



INVENTORYING A FOREST--

CRUISING IN THE WOODS



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The purpose of my this presentation is to introduce you to the procedures used by foresters to inventory your timber resources.

I do not expect you to be able to "cruise timber" from this short introduction.

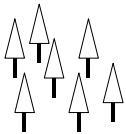
The purpose of forest inventory is to acquire information:

- to buy or sell timber products
- to determine condition of the forest:
 - age
 - species mix
 - ease of harvest
- to evaluate damage to your forest

The purpose of forest inventory:

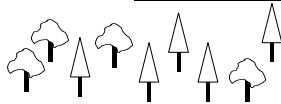
(continued)

- to manage a forest
(basis for economic analysis)
- to determine the amount, value
and/or condition of other forest
resources (wildlife habitat,
wetlands, water resources, etc.)
- for tax assessment or establishing a
timber basis for tax purposes



**How does a forester
inventory a forest?**

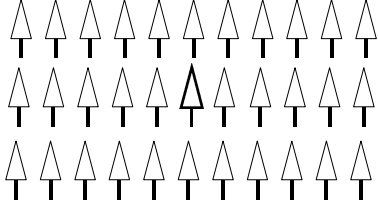
**A forester usually
observes a portion of the
forest – a SAMPLE**



**300 trees per acre on 40 acres
means 12,000 trees would have
to be measured in a
complete “tally.”**

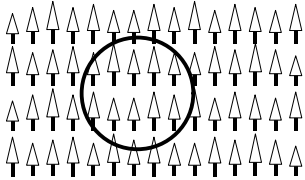
**Foresters attempt to obtain a
REPRESENTATIVE SAMPLE
of the trees of interest.**

If all of the trees on the 40 acres were IDENTICAL— you could sample one tree



ANY ONE WOULD DO!

If there are small differences in the trees, and tree sizes were relatively uniform across the 40 acres--



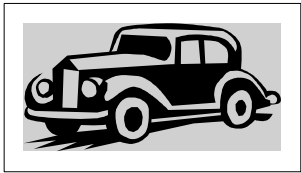
only one plot needed of sufficient size to encompass variation in tree sizes

In reality stands of trees, or any forest resource, are never uniform in either size or any other characteristic, or in distribution.

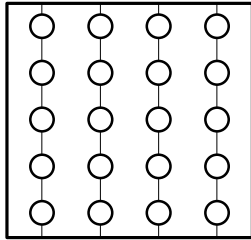
There is always variation in:

1. species and tree size
2. density (crowding)
3. site quality
4. any characteristic of interest

**METHODS TO
INVENTORY OR
"CRUISE" THE
FOREST**



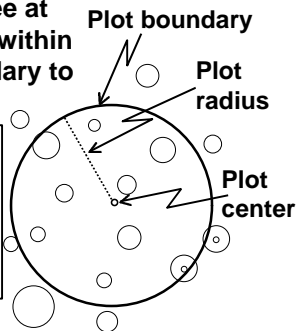
**Systematic Line Plot
or Point Inventory
(fixed area (fixed radius) plots or
"variable radius" points (prism points))**



FIXED RADIUS PLOT

"Center" of tree at
4½ ft must be within
the plot boundary to
be measured

- Pulpwood tree "in"
- Sawtimber tree "in"
- Tree "out"





Pull tape to “center” of tree to check distance from plot center



Typical Measurements Observed on Inventory Plots:

- Product (sawtimber, CNS, pulp, pole)
- DBH – Diameter Breast High
- Height – Total (from ground to tip) or merchantable (logs, pulp height)
- Quality or grade
- Calculate basal area & volume or weight
- (see definitions and how to measure in Advanced MTF Notebook)



Measure or estimate DBH

Measure or estimate total or merchantable height & product



Plot measurement procedures

- Establish a plot center
- Determine a starting direction (due N or direction of travel)
- Systematically work in a clockwise direction to determine and measure “in” trees
- Tally or record measurements to use for volume or weight estimation



You can find more information on Measurements, Form Class Board Foot Volume Tables and Weight Tables in the Notebook and at:

WWW.PFMT.ORG

Click on:

TOPIC MENU
MEASUREMENTS AND INVENTORY
TIMBER

Common Plot Sizes Used in Forest Inventories

Plot size (acres)	Plot radius	Used for:
1/100	0.01 11.78'	Regeneration survey
1/20	0.05 26.33'	Young stand survey
1/10	0.10 37.25'	Pulpwood, small sawtimber
1/5	0.20 52.67'	Larger sawtimber, poles
1/4	0.25 58.89'	Larger sawtimber, poles

How do we convert these plot measurements to numbers we can use?

