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ALABAMA A&M & AUBURN UNIVERSITIES

Woody Biomass Harvesting Practices & Biomass Markets in Alabama

► Timber harvesting serves as a fundamental aspect of forest management. This process includes logging, extracting, and transporting products. In the southern United States, conventional roundwood harvesting and biomass harvesting systems are the most commonly used timber harvesting systems.

Figure 1. Woody biomass left on a conventional harvest site.

Conventional roundwood harvesting (conventional harvesting hereafter) often leaves 25 percent to 45 percent of a tree's woody biomass (limbs, tops, branches, defective trees, trees smaller than pulpwood size) on the harvest site (figure 1). In contrast, biomass harvesting utilizes these leftover materials (residuals) and turns them into wood chips (using a wood chipper), which are sent to facilities such as wood pellet mills (figures 2 and 3).

Biomass harvesting for renewable energy, including the production of wood pellets and other wood-based products, is expected to increase in Alabama as new wood pellet facilities are under construction here and in adjacent states. In addition to the rising number of wood-based energy industries, higher energy prices and government policies to promote biomass for renewable energy production further incentivize participation in this growing market. However, like any other industry, some specific factors and challenges need attention. Proper planning and consideration for potential productivity, cost, and impact on soil quality and water resources are crucial.

Figure 2. Wood chipper.

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Figure 3. Wood chips.

While some Alabama landowners may be knowledgeable in biomass harvesting practices, new and less experienced landowners may need help understanding the basics of biomass harvesting practices and their potential opportunities and challenges. This publication highlights the concept and market opportunities of biomass harvesting practices.

Why Biomass Harvesting?

Woody biomass is often viewed as carbon neutral, given that the carbon emissions generated during combustion are expected to be recaptured by subsequent plant growth. Furthermore, using woody biomass has benefits beyond just emission considerations. When left scattered on the forest floor, residual materials from logging serve as combustible fuel, intensifying the severity of wildfires. Dense forest conditions can heighten vulnerability to disease and insect invasions, causing many trees to be unfit for commercial lumber use. Removing logging residues could help reduce the risk of forest hazards and pest attacks, reestablishing a forest's natural resilience and bringing combustible material levels back to a balanced state. Normally, post-logging areas require replanting preparation, which includes eliminating forest residuals like treetops and branches. These residuals are typically burned. Landowners have the opportunity to harvest this material, which can serve as feedstock for bioenergy production and offset some of the expenses associated with preparing the site for new growth. Similarly, harvesting woody biomass following thinning or clear-cutting activities can generate employment opportunities in both the harvesting and energy sectors.

According to a 2022 article by the Federation of American Scientists, the Infrastructure Investment and Job Acts (IIJA) and Inflation Reduction Act (IRA) allocated $24 billion to address wildfire issues across various programs. Effective biomass use can diminish forest fire risks, saving billions of dollars and potentially redirect investments toward advancing forest technology and research. Furthermore, converting biomass to bioenergy provides a sustainable fossil fuel alternative, diminishing greenhouse gas emissions and avoiding geopolitical challenges related to fossil fuel sources.

Given the global challenges, such as energy trade disputes and supply chain issues, the United States must consider diversifying its energy options. The United States imported about 8.33 million barrels of petroleum daily from 80 countries in 2022, which was vulnerable when geopolitical issues such as the conflict between Ukraine and Russia shook the global energy markets. This situation spiked US gas prices by 42 percent and showcased the pressing need to explore and enhance domestic energy production to stabilize our economy and safeguard against such vulnerabilities. Utilizing biomass, a renewable energy form, could mitigate the US reliance on volatile international energy sources and bolster energy stability. The United States leaves behind 36.2 million dry tons of logging residues each year. If utilized effectively, this biomass could generate a significant 67.5 terawatt hours of electricity, which could power more than 6.1 million homes, considering the average US household uses about 11,000 kWh annually. The availability of logging residues across the United States is shown in the map (figure 4).

Concerns About Biomass Harvesting

Given the market conditions and equipment availability, research examining the financial viability of collecting biofuel material following harvesting procedures indicates that only selling the harvested material won't fully offset operational expenses. Biomass harvesting needs extra equipment, such as chippers, which require a significant initial investment. Beyond the initial investment costs, biomass harvesting also faces increasing logging costs with each operation. This escalates the cost per ton required to make in-woods chipping economically viable. If biomass facilities are located far from harvest sites, transportation costs can rise substantially. Also, the sector is susceptible to fluctuating market conditions, affecting demand and profitability. Intensive harvesting of logging residues

