

Bioenergy Demand in a Market Driven Forest Economy

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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**



SOFAC Members/Supporters

- American Forest Management
- American Forest & Paper Association
- Arborgen
- Electric Power Research Institute
- Enviva Biomass
- Forest Economic Advisors
- Forestland Group
- Forest Investment Associates
- Forest2Market
- Dogwood Alliance
- SELC
- EDF
- Georgia-Pacific
- Southern Company
- Hancock Timber Resource Group
- Huber Engineered Wood Products
- International Paper
- Kapstone Paper
- Larson & McGowin
- Lupold Consulting
- MeadWestvaco
- Southern Group of State Foresters
- NRDC
- National Council for Air and Stream Improvement
- Oak Ridge National Lab (ORNL)
- Plum Creek
- Potlatch Forest Holdings
- Rayonier
- Regions Timberland Group
- Resolute Forest Products
- Resource Management Service
- RockTenn
- UK DECC
- Southern Company
- National Alliance of Woodland Owners (NAFO)
- Timberland Investment Resources

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; increased 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

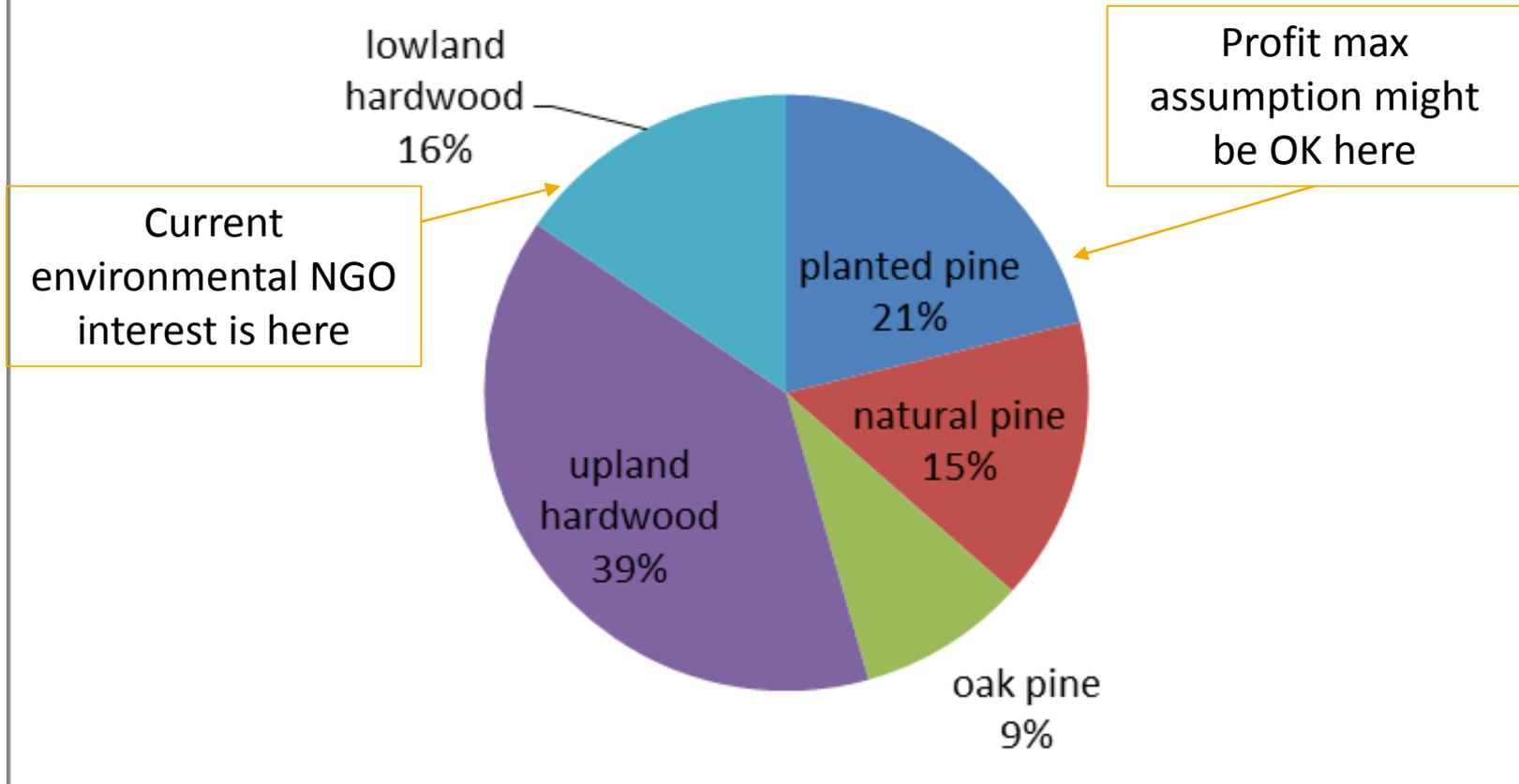
- Logging Residue advantages
 - Clear and easy to understand carbon advantage
 - Reduces competition with traditional industry
 - “Potential” cost advantage
 - Value-added to harvesting operation
- Logging Residue disadvantages
 - Concentrates demand (near high cost roundwood)
 - Significantly expands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

Key Points

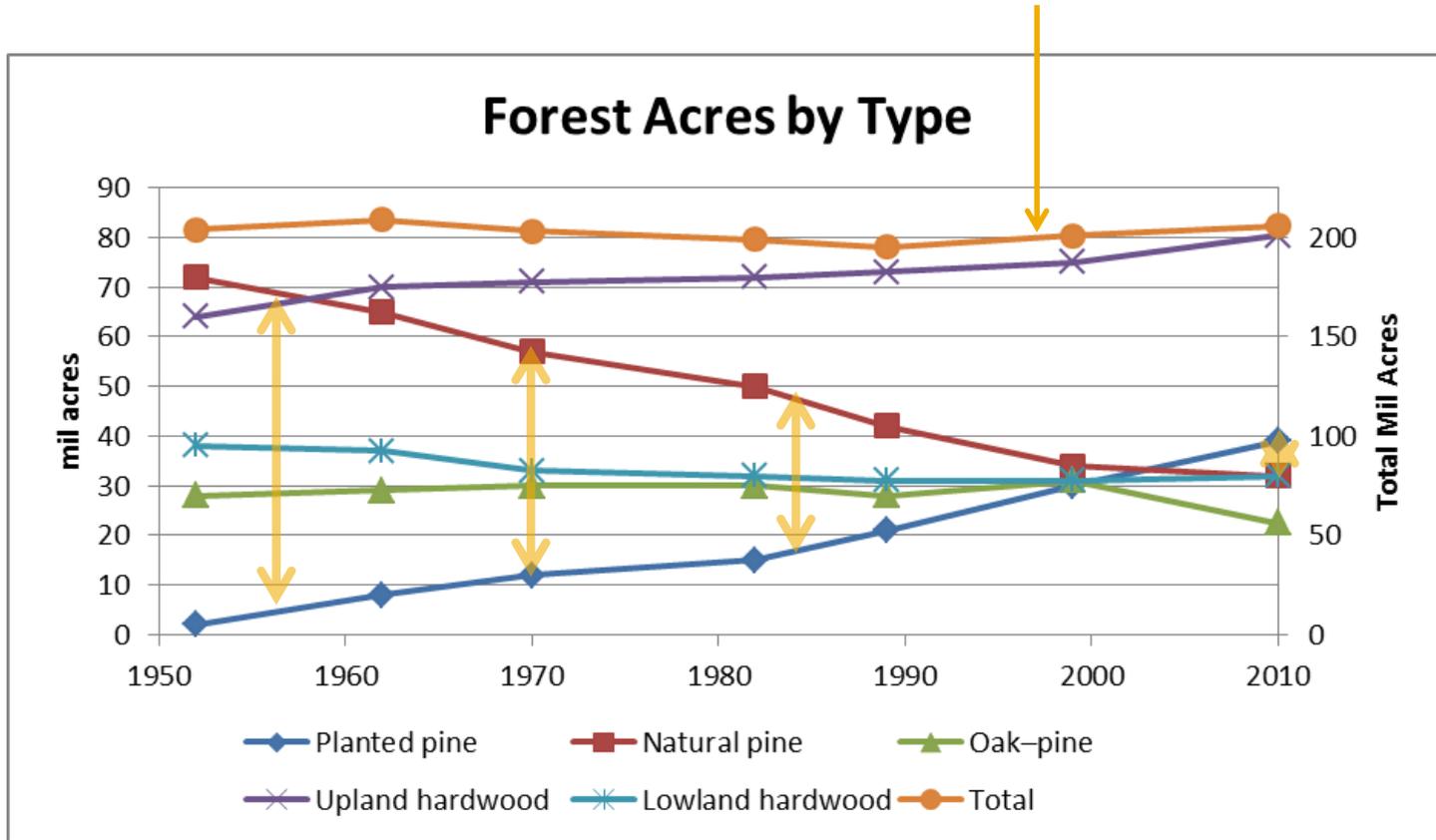
- **Points I'll try to make in the next few minutes**
 - Both short- and long-run forest carbon impacts of wood energy are driven by market responses to increased demand – mainly linked to housing
 - Relevant markets include timber products, ag crops, and land
 - Resource sustainability w.r.t. demand 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?

