Effects of Using Woody Biomass for Bioelectricity in the Southeastern U.S.: considerations and applications

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Workshop #6: Forestry, Agriculture & Climate Change:
Modeling to Support Policy Analyses
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Nicholas Institute for Environmental Policy Solutions, Duke University

College of Natural Resources, North Carolina State University

SRTS Policy Context

Sub-**R**egional **T**imber **S**upply Model:

A regional partial-equilibrium model, best used to answer questions involving localized markets and short to medium time frames:

- State-level effects of NC REPS implementation;
- Sub-regional consequences of biomass co-firing;
- Regional implications of pellet plant operation and expansion.

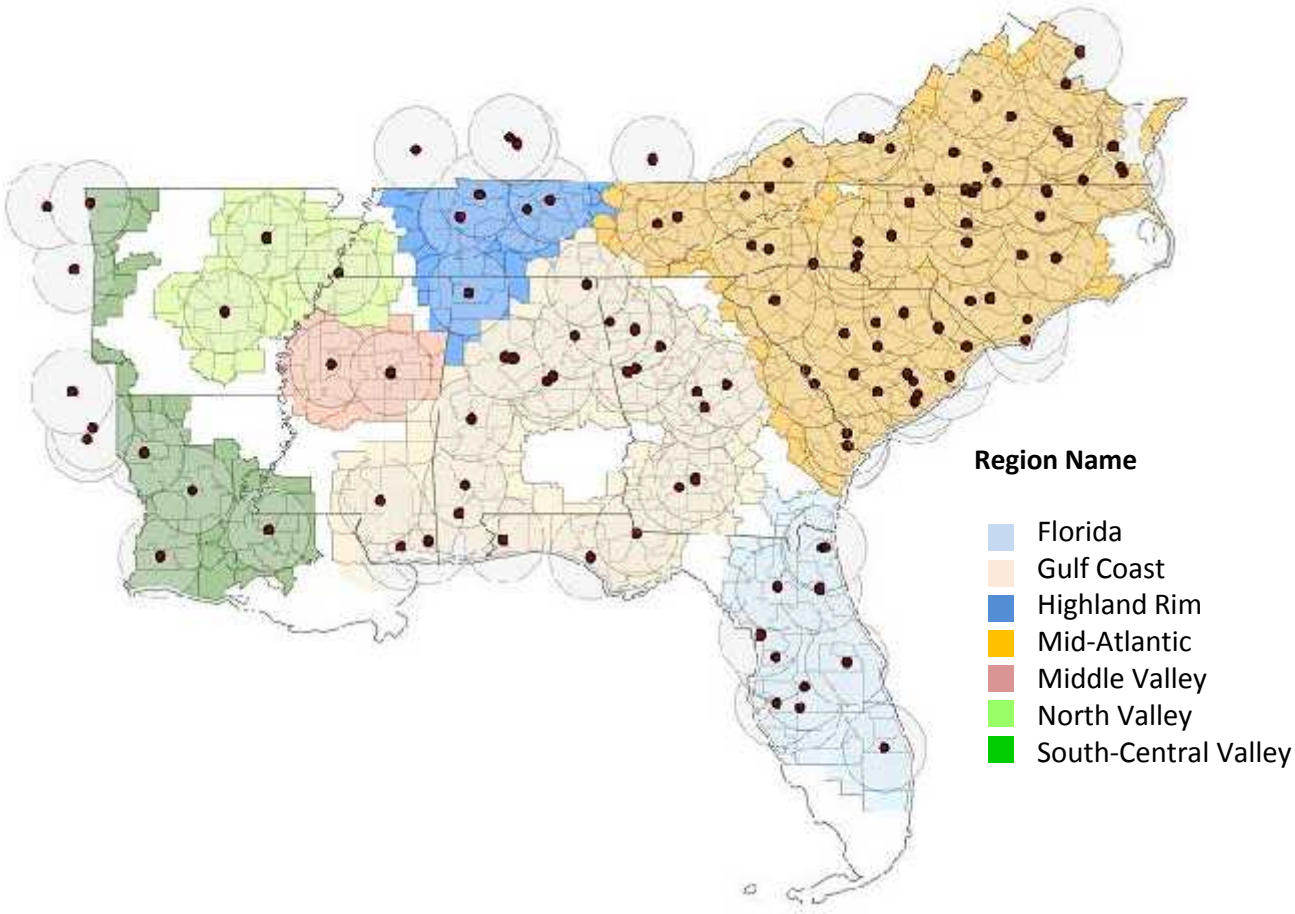
Model Framework

Sub-**R**egional **T**imber **S**upply Model:

