

## Measuring Your Forests

As a landowner, you frequently may want to measure property boundaries, ground slope, standing timber size, and log volume. You need tools for each of these tasks.

You can measure forests and forest products most efficiently and precisely with the aid of sophisticated, and often expensive, instruments. However, you can make most necessary measurements with a few simple and inexpensive tools.

This publication discusses only those tools that are readily available and appropriate for a landowner with basic measurement skills. In Table 1 you will find a list of the tools that compares the accuracy and convenience of each for various measurement tasks.

### The Tools and How They work

**Abney hand level.** This delicate instrument consists of a sighting tube and a level bubble with attached scales. The scales are usually graduated in degrees or percent. The abney measures vertical angles and is useful for determining ground slope, road grade, and tree height (see Figure 1).  
*Approximate Cost: \$75-\$150*

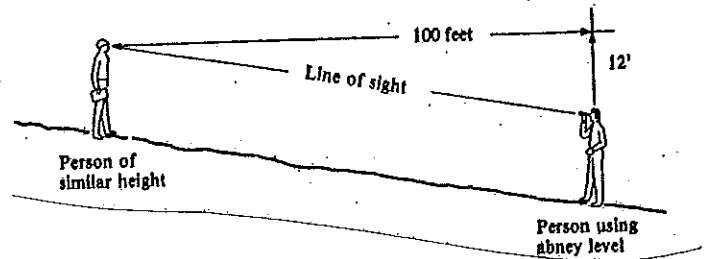


Figure 1 Measuring the slope of a hill with an abney. The reading is +12 on a percent scale. Both people are the same height so the lower person can sight at the eyes of the upper person.

**Biltmore or Tree & Log Scale Stick.** One of several similar sticks or other devices to aid you in making simple but crude estimates of tree height and diameter as well as board foot volumes in trees or logs (see figures 2 and 3). You can purchase or make one easily. *Approximate Cost: \$5-\$30.*

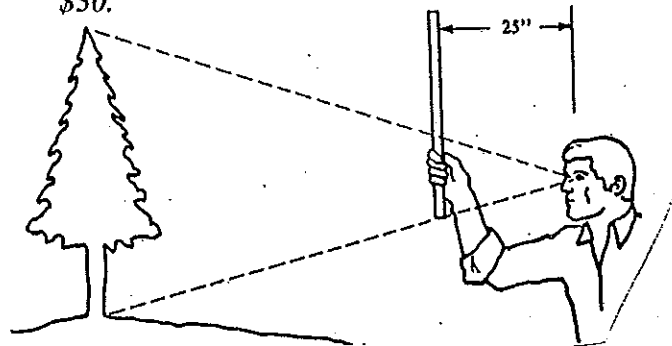
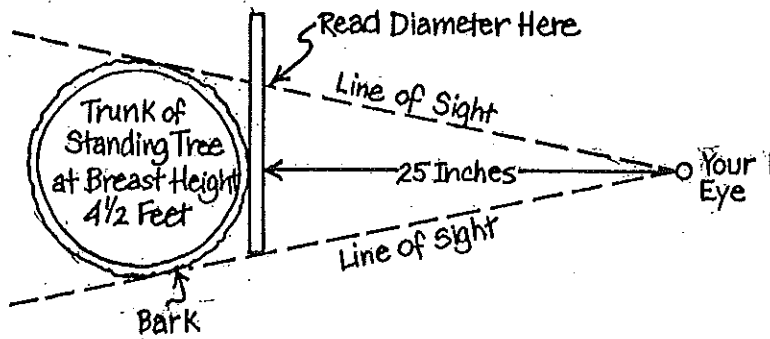
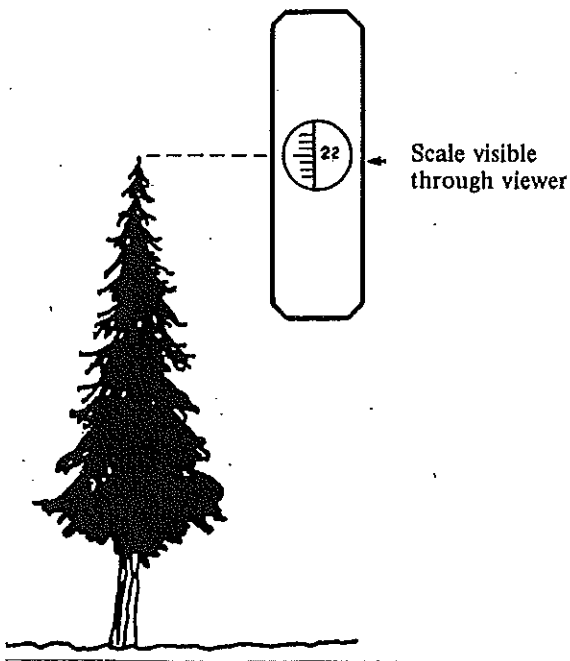


Figure 2. Measuring tree height with a Biltmore or tree and log scale stick. Most sticks are made to be held 25 inches from the eye-any other distance causes incorrect readings.