We need to convert to a Per Acre Basis and Total Stand Values

How many 1/10 acre plots does it take to make 1 acre?

Plot Expansion Factor (PEF) =

$$\frac{1}{\text{plot size in acres}}$$

$$\text{PEF} = \frac{1}{1/10 \text{ ac}} = 10 \text{ (1/10 ac plots/ac)}$$

--Determine volume or weight value on each plot (see information in Notebook)

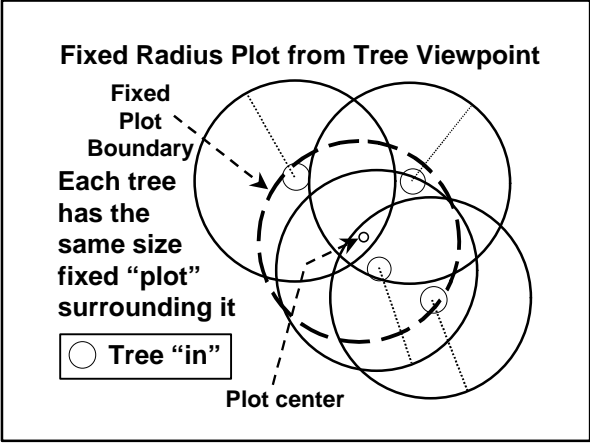
Per acre estimate:

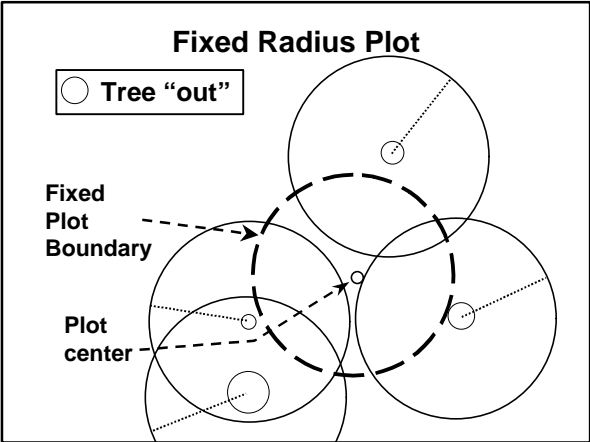
- Add (sum) all plot values**
- Divide sum by number of plots measured**
- Multiply by PEF**

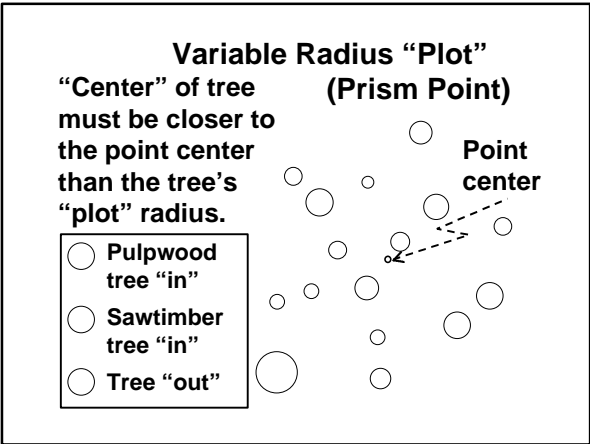
Stand estimate:

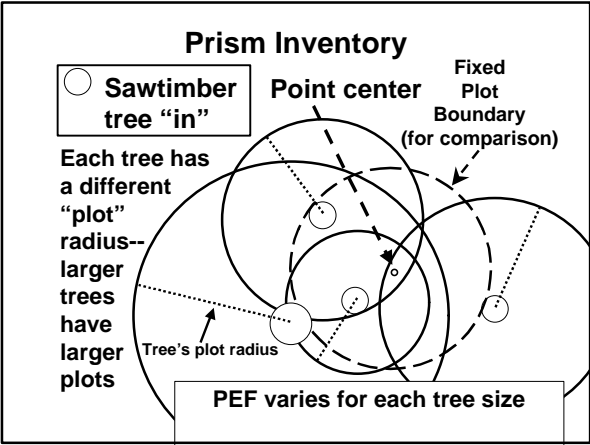
(Per acre value) X (# of acres in stand)

