Forest Research Group

Forest Research Notes

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What Makes a Softwood Tree Valuable?

Trees are the unique feature of the timberland asset class. Land is an important feature, but land is also a component of commercial real estate and agricultural investments. Trees are unique in that they grow (unlike commercial real estate assets) and they can be stored (on the stump), unlike agricultural crops.

Here we look at what determines the value of softwood trees. (Hardwood tree values will require a separate Research Note.)

In *How Trees Grow* (Vol 8 No 2), we looked at total volumes. But, except in very rare cases, timber stands produce more than one product. Figure 1 shows a typical product breakdown of the total yield from a hypothetical loblolly pine stand. The biological rotation age of this stand is 30 years. At that age, 57 percent of the volume would be in sawtimber, 22 percent would be in chip n saw and 21 percent would be in pulpwood (Table 1).

Figure 2 shows what happens when stumpage prices are applied to the volumes in Figure 1. (The prices used here are those reported by Timber Mart-South for the first quarter of 2012.) At age 30, this stand will yield almost $3,000/acre, and due to the difference in the value per ton of the different products, nearly 3/4 of this will be from the sawtimber.

Table 1. Distribution of Volumes and Value from a Hypothetical Stand of Loblolly Pine

	Pulpwood	Chip N Saw	Sawtimber
Volume	21%	22%	57%
Value	10%	18%	73%

It is obvious that sawtimber provides more value than pulpwood or chip n saw, but what makes this so?. What makes one log (or tree) more valuable than another log (or tree)?

