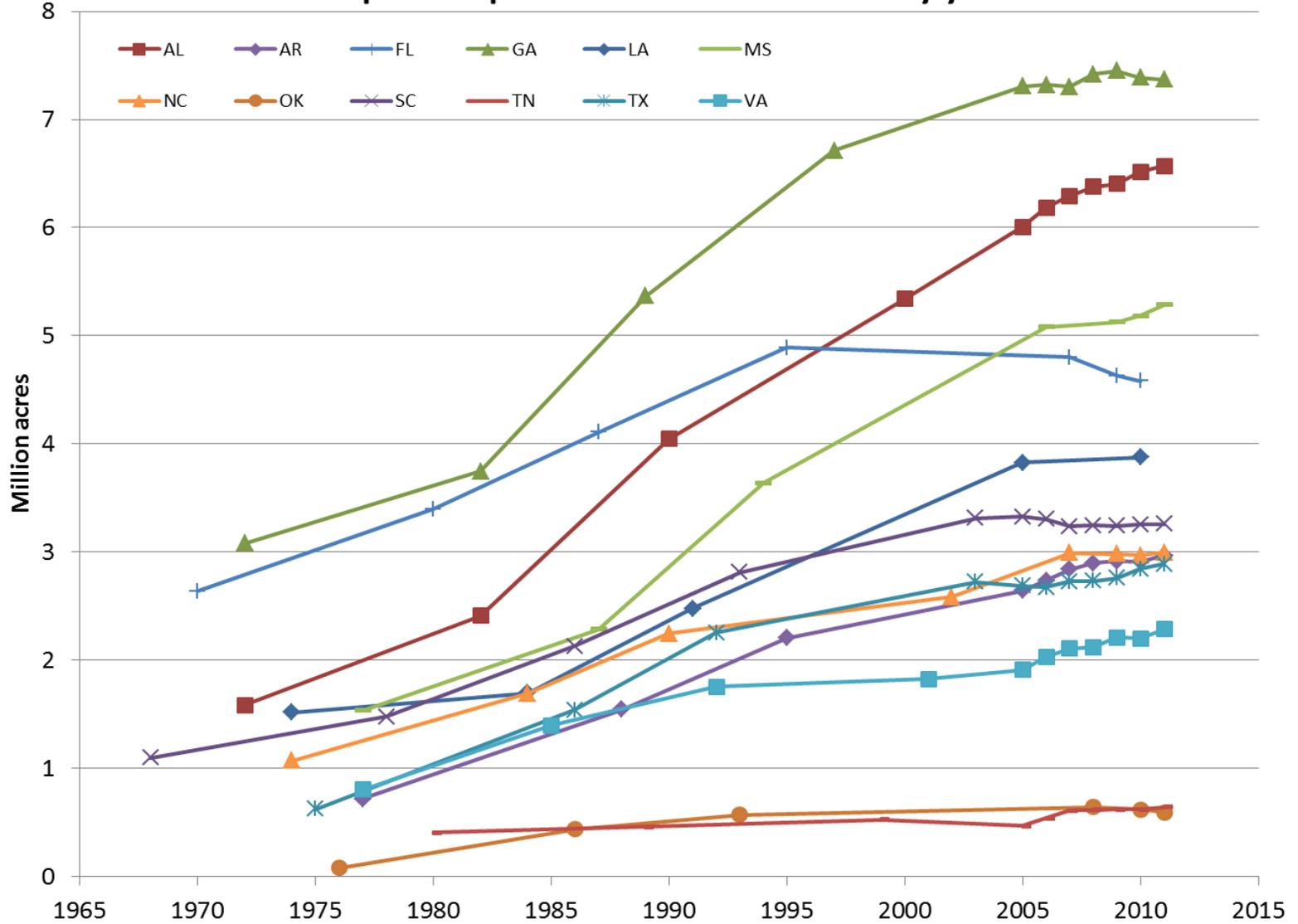
2010 U.S. South Forest Types



Total Timberland Stable but Not Static

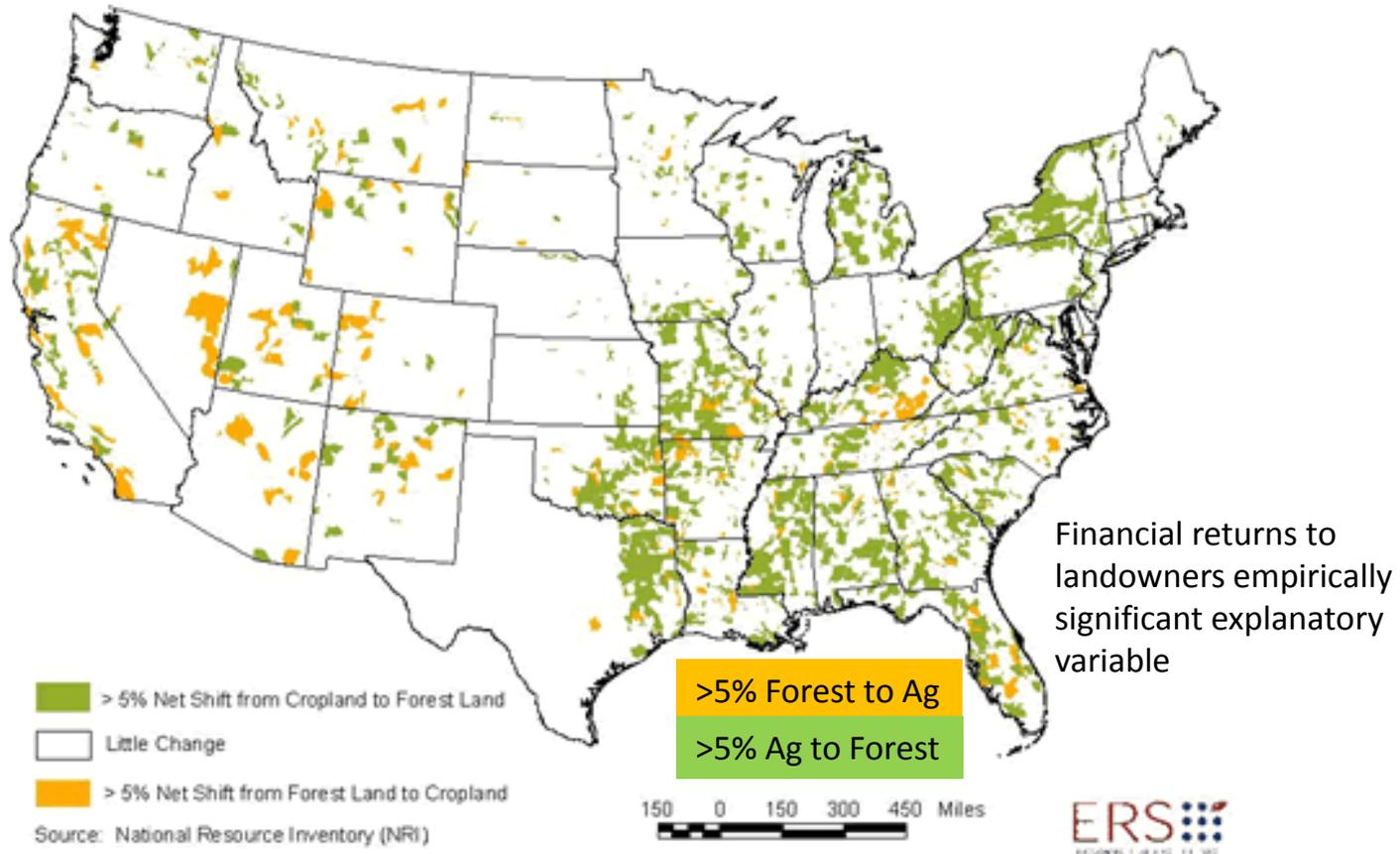


Area of planted pine in 12 Southern states by year

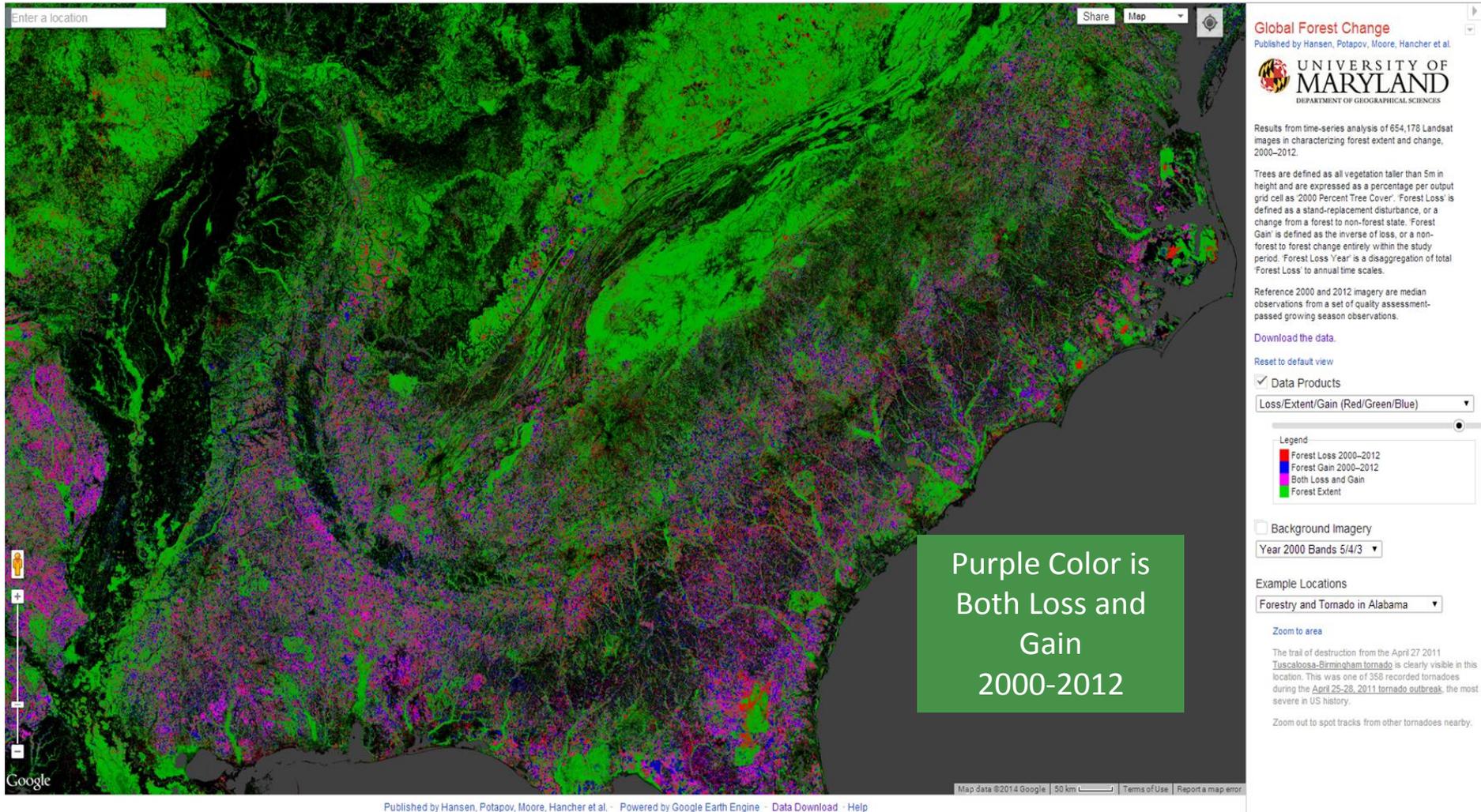


Forestland trend stable, but not static

Net shifts between cropland and forest land, 1982-97



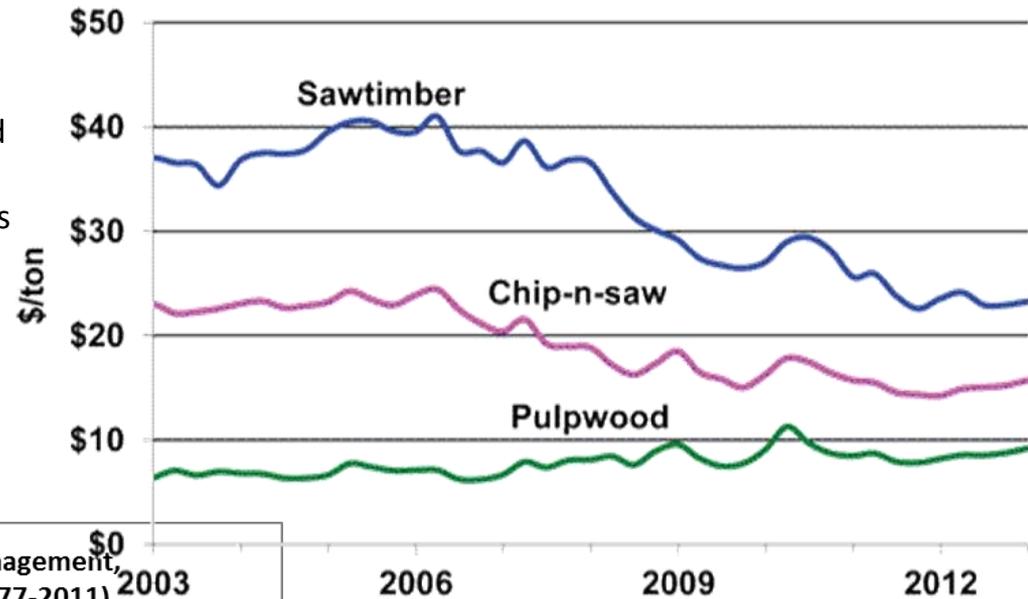
Science Article on Tracking Global Forest Change



What causes this?

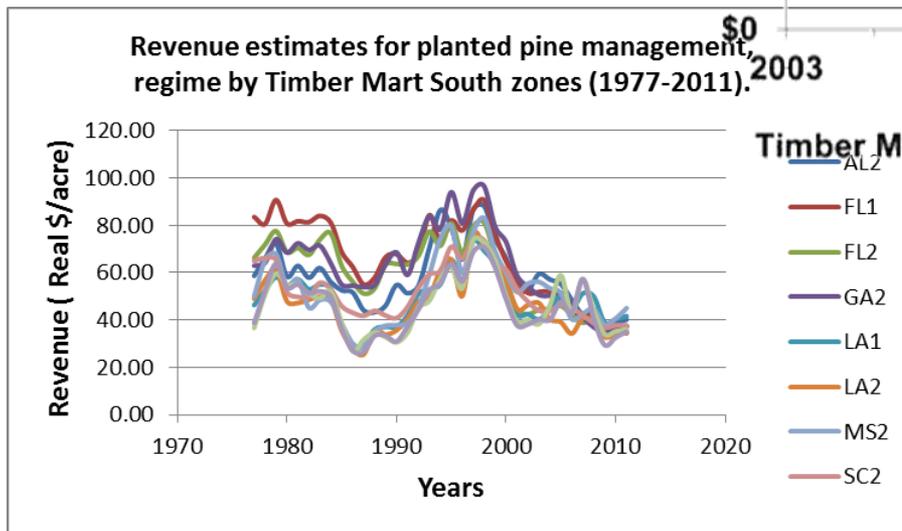
- *“...we identified the rise in timber net returns as the most important factor driving the increase in forest areas between 1982 and 1997. This is consistent with reports that the increase in forests largely involved timberland acreage.” (Lubowski et al. 2008)*
- This is a privately owned landscape where marginal agriculture competes with forest land both at the intensive (plantations) and the extensive (fallow agriculture) margins.
- This is the 4th or 5th southern forest, so whatever attributes the system has now, it evolved from a history of intense utilization

