

# Business Guide for National Firewood Business Workshop 2022

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By

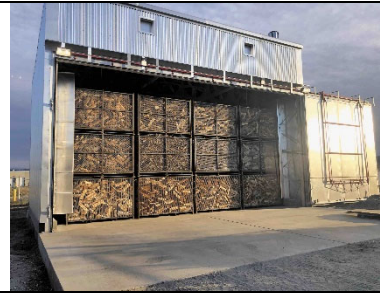
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For

Business Workshop Held at the  
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Firewood log truck



Firewood dry kiln



Happy firewood customer



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## 0-Introduction, Workshop Purpose, Housekeeping

This is the third in a series of National Firewood Workshops as part of a seven educational and networking outreach effort by the US Forest Service and the Wood Education and Resource Center of Princeton, WV. The purpose of this firewood workshop is to dig deeply into the business side of the split firewood industry and provide education about the firewood business so that individual firewood businesses can prosper.

## 1-Workshop Support Organizations for the NFW 2022 WI

This workshop is supported by the US Forest Service, North Carolina State University Extension, the University of Wisconsin Extension, Wisconsin Department of Natural Resources, the Firewood Scout, and the Urban Wood Network.

## 1-Firewood Business Matrix-Business Choices That Determine Business Strategy

The Firewood Business Matrix summarizes the points of a firewood business that has to be selected and aligned for a firewood business to be successful. The matrix lists many of the options available to a business and no business would choose all the options. Every option selected and not selected has implications on the business revenues, expenses and profit that determine the success of the business.

A good use of the matrix is for a proposed or existing firewood business to circle the elements of the business and better understand how the business will work and then link to the cost of assets, labor and overhead expenses to better understand the business. Revenues are driven by prices of products and volume.

## 1-Survey In Process of Homeowners in VA and NC by Dr. Eric Wiseman, USFS Study-Basic Information About Users of Split Firewood

Dr. Eric Wiseman is a professional arborist in addition to being a professor at VA Tech. University in Blacksburg, VA. As an arborist he has been involved in the removal of tree materials removed in tree work and the problems involved in its next use. He has teamed up with two other professors in the survey of homeowners in NC and VA that include:

- Dr. John Munsell, VA Tech., [ifmunsel@vt.edu](mailto:ifmunsel@vt.edu)
- Dr. Mikaela Schmitt-Harsh, James Madison University, [schmi2mi@jmu.edu](mailto:schmi2mi@jmu.edu)

The focus of this effort is to better understand the use of firewood by homeowners in NC and VA. The survey included asking non-firewood users of their opinions about firewood.

Previous research about firewood use in VA reported that 2.2% of households used firewood as their primary home heating source and that the average annual \$ for firewood per household was \$515. In 1960 the percentage of homes in VA heated by firewood was 15.6%.

In NC previous research about firewood for heating homes was 1.6% with an average of \$382 spent on firewood. In 1960 the percentage of homes heated in NC by firewood was 18.7%.

Firewood use is thought to increase with elevation gain from the coast to the mountains and with greater use in rural areas. Rural residents often harvest their own firewood from their own lands with cleanup of down trees a common source. Urban tree material removals can also heat urban homes with modern stoves and for outdoor recreational uses.

Research also shows that both NC and VA are experiencing strong population growth and changes in the makeup of its residents, with younger persons having different lifestyles and backgrounds and thought to be less interested in burning firewood than their elders. Both states have had strong out of state immigration that brings potentially different views of using firewood for space heating, domestic hot water and recreational uses.

Dr. Wiseman is expected to publish the results of the survey and comments later in 2022.

### 1-Firewood Use in US

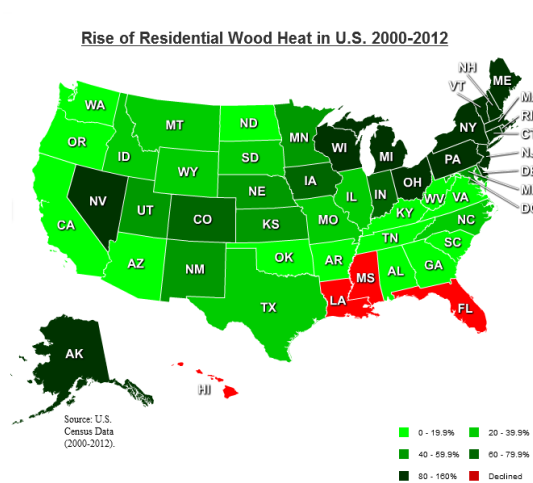
We get statistics on firewood in the US from US Census surveys, US Energy Information Administration and research from university and other sources. In recent years the US Government agencies typically estimate the annual usage of wood for residential heating at about 2% of homes. Also in recent years we have seen a growth of firewood for recreational uses, such as outdoor residential firepits, cooking stoves and campgrounds.

Estimated potential sales for firewood for domestic space heating + hot water in the US:

Estimated US Residential Firewood Usage-Space Heating and DHW	
US 2020 census	332,403,650
US average persons per household	2.4
Estimated # US households	138,501,521
Estimated \$/household space heating + dhw	\$ 1,500
Annual energy cost for households, heat + dhw	\$ 207,752,281,250
Average \$ per 3,006 counties-household energy purchases	\$ 69,112,535

Wow! We should realize our potential to grow firewood sales for heating given that we are currently only serving 2% of the residential homes in the US for space heating and domestic hot water.

The table below from the Alliance of Green Heat shows that firewood usage has risen in recent years, perhaps from greater use of recreational wood at the home and beyond.



Overall, the mission of the firewood producer is to align the business with markets such that the customer is satisfied with firewood purchases and the firewood business operates with sufficient sales and profit margin to be successful. The firewood business has to be organized and produce the needed volume of sales to cover all costs. Frequent reviews by the business owners and managers can insure that once the business finds its success formula that it is followed on a weekly basis and adjusted frequently as needed.

### 1-Firewood Producers in US

There is no complete list of firewood producers in the US and many state forestry organizations attempt to create a list in their state, but these lists are incomplete as firewood businesses are difficult to track. The Firewood Scout effort offers firewood producers the option to list their businesses on line free, but their list is small in relation to the number of operating firewood businesses.

### 1-Forests and Firewood, How Forest Management is Involved in Firewood

Measurements of forests in the US state that 33.87% of the US land mass is covered by forests. This is a large number representing approximately 3.8 million square miles. Wisconsin is stated to be 46% covered by forests while North Carolina is stated to be covered by 60% forests. Overall there is plenty of forest inventory for firewood and removals of excess forest materials for firewood would assist the US to replace fossil fuels with renewables, grow local economies and provide the opportunity for thousands of new firewood businesses.

Most US forests are not under active management and are not having removals needed to reduce fire and insect hazards. If this material was removed it would greatly improve forest growth rates in volume, quality and \$ value.

### 2-Forests Need Firewood Removals

Forests in the US have a surplus of logs that need to be removed to reduce fire hazards and to improve the quality of remaining timber. These trees are the low grade that have problems or are a surplus needed to better balance the number of trees to the space needed for a trees to successfully grow. Surplus trees are a fire hazard.

