

Forest Inventory



Why do forest inventory?

- Species
- Size (diameter, height, age)
- Products
- Health and Vigor

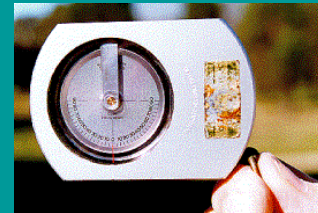
Forest Inventory

Types of Measurements:

Diameter (DBH)



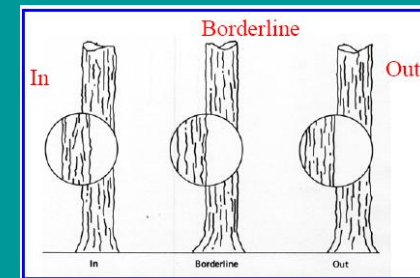
Height



Basal Area (m^2/ha)



Must always be held directly above the "plot center."

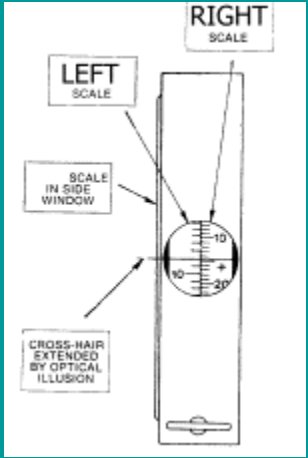
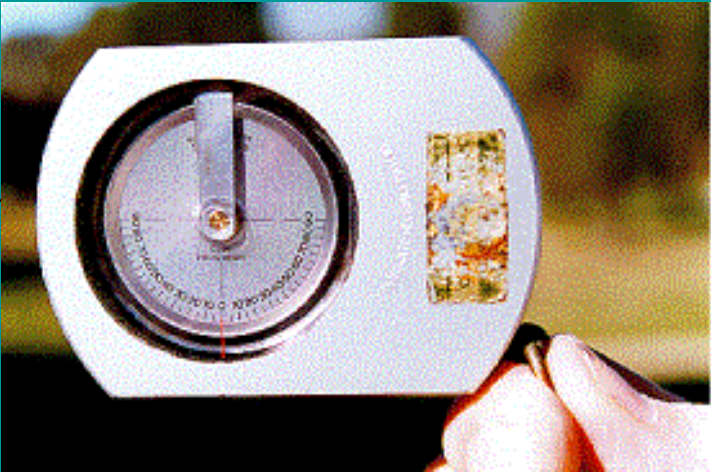


Measuring Diameter

- Use calipers or diameter tape
- Measure at breast height (1.3 metres)
- Always measure in line with centre of plot



How to measure tree height



16	18
14	16
12	14
10	12
8	10
6	8
4	6
2	4
0	0
-2	-2
-4	-4

Horizon "0" metres

20 metres



Tree Height

Stand 20 meters from tree

Horizontal line should read "0"

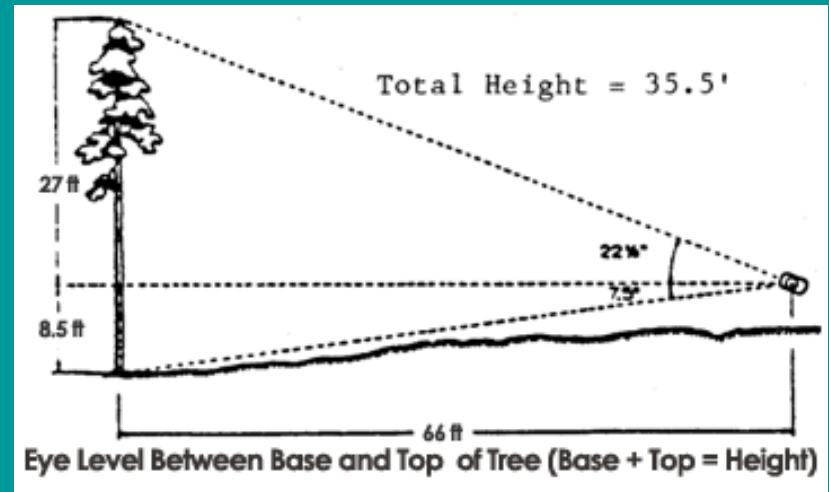
Use left scale

Take reading at top of tree (usually + ve)

Take reading at base of tree (usually - ve)