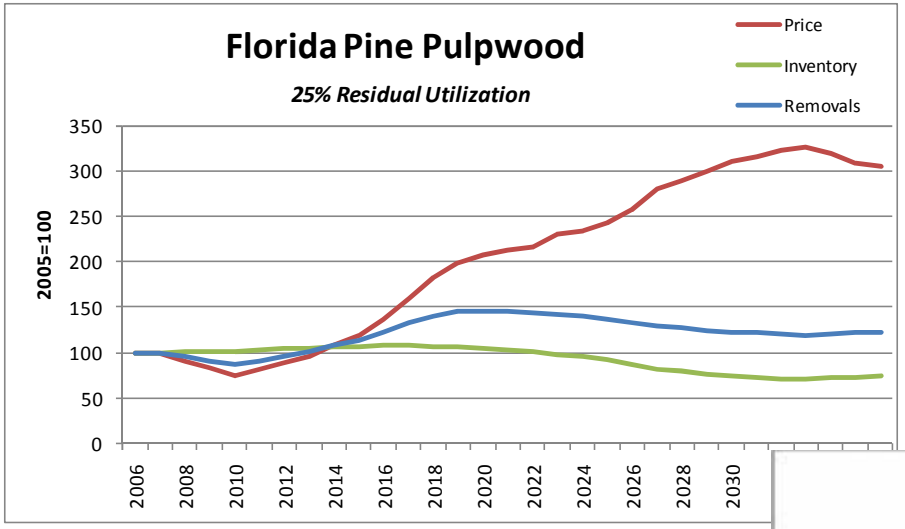
- A simulation tool that provides detailed forest resource supply projections in response to user-defined demands
  - For this application, 3 key components
    - Supply
    - Demand Shifts and "Displacement"
    - Land-use Change