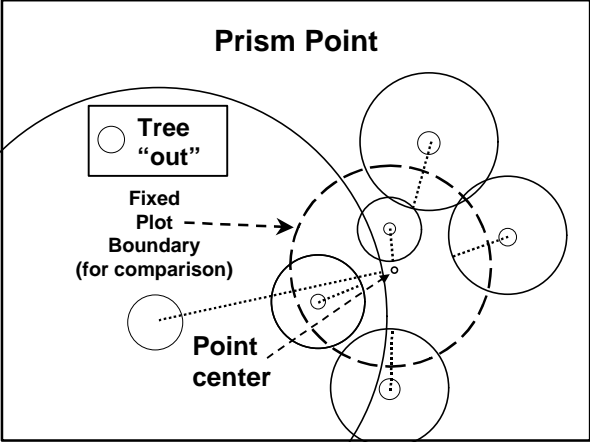
Bd. Ft. (Scr.) 1/10 ac	Example: 9 plots on 35 acres
Pl. 1 = 547	Sum = 5099 N = 9
Pl. 2 = 398	Avg./plot = 5099 bf ÷ 9 = 566.6 bf
Pl. 3 = 738	Per acre = 566.6 bf X 10/ac (PEF)
Pl. 4 = 487	= 5666 bf/ac (5.7 mbf/ac (Scr.))
Pl. 5 = 654	Volume in 35 acre stand
Pl. 6 = 764	= 35 ac X 5.7 mbf/ac
Pl. 7 = 417	= 199.5 mbf Scribner (on 35 ac.)
Pl. 8 = 435	Value @ \$309 per mbf Scribner
Pl. 9 = 659	= \$309/mbf X 5.7 mbf/acre
	= \$1761.30 per acre
	= \$61,645 in stand

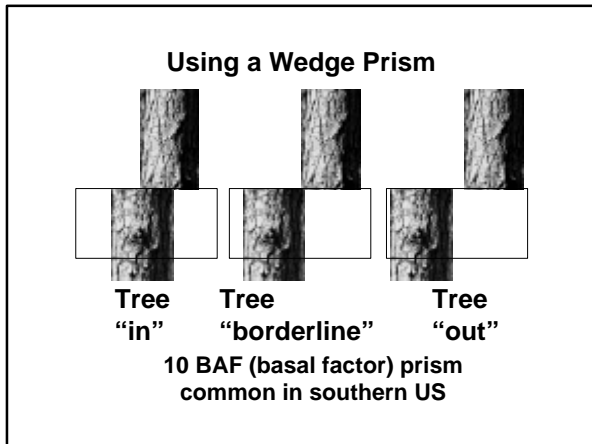










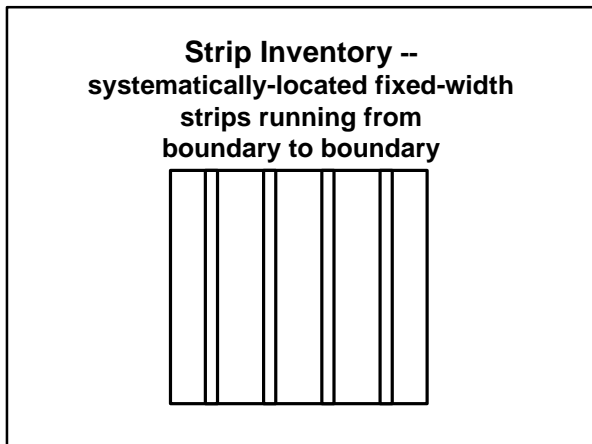


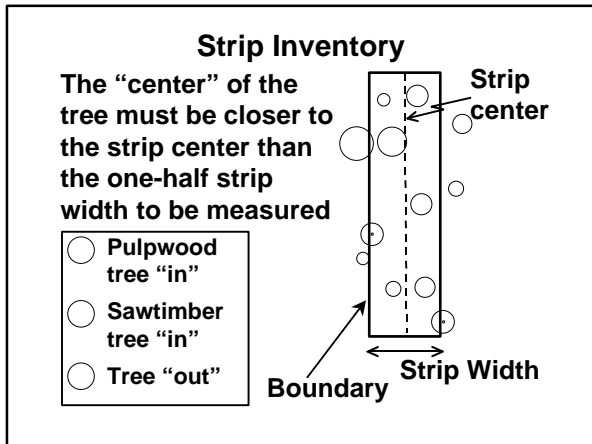
10 BAF means that each "in" tree represents 10 square feet (sf) of basal area per acre

