Forest Cover Classification Model Field Validation

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Background

This tutorial takes you through the process of creating and cataloguing 7.2 meter circular forest plots that will act as field validation for forest cover classification models (see tutorial on this process). The ultimate goal is to use this field validation method to assist in creating a forest cover classification model with >80% accuracy. Furthermore, these plots will be the basis for a subsequent tutorial on digital hemispherical photography.

These plots are separate from the fixed radius quarter-acre forest plots used for creating forest cover classification models and should NOT spatially overlap.

*Note: This approach is similar to the fixed radius quarter-acre forest plots in regards to cataloguing trees within the plot boundaries but does not require tagging trees with individual identification tags or taking diameter breast height (DBH) measurements.

Required Materials

The following items are required for conducting a forest plot calibration:

- Topographic map of forest with GPS waypoints
- GPS unit (it's best to have the plot waypoints already entered into the unit)
- Hard hats
- Blank data sheets
- Clipboard
- 30-meter tape
- Pin flags
- Lumber crayons (if desired for marking trees at the plot boundaries)

*Note: Items that should always be on hand when conducting field research in forested areas: Extra GPS batteries (make sure to take a waypoint with your GPS at the car for your return trip), a bow saw (to remove trees that may fall and block the road), and fully charged two-way radios.

Creating the 7.2 meter plots

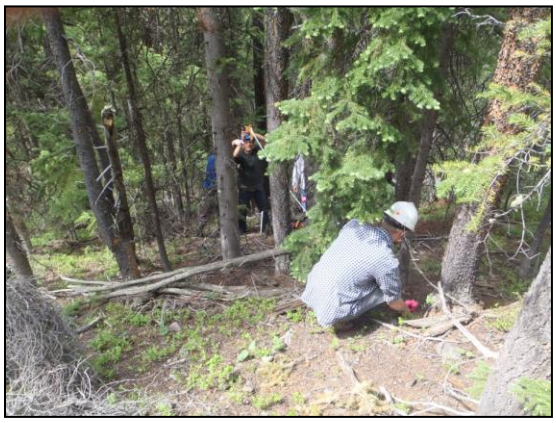
The forest plot will be measured from the GPS coordinate up slope, down slope and both directions across. When calibrating a circular validation plot of this size, two people are required; one person acting as anchor for the 30-meter tape from the central point of the plot and making sure the tape is run in a straight line, and the other acting as the roller/flagger, rolling out and measuring the tape across the transect and marking the measured boundaries with pin flags. *Note: if you have lumber crayons and decide to mark boundary trees, when the 7.2 meter boundary is reached and flagged, the roller/flagger will mark the tree(s) at this farthest point within the plot boundary with a lumber crayon (this can be a mark of "IN" or a simple vertical line. Whichever method is chosen, be consistent).

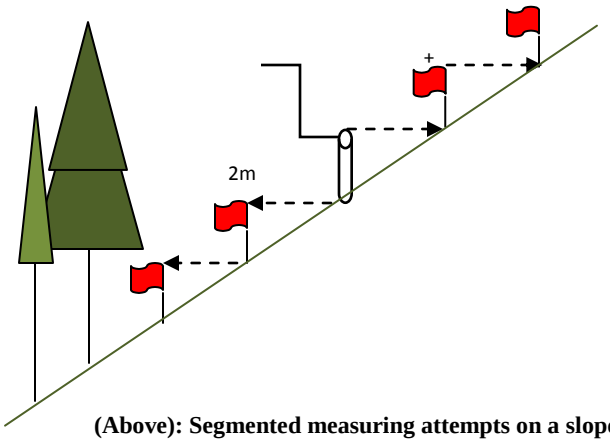
Start by measuring out the upslope boundary. Often, these plots are established on uneven topography. To correctly measure out a horizontal line on a slope, we must account for the change in height. This is done by breaking the line up into segments (for 7.2 meter plots this is usually not an issue).

From the plot's central point, the anchor person will hold the end of the 30-meter tape above their head. *Note: It is best to determine a set height and stick with it for measurement consistency. The roller will walk out as far upslope as they can in a straight line, keeping the tape taught and horizontal.

When the tape starts to slacken, the roller should reel in the tape until taught and the flagger should mark that point. From there, the anchor will move up to the flagged point and start the process again until the roller reaches 7.2 meters (Figure 1. shows how this segmentation would look in steep terrain where only 2 meters distance can be attained in a given measurement attempt. But in general 7.2 meters can be reached in one attempt).

(Below): Keeping the tape taught and horizontal while measuring downslope.

