

Homework #3

Due October 29

1. (Required only of Math students) Show that the variance of the Horvitz-Thompson estimator (formula 5, page 54) under SR sampling (without replacement) is the same as the variance of the conventional estimator (formula 10, page 16).

2. From Barrett and Nutt, Survey Sampling in the Environmental Sciences, COMPress 1979, p. 211. Ecologists wish to estimate the number of species of breeding birds in a population of 38 recreational areas that had been constructed with as little disturbance of the natural vegetation as possible. They took a random sample from the areas. The population units are 2-hectare plots and on each plot, they recorded the canopy diversity (x) and the number of breeding species (y). Canopy diversity is a measure of the coniferous and deciduous foliage about 12 feet, and is expressed as the percent of the less abundant component. The collected data are

Canopy Diversity	8	39	45	10	18	21	0	37	24	28	28	12	23	42	32
N. Species	9	13	10	8	9	10	4	10	11	12	8	8	8	14	11

The mean canopy diversity over the entire 38 areas was 26%. Estimate the mean number of breeding species using the ratio (use your answer from Hmk 2) and regression estimator. Discuss the how well the assumptions of the estimators hold for these data. Calculate standard errors for the estimators using the bootstrap and provide confidence intervals based on each estimate. Which method appears to be preferable?

3. Problem 2, p. 99 of the textbook.