

Woody Debris Research Protocol: CWD dynamics

CTFS Global Forest Carbon Research Initiative
January 2010

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This document can be cited as follows:

Larjavaara, M. & Muller-Landau, H. 2010. Woody Debris Research Protocol: CWD Dynamics. CTFS Global Forest Carbon Research Initiative. Version January 2010.

Illustrative photos are included at the end of this document. You may exclude these photos by printing only pages 1–4.

Introduction

Several field studies of the CTFS Global Forest Carbon Research Initiative are based on subplots of 40 x 40 m; these subplots may be randomly or regularly distributed in the forest dynamics plot. This study of coarse woody debris (CWD, diameter at least 200 mm) is based on an initial inventory and subsequent annual inventories of these subplots. These inventories will provide information on CWD pool size, its variation, input (creation) and output (decomposition, or burning in the case of forest fires). The CWD dynamics protocol requires information on cross-sectional masses of woody debris, which are obtained from the “Long Transects” inventory of woody debris described in a separate protocol of that name. The “Long Transects” inventory and the initial inventory for CWD dynamics should be carried out as close together in time as possible, preferably within one year. Due to methodological similarities, the “Long Transects” protocols should be read first. Data sheets are available in separate documents. We recommend that inventories of both fallen and standing woody debris should be taken at the same time within a subplot.

Field Equipment

- 1) Large caliper (e.g. Hagl f Mantax measuring up to 1270 mm if there are large trees)
- 2) Penetrometer and spare parts
- 3) Marker
- 4) Piece of cloth and bottle of ethanol
- 5) Ruler
- 6) Hammer
- 7) Nails (preferably stainless steel, approximately 100 mm long)

- 8) Resistant tape (e.g., Forestry Suppliers Plastic Tie & Grafting tape)
- 9) Paint (bright colors)
- 10) An instrument to smear paint (alternatively spray bottle of paint)
- 11) Ladder (if trees with buttress)
- 12) Rangefinder / Clinometer (e.g. Nikon Forestry 550)
- 13) Diameter tape
- 14) Clipboard
- 15) Datasheets
- 16) Pencils

Fallen CWD

CWD is inventoried using a line-intersect method along 160 m of transects (see protocol for Long transects, Fig. 1) within each subplot. Only diameter and hardness (using a penetrometer) are recorded for pieces of woody debris.

Use great care when marking woody debris because the same pieces must be located one year later. Mark each inventoried piece by driving one nail through a stretch of plastic tape and then vertically into the piece of CWD at the highest point along the cross-section (only the top of the nail should be visible). Paint a stripe on both sides of the nail parallel to the central axis of the piece of CWD. Record the transect section where the piece is found (Fig. 1). It is recommended that the sections be walked in the following order: B, C, F, G, J, K, N and O. The “tails” (sections A, D, E, H, I, L, M and P) do not need to be walked unless the whole section cannot be seen from its end closer to the subplot center or if there is a piece to be measured. Take photos of the marking-type to facilitate location in future years if field workers are likely to change. The code, for example, of a piece that was first encountered in the inventory of 2011 could be 11-1 if it is the first piece for a given section. In the case of “tail sections” a piece closer to the middle of the subplot is considered to be first.

Use penetrometer exactly as in the “Long Transects” with one addition: After each use, clean the part that penetrates the wood with ethanol and a piece of cloth. This lowers the risk of microbes spreading from one piece to another.

Assess whether the piece of CWD came from a branchfall or treefall (Photo 1). If the piece is a trunk or a branch attached to a trunk, it resulted from a treefall. Also if it appears that the piece is a branch that broke off from a bigger branch or trunk when the tree was falling or when it hit the ground, then it should be labeled as a treefall. Record the tree species if it can be identified (although this will be unlikely during the first of the repeated inventories as many pieces will have decomposed significantly already).

