

Forest Carbon and Climate Program  
Learning Exchange Series

# Regional Scale Forest Product Markets and Effects on Forest Carbon Sequestration

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# Acknowledgments

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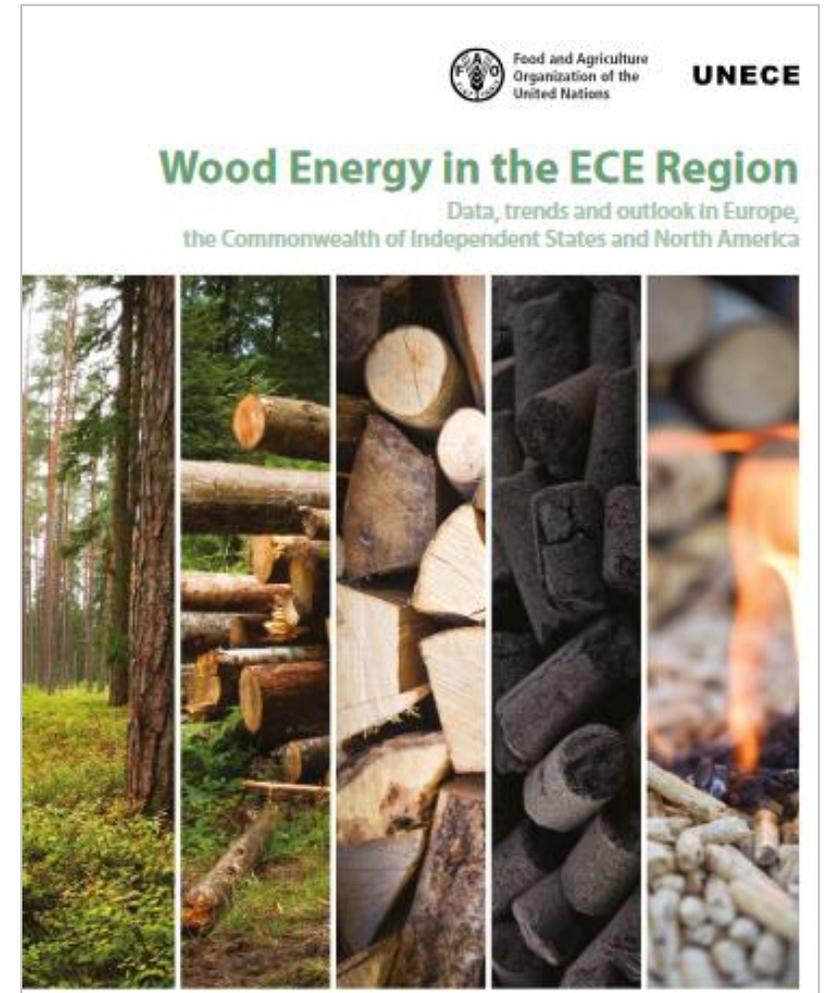
United States  
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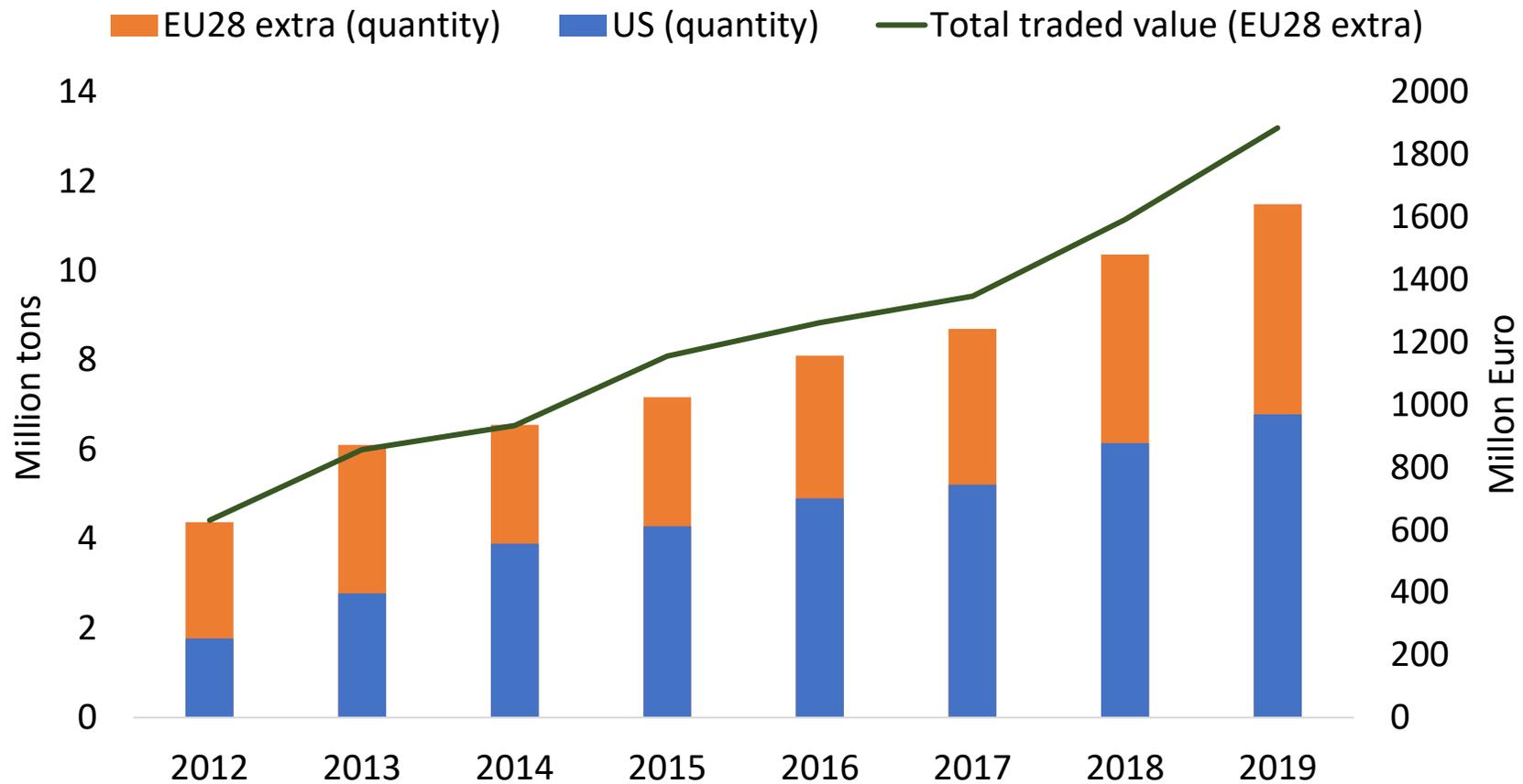
# Wood energy & carbon