Firewood logs are the low-grade leftover logs from forest harvests, forest thinnings, removals from highway and powerline right-of-ways and development clearings. These logs are not quality mill sawlogs or suitable for pulpwood when prices for mill sawlogs or pulpwood logs.

These firewood logs can come from both rural and urban sources. Rural harvests are often thought of coming from large using commercial logging companies. Small tracks are less often harvested due to the economics to landowners and loggers. Large track harvests are the industrial sector where the focus is on logs that are sawn into lumber for cabinets, furniture, pallets, crossties, timbers and other lumber products. Some large sawmills process 70,000 board feet per hour of pine or hardwood, and are highly automated.

Small forest tracks less than 30 acres and are increasingly having a shortage of loggers interested in small tracks. Some firewood operations are small enough for local arborists, land clearing operators, landowners and semi-retired loggers to provide logs for small firewood businesses. Smaller local firewood business can take advantage of the need for small track landowners and source logs cut by small loggers, semi-retired loggers, farmers or themselves.

Some firewood operations in metro city regions are able to obtain sufficient firewood logs from arborists and land developers that want to dump logs at firewood operations to avoid dumping fees at local landfills. An example is Ernie the Woodman Firewood operation in Huntersville, NC who operates an 8-person firewood business where local arborists and developers dump logs from their jobs and projects at no payment from Ernie. He takes both hardwoods and yellow pine and is able to sell split yellow pine firewood as outdoor pit firewood.

It is possible for a firewood business to set up its processor at a logging site and split green firewood into a dump truck or trailer. The advantage is that firewood logs can be staged at the log deck as part of the logging operation and eliminate the log hauling operation. If the green split firewood is presold, then delivery can be made directly from the harvest landing site.

One challenge for firewood businesses sourcing from arborists is that arborists are in a hurry to take down trees and are limited in time needed to buck trees into logs that work well for firewood operators. Firewood operations need limbs cut closely to the log and not short lengths that fit into a skid steer's bucket.

In the future, the US needs to support a group of local cooperating businesses that cater to the local need for processing wood into needed products. Such a group could have a group location where a small sawmill, dry kiln, firewood processor, wood chipper, a wood shop and a small track logger work together to harvest and process small forest lot wood into the typical products used locally. These products include lumber, firewood, chips and shop made products. Such a group of independent businesses then would capture a significant amount of \$ that are leaving the community and having them cycle in the local economy.

## 2-Sourcing Urban and Rural Logs

We find good sources of logs from both urban and rural areas as both have a surplus of removals that need to find a good use. Rural areas have clearcut harvests and timber stand improvement removals as forest management actions that generate logs that are not suitable for veneer, lumber or pulpwood (paper). Firewood economics seeks out low cost logs and timber harvests and timber stand improvement offer large volumes of potential wood for firewood. Currently much useable materials suitable for firewood is left out in the forest to rot or is burned in preparation activities for regeneration.



Urban firewood logs can come from many sources, but arborists and developers are the two primary sources. Arborists work in skilled crews that are well paid for taking down trees that are well suited for firewood processing. They have a great incentive to move the logs quickly from their worksites and need a low cost destination for these logs. Often they will give away

firewood quality logs to avoid paying tipping fees at landfills that can be expensive. It helps the firewood processor to build good relationships with arborists and not to be picky with what they drop if one wants to obtain low cost or free logs. A great incentive is to pick up the logs at the worksite using a grapple truck so the arborist does not have to haul and drop the logs. Arborists usually have the equipment to move the logs to the roadside or drive way.

Paying more for better logs strategy-when a business review “runs the financial numbers” success often is easier to obtain when using better quality logs that cost slightly more than normal firewood grade logs. Pallet quality logs are sawlogs, thus straighter and with greater diameter than firewood logs, and offer more productive production in terms of cords per hour. When operating a full schedule, this extra production means greater sales to cover the higher log cost and overhead costs. Pallet logs offer less wasted time with jams and feeding problems are welcomed by the crew instead of trying to run poor logs that are cheap.

### 3-Firewood quality, measurements, species, firewood science

Certainly, firewood quality is in the eye of the beholder, but generally, we value firewood based on its use. Dense seasoned hardwoods are generally preferred but there are customers that want kiln dried hardwood species and for outdoor recreation uses, pine firewood has its virtues.

Firewood is measured by the full standard cord that is 128 cubic feet of well stacked firewood and is often noted as being a stack that is 4’ wide x 4’ high x 8’ long. Face cords are a fraction of a full cord, such as 16” long then is 16” x 4’ high x 8’ long, thus 43 cubic feet or a third of a standard full cord.



Firewood can also be sold by the ton that is a common method of measurement when a firewood operation is located in conjunction with a sawmill that buys logs that are weighed. The same scale can be used to weigh outgoing loads of firewood and this method offers a consistent frame of measurement for both buyers and sellers.

Species choices are widely variable by customers in the Eastern US as we have a large number of tree species that make acceptable firewood. Many consumer prefer oak and hickory for home stoves as they are dense hardwoods that last a long time in a fire, while outdoor recreational firepit users find pine lights easier and goes out quickly a benefit.

We know that there are wide variations in the heating value per cord of firewood with specific species, but all species can be acceptable for using in home and outdoor stoves, fireplaces and firepits.

#### 4-Firewood Business Management-Outline

Operating a firewood business takes skill and motivation to be thorough in all business details. Areas to pay attention to include:

1. Business management-operations
  - a. Bundling firewood
  - b. Shipping firewood out-green bulk, seasoned bulk, kiln dried, bundles
2. Finance
  - a. Statements-Profit and Loss
  - b. Statements-Balance Sheet
  - c. Statements-Cash Flow
  - d. Finding funding
3. Marketing
  - a. Bulk green split firewood
  - b. Seasoned split firewood
  - c. Wholesale and resale
  - d. Online sales
  - e. Boutique firewood
  - f. Bundle firewood-local retail
  - g. Bundle firewood-wholesale

#### 4-Firewood Business Management-basics and example

Good business skills and practical understanding to operate across all types of businesses and good management is the secret to a successful firewood operation. Good management includes:

• Answering phone	• Monthly financial reports
• Returning phone calls	• Weekly production schedules
• Frequent outreach to customers	• Sense of urgency of employees
• Visually pleasing operation	• Multiple sources of products/revenues
• Good maintenance and repair abilities	• High level of utilization of assets
• Good at invoicing and collections	• "Grubstake" mentality for opportunities
• Balanced steady production	• Pleasant working relationships with others
• Careful to make promises, keep promises	• Balance processing \$ and work

Example-smartest firewood business strategy ever seen-back in the 1990's while doing some consulting work in AR, I visited a large pallet operation where the mill cut oak cants into pallet blanks and normally had a leftover piece of the cant that would be about 12" long x size of the cant. This was a high volume operation that generated two dump truck loads of these waste cants per day. The owner/manager figured out that at 240 working days per year that he needed to move just under 500 of these dump truck loads per year. So, he came up with a simple strategy to sell the waste blocks for firewood and avoid spending lots of money on grinders and trailer loaders to convert the blocks into pulp chips that would have to be hauled two hours away for sale. His solution was to take a printed calendar and seek out buyers for two dump truck loads per day that so that he did not have to store the firewood and have to reload. He began with an empty calendar and over time filled out two buyers per day until the calendar was filled and then there was a waiting list. He priced the wood so that it was a good



bargain and was easily sold in the hills of northwest AR where firewood was valued. His staff would contact the persons on the calendar a week in advance to confirm, prepare the delivery ticket for the drivers each day, include an invoice with the delivery that was sold to be dumped and paid upon receipt. Wow! What a simple business strategy for firewood that that worked almost automatically with little effort by his staff.