South-wide Pine Stumpage Prices 2003 to present

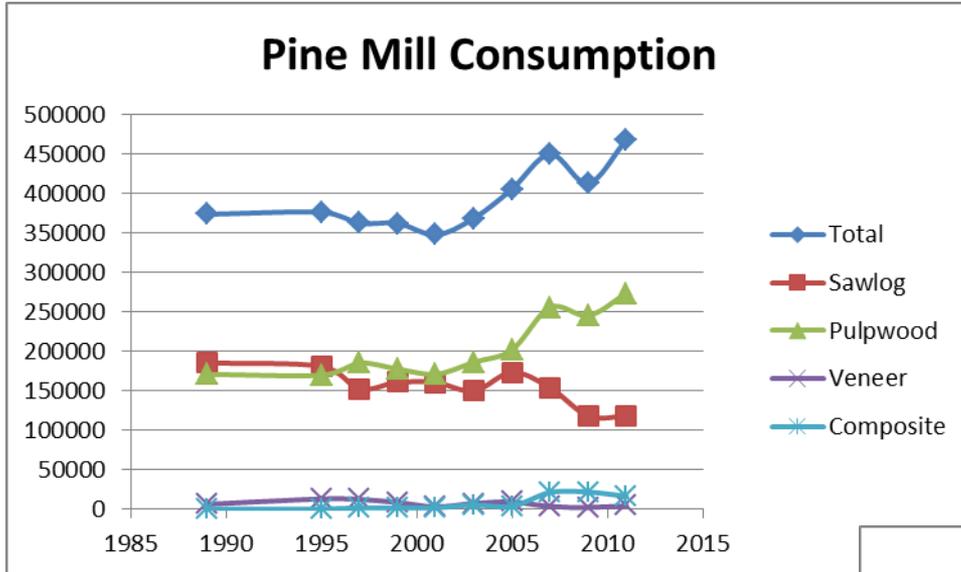


Forest management rents are low

- Pine pulpwood consumption has increased through the recession
- Main income source is pine sawtimber; has not recovered

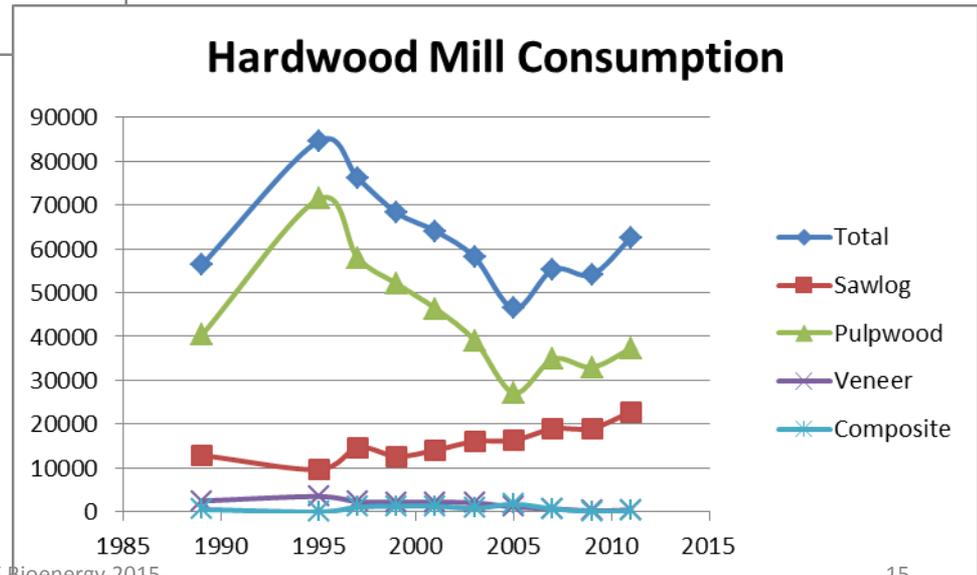


SE-GA Demand/Consumption Dynamics



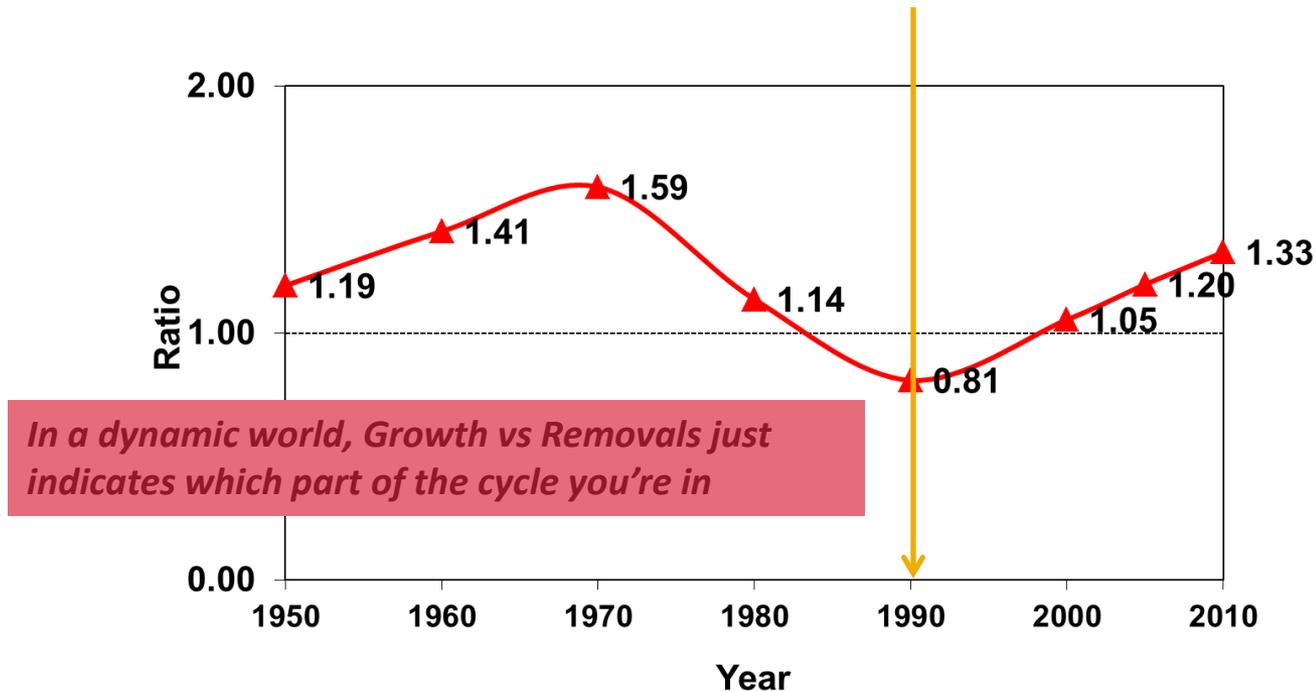
- Every tree can feed multiple markets, every stand has multiple tree types
- Change in one market affects all markets
- Example: pine sawmill residues and pine roundwood consumption

Recession makes the current starting point atypical; this matters for thinking about longterm “baselines”.



WHAT DOES A DYNAMIC FOREST INVENTORY LOOK LIKE IN A MARKET ECONOMY?

Regions with Growth/Removals < 1 in 1990 (21 survey units)

