

# Timber Measurement in Conifer Forests

Preparing for the first thinning



# Why measure?

## Why measure?

Measurement of timber is required for several purposes:

- to evaluate the productivity of a plantation
- to determine whether to thin or not
- to calculate the amount of timber (e.g. thin volume/ha) for sale
- to control the amount of timber harvested and sold

## Why Thin?

Thinning involves the removal of a proportion of a forest crop. This results in the remaining trees to be of higher quality and larger diameters and so increases timber value while providing income opportunities before clearfell.

## Planning to measure

Forests should be measured prior to thinning. For this to happen, proper access is essential.

Inspection paths should be cut following canopy closure when lower branches are dead.

This involves:

- Removing branches along two rows of trees to head height at 50m to 100m intervals using a pruning saw or light chainsaw
- Take appropriate safety measures!



The following is a worked example of the procedure to estimate thin volume per hectare in a 10 ha pre-thinning Sitka spruce forest.

This example should be read in conjunction with participation in a Teagasc Timber Measurement Course.

### Required information

To calculate thin volume/ha, the following information is needed:

- Stocking
- Mean diameter at breast height (mdbh)
- Thin diameter
- Top height
- Form height
- Percentage to be removed
- Production area



# Measurement Plots

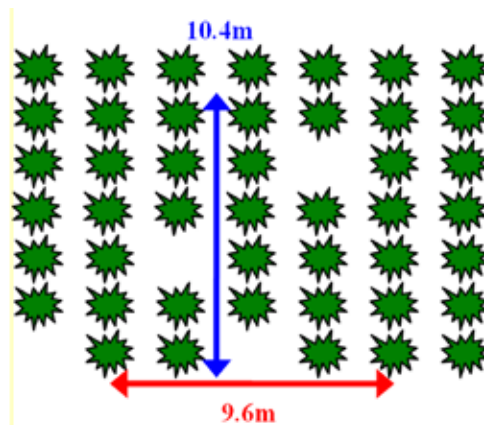
It is not practical to physically count all the trees in a plantation. We can however measure sample areas, these are known as plots. Plots are usually a portion of a hectare. For first thinning, a 0.01 ha (100th of a hectare) is used. Stocking levels can then be built up to a hectare and then stand level.

To get the average stocking level across a site, a number of plots should be measured. Uneven crops will require more plots for accuracy.

Calculating stocking levels in a 0.01 ha plot

- Measure the distance between 5 rows of trees (e.g. 9.6m)
- Divide this figure into 100 ( $100/9.6 = 10.4$ )
- Mark your start point (usually the middle row is along the inspection path)
- As you measure out the calculated distance, count the number of trees in the 2 rows on your right
- On the way back, count the number of trees in the 2 rows on the other side as well
- This will give you the number of trees in a 0.01 ha plot
- Multiply this figure by 100 to give the stocking level per hectare

i.e. 21 trees counted in the plot, then multiply 21 by 100 =>  
Stocking level of 2,100 stems / hectare



# DBH

DBH (Diameter at Breast Height) is a diameter measurement of the stem taken at 1.3 m from ground level. It is a standard term used in timber measurement. DBH can be measured using a specialised tape which converts circumference to diameter.



Remember:

- Always measure from the upper side of a slope
- Always round down the measurement
- Don't count dead trees or trees below 7 cm DBH
- Where a tree is forked below 1.3 m, treat as two separate stems
- For leaning trees, measure at underside

## Calculating mean DBH – example

Take many diameter samples along inspection path. The following 'gate' system allows for efficient recording and counting of sample trees:

DBH	No. of trees counted	DBH	
7		13	I
8		14	I
9		15	11
10	11	16	111
11	111	17	11
12	11	18	1

# Measuring

Total number of trees measured: 63

To get the mean dbh multiply:

$$10 \times 2 = 20$$

$$11 \times 3 = 33$$

$$12 \times 7 = 84$$

$$13 \times 6 = 78$$

$$14 \times 6 = 84$$

$$15 \times 12 = 180$$

$$16 \times 9 = 144$$

$$17 \times 12 = 204$$

$$18 \times 6 = 108$$

Sum of above = 935

935 divided by 63 = 14.8

Mean dbh = 14 (rounded down)

To calculate the diameter of trees to be thinned (thin diameter), take 2 away from mean dbh. This allows for the fact that it is mainly smaller trees that are removed during thinning through selection.

Thin Diameter = 12





## Top Height

Top height is the height of the tree with the largest dbh in a 0.01 ha plot.

Top height = 12m

Tree height can be measured accurately with special, but expensive, equipment, such as a hypsometer. However, tree height can be estimated reasonably accurately using the stick method or felling a sample tree\*. (\*requires Felling Licence)

## Form Height

As trees don't grow as a perfect cylinder, it is important to allow for taper. Form height is used to account for taper and is derived from a table in the British Forestry Commission Field Book 2 using top height and tree species:

Form height = 5.02



## Percentage of trees to be removed

This is specific to a given site (usually between 25 and 33% of stems/ha)  
In this example, 30% of the trees are to be removed.

% removed = 30%

## Productive area

This is an estimate of the total area under trees (usually 85% of total area)

Productive area = 10ha x 0.85 = 8.5ha

# Calculating thin volume per ha

## Thin volume per ha

Having acquired the above data it is now possible to estimate the volume of timber which could be removed in first thinning.

Formula required:

$(\text{thin dbh}^2 \times 0.00007854 \times \text{form height}) \times (\% \text{ removed/ha})$

$(144 \times .00007854 \times 5.02) \times (2,100 \times 0.3)$

$(0.0568) \times (630) = 35.78\text{m}^3/\text{ha}$

## Total thin volume

Total volume to be removed is the thin volume per ha multiplied by the productive area:

$35.78\text{m}^3/\text{ha} \times 8.5\text{ha} = 304.16 \text{ m}^3$

Total volume to be removed =  $304.16 \text{ m}^3$

## And finally...

Once the figure for total volume to be removed is established, a forest owner is better equipped to decide if the forest is ready for thinning while taking other site factors and current markets into account.

Forest owners should consult a professional forester before deciding to thin. Contact your local Teagasc Office or visit [www.teagasc.ie/forestry](http://www.teagasc.ie/forestry) for further details.

## *This leaflet can be read in conjunction with:*

Teagasc Forestry Series No 10: First Thinning of Conifers

Teagasc Forestry Series No 12: Timber Harvesting

Teagasc Forestry Series No 13: Forest Roads