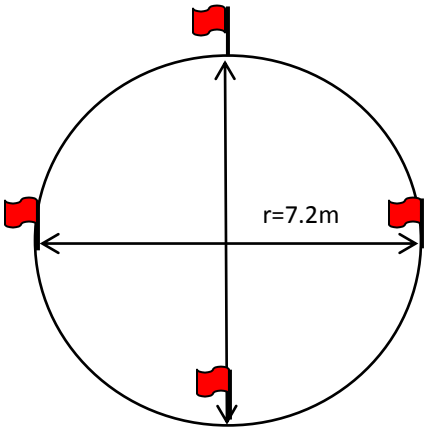




(Above): Segmented measuring attempts on a slope.

Next, measure the downslope boundary. The process is very similar to the aforementioned upslope transect measurement but one key distinction should be made. In this case, the anchor holds the end-point of the 30-meter tape low to the ground and the roller holds the tape above their head. The roller will walk out as far downslope as they can in a straight line, keeping the tape taught. When the tape starts to slacken, the roller should reel in the tape until taught and the flagger should mark that point. From there the anchor will move up to the flagged point and start the process again until the roller reaches 7.2 meters.

Next, measure across slope ensuring measurements are made in both directions, while the anchor and roller hold the tape at the same level (holding the tape lower is recommended). As with the other directions, the roller will walk out as far across slope as they can in a straight line, keeping the tape taught. When the tape starts to slacken, the roller should reel in the tape until taught and the flagger should mark that point. From there the anchor will move up to the flagged point and start the process again until the roller reaches 7.2 meters.



(Left): Four quadrant boundaries forming a 7.2 meter validation plot.

Flags mark the final perimeter.

Cataloguing trees within the 7.2 meter plots

Once the 7.2 meter validation plots have been created, all of the mature trees, seedlings and saplings within the plot boundaries need to be catalogued by species on the accompanying data sheets (see below). *Note: Although tree species are separated when cataloguing, for the final 7.2 meter validation plot categories, Engelmann spruce and subalpine fir are combined.

7.2 meter model validation plot data sheet		L: Living D: Dead			
Recorders _____					
PlotID:	Date Collected:	Final Plot Category:			
	Lodgepole pine	Engelmann spruce	Subalpine fir	Aspen	Notes
Seedling Count (height <1.4m)					
Sapling Count (height >1.4m but DBH <2cm)	L: D:	L: D:	L: D:	L: D:	
Mature Count (height >1.4 m and DBH >2cm)	L: D:	L: D:	L: D:	L: D:	
***Important: Give exact count for all tree categories (L & D)**					

Estimates of seedling, living sapling (L), and dead sapling (D) counts by species are noted by giving a discrete number that is a close approximation of the present total based on a visual assessment of the plot. Exact counts for living mature trees (L) and dead mature trees (D) are noted in their respective section of the split cell. These exact figures can be turned into ranges (e.g. <10, 10-25, >50, etc.) during subsequent data entry and analysis.*Note: Seedlings are less than 1.4 meters high, meaning they do not have a diameter breast height (DBH) to measure. Saplings are at least 1.4 meters tall (approximately 4.5 feet) or greater but have a DBH less than 2 centimeters.

For each plot, always start the cataloguing process by moving upslope of the central plot marker and work clockwise around the plot. Efficiency can be promoted by dividing up trees by species and class, so tree categories are catalogued simultaneously but there isn't overlap in the counts.

Final plot categories will be used for model validation and are comprised of the following: 1) lodgepole pine (LP), 2) lodgepole pine-Engelmann spruce/subalpine fir (LP-SF), 3) Engelmann spruce/subalpine fir-lodgepole pine (SF-LP), and 4) Engelmann spruce/subalpine fir (SF). Categories are weighted by species dominance. For example, designating a 7.2 meter plot as category 1 (lodgepole pine) requires that approximately 90% of the trees within the plot boundaries are lodgepole pine. The same goes for a category 4 distinction (Engelmann spruce/subalpine fir), which would require that approximately 90% of the trees within the plot boundaries be Engelmann spruce and/or subalpine fir. The two combination categories require that the first species listed comprise over 50% of the species. This means for a category 2 distinction (lodgepole pine-Engelmann spruce/subalpine fir), over 50% of the trees in the 7.2 meter plot must be lodgepole pine. For a category 3 distinction (Engelmann spruce/subalpine fir-lodgepole pine), over 50% of the tree species within the 7.2 meter plot must be Engelmann spruce and/or subalpine fir.

Congratulations! You have successfully calibrated a 7.2 meter validation forest plot.