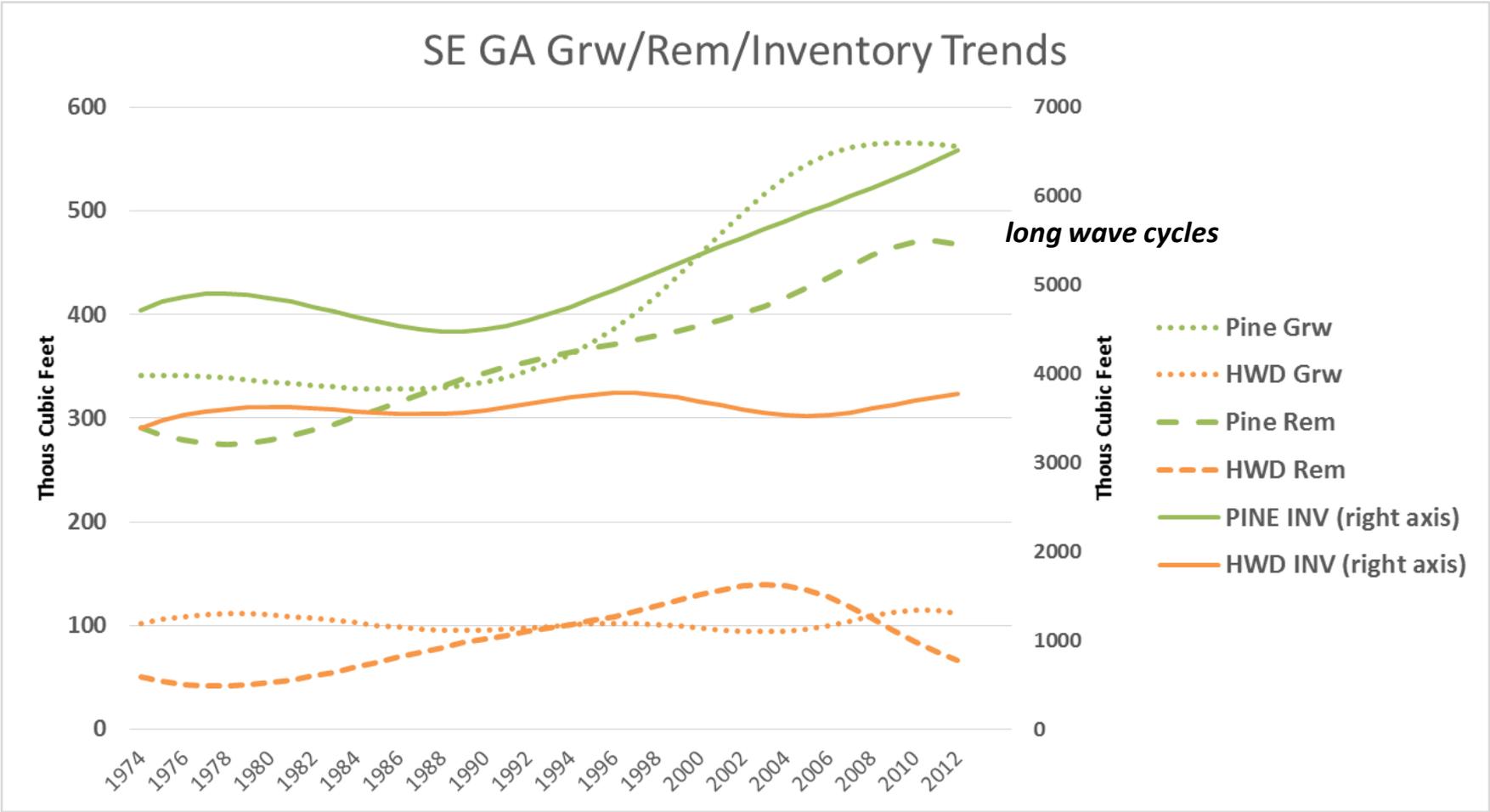


In the long run harvest shifts to lower price regions (*vice versa*) so that growth drain moves through cycles. In the model inventory decreases lead to higher prices and less harvest over time (*vice versa*).

