Integrated Resources Assessment
Field Data Collection – Field Sampling Guide
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Robert Froese, Mike Falkowski and Nick Windmuller
School of Forest Resources and Environmental Science, Michigan Technological University

Introduction

The purpose of this inventory is to collect baseline data on forest condition for the entire Ford Forest. These data will be collected independently of any particular future management objective, for several reasons. Foremost among these is that it is your purpose, in this class, is to establish where, when and how the forest should be managed now and into the future to achieve a desired future condition and the management objectives that you will determine.

Plot locations have been established already, for you, so you will need only to find the plot centers and collect the data. The inventory design emphasizes basic tree and ecosystem attributes, which can be aggregated to generate stand, compartment and entire forest statistics. These data will also be suitable for simulation modelling to forecast future conditions.

The basic inventory design is a set of nested fixed-area plots (see Figure 1). The overstory plot you will use is 1/10th acre in area. Measurements on this plot will be made of stand conditions and on trees that are 4” DBH or larger. Nested within this plot, sharing a common center, is a 1/50th acre subplot for measurement of samplings, which are trees between 1” and 3.99” DBH. Also nested within this plot, and sharing the same common center, is a 1/300th acre subplot for measurement of seedlings. Finally, you will establish a 3’ square subplot, offset 10’ to the west of the main plot center, to make measurements of regeneration.

The protocol also includes measurement of down dead wood (DDW) adapted from Lutes and Keane (2006). The procedure you will use is a form of line intersect sampling where DDW is tallied by size class along 4 transects within the 1/10th acre forest inventory plot (Figure 1.)

Field Equipment

Each two-person crew will be issued a set of field equipment, which you will be responsible for.

<table>
<thead>
<tr>
<th>Equipment supplied to you</th>
<th>Equipment you must have already</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Garmin eTrex Venture HC GPS</td>
<td>1. Clipboard, pencil</td>
</tr>
<tr>
<td>2. Diameter tape</td>
<td>2. Calculator</td>
</tr>
<tr>
<td>3. 100 foot nylon tape</td>
<td>3. Compass</td>
</tr>
<tr>
<td>5. Field data sheets</td>
<td>5. Permanent Marker (Sharpie)</td>
</tr>
<tr>
<td>6. Go-No-Go Gauge</td>
<td></td>
</tr>
</tbody>
</table>
Figure 1. Illustration of the field sampling design.
Field Data Collection Procedure

The general procedure for field data collection is summarized here. Proceed logically, patiently and carefully to record all of the necessary data for each field plot. Please remember that there are explicit error tolerances and minimum quality objectives established for each measurement.

1. Navigation and plot establishment
   a. Navigate to plot using GPS and preloaded points. Do not move plot centers to account for stand boundaries or features under any circumstances.
   b. Double-check that the plot center is properly established using flagging and that the plot number is written in permanent marker on flagging tape.
   c. Record the plot-level attributes
      i. Time, Date and names of field crew
      ii. Slope, aspect, topographic position
      iii. General observations
   d. Identify the cover type at plot center. If the overstory plot includes more than one cover type, record the additional types and estimate the fraction of the plot area that falls within each type. See the procedure for split plots below for details.

2. Overstory measurement - 1/10th acre plots – 37.2’ radius
   a. Identify true north, and then proceed clockwise to identify and measure trees that fall within the plot. Use a nylon tape to measure the distance to each borderline tree.
   b. For each tree record species and crown class. For every tree and snag 4” DBH or larger record DBH and UGS/AGS. If tree is dead mark “snag” in the crown class column.
   c. For largest and smallest (by DBH) tree of every species in the plot, measure total tree height. Remember to correct for slope by measuring slope distance using a nylon tape and record the angle to the top and base of the tree using a clinometer.
   d. For every tree which you measure height also record crown ratio.

