16.2 Sample Height tree types:

- Dominant Height tree (Circular plots only)
    - This is the largest diameter tree within *each* Storey in the plot.
- 1st Stand Height Tree (Whole Section points only)
    - This tree is selected by the Allocate Sample Trees function in the software – see **Chapter 14.0**.
- 2nd Sample Tree (for Circular and Whole Section Plots)
    - This is usually assigned using the Auto-Assign Sample Trees (circular plots) or Allocate Sample Trees (whole Section plots) options in the software. If assigned manually it should be the 3rd nearest Neighbour to the 1st Stand Height or Dominant Height tree within the same storey. Note that for counting between trees only live trees are to be counted. Also coppice stools/multi-stem trees are counted as a single entity (e.g. count the stool) and not counted for each individual stem. The tree must be within the *Section* boundary but, for circular plots, can be outside the Square where the Section extends outside the Square.
- 3rd Sample Tree (for Circular and Whole Section Plots)
    - This is usually assigned using the Auto-Assign Sample Trees (circular plots) or Allocate Sample Trees (whole Section plots) options in the software. If assigned manually it is the 3rd nearest tree to the 2nd Sample Tree within the same storey. Note that for counting between trees only live trees are to be counted. Also coppice stools/multi-stem trees are counted as a single entity (e.g. count the stool) and not counted for each individual stem. The tree must be within the *Section* boundary but, for circular plots, can be outside the Square where the Section extends outside the Square.

Mapping the location of the Dominant, 1st Stand Height and 2nd & 3rd Sample trees is important to allow the QA staff to relocate them.

*NB: **Live** trees - only unsnapped trees which are not excessively leaning (≥20°) can be assessed for height.*
***Dead** Trees – estimate individual tree heights within the plots, these can be snapped and only the actual height is estimated (tops are not added back on for snapped trees).*

16.3 Total Height

For the National Forest Inventory (NFI) the Total height of the trees is required. Total height is the *vertical* distance from the base of the tree to the uppermost point (tip) for live trees.