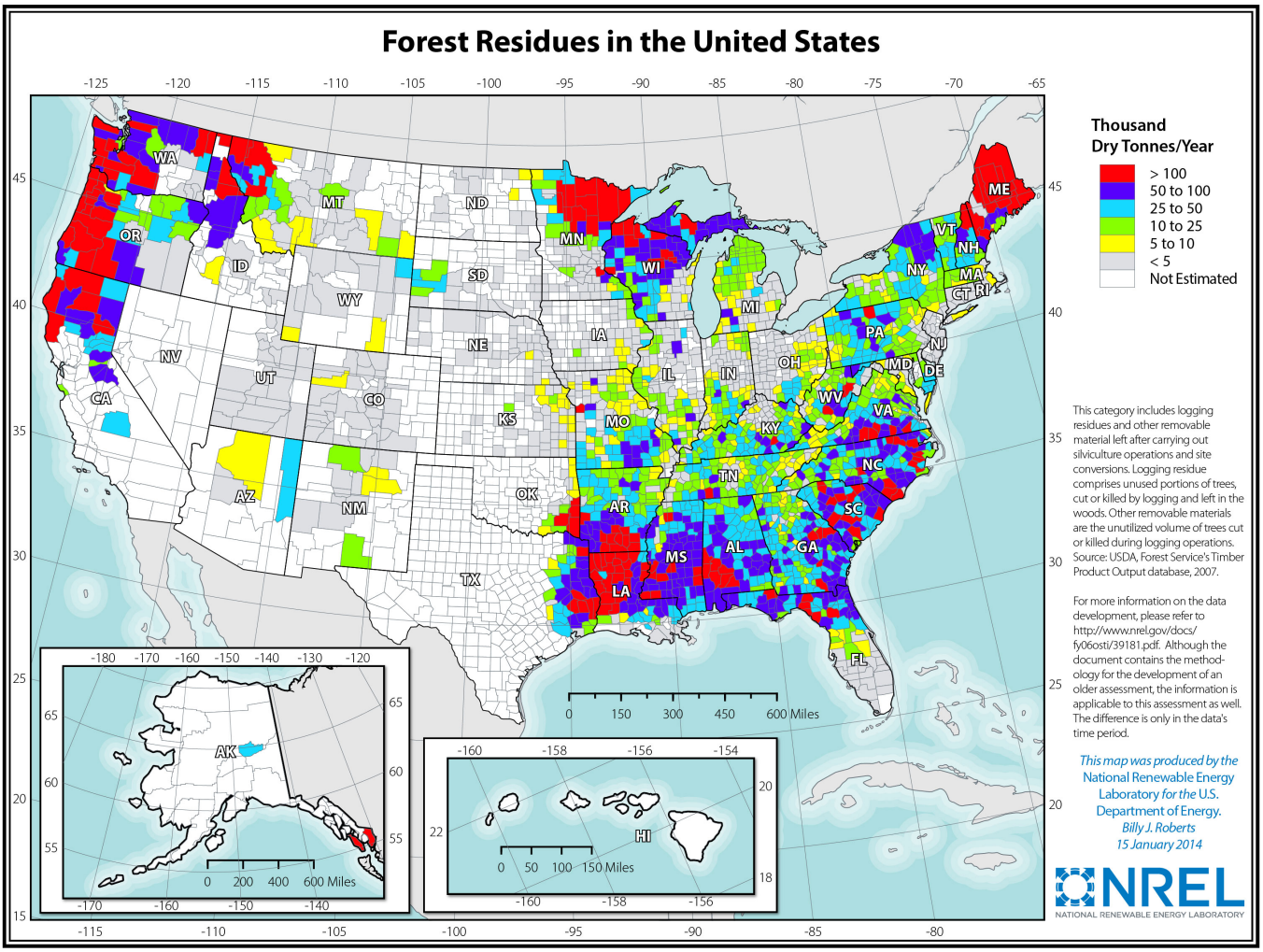

Figure 4. Forest residues in the United States. (Image source: NREL)

during biomass operations reduces woody biomass cover on the soil. This diminished soil cover can adversely affect forest soil quality. Such practices can also result in increased nutrient losses, which may deplete the nutrient stocks in forest soils.

Biomass Market in Alabama

Approximately 71 percent of Alabama's land area comprises forestland, totaling approximately 23 million acres. Privately owned entities possess 93.6 percent of the state's timberland, while public ownership accounts for 6.4 percent. Alabama has demonstrated a remarkable timber volume growth rate compared to many other southeastern states, with a substantial 37.5 percent increase observed between 2002 and 2022. Alabama is among the top states for producing logging residues and offers a significant opportunity for sustainable energy production. However, this comes with its own set of challenges and considerations.

Many countries have adopted renewable energy policies promoting biomass as a source of energy, and this has led to an increased demand for American wood pellets. The heightened demand for wood pellets in the international market has created a favorable environment for biomass harvesting in areas of the United States with available wood pellet facilities. Alabama hosts five biomass pellet mills with a total capacity of 1,184,000 metric tons annually. Two additional pellet mills are under construction, offering a combined capacity of 1,250,000 metric tons per year. There are no active wood biomass power plants in Alabama or any under construction or proposed (tables 1–4).

