TIMBER CRUISING

FORESTRY CHALLENGE℠

WHAT IS TIMBER CRUISING?

- A more efficient way to collect information
- No need to measure every tree

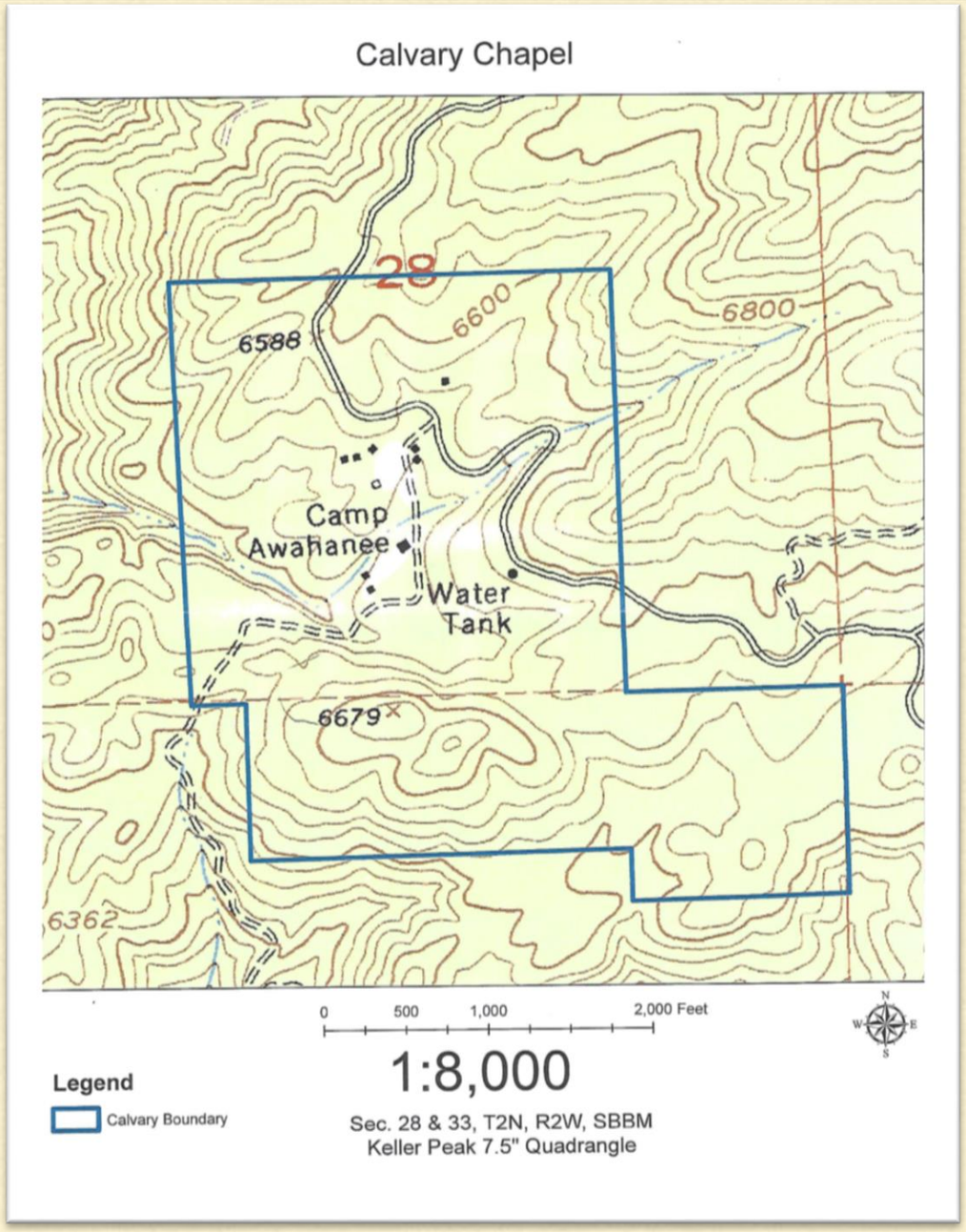
FOREST OR STAND?

- A *forest* is comprised of individual stands.
- A *stand* is a distinct, recognizable area of the forest that is likely to be managed as a unit.
- Age, tree species composition, soil types, topography, or other natural features will differentiate stands.
- Characterizing stands is a subjective process. Different people may look at the same forest and describe different stand boundaries.

