

The US Wood Pellet Industry

Speakers

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November 23, 2020

Expansion of US Wood Pellet Industry Points to Positive Trends but the Need for Continued Monitoring

23 November 2020

scientific reports <https://www.nature.com/articles/s41598-020-75403-z>

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A.M., F.A. and R.M. designed the study. A.M. completed all calculations and prepared related figures and tables. F.A. led writing of the main manuscript text. R.M., S.S., and D.B., contributed policy-, energy-, and resource-related implications of findings. F.A., R.M., S.S., and D.B. secured research funding.

Acknowledgments

- USDA National Institute of Food and Agriculture
- USDA McIntire-Stennis
- Computing infrastructure provided by Research Computing Support Services at the University of Missouri, partly funded by the National Science Foundation

Publication is not intended to reflect the opinions of these institutions



United States
Department of
Agriculture

National Institute
of Food and
Agriculture

Contributions

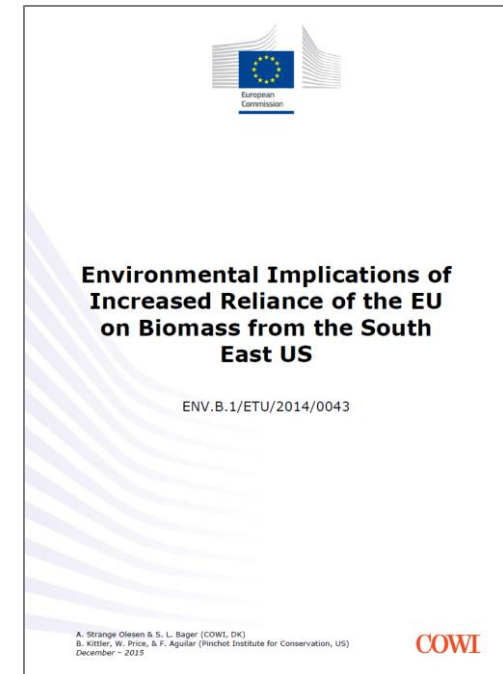
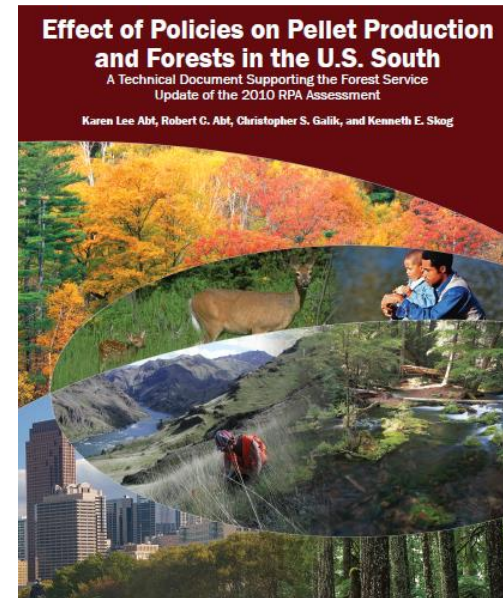
- Framework to assess changes in fundamental attributes of ecological, environmental, and commercial importance within *procurement landscapes*
- *Spatially-explicit* renewable energy policy-induced effects on timberlands
- First comprehensive and *systematic* assessment

COMMENT



Europe's renewable energy directive poised to harm global forests

Timothy D. Searchinger¹, Tim Beringer², Bjart Holtsmark³, Daniel M. Kammen⁴, Eric F. Lambin^{5,6}, Wolfgang Lucht^{7,8}, Peter Raven⁹ & Jean-Pascal van Ypersele⁶



Timberland attributes



Procurement landscapes

- Large-scale: 20.1 km²
- Smaller-scale: 7.2 km²

Number of trees

- Live
- Growing-stock
- Standing-dead

Carbon pools

- Live trees (A&B ground)
- Standing-dead (A&B ground)
- Soil (organic)

Forest Inventory and Analysis

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Forest Inventory and Analysis