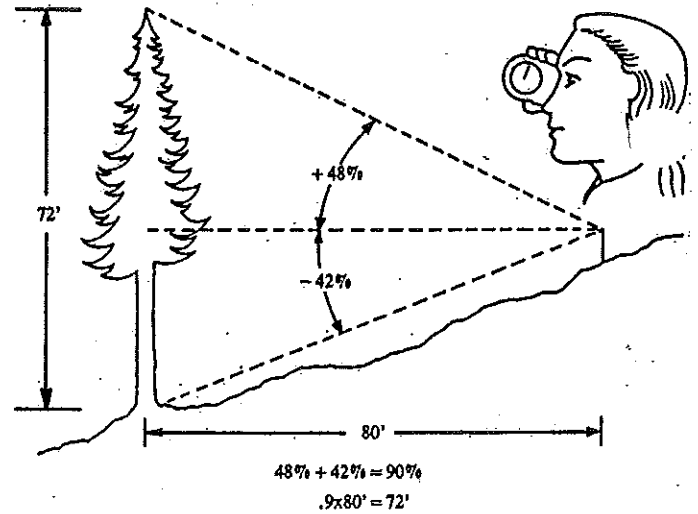
**Clinometer.** A rugged hand-held instrument for measuring vertical angles. Most models have both degree and percent scales. You can use clinometers for the same tasks as abney levels; (see figures 4&5). *Approximate Cost: \$100*



**Figure 3** Measuring tree diameter with a Biltmore or tree and log scale stick.



**Figure 4** Viewing a tree top with a clinometer. View the tree with the left eye and read the clinometer scale with the right eye.



**Figure 5** Estimating tree height with a clinometer.

**Compass.** A hand-held compass is a relatively rugged instrument that measures horizontal angles or direction. Liquid filled, transparent base compasses are generally preferred for all around use. You can make more precise readings when you place the compass on a solid nonferrous object. *Approximate Cost: \$15-\$50.*

**Diameter Tape.** A steel tape that measures the circumference of a tree. It is calibrated to permit direct tree diameter readings. *Approximate cost: \$30-\$60*

**Increment borer.** A hand operated drill with a hollow bit that extracts a wood core from the stem of a tree (see figure 6). Borers vary in length, but the maximum sampling depth is about 16 inches. This is adequate for conveniently determining the age of trees up bark). The wood core also provides a record of a tree's diameter growth in previous years.  
*Approximate Cost: \$120-\$200.*

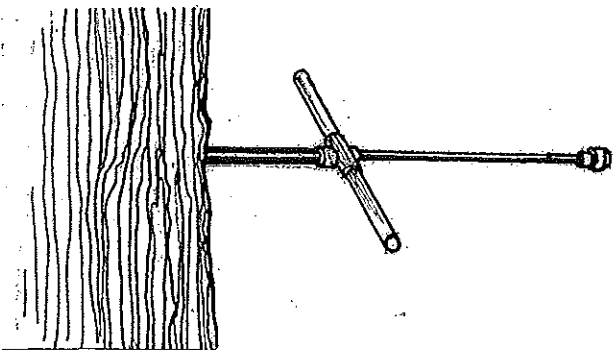


Figure 6. Extracting a core sample from a tree with an increment borer.

**Increment hammer.** A hammer like tool with a hollow bit that you drive into the tree by impact. The short core sample provides a quick record of recent growth, which is limited to the outer inch of the tree.  
*Approximate Cost: \$75.*

**Logger's tape.** A 50' or 75' steel tape, with a nail on the end that hooks with a nail on the end, that hooks on a belt and rewinds automatically when not in use.  
*Approximate Cost: \$30-\$50.*

**Pacing.** This is a skill rather than a tool, but it can be, and commonly is, substituted for tools when horizontal distance measurements do not need to be precise. See "Knowing Your Boundaries" for a discussion on estimating one's pace.