DETERMINE STAND BOUNDARIES

- Aerial
- On-the-ground

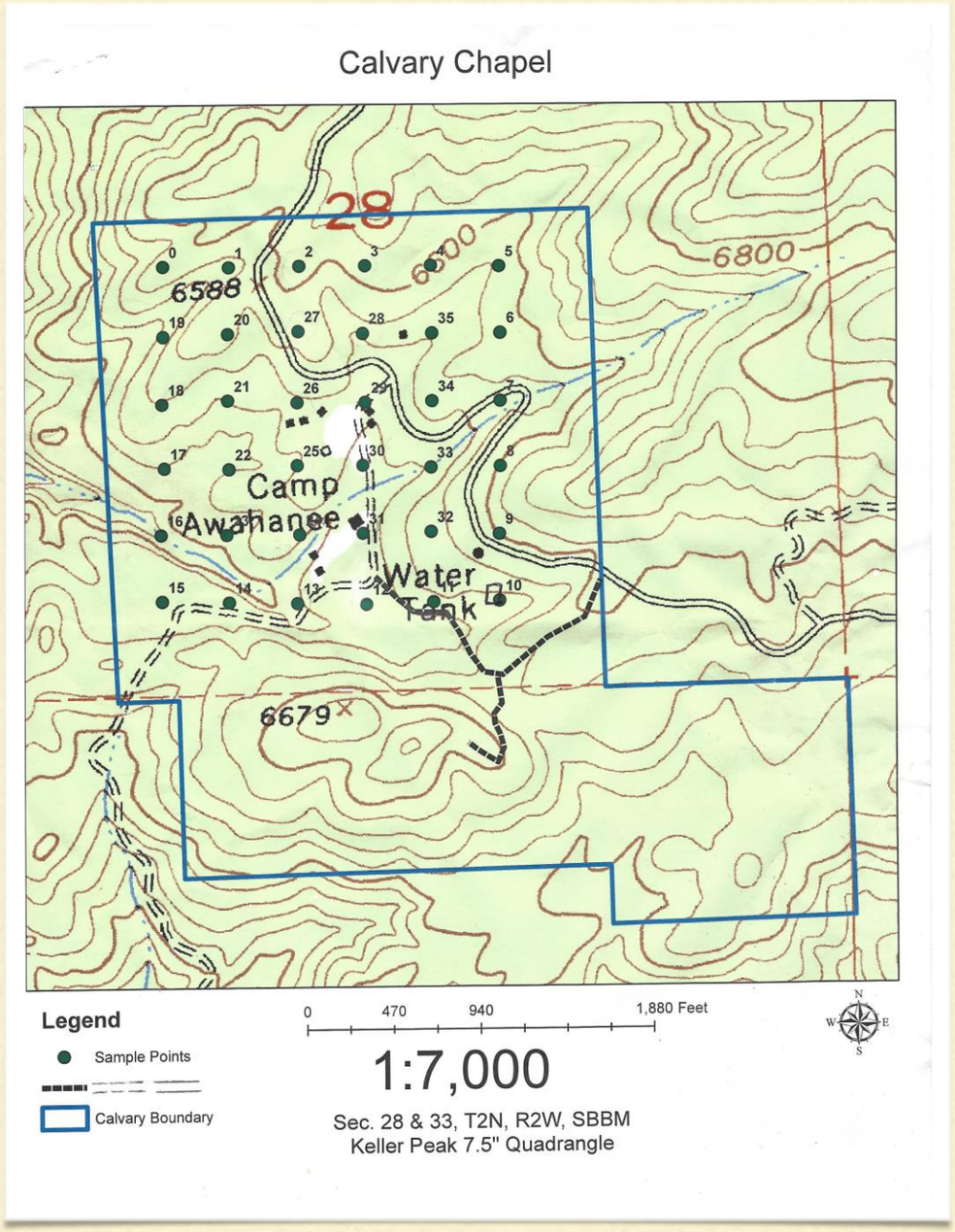
PLOT SAMPLING



QUANTITY

- How many plots per stand?
- Consider species diversity, terrain, desired accuracy, and labor you are willing to put in

PLOT SAMPLING



LOCATION

- Spread data points to evenly and accurately represent stand.
- How far apart should plots be?
- Physical reference points vs. cardinal directions.

LOCATING PLOT CENTERS

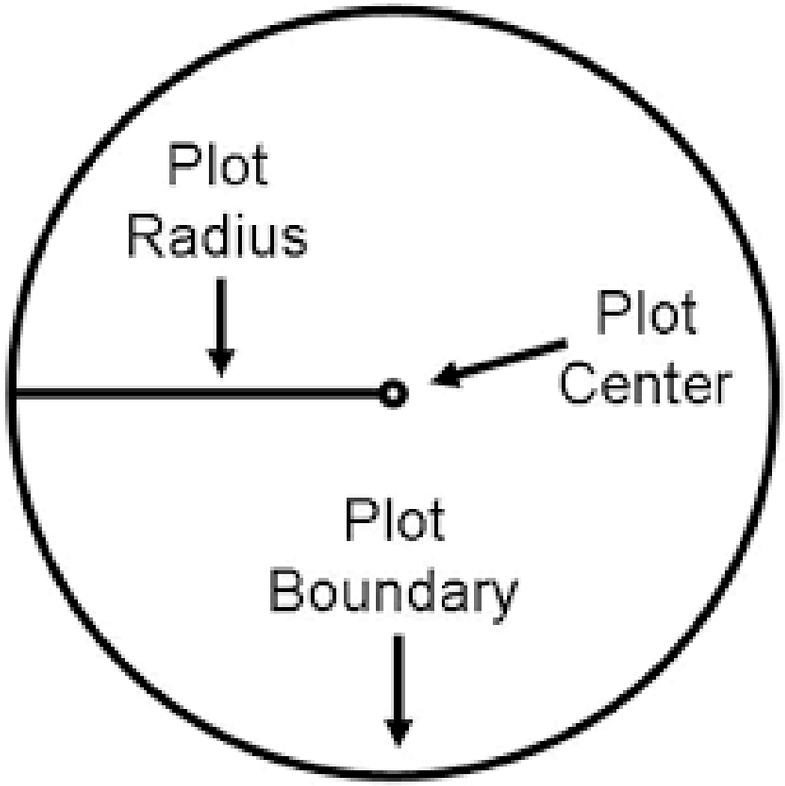
- GPS
- Compass and pacing

How to measure your pace: http://breeze.wsu.edu/inv_pacing/

ESTABLISHING PLOT SIZE

FIXED RADIUS PLOTS

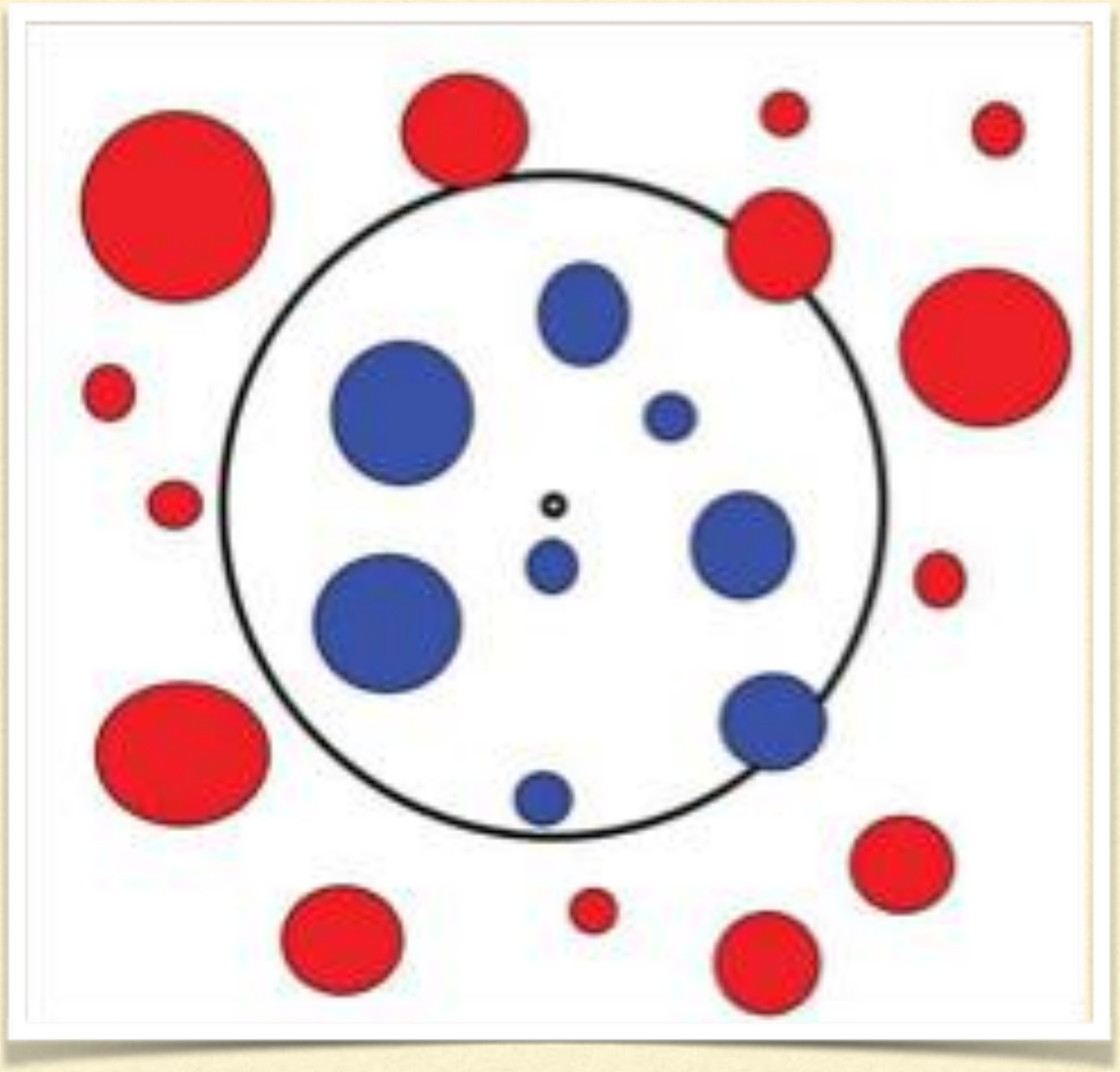
Plot Size (acres)	Radius (feet)
1/5	52.7 (≈52′8″)
1/10	37.2 (≈37′2″)
1/20	26.3 (≈26′4″)
1/30	21.5 (≈21′6″)
1/40	18.6 (≈18′7″)
1/50	16.7 (≈16′8″)
1/60	15.2 (≈15′2″)
1/100	11.8 (≈11′10″)
1/250	7.4 (≈7′5″)



