

Inventory Protocol for 500YFF Sampling - August 2023

Protocol modified by Gabriel Quintero '23 and Brooklyn Ford '22 as a combination of the 2019 Inventory Protocol for 500YFF Sampling by Priscilla Ranitkar '21 and Keyu Jin '21, as well as the Revised Forest Inventory Protocol by McChesney Goodall. Revised May 2022 based on observations during implementation in June 2021. Revised August 2023 to include carbon storage estimation.

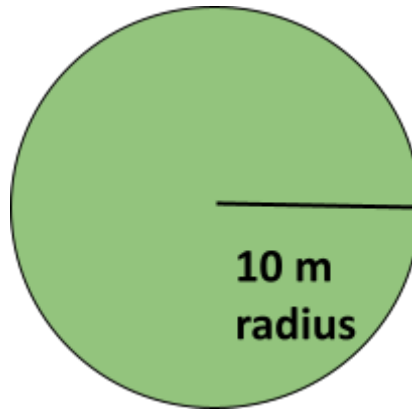
Plot Design

Number of plots:

1 plot per 25 acres of forested area, rounded down.

Plot shape, size, and setup

Each plot is a circular area with a 10m radius.



Methods for locating sample plots

- 500YFF Board, in consultation with the forest owner, identifies distinct areas within a forest with the following aspects:
 - Representative tree species
 - Areas of archaeological interest
 - Sentinel trees
 - History of use
- Using Google Earth Pro, determine additional plots with the following aspects:
 - Slope/aspect
 - Slope position: foot slope, above a stream, dry ridge
 - Riparian zones
- Once on site, the center of a plot will be placed as close as possible to the predetermined location. The edge of a plot can be no closer than one radius to a map-able non-forest obstruction or unproductive area. These include roads, power lines, pipelines, bogs, water bodies, fields, open wetlands, beaver flows, barrens, rock outcroppings, hunting cabins, etc.
- If a plot is shifted due to obstructions, it must be noted and the new location mapped.

Supplies needed to setup a plot:

- GPS unit
- Compass
- Tape measure 100' in length
- Tree tag to demarcate center tree

Procedure for setting up plots:

- Once at the plot site, select a center tree >6 inches DBH closest to the predetermined site. Attach tree tag to center tree, and denote sampling date and plot number on tag. Note GPS coordinates of the center tree on the data sheet.
- Take four photos from the plot boundary towards the center tree at each cardinal direction (NESW).

Data Collection

Site description:

Disturbances will be assessed through visual observation, looking for evidence of the removal or cutting of trees or other vegetation¹, livestock access/grazing, trash, etc. Also, list any general notes or information pertinent to the plot or stand conditions including forest health, regeneration, competing vegetation, harvesting, unproductive/non-forest areas, site limitations, etc.

Tree density, size, and species:

We determine tree density (trees per area) with two different methods: physical counts in each sample plot, and Basal Area Factor (BAF) prism sweep².

Guidelines for visually counting trees

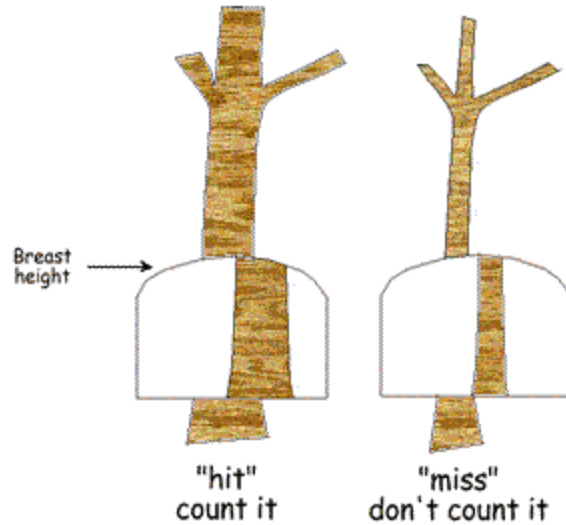
- If the trunk of a tree is more than halfway inside of the perimeter, the tree is counted.
- If the trunk of a tree is more than halfway outside of the perimeter, the tree is not counted.
- If the trunk of a tree is located outside of the perimeter but the foliage of the tree is inside the perimeter, the tree is not counted.
- **If a tree looks to be dead** (i.e. broken branches, trunk of tree being snapped, tree being infested with insects) **then it is counted as a snag.**

