



How to Inventory your TIMBER

By Bruce Springer, Alabama Registered Forester, Alabama Forestry Commission

To determine the amount of timber volume, weight, and value on a property, professional foresters conduct a timber inventory or 'cruise' of the forest. It is extremely important to hire a professional forester to conduct a timber inventory if you plan to sell your timber or timberland, if you need to know the estimated value for tax or financial planning purposes, or if you are planning to purchase forestland. But what if you are just curious as to what your timber is worth? This article explains the process to conduct your own timber inventory on your property. Put on your boots, let's go cruise your timber!

Preparing for Your Timber Inventory

Get ready for some number crunching, because that is basically what timber inventories are about! Because it is not feasible to measure every tree in a forest, foresters take samples of your trees. This process can be very technical. However, the following procedures are extremely simplified for 'do-it yourselves,' but with the downside of producing very generalized results.

First, you need a map of your property, and you need to determine your property acreage. There are many websites that display aerial property maps you can print. Alabama Forestry Commission county staff will also print a map for you. You will need to know the scale of your printed map.

Next, you need to purchase or make a Biltmore Stick.



The Biltmore Stick is a special forestry tool used to measure tree diameter and height. To find a vendor who sells this tool, search for 'Biltmore Stick' on the internet. You can purchase a simple Biltmore Stick for under \$40. (While ordering, also order a compass if you don't already have one.) It doesn't matter if you choose just the simple English stick (shown here) or one with Scribner, International, or Doyle Log Rules, as you will not use those log rules with the following procedures.

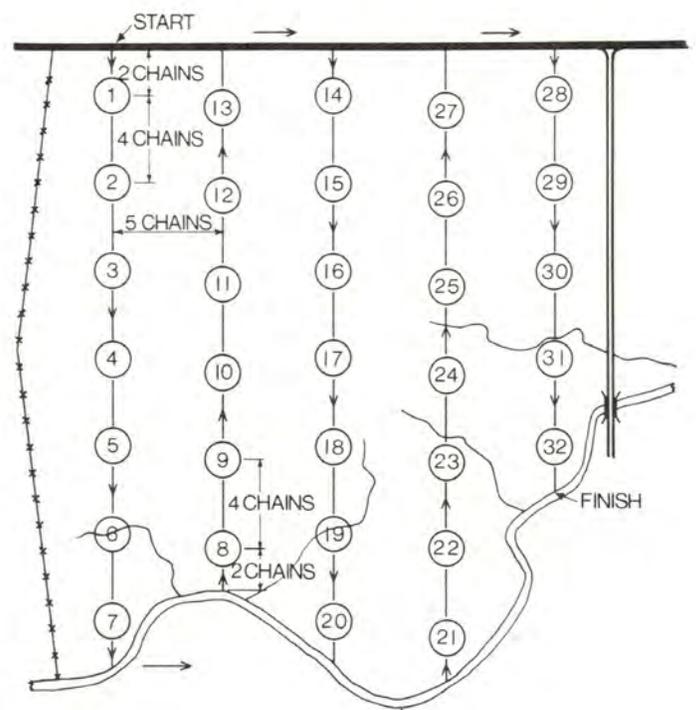
To learn how to use this new tool, search for the phrase 'How to measure trees with a Biltmore Stick' on the internet. YouTube® has several good instructional videos.

Finally, you need a compass, a measuring tape at least 100 feet long, and a ruler.

The next step is to layout the locations of inventory cruise lines and sample plots on your property map. Start at one corner of your property, and draw cruise lines either north-south or east-west. Draw cruise lines every 5 chains (330 feet) apart on your map. A chain is a forester/surveyor's measurement that equals 66 feet. (There are 80 chains in a standard mile and 10 square chains in an acre.)

Then, mark sample plots along each cruise line every 4 chains (264 feet) apart on your map. Your sample plots should generally be located on a 4-by-5-chain grid, which equates to a 264-by-330 foot grid. Notice how the first sample plot and the first cruise line are only half the distance from the starting point, which tends to center everything a little better.