DETERMINING TREES IN A FIXED PLOT

FIXED RADIUS PLOTS

Determine “in” trees.



STAND POPULATION

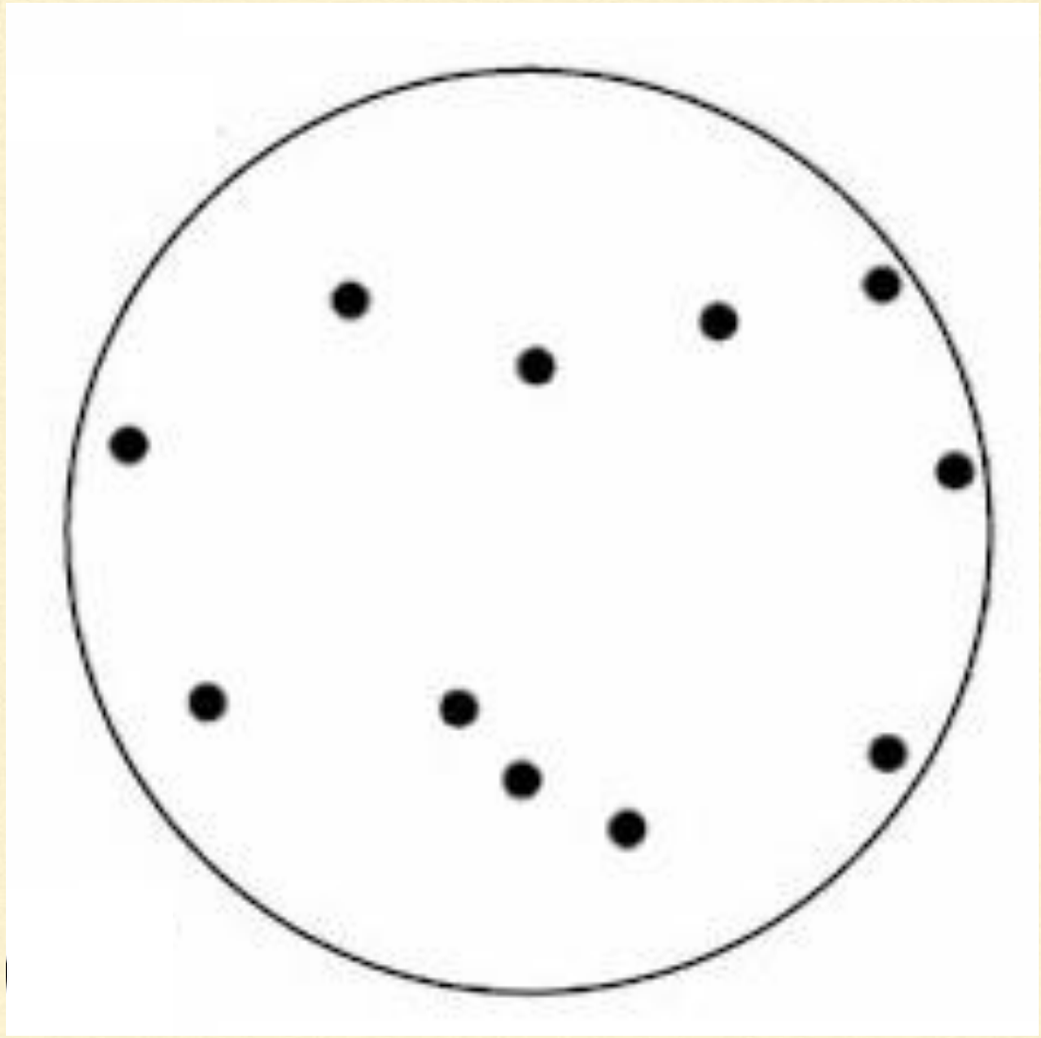
Trees per acre from a **fixed** plot

1. Determine the expansion factor for the plot trees (the number of trees per acre a given plot tree represents; e.g., 20 for a 1/20th acre plot).

2. Add up the total number of trees in a plot and multiply by the expansion factor to get the trees per acre represented by that plot.