#### 4-Startup Firewood Businesses

There is definitely a business opportunity for a startup firewood business to produce green split firewood in bulk deliveries directly from a logging harvest site. The concept is after a clear cut is made on a hardwood site, for an independent business operation to set up at the logging site and harvest firewood logs after the sawlogs and pulpwood logs are removed.

The bulk firewood business could presell the split green firewood so that when sawn and split by an onsite processor that it is loaded onto a dump truck or trailer and delivered directly to the customer. This business configuration involves multiple pieces of equipment that include a grapple skidder, firewood processor and several dump trucks or trailers. Given the nature of following a clear cut harvest, the logs would likely need to be bucked by an on the ground woodcutter.

It would be also possible for a fixed site firewood business to operate the firewood harvest and processor in the field and transport the split firewood to the central business operation where seasoned and kiln dried firewood could be produced.

Practically every firewood business that is selling seasoned split firewood runs out before the winter heating season is over, thus pointing out the need for additional production of seasoned firewood = a business opportunity. Seasoned firewood sells for a premium over green split firewood.

#### 4-Growing Existing Firewood Businesses

Existing firewood businesses can grow by adding sales to existing customers, adding customers, growing the service region, growing the output, and by adding new products. One should be knowledgeable about a customer's business that one can see additional sales opportunities with existing customers. Growing the service region offers the potential to add new customers. New products from existing wood sources and equipment offers the potential to grow sales without additional equipment purchases. New products may also complement sales growth by offering old and new customers reasons to buy the new products.

#### 4-Business Management-Organizing the Log Yard

Firewood operations are improved when logs are sorted in the yard by species, size and other criteria. This sorting allows a more uniform flow of logs into the splitting and processor operations that generates a higher level of production per hour. The yard should also buck crooked logs so they can be fed properly through the processors. Much production is lost when the processor operator has to stop running the processor to use a cant hook to turn logs so the feeding chain and move the log forward to the saw. Both the processor operator and the lift operator dislike stopping to buck logs, but it should be the task of someone other than the processor operator.

Many customers want specific species and sorting allows a single species to be processed at one time on the processor. This sorting is especially needed with producing cooking wood of a single species where including odd stick will result in customer dissatisfaction.

#### 4-Arborists Adding a Firewood Business

Many arborists venture into the firewood business as a way to find a home for the logs they obtain when doing tree jobs and think there may be potential sales and profitability. There are some problems to overcome and many arborists exit the firewood business after a few years when they encounter difficulties operating a firewood business:

1. High labor costs-trained tree climbers and general arborist employees like being up in the trees and often are not happy working in a fixed location splitting firewood. In addition, arborists that climb trees have high salaries due to the skill and danger involved as well as high worker's compensation rates that make it hard to compete with firewood businesses using normally priced labor.
2. Extra equipment costs-firewood processors can be expensive and many arborists have higher priorities with capital purchases in the arborist side of the business.
3. Lack of employees-good employees are hard to find in today's business climate and there may not be enough bodies to run an arborist business with a firewood business attached.

#### 4-Planning for Correct Number of Employees in a Firewood Business, Dealing With Variable Sales Levels and Startup Cash Needs

In the initial business plan for a firewood business one has to estimate the number of employees, their cost in the Goal Profit and Loss Statement and be able to monitor the P & L over time to remain profitable.

In the initial written business plan one begins with estimating the number of employees over several sales levels in order to estimate the direct labor cost. For example, if one was planning to produce \$1 million of firewood wood sales annually and direct labor employee cost at \$15 an hour was \$30,000 a year for ten employees, then the annual cost in the Goal P & L would be \$300,000. If the goal was to have a 25% cost of direct labor in the goal P & L there is a problem as the wanted expense would be \$250,000 but the estimated cost for the ten employees would be \$300,000, over by \$50,000. This is a better problem to resolve in advance of starting up so a solution has to be found to be more productive in terms of the sales per direct employee ration that is \$1 million/10 employees = \$100,000. If the \$1 million in sales was at the 25% direct labor goal, then the needed productivity of direct labor employees needs to be 8.3 employees or eight (needed direct labor productivity of \$1 million/8 employees = 125,000). So, the company has to find a way to obtain the \$1 million in sales by being able to work with less employees, usually by having employees handling more tasks, better equipment, smarter allocation of labor, etc.

4-Planning for changes in sales volume planning-firewood business will have swings up and down in sales volume over time. Traditionally this occurred in the winter versus the summer months when sales rose and fell as home were heated with firewood. The business plan should include a projection of the change of expenses, including labor, based on sales. The plan is needed so management can adjust expenses with the changing volume of business. Knowing that changes will need to be made as sales levels change helps steady the business and not treat changes in sales as surprises.

4-Startup cash shortages-the startup firewood business has to be very careful in how scarce \$ are spent as they are hard to find. \$ are invested in equipment and inventory before sales occur as well as the crew has to be paid every week as the business learns how to produce. Startup firewood businesses can avoid some capital expenses that can take large blocks of money by outsourcing some activities like kiln drying to nearby dry kilns. Leasing property, buildings, equipment, etc. can conserve scarce cash and allow the business to become avoid cash shortages in the early stages of the business. Over time if profitable, the company can invest in capital projects like larger processors, dry kilns, packing lines, buildings, etc. when the company can accumulate cash.

#### 4-Cash Flow Planning

Cash Flow Statements should be created on a monthly basis and in advance of each month, an estimated cash flow statement should be created. Spreadsheets are useful when creating cash flow budgets where the business can track actual and estimated flows in and out of cash. It is easy in business not to track cash flows and be surprised when payments out are exceeding payments in resulting in the need to find temporary sources of cash. Often problems in business management and marketing show up as cash flow problems. For example, let us say a successful firewood business decides it will hire several sales and marketing employees and send them out to sell firewood. After a few months where there are successful in making contacts, but no sales, suddenly the cash flow statement shows a declining trend in cash resulting from increased expenses without sales flowing back to the company. Cash flow statements are different from income statements as cash flow statements track the actual flow of cash while income statements track sales on the dates they are made (payment often is not collected when sales are made).

#### 5-Firewood Regulations and Dry Kiln Certification

Joshua Martin of the VA Department of Agriculture and Consumer Science is one of several Virginia employees that has certified firewood dry kilns and will present a slide show about the certification process.

#### 6-Marketing Firewood

We can organize our thinking of firewood marketing by thinking about these categories:

- Wholesale and retail
- Bulk and smaller lots
- Green, seasoned, kiln dried
- Home stoves, fireplaces, outdoor stoves, firepits
- Home energy, cooking and recreation

Wholesale and retail-while these are different markets, a single firewood operation can offer firewood to both groups of customers and the firewood can be of the same quality and species.

