

Homework 2B. Due in class Monday September 29th

Estimating the size of a population and understanding the factors that control population size are often high priorities for conservation and management. As in all aspects of science, it is important to measure population size in a manner that lets you make statistically-rigorous statements about the uncertainties in your data.

This is the first of three assignments involved in formulating and implementing a research design that uses distance sampling to measure population density, and to test what factors affect population density. Magpies and crows are the suggested study species because they are sufficiently common to allow you to collect good data: 30 sightings is typically the minimum sample size that will allow the unmarked package in R to estimate the probability of detection, density, and the effects of environmental variables on both of these. 40-50 sightings might be needed to estimate the effects of more than one environmental variable. Both species are in the family Corvidae and have similar ecology, so sampling both species is reasonable for many questions.

If you choose, you can work in a team of two to design the study (this assignment) and collect the data (next assignment), but you must analyze the data independently (final assignment in this project).

BIOE 440R:

1. Formulate and **clearly state a hypothesis** (or several hypotheses) about one or more factors that might affect the local density of magpies and/or crows. Consider the possibility that some factors might affect both density and the probability of detection.
2. **Describe the sampling design** that will allow you to test this hypothesis (or hypotheses) using data from distance sampling. Include a description of the variables you will record (in addition to the basic data on distance and bearing), and the logic underlying the process of locating transects so that your data are representative.

BIOE 521:

1. **Formulate a set of competing models**, each of which represents a hypothesis about factors affecting local density of magpies/crows (or another species of your choice), with the goal of using model selection via AIC scores to allow multi-model inferences. Consider the possibility that some factors might affect both density and the probability of detection. Consider whether or not to include an intercept-only model. **Clearly state what questions this process will answer.**
2. **Describe the sampling design** that will allow you to fit these models using data from distance sampling. Include a description of the variables you will record (in addition to the basic data on distance and bearing), and the logic underlying the process of locating transects so that your data are representative.