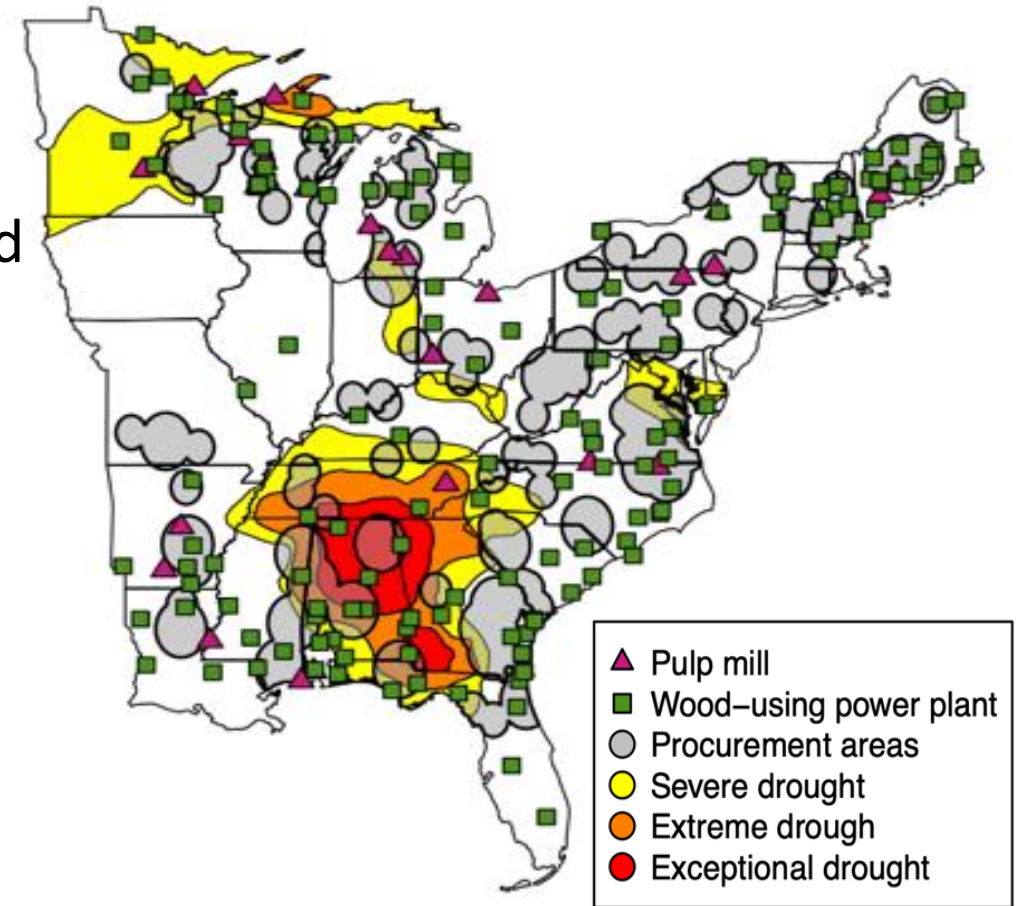
<https://www.fia.fs.fed.us/>

Cut-off point for mills of large-scale capacity: 100K metric tons of annual capacity
Estimated average sampling errors for selected attributes were all less than 5%

Modeling timberland attributes

2008

- Wood pellet mill descriptors
- Coastal southeast, rest of eastern US
- *post* recession, domestic bioenergy policy period
- Population
- Access to export markets
- Severe weather (extreme drought)
- Competition for wood fibers



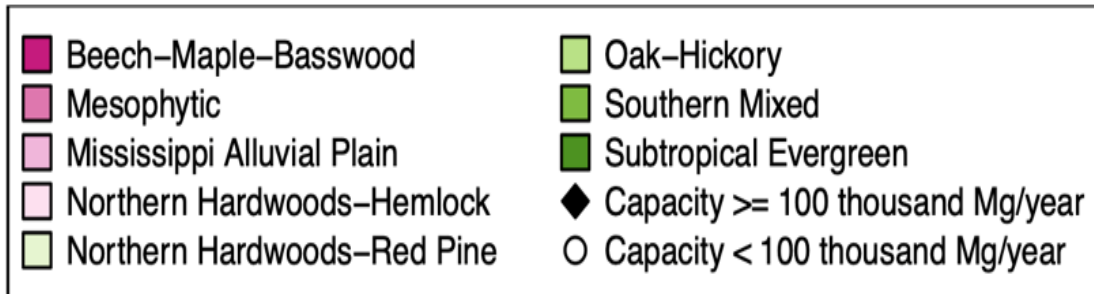
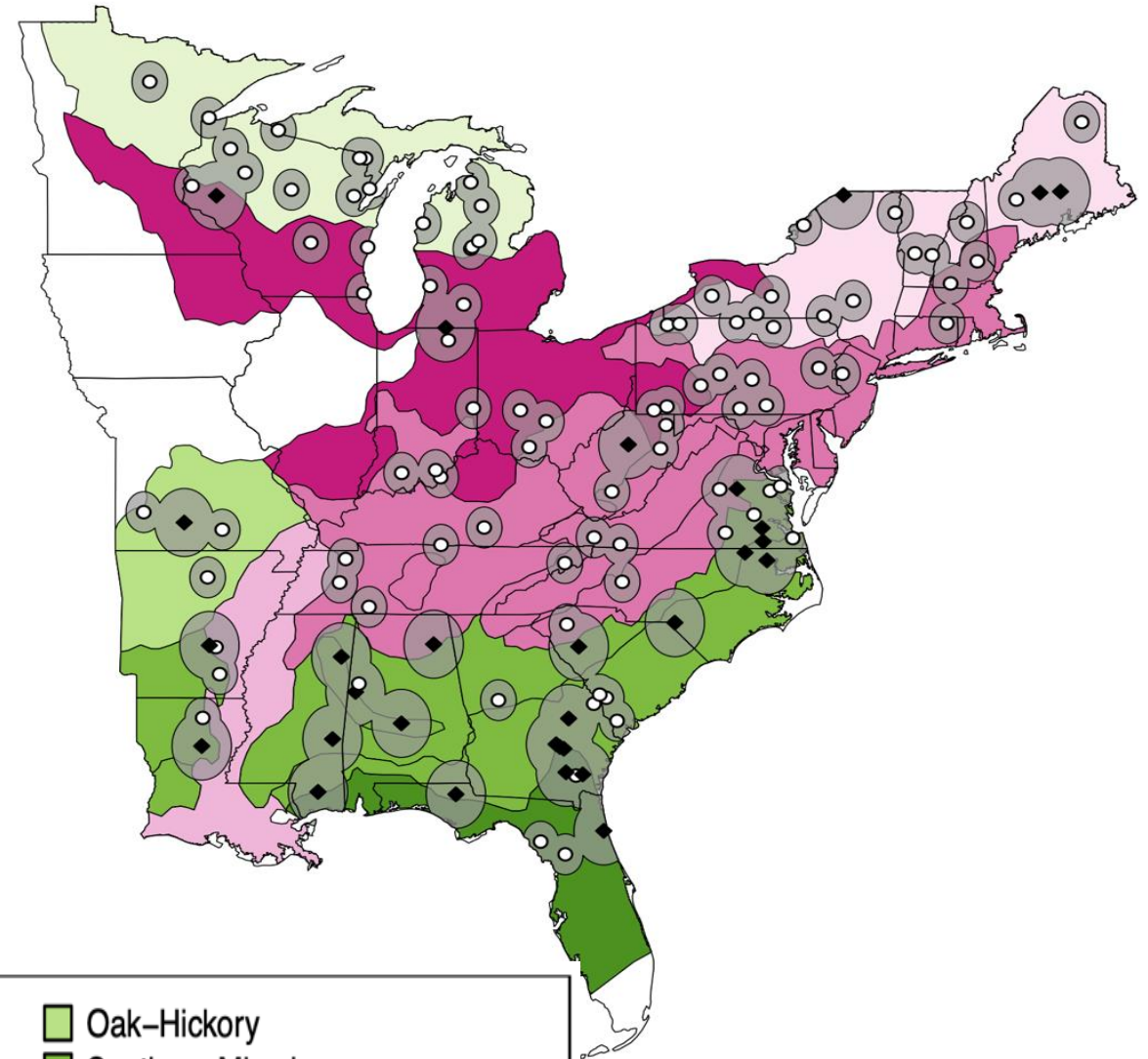
Selected results