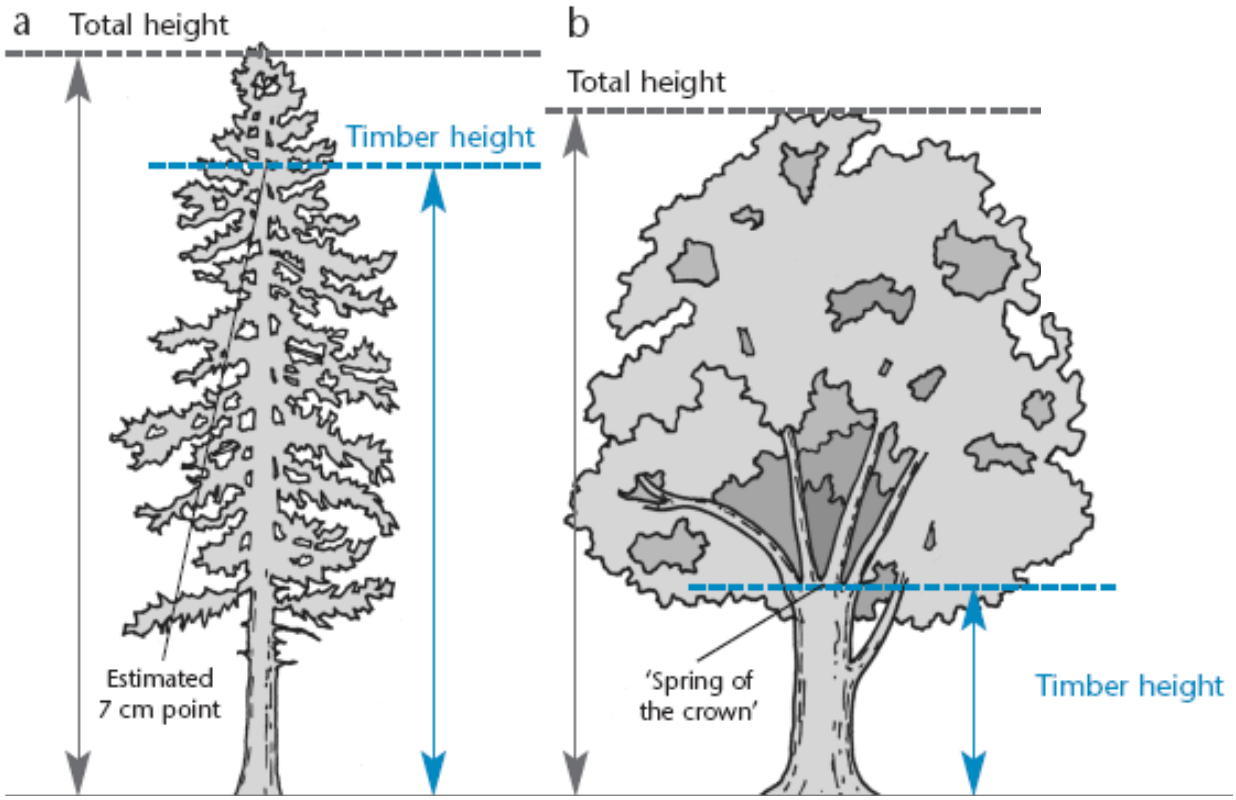


Figure 16 - 1: Total height points on conifers (a) and broadleaves (b).

During the NFI all tree heights are to be assessed either directly with tapes or indirectly using a Vertex hypsometer.

When assessing windblown trees the stem length is assessed to give an indication of total height as if the tree was standing.

16.4 Height Measurement Conventions

16.4.1 Distance from the Tree

The distance between the observation point and the tree ('d' in Figure opposite) should be in the region of 1 to 1.5 times the height of the tree. Errors can prove to be sizeable where the observer is closer than this. The main difficulty in achieving the ideal position is being able to view the tops of trees in dense stands.

The height of the tree is always the *vertical* distance between the top and the base. The precision of the measurement is inevitably related to the capability of the instrument used.

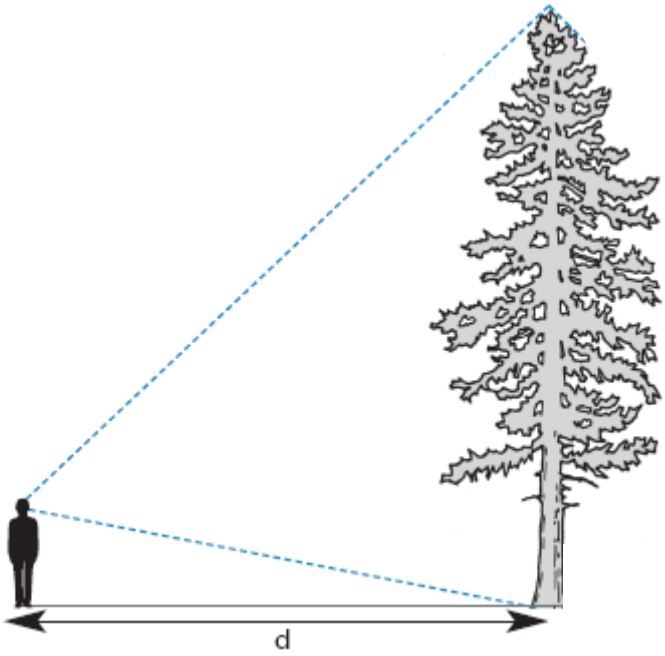
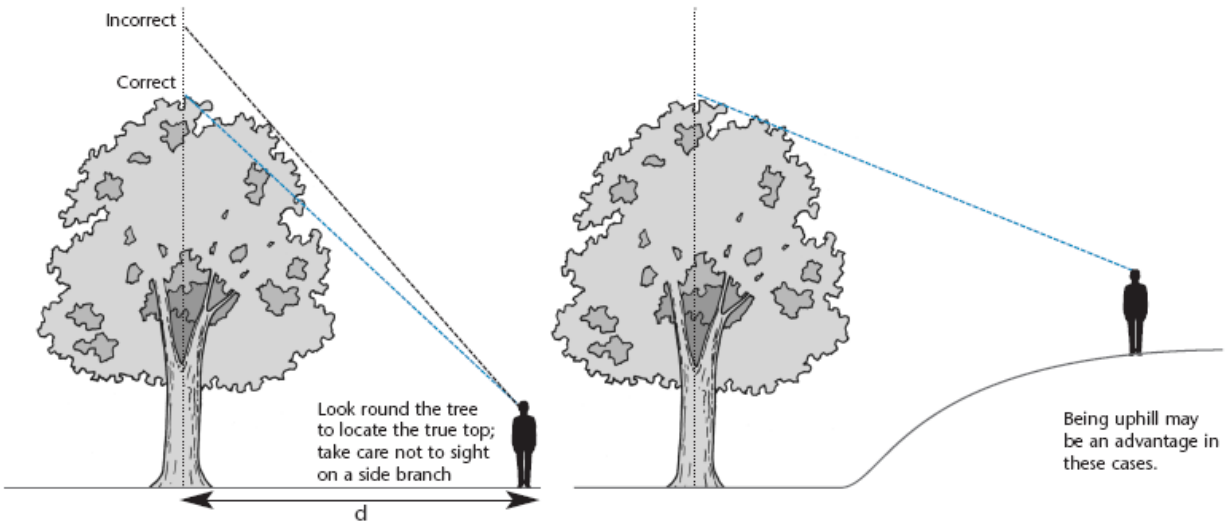