### Comparing the Tools

Use Table 1 to compare tools that you can use for the same tasks. First, check the key at the bottom. Note that the three sizes of circles indicate the degree of precision; the black-to-white range indicates degree of

difficulty in use. Now find in the left column the factors you intend to measure and consider all the tools shown on each line. Some are quick and easy to use but yield rough results. Others are more difficult to use and may or may not give precise results.

Select the tool that fits your need. For example, if you want to measure the grade of a road, you can choose between two tools: the abney hand level and the clinometer.

The abney level shows a large circle (indicating high relative precision) that is half-black (indicating it is somewhat difficult to use).

The clinometer shows middle-sized circle (it is quite precise) that is all black (it is easy to use).

### Availability

Some of the tools discussed here are available locally; all may be purchased from forestry supply houses, most of which will send you a catalog on request. Listed below are some forestry supply houses. The list is not necessarily complete and inclusion in the list does not constitute endorsement on the part of the Cooperative Extension System.

Ben Meadows Company  
 3589 Broad Street  
 Atlanta GA 30366  
 1-800-241-6401

[www.benmeadows.com](http://www.benmeadows.com)

Forestry Suppliers, Inc.  
 205 West Rankin Street  
 PO Box 8397  
 Jackson MI 39204  
 1-800-647-5368  
[www.forestry-suppliers.com](http://www.forestry-suppliers.com)

General supply Corporation  
 303 Commerce Park Drive  
 Jackson, MS 39286-9347  
 1-800-647-6450

Your county Extension office or local Division of Forestry office may have supply catalogs you can browse through.

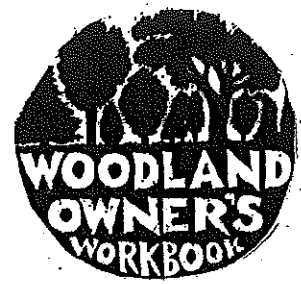
Table 1. - Precision and convenience of tools for various tasks

Task to measure.	Tools										
	Abney hand level	Biltmore stick	Clinometer	Compass	Diameter tape	Increment borer	Increment hammer	Logger's tape	Pacing	Range finder	Tree & log scale stick
Boundaries											
Horizontal angles				●							
Horizontal distance								●	●	○	
Road grade	●		●								
Ground slope	●		●								
Logs											
Diameter		●			○			●			●
Length								●			
Volume											●
Trees											
Age											
Basal area					○						
Current growth						●	●				
Diameter		●			●						●
Height											
Distance								●	●	●	
Vertical angle	●	●	●								●
Volume											●

Precision ← Least → Most  
 Ease of use  
 Easy      ●      ●      ●  
           ↓  
 More      ○      ○      ○  
 difficult

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## Glossary of Terms

Department of Extension

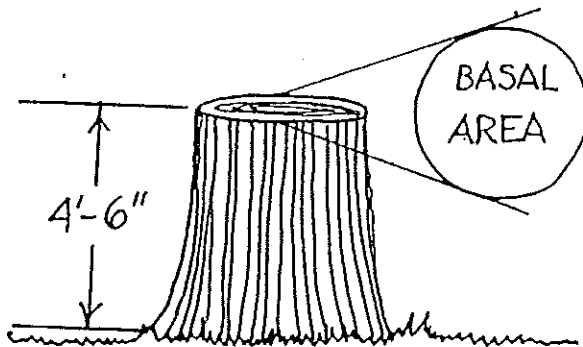
Windham County Extension  
Center

This is the first in a series of fact sheets designed to build into a practical handbook for woodland owners. Future sheets will each address specific skills or topics that are useful in managing your woodland. However, since forestry, like any profession, has its own set of jargon and strange sounding terms, we will begin with a glossary to help you talk turkey with those you encounter as you work in and manage your woodland.

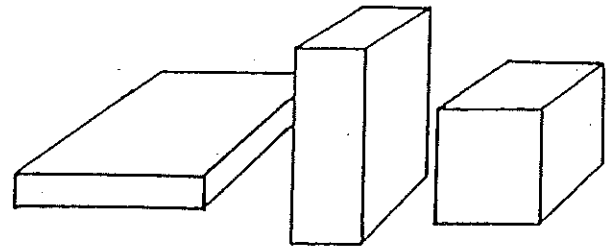
**FSA** - (Farm Service Agency) a branch of the U.S. Department of Agriculture, which administers cost-sharing programs, for certain forestry practices under the Stewardship Incentive Program.

