

Review Homework 2: Sampling Design (not for credit)

A plantation owner looking to buy land in Michigan in which to plant a cherry grove comes to you for help. The planter can buy a piece of land from any part of the state, but would like to save some time and figure out which areas might be the best ones in which to grow cherry trees (an important crop in Michigan, for real). Further, the large area of southern Michigan is highly occupied and land there is too expensive.

The soil association the planter would like to buy land on is an Alfisol; all of the others in the state are either too infertile (e.g., Spodosols) or too marshy (e.g., Histosols).

A) Your job is to help the planter narrow down areas for further consideration. The planter cannot afford the time to cover the entire state looking for good land, but *you* do have a good map of soil-order distribution for the state. What you would like to provide the planter is a representative random sample of the state in order to determine which areas have the highest probabilities of containing Alfisols.

- 1) Set up a sampling frame using the grid on the map (number only those areas with land in them).
- 2) Draw a simple random sample of 25% of the sampling units.
- 3) List each sampling unit and the soil orders represented in it.
- 4) Evaluate your sample; does it have even coverage. Are there areas on the map that you still think you should consider?
- 5) Based on your sample, what is the probability that if you buy land in Michigan an Alfisol will occur on the land? (Divide n with Alfisols by total n of sample units in sample)
- 6) Where should the planter go to find land for the orchard in your opinion based on your sample?

B) A new entrepreneur arrives at your office with different plans; the entrepreneur is thinking about investing in a Scotch distillery, which requires peat and clean water. You are now looking for property with a Histosol soil on it.

- 1) Set up a systematic interval sampling design for 25% of the sampling units.
- 2) What will your interval be?
- 3) Evaluate your sample; does it have even coverage?
- 4) Based on your sample; what is the probability of finding land with a Histosol soil in Michigan?
- 5) Where would advise that the entrepreneur look for land for a distillery?

C) You've become intrigued by whisky and cherries thinking that you might put a cherry-flavored whisky on the market (heaven forbid this!), and you notice through inspection that some areas have higher proportions of Alfisols and Histosols than others, and you would like to keep your options open for a career change.

- 1) Stratify your sampling frame into four areas to guarantee even coverage.
- 2) Draw a simple random sample from each stratum.
- 3) What is the probability of finding an Alfisol *and* a Histosol in the same area based on your sample? Divide those with both by your total sample size.

D) Simply state in a few sentences how cluster sampling might be helpful in projects like the ones in this exercise especially when the owner decides to travel to look at properties.

E) How is what you've done in this exercise different than pure point sampling as explained in lecture and the text? Answer in a few sentences.