3. Repeat this for the other plots in the stand.

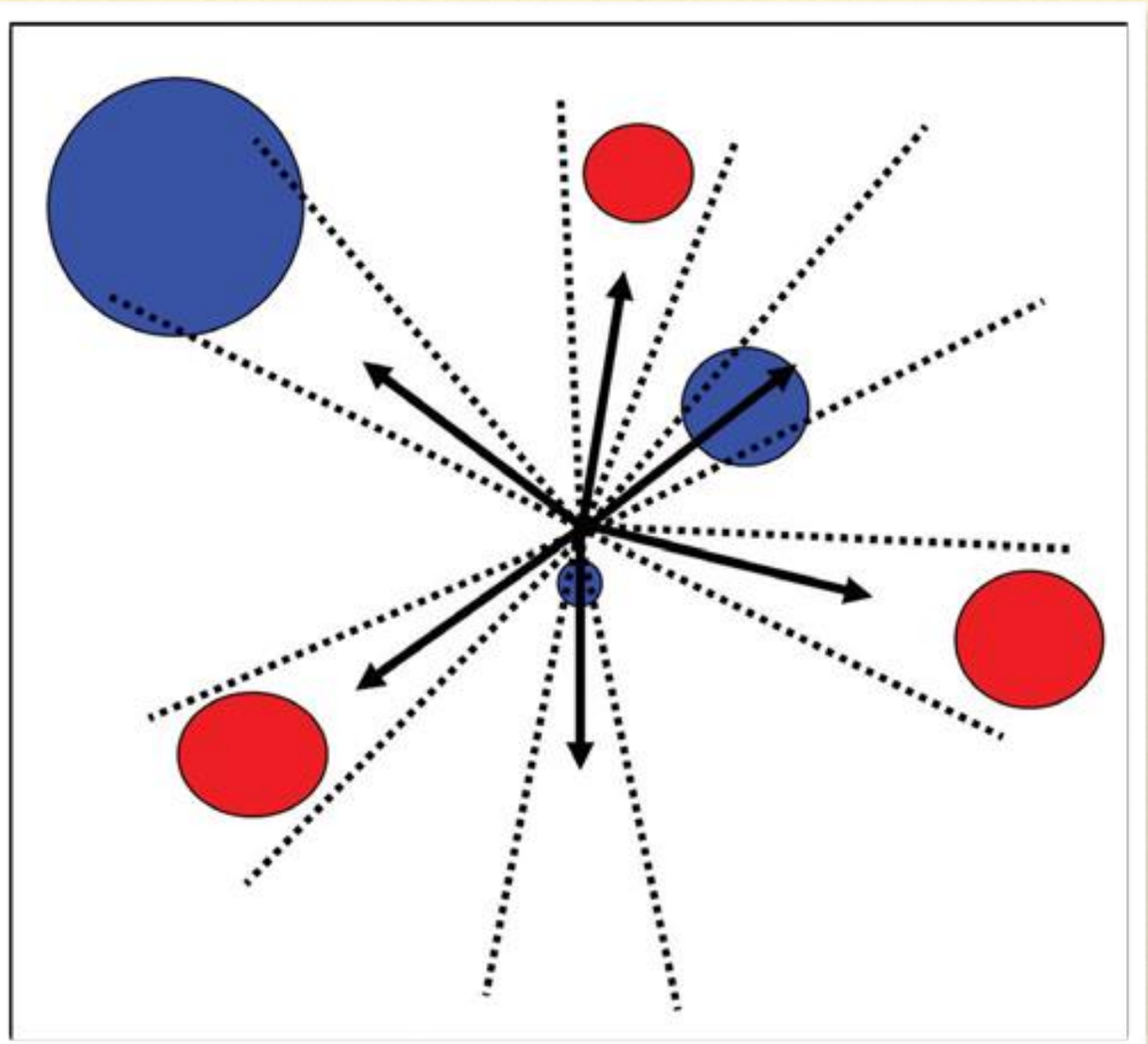
4. Add up the TPA for all plots in the stand and then divide by the number of plots to get the average TPA for the stand.



11 Trees x 20 = 220 Trees Per Acre

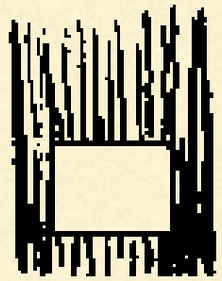
DETERMINING TREES IN A VARIABLE PLOT

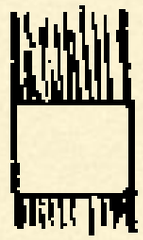
VARIABLE PLOTS



- Unlike a fixed radius plot, which has a defined area, “in” trees will be determined by using an angle gauge.