**aspect** - the compass direction towards which a slope faces.

**basal area** - a) of a tree: the cross-sectional area of the trunk at 4 ½ feet above the ground.  
b) per acre: the sum of the basal areas of the trees on an acre. Used as a measure of forest density.



**board foot** - a unit for measuring wood volume in a tree, log or board. Commonly thought of as a piece 1 foot x 1 foot x 1 inch, but any shaped piece containing 144 cubic inches of wood equals one board foot.



**1 BOARD FOOT = 144 CUBIC INCHES**

**bole** - the trunk of a tree.

**CES** - (Cooperative Extension System) the educational arm of the U.S. Department of Agriculture, designed to provide a link between University researchers and those who can benefit from the useful application of research results.

**canopy** - the covering layer of tree crowns in a forest.

**carrying capacity** - the number of organisms of a given species that can survive in a given ecosystem without causing its deterioration.

**clearcut** - the harvest of all trees on a given area. Used as a regeneration technique for species whose seedlings require full sunlight to grow well.

**consulting forester** - an independent, private professional forester who works on a fee basis for private woodland owners, managing forests and marketing forest products. Consulting foresters have no direct business connections with any firm buying wood products, but rather are retained by woodland owners as their agent.

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*cord* - the legal measure of fuelwood volume in Connecticut, defined as "128 cubic feet of compactly piled wood".

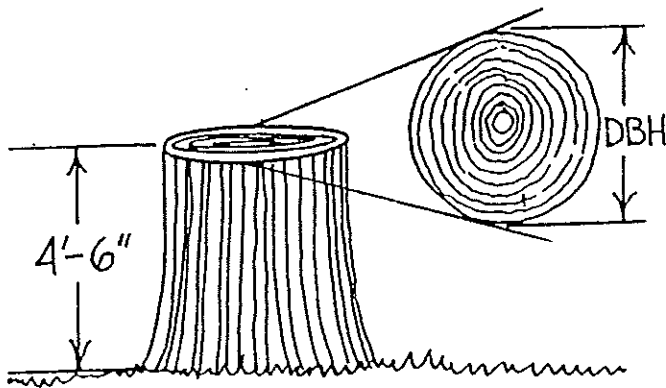
*crop tree* - a tree whose species and attributes produce benefits consistent with stewardship plan objectives, and whose growth is therefore encouraged through forest management.

*crown* - the branches and foliage of a tree.

*cruise* - an inventory of the forest designed to gather information needed in developing a forest stewardship plan.

*cull* - a tree of sawtimber size which has no timber value because of poor shape or damage inflicted by injury, insects, or disease.

*D.B.H.* - diameter of a tree at breast height (defined as 4 ½ feet above ground)



*DEP* - (Department of Environmental Protection) a state agency charged with managing and protecting Connecticut's environment and natural resources. Includes the Division of Forestry, which manages the state's forests and parks and provides service foresters who give on the ground management advice to private woodland owners.

*Extension Forester* - a professional forester employed by the Cooperative Extension System whose job it is to inform and educate woodland owners on how they can effectively manage their forestland.

*forester* - a professional trained in forestry and forest management.

*forestry* - the art and science of tending woodlands to produce a variety of goods and services for society.

*forest type* - a group of tree species which commonly grow together and are logically managed together.

*forwarder* - a rubber tired machine with a grapple loader used to carry logs out of the forest.

*habitat* - the type of ecosystem in which a given wildlife species is commonly found.

*hardwood* - a general term encompassing the broadleaf, deciduous trees.

*industrial forester* - a professional forester employed by a wood using industry, usually a sawmill, who purchases timber from private woodland owners. Many industrial foresters offer free forest management and/or marketing services to landowners who sell their timber to the foresters' employer.

*logger* - an individual who harvests timber for a living.

*log rule* - a method of calculating the wood volume in a tree or log from the diameter and length. The International ¼ inch rule is the legal rule in Connecticut.

*lopping* - the cutting of tree tops left after tree cutting down to a maximum specified height above the ground.

*NRCS* - (Natural Resources Conservation Service) a branch of the U.S. Department of Agriculture charged with coordinating and implementing soil conservation practices on private lands. NRCS can provide a woodland owner with detailed information on the soils found on his/her property.

*overstory* - see canopy.

*patch cut* - a clear cut on a small area.

*pole stand* - a stand of trees whose average DBH is between 4 and 11 inches.

**pruning** - the act of sawing or cutting branches from a living tree. In forest management, pruning is done to promote the growth of clear, valuable wood on the tree bole.

