

# INDIRECT MEASURES OF POPULATION SIZE

## I. Objectives:

1. Learn techniques used to estimate population size through indirect measures
2. Describe the assumptions of these sampling techniques
3. Describe the conditions under which these techniques may be most appropriate for population estimates.

## II. Introduction:

Sometimes it is not possible to estimate the size of a population using mark-recapture or capture-removal sampling techniques. This is especially true for species of wildlife that are difficult to capture, cannot be easily marked, or which you do not want to remove from an area. In those cases, ecologists, wildlife biologists, and fisheries biologists may use indirect measures to estimate population density, such as counting the number of squirrel nests in a hectare of forest or recording numbers of bird vocalization at several points. Indirect measure typically cannot be used to get precise estimates of population density, but rather provide information on relative abundance that may be used in determining which area has greater numbers of an organism or in determining if there are changes in population size. Relative abundances of species can be sufficient to monitor seasonal or annual changes in population levels and to characterize faunal communities.

Indirect measures of population size include both direct observations of organisms that provide information on relative abundances as well as observation of indirect signs of the organisms' presence. Direct observation techniques include strip censuses, point surveys and roadside counts. Strip censuses involve walking (or in aquatic systems, swimming) a measured distance in a fixed time period (e.g. 1 km in 1 hr), with abundances expressed as the number of animals seen per kilometer or hectare. This is a variation on the line transect approach and provides an efficient method to collect a large amount of data quickly and with relatively little effort. The technique has been used for bird, mammal, insect and fish populations (where a diver swims a set distance). Roadside counts are a modification of the strip census technique. Observers travel a specific route, usually at the same time of day and at the same speed, and count the number of individuals seen. Care should be taken to census during the animal's peak activity times and to avoid poor weather conditions when the animals may not be active. Another modification of the strip census technique are point surveys. In point surveys, the observer spends a specific period of time (e.g. 5 min or 1 hr) at sites that afford suitable viewing. An index of abundance can be expressed as the number of animals seen per time unit of observation. This technique has been used widely for birds, mammals, reef fish and insects.

The above techniques involve ways of directly observing animals to obtain information on relative abundances. However, such direct observations of an organism may not always be practical, and one may have to resort to observations of indirect evidence of an animal's passing. Examples include counts of tracks, pellet or scat counts, nest counts,

tree markings for species that mark their territories, bird calls (often censuses from individual points), and feeding stations (as evidenced by shell remains or seed remains). These various indirect measures can be sampled through standard transect or quadrat approaches or by using one of the methods described above, such as a strip census or a point survey.

### **III. Methodology:**

In this lab we will go to a forested area owned by UNCW, the Ev-Henwood Preserve, to gain experience in using indirect measures. The exact methodology may be varied depending on weather conditions and season of sampling.

At the preserve, the instructor will take you on a tour of two trails, one that goes through a bottomland area and one that follows a forested ridge. Emphasis will be placed on showing the various types of indirect measures that can be used and in demonstrating strip census and point survey methods.

Next, the instructor will demonstrate the principles of radiotelemetry using a receiver, antennae, and telemetry device. These devices come in various sizes, depending on the species being studied, but should never weigh more than about 2% of the total body mass of the individual it is placed on. Otherwise, your study might be affected by the impact of the device on the animal.

A real demonstration of the use of the technique can proceed with one student taking the telemetry device and hiding in the woods. Another student will use the receiver, antennae, and headphones (if necessary) to track and locate the 'missing' student. Students may take turns at trying out this methodology and become familiar with the basics of radiotelemetry tracking.

Other points of interest to visit while at this preserve include an historic tar kiln, or circular digging where pine tar was extracted from trees by burning them in a pit. This was a common practice in southeastern pine forests in the 18th and 19th century to obtain the tar for naval stores. In addition, visit the large bald cypress tree on Town Creek. It is one of the largest of these trees left in this region. Finally, the TA will point out fields in various stages of ecological succession, a topic to be covered in the lecture portion of the course.