STAND DENSITY

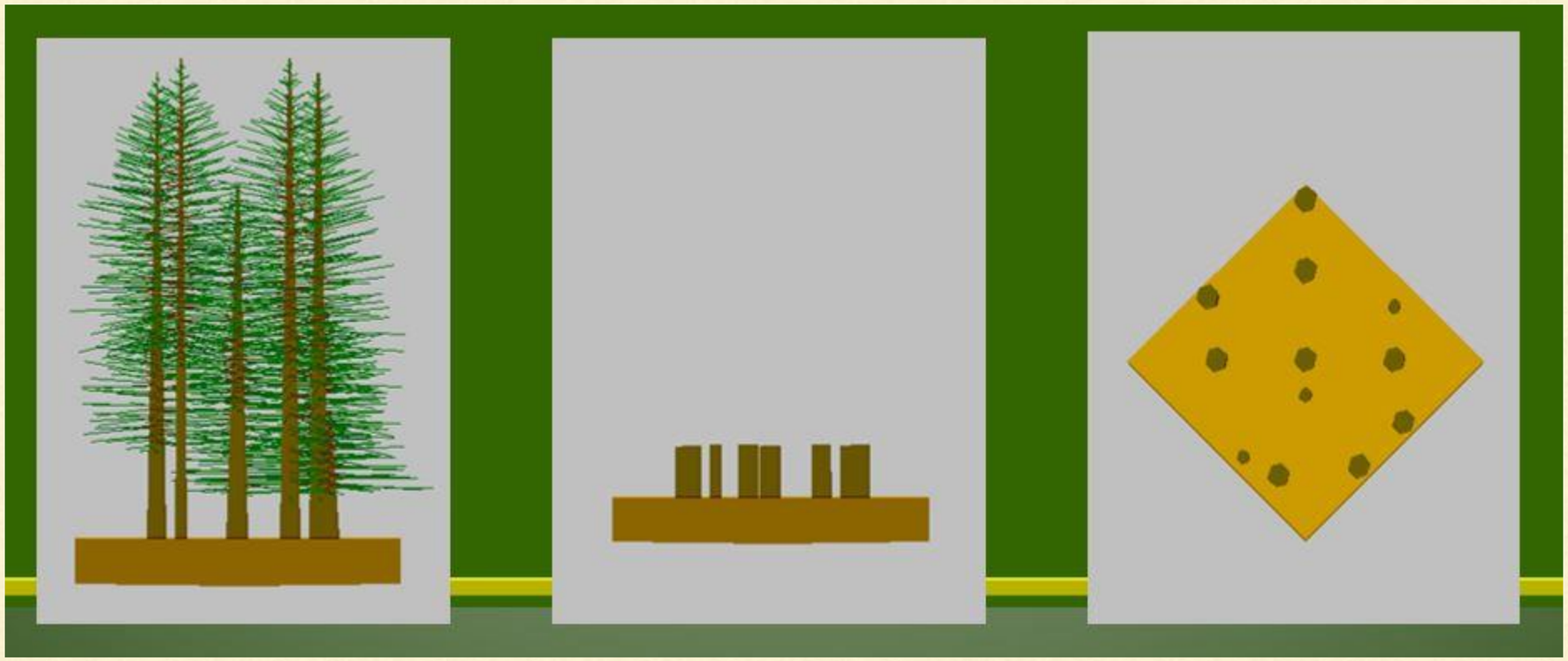




TREES IN YOUR **VARIABLE** PLOT

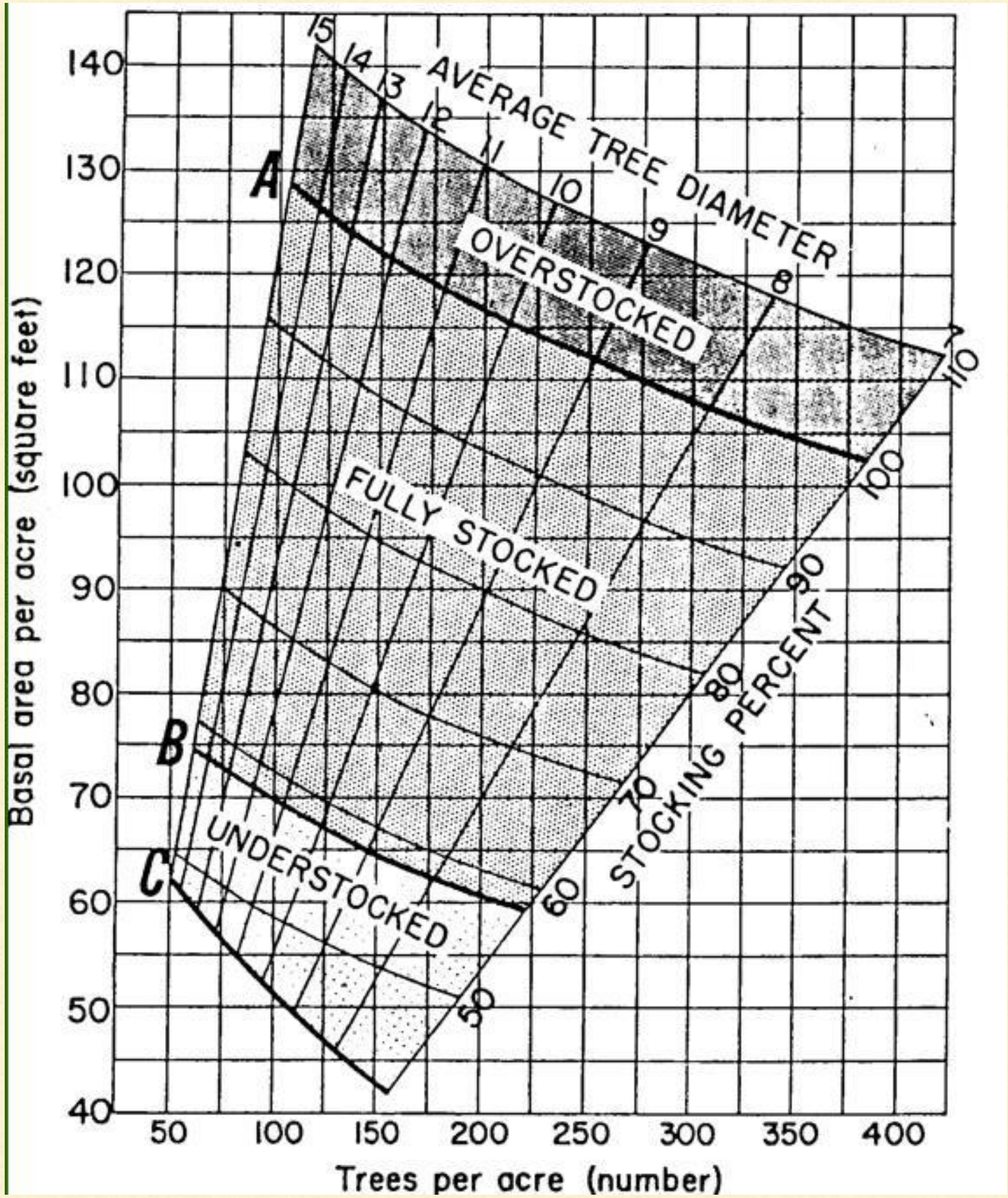
Computing Basal Area

Basal area is the cross sectional area of the trunk of a tree at breast height (i.e., 4.5 feet above the ground). For instance, if you establish a variable plot using a BAF 40 prism, every “in” tree would represent 40 square feet of basal area regardless of the actual basal area of each tree. Thus if you had three trees in a BAF 40 plot, it would represent 120 (3 x 40) square feet of basal area per acre.