Add numbers to obtain height

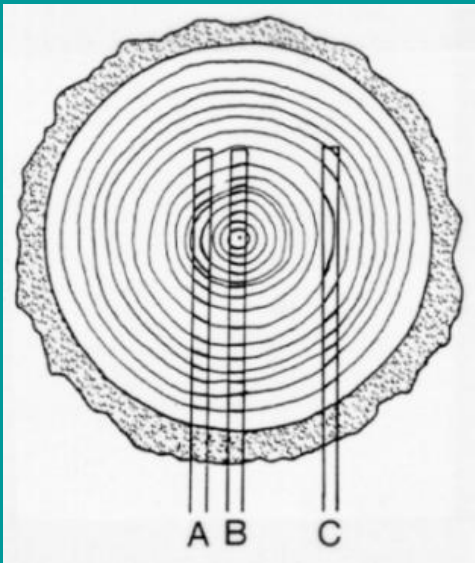
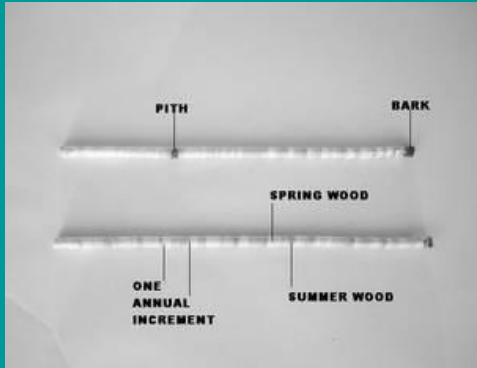
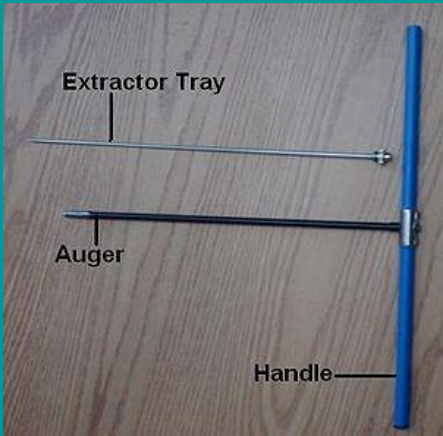
Example 16 meters to top and -2 meters to base = height of 18 meters



horizon →

16	18
14	16
12	14
10	12
8	10
6	8
4	6
2	4
0	0
-2	-2
-4	-4

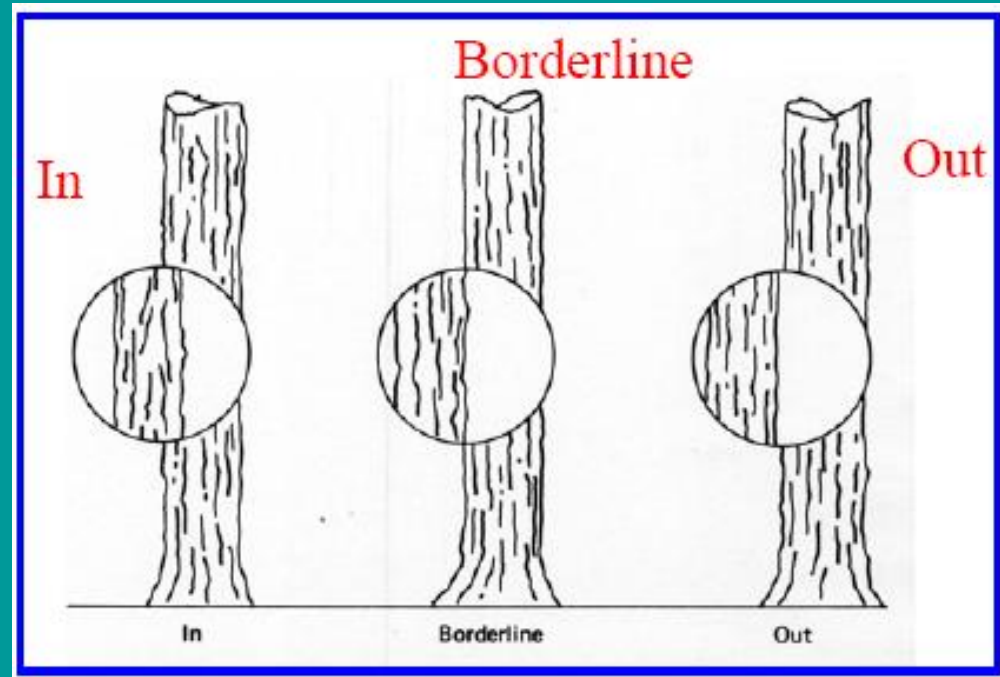
Tree age



Using Prism



Must always be held directly above the "plot center."