Wood-energy *can* be a renewable energy source and *can* reduce net carbon emissions. Some factors:

- Wood energy supply chain (procurement, processing, conversion)
- Alternative energy sources
- Spatial and temporal scope
- ...

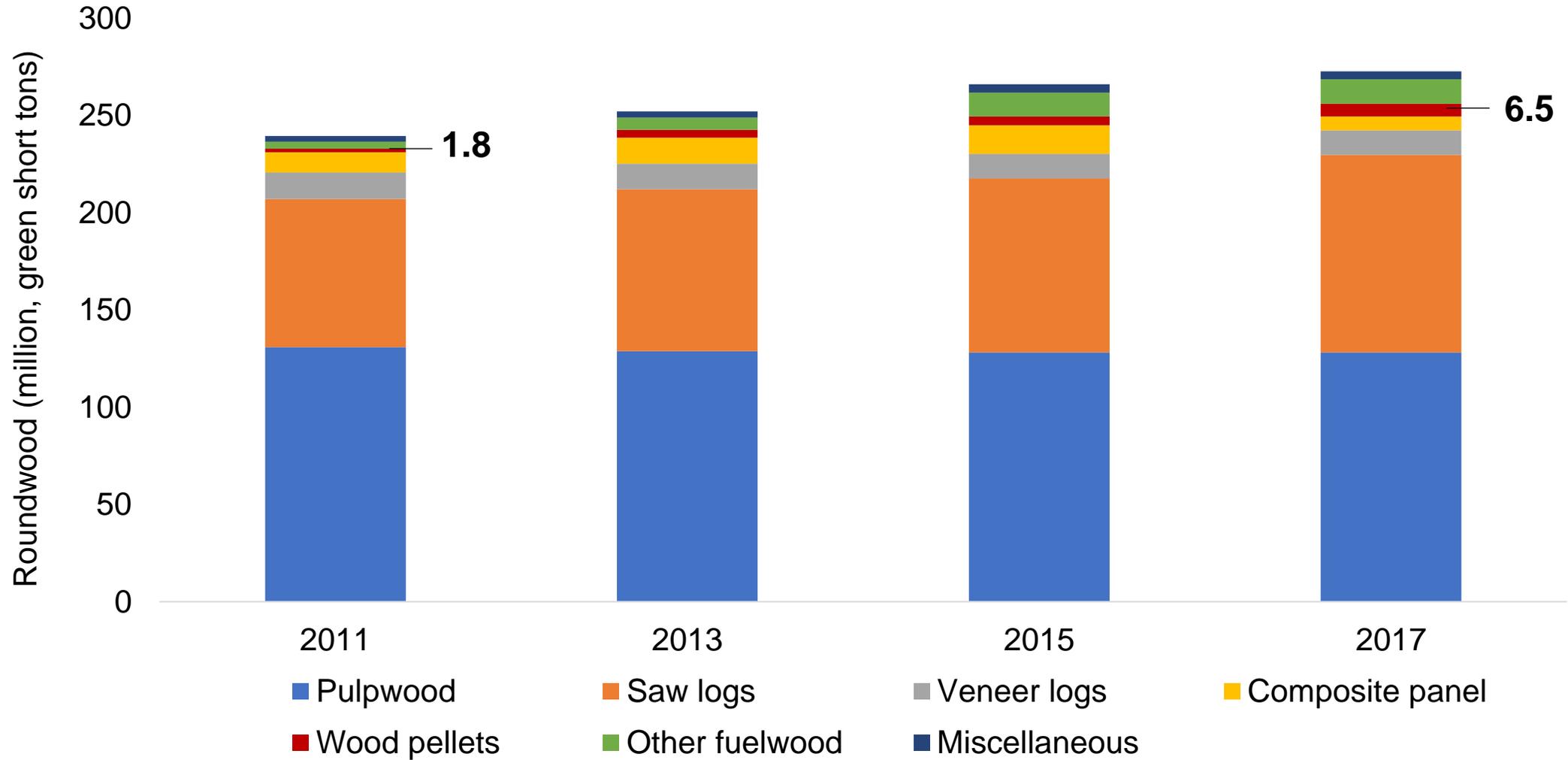


# Wood pellets imported by EU28 countries



Wood pellets=Commodity 440131. Imports from all non-EU28 partners, identifying US sources from 2012 to 2019.  
Source: Eurostat, 2020 .