Figure 16 - 2: Distance from the tree

Take care to find the true total height point and do not sight on a side branch. This can be especially difficult when measuring broadleaved trees.



16.4.2 Assessing Tree Heights on a Slope

On sloping ground it is necessary to correct the measured distance to the tree to obtain this (Figure 16-3). The Vertex hypsometer will do this automatically if used correctly.

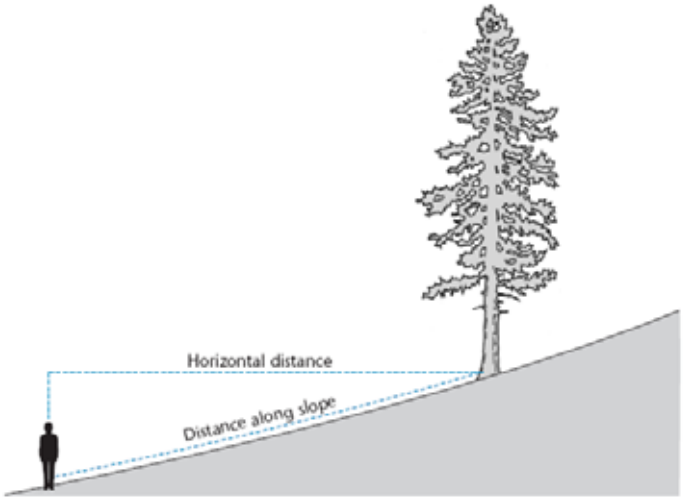


Figure 16 - 3: Measuring tree height on sloping ground.

16.4.3 Assessing Leaning Trees

Trees should be checked for lean and direction of lean. If the tree is leaning the measurement should be taken at right angles to the direction of lean (see opposite). Height should be measured as the vertical distance from the tip of the tree to the ground. Strictly the distance from the observer to the tree should also be measured from a point on the ground vertically below the tip. However, it may be expedient to measure this distance from the base of the tree.

Trees with excessive lean (≥20°) are unsuitable for the assessment of height unless the entire Storey is leaning excessively.

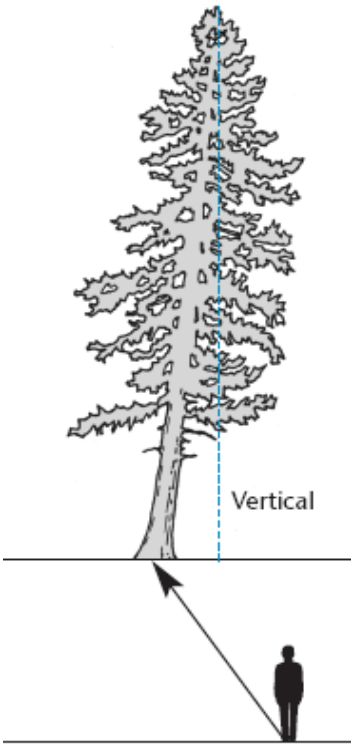


Figure 16 - 4: Measuring tree height on leaning trees.