Figure 1. Product Yield for Loblolly Pine, Hypothetical Stand

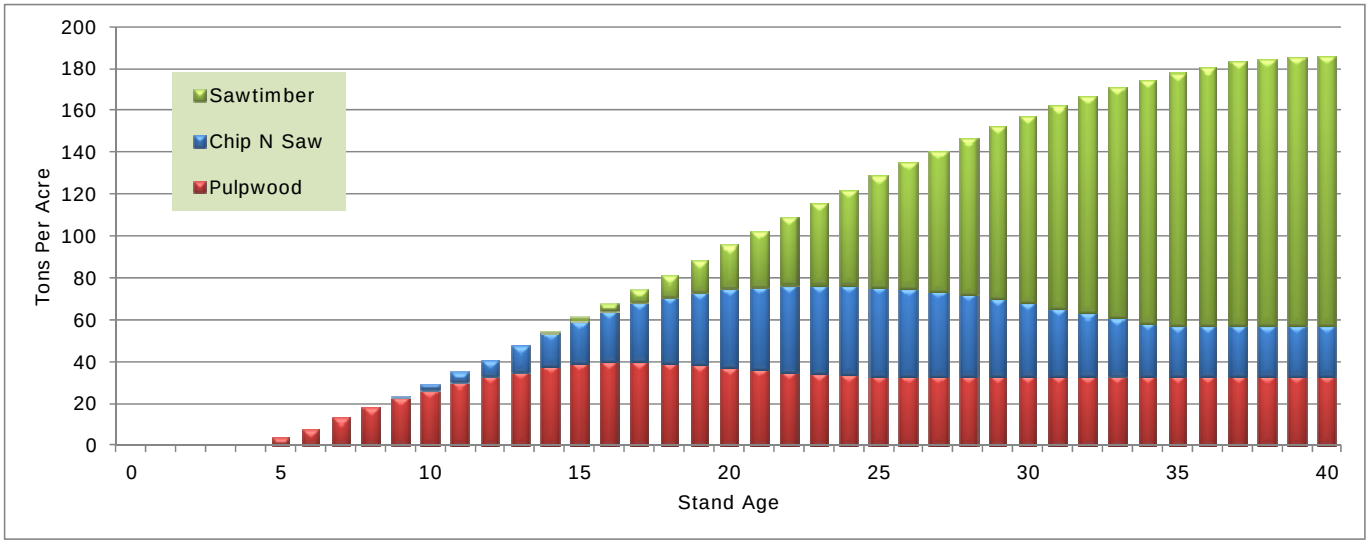
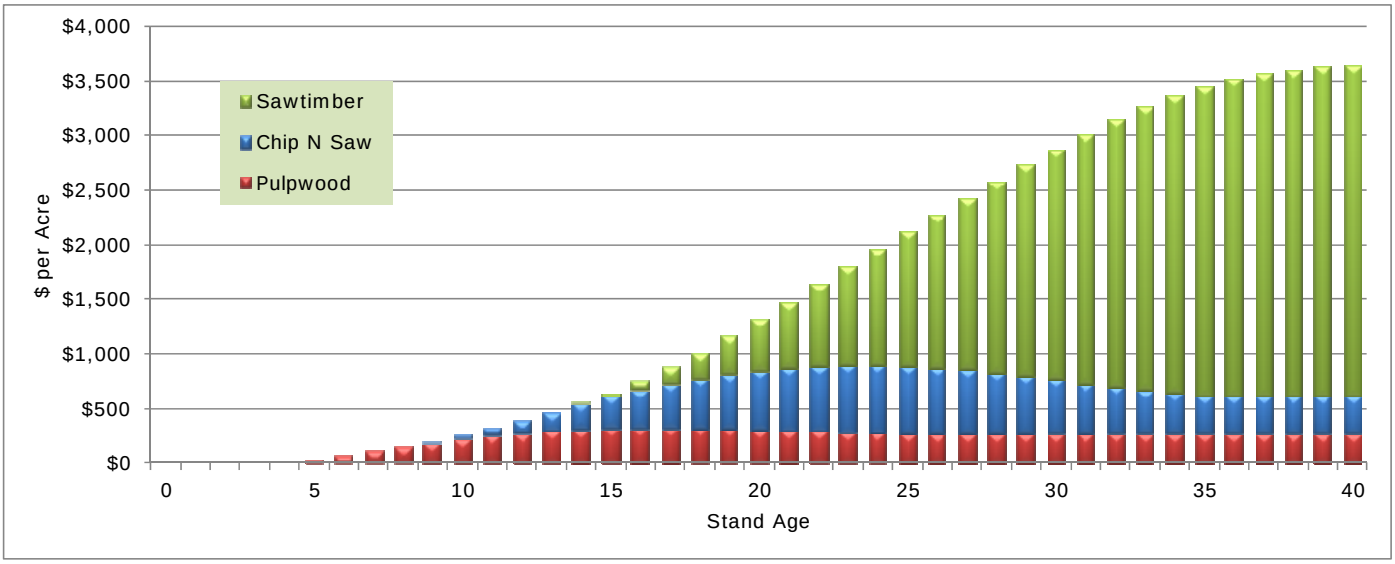


Figure 2. Value Yield for Loblolly Pine, Hypothetical Stand



Size is Critical

A log's value, and therefore a tree's value, depends on the value of the products that can be made from it. One of the most important parameters for softwood trees is size: a larger log can produce a wider variety of products and (usually) more valuable products can be made from smaller logs.

The tricky part is that log products or grades are usually based on the diameter of the small end of the log[1], while tree diameters are measured 4.5 feet off the ground (DBH). The small end of a log will be anywhere from 6 feet to 100 feet higher than that. But, for most species, a minimum DBH can be determined that will yield a log with an acceptable minimum diameter for a product.

For example, Timber Mart-South uses the following specifications for products when reporting timber prices across the South:

Pulpwood:	6" & up DBH
Chip-n-saw:	8" - 11" DBH
Sawtimber:	12" & up DBH
Ply logs (veneer) and poles	local standards

[1] Trees (and logs) are not perfect cylinders: they taper from the bottom of the tree to the top of the tree. This means all logs have a large end and a small end (the end that was closest to the top of the tree).