## 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*

# Study contributions

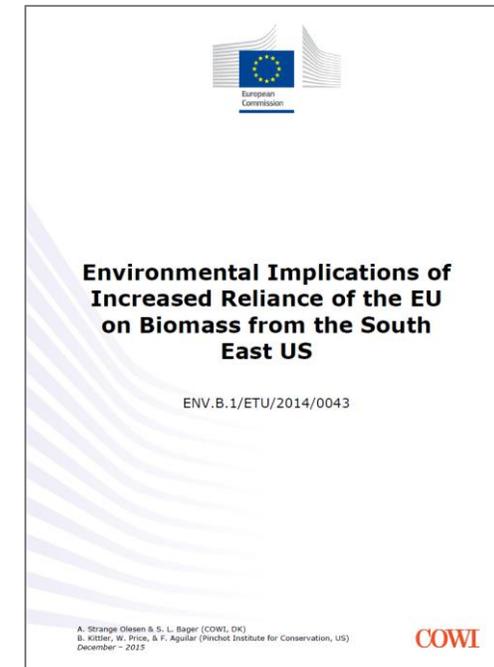
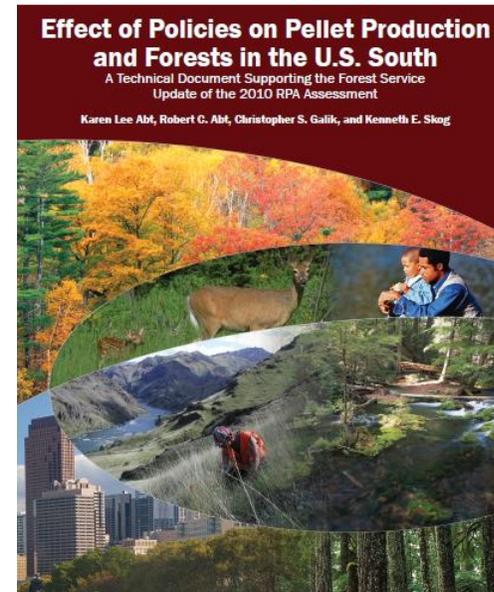
- *Systematic* assessment [vs. case studies]
- *Ex post spatially-explicit* effects on timberlands [vs. projections]
- Framework to assess changes in fundamental attributes of ecological, environmental, and commercial importance within *procurement landscapes*

COMMENT



## Europe's renewable energy directive poised to harm global forests

Timothy D. Searchinger<sup>1</sup>, Tim Beringer<sup>2</sup>, Bjart Holtmark<sup>3</sup>, Daniel M. Kammen<sup>4</sup>, Eric F. Lambin<sup>5,6</sup>, Wolfgang Lucht<sup>7,8</sup>, Peter Raven<sup>9</sup> & Jean-Pascal van Ypersele<sup>6</sup>





# Timberland attributes

## Procurement landscapes

- Large-scale: 20.1 km<sup>2</sup>
- Smaller-scale: 7.2 km<sup>2</sup>

## 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

We are the Nation's Forest Census

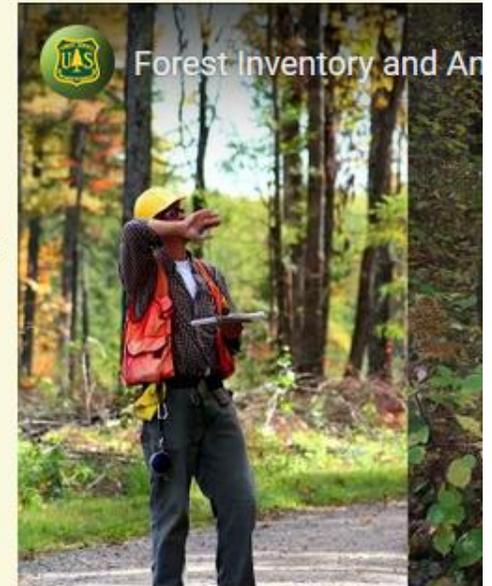
Welcome!

The Forest Inventory and Analysis (FIA) Program of the U.S. Forest Service provides the information needed to assess America's forests.

The long history of scientifically credible FIA data provides critical status and trend information to resource managers, policy makers, investors, and the public through a system of annual resource inventory that covers both public and private forest lands across the United States.

FIA reports on status and trends in forest area and location; in the species, size, and health of trees; in total tree growth, mortality, and removals by harvest; in wood production and utilization rates by various products; and in forest land ownership.

For more information on the FIA program, please see our [About Us](#) page.

