

Protocol for Stand-level Biodiversity – appended information

To assist with the fieldwork for the Protocol for Stand-level Biodiversity, the following information is provided following the summer 2005 field training sessions.

Field procedures for measuring Coarse Woody Debris (CWD) were adapted from the CWD field procedures, as found in the following website link:

<http://srmwww.gov.bc.ca/risc/pubs/teecolo/fmdte/cwd.htm#coarse>

Excerpts are included here to clarify and guide protocol fieldwork.

CWD Defined

Coarse woody debris (CWD) is dead woody material, in various stages of decomposition, located above the soil, larger than 7.5 cm in diameter (or equivalent cross-section) at the crossing point, which is not self-supporting. Trees and stumps (intact in ground) are considered self-supporting – and therefore are NOT considered CWD.

Pieces of coarse woody debris may be suspended on nearby live or dead trees, other pieces of coarse woody debris, stumps or other terrain features. There is NO minimum length for CWD.

Coarse woody debris includes:

- downed horizontal or suspended (not self-supporting) dead tree boles with or without roots attached;
- fallen trees which still have green foliage if they no longer have roots attached (no living cambium) to the ground to keep them alive;
- woody pieces greater than 7.5 cm at the point where the sampling line crosses the piece;
- uprooted (not self-supporting) stumps greater than 7.5 cm in diameter at the crossing point and any of their exposed dead roots greater than 7.5 cm in diameter at the crossing point;
- fallen broken tree tops which may be horizontal or leaning, or large fallen branches; and,
- recently cut logs.

Coarse woody debris does not include:

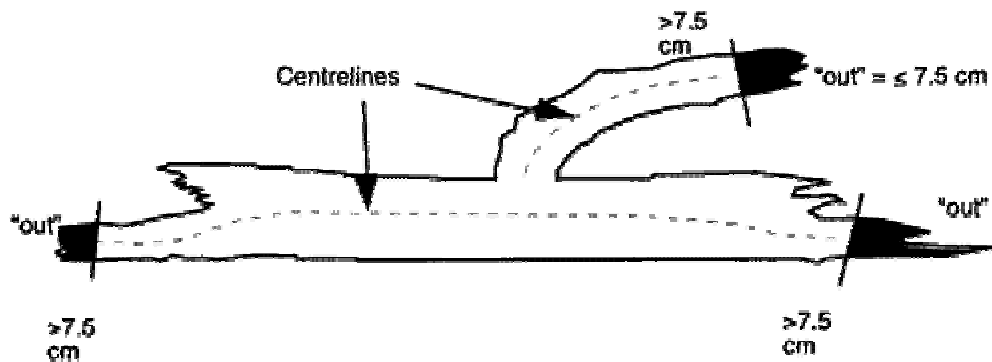
- dead branches still connected to standing trees;
- self-supporting (not overturned) stumps;
- exposed roots of self-supporting trees or stumps;

- material that is buried beneath organic or mineral soil layers or has decomposed enough to be part of the forest floor; and,
- live or dead trees (still rooted) which are self supporting.

FIGURE 1. Rules for sampling coarse woody debris.

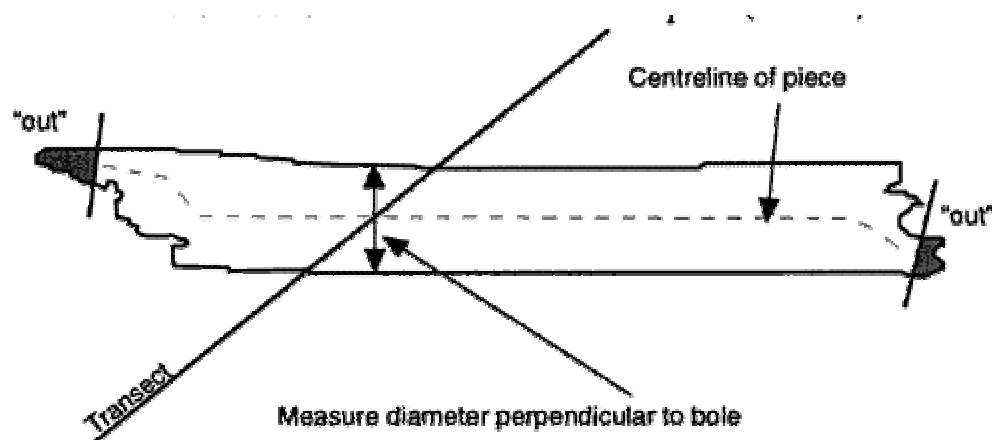
- Coarse woody debris must be greater than 7.5 cm in diameter (or equivalent) at the line intersect point (see 1a). There is NO minimum length.