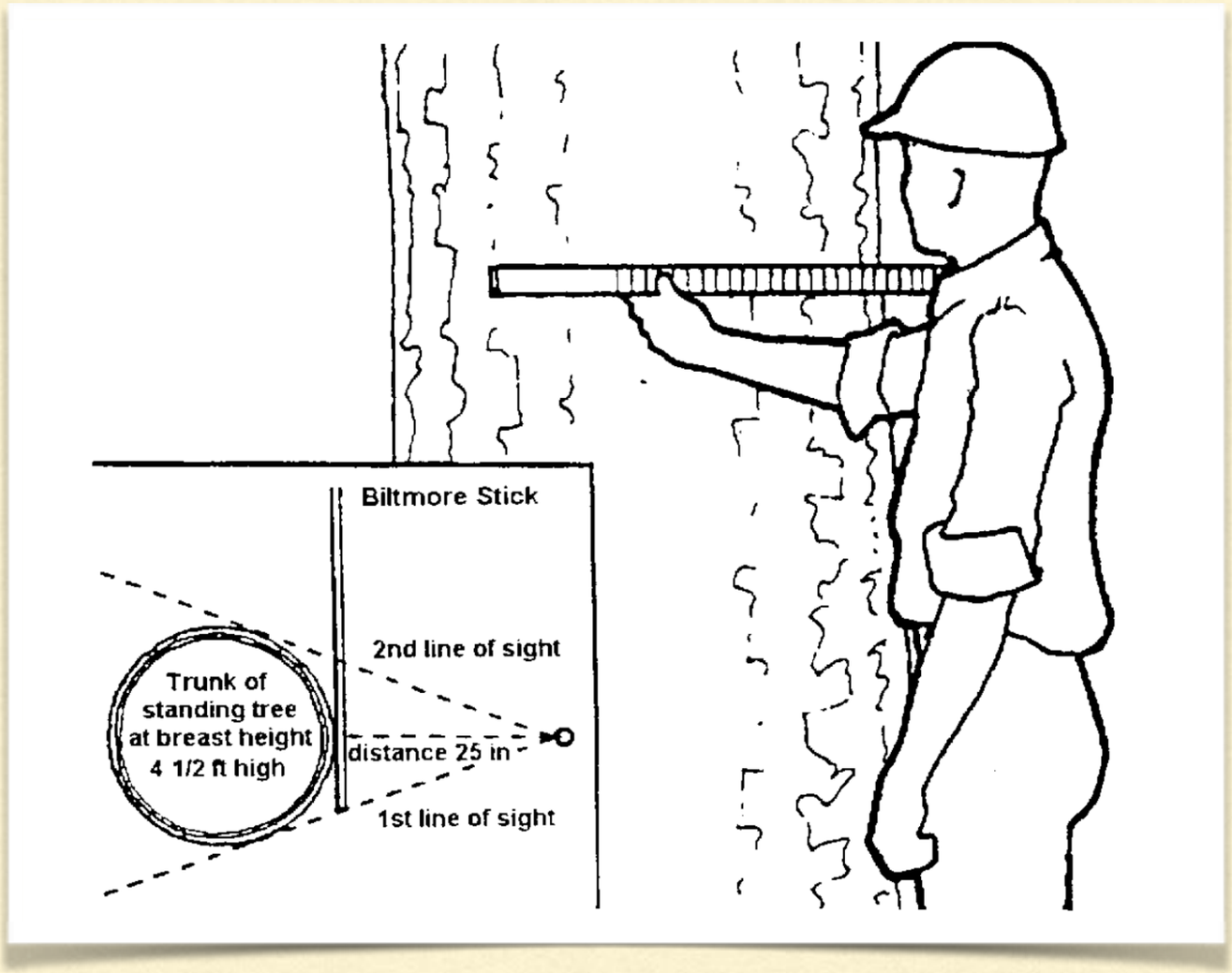
STOCKING

Once you determine the basal area and trees per acre, you can determine if the stand is under, fully, or overstocked.



DIAMETER AT BREAST HEIGHT (DBH)

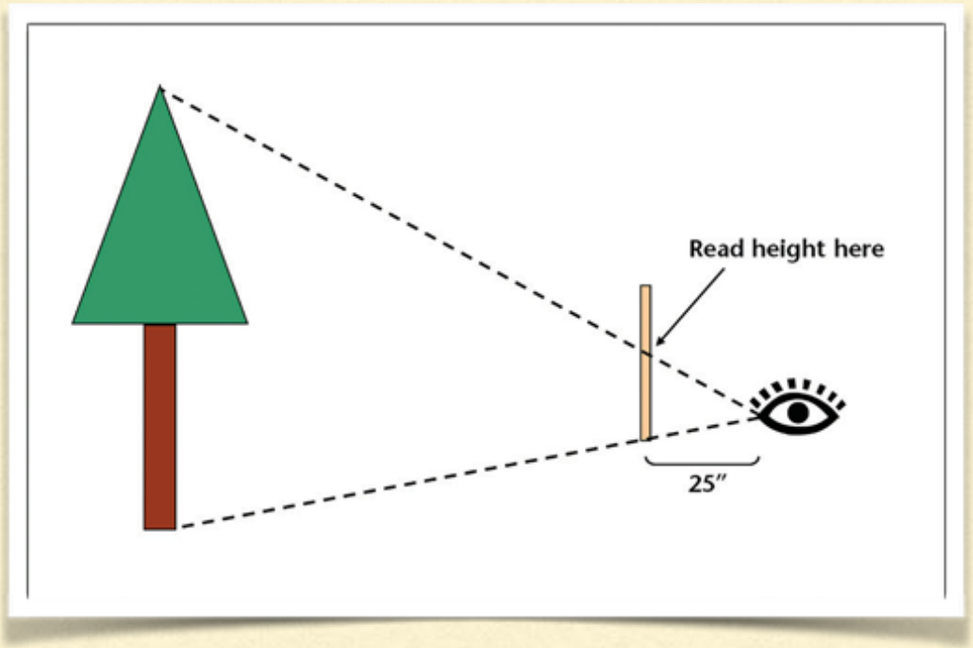
- Breast Height = 4.5 feet from the ground (on uphill side of tree)
- Find DBH using a d-tape
- Find DBH using a Biltmore stick

