105/100 points **Name: ______________________________**

FINAL EXAM-2003

FO-3015 Forest Description and Analysis

1. The following is a complete tally from 25 BAF 20 points on a 40 acre tract.

#Plots	Plot Size	DBH	Trees Tallied	PACF, NTF	Vol/tree (bd.ft)	TPA	BA/ac	Vol/acre
25	BAF 20	12	30		50			
		14	36		100			
		16	39		150			
					Totals			

(13)

If $s^2 = 681{,}705$

Best estimate of mean volume per acre = ___________________________ (4)

The Sampling Error at the 95% Confidence Level = _________________ (4)

Best estimate of mean basal area per acre = _________________________ (4)

2. The following is a complete tally from 10- 1/5 acre fixed, radius plots on a 40 acre tract. Calculate the entries for a stand and stock table and give an estimate of volume per acre:

DBH	Trees Tallied	Volume/tree	Trees/Acre	BA/Acre	Volume/Acre
10	21	60			
12	25	72			
14	40	84			
16	46	96			
		TOTALS			

(15)

The best estimate of mean volume per acre is: ______________________ (5)

3. You are designing a cruise for 80 acres using 0.2 acre plots to achieve a ±10% sampling error at the 95% confidence level for a tract that has a standard deviation of ±800 cu. ft. and an estimated mean volume of 1,600 cu. ft per acre. The sample size equation is:

$$n = \frac{\left(\frac{A}{ps}\right) t^2 (CV\%)^2}{\left(\frac{A}{ps}\right)(AE\%)^2 + t^2 (CV\%)^2}$$

a. How many plots are needed ? ____________________ plots (4)

b. The plot and line spacing should be _____ chains by ______ chains. (2)

4. Data analysis showed a 10 year DBH growth rate of 2.8 inches for the 12-inch DBH class and 1.7 inches for the 14-inch DBH class (using **2-inch** classes). If there are 60 trees in the 12-inch class and 40 trees in the 14-inch class, complete the stand table below:

(6)

DBH Class	10yr Growth	Current No. Trees	Future No. Trees (in 10 yrs.)
12	2.8	60	_______
14	1.7	40	_______
__		_____	_______
__		_____	_______

5. Given the following partial computations from the volume points of a BAF 10 double-sample:

No. of volume points = 25
No. of tally trees on volume points = 241
basal area per acre = (below)
volume per acre = (below)

Point#	Trees/Ac	BA/Ac	Vol/Ac		Y^2	X^2	XY
1	200	131	4434		19,660,356	17,161	580,854
3	80	85	2743		7,524,049	7,225	233,155
5	300	123	3320		11,022,400	15,129	408,360
7	80	70	2222		4,937,284	4,900	155,540
9	120	110	3462		11,985,444	12,100	380,820
11	180	66	1720		2,958,400	4,356	113,520
13	120	110	3543		12,552,849	12,100	389,730
15	80	83	2957		8,743,849	6,889	245,431
17	60	83	3191		10,182,481	6,889	264,853
19	100	130	6561		43,046,721	16,900	852,930
21	80	116	4035		16,281,225	13,456	468,060
23	80	102	3471		12,047,841	10,404	354,042
25	40	52	1923		3,697,929	2,704	99,996
27	80	97	3380		11,424,400	9,409	327,860
29	80	92	3372		11,370,384	8,464	310,224
31	100	130	6007		36,084,049	16,900	780,910
33	40	46	1625		2,640,625	2,116	74,750
35	60	55	1831		3,352,561	3,025	100,705
37	400	100	2048		4,194,304	10,000	204,800
39	60	56	1922		3,694,084	3,136	107,632
41	120	90	2874		8,259,876	8,100	258,660
43	100	99	3299		10,883,401	9,801	326,601
45	100	115	4040		16,321,600	13,225	464,600
47	160	130	5381		28,955,161	16,900	699,530
49	120	140	7608		57,881,664	19,600	1,065,120
Sums	**2940**	**2411**	**86969**	**Sums**	**359,702,937**	**250,889**	**9,268,683**
Means	**117.6**	**96.4**	**3478.8**				

The relationship between volume and basal area can be expressed by the linear regression equation:____ (10)