As an example, on the property map shown here, inventory cruise lines start at the northwest corner of the property. You would walk south for the first seven plots. Once you reached the end of the cruise line, i.e. the property line, you would walk 5 chains east to the next cruise line on the map. On the second cruise line, walk north for plots 8-13, then move east 5 chains,



then walk south for plots 14-20, then move east 5 chains, then walk north for plots 21-27, then move east 5 chains, and then walk south for plots 28-32. You would stop to record sample plot measurements every 4 chains along each cruise line. The last plot, number 32, is near the southeast corner of the property.

Your sample plot size is one-tenth acre. Since you recorded 32 plots, the total area sampled is 3.2 acres. Each sample plot represents the surrounding 2 acres. The entire tract is 64 acres. Therefore, this inventory would measure 5 percent of the entire property (3.2 acres/64.0 acres = 0.05, or 5%). This is sufficient for obtaining a ‘ballpark’ estimate of your timber’s value. (For greater accuracy, foresters usually conduct a 10 percent forest inventory when evaluating timber for harvest or land sales.)

Measuring Trees within Each Sample Plot

Enough homework, let’s go play in the woods! While walking along the cruise line using your compass to stay true on direction, stop every 4 chains (264 feet) to measure and record all the sample trees within each one-tenth acre sample plot. (Using your 100-foot tape, you will need an assistant to ‘pull tape’ to be sure you stop at the correct distance.) Each stopping point is considered a **Sample Plot Center**. Because the sample plot is a circle, you use a radius to determine whether a tree is within your sample plot. Measure and record each tree of which the main stem (trunk) is within 37 feet, 3 inches of your Sample Plot Center. It is considered a Sample Tree.

You must record each tree as to product: pine pulpwood, pine sawtimber, hardwood pulpwood, or hardwood sawtimber. Pulpwood must be at least 6 inches in diameter. Sawtimber must be at least 10 inches in diameter for pine, and 12 inches in diameter for hardwood. If a sawtimber-sized tree doesn’t have a clear main stem because of numerous limbs, branching, or is not

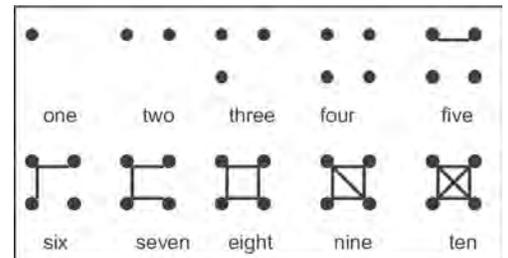
straight enough to make at least one 16-foot board, then record it as pulpwood. (Foresters are trained in determining whether a tree is pulpwood or sawtimber, but you must use your best ‘guestimate.’)

To inventory your timber, you will measure each sample tree’s diameter and merchantable height using the Biltmore Stick. Measure and record the tree’s diameter at 4.5 feet above the ground. Diameters are recorded in 2 inch increments. (For example, record as a 12-inch diameter any tree with a diameter ranging from 11.0 inches to 12.9 inches.) You will also measure and record the tree’s merchantable height. For pulpwood, measure to a 4-inch top diameter. For sawtimber, measure to a 6-inch top for pine, or to a 9-inch top for hardwood.

Recording Sample Plot Trees

As you measure sample trees, you must record them using the **‘1/10-ACRE TREE TALLY SHEET’** as shown on the following page. (For your future use, a blank Tally Sheet is located on page 12.) Each sample tree is recorded as PINE or HARDWOOD. Each sample tree is also recorded as pulpwood (PW) or sawtimber (ST). To distinguish, pulpwood is recorded by 30-foot, 40-foot, or 50-foot merchantable heights, while sawtimber is recorded by one, two, three, or four 16-foot logs.

Record all the trees within the sample plots on the same form. With this tally sheet, it is easiest to use a dot count recording system, as shown to the right. This is your **Tree Tally**.