See also: Abt et al. 2009

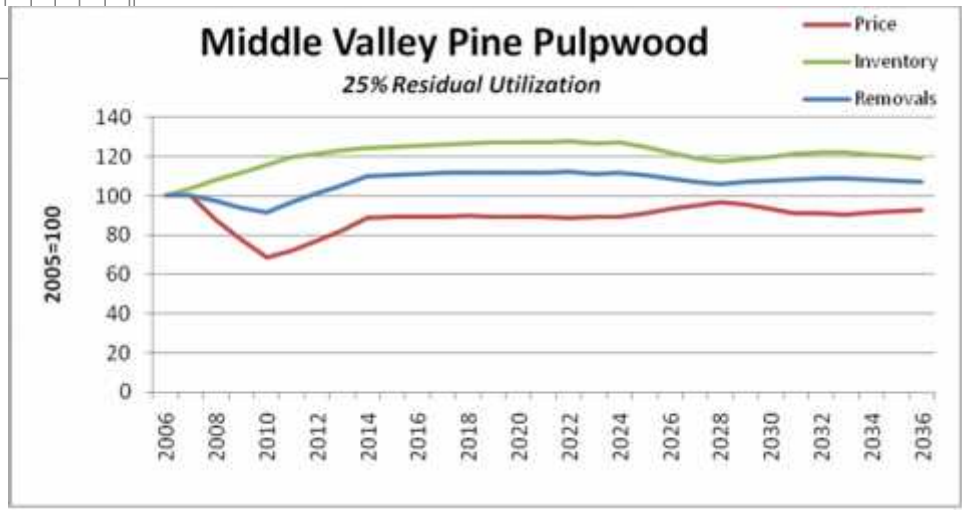
Regions Defined



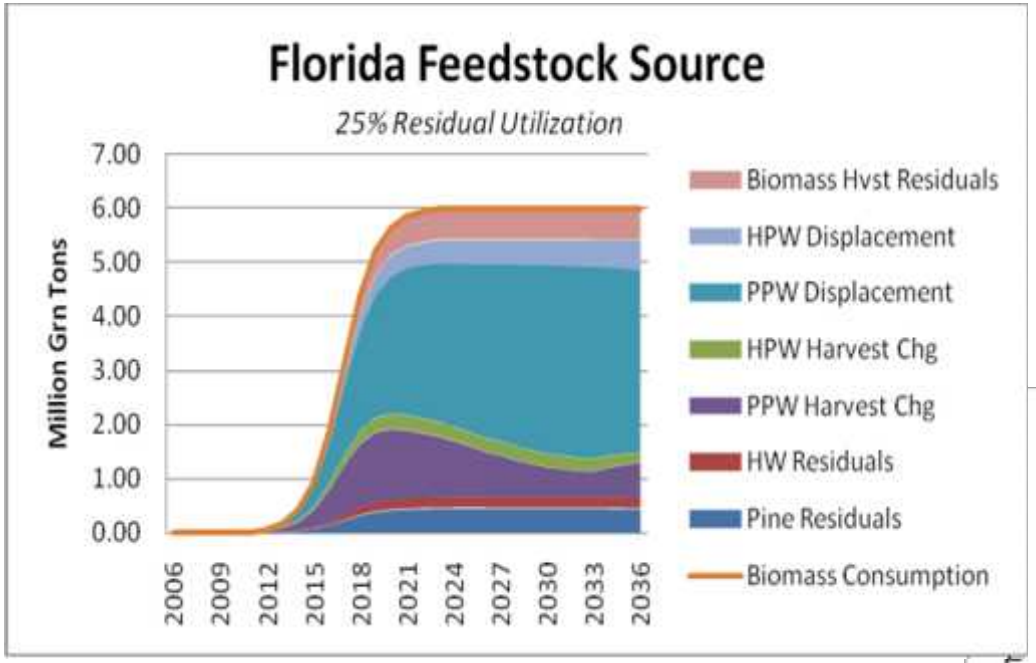
Price Change & Harvest Response



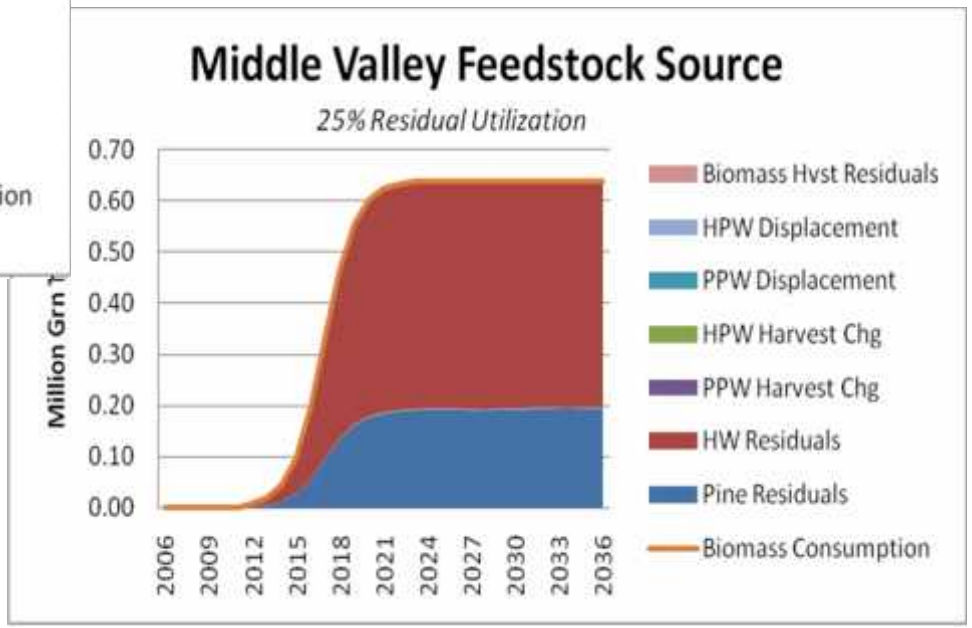
