

Name: Keya

**FO-2133 Forest Measurement
Exam 2 - 2009**

1. Volume computation:

Given: A single tree segment is 16.5 ft in length and has a butt diameter of 18.6 inches, o.b., with single bark thickness of 0.9 inches and a top diameter of 14.5 inches, o.b., with a single bark thickness of 0.6 inches.

A. The cubic volume, outside bark, of the total log is: 25.03 cubic feet (5)

$$\left(\frac{.005454 (18.6)^2 + .005454 (14.5)^2}{2} \right) 16.5$$

B. The cubic volume, inside bark, of the total log is: 20.66 cubic feet (5)

$$\begin{array}{r} 18.6 \\ - 1.8 \\ \hline 16.8 \\ 14.5 \\ - 1.2 \\ \hline 13.3 \end{array}$$

C. The scaling length of the log for Doyle board foot volume is: 16 feet (5)

D. The scaling diameter of the log for Doyle board foot volume is: 14 inches (5)
 $14.5 - 0.6 = 13.9 \rightarrow 14.$

E. The Doyle Board Foot volume of the single log is: 100 bd. ft (5)

$$\text{Doyle} = \frac{(14-4)^2 14}{16} = 100$$

2. Stand table projection for 10 year period; Complete the computations: (15)

$\text{Dbh}_{\text{growth}} = 0.5 + 0.1(\text{DBH})$
 $\text{Bd. Ft Volume} = 60 + 0.10(\text{DBH}^2)$

DBH Class	Periodic Growth	Current Trees/ac		Future Trees/ac	Future BA/ac	Future Vol/ac	Vol per tree
10	1.5	100 ^{0.75}	25	25	13.64	1750.	70.0
12	1.7	100 ^{0.85}	75 + 15	90	70.68	6696	74.4
14	1.9	100 ^{0.95}	85 + 5	90	96.21	7164	79.6
16			95	95	132.64	8132	85.6
Total		300		300	313.17	23,739	

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3. Fixed-area cruise computations: (3 - 0.2 acre, fixed-radius plots on 40 acre tract)

0.2	40 acres								
Plot#	dbh	height	no.	PACF	Tree/ac	Vol/Tree	Vol/ac	Vol/Plot	(Vol/plot) ²
1	6	59	2	5.0	10.0	9.1	91		
	8	70	1	5.0	5.0	15.2	76		
	10	78	2	5.0	10.0	23.8	238		
	12	83	2	5.0	10.0	34.7	347	752.1	565,705
2	6	59	2	5.0	10.0	9.1	91		
	8	70	2	5.0	10.0	15.2	152		
	10	78	3	5.0	15.0	23.8	357	600.0	359,996
3	8	70	2	5.0	10.0	15.2	152		
	10	78	2	5.0	10.0	23.8	238		
	12	83	2	5.0	10.0	34.7	347	737.2	543,493
			20		100		Sum	2,089.3	1469192.91
			6.7		33.333		Mean	696.4	

A. s^2 ~~7088.1~~ 7102.20 (10)
 s 83.9 84.27
 s_{xbar} ~~40.2~~ 37.2 $\sqrt{\frac{7102.20}{3} (1 - \frac{3}{20})}$ = 48.29
 t 4.303
 B. $se\%$ 23.09% 29.83% (10)
 C. $cv\%$ 12.09% 12.1% (10)

dbh	height	no.	PACF	Tree/ac	Vol/Tree	Vol/ac	Trees	Volume
6	59	2	5	10	9.1	91.1		
6	59	2	5	10	9.1	91.1	20	182.2
8	70	1	5	5	15.2	76.2		
8	70	2	5	10	15.2	152.4		
8	70	2	5	10	15.2	152.4	25	381
10	78	2	5	10	23.8	237.7		
10	78	3	5	15	23.8	356.5		
10	78	2	5	10	23.8	237.7	35	831.9
12	83	2	5	10	34.7	347.2		
12	83	2	5	10	34.7	347.2	20	694.4
			Sum	100		2089.3		

D. The best estimate of mean volume per acre is: 696.3 ft³ (10)

E. Complete the Stand & Stock Table below from the cruise data above: (20)

DBH	Trees/ac	Volume/ac
6	6.67	60.73
8	8.33	127.0
10	11.67	277.3
12	6.67	231.47
Total	33.34	696.5

Equation Formula Sheet

$$s^2 = \frac{\left[\sum_{i=1}^n x_i^2 - \frac{(\sum_{i=1}^n x_i)^2}{n} \right]}{(n-1)} \quad s^2 = \frac{\left[\sum_{i=1}^n x_i^2 - \bar{x} \sum_{i=1}^n x_i \right]}{(n-1)} \quad s = \sqrt{s^2}$$

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

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

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

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

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

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

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

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

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

TSS

$$SS_y = \sum y^2$$

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

RSS

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

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

$$S_{y.x} = \sqrt{\frac{\sum (Y - \hat{Y})^2}{n-2}} = \sqrt{\frac{ESS}{n-2}} \quad S_{y.x} = \sqrt{\frac{\sum y_i^2 - b_1 \sum xy}{n-2}} = \sqrt{\frac{ESS}{n-2}}$$

Smalian: $ft^3 = [(B + b)/2] L$

Huber: $ft^3 = [(B_{12})] L$

Newton: $ft^3 = [(B + 4 B_{12} + b)/6] L$

Doyle Board Feet = $(D - 4)^2 L / 16$

Scribner Board Feet = $(0.79D^2 - 2D - 4)L / 16$

International 1/4 Board Feet 4 ft. log = $0.199D^2 - 0.6420D$

8 ft. log = $0.597D^2 - 1.3290D - 0.7143$

16 ft. log = $0.796D^2 - 1.3740D - 1.2295$