Prism measures basal area

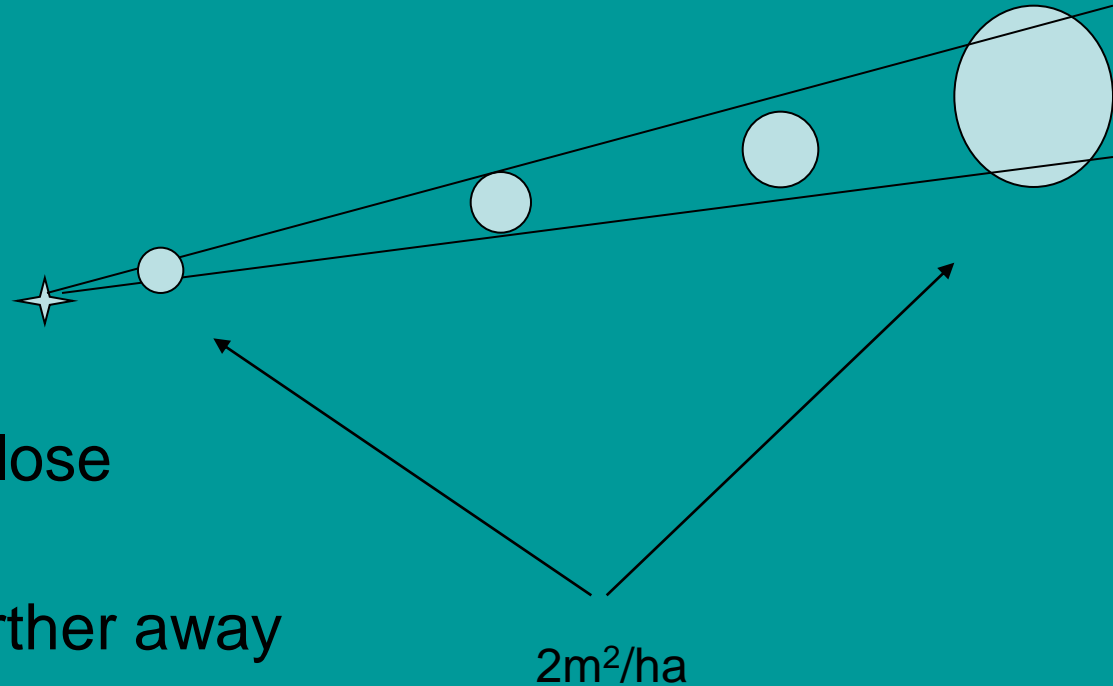
Each tree tallied represents the same amount of basal area per hectare (regardless of size)

Forest Inventory

- Not practical to measure all trees
- Need to Sample
- Variable or Point Sampling
 - No set shape and size of plots
 - Use wedge prism or angle gauge

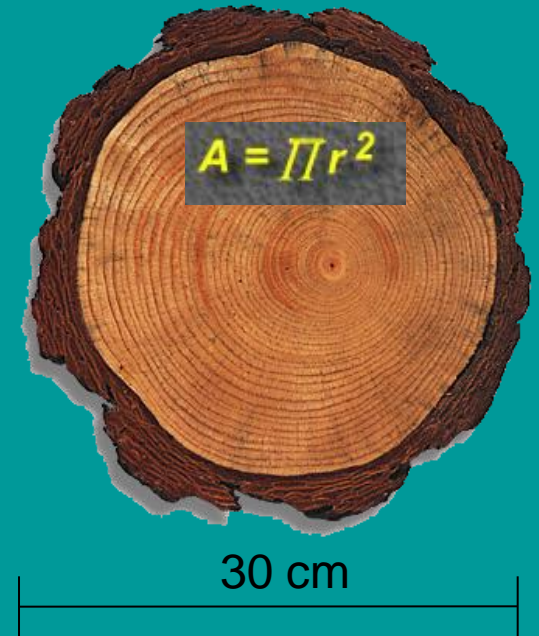
Point Sampling

- Use prism
- No fixed plot size
- Count number trees
- Small trees must be close
- Large trees can be farther away
- **Each tree represents same basal amount of basal area**



Number trees/hectare by diameter class

Diameter	Area of 1 tree	Trees/hectare
10 cm	.00785 m ²	254
12 cm	.01130 m ²	177
14 cm	.01539 m ²	130
16 cm	.02010 m ²	100
20 cm	.03140 m ²	64
30 cm	.07065 m²	28
40 cm	.12560 m ²	16
50 cm	.19625 m ²	10



$$\begin{aligned}
 \text{Area} &= 3.14(15\text{cm})^2 \\
 &= 3.14 \times 225\text{cm}^2 \\
 &= 706.50 \text{ cm}^2 \\
 &= 0.07065 \text{ m}^2
 \end{aligned}$$

How to Determine Volume



- Need to use Volume Table
 - Some use only diameter (Local Volume Table)
 - Some use diameter and height
 - Some use diameter height and species
 - Some use diameter height and site class
 - **We will use basal area and height**
- Volume Tables take into account shape of tree

Calculating Basal Area and Volume

You have just completed an assessment using a prism with a basal area factor $2\text{m}^2/\text{ha}$. Following is a summary of the information that was collected. The numbers represent the number of trees tallied. The information represents the data collected one sample plot.