The neighboring states of Georgia, Mississippi, Florida, and Tennessee are home to several pellet mills and power plants, which can influence biomass harvesting practices in Alabama. While it is generally true that pellet mills prefer to source their raw materials from nearby areas to minimize transportation costs, this is

not always a strict limitation. In some instances, mills may extend their procurement range, especially when local supply is insufficient or prices are more favorable. This creates potential opportunities for Alabama landowners, especially those located near state borders. The expanding biomass market across Alabama and its neighboring states continues to create new opportunities for landowners to contribute to the biomass supply chain. However, it's important to know that such opportunities can vary and are subject to the specific policies of individual mills and the fluctuating market demands and supply chain factors.

Table 1. Active US Pellet Mills in Alabama, Georgia, Tennessee, Mississippi, and Florida

#	Pellet Mills	State	City/Town	Capacity (Metric tons/yr)
1	Alabama Pellets–Aliceville	AL	Aliceville	369,000
2	Alabama Pellets–Demopolis	AL	Demopolis	360,000
3	Fruitdale Pellets	AL	Fruitdale	30,000
4	Jackson Pellets	AL	Jackson	150,000
5	Zilkha Biomass-Selma	AL	Selma	275,000
6	Brookhaven Pellets	MS	Brookhaven	75,000
7	Enviva Pellets Armory	MS	Armory	115,000
8	Appling County Pellets LLC	GA	Baxley	181,400
9	Archer Forest Products, LLC	GA	Nahunta	100,000
10	Douglas Pellets	GA	Pearson	150,000
11	Enviva Pellets Waycross	GA	Waycross	800,000
12	Hazlehurst Wood Pellets LLC	GA	Hazlehurst	317,500
13	Ideal Pellets	GA	Oglethorpe	112,000
14	LJR Forest Products	GA	Swainsboro	226,800
15	Telfair Forest Products, LLC	GA	Lumber City	136,100
16	Varn Wood Pellets	GA	Hoboken	80,000
17	Enviva Pellets Cottondale LLC	FL	Cottondale	780,000
18	Equustock	FL	Montebrook	36,287
19	Hassell & Hughes Lumber Co.	TN	Collinwood	16,300
20	Henry County Hardwoods Inc.	TN	Paris	33,100
21	Jasper Pellets	TN	Jasper	100,000
Total				4,443,487

Source: *Biomass Magazine*

Table 2. Pellet Mills Under Construction in Alabama

#	Pellet Mills	State	City/Town	Capacity (Metric tons/yr)
1	Enviva Pellets	AL	Epes	1,100,000
2	Peak Renewables	AL	Dothan	150,000
Total				1,250,000

Source: *Biomass Magazine*

Table 3. Pellet Mills Proposed for Construction (Currently only in Mississippi and Florida among the five states)			
#	**Pellet Mills**	**State**	**Capacity (Metric tons/yr)**
1	Enviva Pellets Bond	MS	1,100,000
2	Agrarian Resource Capital	FL	NA
3	US BioEnergy	FL	NA
Total			1,100,000

Source: *Biomass Magazine*

Table 4. Active Woody Biomass Power Plants in Florida and Georgia (No active woody biomass power plants in the other three states)					
#	**Power Plants**	**State**	**City/Town**	**Feedstock**	**Capacity (MW)**
1	Multitrade Rabun Gap	GA	Rabun Gap	Woody biomass	18
2	Piedmont Green Power	GA	Barnesville	Woody biomass	55
3	Brooksville Power Plant	FL	Brooksville	Woody biomass	80
4	Deerhaven Renewable Generating Station	FL	Gainesville	Woody biomass	102.5
5	Okeelanta Biomass Cogeneration (Producer)	FL	South Bay	Softwood	140
Total					395.5

Source: *Biomass Magazine*

Summary

The practice of woody biomass harvesting is expanding. It is influenced by various factors, presenting its own set of advantages and disadvantages when compared to conventional harvesting systems. Factors such as location, tree species composition, stem size, piece size, chipper size, weather conditions, moisture content, and delay time all influence the overall biomass harvesting operations productivity. Understanding these factors can lead to more efficient operations.

In response to the increasing demand for renewable energy, the rising number of biomass facilities, and government support for bioenergy initiatives, woody biomass harvesting emerges as a valuable prospect for landowners and loggers. In terms of markets, Alabama and its neighboring states have seen a significant increase in wood pellet production facilities, creating opportunities for landowners to sell biomass feedstock. Landowners near these facilities can benefit from a readily available market for their woody biomass resources, offering an additional revenue stream. Utilizing woody biomass for bioenergy and other renewable products can potentially improve forest management practices. However, it is crucial to approach woody biomass harvesting with a focus on sustainability. Proper planning and consideration for the potential impact on soil quality, water resources, and biodiversity are essential.

Additional Resources

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NOTE: For the latest information on mill construction, visit the *Biomass Magazine* website at www.biomassmagazine.com.

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