



Forest2Fuel®

Renewable Fuel Standards: Wood Biomass

a product of Forest2Market

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The Renewable Fuel Standard (RFS) program established the first renewable fuel mandate in the United States. Created under the Energy Policy Act of 2005, the standard was expanded under the Energy Independence and Security Act of 2007.

RFS program oversight belongs to the Environmental Protection Agency (EPA). The EPA creates and implements regulations intended to ensure transportation fuel sold in the United States contains a minimum volume of fuel made from renewable biomass. Volume mandates are tracked via unique Renewable Identification Numbers (RINs) generated to represent renewable fuel quantities.

Although the RFS was intended to increase the use of renewable fuels, the legislation restricts qualified feedstock at the same time it mandates biofuels. To be considered RFS compliant, producers must use qualified materials from qualified sources according to four criteria.

1. **Ownership:** Wood biomass that originates on land owned by the federal government is ineligible.
2. **Origin:** Planted trees, tree residue, slash, and pre-commercial thinnings that comes from tree plantations is eligible. On non-plantation land, only slash and pre-commercial thinnings qualify.
3. **Conversion:** Tree plantations must have been cleared prior to and actively managed no later than December 19, 2007.
4. **Non-ecologically sensitive:** Biomass sourced from ecologically sensitive or old growth forests is excluded.

Qualified Materials

Planted Trees

The EPA defines¹ planted trees as “trees harvested from a tree plantation.” A tree plantation consists primarily of hand-planted or machine-planted trees. Trees originating from natural seeding by the mature trees growing on plantation land also qualify as renewable biomass. Therefore, “planted trees” is a misnomer in the sense naturally-regenerated trees on plantation land is allowable under the RFS program.

¹ All definitions in this document are from the Environmental Protection Agency 40 CFR Part 80 [Regulation of Fuels and Fuel Additives: Changes to Renewable Fuel Standard Program](#); Final Rule. March 26, 2010.

A tree plantation is defined as “a stand of no less than one acre composed primarily of trees established by hand- or machine-planting of a seed or sapling, or by coppice growth from the stump or root of a tree that was hand- or machine-planted.”

Producers must provide written records to serve as documentation that the land from which the feedstock was sourced was:

- a) Cleared or cultivated prior to December 19, 2007, and
- b) Actively managed as a tree plantation on December 19, 2007
- c) Continuously actively managed since December 19, 2007

The EPA considers actively managed as “managed for a predetermined outcome as evidenced by any of the following that must be traceable to the land in question:”

- Sales records for planted trees or slash
- Purchase records for seeds, seedlings, or other nursery stock
- A written management plan for silvicultural purposes
- Documentation of participation in a silvicultural program sponsored by government agency
- Documentation of land management in accordance with a silvicultural product certification program such as the Forest Stewardship Council, the Sustainable Forestry Initiative, or the American Tree Farm System
- An agreement for land management consultation with a professional forester

In addition, the existence and continual maintenance of a road system or other infrastructure designed and maintained for logging use is acceptable documentation when combined with one of the aforementioned records. Although this piece of documentation is not enough to stand on its own as proof of active management, the use of the word “any” to define “actively managed “ appears to indicate just one of the other documents is sufficient evidence.

Tree Residue

The wood residue generated when planted trees that are harvested from actively managed tree plantations and processed for use in another application such as lumber, paper, or furniture is what the EPA considers tree residue. Qualified wood raw materials maintain their status as renewable fuel feedstock when processed for use in the manufacture of wood products.

Producers may generate RINs only for the biogenic portion of the tree residues. Tree residues mixed with chemicals or other materials during production are not eligible. Likewise, residues lose their qualified status if mixed with tree residues that did not originate on an eligible tree plantation.

Slash

The EPA considers slash as the material typically left on the forest floor following a logging operation or after a disturbance such as a storm or fire. Furthermore, materials traditionally left on the forest floor to replace nutrients in and improve the quality of soil qualify as slash. This includes tree tops, branches, bark, and unmerchantable trees.

Pre-Commercial Thinnings

Trees removed to promote the growth and improve the quality of the most desirable trees in a stand are considered pre-commercial thinnings. The EPA does not limit trees harvested as part of a pre-commercial thinning in terms of diameter, citing tree diameter varies according to the type and location of forest.

Trees that remain in a stand after a first pre-commercial thinning are restricted as qualified biomass. The EPA takes the position that trees that remain after the first thinning cannot generally be considered pre-commercial thinnings at a later date.

However, in the US South, it is common practice to thin stands twice between the time they are planted and the final harvest. Under the terms of the RFS, only those trees removed in the first thinning would qualify as renewable biomass.

This caveat could have implications in regards to the timing of thinnings, although it is most likely that timberland owners will continue to manage their timber assets to maximize sawtimber production as the economics are more favorable than they are for biomass. Any adjustments made in timing to accommodate biofuels markets will be made within the boundaries of this higher objective.