Source: Abt et al. 2010



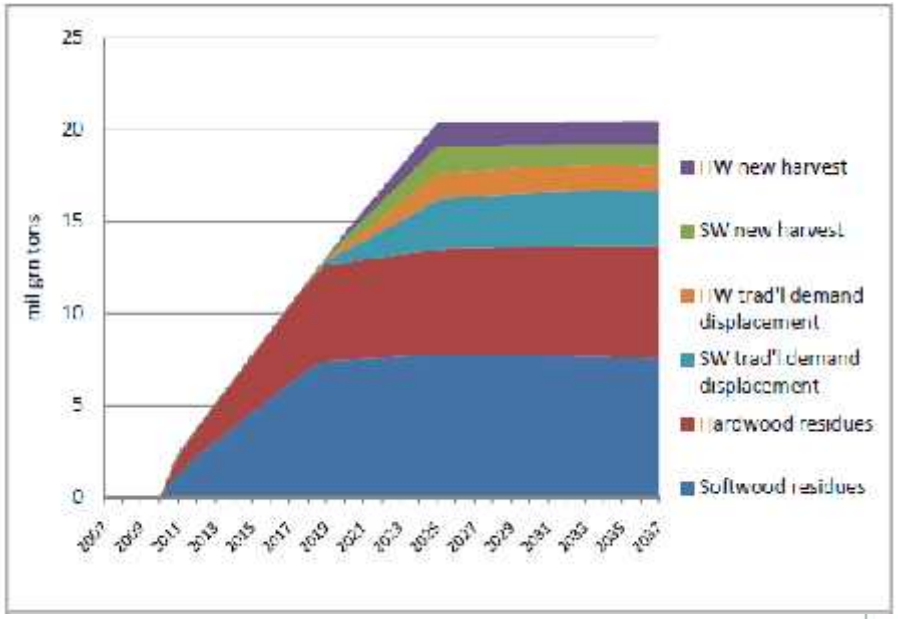
Biomass Source



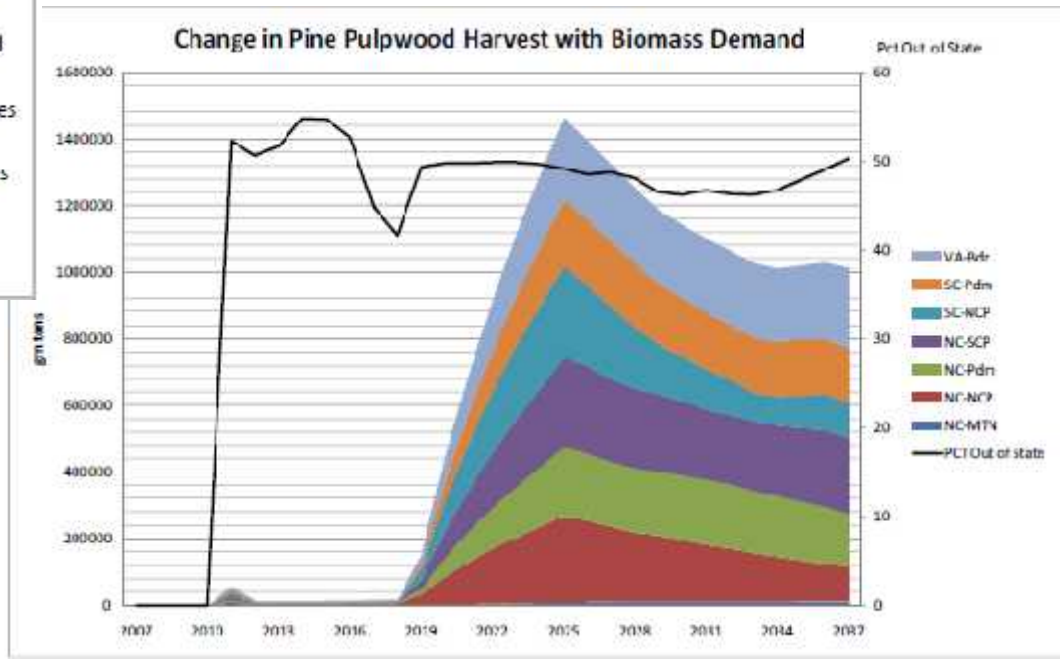
Source: Abt et al. 2010



Biomass Source



Source: LaCapra Associates, Inc. 2011.