3. Sapling measurement – 1/50th acre plots – 16.7’ radius
   a. Starting again from true north, identify each tree between 1” and 3.99” DBH that fall within the sampling subplot. Use a nylon tape to measure the distance to each borderline tree.
   b. On each tree that falls within the plot use a dot tally to tally the tree stems by species and 1” DBH class

4. Seedling measurement – 1/300th acre plots – 6.8’ radius
   a. On any tree less than 1” DBH and taller than 1’ in height, use a dot tally to tally the tree stems by species in the following classes
      i. Taller than breast height
      ii. Taller than 2.5’ but shorter than breast height
      iii. Taller than 1’ but shorter than 2.5’
5. Regeneration measurements – 1 square yard offset 10’ due west
   a. Visually approximate a 3’ by 3’ area offset 10’ to the west of the overstory plot center.
   b. Within this area estimate cover class of each of the following cover groups. A visual aid is included in the appendix to help you generate accurate estimates
      i. Trees (shorter than 1’) by species
      ii. Shrubs (shorter than 1’)
      iii. Ferns
      iv. Herbs
      v. Grasses and sedges
      vi. Mosses and lichens
      vii. Down dead wood
      viii. Leaf litter
      ix. Bare soil
      x. Rocks

6. DDW measurements – four transects connecting plot “corners”
   a. Establish the edge of the overstory plot in each of the four cardinal directions (N, E, S, W). These points are 37.2’ horizontal distance from plot center. We will call these the plot “corners”. Remember to correct for slope if necessary.
   b. Starting from the north corner, run your measuring tape between the north and the east corner. This is called the “north-east” or “N-E” transect. Lay your tape as close to the ground surface and as straight as possible. The length of this transect should be 52.6’ if the slope is perfectly flat, but will otherwise be longer.
   c. Carefully measure the slope of the transect using a clinometer, and record the slope and total length of on your field data sheet.
   d. Starting from the N-E corner, tally DDW particles that intersect the transect in four size classes:
      i. For the first 6 feet along the transect tally 1-hr fuels (particles 0-0.25” in diameter) and 10-hr fuels (particles 0.25-1.0” in diameter)
      ii. For the first 16 feet along the transect tally 100-hr fuels (particles 1.0-3.0” in diameter)
      iii. For the entire length of the transect identify 1000-hr fuels (particles 3.0” or larger) that intersect the transect. For this size class only measure the diameter of the particle at the point of intersection and record the decay class.
   e. When you have completed the N-E transect, repeat the procedure for the E-S (“east-south”), S-W (“south-west”) and W-N (“west-north”) transects, in that order.

Procedure for split plots, which contain more than one cover type

The goal of this inventory is to measure forest conditions across the entire MTU forest ownership, including areas that will never receive any commercial timber harvest. Therefore, **plot centers have not been moved under any circumstances**, even if parts of the plot area
fell partly outside of traditional stand boundaries, into areas such as riparian zones, transition zones, or skid trails.

If a plot straddles stand boundaries, or if plots include permanently deforested features, then we say that the plot contains more than one cover type. One example is a plot that clearly falls on the edge of a stand; e.g., the plot center could be in mature jack pine but the plot radius extends into an adjacent clearcut. Another example is when the plot center falls in forest but the radius extends onto a permanent road. In these cases, you will have to “split” the plot. By splitting, we mean estimating the fraction of the plot that falls within each cover type, and noting the cover type that each measured tree falls within.

Splitting should be necessary on only very rare occasions. Be careful to distinguish between natural stand variability and stand boundaries. Also be careful to distinguish between permanent and temporary deforestation. For example, skid trails are not permanent roads and a plot would not be split because it contains part of a skid trail even if there are no trees found on the trail.

References


Quality Control Standards

The goal of this inventory is not only to create an inventory of the Ford Center lands but also to have data for each of you to use for your final project. High quality data are essential and your work will be examined for quality in the field. The following tolerances and minimum quality objectives (MQO) are used by the US Forest Service on the Forest Inventory and Analysis plots throughout the country and are sufficient for this class:

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Tolerance</th>
<th>MQO</th>
<th>Values</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Plot-Level Data</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time, date, crew names</td>
<td>No errors</td>
<td>At least 99% of the time</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Slope</td>
<td>± 10%</td>
<td>at least 90% of the time</td>
<td>000 to 155</td>
<td>percent</td>
</tr>
<tr>
<td>Aspect</td>
<td>± 10 degrees</td>
<td>at least 90% of the time</td>
<td>000 to 360</td>
<td>degrees</td>
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<tr>
<td><strong>Overstory and Sapling Data</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Borderline Trees</td>
<td>no errors</td>
<td>at least 95% of the time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Species</td>
<td>no errors</td>
<td>at least 99% for genus</td>
<td>two letter code</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td></td>
<td>at least 95% for species</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DBH</td>
<td>± 0.1 in. for 5 to 20 in. DBH</td>
<td>at least 95% of the time</td>
<td>001.0 to 999.9</td>
<td>inches</td>
</tr>
<tr>
<td></td>
<td>± 0.2 in. for 20.1 to 40 in. DBH</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>± 0.3 in. for 40.1 to 60 in. DBH</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height</td>
<td>± 10% true</td>
<td>at least 90% of the time</td>
<td>005 to 400</td>
<td>feet</td>
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<tr>
<td>Uncompacted Live Crown Ratio</td>
<td>± 10%</td>
<td>at least 90% of the time</td>
<td>00 to 99</td>
<td>percent</td>
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<tr>
<td>Crown Class</td>
<td>no errors</td>
<td>at least 85% of the time</td>
<td>1 to 5</td>
<td>n/a</td>
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<tr>
<td><strong>Seedling Data</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Species</td>
<td>no errors</td>
<td>at least 99% for genus</td>
<td>two letter code</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td></td>
<td>at least 95% for species</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seedling Count</td>
<td>no errors for 5 or less per species ± 20% over a count of 5</td>
<td>at least 90% of the time</td>
<td>001 to 999</td>
<td>number</td>
</tr>
<tr>
<td><strong>Understory Vegetation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cover Percent</td>
<td>total cover ± 20%</td>
<td>at least 90% of the time</td>
<td>00 to 99</td>
<td>percent</td>
</tr>
</tbody>
</table>
1. Definition of Acceptable and Unacceptable Growing Stock (FIA)

Acceptable Growing Stock (AGS) – A tree which contains or potentially contains at least one 12’ sawlog or two 8’ sawlogs and will survive until the next harvest.

Unacceptable Growing Stock (UGS) - A tree which will never contain one 12’ sawlog or two 8’ sawlogs (due to poor form, cull, etc.) or will not survive until the next harvest

2. Percent Cover Diagram (NOAA CCMA)
3. Crown Position Diagram (USFS)

D = Dominant; C = Codominant; I = Intermediate; S = Suppressed; OG = Open Grown

4. How to conduct a dot tally

**How to DOT TALLY**

- •• Signifies 2 trees
- •••• Signifies 3 trees
- ••••• Signifies 4 trees
- •••••• Signifies 5 trees
- •••••••• Signifies 6 trees
- ••••••••• Signifies 7 trees
- •••••••••• Signifies 8 trees
- ••••••••••• Signifies 9 trees
- ••••••••••••••• Signifies 10 trees
6. Common Corrections for issues in measuring DBH

- Tree on Level Ground
- Tree on Slope
- Leaning Tree
- Tree with Branch/Deformity at Breast Height
- Tree Forked Below Breast Height
- Tree Forked Above Breast Height
7. CWD measurements

Go-No-Go Gauge and associated size classes.

![Diagram of Go-No-Go Gauge]

Decay classes and descriptions

<table>
<thead>
<tr>
<th>Decay class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>All bark is intact. All but the smallest twigs are present. Old needles probably still present. Hard when kicked.</td>
</tr>
<tr>
<td>2</td>
<td>Some bark is missing, as are many of the smaller branches. No old needles still on branches. Hard when kicked.</td>
</tr>
<tr>
<td>3</td>
<td>Most of the bark is missing, and most of the branches less than 1 inch in diameter also missing. Still hard when kicked.</td>
</tr>
<tr>
<td>4</td>
<td>Looks like a class 3 log but the sapwood is rotten. Sounds hollow when kicked, and you can probably remove wood from the outside with your boot. Pronounced sagging if suspended for even moderate distances.</td>
</tr>
<tr>
<td>5</td>
<td>Entire log is in contact with the ground. Easy to kick apart but most of the piece is above the general level of the adjacent ground. If the central axis of the piece lies in or below the duff layer then it should not be included in the CWD sampling, as these pieces act more like duff than wood when burned.</td>
</tr>
</tbody>
</table>