Stand at the plot center and rotate 360 degrees as you record sample trees. Remember your starting point or first tree. (I always forget!) Measure and record all the trees within the sample plot’s 37 feet, 3 inch-radius of the Sample Plot Center.

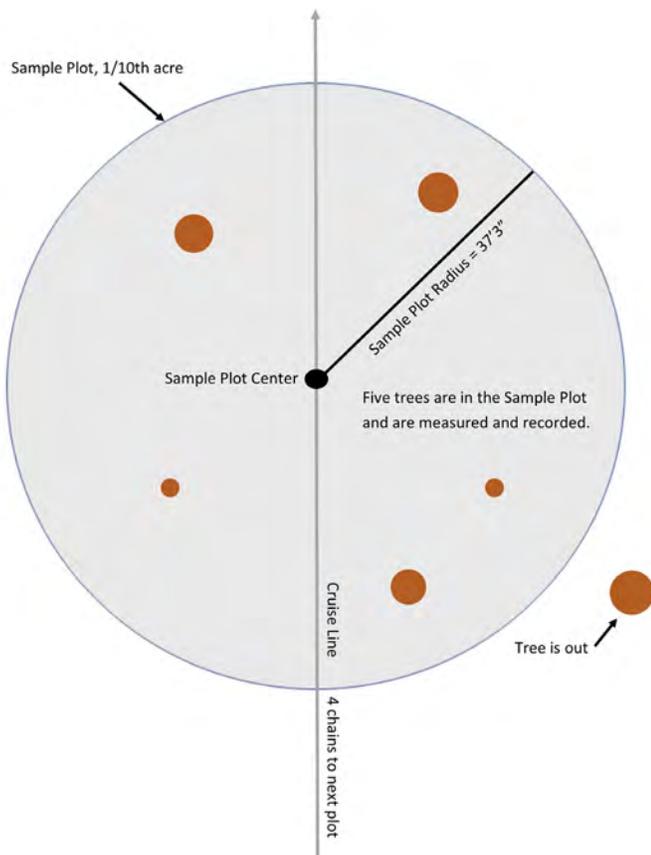
After completing each sample plot, mark through the next plot number at the bottom of the form (**‘Number of Sample Plots’**) to keep up with how many plots you have recorded. Do this even if you did not record any trees.

For example, on your sample plot, you recorded five trees that are within the sample plot’s radius of 37 feet, 3 inches, three pulpwood trees and two sawtimber trees, as follows:

- You record two Pine Pulpwood trees as PINE, 6” diameter with 40’ merchantable height, and PINE, 8” diameter with 50’.
- You record one Hardwood Pulpwood tree as HARDWOOD, 12” diameter with 50’ height because it does not have a clean, straight stem that would make a 16-foot log.
- You record two Pine Sawtimber trees as PINE, 14” diameter with 3 logs, and PINE, 16” diameter with 3 logs.

After you complete all the sample plots, it is time to go back to the house to summarize the results.

(Continued on page 10)