Potential Restrictions to Supply

Land Conversion Dates

The requirement to source wood biomass from land converted to plantation prior to December 19, 2007 is intended to prevent the widespread conversion of natural forests to biomass plantations. Today, age-class is the most readily available source of data to determine conversion date. As the length of time between December 19, 2007 and the present widens, however, proving land conversion dates may become more difficult.

Records the EPA deems satisfactory to prove a plantation's conversion date - sales and purchase records or management plan documentation, for example - are not necessarily transferred when land is sold. As a result, it is possible that qualified plantation land will be removed from consideration simply due to a lack of documentation.

Ecologically Sensitive Lands

Biomass sourced from ecologically sensitive or old growth forests is excluded as renewable biomass under the terms of the RFS. The EPA defines ecologically sensitive forestland as "an ecological

community with a global or state ranking of critically imperiled, imperiled, or rare pursuant to a State Natural Heritage Program.”

Specifically, the EPA considers a State Natural Heritage Program as one associated with the non-governmental organization [NatureServe](#). It is this organization that defines the terms “critically imperiled, imperiled, or rare” as a global ranking of G1 or G2 or a state ranking or S1, S2, or S3. Old growth (or late successional) forests are defined as trees that are 200 years or more in age.

Competition and Capacity to Pay

Every market participant has a different capacity to pay - the highest price a facility can pay for wood raw material and continue operating at a profit. Capacity to pay is determined by both the quantity of wood raw material a facility needs to produce a finished product and the price at which that finished product can be sold.

A significant portion of wood raw material received at a mill is “lost” in the manufacturing process. Depending on the finished product, bark loss can be as high as 15 percent, while moisture and processing loss can be in the 33 to 55 percent range. Lumber mills also “lose weight” in a milling process that turns round logs into square lumber.

This “yield loss” affects all forest products manufacturers and has a multiplying effect on the cost of goods sold. The inverse of yield loss is conversion factor, which can range from a low of two to five tons of ‘bark-on’ logs to one ton of finished goods.

In sustained periods of constrained supply, the demand source(s) with the highest capacity to pay will receive the available supply. As such, it is important for new market entrants to understand a local market’s capacity-to-pay when evaluating the feedstock risk for new facilities.

Take a hypothetical local market with no excess wood and four sources of demand, each consuming 250,000 tons of the 1,000,000 tons of sustainable supply. Each competitor has a capacity to pay of \$50, \$100, \$150, and \$200, respectively. Scenarios for potential market entrants include:

- A new market entrant with a capacity to pay of \$35 per green short ton will be priced out of the market and should build elsewhere.
- A new market entrant with a consumption requirement of 250,000 tons should be prepared to pay, on average, \$50 per ton.
- Assuming all four competitors are willing to pay up to their capacity, a new market entrant with a consumption requirement of 1,000,000 tons should have a capacity to pay in excess of \$125 per ton.

These examples illustrate that capacity to pay, along with the sustainably harvestable volume of a wood basin, should be considered when calculating supply availability.

Type of Supply

The EPA defines “plantation” differently than the US Forest Service (USFS). The USFS considers only artificially planted acres as plantation acres when it compiles the US Forest Inventory Assessment (FIA) - the principal source of timber resource information in the United States. Because these definitions differ, the FIA plantation data can only grossly estimate RFS qualified supply.

Private Acres by Timberland Type		
Timberland Type	Total Acres	Percent
Natural - Conifer	41,896,113	19%
Natural - Hardwood	130,921,299	59%
Plantation - Conifer	39,233,684	18%
Plantation - Hardwood	4,462,678	2%
Non-Stocked	5,393,369	2%
Grand Total	221,907,143	

Assuming RFS qualified feedstock from “naturally regenerated plantation” is minimal; the FIA plantation acres data illustrates how few US forest resources are RFS qualified. Of the 221 million acres of timberland in the US South, only 20 percent are RFS qualified; 39 million acres of plantation-conifer (softwood) and 4 million acres of plantation-hardwood².

Harvest Rates of Logging Residue

On a weekly basis, a productive logging crew can deliver 92 truckloads of merchantable roundwood at 26 tons per load³ to nearby mills, which equates to an approximate rate of 120,000 tons of stem material (de-limbed logs cut to a minimum two-inch top diameter) annually.

Using a ratio of one ton of logging residue (slash) to seven tons of logs to measure the total potential in-woods wood fuel supply, the same logging crew will generate approximately 17,000 tons of logging residue on an annual basis. However, the amount of this material that is actually recovered and transported to a buyer is significantly less than the 17,000 tons generated.