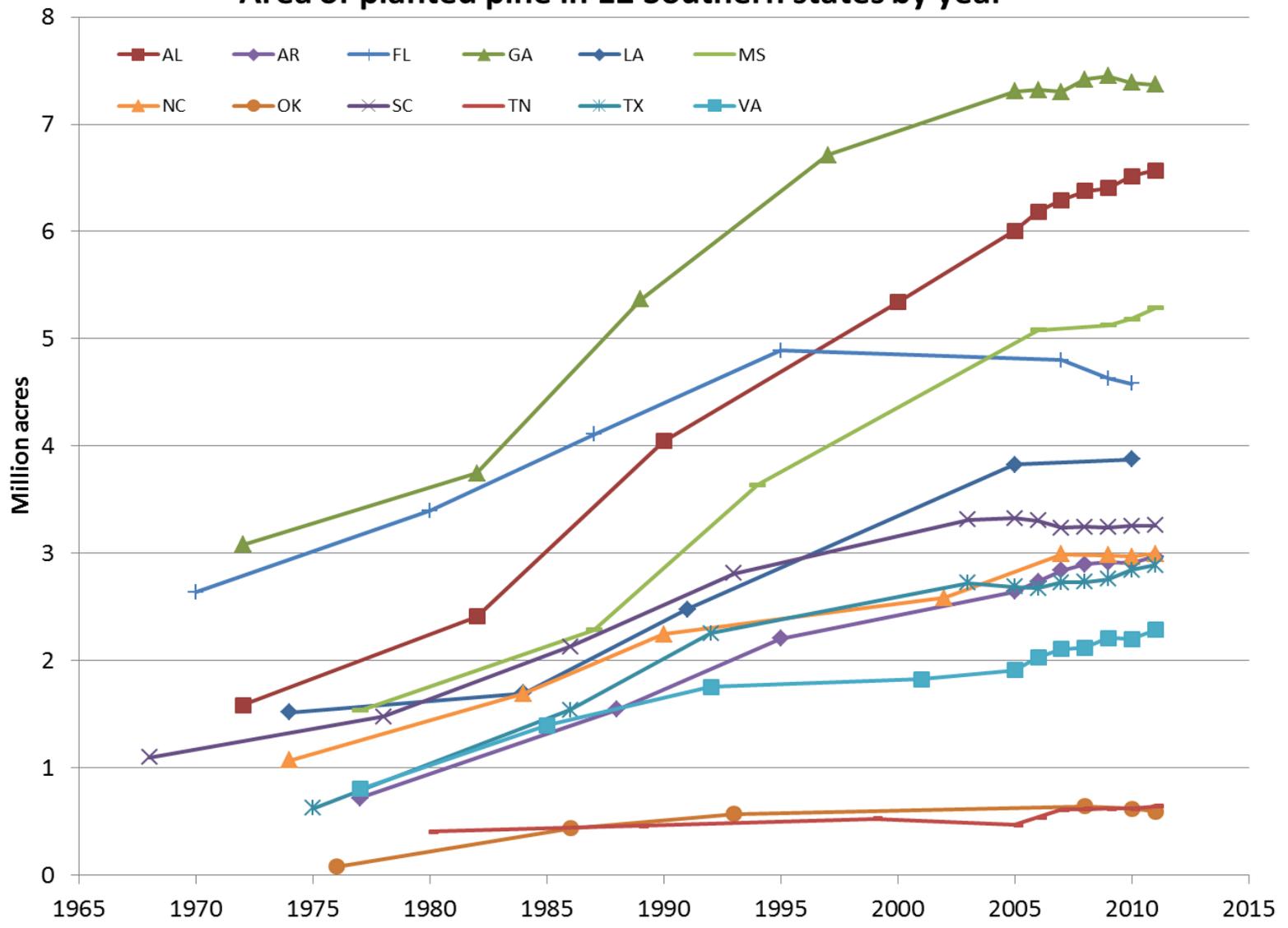
2010 U.S. South Forest Types



Total Timberland Stable but Not Static

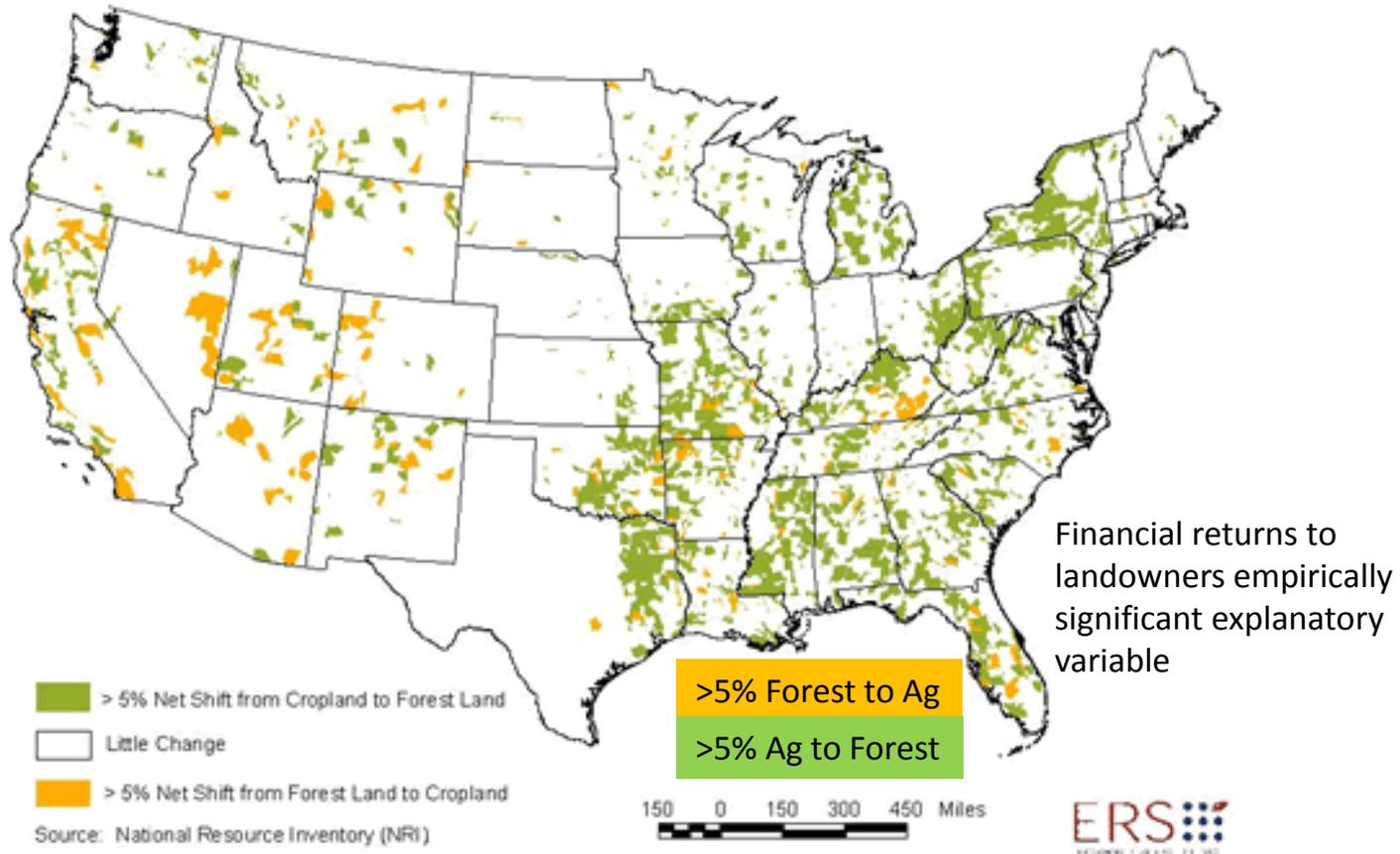


Area of planted pine in 12 Southern states by year

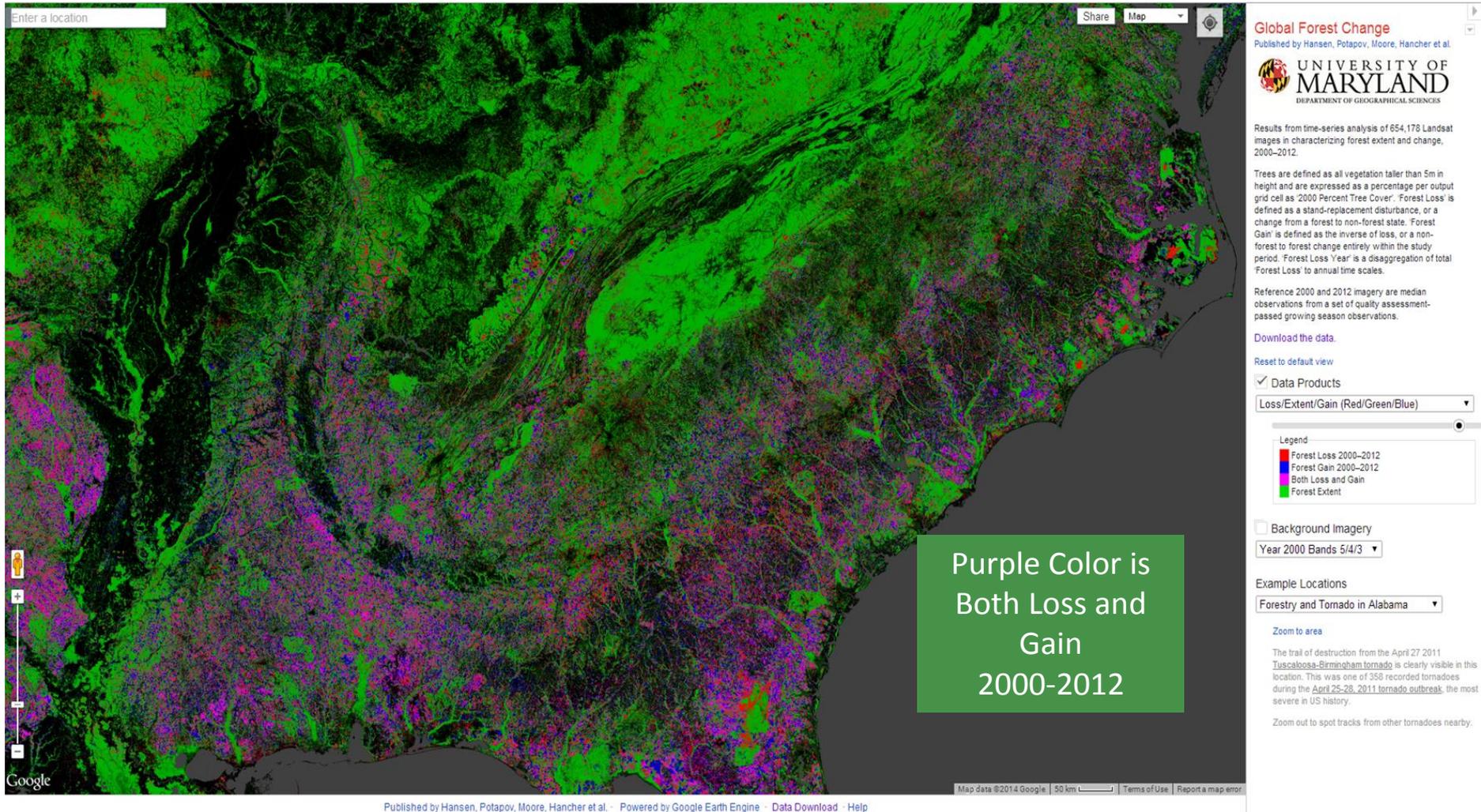


Forestland trend stable, but not static

Net shifts between cropland and forest land, 1982-97



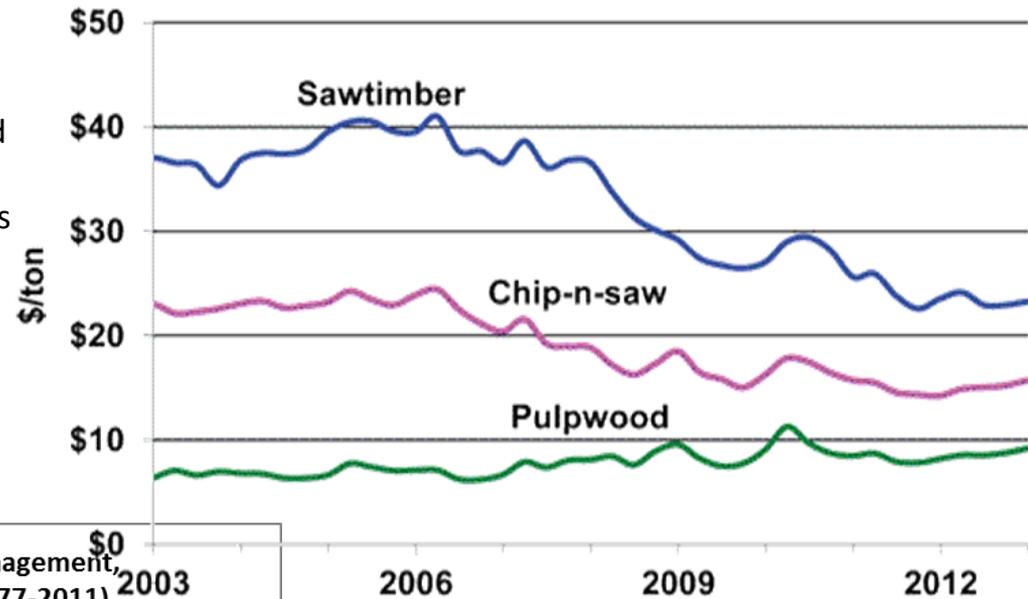
Science Article on Tracking Global Forest Change



What causes this?

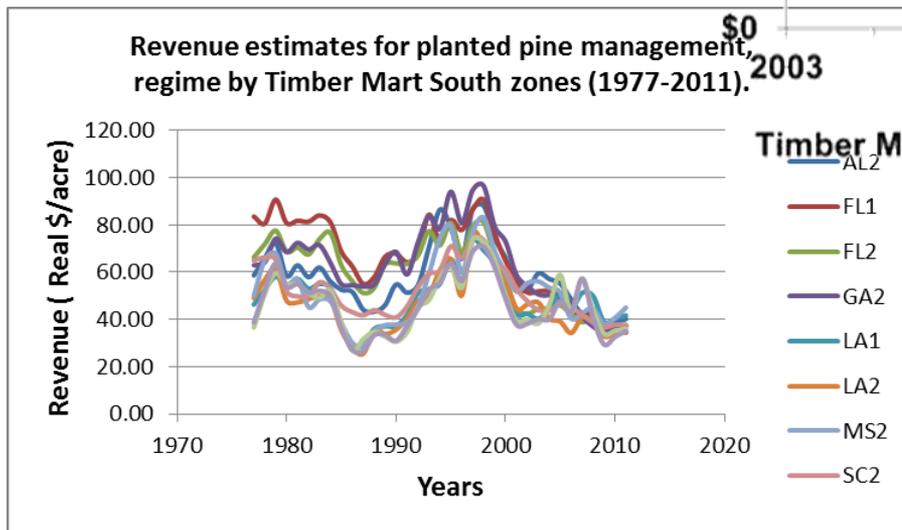
- *“...we identified the rise in timber net returns as the most important factor driving the increase in forest areas between 1982 and 1997. This