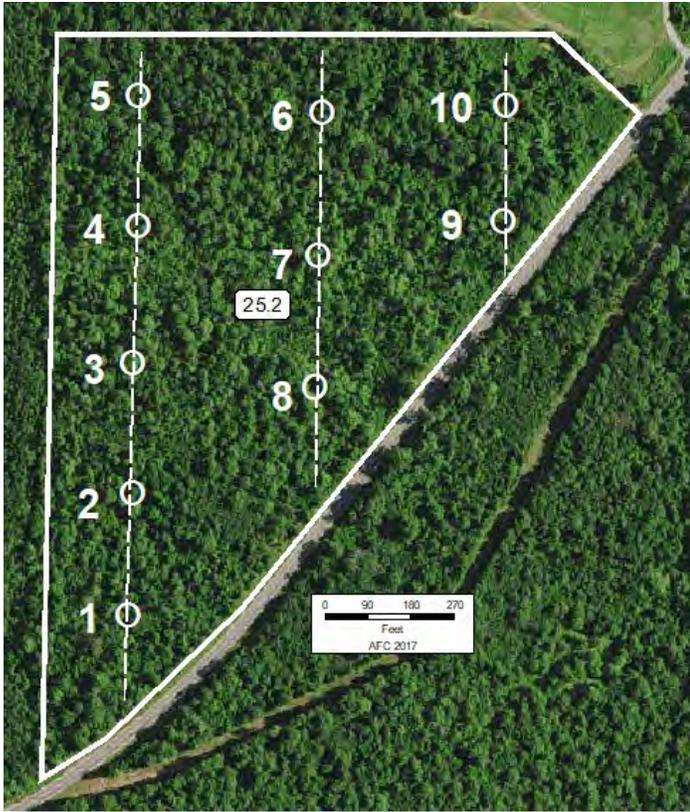
Calculating Tree Weights

Once back home, it is time to complete the final steps of your timber inventory.

STEP 1: For each diameter and merchantable height, multiply your accumulated **Tree Tally** by the **'Weight per Tree (Tons)'** that is shown on the row immediately below your tree tally. Record to three decimal places. Record the result on the row, **'Total Weight of Trees Sampled.'** Do this for every diameter and merchantable height for PINE. Then, do the same thing for the **HARDWOOD.**

STEP 2: For each diameter and product (Pulpwood or Sawtimber), first sum the **'Total Weight of Trees Sampled.'** (For example, for the 10" diameter class, sum the weights for the 30', 40', and 50' heights). Multiply the result by 10, and then divide that number by the **'Number of Sample Plots'** that you recorded on your tally sheet. This represents the **Weight per Acre** for that diameter and product (i.e. Pine Pulpwood, 10" using the above example). Record this in the spaces provided to the right of 'Pine Pulpwood' or 'Pine Sawtimber.' Do this for every diameter and product for PINE. Then, do the same thing for the **HARDWOOD.**

STEP 3: Finally, sum the results across to obtain each product's **'Total Weight per Acre (Tons).'**



1/10-ACRE TREE TALLY SHEET

	6"				8"				10"				12"				14"				16"				18"				20"				TOTAL WEIGHT PER ACRE (Tons)								
	30	40	50		30	40	50		30	40	50	1	2	3	4	30	40	50	1	2	3	4	30	40	50	1	2	3	4	30	40	50		1	2	3	4				
PINE	1	1	1		1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1					
Weight per Tree* (Tons)	0.085	0.105	0.142		0.231	0.187	0.232		0.379	0.306	0.219		0.597	0.731	0.340		0.496	0.614	0.760		0.727	0.805	0.997		1.324	0.925	0.502		1.710	1.286	1.022		1.444	1.639	0.959		1.985	1.384	0.750		2.584
Total Weight of Trees Sampled	0.085	0.395	0.595		0.928	0.498	1.690		1.514	1.160	0.604		2.387	2.967	1.160		1.986	2.481	3.096		2.881	3.240	3.994		4.248	3.498	1.504		5.880	4.998	2.117		7.576	5.399	1.639		10.169				
(Total Weight of Trees Sampled x 10) / Number of Sample Plots = Weight Per Acre (record below)																																									
Pine Pulpwood:	2.390	9.303	10.284											2.240				0.614				0.805											25.636								
Pine Sawtimber:									0.567				8.473				3.617					2.648				3.756							19.061								

	6"				8"				10"				12"				14"				16"				18"				20"				TOTAL WEIGHT PER ACRE (Tons)				
	30	40	50		30	40	50		30	40	50	1	2	3	4	30	40	50	1	2	3	4	30	40	50	1	2	3	4	30	40	50		1	2	3	4
HARDWOOD	1	1	1		1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Weight per Tree* (Tons)	0.065	0.072	0.088		0.119	0.151	0.193		0.222	0.261	0.332		0.388	0.478	0.555		0.622	0.731	0.833		0.937	1.043	1.104		1.207	1.332	1.480		1.542	1.687	1.867		1.985	2.008	2.132		2.514
Total Weight of Trees Sampled	0.065	0.216	0.216		0.357	0.495	0.785		0.888	1.183	1.966		1.514	2.390	3.058		2.514	3.058	3.617		3.756	4.998	5.549		6.216	8.800	10.800		10.653	13.998	16.800		16.649	16.649	16.649		31.627
(Total Weight of Trees Sampled x 10) / Number of Sample Plots = Weight Per Acre (record below)																																					
Hardwood Pulpwood:	1.371	2.123	2.744											4.823				2.429				2.296											0.863				16.649
Hardwood Sawtimber:													2.063								2.567			8.856			10.653				7.488				31.627		