Wholesale buyers are getting lower prices and take larger volumes than retail buyers. Wholesale customer groups to target include garden stores, building material centers, retail store chains, nurseries, non-profits, restaurant chains, other firewood operations, local

governments, etc. These wholesale buyers can purchase in bulk green split firewood, seasoned firewood, bundles and kindling. What matters to wholesale customers is that they buy in bulk and take delivery in bulk, such as truckloads. Deliveries can be directly to their customers, a firewood operation, warehouse, store, etc.

We would want wholesale customers to set up an account and pay on terms or with a check upon delivery. For best results, the marketing needs to be in advance and production at the firewood business should operate on a "full capacity everything sold basis." This follows the concept of a green sawmill where when the green lumber is produced it is shipped to a customer directly unless stacked and set outside for air drying.

Value added services like seasoning, small splits, specific species, etc. allows the firewood business to target the exact needs of the customer, such as offering kiln dried cherry split firewood for cooking. Bundle firewood is also an example of a value added wood product where the bundle is configured to the specifics of the buyer.

Retail store marketing-while most firewood sold in retail stores is kiln dried bundled firewood, it is possible to sell air dried split bundles in one's local area. It is also possible to sell green, seasoned and kiln dried firewood in bulk to a retail store like a garden store where customers load their vehicles from a pile. The firewood producer dumps on the parking lot and the retail store may palletize to better organize the firewood. Additionally if one were to take a 4' x 4' wooden pallet and nail side boards to contain the firewood, such a pallet could hold a one third cord that could be loaded onto a vehicle using a forklift. This method can also be used at the firewood producer when splitting the logs initially to eliminate any future manual handling of the firewood.

#### 5-Marketing Bulk Firewood

Many firewood processors even if making kiln dried split wood or bundles will sell green bulk firewood to help even out seasonal sales and to offer sales to locals. These bulk sales should be organized so not to be a disruption to the ongoing kiln dried and bundle business by advance sales or loading by appointment or limited loading times.

Dump trucks and trailers are required to make the bulk business profitable and the business should insist on quick payment terms. Bulk buyers can include bundle firewood operations, farm and garden stores, greenhouses and other users of hot water stoves, firewood charities, etc.

#### 5-Marketing Bundles

Bundle marketing-while most think of selling wholesale firewood bundles through brokers to big box retail stores, there are other options available to bundle producers. For a local bundle business, one can seek out local retail stores and regional chains so that the processor can deliver in its own trucks or trailers. Often the deliveries can be made on pallets or in retail racks to eliminate filling wire cages and fixtures. Finding retail chains to contact is easy using Business Databases found at local public libraries and colleges. Go to the Reference Room and ask the librarian what business databases are available and research area retail chains to see where the owners are headquartered. You should make up a professional looking set of documents to look professional and see if you and the retailer can do business. You can look at retailers that are selling firewood and not yet selling firewood for opportunities.

Large retailers like Lowes, Home Depot, Tractor Supply, etc. do not buy directly from firewood processors but from national firewood brokers. They want to reduce the number of businesses they have to deal with to buy firewood and have standard contracts with the dealers with lots of penalties if problems arise. The brokers have standard contracts with firewood producers that pass along any problems to the producer, so it's a judgement call by the producer if one wants to be supplying bundle firewood to the big box retailers, but one has to sign to get the business.

Bundle package sizes-the standard size of bundles is the 0.75 cubic foot bundle that one sees at most retail stores. The bundle may be wrapped, bagged or some other configuration. It is important that every bundle be full sized and slightly exceed the state volume on the label. Each state has a Weights and Measures Department that visits retailers and checks to see if the stated volume on the label is correct. Some firewood processors have taken to reduce the stated volume to 0.65 cubic feet and still adhere to the 0.75 cubic foot standard to avoid being contacted by Weights and Measures if a short bundle gets out. Retail stores generally do not want bundles greater in size than 0.75 cubic feet as their research shows women are important buyers of bundle firewood and larger sizes have a negative impact on sales.

Bundle labeling-it is common for retail sales of bundles to have labels that include the name of the producer (can be private labeled), state certificate for kiln drying, volume, species and some promotional claims of quality. Typically, the label is placed onto the assembled bundle or bag before closing.

Bundle handles-some buyers want a woven handle stapled onto the bundle and some do not. The buyers pays an additional \$0.15 or so for the handle to be installed and are made from scrap woven fabric from the textile industry. Those that don't like handle report problems if the handle fail and the buyer is injured.

#### 6-Marketing Outdoor Recreational Firewood

There is a growing market for outdoor firewood in both home and public places. Many of our national and state parks and campgrounds have moved to requiring purchased kiln dried firewood for campers and recreational uses at these public locations.

Home use of outdoor recreation wood in firepits and fireplaces has created an opportunity for seasoned split pine firewood as pine offers faster starting and going out that has its advantages for home outdoor recreational uses. Ernie the Woodman of Huntersville, NC has pioneered the use of pine for outdoor use that helped him obtain free logs from arborists and developers that wanted a free place to dump logs suitable for firewood. He offers a free sample of pine for outdoor recreation uses at a lower price than for hardwood and has created such a good customer base that he normally sells out of pine split firewood.

#### 6-Marketing Cooking Firewood

There is both a wholesale and retail marketing for cooking wood that is growing. Cooking wood for barbeque restaurants has long been popular in North Carolina and Virginia, but now we are seeing growth for cooking wood in pizza ovens and other restaurant needs. Oak and hickory are the most popular species for restaurants but woods like cherry and orchard species like apple are also popular.

May homeowners smoking their own meats use cooking woods to add the wanted smoke taste to their creations. These homeowners pay full retail prices for their smoking woods offering a

good profit margin though the sales volume may be small for an individual buyer. There should be a wholesale opportunity to bag or box cooking wood to the homeowner market niche.

Supporting restaurants offer a chance to offer value added services that includes transporting the cooking wood in metal storage racks on dollies so entry and storage in the restaurant reduces handling by the delivery and restaurant staff.

## 7-Equipment-Splitters and Processors

There is a wide variety of the work quality of individual splitter and processor operators as well as a great variety of productivity due to log quality and the equipment in use. Some things to note about splitters and processors:

- Typical homeowner splitter-has a stop where the moving wedge splits the block and can be used in the vertical and horizontal position. This is the least productive powered splitting piece of equipment but versatile and the most affordable. This machine has one splitting taking place at a time with the wedge at the end of the hydraulic cylinder pushing against a solid end stop.
- Feed through wedge splitters-a great innovation that can be found on hydraulic and kinetic wood splitters using pass through wedges. These splitters are typically horizontal and have a supporting table that can hold splits for resplitting if needed. The pass through wedges offer an improvement from two to four times of that of the typically homeowner splitter. The kinetic splitters (cycle times of two seconds) are very fast and much more productive as compared to a hydraulic splitter with the wedge on the cylinder.
- Industrial wood splitters-these machine have larger engines and have multiple wedge splitters. They can put out a large amount of split wood but don't have a chainsaw bar to make the blocks. The blocking is typically done manually by a chainsaw operator.
- Smaller firewood processor-these machines typically have gas engines that may be up to the mid-twenties of horsepower. They may offer a dragline system or a lifting system to pick up logs off the ground. They have chain bar saws to cut logs into blocks and have a drag belt or chain to move logs to the saw. They may also have a short log deck to hold a couple of logs loaded by a tractor with lift or a skidsteer. They can have adjustable splitting wedges typically from two to six ways and often have a belt or chain conveyor to remove split wood.
- Larger firewood processors-these typically have larger diesel engines and have larger log capacity than smaller processors. Often they have large circle saw replacing the chain saw for blocking the wood. Some have grapple log movement configurations that replace bottom chains found on smaller machines. These machines have larger wedges that include the large box 16 way wedges. These are the most expensive and most productive of the processors typically seen at larger firewood operations.
- Forest industry made firewood processors-starting back in the 1970's some experienced forest industry professionals took typical forest industry equipment and made their own firewood processors. Some of these processors were well made and highly productive and typically separated the blocking and splitting into two operations handled by two operators.

