

Examples of Sampling Problems

For the following situations, identify the population, the sampling units, and the sampling plan. If it is a multistage sampling plan, identify the population, sampling unit, and sampling plan at each stage.

1. A researcher has a list of all 4-year colleges and universities in the United States.
 - (a) The parameter of interest is the proportion of 4-year schools which offer a degree in education. The names of 50 schools are drawn at random from the list and the proportion of these 50 offering such a degree is computed.
 - (b) As in (a), but the list is divided into three groups according to enrollment: less than 2000 students, 2000 to 10000 students, greater than 10000 students. Twenty schools are drawn at random from each group.
 - (c) The groups in (b) are each subdivided into two groups: those which offer graduate degrees (in any field) and those which do not. Ten schools are drawn at random from each of these subgroups.
 - (d) The parameter of interest is the average age of full-time students in all the schools. Fifty schools are drawn at random and the average age of all students at these 50 schools is computed.
 - (e) As in (d), except that 100 students are chosen at random from each of the 50 schools and the average age of these students computed.
2. A researcher wishes to estimate the proportion of bare ground on a 40-acre parcel of land.
 - (a) She stands in the “middle” of the parcel and randomly chooses five numbers from 1 to 360. These represent the directions, in degrees from North, of five transects through the middle point which extend to the edges of the parcel. On each transect, she uses a measuring wheel to determine how much of that transect lies in bare ground.
 - (b) As in (a), except that for each transect she chooses a random distance from 0 to 5 meters from the center. At five-meter intervals along the transect starting at this point, she centers a circle with radius 0.5 meters. She does this for all the transects. She then determines the proportion of bare ground in all the 0.5-meter circles.
 - (c) As in (a), except that she chooses ten points at random along each transect and centers a 0.5-meter circle at each of these points. She then determines the proportion of bare ground in all the 0.5 meter circles.
 - (d) Repeat (a), (b), and (c), except that the transects are five parallel North-South lines evenly-spaced across the parcel.
3. A researcher is interested in black bears in a certain geographic region, particularly the size of the bears and the amount of time they spend in various habitats during the summer.

- (a) He sets up traps at five locations scattered throughout the region. He continues trapping until ten bears have been caught. He estimates average size characteristics from these ten bears.
 - (b) As in (a), but he radio collars the bears. Each bear is located once each week during the summer at the same time on the same day of the week. These observations are used to estimate the proportion of time bears spend in various habitats during the summer.
 - (c) As in (b), but each bear is located at a randomly chosen time on a randomly chosen day during each week.
 - (d) As in (a), but he radio collars the first five females and the first five males he traps.
4. A bird biologist wants to describe the use of patches for foraging by two species of sparrows. He defines patches based on their discontinuity with the surrounding background. Each year over a 3-year period, 300 patches were selected from an 800x300 m study area by first choosing one of 72 reference grid points on the sampling area, then randomly selecting one of eight principal compass directions, and finally, stretching a 50-meter tape from the grid point in the selected direction. All patches whose canopy area intercepted the tape (omitting those within the first 10 m because of possible trampling around the grid point) were measured. Each 40-m line transect intercepted 15-20 patches.
 5. A researcher is interested in the average size of the ponds in a pothole region. She takes an aerial photograph of the region and places points randomly on the photograph. The pond on or nearest each point is included in the sample. She continues until 50 ponds have been chosen.
 6. A geologist is interested in the surface geology of a certain area. He divides the area up with a grid into 20 equal-sized parcels. Within each parcel, he randomly selects 5 points and obtains measurements at each of these points.
 7. A fire researcher is interested in estimating the average fuel moisture in the leaves of the bushes in a small area. She randomly selects ten bushes from the area and then randomly selects two branches off of each bush. She strips all the leaves off these two branches to analyze.
 8. A sociologist is interested in the sex and age makeup of Missoula bar patrons. He randomly selects five bars and visits them in random order, one on each of five consecutive Friday nights. He observes all people entering the bar from 8 to 12 pm, recording the sex and estimated age of each.