This means, for example, that a tree with a 12 inch DBH is expected to produce a log that has a small-end diameter large enough to be sold to a sawmill.

High End, Rare Logs

At the top of the size (and value) list are veneer logs and poles. Pole logs (used in making utility poles) are perhaps the rarest, because not only must they be large in diameter, but they must be long, sometimes over 100 feet long. Veneer logs (or ply logs) must be large in diameter, but don't need to be nearly as long as poles.

However, as valuable as these logs are, they are usually not a significant component of most institutional investment forests. Intensive management and maximization of returns tend to lower rotation ages, which reduces the volume of larger trees suitable for these products.

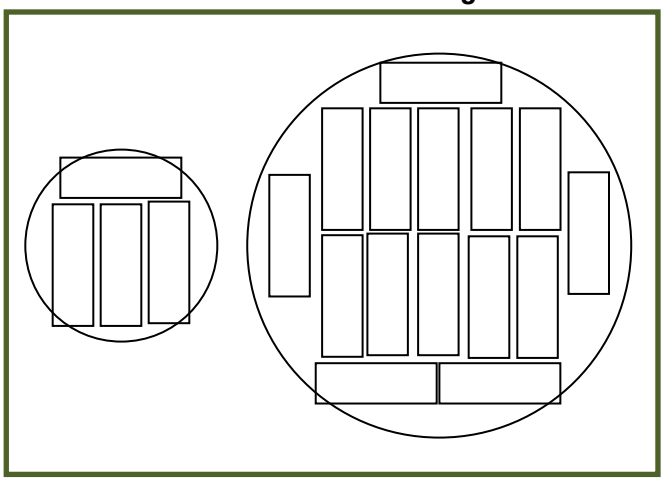
Sawtimber

Sawtimber accounts for most of the timber value in an investment forest. A significant portion of a sawlog ends up as lumber. Another sizeable portion ends up as chips (for pulpmills), while bark and sawdust contribute some value.

The first requirement for a sawlog is size: a minimum diameter and a minimum length must be met, and these vary with the mill purchasing the timber. For example, Georgia-Pacific's Coos Bay, OR, softwood sawmill wants logs with a minimum small end diameter of 5 inches[2] and a maximum large end diameter of 25 inches, while its Philomath, OR, sawmill wants logs with a minimum small end diameter of 8 inches (no large end diameter is specified). The logs from both mills need to be at least 36 feet long.

Larger diameter logs produce more lumber and more valuable lumber than smaller sawlogs. In the diagram below (Box 1), the log on the right is twice the diameter of the log on the left, but it will yield 17 boards of the size shown compared to 4 boards for the smaller log. (Real mills would squeeze another piece or two of smaller size out of both logs.)

Box 1. Lumber Yields from Logs



The larger log can also produce wider pieces of lumber, which are usually more valuable than narrower pieces of lumber (e.g., a 2X12 sells for more per board foot than a 2X4).

Quality is also important. Crooked logs or those with splits or rot or other defects are less valuable Growth rates can affect quality and value as well--some West Coast softwood log export grades specify a minimum number of annual growth rings per inch.

Chip N Saw

Chip n saw logs have been a significant product over the past 30 years or so. These are logs that formerly would have been small sawlogs or larger pulpwood logs. Rather than sawing boards out of a log, these mills chip the round part of the log away from the lumber. Because they are smaller logs, they tend to produce a higher proportion of chips than the larger sawlogs Georgia-Pacific's chip n saw mills in its Southeast Region have minimum diameters that range from 4 to 6 inches (depending on the mill) and maximum diameters that range from a minimum of 9 inches to a maximum of 16 inches.

Pulpwood

Pine pulpwood logs can be as small as 2.5 inches on the small end. Forked trees and large logs that are big enough to be sawlogs but are too crooked or have too many defects to be graded as sawlogs will be sent to pulpmills.