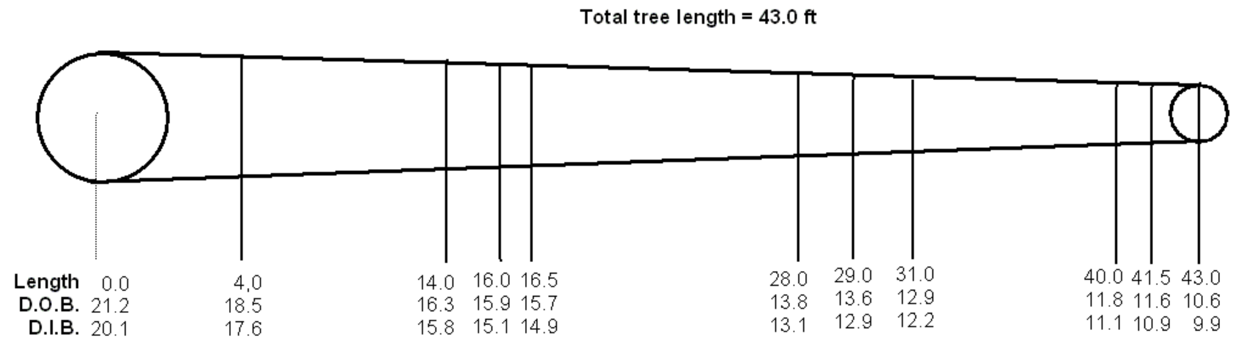
6. If the point sample data in Questions 5 above were the 25 volume points from a BAF 10 double sample and the count plots had the following data:

Number of Count points = 25
No. Of trees on Count points = 225 trees

a. The large sample (i.e. overall) basal area per acre is ________________ **(4)**

b. The adjusted volume per acre with the linear regression adjustment formula is ____ (4)

7. Based on the depicted tree length log, scaling table for log segments, and Doyle log rule volume equation; compute the following log scale values: (note: cumulative length in feet from the butt is shown on the top line, diameter o.b. on the 2nd line, and diameter i.b. on the 3rd line.)



Log Segs for Tree Length Logs:

Length	Short Logs
41.5	16 - 12 - 12
43.5	16 - 14 - 12
45.5	16 - 14 - 14

Doyle Log Rule Volume: Bd.Ft. = $(SD - 4)^2 * SL/16$
REQUIRED TRIM = 0.5 ft. per short log

a. Assuming a 0.5 ft. stump, the dbh of the standing tree was _______ (2)

b. Assuming a 0.5 ft. stump, the Form Class of the standing tree is _____% (2)

c. Based on the total length and the log-segment chart above, the tree length should be scaled as follows: (fill in the blanks) (9)

Log#	Scaling Length	Scaling Diameter	Log TableVolume in Board Feet
1			
2			
3			
Total	xxxxxxxxxxxx	xxxxxxx	

d. If the standing tree FC volume was 183 board feet, the over/under run of scaled volume versus standing tree volume is ___________ %. Hint: Use standing tree FC volume as the mean. Denote overrun as a plus sign and underrun as a negative sign. (2)

Circle the correct answer for the following multiple choice questions or fill in the blank:

8. A tree that measures 14.5 inches, DBH, with a bark thickness of 1.5 inches has a basal area of:

   a. 0.922 sq. ft (2)
   b. 1.147 sq. ft
   c. 0.855 sq. ft
   d. 1.666 sq. ft

9. During a growth study, you measure a 16.2 inch DBH tree that has a single bark thickness of 1.6 inches and a 10 year radial growth (i.e. increment core) measurement of 1.5 inches. If you assume that double bark thickness is equal to 10 percent of past d.i.b., the diameter (DBH) growth of the tree in the past 10 years is:

   a. 3.2 inches (2)
   b. 4.2 inches
   c. 5.2 inches
   d. 6.2 inches

10. Magnetic azimuth of 205° with a declination of 5°W = true bearing of __________ (2)

    True azimuth of 255° with a declination of 5°E = magnetic bearing of __________ (2)

11. Your Suunto has a single-error of **-6** ft measured over a distance of 60 ft; therefore the corrected height for the following measurements was computed as _____________ ft. (2)

    Reading to top of tree = +95 ft
    Reading to base of tree = +5 ft
    Distance from tree = 110 ft.
    Scale used = percent

Bonus: 5 points (all or none)

What are the advantages of a double-point sample over a single-phase point sample; or, why do a double-sample instead of a single-phase point sample?