**regeneration** - the seedlings and small saplings which will make up the next forest stand. *Advanced regeneration* refers to regeneration which is established before the existing forest stand is removed.

**rotation** - the number of years required to establish and grow a stand of trees to a desired size or condition of maturity.

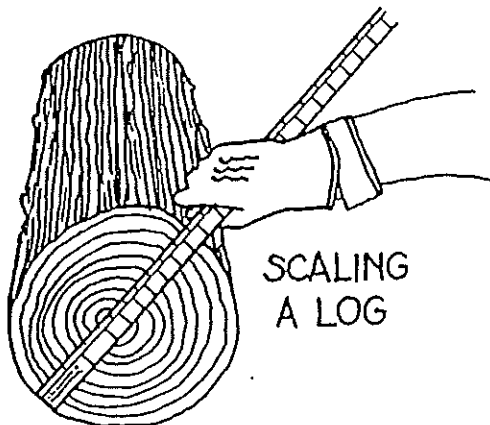
**sapling stand** - a stand of trees whose average DBH is between 1 and 4 inches.

**sawlog** - a log large enough to be sawn economically on a sawmill - usually 8 inches in diameter at the small end and at least 16 feet in length.

**sawtimber** - trees from which sawlogs can be made.

**sawtimber stand** - a stand of trees whose average DBH is greater than 11 inches.

**scale stick** - a calibrated stick, used to estimate wood volume in a log.



**sealed bid sale** - sale of timber, usually offered through a consulting forester, where several timber buyers are invited to submit a secret bid stating what each would pay for the timber offered.

**seed tree harvest** - the harvest of all trees on an area except for a selected few of desirable species and quality which are left to provide seed for the next forest.

**selection harvest** - the harvest of individual or small groups of trees at regular periodic intervals, designed to maintain an unevenaged forest. Used as a management tool with species that do not require full sunlight to grow well.

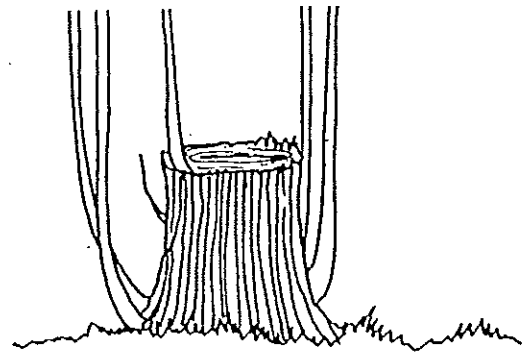
**service forester** - a professional forester employed by the DEP Bureau of Forestry. Service foresters are tax paid and can offer up to 1 day per year of on the ground service to a private woodland owner, helping to develop and implement forest management plans and practices.

**shelterwood harvest** - the harvest of all trees from an area in a series of two or more cuts overtime, designed to maintain partial shade and protection for new forest seedlings.

**snag** - a dead tree which is still standing. Snags provide important food and cover for a wide variety of wildlife species.

**softwood** - a general term encompassing the coniferous, needle bearing trees.

**sprout** - a tree growing from a cut stump or previously established root system.



**silviculture** - the art and science of growing forest trees.

**site index** - a measure of site productivity, expressed as the average height of the dominant and co-dominant trees on a site at age 50.

**skidder** - a rubber tired machine with a cable winch or grapple used to drag logs out of the forest.

*slash* - the branches and other woody material left on a site after logging.

*stand* - group of forest trees of sufficiently uniform species composition, age, and condition to be considered a homogeneous unit for management purposes.

*stocking* - the number and density of trees in a forest stand. Stands are often classified as under-stocked, well stocked, or over-stocked.

*stumpage* - the value of standing trees in a forest.

*stumpage price* - the price paid for standing trees in a forest.

*T.S.I.* - timber stand improvement. Any practice which increases the value or rate of value growth in a stand of potential sawtimber trees. Includes pruning and thinning operations.

*thinning* - a partial cut in an immature, over-stocked stand of trees designed to increase the rate of value growth of the stand by concentrating wood growth on the trees of best potential.

*tolerance* - the capacity of a tree species to grow in shade.

*Tree Farm* - a privately owned forest which is managed on a multiple use basis with timber production a primary management goal.

*understory* - the tree and shrub species that constitute the lower level of forest vegetation, beneath the canopy.

*windthrow* - the blowing down of forest trees in high wind.

*wolf tree* - a large older tree with a spreading crown and little or no timber value, but often great value for wildlife.