FIGURE 1a



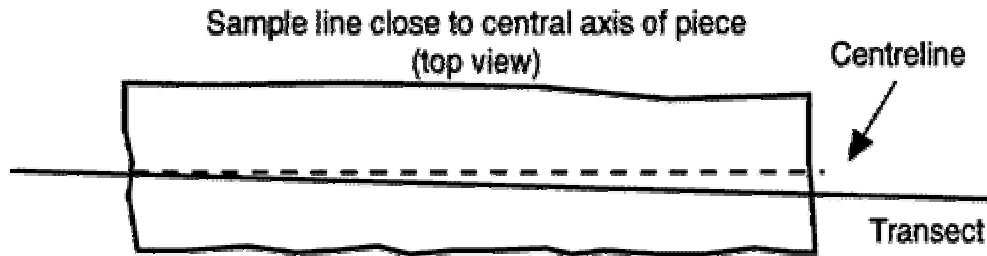
- The transect must cross the central axis of the piece (see 1b).

FIGURE 1b



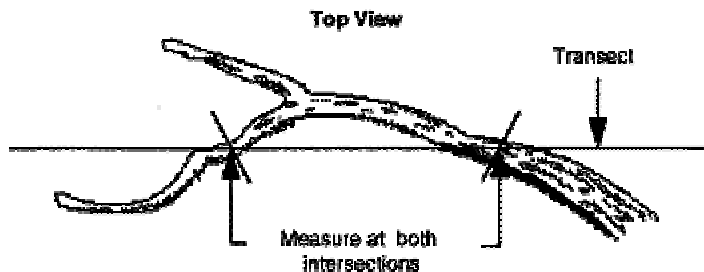
- If the transect coincides closely with the centreline, make the best decision as to whether the line crosses the centreline, and where (see 1c).

FIGURE 1c



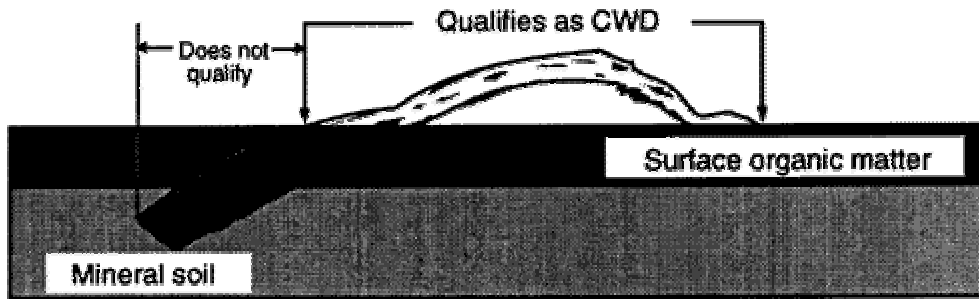
- If the transect intersects a curved or angular piece more than once, measure each intersection as a separate observation (see 1d).

FIGURE 1d



- If a log has split open, but is still partially held together, record the diameter as if the piece were whole. If a stem has shattered into a number of distinct, unconnected pieces, record each piece that is greater than 7.5 cm in diameter at the point of sampling.
- Do not tally undisturbed stumps. Tally uprooted stumps and their exposed dead roots if they meet the other criteria.
- Tally only the CWD that lies above the soil (see Figure 2). A piece is no longer above the soil when it is entirely buried beneath a layer of surface organic matter (forest floor) and/or mineral soil. Estimate an "equivalent" diameter for the remaining portion of logs where part of the wood has decayed and become part of the soil layer.

FIGURE 2. Tally only coarse woody debris that lies above the soil.