is consistent with reports that the increase in forests largely involved timberland acreage.” (Lubowski et al. 2008)*
- This is a privately owned landscape 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

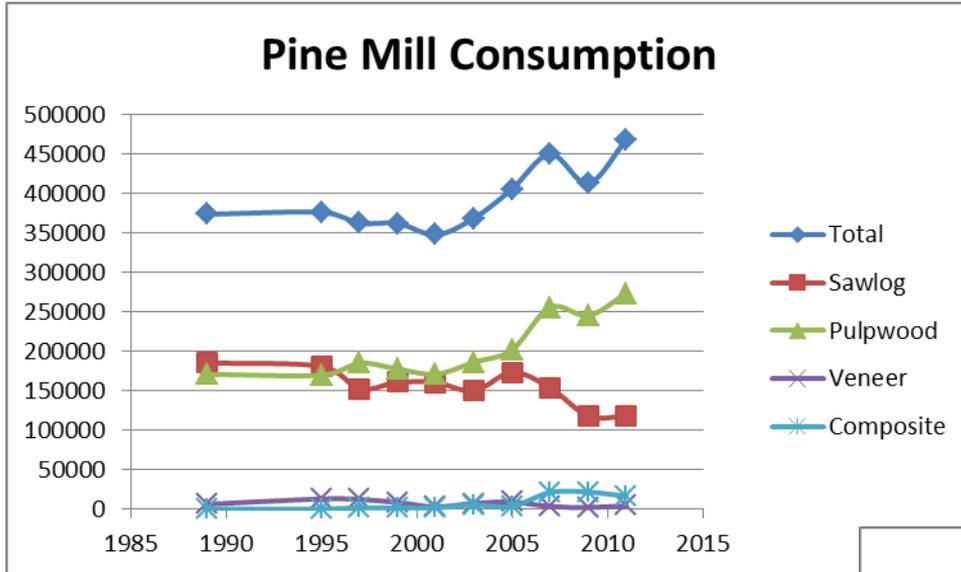


Forest management rents are low

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

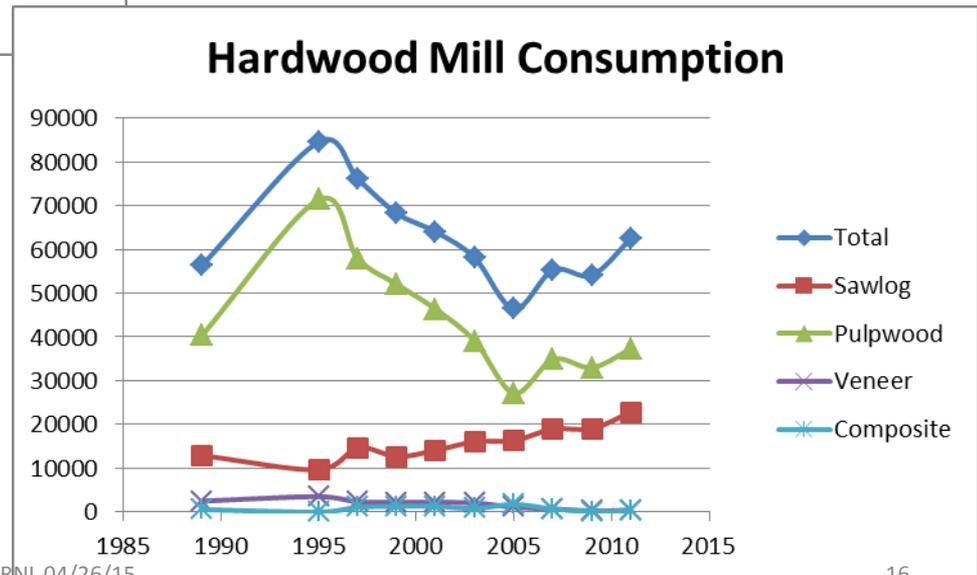


SE-GA Demand/Consumption Dynamics



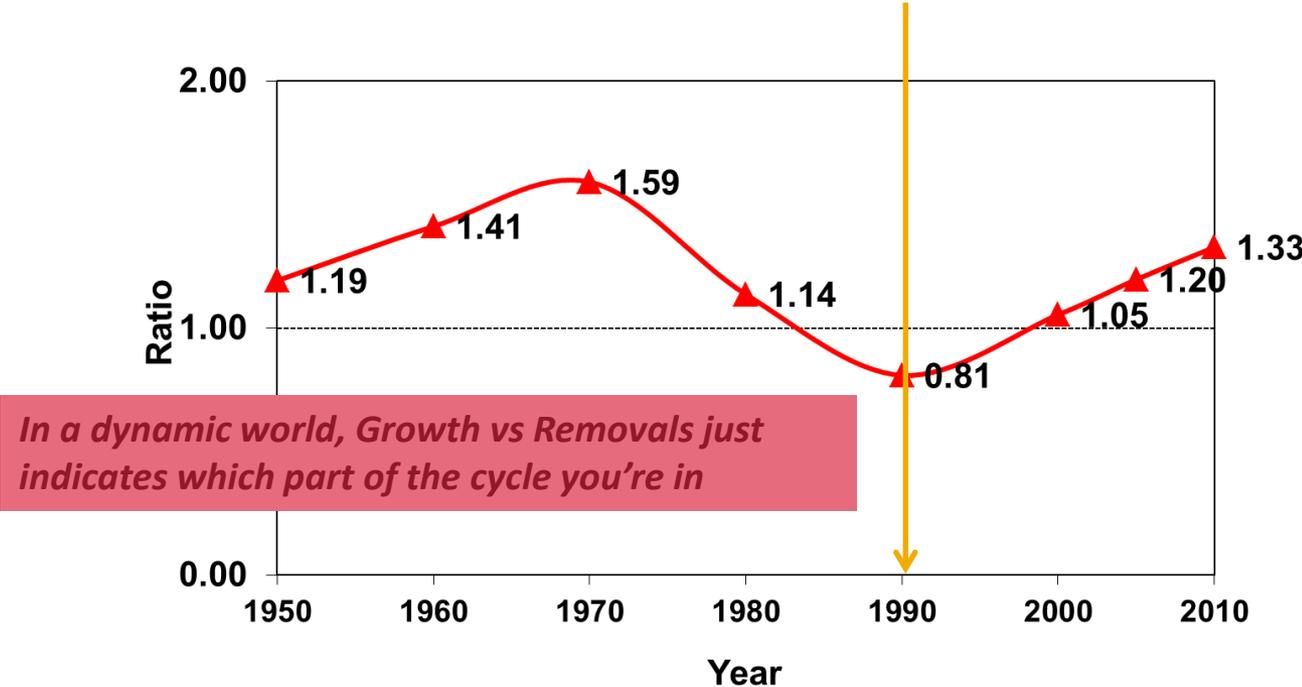
- Every tree can feed multiple markets, every stand has multiple tree types
- Change in one market affects all markets
- Example: pine sawmill residues and pine roundwood consumption