Density of Trees using BAF

- Basal area is the average cross sectional area of the tree boles at 4.5 ft above ground level per unit area. Use a 10 basal area factor (BAF prism) to calculate this in terms of square feet of tree coverage per acre.
- To use a BAF prism, hold the prism at breast height (around 4.5 ft).
- While standing in one spot, do a circular swoop and look through the prism to determine which trees are “in” and which are “out”. Use the diagram below for assistance.
- Multiply the number of “in” trees by 10 to find the density, units of square feet of tree coverage per acre.

¹ The 500YFF prohibits cutting/removal of trees other than for eradication of invasive species, protection of people, livestock, and buildings, maintenance of approved roads and trails, and collection of non-timber forest products and firewood from downed trees for personal use on the owner's property

² https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5413736.pdf



Tree tally: size & species³

- Measure and note the circumference at breast height (4.5 feet from forest floor)
- Make species ID and indicate whether the tree is native or invasive
- Mark tree with orange tag after ID/count, to avoid double counting. Retrieve all orange tags when done sampling.

*Note American chestnut, longleaf pine, red spruce, also shortleaf pine, bald cypress (first three are of interest to Oak Hill Fund, “Diminished Tree Species”)

Snags:

Snag species and DBH will be tallied in the visual tree count along with the living trees.

A snag is defined as any standing dead wood, at least six (6) inches in diameter and at least five (5) feet tall, with more than half of the stump rooted to the ground within the plot and standing upright within 45 degrees of vertical (straight upwards). Snags can either be self-supported or leaning against other trees but need to be attached to the root stump in some measure.

Along with the DBH category, the decay class and, if possible, species of each snag is recorded:

Stand age⁴:

- Choose two trees within the forest that are considered to be representative of stand age. Tag each tree to be cored and indicate core sample date.
- If possible, choose oak (preferably red oak) or pine species. Choose trees of two different species. Watch for newly felled trees which can be aged without coring.
- Follow procedure for taking one core sample from each tree using an increment borer.⁵

Visual Representation (Structure):

- Differentiate cover layers first
- Mark the estimated % cover for each of the following canopy layers;

³ Using method for determining circumference from

https://www.americanforests.org/wp-content/uploads/2014/12/AF-Tree-Measuring-Guidelines_LR.pdf

⁴ Since the largest trees may be very difficult to count rings on (yellow poplar, maple), instead core a tree that is easier to core and count rings on (red oak, pine), and is representative of stand age.

⁵ <https://pubs.usgs.gov/wri/1985/4148/report.pdf>

- Shrub layer (2-6') things like azalea and mountain laurel
- Understory (6-35') of intermediate or subordinate trees that never reach the canopy such as dogwood, redbud, hop hornbeam
- Canopy (35''+)

Ref: Gill forest inventory, and do the same procedure. Streamlined version of the above.

Undergrowth

- Note down primary undergrowth type (leaf litter, grasses, etc.)
- Note any species of interest or invasives

Carbon Assessment

- Using a biltmore stick, measure the height of three representative trees in or around the plot

To estimate stand height using a Biltmore stick, first select a tree which is representative of the stand. Starting at the selected tree, walk 66 feet in a straight line, making sure not to walk on an incline if possible. Turn and face the tree, and hold the Biltmore stick upright, 24 inches from your eye. Aim the bottom of the stick at the base of the selected tree, then look up and find the cutoff point. Read the height of the tree on the Biltmore stick to the nearest half-log. Do this at least three times in the stand to estimate average stand height.

- Using a soil corer, take one 18'' soil sample in each plot
- Using a sampling ring of 12'' diameter, take three separate litter samples in the plot

To take a litter sample, toss the ring in a random direction within the plot, then collect all litter within the ring.

Invasive Species:

Identify and make note of any and all invasive species in and/or around the plots.

Species of Interest:

Keep an eye out for and make note of any diminished species present throughout the area. These include red spruce, american chestnut, longleaf pine, shortleaf pine, and bald cypress.