Eastern US from 2005 to 2017:

- 123 procurement landscapes
- Values derived from over 38 thousand inventory plots

Net wood pellet industry effects:

- US coastal southeast
- Large-scale pellet mills



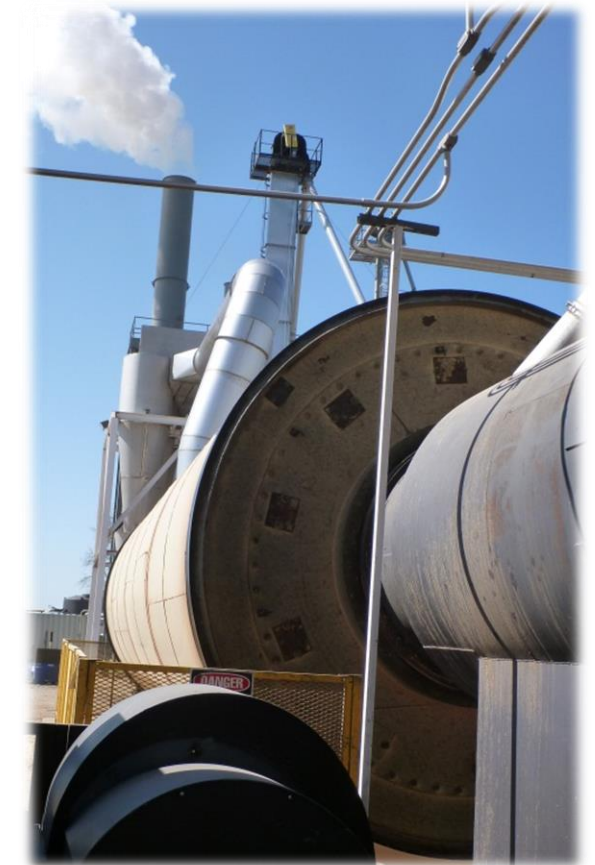
Annual operation

Wood pellet plants in US coastal southeast * :

Attribute	Procurement area	Area-adjusted
Live trees	-8.21 million trees	-11.22 trees/ha/year
Growing stock trees	-1.55 million trees	-2.12 tress/ha/year
C stocks: Soils	-234.95 thousand tons	-0.32 tons/ha/year

Large-scale wood pellet mills (100K tons of annual capacity) *:

Attribute	Procurement area	Area-adjusted
C stocks: Live trees	+407.85 thousand tons	+0.20 tons/ha/year
Standing dead trees	- 474.9 thousand trees	-0.23 trees/ha/year



FX Aguilar

* As compared with procurement areas of wood pellet mills in the rest of the eastern US, under 100K tons/year capacity

Increase in fiber competition over landscape



FX Aguilar

A 1% increase in overlap of wood pellet mill procurement areas

- More growing stock trees: 7,817.90 thousand trees
- More C in live trees: 1,518.17 thousand tons
- More C in standing-dead trees: 47.94 thousand tons
- Greater C in soils: 965.97 thousand tons.

Insights

- **More C in live trees**
Incentive to grow and regrow wood fibers.
- **Fewer dead trees:**
Cope with wildfires, may affect habitat & nutrient cycles.
- **Less C in soils:**
Reflection of intensification?



Florian Steierer, UNECE

Current & expected trends

Wood fiber demand & composition

- 69% of pellet fibers were sawmill residues (by weight), prior to EU RED. By 2017 sawmill residues accounted for about 18%.
 - Residues have little/no C additionality effects.
- Wood directly coming from timberlands of increasing importance: 49% residual biomass & 20% roundwood/pulpwood in 2017.
 - Potential to increase C in live biomass.



Florian Steierer, UNECE

Continued monitoring

- Control for other localized conditions of concurrent effects:
 - Population changes
 - Expansion in wood fiber demand from other competing sectors
 - Extreme weather
- Compounded effects of EU and US renewable energy policies deserve continued examination.