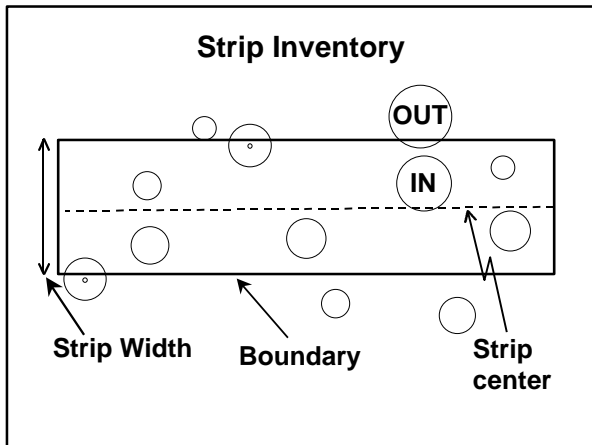
We can use a prism to help make silvicultural decisions, such as thinning

**Example: 10 points has 132 "in" trees
132 trees/10 points = 13.2 trees/point avg.
13.2 trees X 10 sf/tree = 132 sq ft basal area/ac**

If your are using 120 sq ft of basal area to trigger thinning – it's time to thin!!!



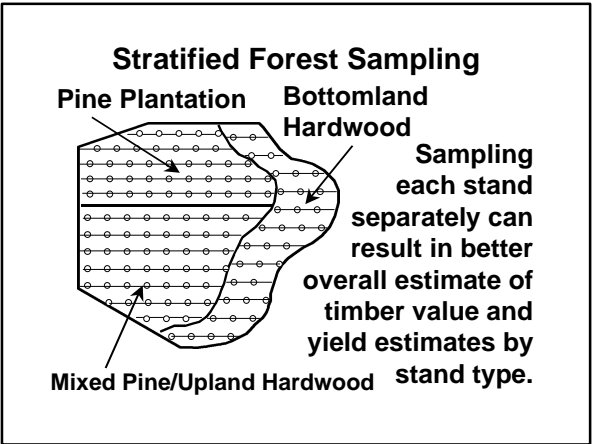


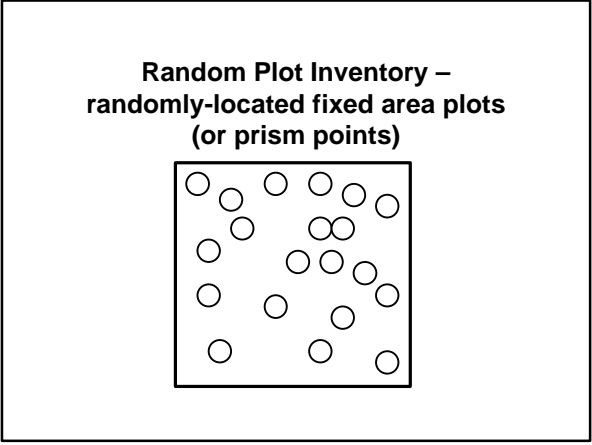


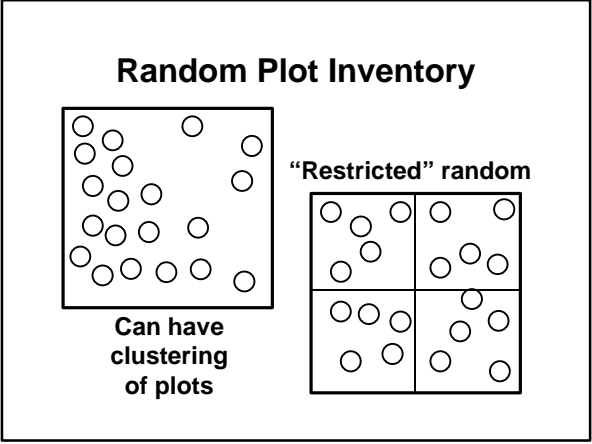
Strip Inventory

This inventory method works well when you have a relatively few, large trees to sample, such as mature hardwood trees in a river bottom.

Common strip width is
1 chain (66 feet)



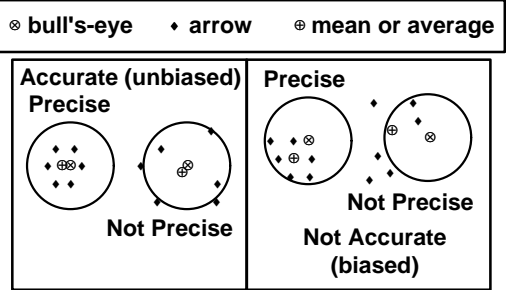




Random inventories have NOT been commonly used by practicing foresters.