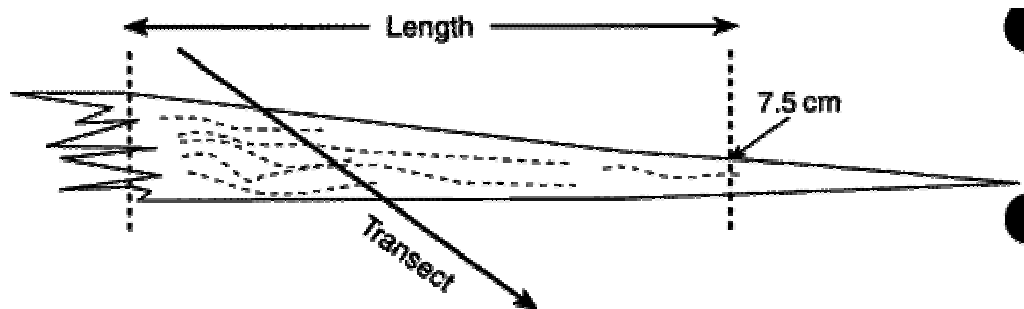
CWD Length

Record the length of each piece to the nearest 0.1 m (see figure 3a).

- If a log has broken lengthwise but is still partially held together, record the equivalent length as if the piece were whole.
- If the end(s) of the piece are broken, visually fold in the broken sections to compensate for the missing parts.
- Piece length is from the largest end down to the 7.5 cm diameter limit.

FIGURE 3. Rules for measuring length of coarse woody debris.

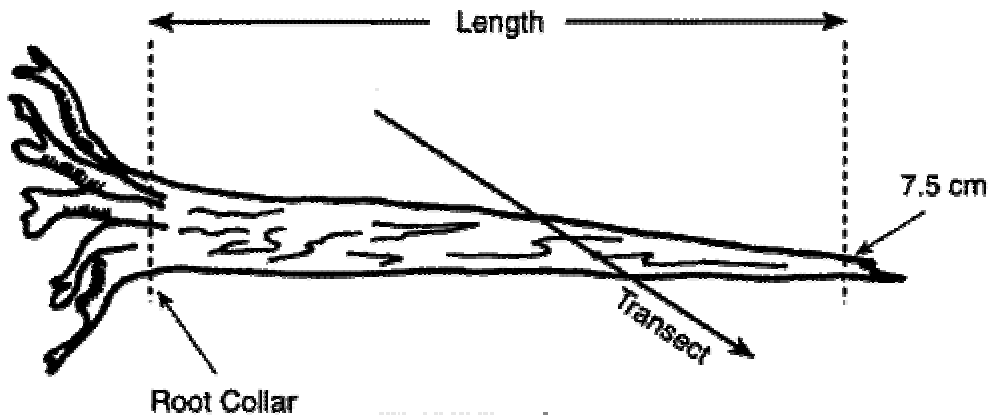
FIGURE 3a.



Measurement of stems from attached roots:

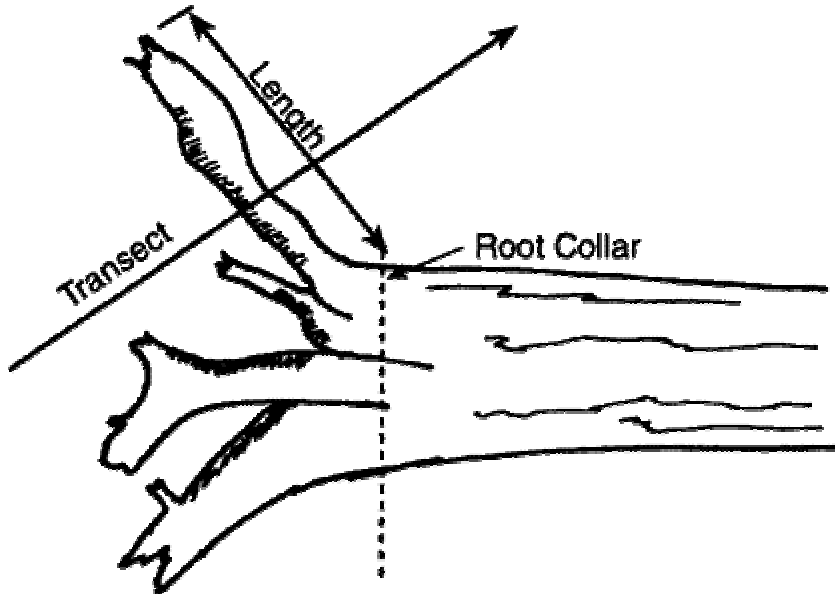
- For main boles with exposed roots, piece length is measured only down to the root collar (see 3b).