Ray Sheffield

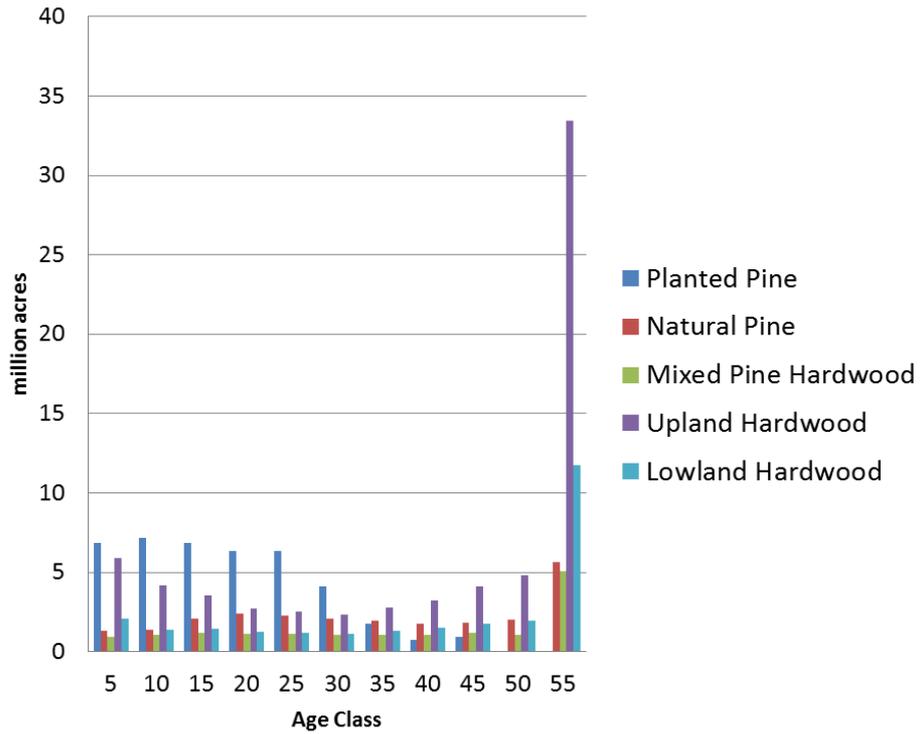
DOE Bioenergy 2015

Southeast Georgia - Growth vs Removal Trends

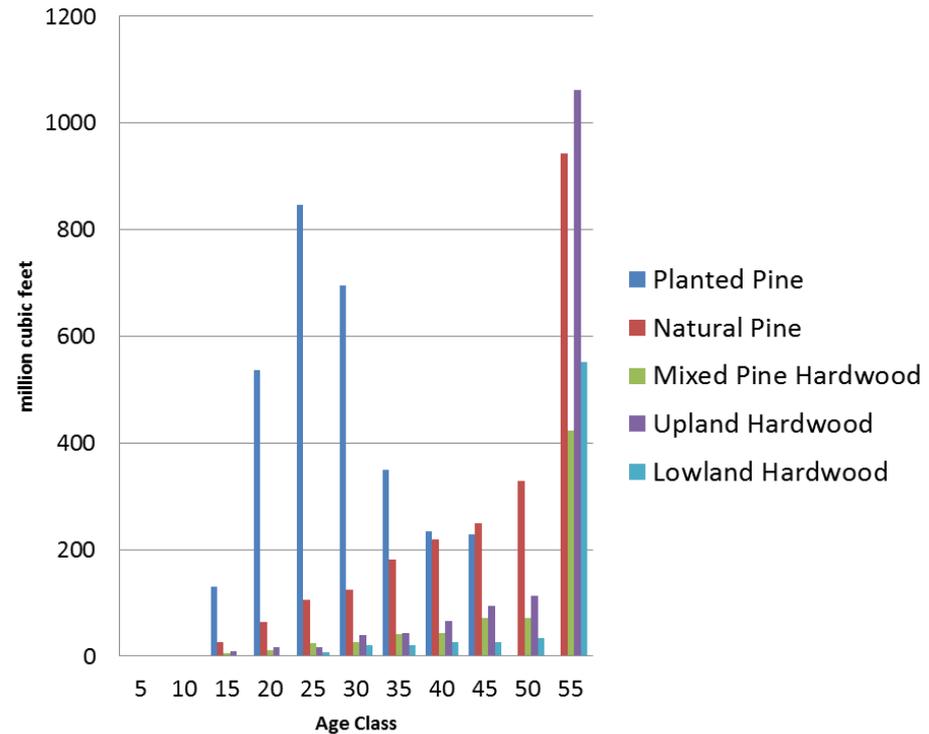


AGE CLASS STRUCTURE

U.S. South Acres
by Forest Type by Age Class

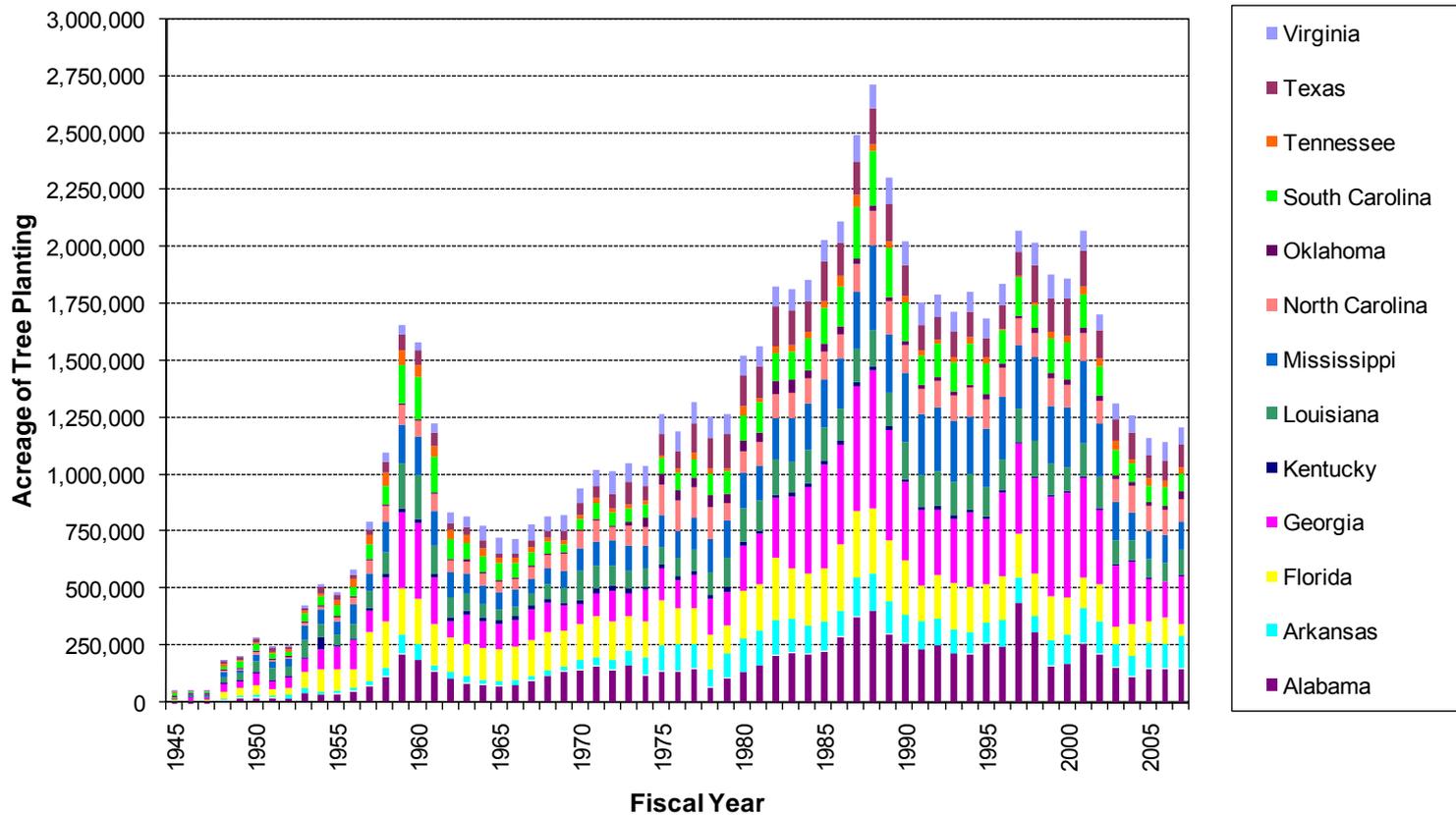


U.S. South Removals
by Forest Type by Age Class



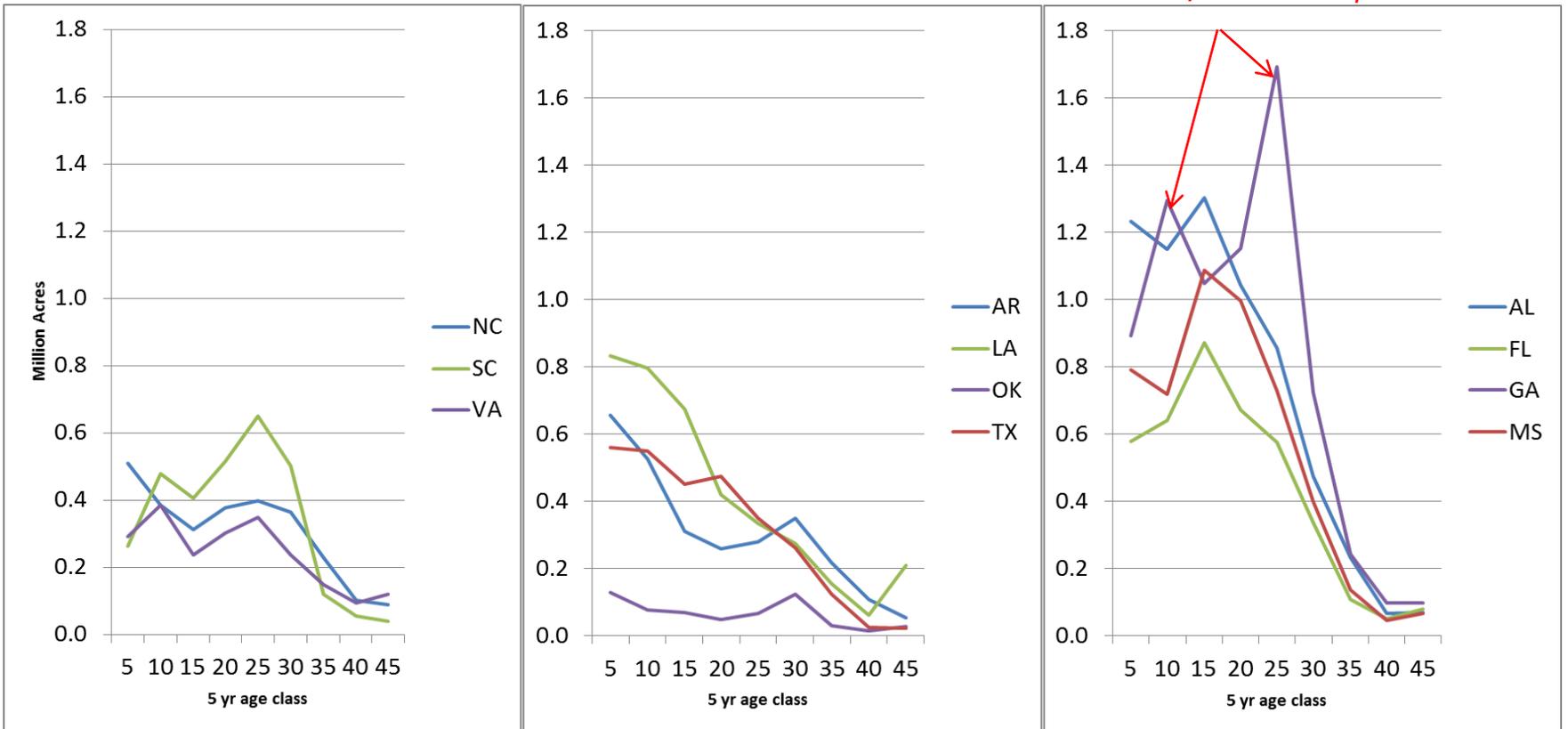
Tree Planting in the South

Southern Tree Planting, All States and Ownerships, 1945-2007



Source: USFS, GFC, TMS

Current Plantation Age Class Structure



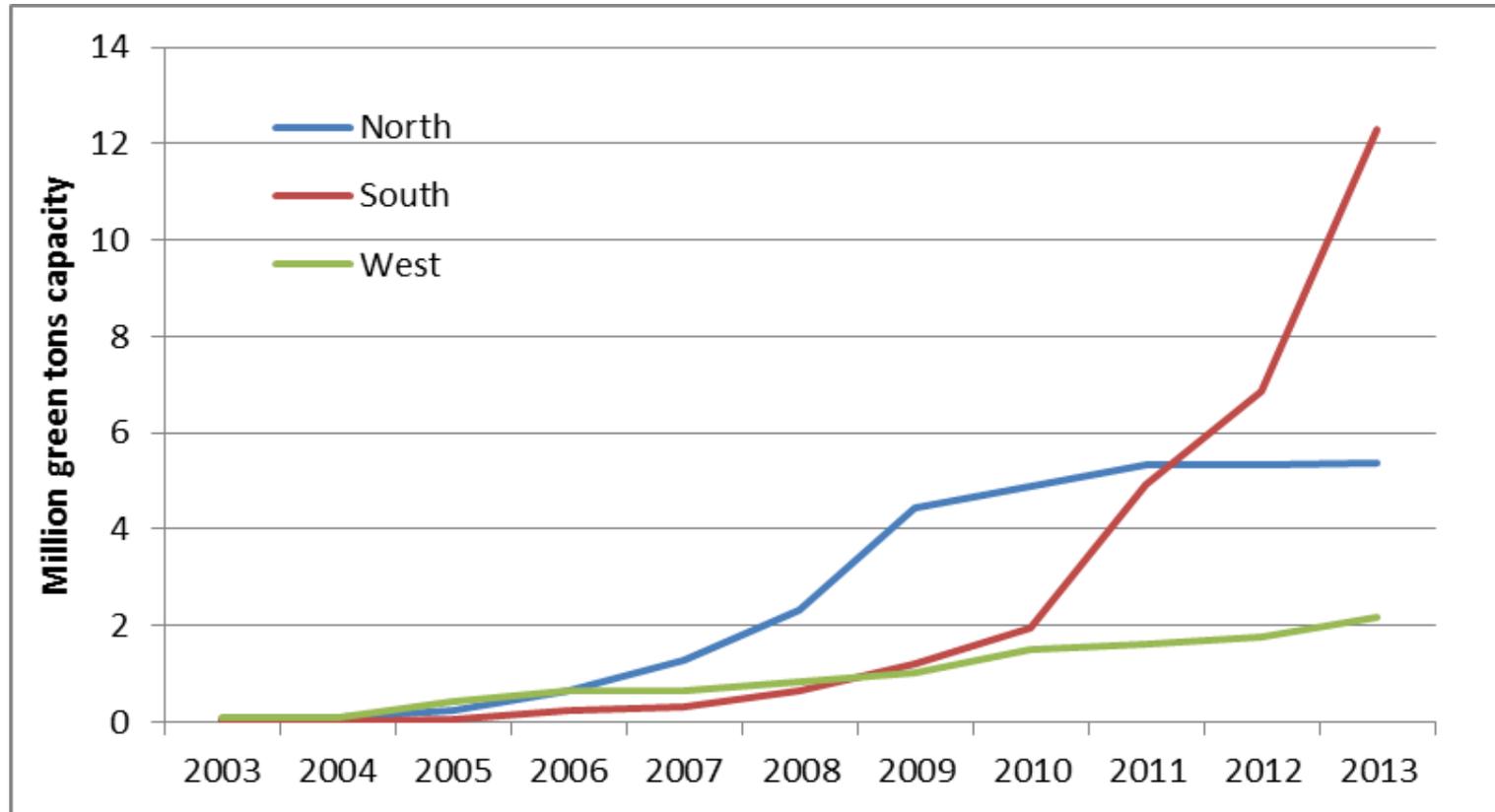
WHAT DOES THIS MEAN FOR THE CARBON IMPACTS OF PELLET DEMAND?

Why am I talking about pellets?

