STAND ASSESSMENT: Applications & CFI
Mean DBH & QMD – An Application

Mean DBH: \[ \overline{DBH} = \frac{1}{n} \sum_{i=1}^{n} DBH_i \]

Quad. Mean DBH: \[ QMD = D_g = \sqrt{\frac{\bar{g}}{0.005454}} \]

Dispersion of DBHs: \[ S_{DBH}^2 = \left( \frac{n}{n-1} \right) \left( QMD^2 - \overline{DBH}^2 \right) \]

Coefficient of Variation: \[ CV_{DBH} = \frac{S_{DBH}}{DBH} \]
One view of Stand Structure

- Diameter (size) distributions

2006 Stand Table (plot 70303)
Site Index & Basal Area - An application

<table>
<thead>
<tr>
<th>Site Class</th>
<th>Core Zone Width</th>
<th>Inner Zone Width</th>
<th>Outer Zone Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>SITE CLASS I</td>
<td>200’ WIDE RMZ</td>
<td>50’</td>
<td>83’</td>
</tr>
<tr>
<td>SITE CLASS II</td>
<td>170’ WIDE RMZ</td>
<td>50’</td>
<td>63’</td>
</tr>
<tr>
<td>SITE CLASS III</td>
<td>140’ WIDE RMZ</td>
<td>50’</td>
<td>43’</td>
</tr>
<tr>
<td>SITE CLASS IV</td>
<td>110’ WIDE RMZ</td>
<td>50’</td>
<td>23’</td>
</tr>
<tr>
<td>SITE CLASS V</td>
<td>90’ WIDE RMZ</td>
<td>50’</td>
<td>30’</td>
</tr>
</tbody>
</table>

No Harvest

10’
AGE & TPA – An Application

- Structure / Constitution is determined by:
  - Size variability
    - Diameter
    - Height
    - Crown
  - Frequency of occurrence; shape, location of size distribution
  - Age; shape, location of age distribution
  - Spatial arrangement of trees in stand
Forest Structure / Constitution

- Five Typical Stand Constitutions (age structures)
  - Single-cohort (even-aged) stand
  - Single-cohort stratified mixture
  - Two-aged stand
  - Balanced uneven-aged stand
  - Irregular uneven-aged stand

- Represent different life histories & management (stewardship) options / potentials
Five Typical Stand Constitutions

- Single cohort (even-aged) stand

(Smith, et al. 1996)
Five Typical Stand Constitutions

- Single cohort stratified mixture

(Reprinted from Smith, et al. 1996)
- Double Cohort (Two-Aged) Stand

(Smith, et al. 1996)
Five Typical Stand Constitutions

- Multi-cohort (uneven-aged) stands

(Smith, et al. 1996)
Continuous Forest Inventory

- The ONLY way to get a complete historical record on forest change is to monitor permanently monumented plots.

- Data from Permanent Sample Plots (PSP’s) is for:
  - Studying how biodiversity, wildlife habitat quality, etc. change over time.
  - Forecasting growth, i.e., developing and testing forest simulation models.
  - Studying the effects of cultural practices, insect attacks, weather, climate, etc.

- Chief purpose is to assess change so forest stewards are alerted to potential need for changing practices or policies.
Continuous Forest Inventory

- CFI is generally very low intensity
  - TSP’s will typically be used to supplement PSP’s

- CFI plots must be representative of the forest; no special “reserve status”

- Systematic sampling is often used
  - Stratified sampling is often messed up by natural disaster, natural changes in species composition

- Sample size determination is difficult
  - Must be applicable now AND in the future
  - Large enough to be precise for several forest attributes
  - Sampling intensities often range from 0.1% to 1%
Continuous Forest Inventory

- Plot locations can be placed onto a photomosaic, orthophoto, topographic, or other map of the ownership, then transferred to 9 x 9” photos to take into the field.
- Distance & bearing to plot center is determined from the photo or map from a known permanent location (primary control) to avoid bias.
- Plot center is marked with aluminum stake, re-bar, or PVC pipe.
- Tags on trees in plot are stapled, nailed and / or trees are painted near breast height.
Continuous Forest Inventory

- Five percent of all plots (randomly selected) are normally “check-cruised” for accuracy.
- Measurement interval is typically 3 to 10 years.
- Repeat measurement cycle is either annual or periodic.
  - In a periodic survey, with periodic measurement interval $p$, EVERY plot is measured every $p$ years.
  - In an “annual” survey, $1/p$ plots will be measured EVERY year.
Summary Remarks

- Measurement data collected from trees in a forest system yields information
  - Forest Structure / Function
    - Four major stages of stand development
    - Five major age constitutions

- Repeated measurement (monitoring) of forest systems is key to assessing real change

- Sound data enables sound stand, forest, and landscape management decisions
Example Exam Questions

Upper canopy vegetation

Q. You are 100 feet away from a tree on flat ground to measure its height. The clinometer reading to the top is 98% and to the base it is -4%. How tall is the tree?

A:  

\[ H = 100 \times \frac{98 - (-4)}{100} = 102 \text{ feet tall} \]
Example Exam Questions (cont’d)

• Define Site Index

A: Average height of undamaged, dominant trees of a particular species at a particular index age.

In Washington, index age used in site index charts is typically 50 years west of Cascades, 100 years east of Cascades.