FIGURE 3b



- If a root mass is transected, piece length for individual roots (larger than the minimum diameter) is measured only up to the root collar (see 3c).

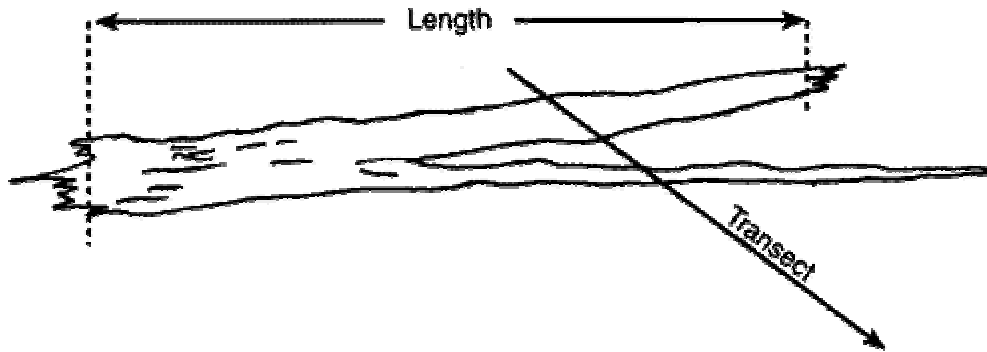
FIGURE 3c



Measurement of forked stems

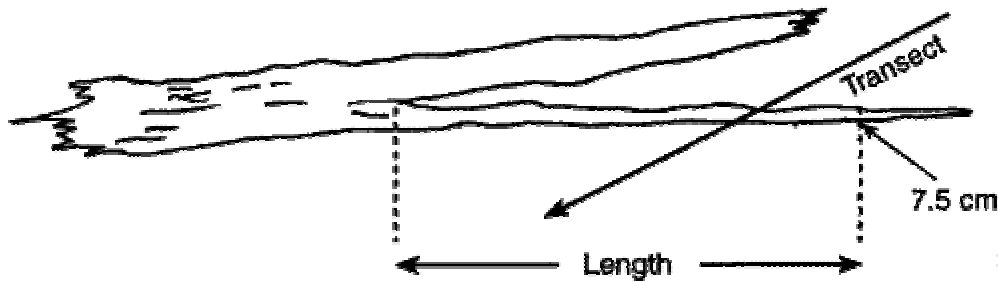
- Where one of the forks transected is determined (by largest diameter) to be a continuation of the main bole then the length will be measured to the ends of the main piece (see 3d).

FIGURE 3d



- The piece length of the smaller stem(s) (smaller diameter) will be measured only to the junction with the main bole (see 3e).

FIGURE 3e

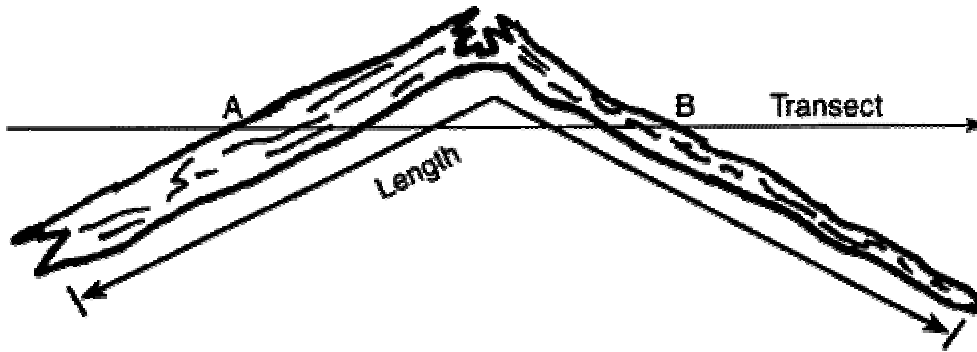


- For forks of near equal stature make a determination as above and measure accordingly.

