

Environmental & Resource Assessment (ESRM 304)

Puzzles in Sampling Design and Experimentation

Tuesday Lab 5 Dec 2017 12:30-2:00 PM AND 306

Puzzle 1: (Aaron Wirsing)

A graduate student hypothesizes that old-growth forests provide the highest quality habitat for southern red-backed voles (*Myodes gapperi*) in the Western Washington Cascades. He selects three stands: one young stand (35 years old), one mature stand (85 years old), and one old-growth stand (260 years old). In each stand he selects four plots, which for logistical reasons, he places in flat areas without much shrub cover. He measures the abundance of voles in each plot using a capture/mark/release method.

Here are his data. The numbers are his estimated numbers of red-backed voles/plot.

	Old Growth Stand	Mature Stand	Young Stand
Plot 1	21	11	2
Plot 2	15	9	0
Plot 3	25	6	4
Plot 4	19	7	3

After transforming the counts, he runs a one-way analysis of variance with post-hoc testing which yields very significant results among all stands. He claims that these data show that old-growth forests are the best habitat for this species, with mature forest next best, and young forests the worst.

Do you agree? Why or why not? What conclusions can he make from the study? If you think changes are in order for the study, how would you alter it to test his hypothesis?

Puzzle 2: (Ben Dittbrenner / Catherine Means)

A team of hydrologists needs to estimate the amount of rainfall that will show up in a local stream as streamflow. One of the factors that affects runoff is the infiltration rate (how fast water is absorbed into the soil) of the ground. Precipitation that enters the soils takes much longer to reach the stream than does precipitation that runs over the surface of the soil. They assume that land-use/land-cover affects the infiltration rate so they select 30 sites to run an infiltrometer test. This test will provide information for local infiltration rates. Ten sites will be in urban yards, 10 in forested parks and 10 in harvested timber areas. They will compute an average rate for each land-use and then use the respective rates for the total amount of area in the watershed that is urban, forested, or harvested.

Will this approach used provide data for their estimates of streamflow? If not, why not? How could the design be improved?

Puzzle 3: (Miku Lenentine)

St. Edward State Park was established as a state park in 1977 after having served as a Catholic Seminary for about fifty years. Much of the 316 acre park is undeveloped forest land with a core area of the park devoted to picnicking, play area, ball fields and meadows. Over the years the seminary buildings have fallen into disrepair and are in need of serious renovation. Recently a private company has proposed renovating the buildings for use as a hotel, restaurant and spa. Feelings about the hotel proposal are mixed with some people strongly opposed because of the possible impact on the tranquility of the park and the added traffic to the surrounding area. In order to tap the sense of the public, the park manager is going to interview park users to find out what they think about the proposal. He plans to have one of his employee's interview park visitors on two Saturday mornings in September as they arrive at the parking lot in the center of the park. The employee will interview the first fifty people who show up, asking them the question....."What do you think of the hotel proposal?" You have been asked to assess the approach the manager is taking to finding out how people will be impacted by the proposal. What part of his approach is sound social science, and if you see problems in his approach, what would you do differently to obtain a clear sense of what people think of the hotel proposal?

Puzzle 4: (Daniel Vogt)

The ASARCO Smelter was located in Tacoma near Ruston and processed copper-bearing ore for 70 years—it was eventually closed in 1985. The smelter had a tall smoke stack, but essentially no emissions controls. An environmental researcher for the EPA wants to determine if the smelter caused significant contamination to soils in the surrounding area. To survey this, she set up a sampling transect that begins adjacent to the former smelter site and extends 64 km SE into Mt. Rainier National Park. She plans to sample the top 5 cm of mineral soil every 3 km along the transect. After collection, the soil will be dried, ground, and digested using HFl acid to release metals in solution. The solution will then be analyzed for Cu using an Inductively Coupled Atomic Emission Spectrophotometer. For quality assurance and quality control, a soil standard with a known concentration of metals will be analyzed after every 10 samples to test the accuracy of the ICP/AES analysis. The precision of the analysis will be assessed by taking every 10th sample and re-analyzing it at the end of the samples. Regression will be used to determine if there is an effect from smelter.

Will this approach appropriately address the researcher's concerns? If not, why not? How could the design be improved?

Puzzle 5: (Eric Turnblom)

A researcher in forestry received a grant to investigate five (5) newly developed varieties of Douglas-fir trees, to determine which new variety has the greatest annual growth. A greenhouse study was designed using 100 large pots, 20 pots for each variety. The researcher tried to leave nothing to chance, such as sowing enough seed in each pot so that the best single seedling would be left when each plot was thinned after four weeks. After three full growing seasons, the results of the experiment were statistically analyzed and variety "B" was recommended as best (for maximum annual growth). Results were so overwhelming that ten forest companies planted variety B on half of all their regeneration acreage. After four years, eight of the ten companies complained that variety B trees were only 75% as tall as an old "stand-by" variety.

What could have happened? Critique this study, and suggest what the researcher might have done to avoid any problems you find.