Sample Plots

FOR 1001
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Today’s Objectives

- Concept & role of sample plots
- Plot calculations
- Plot establishment

You will establish plots & measure trees to address your *first case study*
Sample Plots

What?

- Plot is:
  An area of land, representative of larger area of land, in which trees or other features are measured.

- We apply what we measure in the plot to larger area of land it represents.
Sample Plots

Why?

- Remember, to get meaningful information for a forest, we need to *scale up* from:

  tree to stand to forest

- Sample plots help us take the step from tree to stand
Tree → Stand → Forest
Sample Plots

How Used?

- Our area is of interest is a stand 1ha in size.

How many trees does it contain?

- What if the area of interest is:
  - 100 ha?
  - 10 000ha?
  - Even larger?
Sample Plots

How Used?

- Our area is of interest is a stand 1ha in size

How many trees does it contain?

- We establish a plot 10m X 10m
- $100m^2 = 0.01 \text{ ha}$
- We count 15 trees in the 0.01 ha plot
- How many trees in the 1 ha stand?

\[
\frac{15 \text{ trees}}{0.01 \text{ ha}} = \frac{X \text{ trees}}{1.0 \text{ ha}}
\]
Sample Plots

How Used?

- How many trees in the 1 ha stand?
  
  \[
  \frac{15 \text{ trees}}{0.01 \text{ ha}} = \frac{X \text{ trees}}{1.0 \text{ ha}}
  \]

- \[
  X \text{ trees} = 15 \text{ trees} \times \frac{1.0 \text{ ha}}{0.01 \text{ ha}}
  \]

- \[
  X \text{ trees} = 1500 \text{ trees}
  \]
Sample Plots

**How Used?**

General Forms

\[
\text{per ha value} = \frac{\text{plot value}}{\text{plot size (ha)}}
\]

\[
\text{stand value} = \text{per ha value} \times \text{stand size}
\]

<table>
<thead>
<tr>
<th>How Many Trees</th>
<th>How Much Volume</th>
<th>How Much Carbon</th>
<th>How Many Snags &gt;40cm</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>plot value</strong></td>
<td>100 trees</td>
<td>40 m³</td>
<td>80 tonnes</td>
</tr>
<tr>
<td><strong>plot size</strong></td>
<td>0.04 ha</td>
<td>0.1 ha</td>
<td>0.01 ha</td>
</tr>
<tr>
<td><strong>per ha value</strong></td>
<td>2500 trees/ha</td>
<td>400 m³/ha</td>
<td>8000 tonnes/ha</td>
</tr>
<tr>
<td><strong>stand size</strong></td>
<td>8.0 ha</td>
<td>20.0 ha</td>
<td>2.0 ha</td>
</tr>
<tr>
<td><strong>stand value</strong></td>
<td>20 000 trees</td>
<td>8000 m³</td>
<td>16000 tonnes</td>
</tr>
</tbody>
</table>
Sample Plots

How Used?

General Forms

per ha value = \( \frac{\text{plot value}}{\text{plot size}\ (\text{ha})} \)

scale up factor = 1 divided by plot size

per ha value = scale up factor times plot value
Sample Plots

General Forms

How Used?

per ha value = \frac{\text{plot value}}{\text{plot size} \,(\text{ha})}

scale up factor = 1 \text{ divided by plot size}

per ha value = \text{scale up factor \times plot value}
**Sample Plots**

**How Used?**

- **General Forms**
  - \[ \text{per ha value} = \frac{\text{plot value}}{\text{plot size} \ (\text{ha})} \]
  - **scale up factor** = \( \frac{1}{\text{plot size}} \)

**How Many Trees**

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>Scale-up factor</th>
<th>Calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>plot value</strong></td>
<td>100 trees</td>
<td></td>
<td>( \frac{1}{0.04} = 25 )</td>
</tr>
<tr>
<td><strong>plot size</strong></td>
<td>0.04 ha</td>
<td></td>
<td>( \text{trees/ha} = \text{trees/plot} \times \text{scale-up factor} )</td>
</tr>
<tr>
<td><strong>per ha value</strong></td>
<td>2500 trees/ha</td>
<td></td>
<td>( \text{trees/ha} = 100 \text{ trees/plot} \times 25 \text{ plots/ha} )</td>
</tr>
<tr>
<td><strong>stand size</strong></td>
<td>8.0 ha</td>
<td></td>
<td>( \text{trees/ha} = 2500 )</td>
</tr>
<tr>
<td><strong>stand value</strong></td>
<td>20,000 trees</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Sample Plots**

**How Used?**

General Forms

- per ha value = \( \frac{\text{plot value}}{\text{plot size (ha)}} \)
- scale up factor = 1 divided by plot size

**How Many Snags >40cm**

- plot value
- plot size
- per ha value
- stand size
- stand value

scale-up factor = \( \frac{1}{0.5} = 2 \)

5 snags

0.5 ha

10 snags/ha

12.0 ha

120 snags
Sample Plots

Remember!

- Conditions in the plot must be representative of the larger area to which sample results will apply.

Or here?

Apply plot results here?
Sample Plots

How Established?

- Various shapes & forms
  - circular
  - rectangular or square
  - strip
  - “unbouded” (observations taken from a point)
How Established?

- Choosing size & shape
  - Ease of establishment
  - Area/perimeter ratio
  - “Representativeness”
Sample Plots

How Established?

- Circular
  - Select plot size
  - Determine radius

E.g. If we want a **0.01** ha plot, what **radius** to use?

\[
1 \text{ha} = 10000 \text{m}^2 \text{ so } 0.01 \text{ha} = 100 \text{ m}^2
\]

Area = \pi * r^2

\[
100 \text{m}^2 = \pi * r^2
\]

\[
r = \sqrt{100 \text{m}^2/\pi}
\]

\[
r = 5.64 \text{m}
\]
Sample Plots

How Established?

- Circular
  - Locate and stake plot centre
  - Run out correct radius with tape
  - Starting with nearest tree
    - Number trees with lumber crayon
    - Number faces plot centre
    - Proceed clockwise
    - Mark with “X” trees outside plot, but within 1.5 m of boundary
Sample Plots

Tree “in” if centre is in

100m² Circular Plot

5.64m

1.5m

Numbered points around the plot: 1, 2, 3, 4, 5, 6, 7, 8, 9.

Dimensions and annotations indicate the layout for sample plots.
Sample Plots

Tree “in” if centre is in

100m² Circular Plot

1.5m

5.64m
Summary

- we use sample plots to help us “scale up” information from tree to stand to forest

- plots must be representative of the area to which results are applied

- advantages and disadvantages to different plot shapes & sizes (consider carefully before choosing)

- regardless of shape and size, “scaling up” from plot to hectare to stand is the same for all area plots