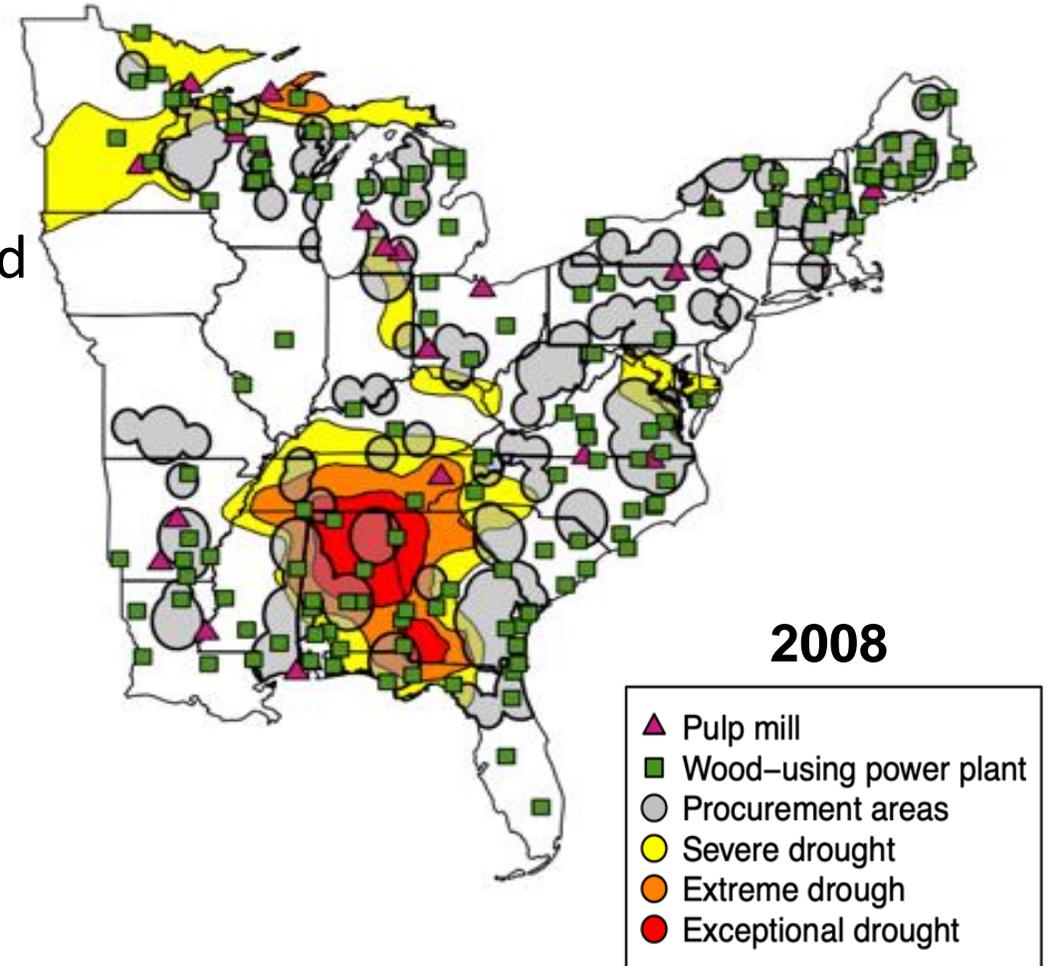


<https://www.fia.fs.fed.us/>

*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: 2005-2017

- 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



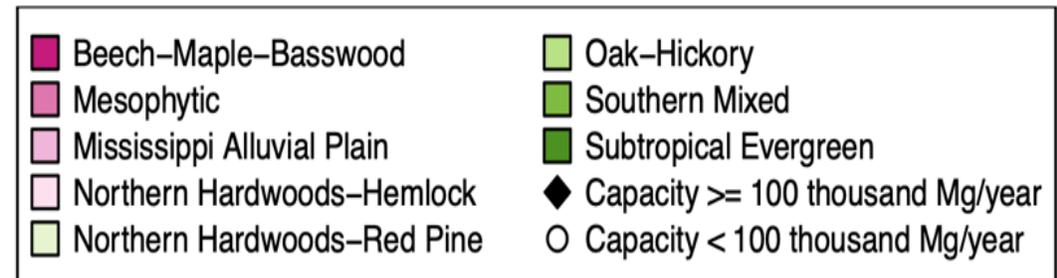
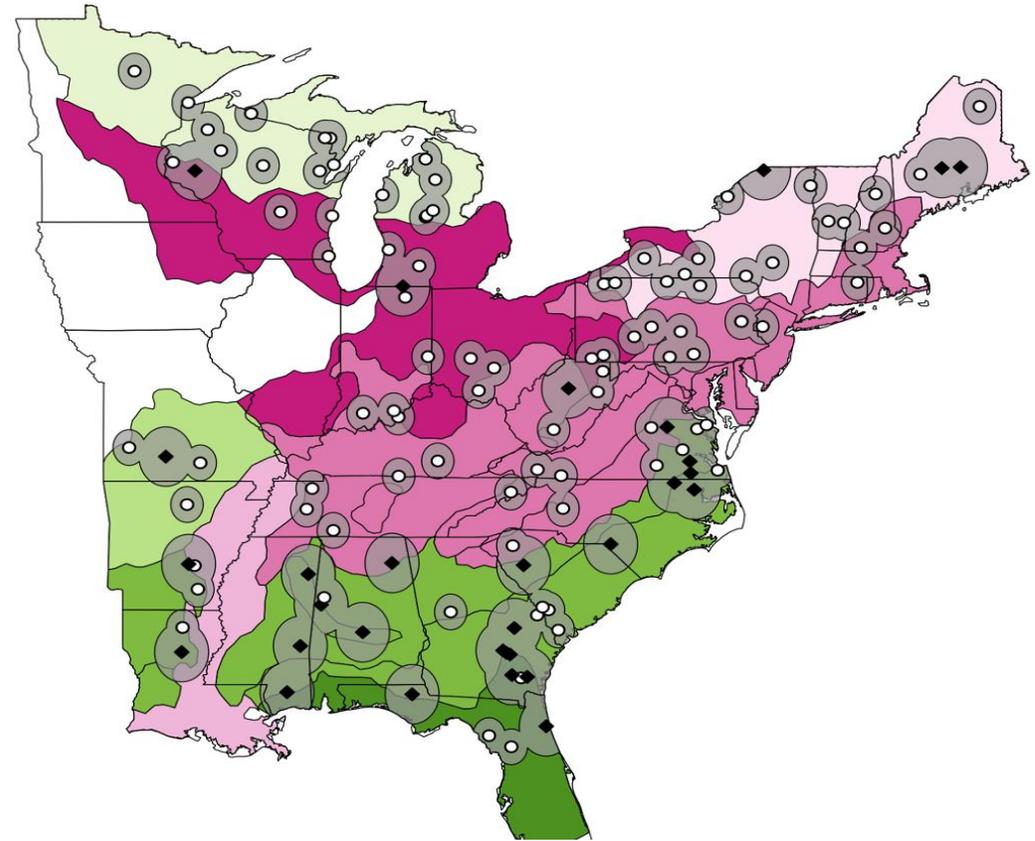
# Modeling timberland attributes: 2005-2017

## Eastern US:

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

## Net wood pellet industry effects:

- US coastal southeast
- Large-scale pellet mills



# Selected Results

**scientific** reports

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

# Annual operation – statistical significance

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



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\* 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



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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

- Prior to 2009, 69% of pellet fibers were sawmill residues (by weight). By 2017 sawmill residues accounted for about 18%.
  - Residues have little/no C additionality
- 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