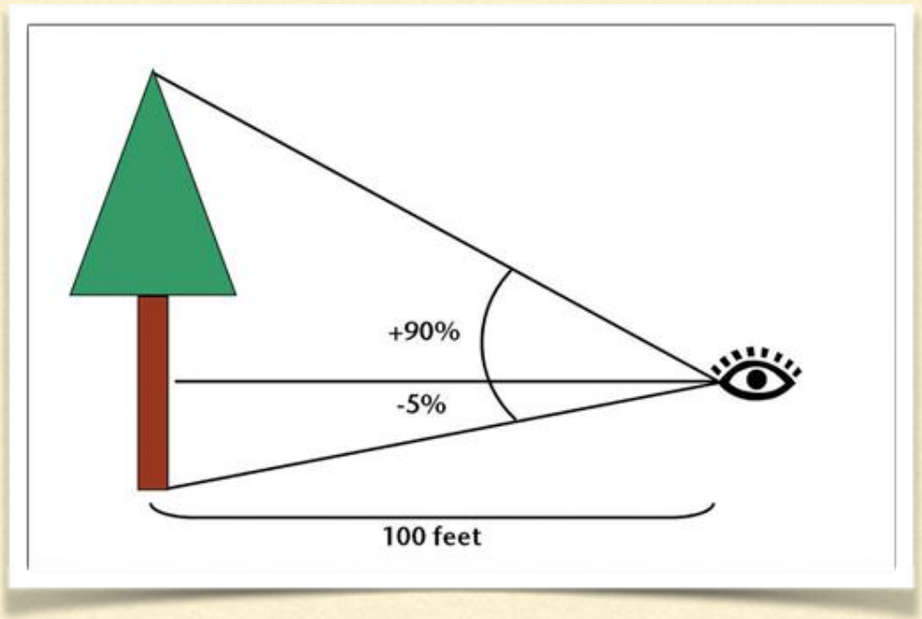


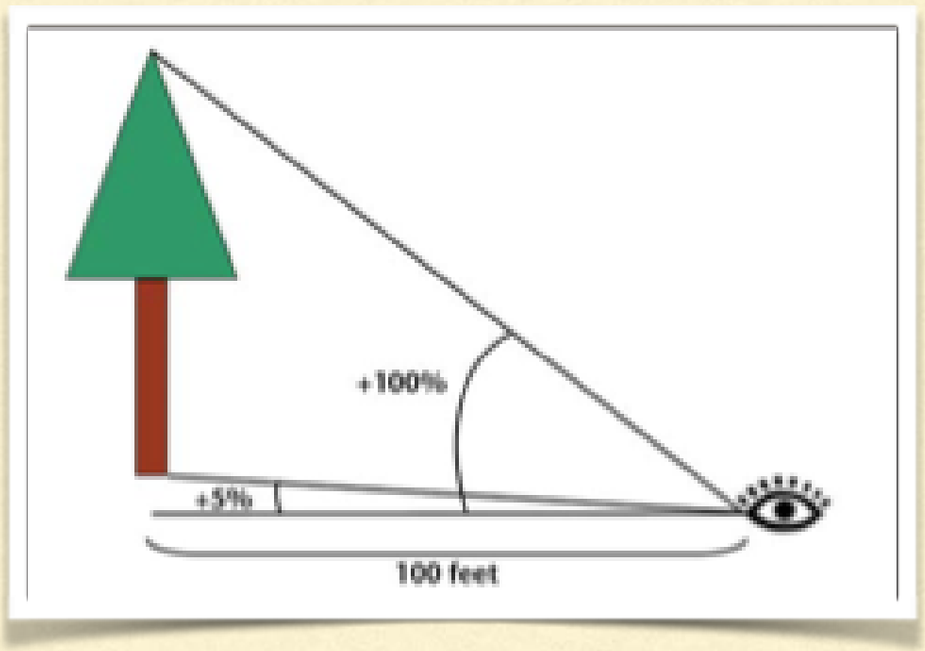
How to use a Biltmore stick: http://breeze.wsu.edu/inv_dstick/ How to use a d-tape: http://breeze.wsu.edu/inv_dtape/

DETERMINE TREE HEIGHT

- Find height using Biltmore stick
- Find height using Clinometer
- How to measure or pace away from a tree







Using a Clinometer: http://breeze.wsu.edu/inv_clinometer/

Using a Biltmore Stick: http://breeze.wsu.edu/inv_hstick/

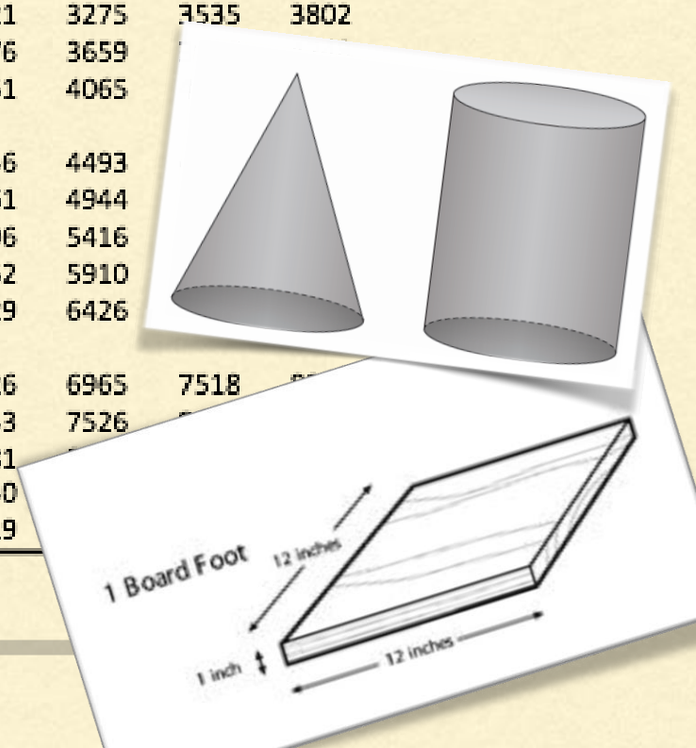
VOLUME

ONCE YOU KNOW THE DIAMETER AND THE HEIGHT, YOU CAN USE A VOLUME TABLE TO DETERMINE THE VOLUME OF WOOD IN A TREE, EXPRESSED IN BOARD FEET.