Measurement of pieces that are crossed more than once on the transect:

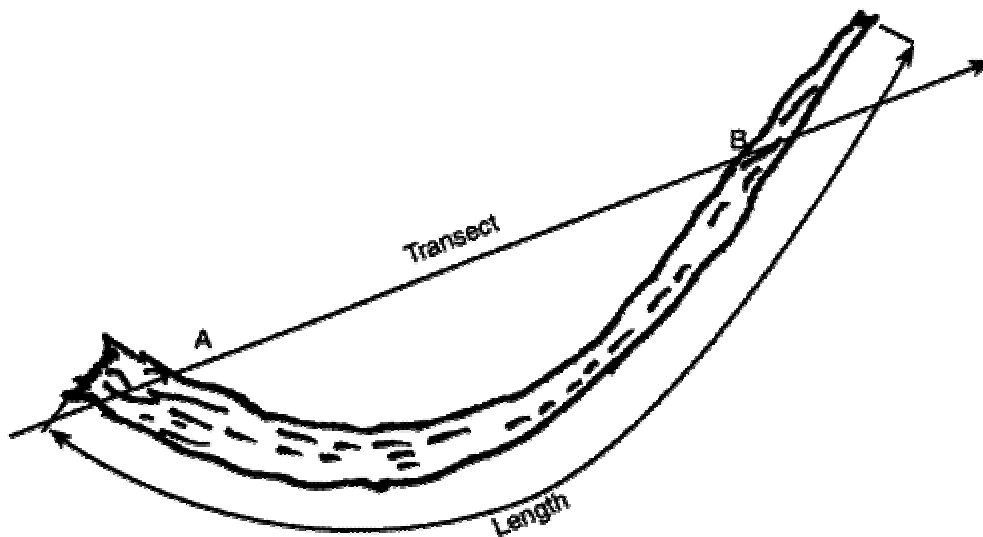
- Pieces broken but still physically attached are measured as one piece at each transect point. The length measurement is taken along the central axis of the piece (see 3f).

FIGURE 3f



- The full piece length of curved/crooked pieces is measured at both crossings (see 3g).

FIGURE 3g



- In the same manner as above, record the full piece length twice where the same piece is crossed by two transects at right angles to each other.

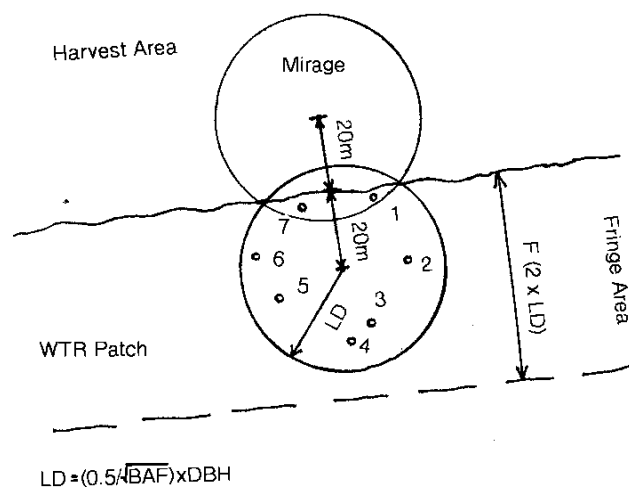
Wildlife Tree Retention Patch – Prism Plots

During protocol field training, a number of questions arose as to how to deal with prism plots that randomly land near the edges of Wildlife Tree Retention (WTR) patches. To reinforce the edge plot procedures, the following information is provided.

Where a plot is situated within the fringe areas of a WTR patch, a Mirage Correction procedure can be used to tally standing stems (see figure 4). The fringe width of a WTR patch depends upon the selected prism BAF and the largest diameter tree in the plot.

- Determine whether the plot is an edge plot by calculating the plot's Limiting Distance (LD) based upon the largest tree. E.g., Prism BAF = 4 (has a plot radius factor of 0.25), DBH of largest tree = 45cm; $LD = PRF \times DBH = 0.25 \times 45 = 11.25$ meters. Fringe width (F) is twice the LD = 22.5 meters.
- If a plot lands within the F portion of the patch, then a mirage plot must be established across the edge of the patch. The mirage plot is located equidistant from the edge and perpendicular to the edge. E.g., if the fringe width is 22.5 meters and the plot center lands 20 meters from the edge, then a mirage plot is placed 20 meters out from the edge.
- Prism sweep and tally all trees from within the WTR patch plot, and then conduct the prism sweep looking back to the WTR patch from the Mirage plot centre. A tree may be counted more than once, depending upon the number of mirage plots established.

Figure 4. Example of a simple mirage plot layout.