These processing operations would be housed in a building, powered by large electric motors, have large circle saws for making blocks and would have conveyors to move split wood into trucks, trailers and piles. Some of these two-person forest industry made processors were more productive than any processor made today operated by one person and located on a trailer because of the two person manning the processor, large power output of engines and motors, circle saws instead of chainsaw blades and long infeed log decks.

## 7-More on Splitters

Homeowner hydraulic wood splitters-these splitters are most seen type of splitter in use are the homeowner variety that can be rotated vertical and horizontal, have the wedge attached to a hydraulic cylinder and have a stop at the end of an I-beam. This is an affordable, versatile and flexible machine for splitting firewood, but is not wildly productive. These splitters sell in the range of about \$1,200 to \$1,600 at the big box stores, have gasoline engines and are towable for short distances.

A better splitter that is four times as productive and cost about twice as much are the kinetic wood splitters. They use a gas engine or electric motor to power a 75 pound set of flywheels that power a ram quickly towards a single vertical wedge. The configuration most popular has a metal table to the sides and rear that catch the splitting pieces. The stroke is powerful and fast, far faster than the cycle of a hydraulic splitter with the same power Hp. SuperSplitter of MA invented the kinetic wood splitters and are the most widely seen manufacturer.

Multiple wedge hydraulic wood splitters-these are production machines that can be quite productive with powerful engines and the ability to install multiple wedge configurations. It is common to see six and eight way center point wedges that can be removed and changed to other configurations. Eastonmade is an innovative technology manufacturer of this type of wood splitter. Its production can equal or exceed that of a firewood processor with a second person converting logs into splitting blocks in cords per hour. These industrial sized wood splitters are good entry machines for a firewood operation that wants to become a production operation at minimal capital expenditures.

Entry firewood processors-these machines are affordable and offer one person operation that saws and splits the firewood logs with one machine. Some entry level processors can lift or drag the firewood log off the ground, thus eliminating the need for a lift. These entry level firewood processor start at just under \$20,000 and are good entry level machines for a startup firewood operation. Both US, Canadian and European manufacturers offer processors of this level. These processors typically have gas engines and are not configured for power by diesel engines or electric motors. Conveyors to carry split wood from the processor are optional. These machines may process up to 14" diameter logs. This level of processors don't have cabs for the operator. These processors have chain saws for blocking the logs. The logs are moved forward to the saw by a belt or simple bottom chain drive.

Mid level firewood processors-these are larger processors that are often powered by diesel engines, support better log handling options, have larger wedge configurations and have conveyors as standard to remove split wood from the processor. These machines often can process up to 18" diameter logs. This level of processors don't have cabs for the operator. These machines typically have a chain saw bar for sawing the blocks for splitting. Logs are typically moved to the saw by a bottom chain drive.

Large level firewood processors-these are the larger machines with high Hp diesel engines, large center point and box wedges, larger log decks and more options for decking and feeding

logs, and cabs for the operator. The sawing is often done with a large carbide tipped circular blade. The logs are moved forward to the saw by a bottom chain drive or with an overhead grapple.

European vertical processor-new from Europe are large processors that split the blocks automatically vertically with a cycle that advances the blocks sitting upright an indexed amount using an X shaped wedge. A one person operator saws the blocks that then drop down a slide to stand upright. The blocks are conveyed on a steel slat conveyor that accumulates the blocks forward tightly so the index cycle splits the blocks into rectangular pieces sized per the length of the index movement forward. This may be the future of processors as they are productive and produce great quality firewood.

### 7-Firewood Conveyors

After the Splitting Wedge-productive processors and industrial splitters require a powered conveyor after the splitting to get the firewood out of the way and onto its next destination. The type of conveyor can include rubber belt conveyors and chain conveyors. Both work well and are often attached to a processor that can be transported with a processor. These conveyors are typically powered by a hydraulic motor powered by the processor engine with larger processors and may have their own small gas engine in a small processor.

Pivot conveyors are a special conveyor that has powered wheels under the conveyor that is connected to the processor by a pin that allows the exit end of the conveyor to pivot for loading into piles, trucks or trailers. These pivot containers are common in the gravel and sand industry and are a welcome booster of labor productivity as the processor can be operated continuously when loading. These conveyors eliminate most of the waits and delays that occur when trucks are full and need to be moved to complete loading. These pivot conveyors can be powered by an electric motor or by a hydraulic motor of the processor.

### 7-Cleaning the Splits

The splitting process generates small slivers and sawdust not wanted in split firewood in bulk or for packaged bundles. There are a couple of screening methods used in the firewood industry:

- Angled slat slide-a fixed set of spaced pipes or tube steel allows the split firewood to slide down a ramp and slivers have the opportunity to drop out. This is the most economical option as there is no motion and power required by the screen.
- Rotating cage-a cage made of pipes or tube steel is set on a downward pitch with the cage rotating the firewood from the processor. This rotation allows for more removal of splinters and sawdust and cleans the firewood to a better degree than does the simple slide.
- Vertical disc separator-this is a line of grouped discs that have notches that bounces up the firewood and is powered. The spaces between the discs allows for splinters and sawdust to drop out and the gaps in the discs allows for bouncing to assist unwanted material to drop out.

### 7-Packaging Bundle Options

One of the areas of firewood operations is the need for better equipment and methods of making bundles. Currently the methods include stretch wrapping, shrink wrapping and netted bags.