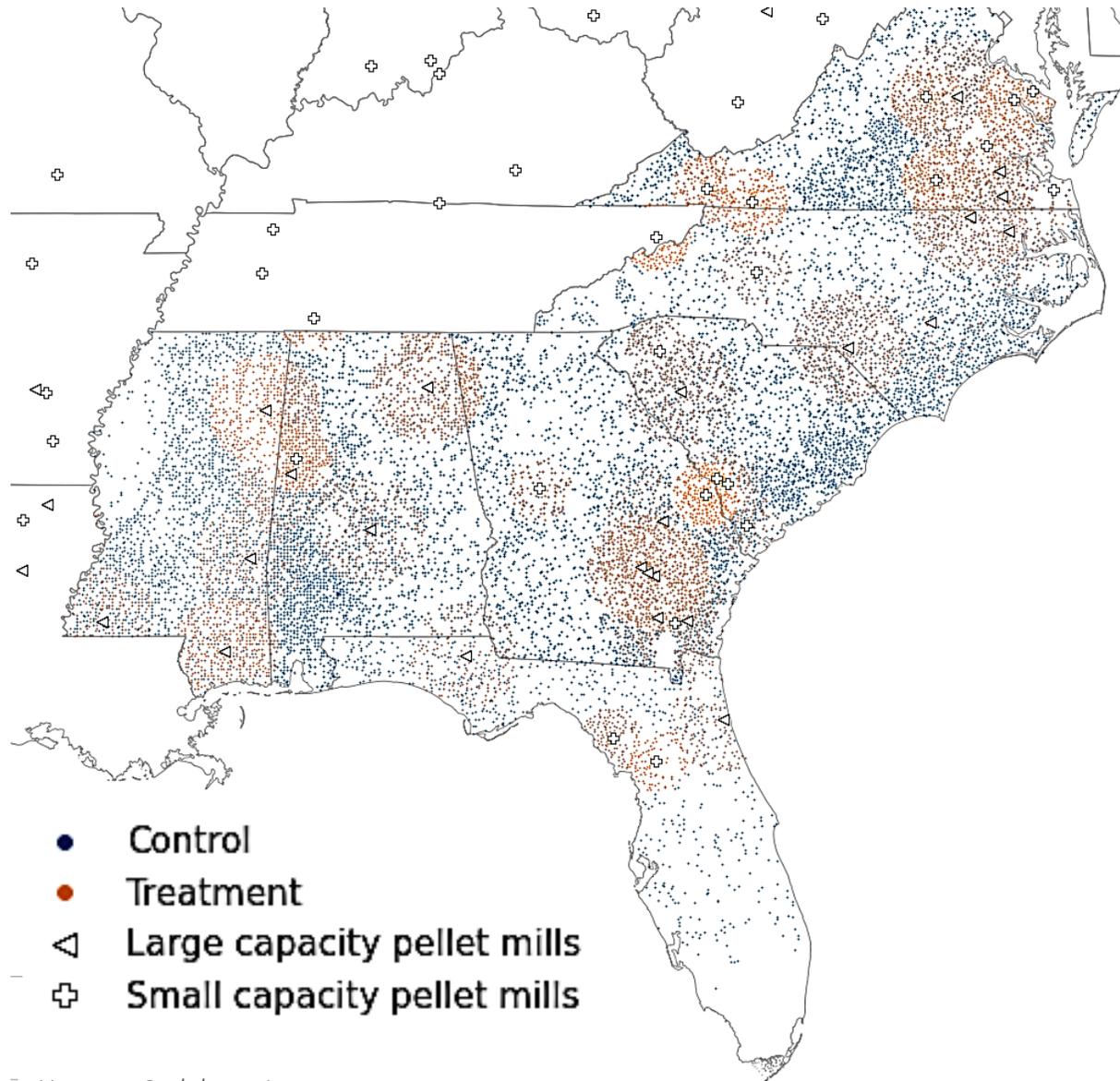
# Continued monitoring

- 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*

# Work in progress



- 2005-17: Small window in forestry
- Extend analysis to plot-level inventory information
  - Further examine soil pools
  - Changes in tree biodiversity
- Expand & update model with most current information

# Contributors



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- Dallas Burtraw, Resources for the Future

# Questions

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