Number of Sample Plots: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

1/10-Acre Plot Radius is 37' 3"

Pulpwood: Height to 4-inch merchantable top (i.e. 30, 40, or 50 feet)

Sawtimber: Height in 16-foot logs to a 6-inch top for pine or a 9-inch top for hardwoods (i.e. 1=16 feet, 2=32 feet, 3=48 feet, 4=64 feet)

* Weight per Tree is highly variable. These weights are based on averages calculated by Clark and Saucier - USDA Forest Service.

Property: Example

10 plots

TREE TALLY SHEET SUMMARY

Property: Example

	TOTAL WEIGHT PER ACRE (Tons)		UNIT RATE (Per Ton)		PER ACRE VALUE (\$)
Pine Pulpwood:	25.636	x	9	=	230.72
Pine Sawtimber:	19.061	x	24	=	457.46
Hardwood Pulpwood:	16.649	x	7	=	116.54
Hardwood Sawtimber:	31.627	x	30	=	948.81
Total Per Acre Value:					1,753.53
					x
Property Acres:					25.2
					=
Total Estimated Timber Value:					\$44,188.96

Calculating Tree Value

The final step is to calculate your property's timber value based on your timber inventory cruise. Using the 'TREE TALLY SHEET SUMMARY' form, first transfer the 'Total Weight per Acre (Tons)' from the Tally Sheet to the first column.

To calculate your timber value, you must estimate current unit rates for the four products. These are the rates that buyers are paying landowners for their standing timber, commonly referred to as the 'Stumpage Price.' These are highly variable, depending on buyer needs, market trends, your property conditions, and your timber characteristics. Check with some local timber purchasers to get the most accurate rates. Or you can use market averages. (Timber-Mart South® is a service that publishes average market rates. While this is a fee-based service for specific locations, the service currently publishes averages for the Southeast on their website, <http://www.timbermart-south.com/prices.html>®. Use with caution as these rates may not reflect the unit rates a buyer would offer for your timber.)

STEP 4: Once you have determined the appropriate unit rates (dollar per ton), multiply the 'Total Weight per Acre (Tons)' by the Unit Rate (Per Ton) and record the result in the last column, 'Per Acre Value (\$).'

STEP 5: Sum these values for all four products and record as 'Total per Acre Value' for the timber on your property. Multiply this amount by your 'Property Acres' and record as the 'Total Estimated Timber Value.'

Review the example above to further see how all the calculations are made.

That is all there is to it! Now you have a general estimate of what your timber is worth.

As previously mentioned, it is highly recommended that landowners use the services of a consulting forester who has training and professional expertise in evaluating timber weights and values, if they want to sell their timber or need estimates for financial planning or tax purposes. You may locate these professionals by visiting the Alabama Forestry Commission's website, www.forestry.alabama.gov. ☞

REFERENCES:

- Clark, Alexander III and Saucier, Joseph R. 1990. "Tables for Estimating Total-Tree Weights, Stem Weights, and Volumes of Planted and Natural Southern Pines in the Southeast." Georgia Forest Research Paper #79. Georgia Forestry Commission, Research Division.
- Clark, Alexander III, Saucier, Joseph R., and McNab, W. Henry. 1986. "Total-Tree Weight, Stem Weight, and Volume Tables for Hardwood Species in the Southeast." Georgia Forest Research Paper #60. Georgia Forestry Commission, Research Division.

PHOTO CREDITS:

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