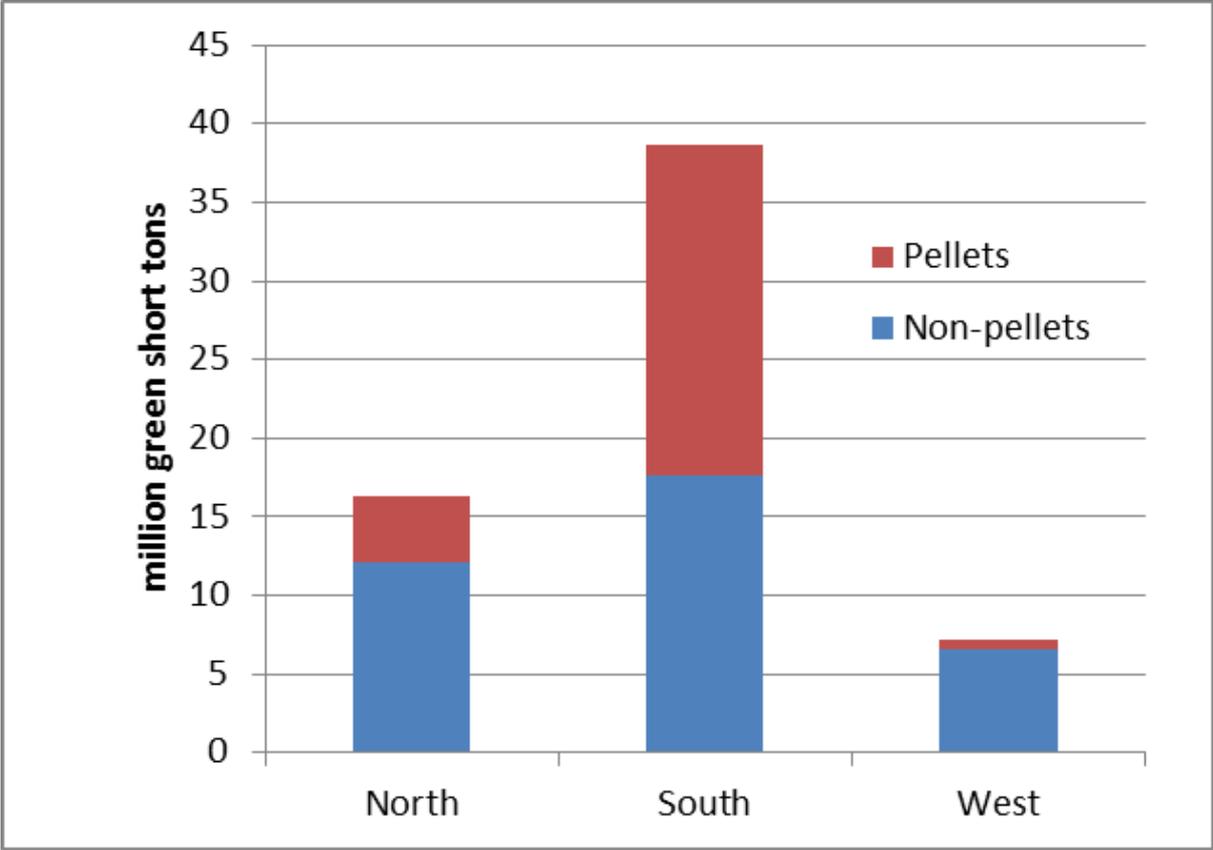
2009 EU RED is actually happening

Target/objective	Requirement
GHG reductions	<ul style="list-style-type: none"> ●Wastes/residues are bound only by GHG reduction requirements ●Minimum GHG reductions of 35% in 2009, 50% in 2017, 60% in 2018
Land use and production	<ul style="list-style-type: none"> ●Prohibits material from high biodiversity areas, undrained peatland, high carbon-stock areas ●Requires EU-sourced material to be produced in accordance with applicable regulations
Sourcing/chain-of-custody	<ul style="list-style-type: none"> ●Requires operators to verify chain of custody using mass balance approach