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)

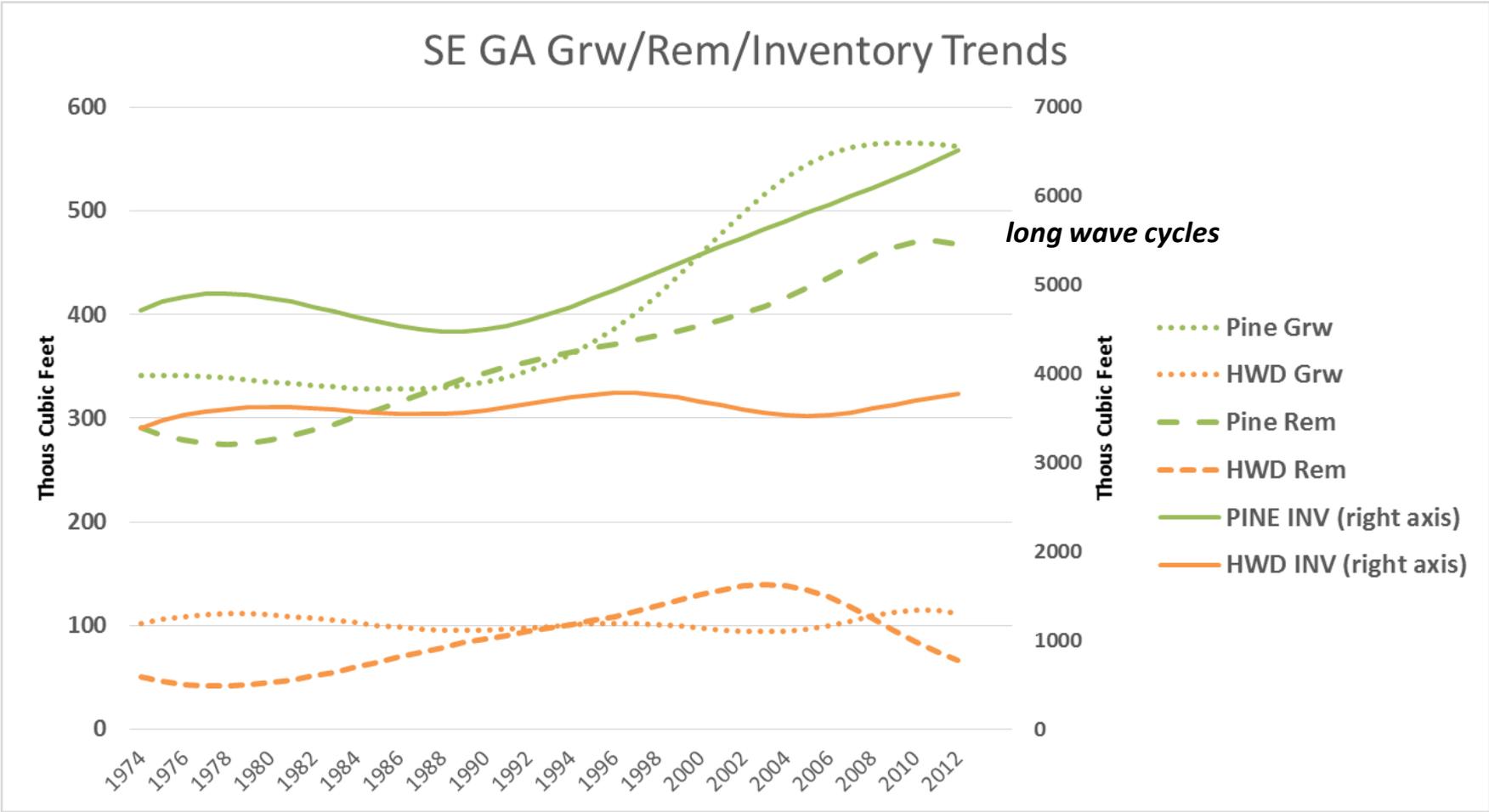


In the long run harvest shifts to lower price regions (*vice versa*) so that growth drain moves through cycles. In the model inventory decreases lead to higher prices and less harvest over time (*vice versa*).