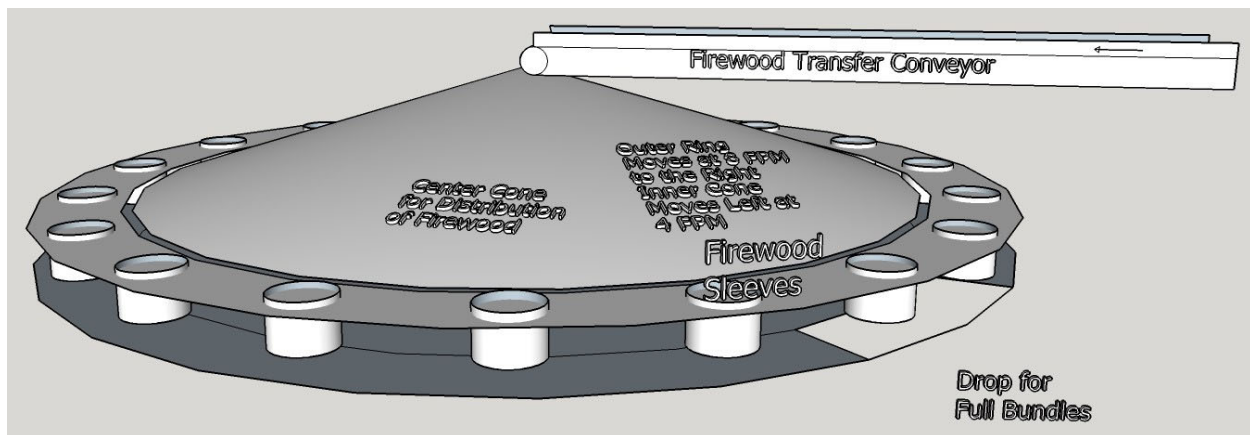
Stretch wrapping is commonly used in smaller and startup operations as it is quick, easy and takes little equipment \$. Stretch wrapping uses a steel u-shaped fixture to hold the bundle of firewood that is hand or machined wrapped around its outside. A paper label is installed prior to wrapping. A good employee can be productive and every effort should be made to raise the level of the work to waist high so the employee is not working off the floor. Bundles are placed on a pallet near the employee that typically works alone when manually stretch wrapping. There are electric stretch wrappers available that will carry the stretch wrap in a circle around the bundle for a set number of cycles and offers the employee a quick rest while wrapping.

Shrink wrapping is typical on a production line machine where a crew on the front end places a section of the shrink wrap material in a U-shaped fixture on a conveyor before the splits are placed into the fixture. Normally larger pieces are placed in first before smaller pieces are loaded to complete the bundle. The label is placed onto the bundle before the shrink wrap material is folded over. The conveyor takes the bundles into a heated box for a specific period of time before exiting for offloading onto pallets.

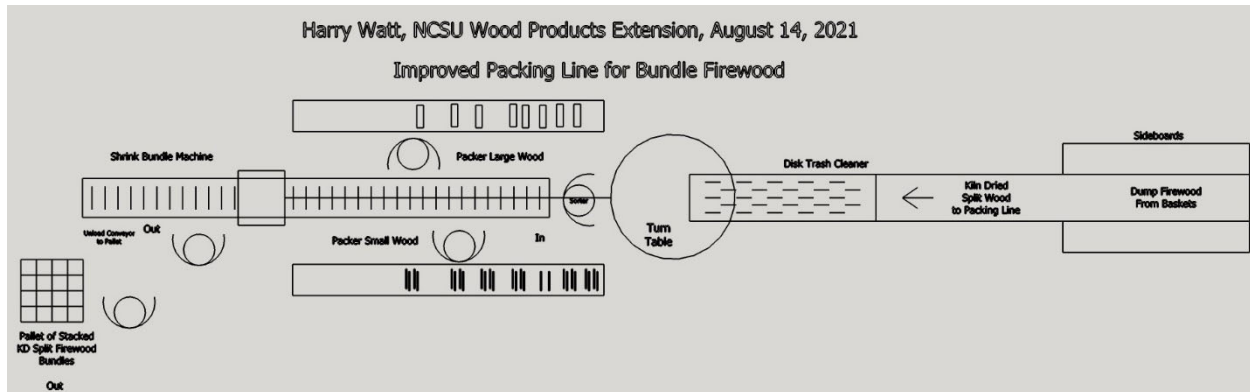
Multiple manufacturers make production line shrink wrapping machines that can cost into the hundreds of thousands of dollars. They are productive and needed when the firewood business needs to make thousands of bundles per day. Most are heated with propane given the lack of natural gas at most firewood operations.

Netted bags are becoming more popular as consumers are beginning to want to avoid the use of large amounts of clear plastic in their purchasing of goods. Bags are either top or end loaded and have some difficulty in use with corners of sticks of firewood getting caught as the sticks are being placed into the bag.

The production line concept is being adapted to the netted bags but so far the past issues with straight line production lines have not been overcome. Harry Watt has developed a circular bag packing system to overcome the shortcomings of straight line production packing firewood lines. The most common problems with straight line packing lines are the crowding of employees onto a single side making a poor working environment and poor productivity. It is common for a packing line to have a lower per hour productivity per employee than when employees are wrapping as individual employees.



Layout for Improved Lineal Firewood Packing Production Line



## 7-Moving and Hauling Equipment

Firewood is bulky and the more it is moved around, the more labor is involved and production cost. Most firewood businesses want to eliminate moving firewood and most struggle in how to accomplish that goal.

Firewood from the processor can be dropped into piles and moved with buckets on tractors, skidsteers and heavy equipment. All take a piece of equipment and an operator, both high cost expenditures.

Moving by conveyor is a lower cost option but has limits. One can move by conveyor into vented storage bags for air drying, steel baskets for kiln drying, dump trucks and trailers or other hauling methods. Kiln drying in baskets has limits of how many baskets are available at any given time because of the high cost of baskets. Bags can be low cost especially when one can purchase once used bags at a discount.

Most firewood operations making bulk deliveries match the size of their delivery units to their distance to travel and the volume of firewood wanted in a delivery.

## 8-Drying Firewood-Options for Seasoning

Seasoning is most commonly described as outdoor drying of firewood below 19% moisture content based on oven-dried weight. Some woods dry faster than others with oak, hickory and other dense hardwoods taking the longest time. Some firewood businesses avoid oak and hickory due to the longer seasoning time required.

Some methods work better than others when seasoning firewood:

Best option 1-stack under a roof, get well off ground, lots of air circulation

Best option 2-drop into a vented bag with hooks, store under an open shed

Best option 3-drop into a wire basket off the ground and covered

Worst option-pile up outdoors in a tall stack

One can check on the progress of air-dry seasoning by splitting a large stick of firewood and use a pin moisture meter to test the moisture content. Readings below 30 percent may be believable while those greater than thirty percent cannot. Recall that the short needle electric pin meters measure the wettest wood they contact, so you want to split the firewood stick and

measure the interior of a larger piece of wood to understand where in the seasoning is the pile of firewood.

Some firewood producers put pile firewood atop a set of wooden pallets and perhaps having two pallets high will provide the air flow under the pile they wish. Some have tried to stand a plastic or steel pipe in the center of the pile with holes in the pipe for better ventilation in the pile, like a chimney.



### 8-Kiln Drying

Only in the last twenty years or so has anyone been kiln drying firewood. Most of this effort has been related to the bundle firewood products and the need to kiln bugs and eliminate mold in stored bundles. More recently there has been a growth of kiln dried cooking firewood and stick firewood for those that want superior performance in their firewood products. Each year more firewood buyers find kiln dried split firewood is what they want to buy due to its superior burning qualities.

The equipment for kiln drying firewood is what we use for traditional drying of lumber with the exception of using higher temperatures and the doubling of kiln fan horsepower for greater heat and air flow. Stick firewood in baskets has significantly greater air resistance than lumber on stickers that convention lumber dry kilns operating at 180 degrees F take two weeks for proper firewood drying versus about three days for our new firewood dry kilns.

Dry kiln operate on the principle that one sets the desired temperature as measured by a temperature probe in the air. Moisture is removed from the kiln based on the level of moisture as determined by a temperature probe that has a wet sock over it. The kiln controller then turns the heat on and off as needed and opens and closes the vents as needed according to the settings by the operator. Excessive venting wastes heat and under venting prolongs the drying time required.

