FW663 -- Laboratory Exercise

Line Transect Estimation

This exercise is a week-long exercise to estimate a population of rat chow pellets (RCP) on the Oval. The schedule and activities follow.

First Day

Design a line transect survey for the Oval. We will show you what RCP look like when scattered on the grassy surface by scattering a few in the alcove behind the Wagar building. Then we will walk around the Oval to get an idea of just what the survey will be like. Back in the classroom with the map of the Oval (Figure 1) as background, we will design a survey to estimate the density of RCP. We will guess that the density is approximately 0.1 pellet per m^2, and the area of the oval approximately 26,437 m^2 (284,568 ft^2) (Figure 1). We will determine a standard transect length and width to be used in the survey, and determine the number of transects to be surveyed by each survey team. Teams will consist of pairs of class members. Other design decisions to be resolved will be the location of each transect, how the transect will be located, how observers will know where the line is on the ground, and how distances will be measured.

Second Day

Surveys will be conducted by the survey teams. Plan on at least 2 hours for the sample, maybe longer. Data will be entered in a spreadsheet with 3 columns: line number, distance to object, and size (length) of object. Email your spreadsheet to gwhite@cnr.colostate.edu for compilation into a DISTANCE (Buckland 1993, Laake 1993) file. The citations given are for the old DOS DISTANCE, but we plan to use the new Windows DISTANCE.

Third Day

The instructors will have compiled the data, and we will run DISTANCE in class to produce an estimate of RCP density. Come prepared to suggest sightability models to run, how to arrive at a final estimate of RCP density, and how to evaluate assumptions. The TA's know the true density, so we'll have reality to compare against. After class, you may want to become more familiar with DISTANCE by redoing some of the analyses conducted during class.

Questions to be Considered:

1. Does the confidence interval for the density estimate include the true density? If so, great. If not, why not? What went wrong?

2. Is there evidence that the size (length) of a RCP affected its sightability?

3. What happens if some of the teams are tardy in performing their surveys, and squirrels eat a fraction of the RCP?

4. What is the impact of pooling distance data from different observers or pairs of teams when the detection functions for the teams may be different? Likewise for different densities of RCP, or different light conditions when the surveys were conducted.. Is there any way to evaluate these differences in DISTANCE?

5. What is the sample size in a line transect survey? Is it the number of lines, or the number of distances, or somehow both?

6. Suppose the RCP were distributed over an area 100X the size of the Oval. How much larger of a sample would be required to estimate density to achieve the same CV? What if the density remained the same, but the area to be surveyed was 100X the size of the Oval. Again, how much larger of a sample would be required to estimate density to achieve the same CV?

7. What does the bootstrap procedure provide to Program DISTANCE? What is the logical level to perform bootstraps with for the RCP density estimate?

Literature Cited

Buckland, S. T., D. R. Anderson, K. P. Burnham, and J. L. Laake. 1993. Distance sampling: estimating abundance of biological populations. Chapman and Hall, London. 446pp.

Laake, J. L., S. T. Buckland, D. R. Anderson, and K. P. Burnham. 1993. Distance user's guide version 2.0. Colorado Cooperative Fish & Wildlife Research Unit, Colorado State University, Fort Collins, Co. 72pp.

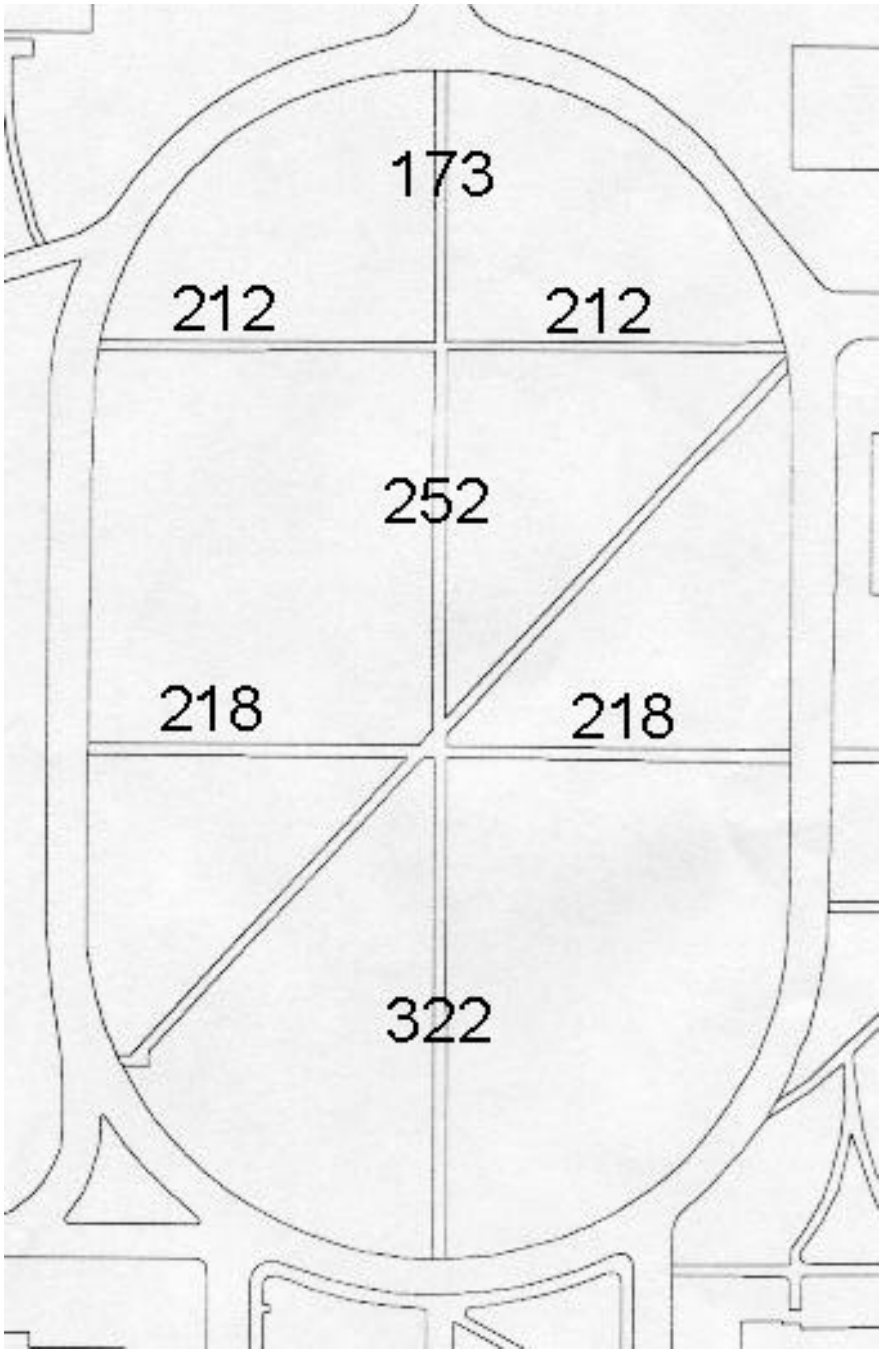

Figure 1. Map of CSU Oval with dimensions in feet.