Environmental & Resource Assessment (ESRM 304)

Puzzles in Sampling Design and Experimentation

Wednesday Lab 6 Dec 2017 12:30-2:00 PM AND 306

Puzzle 1: (Aaron Wirsing)

A graduate student wishes to estimate the size of a snowshoe hare population in a forest stand using the Lincoln Index, which is a capture/mark/recapture (CMR) technique. During her initial sampling (live-trapping) interval, she captures 100 individual hares and marks 50. A year later, she returns to the same site and live-traps again, this time capturing 50 hares of which 9 are marked.

Using her CMR data, the student calculates the abundance of hares at the site as follows:

N (population size) = $(M*n_1)/m_1$ = (50*50)/9 = 278 hares

Are you confident in the student's population estimate? Why or why not? If you think changes are in order, how would you alter the student's approach in order to generate a more robust population estimate?

Puzzle 2: (Ben Dittbrenner / Catherine Means)

A team of stream ecologists are studying the effects of suburban neighborhoods on stream ecology. They have limited time and money so they plan on looking at one stream in two locations: one upstream of the neighborhood in a small urban forest and one downstream of the neighborhood in a restored park. They plan to sample water temperature, dissolved oxygen and aquatic macroinvertebrates in April and October for 2 years.

Will this design give them defensible scientific results? Why or why not? How would you improve the sampling design?

Puzzle 3: (Miku Lenentine)

The DNR Management Team (MT) of Tiger Mountain State Forest will be revising its site management plan. The site supports multiple uses, including timber harvest and recreation. As part of the data collection for the planning process, the MT would like to do a user evaluation. A team of students is working with a professor to do the evaluation. The MT explains to the team that Tiger Mountain has diverse users: hikers, bikers, hang gliders, animal walkers, naturalists, education groups and more. Little is known about the behavior of the different visitors once they arrive at the site.

The research team meets to plan the data collection methods. First, a pencil-and-paper questionnaire is designed. It includes questions of visit purpose, time, duration, frequency, travel distance, visit motivations, positive experiences, and program suggestions, and takes about 30 minutes for a respondent to complete. Then, the sampling protocol is designed. Questionnaires will be distributed at the I-90/High Point Entrance. They will be given to every other visitor who parks in the parking lot, up to 20 per day. Data collection will occur during four weekends in early autumn, generating up to 320 completed questionnaires. Data analysis will include descriptive statistics, and multivariate analysis to determine visitation patterns.

Will this approach provide useful data for the user survey? *Why or why not*? *How could the approach be improved*?

Puzzle 4: (Daniel Vogt)

A watershed was studied by soil scientists on the east side of the Cascades in a local National Forest. Soil samples were collected from 10 riparian sites and 10 upslope sites within the watershed from the O, A and B horizons down to 50 cm and analyzed for pH, total C, N and macronutrients, and also for available N. Five years later a wildfire burned through the entire research watershed. Those research soil scientists then decided to collect new soil samples from 10 upslope and 10 riparian areas from as near to the original sites as possible and analyze those new samples also for pH, total C, N and macronutrients, and available N. The scientists then compared the new dataset with the original data collected before the fire. They used a T-test to compare their results for fire effects on soils. They then wrote a manuscript and submitted it to a journal. The journal rejected the manuscript.

Should the journal have rejected the research paper? Explain why or why not. If you wanted to determine wildfire effects on soils, what approach would you take?

Puzzle 5: (Eric Turnblom)

A forestry researcher was asked to analyze a dataset from an experiment that was set up ten years ago. Ten years ago several landowners in the Pacific Northwest desired to know what silvicultural treatments (thinning, fertilization with nitrogen, or thinning and fertilization) would produce the most usable (merchantable) wood volume from Douglas-fir plantations growing in the region. Each landowner had looked over their land base and found a plantation that was at least 20 acres in size and about 30 years old at the time in which to conduct the experiment. The landowners set up six 2-acre plots within each plantation where stand conditions were most uniform and randomly assigned each of the three treatments to two of the six plots. Plots were measured immediately prior to application of the treatments in the dormant season of that year. About six months later, they realized they should have set up control plots, that is, plots with neither thinning nor fertilization. So, before the growing season began the following year, they all went out and quickly put in two more plots to serve as controls, and recorded initial measurements. They derived total cubic foot volume for each plot on a per acre basis. Then, after ten years, they went back to the same plots, re-measured them and again calculated total cubic foot volumes on a per acre basis for all the plots. The difference between the final measured volumes and the initial were taken to be the responses of the treatments.

How confident are you in the results that could be derived from this experimental set up, that is, would the results be defensible?

What is 'good' about this experiment?

Critique this study, and suggest what the landowners might have done differently to avoid any problems you find.