### 8-Common Types of Firewood Dry Kilns

The standard dry kiln types are hot water and steam heated kilns. While other types work for lumber these two types are the only commercially viable types for firewood that balances production and cost. Dry kiln types that have not proven useful for firewood are the dehumidification and vacuum dry kilns.

## 8-Firewood Dry Kiln Manufacturers

There are several dry kiln manufacturers made in the US that are being used by the firewood industry:

<p>Kiln-Direct          Burgaw, North Carolina          Phone 910 259 9794          Web-www.kiln-direct.com          Contacts-Niels Jorgensen</p>	
<p>SII          Lexington, North Carolina          Phone (336) 357-7146          Web-www.siidrykilns.com          Contacts-Brian Turlington, Jim</p>	
<p>KDS Windsor          Etowah, North Carolina          Phone 828-891-8115          Web-kdskilns.com          Contacts-Nick Girardi</p>	
<p>Nyle Systems, LLC          Brewer ME 04412          Phone (207) 989-4335          www.nyle.com          Email: kilnsales@nyle.com</p>	

## 8-Kiln Heat Certification

In recent years due to challenges by invasive insects to US forests, we have been setting standards to heat treat firewood. The standards vary from specific insects but generally temperatures from 140 to 160 degrees F are sought to reach inside the firewood for at least 35 minutes. This treatment has to be verified by temperature probes that record these heat treatment that may be in the probe or by a recording device outside the kiln.

The Animal Health Inspection Service set standards for heat treating firewood and until recently helped monitor the certification of kilns. Today individual US states have taken over the certification of kilns duties. In North Carolina, the certification of kilns is conducted by the North Carolina Forest Service that annually tests kilns and offers a certification certificate that is shown on labels of bundled firewood. Other states have similar organizations doing kiln certification.

The US Forest Service in 201 published FPI GTR 2000 that details the proper heat treatment of firewood and should be used as a reference. The address to download this publication is [https://www.fpl.fs.fed.us/documnts/fplgtr/fpl\\_gtr200.pdf](https://www.fpl.fs.fed.us/documnts/fplgtr/fpl_gtr200.pdf).

## 9-Cooperation With Others

Firewood businesses can expect to reach higher levels of sales, profitability and stability when cooperating with other businesses and support organizations. Cooperation offers a support network that can increase the number of contacts for sales, material sourcing, customers, assistance with government regulators, etc. than operating as an individual isolated businesses.

Here are some groups to pursue a constructive mutually beneficial relationship:

1. North Carolina Forest Service, Virginia Division for Forestry, US Forest Service, North Carolina Forest Association, Virginia Forestry Association
2. Local and state economic assistance organizations
3. Local community college small business center
4. Local county forestry associations-help start one if one does not yet exist
5. Local government heating assistance groups
6. Local church and civic group heating assistance groups
7. Chimney sweeps
8. Retailers of patio fireplaces, woodstoves, firepits, hardscapes, cooking stoves

A concept that Harry Watt and the NC Forest and Wood Products Marketing Team USFS grant project is involved is to develop a workable local business center in NC's communities for a Local Wood Center where multiple important activities take place-sawing lumber, kiln drying lumber, chipping waste wood, making simple wood products, hauling wood, and small forest track harvesting.

The idea is to have locally the wood products many of us buy from big box stores.

## 10-Future of Firewood

Equipment-processors-there may be some innovations that may come to the US firewood industry, some from Europe and some homegrown. From Europe there is an Italian company that makes a somewhat automated vertical index splitter that uses an X wedge in a high volume processor. It has an end pusher for more accurate blocking and uses one operator.

Homegrown innovations may include going back to the processors that used one operator for sawing and one for splitting. The productivity gain per hour as shown in a projected Profit and Loss Statement could overcome the extra hourly labor. Splitting the work duties allows each operator to focus on just sawing or splitting, resulting in higher hourly output and potential sales of firewood.

Equipment-bundle packers-currently our packers are challenged by labor productivity and cost where many firewood businesses that bundle firewood find that single operators using electric wrappers are more productivity than shrink wrap production machine and at less cost. Harry Watt has proposed a circle net bag packing workcenter as an alternative.

Dry kilns and baskets-it may be that we rethink our baskets to use fewer baskets but taller in the modular kilns made by companies like Kiln-Direct. If baskets were full length of the kiln, they could be easier to load after the cleaner when loaded from above and moved as needed to fill up. Moving one long basket could be managed by a system of rollers, conveyors or other means from the loading station to in and out of the kiln, and would require some kind of a dumping mechanical system. The outcome would be less material in baskets, less labor to load

and less time in and out of the kiln. Fewer baskets should have less by-pass in air flow and could lead to faster drying.

Better and cheaper woodstoves-most homeowners want a new woodstove to be able to pay for itself in a reasonable number of years. Currently for both inside and outdoor woodstoves, the payback period may be ten to twenty years just on the costs of the stove and installation. Better stoves would have more mass, like masonry and more baffling, so that the firewood is burned hotter and longer in the stove.

Wood chip and blocks woodstoves-much of the public does not like our woodstoves because of smoke issues. Smoke output is related to many factors but loading large amounts at one time causes smoke until the wood is hot. One way to reduce smoke is to load the stove more frequently with less wood. Wood chips and small wooden blocks can be automatically loaded when controlled with an auger and PLC logic unit. Temperature probes would give feedback to the stove temperatures and provide more wood only when needed.

Multiple family woodstove sharing-our modern outdoor woodstoves can provide for several homes when the home are close by and have modern construction with adequate insulation, modern double pane windows and sealed to limit leaks. Hot water can be pumped several hundred feet and heat garages and other insulated buildings.

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#### Appendix 1-Concepts of Moisture in Firewood and Its Measurement

Moisture in wood starts in the standing tree and USFS studies have developed charts that show the typical moisture content found in standing trees. For oak, the value is 65%. In the wood industry we state moisture content as the ration of water to oven dry wood in a piece of wood, so if we had a 165 pound block of fresh oak it would contain 65 pounds of water and 100 pounds of dry wood. The public might think that the weight of water would be = 0.65 x 165 pounds = 107 pounds, but that is incorrect. So if we wanted to dry the 165 pound block of green oak to 19% moisture content we would have to remove 65 – 19 pounds of water = 46 pounds of water to reach the 19% moisture content level.

Thus the formula for figuring moisture content in wood is % MC = ((greet wt – od wt)/od wt) x 100 or the weight of water divided by the od weight x 100.