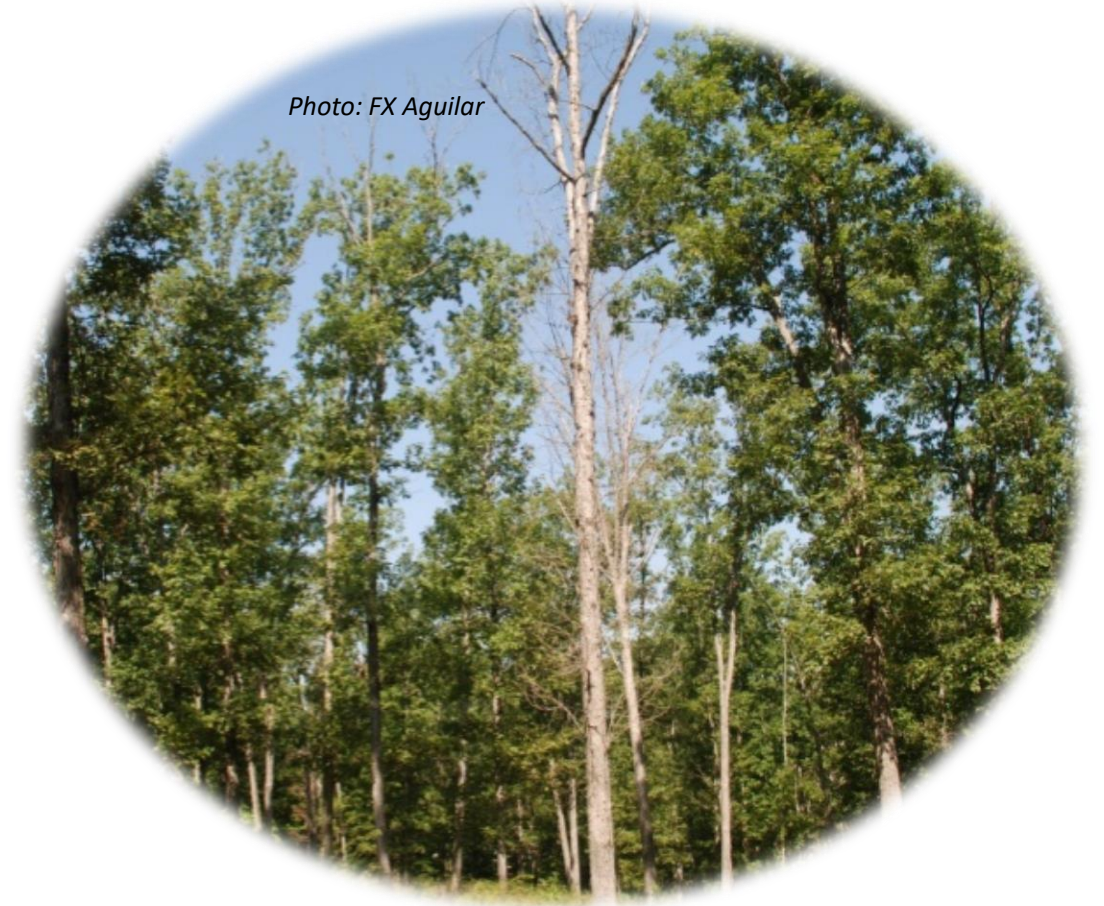
Florian Steierer, UNECE

Questions

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Swedish University of Agricultural Sciences



Supplementary information

Rapid growth in pelletization capacity

2005:

Total capacity: 0.2 million metric tons

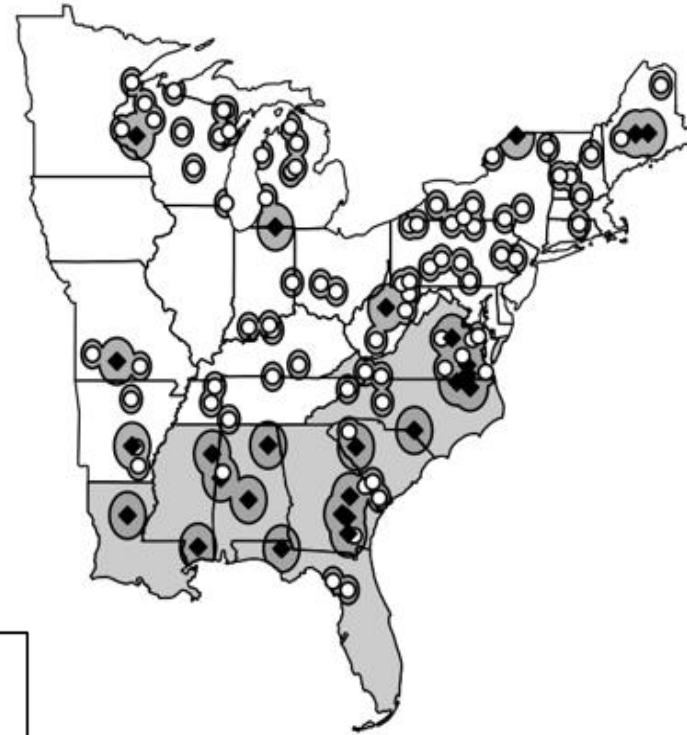
Coastal Southeast 0.1 million metric tons



2017:

Total capacity: 11.2 million metric tons

Coastal Southeast 7.3 million metric tons



- US coastal southeast
- Rest of US east
- ◆ Capacity ≥ 100 thousand Mg/year
- Capacity < 100 thousand Mg/year