C.1 GROSS BOARD-FOOT VOLUME TABLE
DOUGLAS FIR

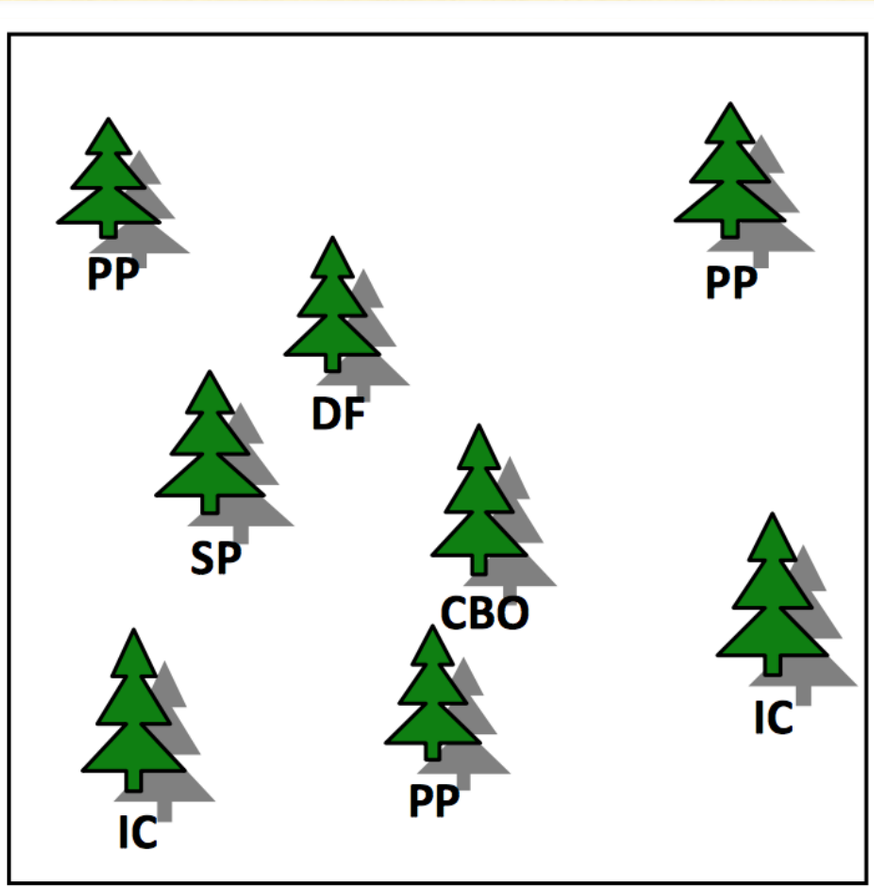
DBH	TOTAL HEIGHT (FEET)																
(INCHES)	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210
12	47	62	78	95	113	132	152	173	195	218	242	266	291	317	344	371	399
14	64	85	106	130	155	181	209	238	268	299	331	365	399	435	472	509	547
16	85	111	140	171	204	238	275	313	352	393	436	480	525	572	620	669	720
18	108	142	178	218	259	303	350	398	449	501	555	611	669	729	790	852	917
20	134	176	221	270	322	377	434	494	557	622	689	759	831	904	980	1058	1138
22	163	214	269	328	391	458	528	601	677	756	838	923	1010	1100	1192	1287	1384
24	195	256	322	393	468	547	631	718	809	904	1002	1103	1207	1315	1425	1538	1654
26	230	301	379	463	551	645	744	847	954	1065	1181	1300	1423	1549	1680	1813	1950
28	267	351	441	539	642	751	886	986	1111	1240	1375	1513	1657	1804	1955	2111	2270
30	308	404	509	621	740	865	997	1136	1280	1429	1584	1744	1909	2078	2253	2432	2615
32	352	461	581	708	844	988	1139	1256	1461	1631	1808	1991	2179	2373	2572	2776	2986
34	398	522	657	802	956	1119	1290	1468	1654	1847	2048	2254	2468	2687	2912	3144	3381
36	448	587	739	902	1075	1258	1450	1651	1860	2077	2302	2535	2775	3021	3275	3535	3802
38	500	656	826	1008	1201	1406	1620	1845	2078	2321	2573	2832	3100	3376	3659		
40	556	729	918	1120	1335	1562	1800	2049	2309	2579	2858	3147	3444	3751	4065		
42	614	806	1014	1238	1475	1726	1990	2265	2552	2850	3159	3478	3807	4146	4493		
44	676	887	1116	1362	1623	1899	2189	2492	2808	3136	3475	3826	4188	4561	4944		
46	740	972	1223	1492	1778	2080	2398	2730	3076	3435	3807	4192	4588	4996	5416		
48	808	1060	1334	1628	1940	2270	2617	2979	3357	3749	4155	4574	5007	5452	5910		
50	879	1153	1451	1770	2110	2469	2846	3240	3650	4076	4518	4974	5445	5929	6426		
52	952	1249	1572	1918	2287	2676	3084	3511	3956	4418	4897	5391	5901	6426	6965	7518	
54	1029	1350	1699	2073	2471	2891	3332	3794	4275	4774	5291	5825	6376	6943	7526		
56	1109	1455	1830	2234	2662	3115	3591	4088	4606	5144	5701	6277	6870	7481			
58	1191	1563	1967	2400	2861	3348	3859	4393	4950	5528	6127	6745	7383	8040			
60	1277	1676	2109	2573	3067	3589	4137	4710	5306	5926	6568	7231	7915	8619			

VOLUME = EXP (-7.0809 + 2.0521 LN (DBH) +1.4906 LN(HT))



SPECIES COMPOSITION

IN MIXED SPECIES STANDS, IT IS IMPORTANT TO KNOW THE RATIO OF THE VARIOUS SPECIES.



The answer for this plot would be as follows:

Species: Ponderosa Pine # trees: 3

Species: Incense Cedar # trees: 2

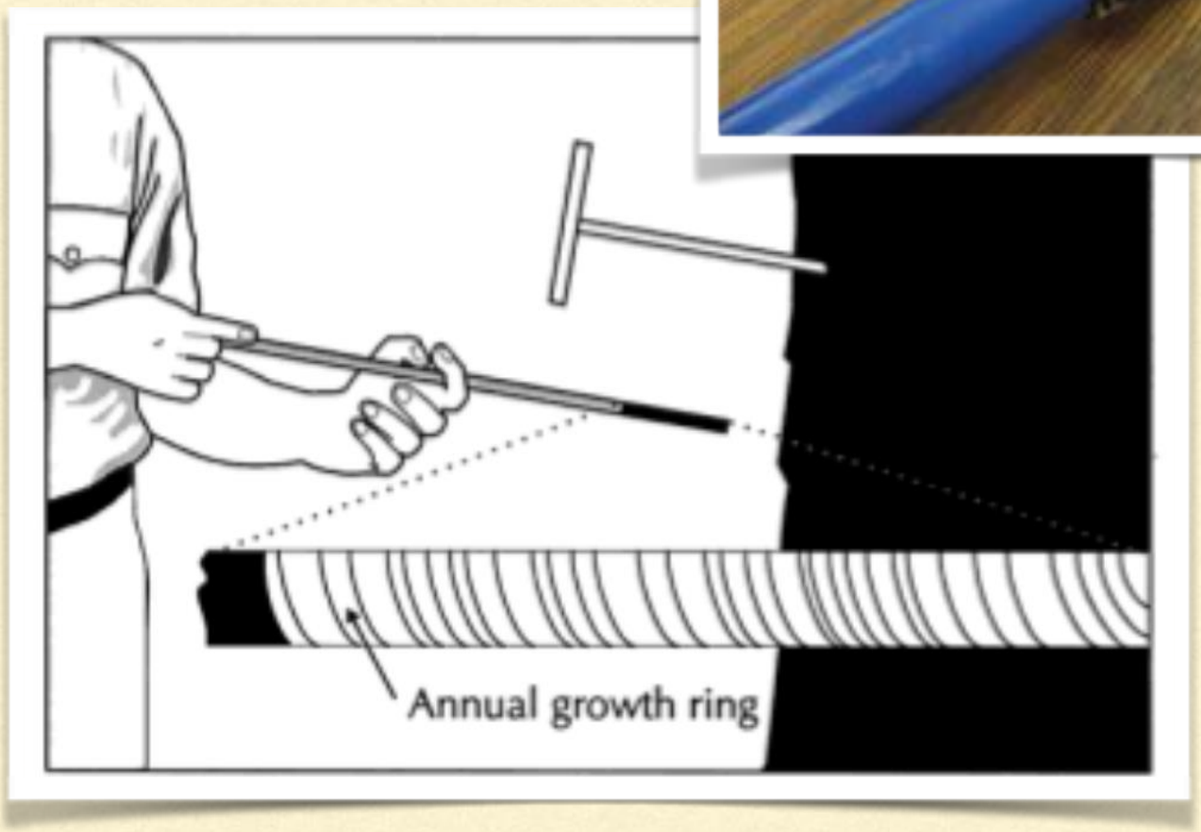
Species: Sugar Pine # trees: 1

Species: Douglas Fir # trees: 1

Species: California Black Oak # trees: 1

This site is **PINE** dominant.

OTHER TOOLS



- Densitometer
- Increment Borer