#### Appendix 2-Weights of Firewood by Species

US Forest Service Summary Table for Firewood by Species

Species	Weight (lbs./ Cord)		Heat per Cord (Million BTUs)	Ease of Splitting	Smoke	Sparks	Coals	Fragrance	Overall Quality
	Green	Dry							
Ash, Green	4184	2880	20.0	Easy	Low	Few	Good	Slight	Excellent
Ash, White	3952	3472	24.2	Medium	Low	Few	Good	Slight	Excellent
Aspen, Quaking		2160	18.2	Easy		Few	Good	Slight	
Basswood (Linden)	4404	1984	13.8	Easy	Medium	Few	Poor	Good	Fair
Beech		3760	27.5	Difficult		Few	Excellent	Good	
Birch	4312	2992	20.8	Medium	Medium	Few	Good	Slight	Fair
Boxelder	3589	2632	18.3	Difficult	Medium	Few	Poor	Slight	Fair
Cherry	3696	2928	20.4	Easy	Low	Few	Excellent	Excellent	Good
Cottonwood	4640	2272	15.8	Easy	Medium	Few	Good	Slight	Fair

Douglas-fir	3319	2970	20.7	Easy	High	Few	Fair	Slight	Good
Elm, American	4456	2872	20.0	Difficult	Medium	Few	Excellent	Good	Fair
Fir, White	3585	2104	14.6	Easy	Medium	Few	Poor	Slight	Fair
Hackberry	3984	3048	21.2	Easy	Low	Few	Good	Slight	Good
Hemlock		2700	19.3	Easy		Many	Poor	Good	
Honeylocust	4640	3832	26.7	Easy	Low	Few	Excellent	Slight	Excellent
Locust, Black	4616	4016	27.9	Difficult	Low	Few	Excellent	Slight	Excellent
Maple, Other	4685	3680	25.5	Easy	Low	Few	Excellent	Good	Excellent
Maple, Silver	3904	2752	19.0	Medium	Low	Few	Excellent	Good	Fair
Mulberry	4712	3712	25.8	Easy	Medium	Many	Excellent	Good	Excellent
Oak, Red	4888	3528	24.6	Medium	Low	Few	Excellent	Good	Excellent
Oak, White	5573	4200	29.1	Medium	Low	Few	Excellent	Good	Excellent
Osage-orange	5120	4728	32.9	Easy	Low	Many	Excellent	Excellent	Excellent
Pine, White		2250	15.9	Easy		Moderate	poor	Good	
Poplar		2080	Low	Easy		Many	Fair	Bitter	
Redcedar, Eastern		2060	13.0	Easy	Low	Many	Poor	Slight	Fair
Redcedar, Western	2950	2632	18.2	Medium	Medium	Many	Poor	Excellent	Fair
Spruce	2800	2240	15.5	Easy	Medium	Many	Poor	Slight	Fair
Sycamore	5096	2808	19.5	Difficult	Medium	Few	Good	Slight	Good
Walnut, Black	4584	3192	22.2	Easy	Low	Few	Good	Good	Excellent
Willow	4320	2540	17.6	Easy	Low	Few	Poor	Slight	Poor

Green weight is the weight of a cord of freshly cut wood before drying.

Dry weight is the weight of a cord after air drying. Green firewood may contain 50% or more water by weight.

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Harry Watt Youtube Firewood Videos-40 videos-just put "Harry Watt Firewood" and the 40 videos will come up.

Profit and Loss Statement  
Firewood Inc.  
Dates

		Units	Volume	\$	Total \$	% of sales
Sales	Green split firewood	Cords				
	Seasoned split firewood	Cords				
	Kiln dried split firewood	Cords				
	Firewood bundles	Bundles				
	Kindling	Bags				
	Other					
	Returns and allowances					
				Net sales		

					Total \$	% of sales	
Expenses	Firewood logs						
	Direct labor						
	Overhead	Depreciation					
		Fuel					
		Indirect labor					
		Insurance					
		Interest					
		Lease payments					
		Maintenance					
		Miscellaneous					
		Office supplies					
		Power					
		Repairs					
	Supplies						
	Tools						
	Total overhead						
Total expenses							
Net income							



## Appendix 4-Financial Statements, Cost of Firewood

### 7-Three Traditional Financial Statements

Traditionally business operate using three basic financial statements:

- Profit and Loss-a statement for a period of time, such as a month or annually, measures the expenses such as materials, labor and overhead as well as sales revenues and profit.
- Balance Sheet-a snapshot statement for a date of the status of assets and liabilities
- Cash Flow-a statement for a period of time of the cash in and out of the business

Together these statement are the measurements needed to manage the financial status of the company. They are all a today or past summary of the business in financial terms.

Looking into the future one can create projected financial statements to forecast different potentials in order to see the likely effect of various management options, that would be changes of strategy. Hopefully seeing a problem in the sales, profitability or cash flow will create taking actions now to improve the statements in the future.

Business Strategy Alignment = Pricing to Scheduling to the Goal P & L Statement

The three concepts that sawmills need to understand for financial success are:

1. Product costing, bidding-know what are the costs of materials, direct labor, overhead
2. Production scheduling
3. Goal profit and loss statement

These have to align to configure the business to generate enough profitable sales to reach the goal profit and loss goals. Product costing provides the estimates of cost, the schedule relates the level of sales and the profit and loss statement shows if the estimates make financial sense.

### Small Sawmill Business Management-Product Costing Concepts

Figuring costs of firewood, kindling, sawdust, etc. is an art and a science that one cannot do in a simple system, like using weight measurements at the same \$ per pound. One has to develop a consistent system that makes sense and is easy to figure. We realize that competitors often seem to set prices but costs are not prices and one needs to know what cost are experienced by their operation and always if possible sell at a sufficient markup so that the business is sustainable.

Log Cost of Wood Products-most of incoming logs go into firewood products except for sawdust and odd small pieces. One can figure the cost of wood products by taking the input cost of a log by what is coming out of the logs with some estimates of yield and value, realizing that the total of volume and value has to add back to the cost of the log.

Log Processing Cost into Firewood-as soon as a log truck enters the firewood yard, cost begin to accumulate. In addition, there are yield losses where purchased logs do not become firewood sales. One should breakdown the manufacturing processes that convert logs into firewood at the dock step by step. Generally the steps are 1-receiving and log storage, 2-sawing, splitting, cleaning, exit to a pile, loading into trucks and trailers if green bulk, 3-air drying

seasoning, 4-loading into baskets for kiln drying, 5-kiln drying, 6-packing or bundling, 7-loading for shipping.

Each of these operations takes time, equipment, labor and overhead expenses. These expenses can be estimated based on previous experience and looking at the monthly profit and loss statements.

Eventually one can estimate the cost of firewood based on volume realizing that the cost does vary with volume.

So, to figure the cost per log to saw for slabs or lumber it requires some data collection. Some of the following information is useful for figuring log production costs:

- Use last year's Profit and Loss Statement to find the annual direct labor and overhead expense. Create a daily rate for direct labor and overhead by dividing by the number of production days, and it may not be the standard 240 wood days per year if running less than full time. Overhead costs are easy to figure as Total Expenses – Direct Labor – Overhead Expenses.
- Look at your production reports to learn the number of logs sawn in the same period as you Profit and Loss Statement used above. Then generate a \$ figure per log for labor and overhead. You do have to be careful if your operation is large and is involved in dry kilning and other activities.
- Be careful in figuring costs when you are selling a mix of products, some green, some dry, some bulk, some bundles, etc. If you are careful you can develop good estimates of the cost of all your products. Remember that the sum of all annual expenses have to be split among all the products. Each product will have its cost and profit margin based on your volume.
- It is important to avoid spoilage of logs and firewood in order to be profitable. One should pay attention to firewood that has gotten out of the product flow and get into a saleable product before it spoils.
- Do keep track of the \$ value of inventories and their trends in regards to total \$ and how relative to sales. Remember that inventory turnover is calculated as the \$ of sales / \$ of inventory on an annual basis.