Selected timberland attributes

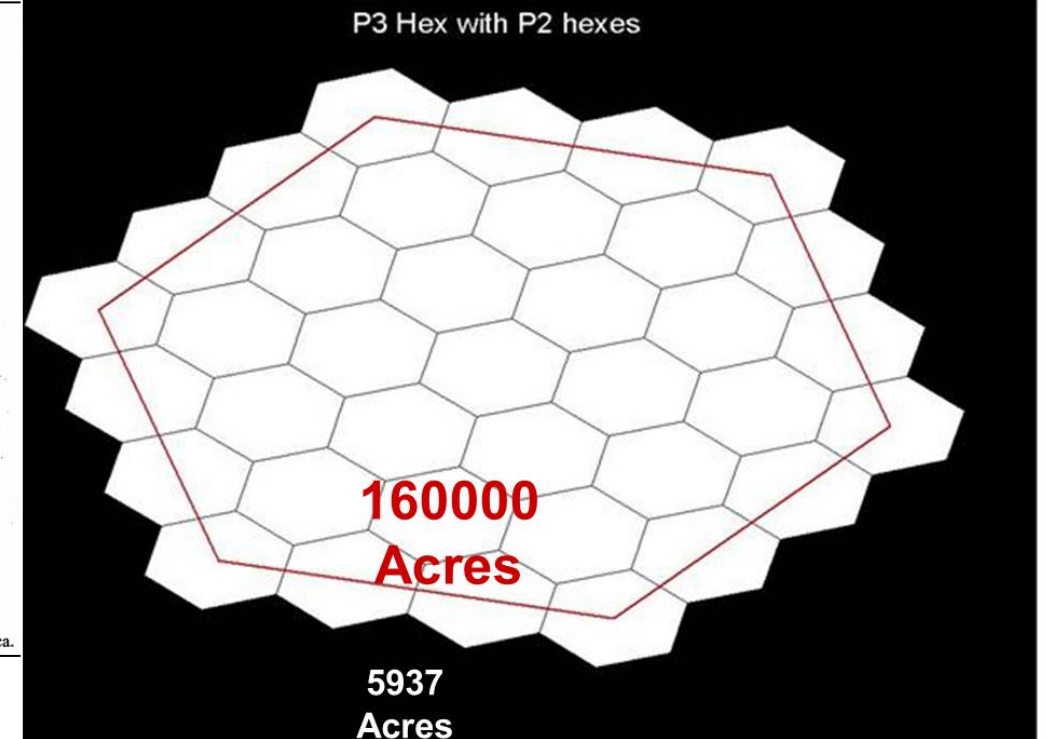
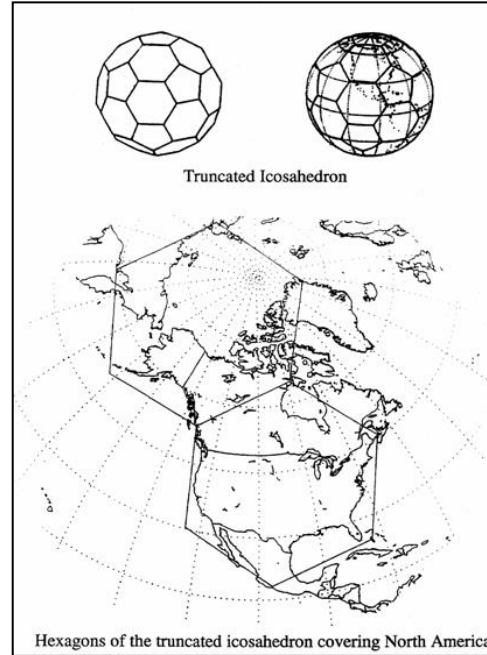


Number of trees:

- Live
- Growing-stock
- Standing-dead

Carbon pools

- Live trees (A&B ground)
- Standing-dead (A&B ground)
- Soil



1 plot = 6,475 ha

Estimated average sampling errors for selected attributes were all less than 5%

Spatially-explicit explanatory variables:

Wood pellet mill descriptors:

- size, location, years operation, proximity to ports

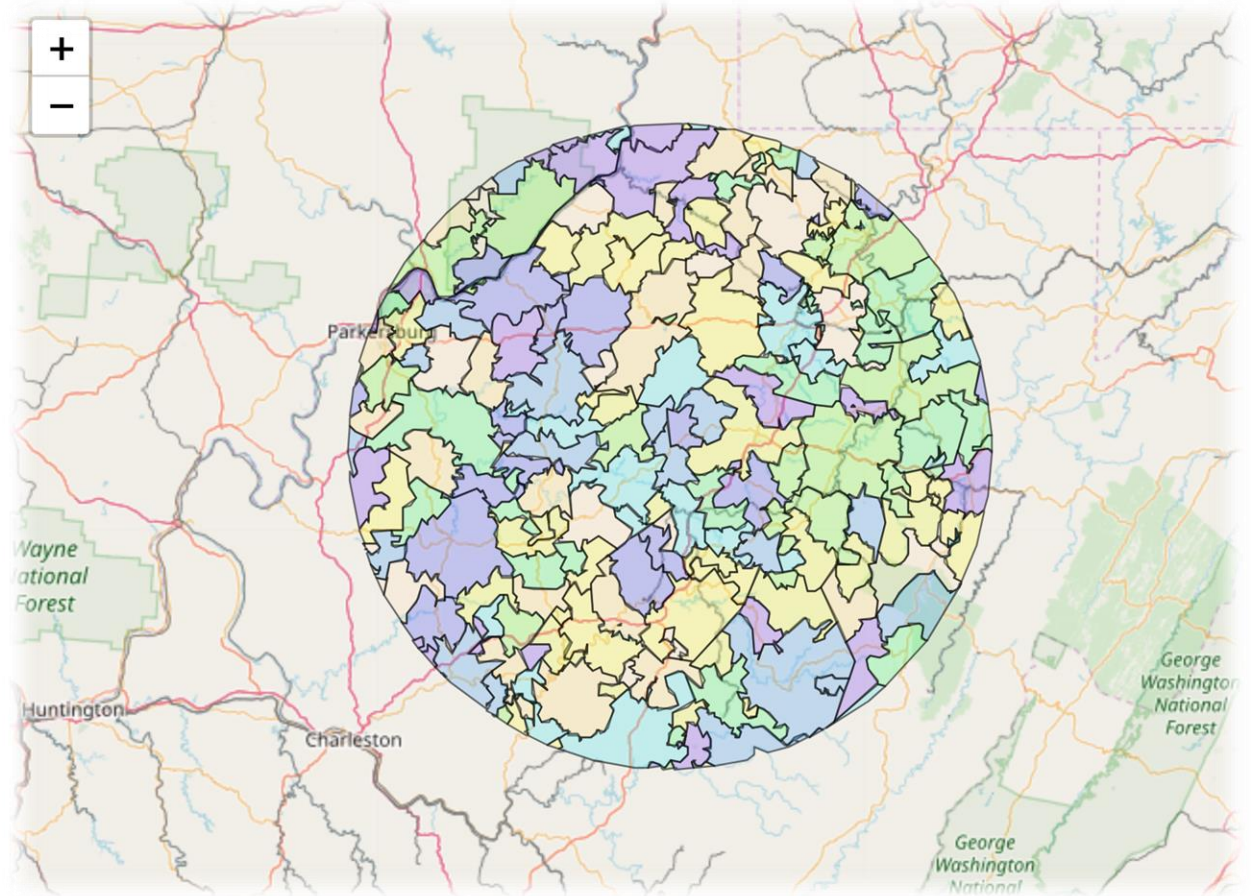
Fiber competition:

- pulp mills, wood-using power plants

Population

Extreme draught

Post recession ('11, '14, '17)



Panel data: Resampling over 3-year windows

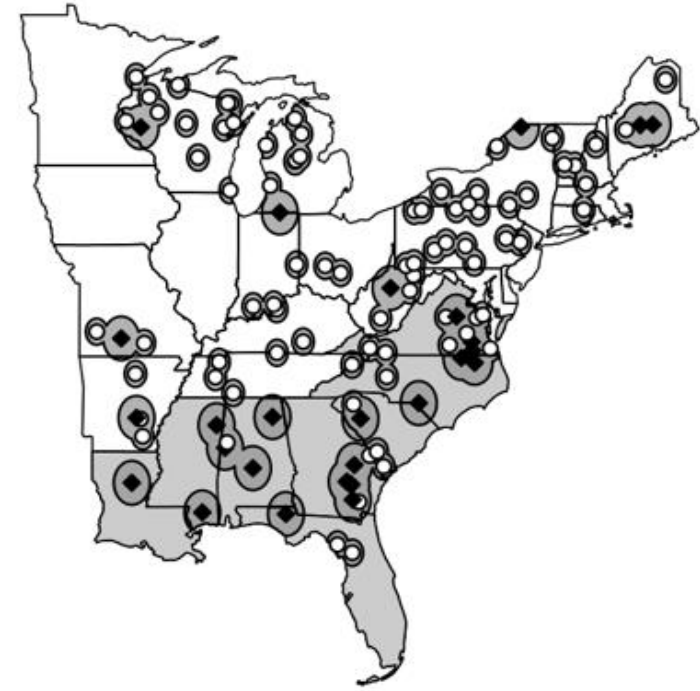
Total capacity: 0.2 million megagrams (2005)