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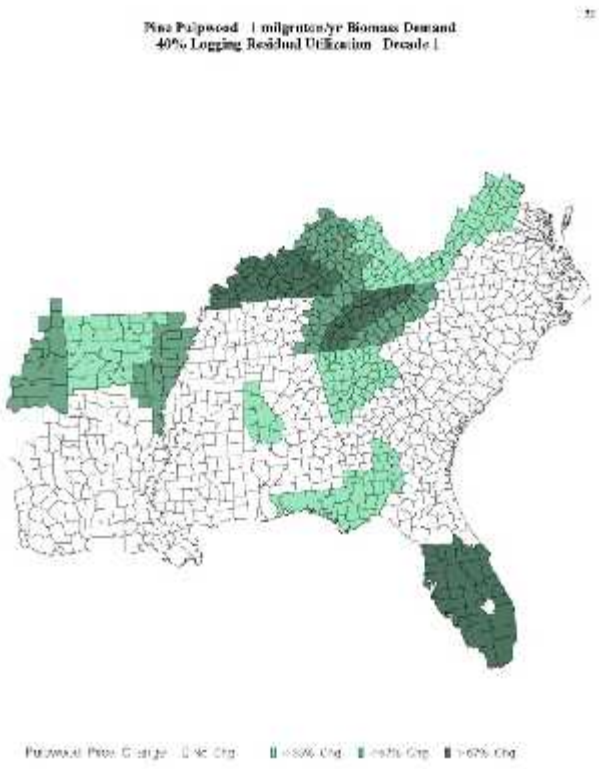
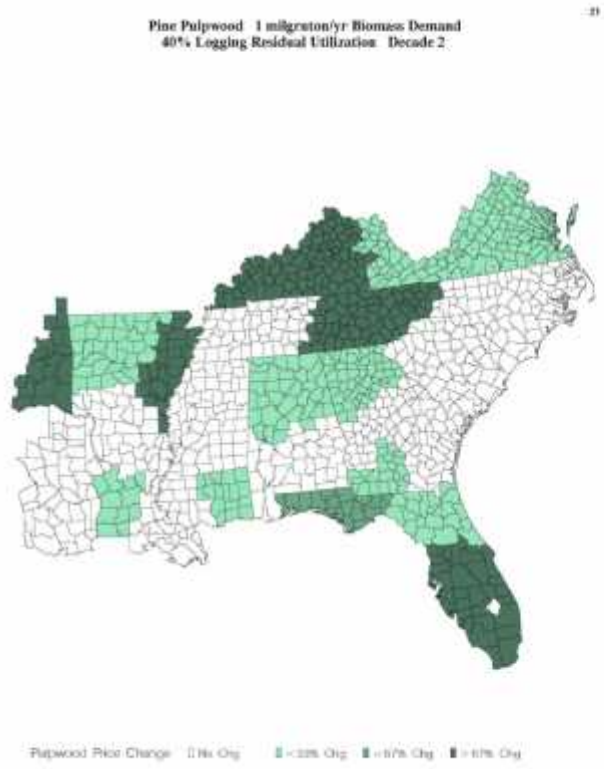
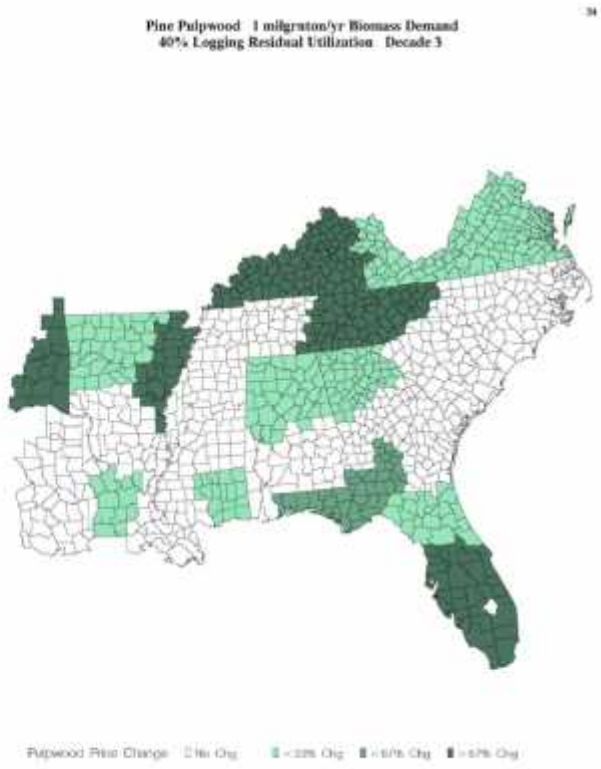
Biomass Source & Price Change