"Pulpwood" logs also go to panel/OSB plants and some are finding their way to pellet plants and biofuel plants.

Location, Location, Location

Physical attributes are only part of the picture. Asking how much your trees are worth is like asking how much your house is worth. We need to know where it is. A three bedroom house in Los Angeles, CA, will probably have a different value than an otherwise similar three bedroom house in Bangor, ME. And the value depends on what part of Los Angeles or Bangor we are talking about.

As with houses, the value of timber also depends on where it is located. You do not own timberland in the US South (or West), you don't own timberland in the state of Georgia (or Wisconsin), nor even in southern Georgia. You own timberland that is located within about 100 miles[3] of a collection of wood-using mills.

[2]The specifications are published on GP's web site: http://www.gp.com/forYourBusiness/forestry/facilities.html

[3] This distance has some flexibility. Higher value logs can travel longer distances.

If there is a chip n saw mill within 100 miles of your property, you can sell chip n saw logs. If there is not, then you have large pulpwood trees and small sawtimber trees, but you have no chip n saw trees.

If there is only one pulp mill within 100 miles of your timber, you will not see strong pulpwood prices. But if there are two or three pulp mills and several panel/OSB plants and a pellet plant, the competition for smaller logs will be strong and you will experience strong markets for your smaller trees.

Other Factors

Organizations and agencies that publish stumpage prices often provide a list of factors that affect the value of standing timber (i.e., why the price you get for your timber may differ from the published prices). The New York Division of Lands and Forests provides a pretty complete list (which includes factors we've discussed above):

1. Timber quality (see above)
2. Volume to be harvested per acre
3. Variability of terrain
4. Market demand
5. Distance to market (see above)
6. Season of year
7. Distance to public roads
8. Costs of harvesting
9. Size of timber (see above)
10. Species mix
11. Type of logging equipment
12. Landowner requirements for harvest
13. Landowner knowledge of values
14. Insurance Costs
15. Performance bond and other requirements

Values Change

Another things to keep in mind about the value of your trees is that timber prices are not static. They change due to the demand for the products that wood is made from and the supply of logs that can produce that product. Over the short term, logs may be scarce or plentiful as rain or snow stop logging operations or dry spells or lack of snow allow loggers to operate in areas that are normally inoperable.

Table 2 shows real southwide southern pine stumpage prices at various times over the past 30 years.[4]

Table 2. Changes in Real (2012$) Southwide Southern Pine Stumpage Prices

Quarter	Poles	Ply Logs	Sawtimber	CNS	Pulpwood
	2012 $/ton				
1980-Q1	$87.00	$62.74	$50.43	$34.12	$12.23
1990-Q1	$55.13	$39.61	$29.84	$23.73	$11.15
2000-Q1	$82.38	$57.72	$56.29	$38.64	$12.15
2010-Q1	$53.82	$31.56	$29.00	$17.96	$11.28
2012-Q1	$52.69	$27.83	$24.15	$15.04	$8.56
	Ratio of Product Price to Pulpwood Price				
1980-Q1	7.12	5.13	4.12	2.79	1.00
1990-Q1	4.94	3.55	2.68	2.13	1.00
2000-Q1	6.78	4.75	4.63	3.18	1.00
2010-Q1	4.77	2.80	2.57	1.59	1.00
2012-Q1	6.16	3.25	2.82	1.76	1.00

Source: Timber Mart-South

The difference in price between products changes over time. Note in particular that the ply log premium (compared to sawtimber) is much less than it used to be. Ply log trees sold for 24 percent more than sawtimber trees in 1980, but that premium had dropped to 8 percent in 2010 (it had improved to 15 percent in 2012).

Summary

While there are many sources of published timber prices, determining the value of a particular stand of timber is a complex task, with must take into account the individual trees in the stand, logging conditions and the distance to the mills than can use them.

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[4] These prices probably do not apply to *your* trees: see *Location, Location, Location.*