____

____

____

____

Statistical Formulas

$$s^2 = \frac{\sum_{k=1}^{n} x_i^2 - \frac{\left(\sum_{k=1}^{n} x_i\right)^2}{n}}{n-1}$$

$$s_{\bar{x}} = \sqrt{\frac{s^2}{n}\left(1-\frac{n}{N}\right)}$$

$$SE\% = \left(\frac{t_{n-1,\alpha} s_{\bar{x}}}{\bar{x}}\right) * 100\%$$

$$\bar{x} \pm (t_{n-1,\alpha}) s_{\bar{x}}$$

$$CV\% = \frac{\sqrt{s^2}}{\bar{x}} * (100\%)$$

$$NTF = \frac{BAF}{(\text{Tree basal area})} = \frac{BAF}{.0054541(dbh^2)} = \frac{183.3483BAF}{dbh^2}$$

$$\boldsymbol{b = \frac{S_{xy}}{Sxx}} \qquad \boldsymbol{a = \frac{\sum Y_i}{n_2} - b\frac{\sum X_i}{n_2}}$$

$$\text{where} \quad S_{xy} = \frac{\left[\sum X_i Y_i - \frac{\sum X_i \sum Y_i}{n_2}\right]}{(n_2 - 1)}$$

$$S_{xx} = \frac{\left[\sum X_i^2 - \frac{(\sum X_i)^2}{n_2}\right]}{(n_2 - 1)}$$

X_i = *basal area per acre on ith volume point*

Y_i = *volume per acre on ith volume point*

$$\boldsymbol{\bar{Y}_{adj} = \bar{Y}_2 + b(\bar{X}_1 - \bar{X}_2)}$$

Student's t-Table

Forest Description and Analysis

The Distribution of Probability

df	0.5	0.4	0.3	0.2	0.1	0.05	0.02	0.01	0.001
1	1.000	1.376	1.963	3.078	6.314	12.706	31.821	63.657	636.619
2	0.819	1.061	1.386	1.886	2.920	4.303	6.965	9.925	31.598
3	0.765	0.978	1.250	1.638	2.353	3.182	4.541	5.841	12.941
4	0.741	0.941	1.190	1.533	2.132	2.776	3.747	4.604	8.610
5	0.727	0.920	1.156	1.476	2.015	2.571	3.365	4.032	6.856
6	0.718	0.906	1.134	1.440	1.943	2.447	3.143	3.707	5.959
7	0.711	0.896	1.119	1.415	1.895	2.365	2.998	3.499	5.405
8	0.706	0.889	1.108	1.397	1.860	2.306	2.896	3.355	5.041
9	0.703	0.883	1.100	1.383	1.833	2.262	2.821	3.250	4.781
10	0.700	0.879	1.093	1.372	1.812	2.228	2.764	3.169	4.587
11	0.697	0.876	1.088	1.363	1.769	2.201	2.718	3.106	4.437
12	0.695	0.873	1.083	1.356	1.782	2.179	2.681	3.055	4.318
13	0.694	0.870	1.079	1.350	1.771	2.160	2.650	3.012	4.221
14	0.692	0.868	1.076	1.345	1.761	2.145	2.624	2.977	4.140
15	0.691	0.866	1.074	1.341	1.753	2.131	2.602	2.947	4.073
16	0.690	0.865	1.071	1.337	1.746	2.120	2.583	2.921	4.015
17	0.689	0.863	1.069	1.333	1.740	2.110	2.567	2.898	3.965
18	0.688	0.862	1.067	1.330	1.734	2.101	2.552	2.878	3.922
19	0.688	0.861	1.066	1.328	1.729	2.093	2.539	2.861	3.883
20	0.687	0.860	1.064	1.325	1.725	2.086	2.528	2.845	3.850
21	0.686	0.859	1.063	1.323	1.721	2.080	2.518	2.831	3.819
22	0.686	0.858	1.061	1.321	1.717	2.074	2.508	2.819	3.792
23	0.685	0.858	1.060	1.319	1.714	2.069	2.500	2.807	3.767
24	0.685	0.857	1.059	1.318	1.711	2.064	2.492	2.797	3.745
25	0.684	0.856	1.058	1.316	1.708	2.060	2.485	2.787	3.725
26	0.684	0.856	1.058	1.315	1.706	2.056	2.479	2.779	3.707
27	0.684	0.855	1.057	1.314	1.703	2.052	2.473	2.771	3.690
28	0.683	0.855	1.056	1.313	1.701	2.048	2.467	2.763	3.674
29	0.683	0.854	1.055	1.311	1.699	2.045	2.462	2.756	3.659
30	0.683	0.854	1.055	1.310	1.697	2.042	2.457	2.750	3.646
40	0.681	0.851	1.050	1.303	1.684	2.021	2.423	2.704	3.551
60	0.679	0.848	1.046	1.296	1.671	2.000	2.390	2.660	3.460
120	0.677	0.845	1.041	1.289	1.658	1.980	2.358	2.617	3.373
∞	0.674	0.842	1.036	1.282	1.645	1.960	2.326	2.576	3.291