1 milgrnton/yr
40% residues
decades 1-3

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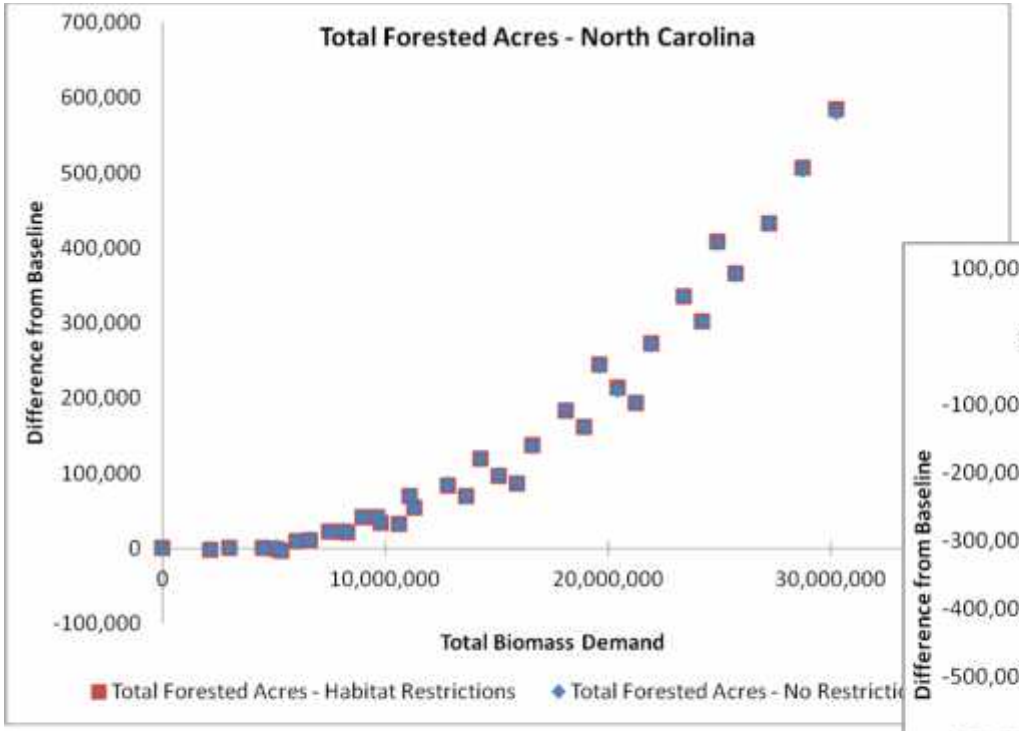
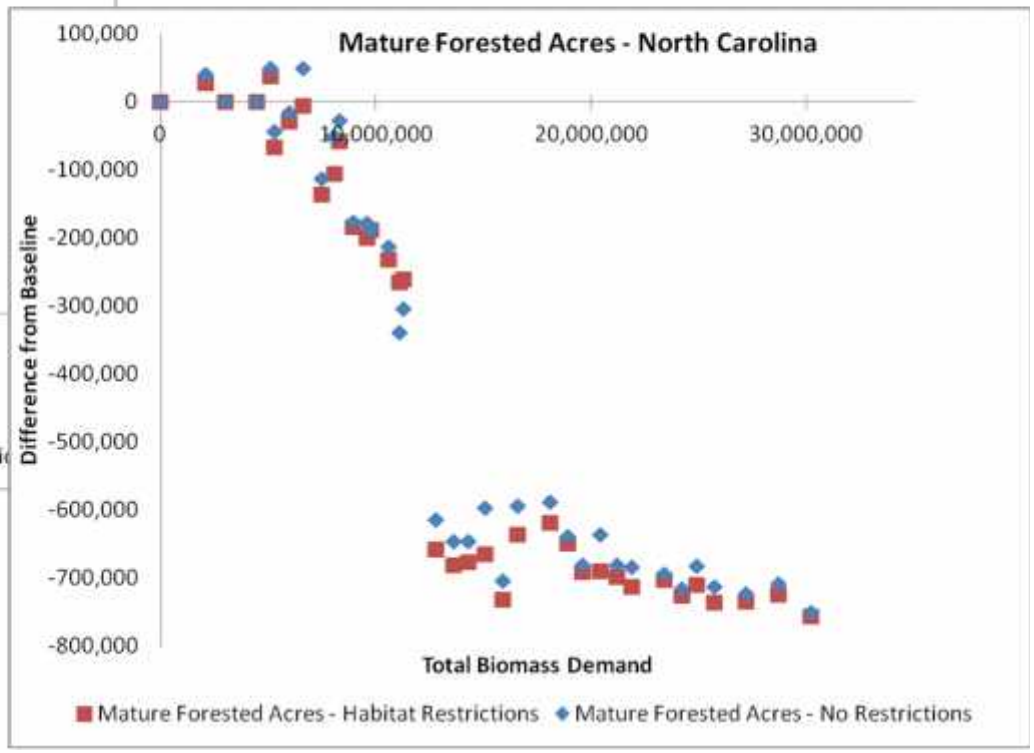
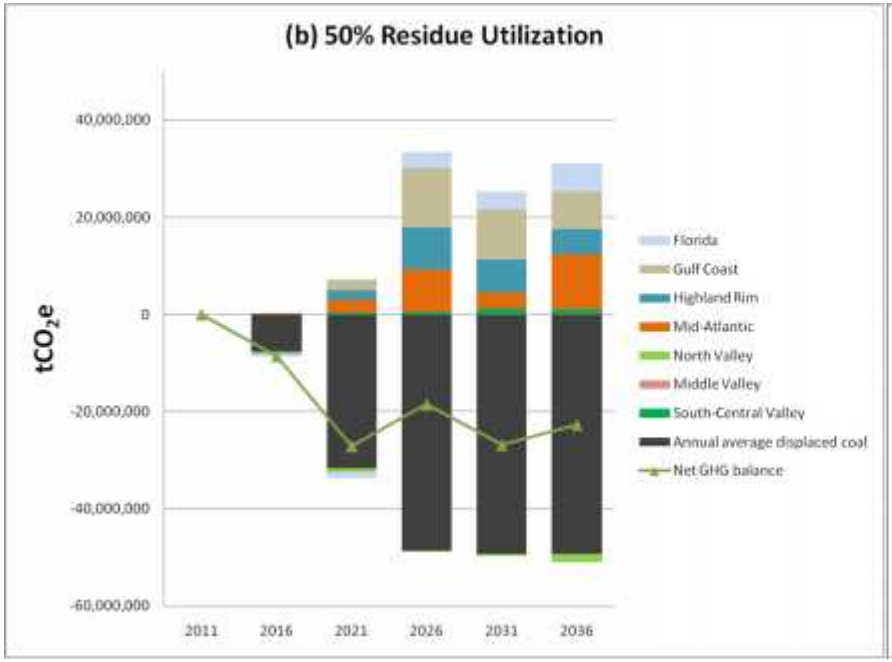
Forest Composition & Extent