Coastal southeast: 0.1 million Mg, Rest of east: 0.2 million Mg

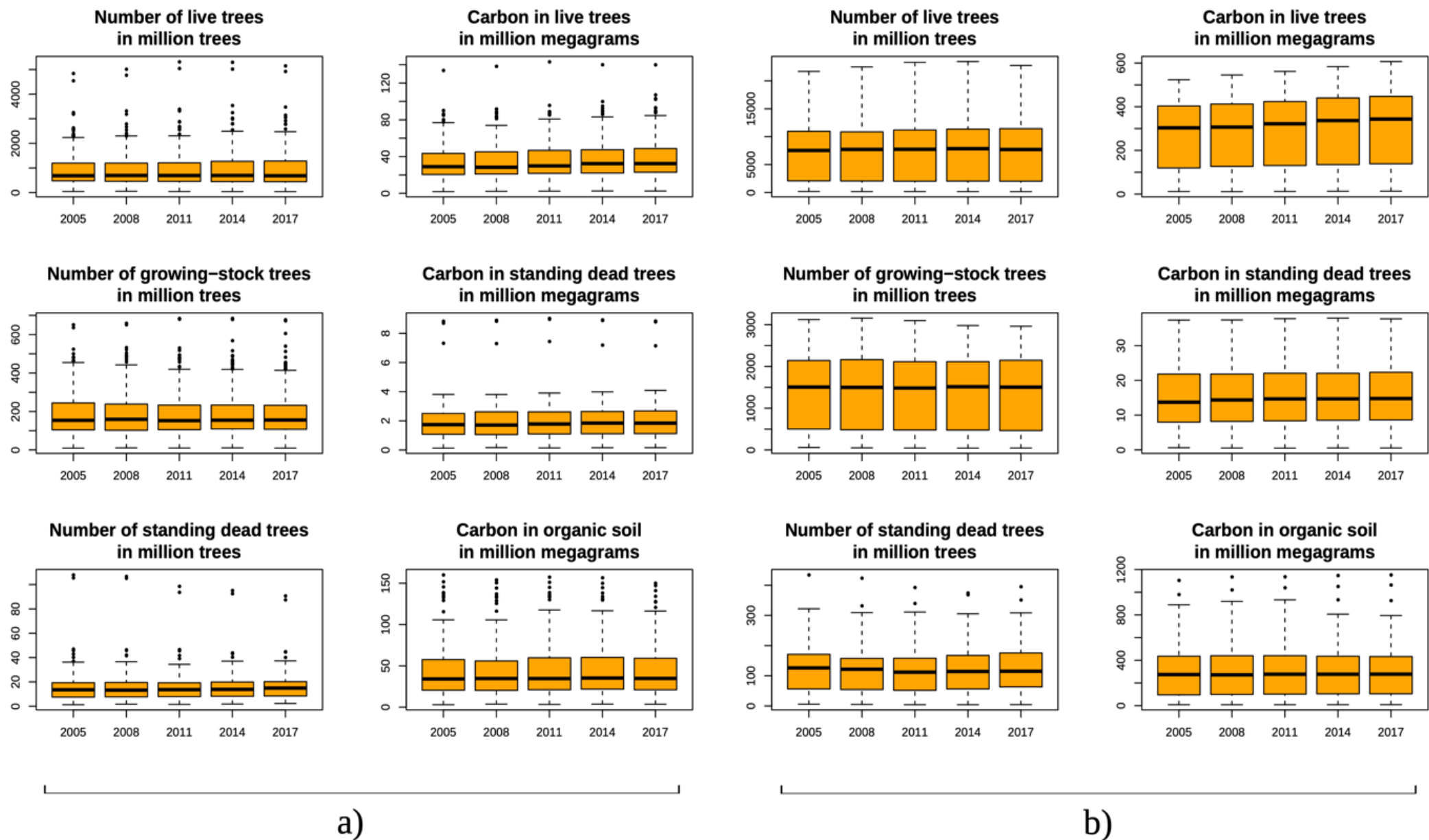


Total capacity: 11.2 million megagrams (2017)

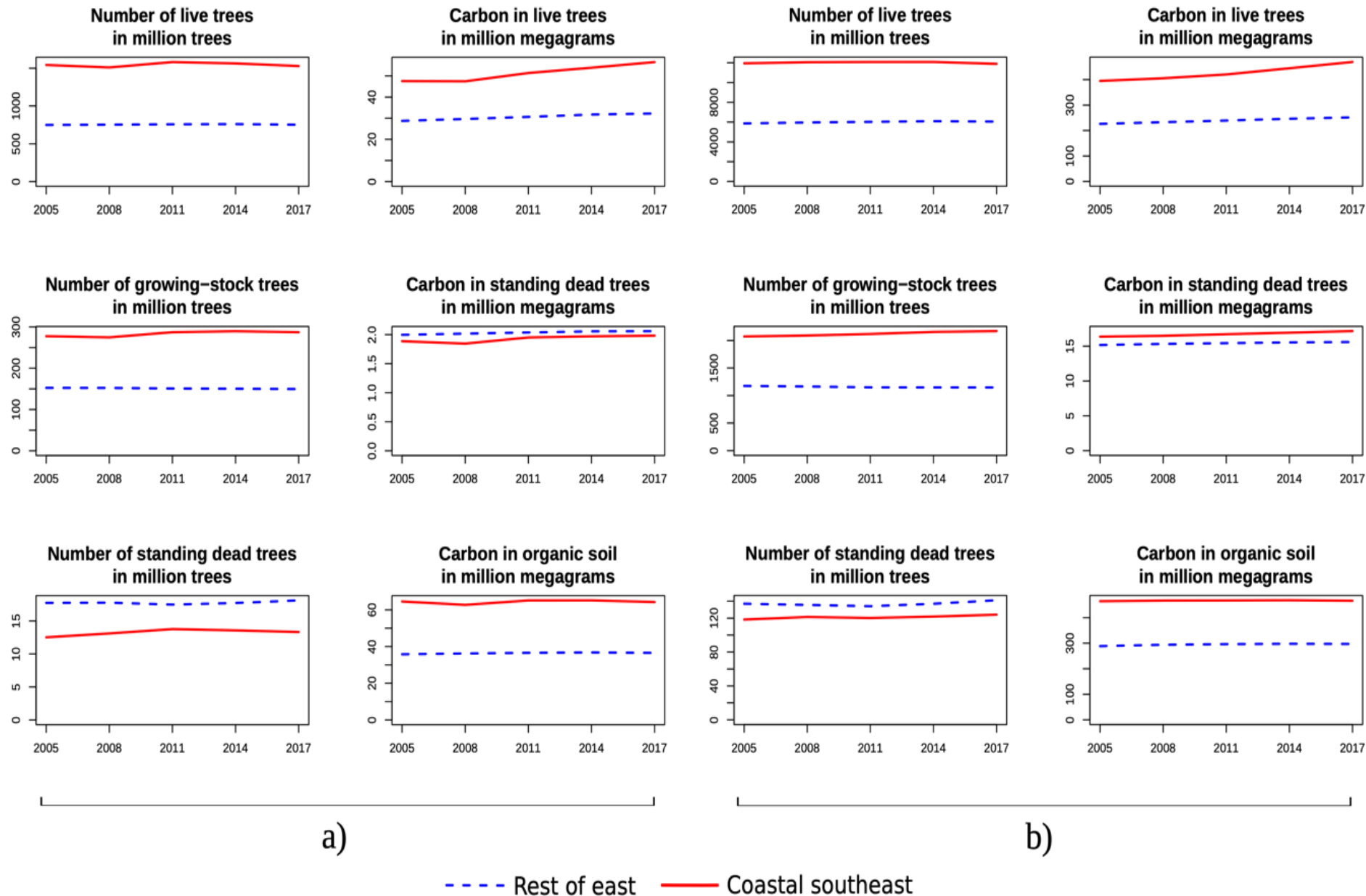
Coastal southeast: 7.3 million Mg, Rest of east: 3.9 million Mg