Ray Sheffield

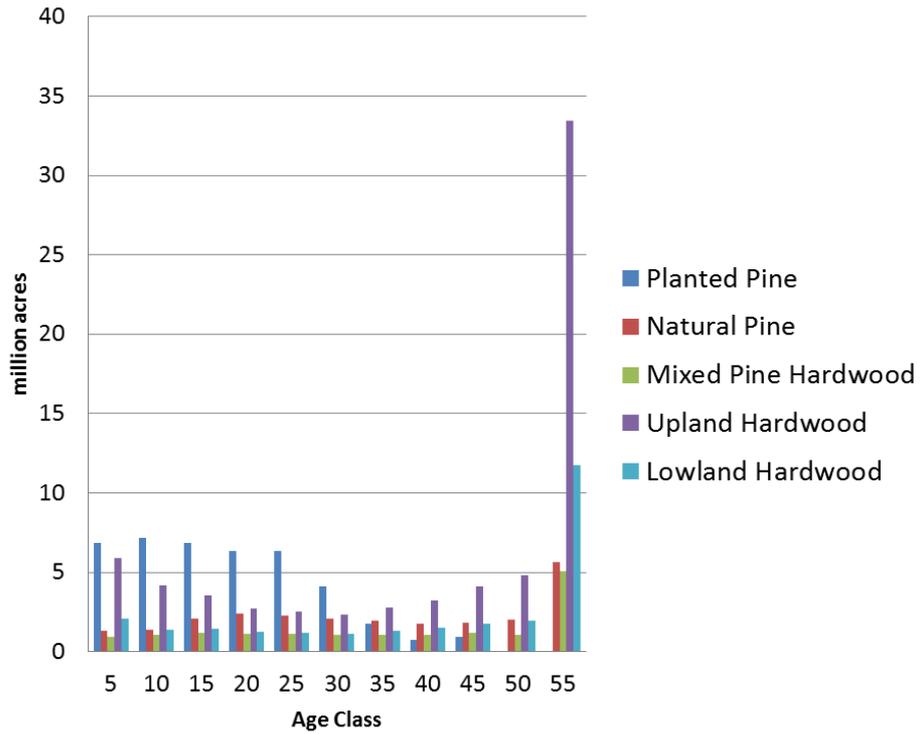
ORNL 04/26/15

Southeast Georgia - Growth vs Removal Trends

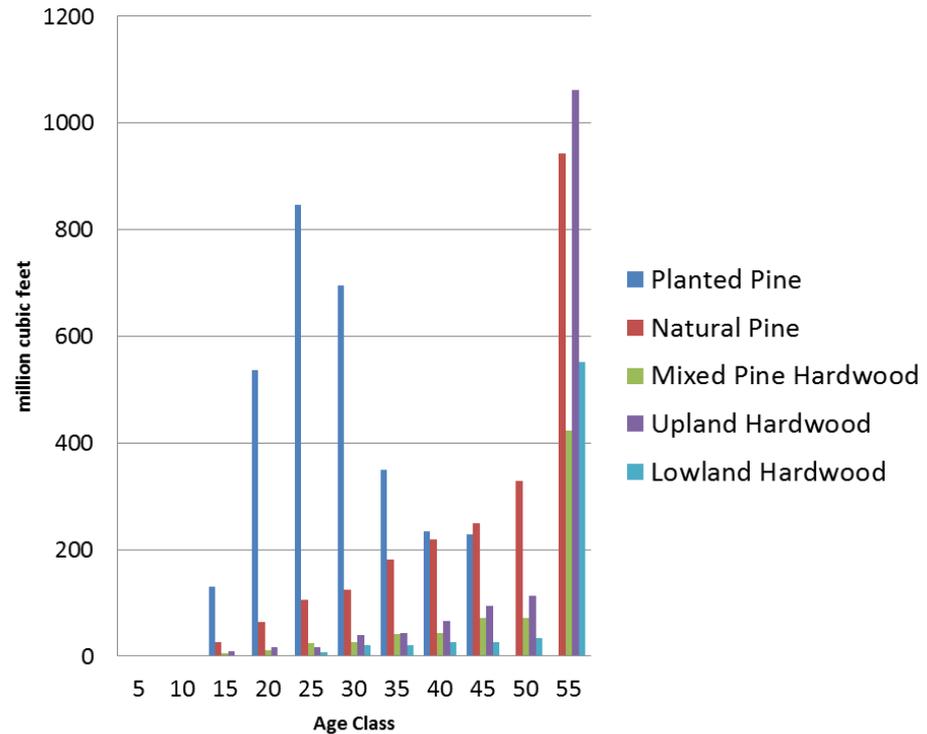


AGE CLASS STRUCTURE

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

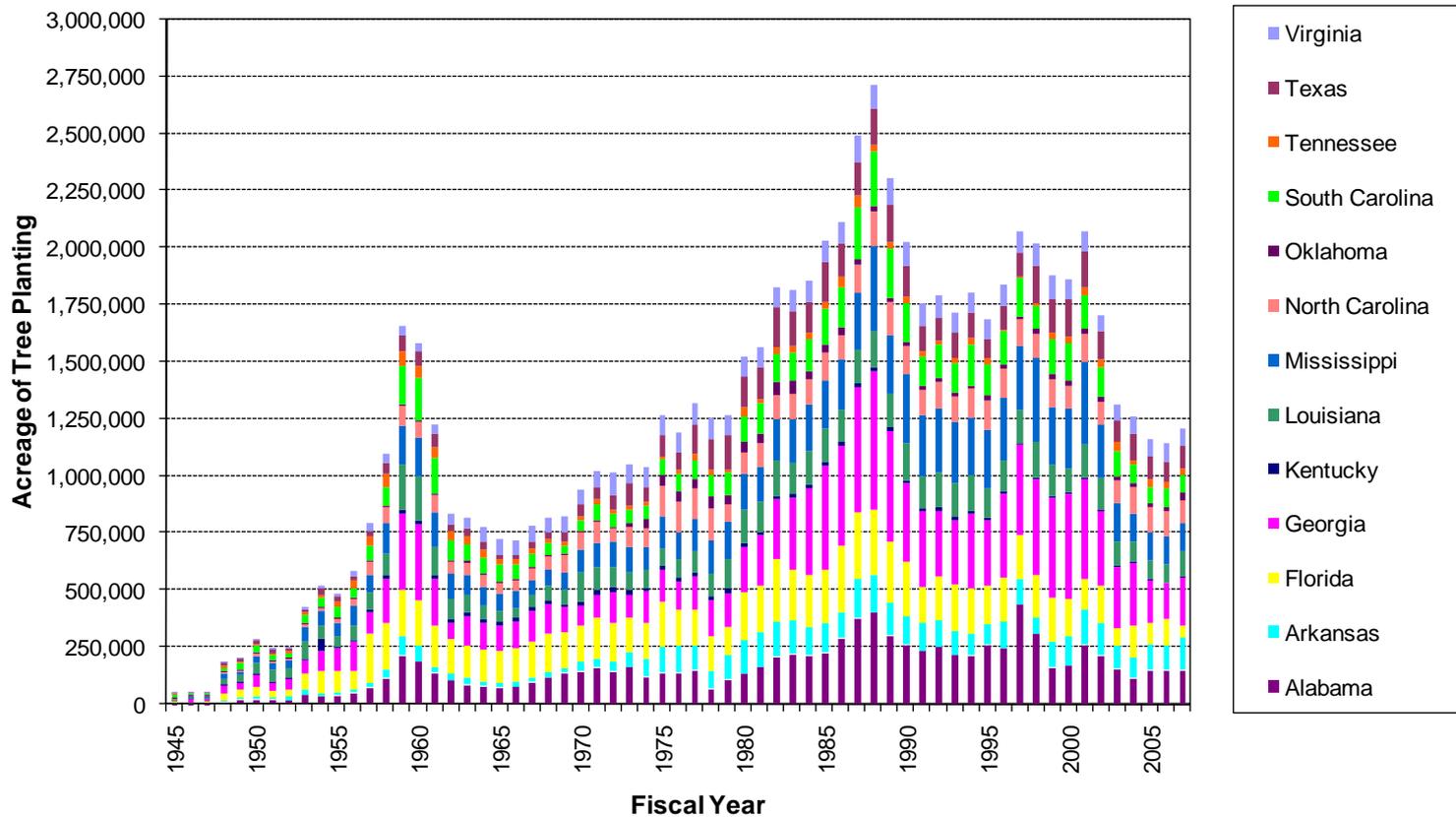


U.S. South Removals
by Forest Type by Age Class



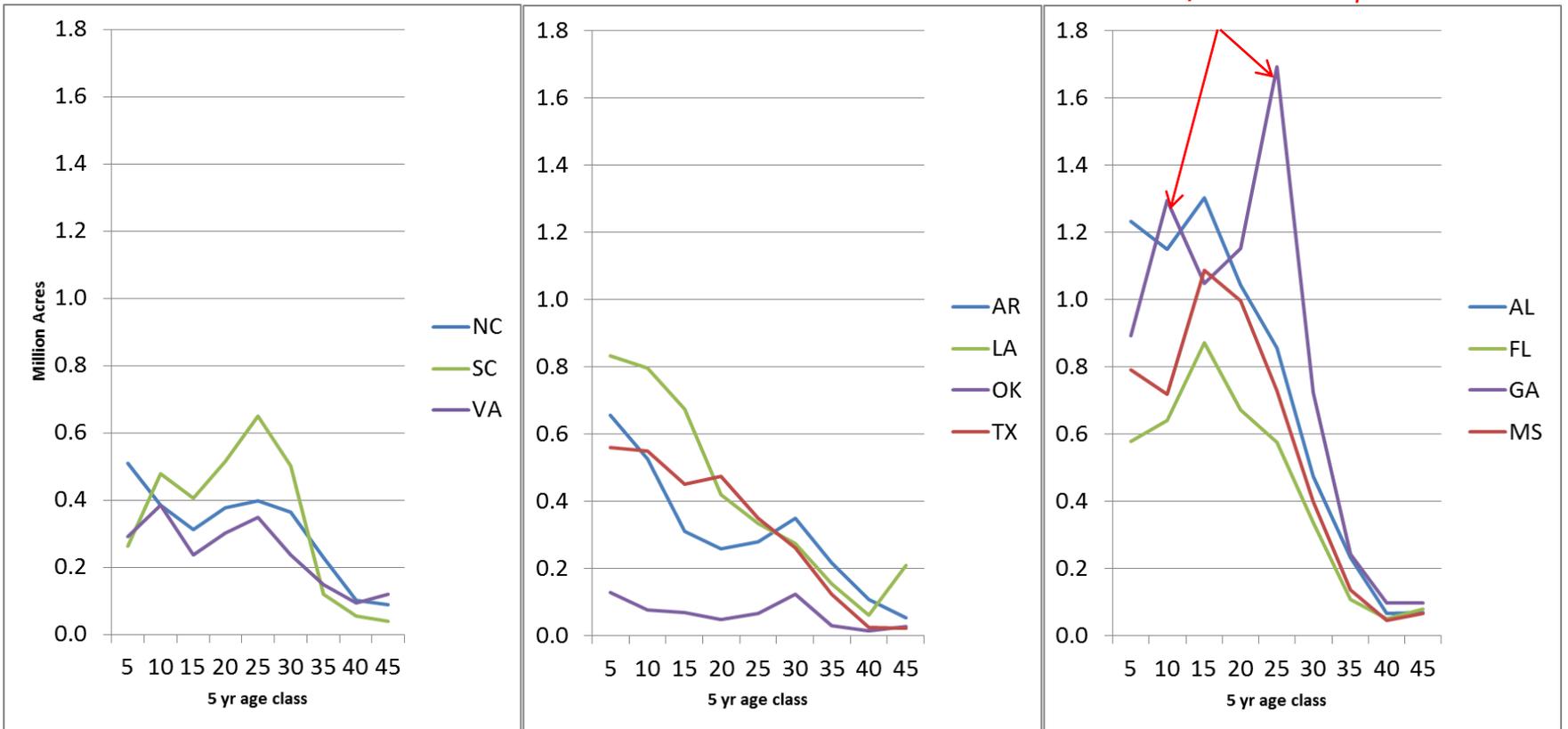
Tree Planting in the South

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



Source: USFS, GFC, TMS

Current Plantation Age Class Structure



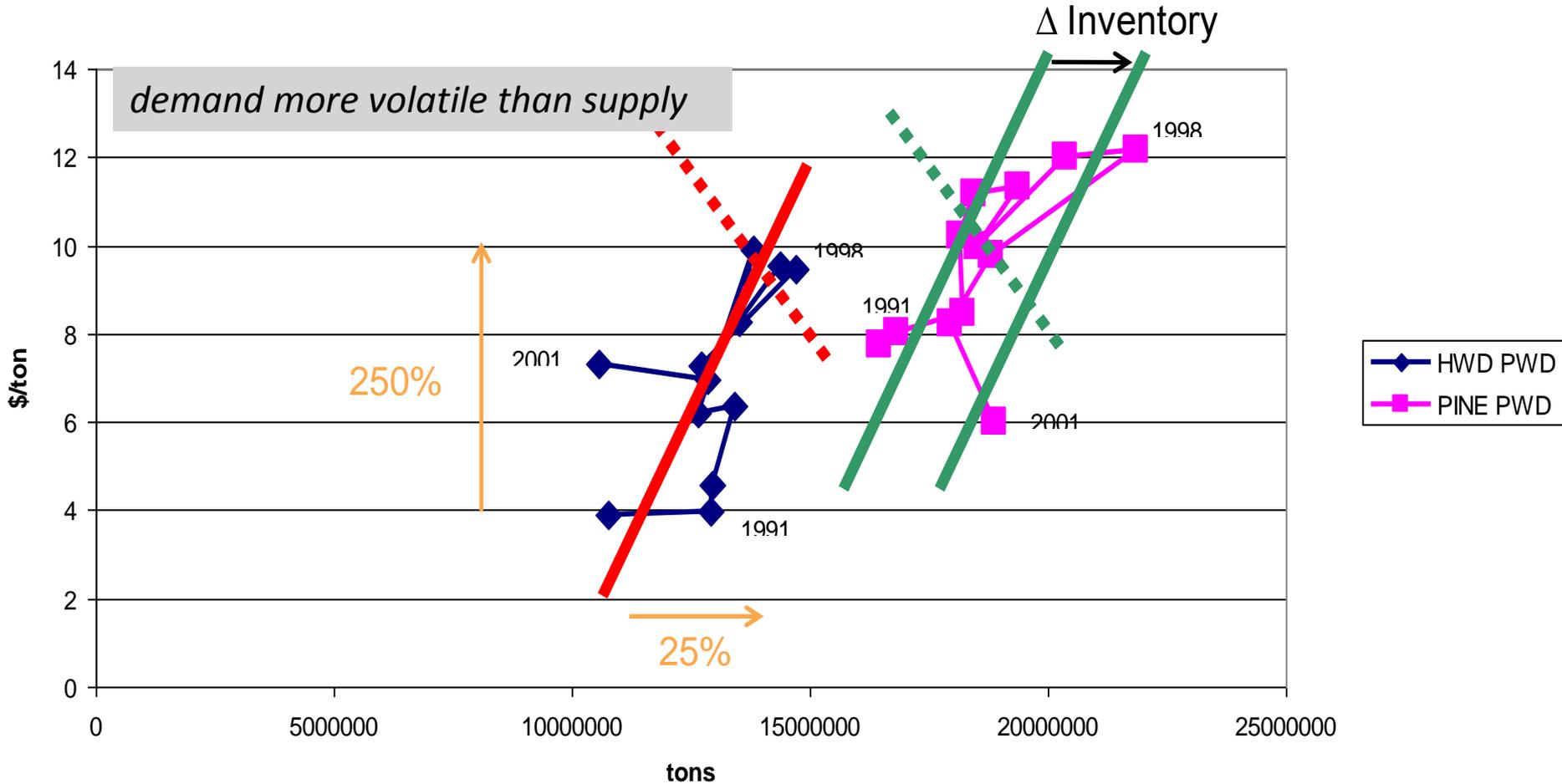
PROJECTING INVENTORY SRTS MODEL

Sub-Regional Timber Supply

SRTS

- SRTS is a stumpage market simulation system that links a detailed inventory model built on the most recent FIA data to a market framework (*first order economics s/d, applied to demographic biology*)
- Takes advantage of the fact that the next 10 – 20 years of timber inventory is already in the ground and future product inventory can be tracked
- Makes it relatively easy to track the first order market impacts of various demand scenarios given medium-run supply.