Terrain, landowner objectives, and a lack of local markets constrain the recovery of logging residue. In fact, most researchers estimate only 60 to 65 percent of logging slash can be recovered economically. Across the US South, five to 35 percent of the total potential generated residues are recovered and transported⁴. On average, a single logging crew would recover only 850-6,000 tons of the 17,000 tons generated.

An average wood basin in the US South has a radius of approximately 75 miles and a log market of approximately eight million tons. Using the 1:7 recovery ratio, the current average 20 percent utilization rate, and a 60 percent economic recovery rate, a typical wood basin has approximately 500,000 tons of excess logging residue available to a new market entrant.

² Forest2Market. [Forest Resources in the United States](#). Table 2.1

³ Forest2Market research and corroborated by our corporate landowner customers.

⁴ Forest2Market data.

Recordkeeping and Reporting Requirements

Renewable Identification Numbers

The EPA uses renewable identification numbers (RINs) to measure RFS compliance. Renewable fuel producers are authorized to generate RINs only for fuels produced from feedstocks that meet the definition of renewable biomass. As such, producers must maintain records that document feedstock purchases, transfers, and where applicable, records that show the feedstocks were sourced from land that meets the requirements set forth by the RFS.

Although the EPA takes a firm “buyer beware” stance on the issue of fraudulent RINs, the agency offers little in terms of published verification standards and procedural guidelines for auditing reported feedstock sources. The EPA anticipates producers will modify their contracts and supply chain interactions to satisfy the requirements that prove feedstock origins.

Companies developing renewable fuels from wood biomass must apply RFS feedstock procurement requirements to a supply chain much different than the traditional fossil fuel supply chain. Because a biofuels facility will receive wood from a number of tracts of land over the course of a year, the supply chain is more complicated.

Each type of feedstock— whole trees, residues, and slash —will take a slightly different path to the facility. In addition, there are multiple buyers. Wood dealers purchase timber from landowners and sell direct to biofuels facilities. Dealers typically contract with loggers and truckers, but loggers might also buy directly from landowners. Biofuels facilities will also compete with established mills that have wood supply contracts with timberland owners.

Fortunately, the forest products supply chain has an established documentation system that serve as evidence that the feedstock qualifies as renewable biomass. Acceptable records to demonstrate compliance with the definition of renewable biomass include:

- Maps or electronic data that identifies the boundaries of the land where the feedstocks were produced.
- Product transfer documents or bills of lading that trace the feedstock from that land to the production facility.
- Written documents from feedstock suppliers such as timber sale contracts and load tickets that establish material origin and chain of custody.

Timber sale contracts document prices for various forest products, compliance with best management practices, harvest restrictions, and contract duration. Scale tickets generated by the feedstock recipient can serve as documentation of the:

- Name and location of receiving facility
- Date received at facility
- Tree species

- Tract name
- County and state of origin
- Dealer, producer, and logging company name

This system helps establish chain-of-custody requirements between the timber tract and receiving facility, which helps with RFS recordkeeping.

Alternative Recordkeeping

To comply with the specific recordkeeping and reporting requirements set forth by the EPA, renewable fuel producers can maintain the appropriate records for each feedstock supplier or opt to report via an alternative biomass tracking system. This alternative approach requires submission of an annual compliance survey plan to the EPA. The alternative recordkeeping system requires:

1. Annual compliance surveys representative of the supply area its feedstock suppliers.
2. Surveys planned and conducted by an independent surveyor.
3. Surveys conducted on-site at biofuel facilities and feedstock supplier locations.
4. Each survey must be designed to achieve the same level of quality assurance.

The independent surveyor is responsible for submitting a detailed report to the EPA within 30 days of survey completion. Independent surveyors must also permit the EPA to monitor how the audits are conducted and to review the survey records and results if requested.

The primary advantage afforded by an alternative recordkeeping system is that it spreads the responsibility for maintaining documentation across the biomass supply chain. Its disadvantage is it may expose the renewable fuels producer to shortcomings on the part of the supplier.



Contact

Whether you need to locate a site for a new biofuels project or plan feedstock procurement strategies for an existing project, Forest2Market's biofuels practice experts can help answer your questions. We are available to help navigate the complexities of sustainable supply throughout the project lifecycle.

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Stan has spent his career in renewable energy and advanced manufacturing technology for the forest products industry. His experience includes 12 years in strategic consulting services, five years in consulting engineering, 23 years in advanced manufacturing technology supply, nine years with a North American technology supplier and 14 years as VP North America responsible for technology, sales and project execution for two major Scandinavian technology suppliers.

Prior to coming to Forest2Market, Parton was principal in The Parton Group, which he established in 2001. A provider of project development support services for the renewable energy and forest products sectors, The Parton Group conducted dozens of studies, including technology options analyses, plant evaluations, and many of the same services offered by Forest2Market. Stan has a BS in Pulp and Paper Science and Technology, a specialized Chemical Engineering program for the pulp and paper industry, from North Carolina State University.