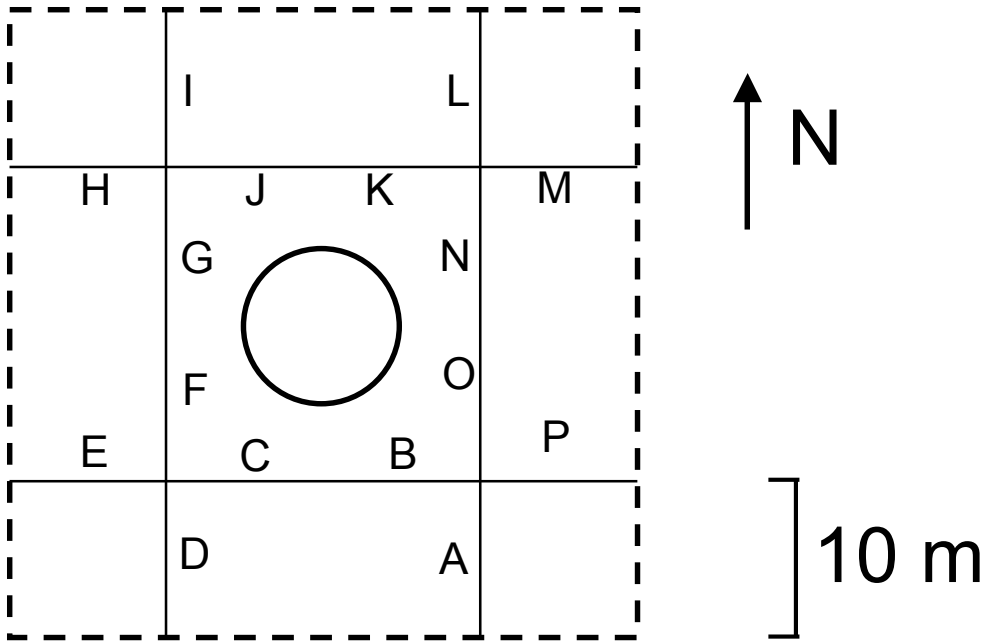


Figure 1. Orient the transects (thin solid lines) in a 40 x 40 m subplot (thick dashed lines). The letters refer to codes of sections that are used when recording data. The thick solid circle denotes the edge of the area in which standing fine woody debris is inventoried.

The interval between inventories should be 12 months (± 1 month). Each annual census is identical, except the color of paint and plastic tape should be different each year. Add a new stripe of paint (parallel) to those pieces that have already markings. If necessary, drive the nail in deeper so that the top is level with the surface of the piece of CWD. New pieces of CWD should be marked according to the initial census using the new color of paint. However, if a piece has moved from the original point along the transect (e.g., collapsed from an earlier suspended position), then remeasure at the original marked location. When the measured diameter is less than 200 mm, record the diameter but do not measure the penetrometer penetration and, then remove the nail and plastic tape. These pieces will not be censused in subsequent years.

Standing woody debris

A “standing” dead tree is one whose trunk has not fallen (where fallen means that it is supported by its upper parts of trunk or branches touching the ground) and where the base of its trunk has not moved significantly. If the height is at least 1.3 m, measure diameter with a diameter tape at 1.3 m. For shorter pieces (stumps), measure the diameter half way between the ground and the top.

Measure the height for all pieces of woody debris except for those with unbroken trunks. For very short pieces of standing woody debris (Photo 2) use a diameter tape (making

sure to measure with the side of the tape that is actual distances not the diameter side) or a caliper; otherwise use a rangefinder. Make an inventory of all standing CWD with a diameter ≥ 200 mm from the whole subplot and record the transect section that is closest to the piece. Measure the DBH above the buttresses (using diameter tape) if the trunk is buttressed at 1.3 m height (a ladder will probably be necessary). Inventory standing pieces of fine woody debris (diameter 20 – 199 mm) only within a 5-m radius circle in the middle of the subplot. Use the diameter tape to check the distance from the subplot center for pieces close to the edge of this circle. Assess the quantity of necromass in branches relative to the biomass in an average living tree of the same diameter and species: $<10\%$ (mostly gone), $>90\%$ (mostly intact), or in between.

Mark the standing dead trees and stumps using a similar marking system as for fallen pieces of woody debris (nails on the side on which penetrometer is used). The coding should be based on year, as with fallen woody debris and the location as in a census of living trees in the plot in question.

For standing CWD use the penetrometer at a 45° angle from vertical (not from the surface of the piece) on the southern side of the standing dead tree (at 1.3 m of height) or stump (half way between ground and top) as with fallen woody debris. If the central axis of a standing dead tree is leaning more than 10° on the southern side use the penetrometer at the closest side from South were the side of the standing dead tree is approximately vertical. With standing CWD it is important to keep the rod along which the 1000 g weigh slides clean so that the friction and therefore the dropping speed is not altered.

Carry out subsequent inventories for standing dead trees and stumps in the same manner. Remeasure all the variables and apply markings as for fallen woody debris. However, do not lower the height of diameter measurement even if the buttress decays. Continue the inventories until the pieces fall or diminish in size to the thresholds of the first inventory.



Photo 1. When the base of a broken branch can be seen in the canopy it is certain from which tree the branch has fallen.



Photo 2. Measure the height of pieces of standing woody debris from the top (marked with a blue line).