In the above example, the original plot landed within the fringe area and 20m from the boundary. The mirage plot was subsequently located equidistant (20m) and perpendicular to the WTR edge. For this example, trees 1 and 7 are tallied twice while trees 2, 3, 4, 5 and 6 are only tallied once.

Table 1. Plot Radius Factors for Prisms

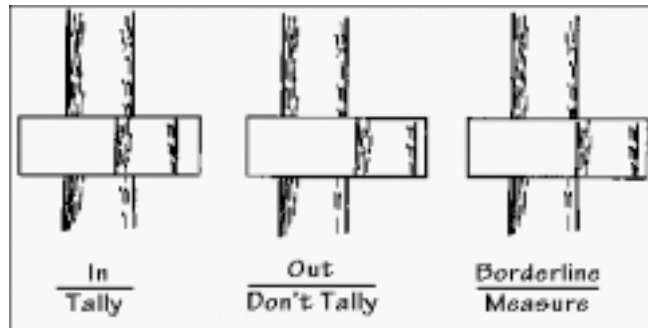
The following table gives plot radius factors (PRF) for a selection of prism basal area factors (BAF). To determine the plot limiting distance (LD) for your prism, multiply the PRF by the diameter of the largest tree in your plot.

Basal Area Factor BAF	Plot Radius Factor PRF	Basal Area Factor BAF	Plot Radius Factor PRF
1	0.5000	12.25	0.1429
2	0.3536	13	0.1387
3	0.2887	14	0.1336
4	0.2500	15	0.1291
5	0.2236	16	0.1250
6	0.2041	18	0.1179
6.25	0.2000	20	0.1118
7	0.1890	20.25	0.1111
8	0.1768	24	0.1021
9	0.1667	25	0.1000
10	0.1581	30.25	0.0909
11	0.1508	32	0.0884
12	0.1443	64	0.0625

Borderline Trees with Prism Plots

The status of borderline trees (figure 5) should be checked by determining the horizontal distance from the plot center to the face of the tree trunk at DBH. Add one half of the tree diameter to the horizontal distance to determine the horizontal distance from the tree to the plot center. In prism cruising every tree has its own plot radius depending on its diameter. The plot radius factor (table 1) times DBH gives the appropriate plot radius for any tree.

Figure 5. Prism views of trees that are “in”, “out” or “borderline”.



The tree's plot radius, distance from the sample plot center and the prism size determine whether the tree is "in" or "out" of the plot radius. A tree is "in" the plot if at least half of the diameter of the tree measured at DBH is inside the plot.

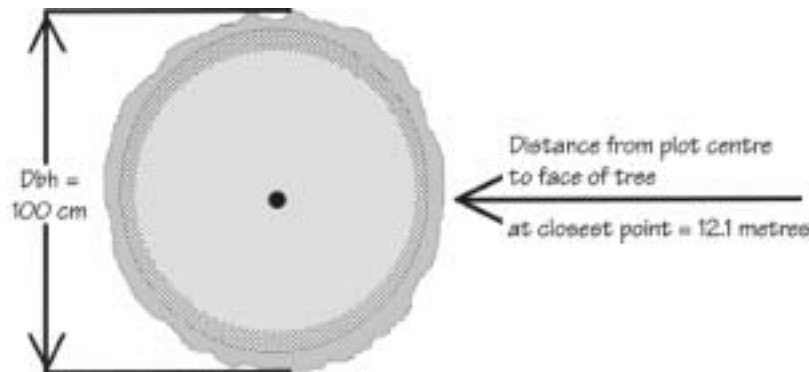


Figure 6. Borderline Tree Measurements - Variable Plot.

For example purposes, if the borderline tree (figure 6) has a diameter of 100cm and the tree is located 12.1 meters from a plot center using a BAF 16 Prism the following calculations are made to determine whether the tree is "in" the plot.

Calculate Plot Radius Factor (or use table 1): $PRF = \frac{1}{2\sqrt{16}} = 0.125$

Plot radius for the 100 cm tree = $PRF \times DBH = 0.125 \times 100 = 12.50$ m.

Distance to center of tree = $12.1 \text{ m} + \left(\frac{100\text{cm}}{2} = 0.5\text{m} \right) = 12.60 \text{ m}$.

The measured distance exceeds the plot radius of the tree; therefore the tree is out and not tallied.