AL Pulpwood Mkt 1990-2001

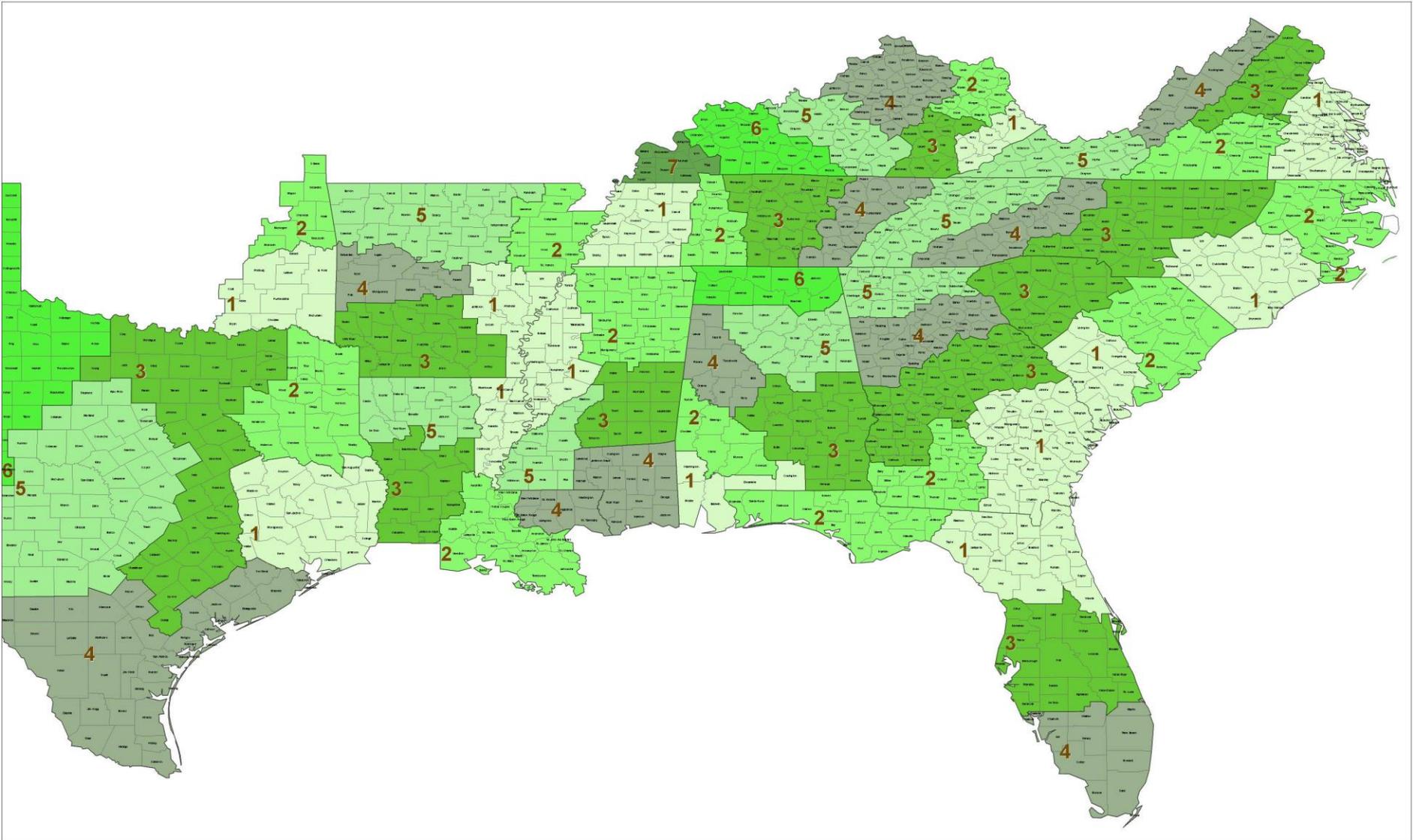


*southwide - **timber supply is price inelastic** - price impacts of demand changes much bigger than harvest impacts – prices affect leakage – management - landuse – etc.*

SRTS Biological Resolution

- Inventory, Growth, Removals and Acres are Tracked By:
 - **Region** – e.g. survey units
 - **Owner** – **Private Only** (Corp or Non-Corp)
 - **Species Group** – **Pine**, Soft Hwd, Hard Hwd
 - **Mgt. Type** – Plt Pine, Nat Pine, Mix Pine, Upland Hwd, Lowland Hwd
 - **Age Class** – 5 year

FIA Survey Unit for Southern States



Land use model

- **Hardie, I.W., P.J. Parks, P.Gottlieb and D. N. Wear. 2000. Responsiveness of rural and urban land uses to land rent determinants in the U.S. South. Land Economics.78 (4): 659-673. updated to latest NRI**
- **Nested model**
 - Urban/Rural driven by county level population forecast
 - **Ag/forest driven by relative rents**
 - Ag rents held constant in these runs
- **Model predicts percentage of forest land**
- **Does not predict forest composition (pine plantation vs. natural)**
- **Heuristic applied in these runs:**
 - Plantation acres assumed twice as price responsive as natural stands
 - Lowland hardwood assumed half as price responsive as other natural stands
 - Plantations gain at extensive margin and consume natural stands when timberland ↑
 - Plantations lose at extensive margin and revert to natural stands when timberland ↓

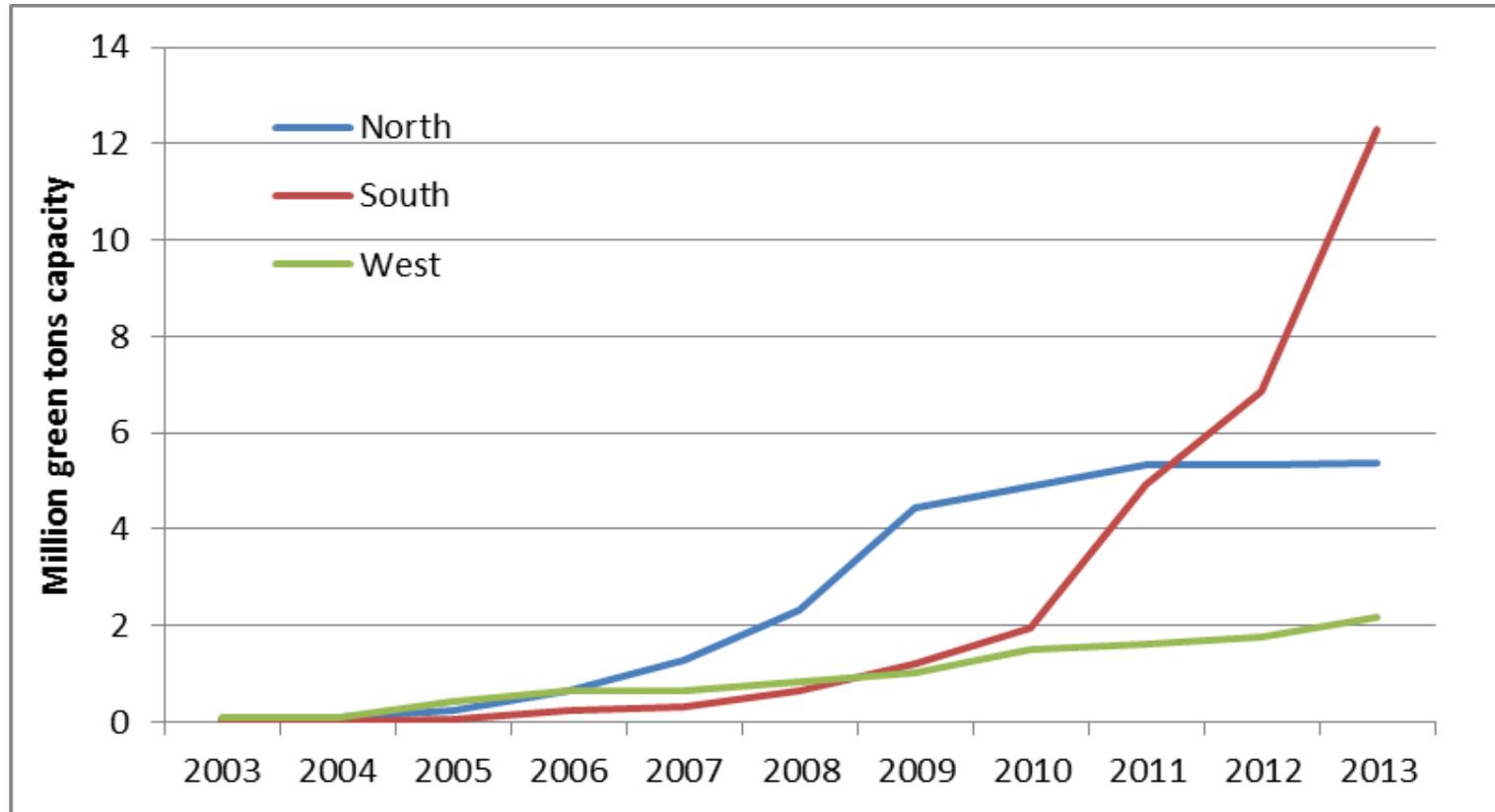
WHAT DOES THIS MEAN FOR THE CARBON IMPACTS OF PELLET DEMAND?

Why am I talking about EU Policy?