The advent of affordable GPS units (Geographic Positioning System) along with handheld data recorders may change this.

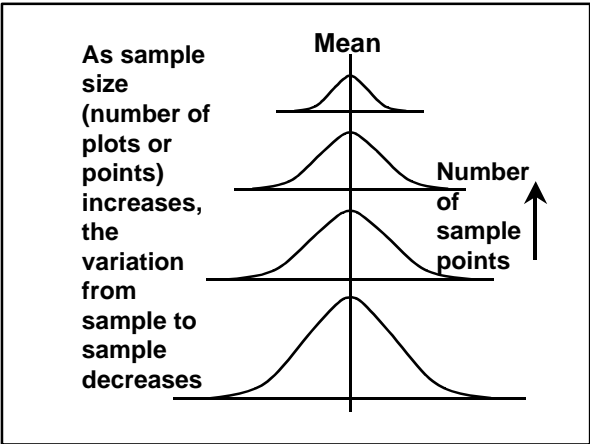
Accuracy and Precision in Inventory

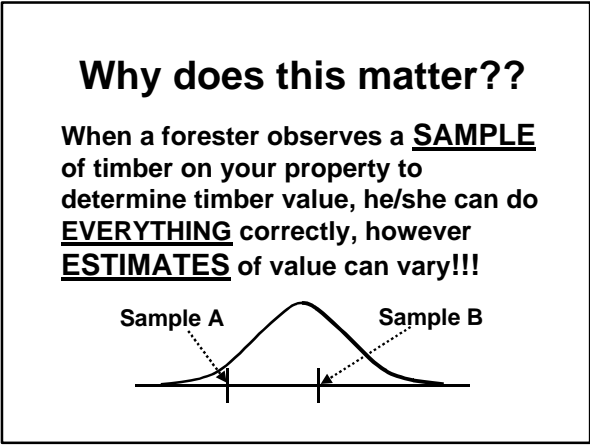


Cruise Value Summary of 24 Student Crews, Each Sampling 50 Prism Points on 108 acres

Total Value 1000\$	24 crews 50 pt. ea.	12 "crews" 100 pt. ea.	6 "crews" 200 pt. ea.	3 "crews" 400 pt. ea.
\$200-230 M	8%	--	--	--
\$231-260 M	4%	8%	--	--
\$261-290 M	42%	33%	50%	33%
\$291-320 M	13%	42%	33%	67%
\$321-350 M	25%	8%	17%	--
\$351-380 M	4%	8%	--	--
\$381 M +	4%	--	--	--

Mean Value: \$295,980 or \$2741/acre





This is **PART** of the reason that you can have a wide range of sealed bids when selling timber

Other factors include:

- Distance to mills
- Inventory on mills' woodyards
- Orders a company may (not) have
- Available money (inventory)
- Expectations of future markets, weather, etc.

Experienced foresters often have a good idea of timber value when they leave a tract, BEFORE calculating value based on their inventory.

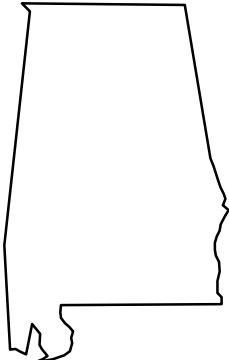
If a forester's "gut fee" differs from their inventory value, they may:

- install more plots (points);
- have someone else in their organization inventory the tract;
- "adjust" their inventory;
- not bid on the tract or bid low (particularly on highly variable tracts)

CONTINUOUS FOREST INVENTORY



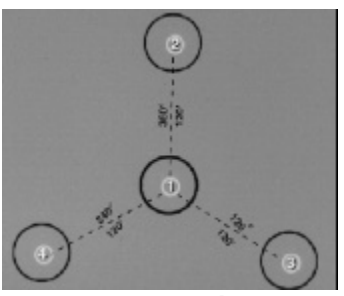
FOREST HEALTH MONITORING



FIA & FHM

3 X 3 mile grid of permanent plots across each state

Cluster of Plots at Each Location



GPS-located -- Inconspicuously marked

Measurement crews observe:

- Tree and plant information
- Land use information
- Forest Health
- Physical information (soils, etc.)

Has been repeated ~10 years
 Changing to 20% of plots per year
 Complete Remeasure Every 5 years

**INVENTORY of a Forest
provides
INFORMATION
with which to make
INFORMED DECISIONS**



**Decision making without good
information is a
shot in the dark**