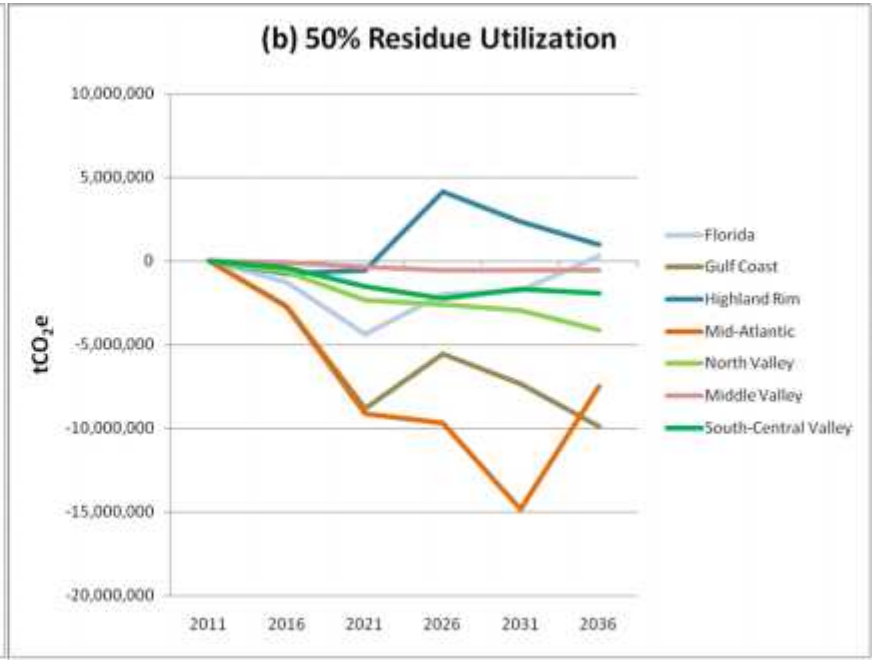


Source: Galik and Abt 2011

Carbon Dynamics



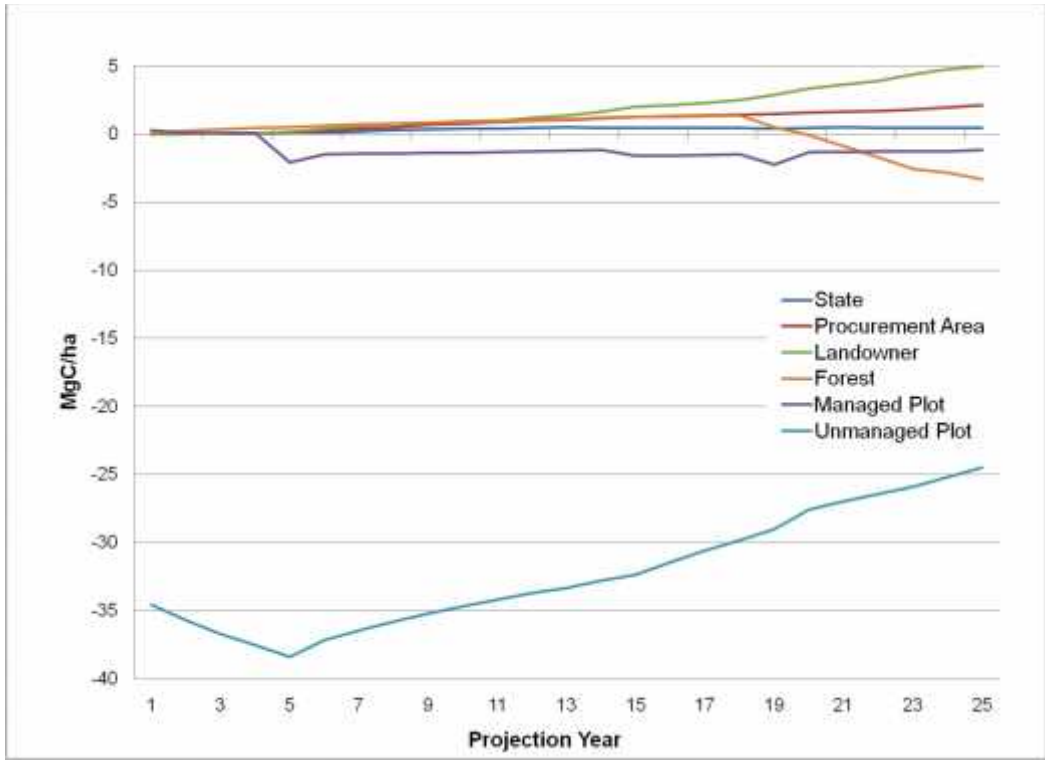
Net flux and source of GHG emissions from maximizing co-firing in the Southeast 50% residue utilization.



Net GHG emission flux from maximizing co-firing in the Southeast, by supply subregion, assuming 50% residue utilization.

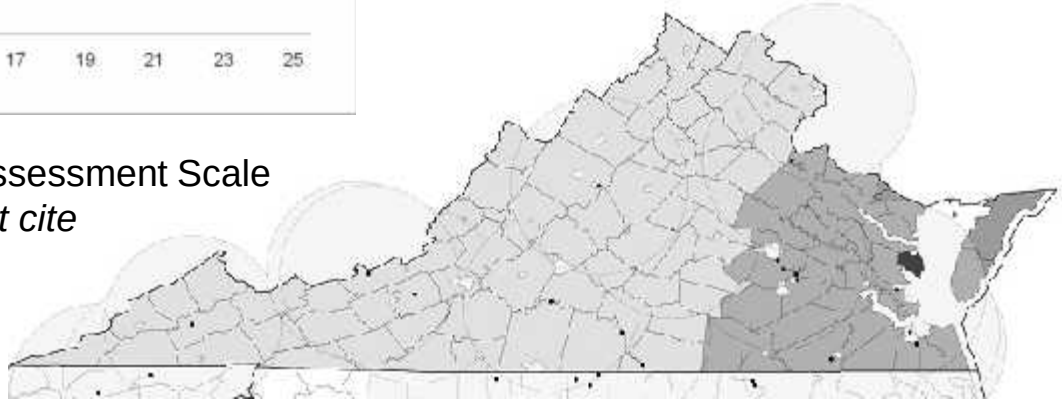
Source: Abt et al. 2010

Carbon Dynamics



Relative Net GHG Implications by Assessment Scale

Preliminary data – do not cite



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General Conclusions

- Short-run adjustments are limited;
- Results therefore hinge strongly on issues of -
  - Timing;
  - Scale and magnitude;
  - Baseline;
  - Starting conditions.
- Not surprisingly, these issues are central to EPA assessment of biomass and biogenic emissions…

Further Information…

http://www.nicholasinstitute.duke.edu/, search “biomass”

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Extra Material – Land-Use Assumptions

- Urbanization -> decreasing rural land driven by county level population forecasts
- Rural allocation to ag vs. forest depend on relative prices
- Increasing wood prices (holding ag constant) leads to additional timberland
- Allocation to forest types
  - Increases favor plantations
  - Decreases affect all types