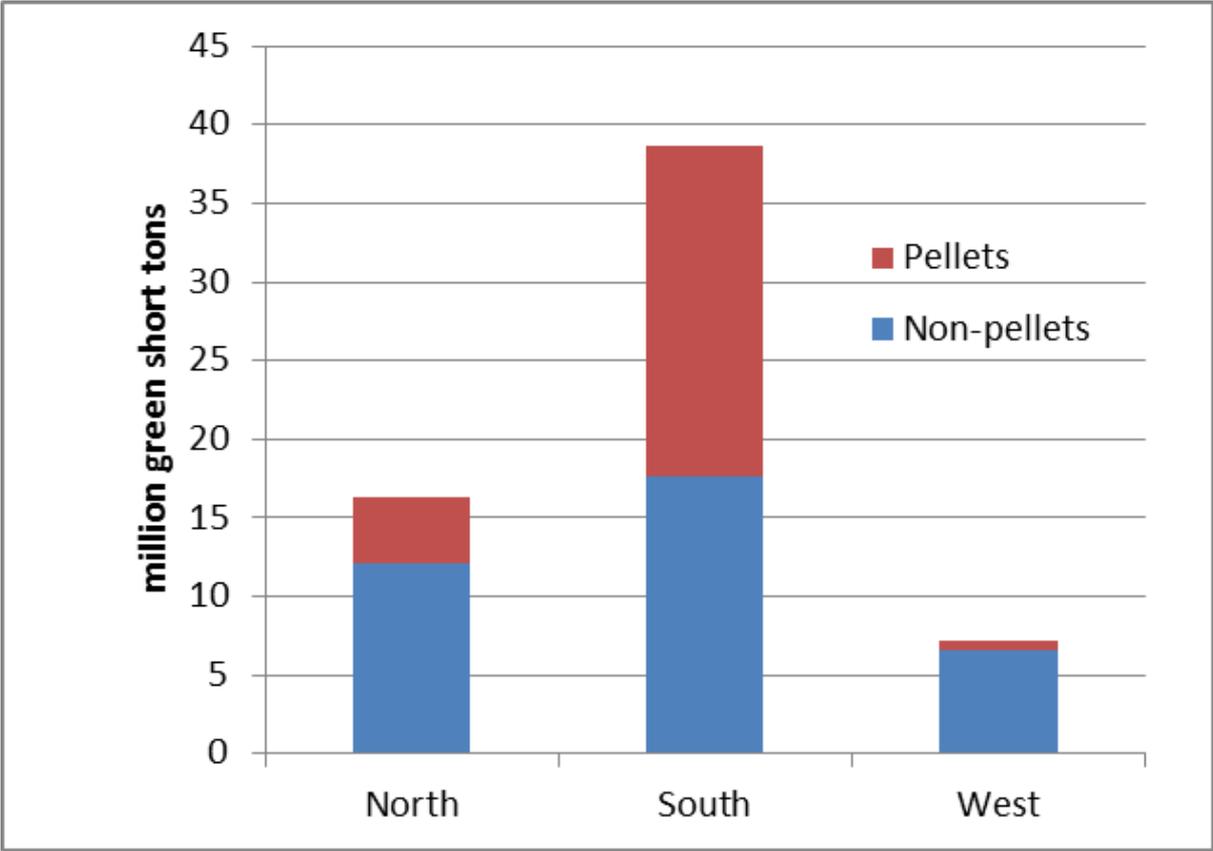
2009 EU RED actually exists

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



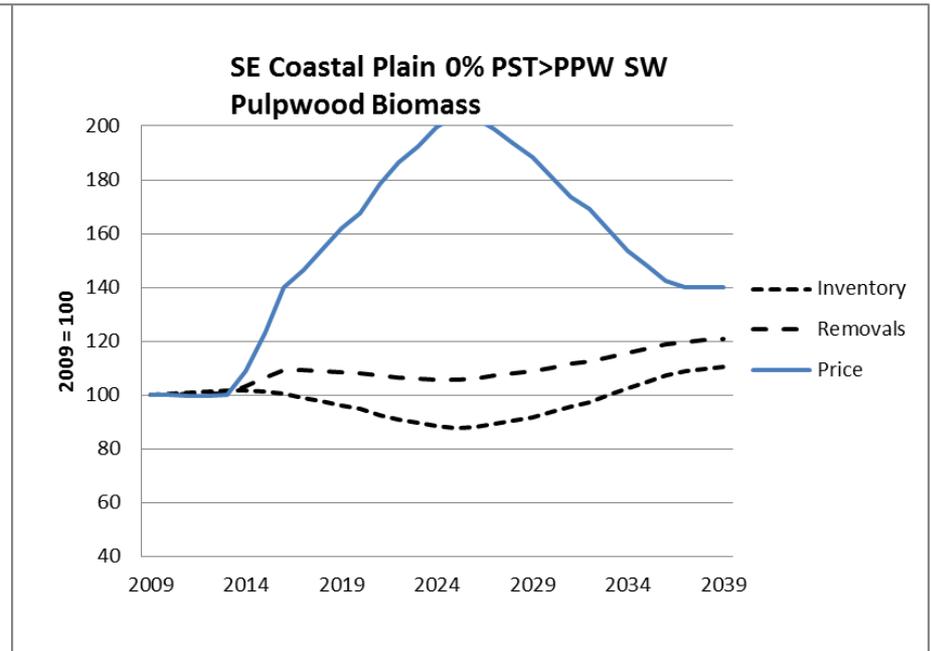
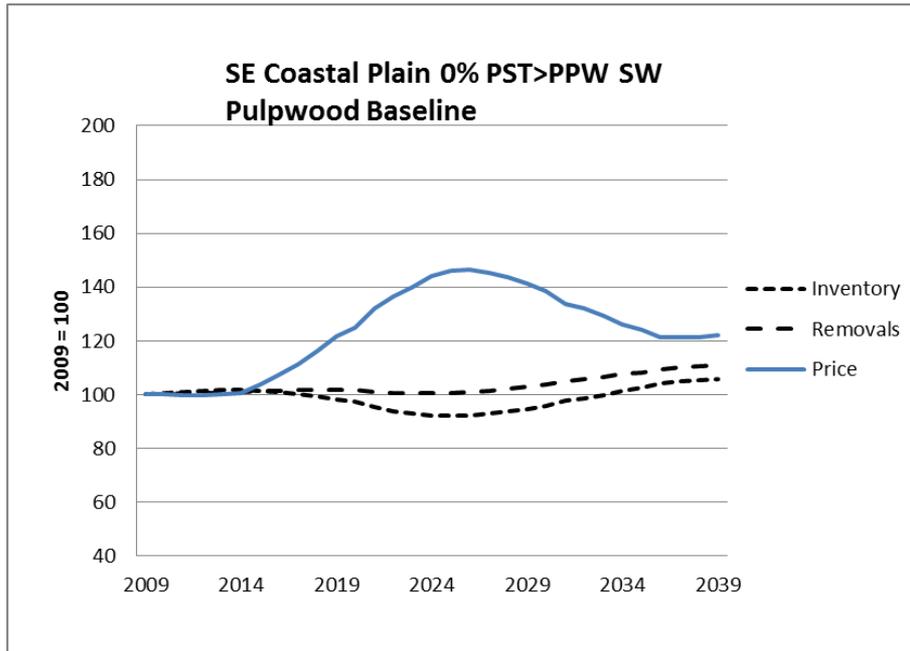
Announced bioenergy capacity by region (2014-2020)



Biomass Results

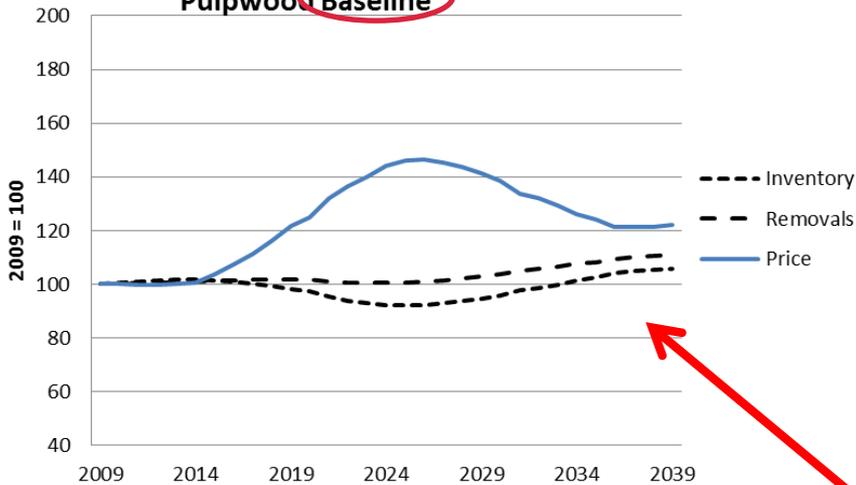
Baseline

Biomass – (70% pine)