Pellet Production Capacity by Region 2003-2013



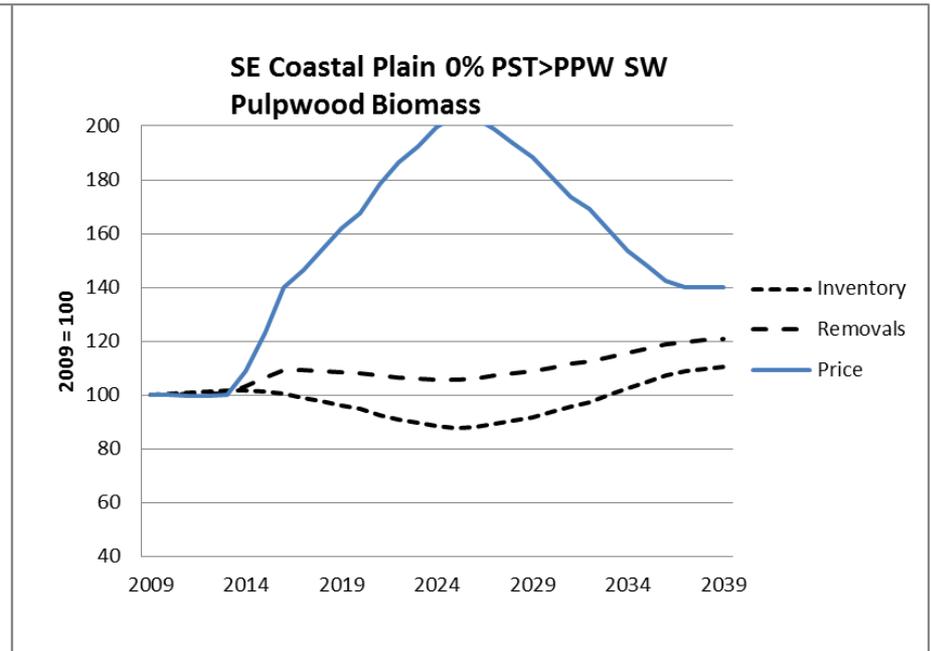
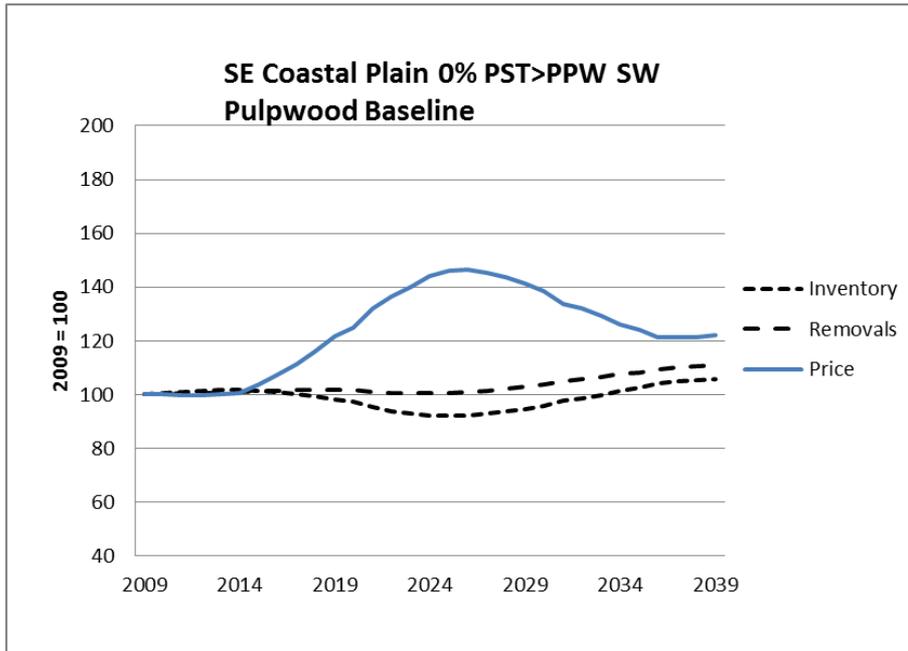
Announced bioenergy capacity by region (2014-2020)



Biomass Results

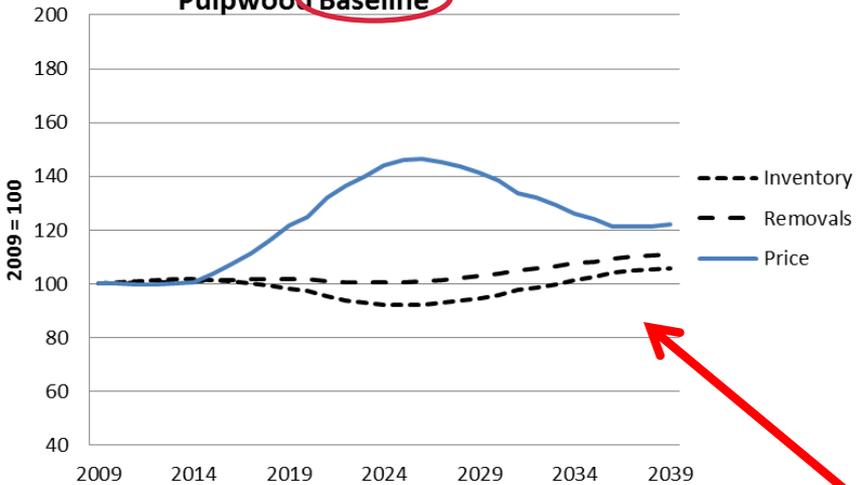
Baseline

Biomass – (70% pine)

