

FOR 373: Assignment 3 – Stratified Sampling [60 points]

Notes: 2-pages of notes can be attached to this assignment and you are encouraged to use your calculator or Excel where necessary. You must show your work to receive any credit (e.g., the equation you use and any assumptions you make). Doing so also indicates whether you understand the method and help you receive partial credit, even if your final answer is incorrect.

1. What is stratified random sampling and what are the three reasons we use it?

2. What are the steps in the stratification process?

3. What are the three types of allocation in stratified random sampling and give their formulas?

4. From the following preliminary cruise statistics, determine how many 1/10 acre plots you would need in order to estimate the mean volume per acre within the stand to within 12% at 90% confidence. Assume the Stand is 72 acres.
 Mean = 1050 cu ft/ acre plots = 6 standard deviation = 210 cu ft/ acre

5. You are given the following stand information and told to allocate 160 1/10 acre plots. Calculate how many plots you would allocate to each strata using proportional allocation.

Strata	Strata Area (acres)
1	22
2	48
3	95
4	55

6. Now allocate the 160 plots using Neyman allocation.

Strata	Strata Area (acres)	Std. dev.
1	22	20
2	48	65
3	95	45
4	55	35

7. Calculate the missing strata statistics for the plot volumes (cu ft) inventoried in the cruise performed using stratified sampling of 1/10 acre plots, each strata is 30 acres in size. Assume sampling without replacement.

A	B	C	D
42	53	30	65
44	55	28	66
41	56	29	68
45	55	30	66
43	54	31	69
46	52	28	68
41	53	30	67
44	56	29	65
43	55	31	66
43	54	30	68

Strata	Mean per acre	Variance per acre
A		
B		
C		
D		

8. Calculate the following combined statistics for the cruise in question #7, assuming sampling without replacement.

Combined mean per acre:

Combined variance per acre:

9. Using your calculations from question #8 and what you know from question #7, compute the 90% confidence interval for how much you can expect to earn for harvesting all of your land. You are able to get a price of \$250 mbf.

10. Using the computed cu ft volume per plot, provided from a cruise of 1/10 acre plots, calculate the sampling intensity for each strata and the combined mean per acre.

A	B	C	D	Strata	Acres
30	45	28	38	A	20
32	46	27	39	B	45
35	48	28	36	C	35
	50	30	37	D	35
	50		39		
	48				
	46				

11. If you decide to harvest only Strata B from question #10, what would be the maximum profit you would expect if the stand consisted of 80% fir, 20% cedar and you received \$260 mbf for fir and \$315 mbf for cedar. Use a 90% confidence level.

12. The bid for harvesting Strata B from question #10 was:

- A delivery charge of \$160 per load, were a truck can haul 9,000 bf per trip. (round up to nearest load)
- With a mileage charge of \$0.125/mile round trip and the mill is 32 miles from the landing.

With these costs to harvesting what would your maximum potential profit be from question #12?

Extra Credit: Explain the balance between number of plots, plot spacing, and allowable error (%) as presented in “Plot Spacing in Systematic Sampling” and why it is important to consider when designing an inventory. There is no set length, but you must support your argument with at least two reasons. Grammar and writing clarity will be considered in grading; typing your thoughts in a word processor is encouraged. (10 points)