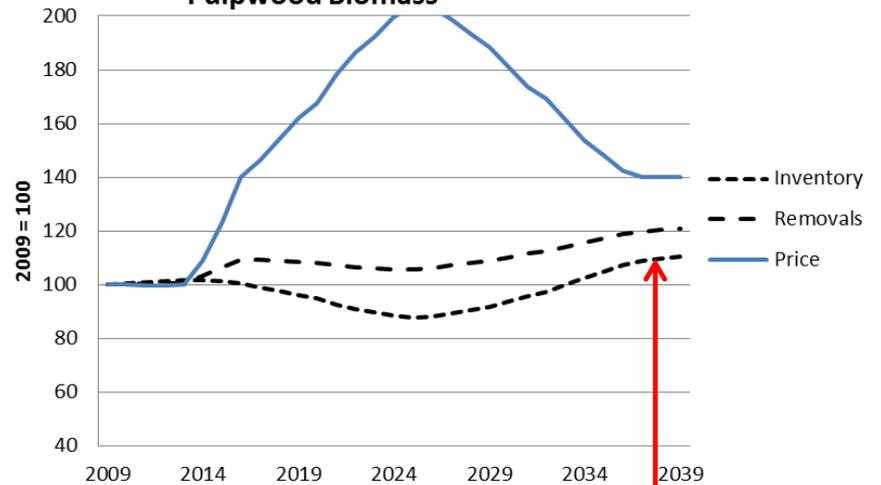


No Feedback

SE Coastal Plain 0% PST>PPW SW Pulpwood Baseline

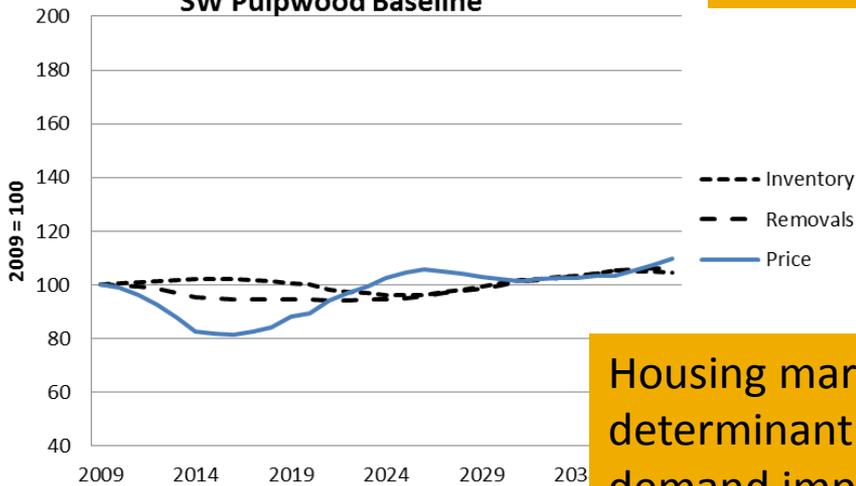


SE Coastal Plain 0% PST>PPW SW Pulpwood Biomass

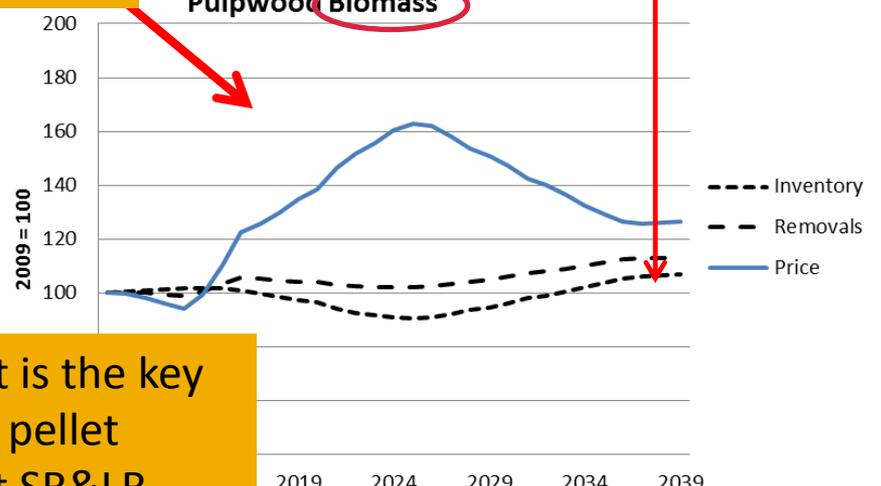


50% Feedback

SE Coastal Plain 50% PST>PPW SW Pulpwood Baseline



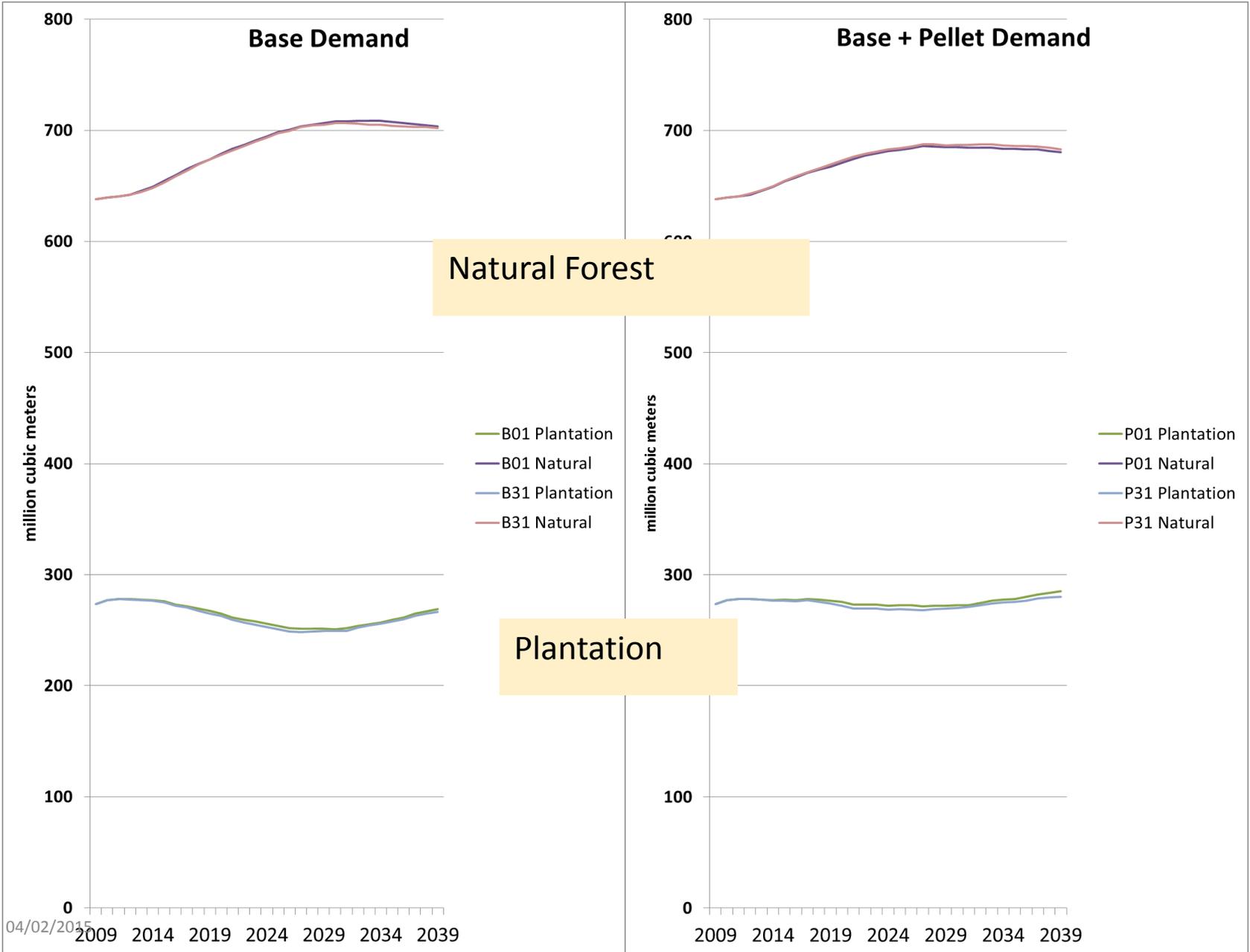
SE Coastal Plain 50% PST>PPW SW Pulpwood Biomass

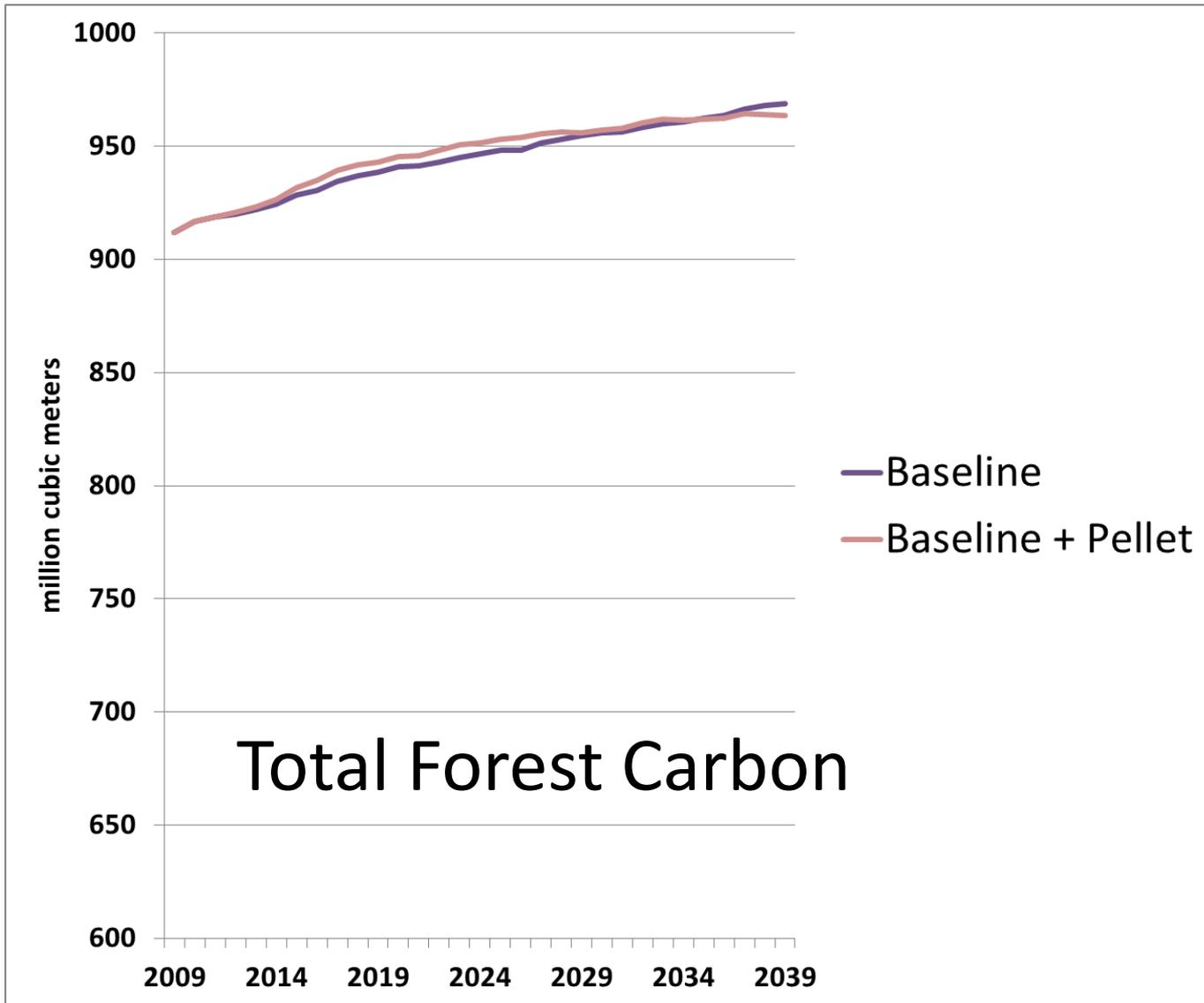


Housing market is the key determinant of pellet demand impact SR&LR



FOREST CARBON





Questions?

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