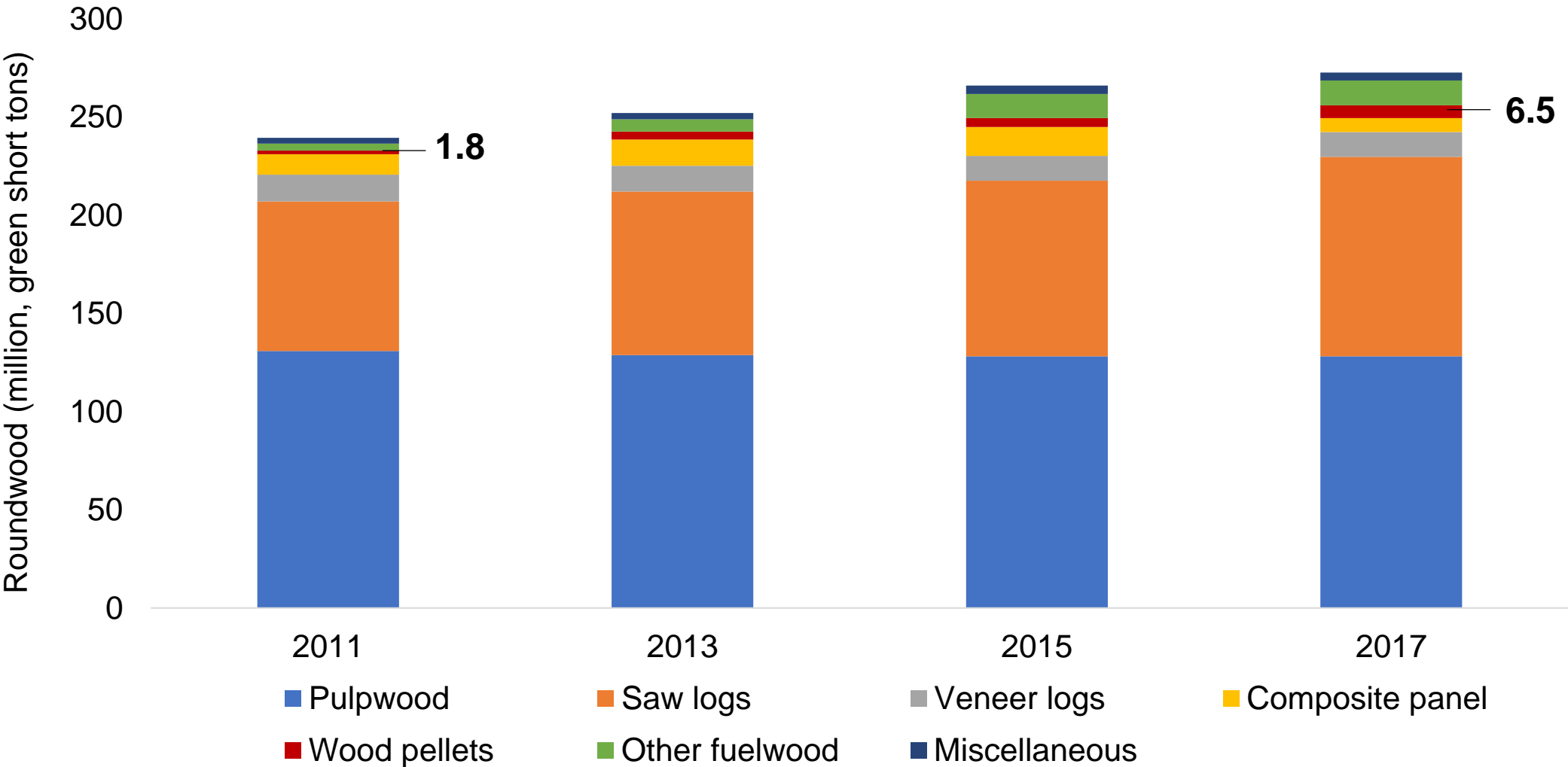
Box-plots of annual means and ranges of attributes across (a) all 123 procurement areas, and (b) all 31 states, included in our analysis of US eastern timberland conditions



Temporal average values of selected timberland attributes (a) within wood pellet mill procurement areas and (b) state-wide, distinguishing between US coastal southeast and the rest of eastern US.



US South production, by product type



*Other fuelwood: CHP (primarily pulp & paper mills), power/utility mills, charcoal, and industrial firewood.
Courtesy: Consuelo Brandeis (USDA Forest Service), adapted*