Diameter Class	Fir	Pine	Maple	Birch	Cedar
12	2	1	2	0	0
14	2	3	0	0	2
16	0	4	0	1	0
18	0	0	0	1	0
Basal area/ha					
Volume/ha					

To calculate basal area/ha multiply number trees by $2\text{m}^2/\text{ha}$

To determine volume use volume table (use basal area and average height)

VOLUME TABLE

BASAL AREA (m ² /ha)	HEIGHT (METRES)						
	10M	12M	14M	16M	18M	20M	22M
2	12	15	17	18	20	23	25
4	24	30	33	37	40	46	50
6	37	45	50	55	60	68	74
8	49	60	67	74	81	91	99
10	61	75	83	92	101	114	124
12	73	90	100	111	121	137	149
14	86	104	117	129	141	159	174
16	98	119	133	148	161	182	198
18	110	134	150	168	181	205	223
20	122	149	167	182	202	226	248
22	135	164	183	203	222	250	273
24	147	179	200	222	242	273	298
26	159	194	217	240	262	296	322

Volume m³/ha

Volume Tables

- Use only diameter and species
- Use diameter and height for each species
- Use basal area and height

8. You have just completed an assessment using a prism with a basal area factor $2\text{m}^2/\text{ha}$. Following is a summary of the information that was collected. The numbers represent the number of trees tallied. The information represents the data collected one sample plot.

Diameter Class (cm)	Species				
	Jack pine	White birch	White spruce		
10					
12					
14					
16					
18	3				
20	4				
22	3	2			
24			1		
26		2	1		
28					
≥ 30					
Total					

Based on the information provided please answer the following: (please use appropriate units of measure).

- What is the basal area per hectare for each of the species?
 Jack pine _____
 White birch _____
 White spruce _____
- Use the clinometer (provided) to determine the average height (m) of the stand by measuring the tree marked with blue flagging tape. _____
- Use the volume table to determine the volume/hectare (vol/ha) for each species.
 Jack pine _____
 White birch _____
 White spruce _____
- If the stand measures 10 ha, what is the total volume of the stand? _____

Team #: _____

Test Total: _____

8. A wedge prism with a basal area factor of $2\text{m}^2/\text{ha}$ was used to carry out a forest inventory survey of a 10 hectare stand of mixed hardwood/softwood. Data was recorded from 5 points in the stand. The table below gives the tree tally. Use the attached volume table to assist you with your answers.

(20 points)

Sample Point	bF	rS	wS	sM	rM	Total
1	2	4	3	2	1	
2	1		1	2	1	
3			2	2	1	
4	1	1	2	2	1	
5	1		2	2	1	
BA						
Volume						
Avg ht (m)	18	18	18	20	20	

Use the information provided to answer the following questions (use correct units).

- a) What is the basal area per hectare for the red spruce (rS) _____
- b) What is the total basal area per hectare? _____
- c) What is the total volume/ha (all species)? _____
- d) What is the total volume for the stand (all species)? _____
- e) What is the total basal area per hectare if a prism of basal area factor of $1\text{m}^2/\text{ha}$ was used?

Team #: _____

Test Total: _____

VOLUME TABLE (M ³ /HA)							
BASAL AREA (M ² /HA)	HEIGHT (METERS)						
	10M	12M	14M	16M	18M	20M	22M
2	12	15	17	18	20	23	25
4	24	30	33	37	40	46	50
6	37	45	50	55	60	68	74
8	49	60	67	74	81	91	99
10	61	75	83	92	101	114	124
12	73	90	100	111	121	137	149
14	86	104	117	129	141	159	174
16	98	119	133	148	161	182	198
18	110	134	150	168	181	205	223
20	122	149	167	182	202	226	248
22	135	164	183	203	222	250	273
24	147	179	200	222	242	273	298
26	159	194	217	240	262	296	322
28	171	209	234	259	282	319	347
30	181	224	250	272	302	341	372
32	194	239	237	293	323	364	397
34	208	254	284	314	343	347	422
36	220	269	300	333	363	410	446
38	233	283	317	351	383	432	471
40	245	298	334	370	403	455	496
42	257	313	350	388	423	478	521
44	269	328	357	407	444	501	546
46	282	343	384	425	464	523	570
48	294	358	400	444	484	546	595
50	306	373	417	462	504	569	620