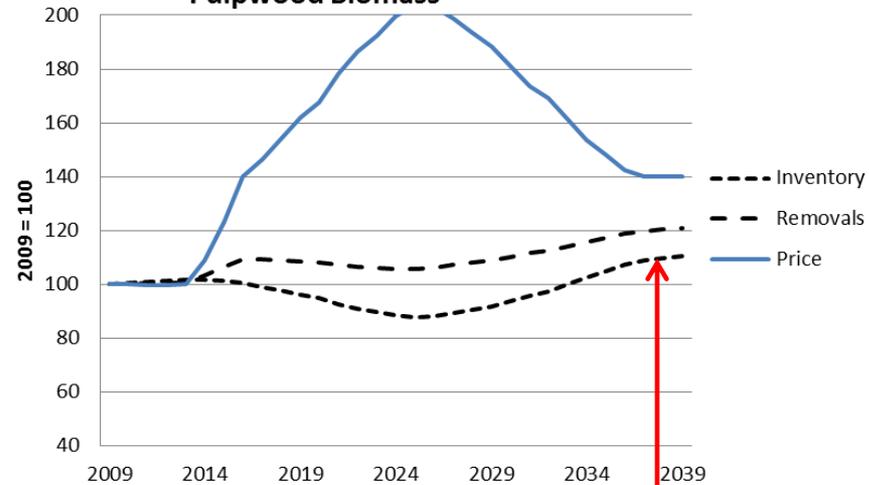


No Feedback

SE Coastal Plain 0% PST>PPW SW Pulpwood **Baseline**

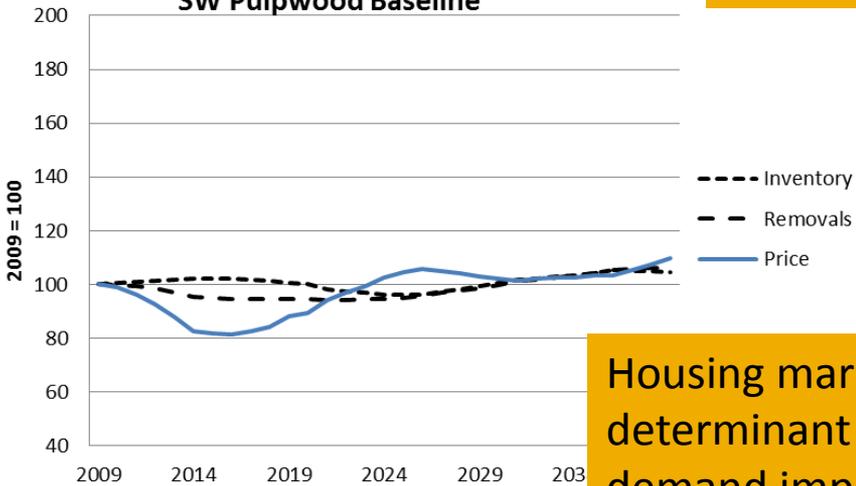


SE Coastal Plain 0% PST>PPW SW Pulpwood Biomass

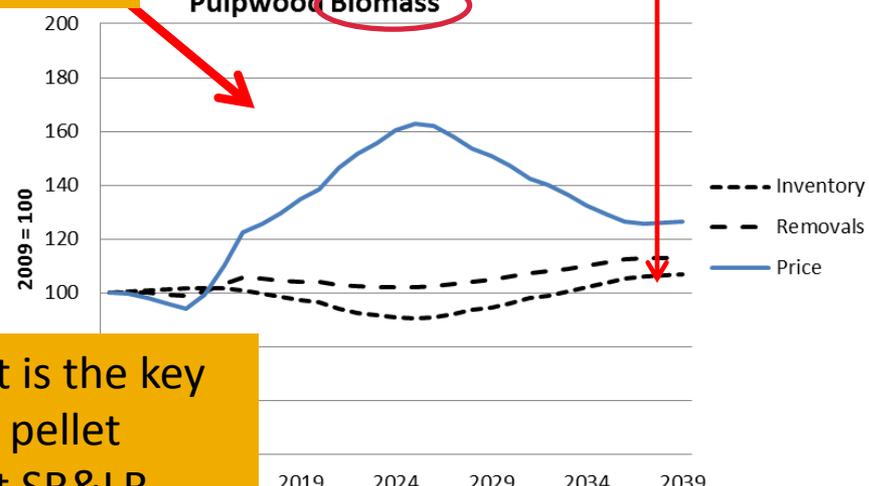


50% Feedback
Sawmill Residue

SE Coastal Plain 50% PST>PPW SW Pulpwood Baseline



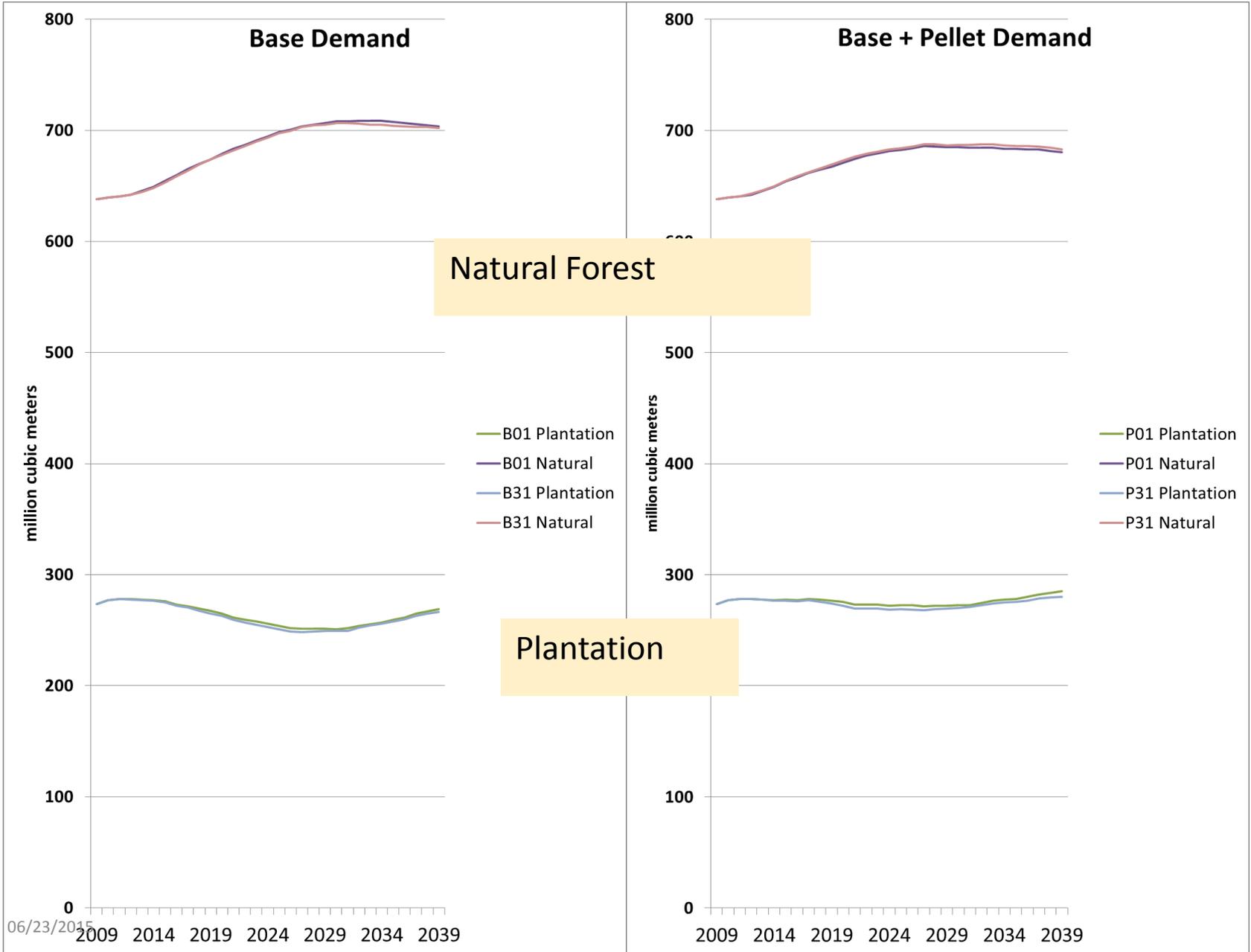
SE Coastal Plain 50% PST>PPW SW Pulpwood **Biomass**

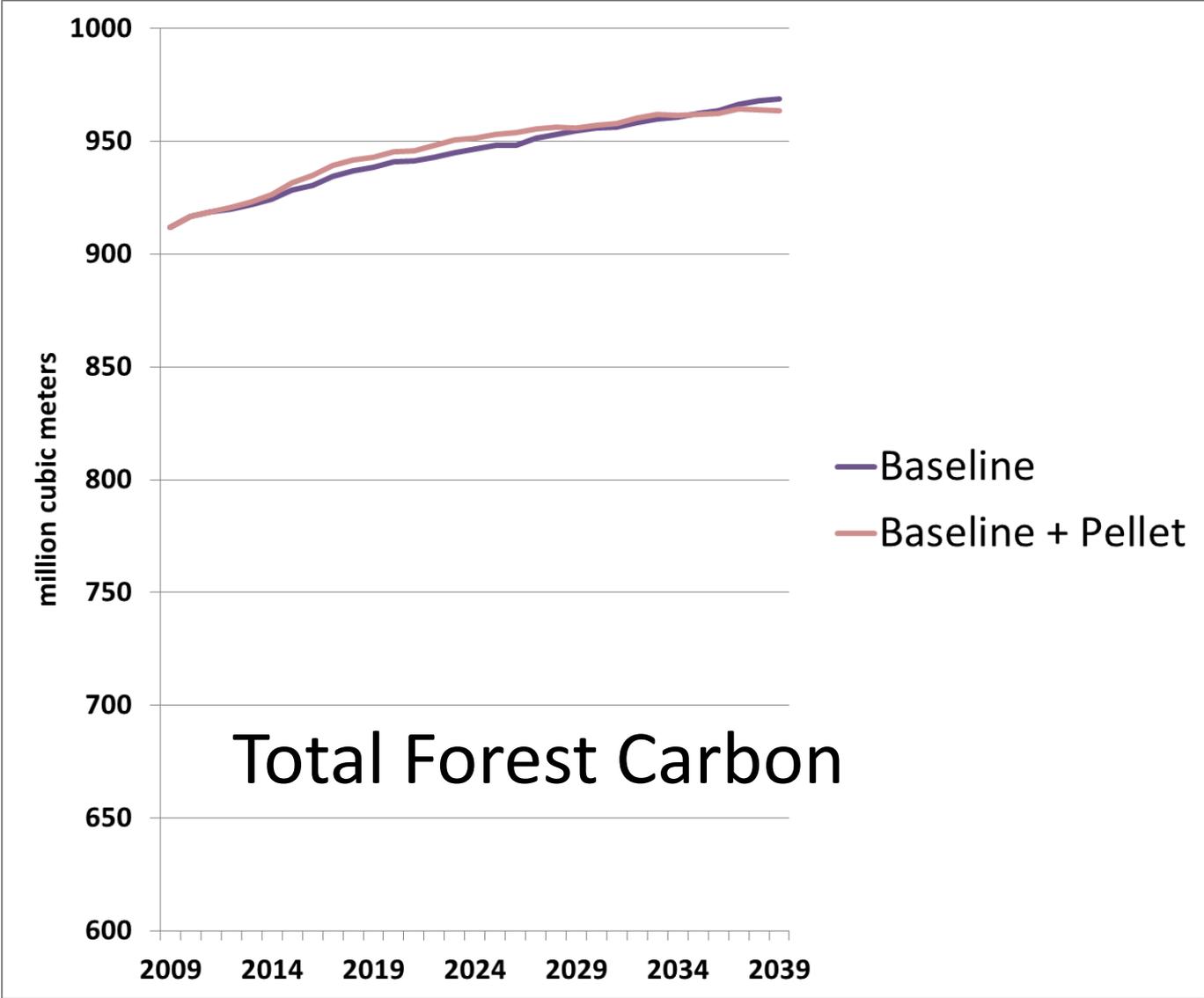


Housing market is the key determinant of pellet demand impact SR&LR



FOREST CARBON





Key Points

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Questions?

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