

Name: Key

**FO-2213 Forest Measurement
Exam 3 - 2008**

1. Given the field tally and standing tree volumes from 20 plots of a 0.1 acre plot cruise on 80 acres,

A. Complete the per acre, stand and stock table computations: (10)

DBH	#trees	Vol/tree			BA/ac	Trees/ac	Vol/ac
10	46	50			12.5	23	1,150
12	58	75			22.8	29	2,175
14	76	100			40.6	38	3,800
Total	180				75.9	90	7,125

B. Given the cruise computations, compute the precision statistics on per acre basis:

$$\sum X^2 = 1,100,000,000.0$$

$$\sum X = 142,500$$

Mean Volume per Acre = $\frac{7,125}{90} = 79.17$ (5)

Quadratic Mean DBH = $\sqrt{\frac{75.9}{90} / .005704} = 12.7$ (5)

95% Sampling Error (SE%) = $\frac{(2.086)(466.14)}{7,125} = 13.6\%$ (5)

$$s^2 = 4,453,236.84$$

$$s = 2,111.216$$

$$\bar{x} = 466.14$$

$$t_{9,95} = 2.086$$

Coefficient of Variation (CV%) = $\frac{2,111.216}{7,125} = 29.6\%$ (5)

C. If the Allowable Error was specified as $\pm 10\%$ at the 95% Confidence Level,

Did the cruise meet specification, answer Yes/No NO (2)

If NO, then how many **ADDITIONAL** plots are need? 35-20=15 (3)

$$(1) n_1 = \frac{1}{\frac{1}{800} + \left(\frac{10}{(1.96)(29.6)}\right)^2} = 32.3$$

$$(2) n_2 = \frac{1}{\frac{1}{800} + \left(\frac{10}{(2.04)(29.6)}\right)^2} = 35$$

2. The following tally is from a BAF 20 prism cruise where 8 points were taken on 40 acres, and where sample tree data resulted in the local volume equation: Board feet = 10.0 + 5.0(DBH)

A. Complete the calculation for the Stand and Stock table from the prism cruise (with basal area by dbh class): (18)

DBH	Tally	PACF	Trees	%Tree		Trees/ac	BA/ac	Vol/ac
10	10	36.67	36.67	60		45.8	25.0	2748
12	12	25.46	305.6	70		38.2	30.0	2,674
14	14	18.71	261.9	80		32.7	35.0	2516
Total	36					116.7	90.0	8,038

3. DOUBLE POINT SAMPLE: Suppose the point sample in Question 2 above was the 8 volume points from a BAF 20 **double** sample with a 3:1 ratio of basal area to volume points.

Additional data from double sample cruise:

Tree Tally: = 124 trees on 24 Count points
 = 36 trees on 8 Volume points
 Total trees = 160 trees on 32 Total BAF 20 points

From regression of volume per acre as a function of basal area per acre:

$$\text{Volume} = 1,718.0 + 70.0(\text{BA})$$

A. The large sample (i.e. overall) basal area per acre is: 100.0 ft²/ac (5)

The small sample (i.e. volume points) volume per acre is: 8,038 bd. ft/ac (3)

The small sample (i.e. volume points) basal area per acre is: 90.0 ft²/ac (2)

B. The quadratic mean DBH is: $\sqrt{\frac{90}{116.7} / .005491}$ 11.9 inches (2)

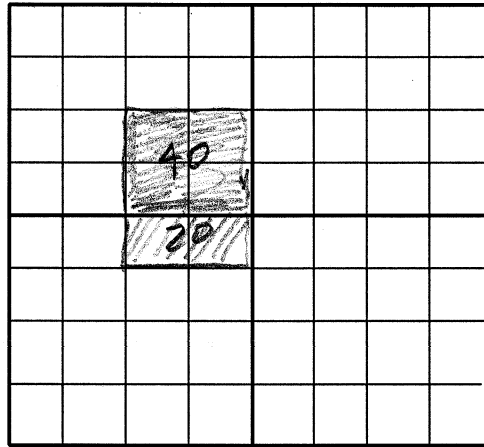
C. The adjusted volume/acre with the linear regression adjustment formula is: 8,738 (10)

$$\begin{aligned} \hat{V}_{1r} &= 8,038 + 70.0 [100 - 90] \\ &= 8,738 \end{aligned}$$

4. A. Locate the following parcel from the GLO description in the section below: (i.e. blacken in the area). The legal description is:

SE 1/4, NW 1/4 and the N 1/2, NE 1/4, SW 1/4

(10)



B. The combined parcel contains 60 acres

(5)

5. If the scale of a 7.5 minute quadrangle sheet is 1:24,000, convert the following measurements:

A. 1.0 inches on the quad sheet = 2,000 feet on the ground.

(2)

B. 1.0 inches on the quad sheet = 30.3 chains on the ground.

(3)

C. With reference to 5A above, 15/20 inches would be approximately 1,500 feet if you use the "20" scale on the engineer's ruler.

(2)

D. With reference to 5B above, 10/30 inches would be approximately 10 chains if you use the "30" scale on the engineer's ruler.

(3)

Bonus: ~~10~~ points, all or none

If the quadratic mean dbh was 13.5 inches and

a. you were using a BAF 10 prism, the average plot size would be 0.10 acres or, (0.0999)

b. you were using a BAF 20 prism, the average plot size would be 0.05 acres. (0.0496)

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

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

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

$$CV\% = \left(\frac{s}{\bar{x}} \right) (100)$$

$$n = \frac{1}{\frac{1}{N} + \left(\frac{AE\%}{t_{cv\%}} \right)^2}$$

$$PACF = \frac{1}{\text{plot size}}$$

$$\text{plot size} = \frac{ba}{BAF}$$

$$SS_y: \sum y^2 = \sum Y^2 - \frac{(\sum Y)^2}{n}$$

$$b_1 = \frac{\sum xy}{\sum x^2} = \frac{SP_{xy}}{SS_x}$$

$$SS_x: \sum x^2 = \sum X^2 - \frac{(\sum X)^2}{n}$$

$$b_0 = \bar{Y} - b_1 \bar{X}$$

$$SP_{xy}: \sum xy = \sum XY - \frac{\sum X \sum Y}{n}$$

TSS

$$SS_y = \sum y^2$$

$$ESS = \sum (Y - \hat{Y})^2$$

$$RSS = \frac{(SP_{xy})^2}{SS_x} = \frac{(\sum xy)^2}{\sum x^2} = b_1^2 \sum xy$$

$$I^2 = \left(1 - \frac{\text{Error SS}}{\text{Total SS}} \right)$$

$$\bar{Y}_{lr} = \bar{y}_2 + b_1 [BA_1 - ba_2]$$

Student's t-Table: The Distribution of t

df	Probability = α								
	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
15	0.691	0.866	1.074	1.341	1.753	2.131	2.602	2.947	4.073
20	0.687	0.860	1.064	1.325	1.725	2.086	2.528	2.845	3.850
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