ECOLOGY LAB, PCB 3043L

Lab #1 – Sept. 11-12

FIELD SAMPLING TECHNIQUES

GENERAL LAB INTRODUCTION

Field sampling is an integral part of any ecological study. It is thus very important that you have a solid understanding of the methods employed. This assignment will introduce several basic techniques that ecologists frequently use to sample ecological parameters. Notably, very different techniques are generally used to field sample plants and animals. This lab will emphasize plant sampling. Most often, plant communities are sampled for either: 1) species composition and relative abundance of each species in the entire system, or 2) biomass and relative importance of each species to the system. Both are measures of the **structure** of the community or ecosystem you are sampling. However, biomass data, collected through time, also allow you to estimate productivity (as the rate of change of biomass), which is a measure of **function**.

Plant species composition is most often sampled in 1 of 2 ways. The Braun-Blanquett method involves identifying a specific area (called a "plot" or "quadrat"), identifying all species represented in that area, then assigning each a code based on its contribution to the total area. An example of Braun-Blanquet codes is:

0: species not present

1: species <5% of total

2: species=5-10% of total

3: species=10-25% of total

4: species=25-50% of total

5: species=50-90% of total

6: species>90% of total

Clearly, these are somewhat subjective classifications. It is thus important that the same observer make code classifications whenever possible. The second way to sample plant species composition involves identifying a plot or quadrat, as with Braun-Blanquet, but then counting the total number of individuals of each species within that area. Clearly, the second method is much more objective, but it is also much more time consuming.

Plant species biomass may be sampled either destructively (using harvest methods) or non-destructively. The former nearly always involve identifying a plot, clipping all aboveground vegetation within the plot, sorting this vegetation by species, drying it, and weighing it. Non-destructive sampling methods are numerous and variable. In some settings, such as wetlands and grasslands, clip-plot destructive techniques work very well. In other systems, such a forests, harvest methods are not tenable and non-destructive methods must be used. There are many ecological situations where it is against the best interest of either your ecosystem or your study to destructively sample plants. In these cases, you must think of ways to estimate plant biomass without actually harvesting your plants.

In lab today, we will measure both species composition and biomass using the following sampling techniques:

1. **Plot sampling**, or quadrat sampling, is most often used to intensively study a small portion of the system in question in order to obtain a representative sample. Most often plot samples are **replicated** a number of times, in a **random** or **haphazard** way, to ensure that the data represent an unbiased picture of the system.

2. **Point-quarter sampling** is more complex but expands on plot sampling in an attempt to reduce the amount of intensive labor involved in plot sampling. Rather than quantify the exact make-up of a specific plot a random number of individuals are selected to provide the **unbiased** picture of the system. **Replicate** samples using this method should also be taken to ensure statistical validity.

3. **Transect sampling** is another often-used method for sampling ecological systems. This method may be thought of as a long, narrow plot sample. Measurements are taken for all individuals who fall along the transect line.

The lab exercise today will involve working in the shallow wetland region of Hennington Pond, which is located just west of our Great New Golden Panther Arched Gates entrance to campus. The objectives are: 1) to compare and contrast the above 3 methods of sampling plant species composition in wetlands; 2) to compare and contrast several different destructive and non-destructive methods of sampling plant species biomass, and; 3) to identify important environmental factors (i.e.

water depth, soil depth) that appear to control plant species composition and biomass patterns in the Hennington Pond wetlands.

PRE-FIELD LAB INSTRUCTIONS

1. Generate several testable hypotheses as a class that you can test with today's exercise (Hint: the objectives, above, may help with this).

2. Discuss how to keep track of data when doing field ecological sampling. Set up field data sheets.

3. Divide into groups and work as teams in the field. Work should be divided up so that all team members get to experience each aspect of the exercise. In other words, don't make one person record data for the entire lab exercise!

4. Be sure that you have all field sampling equipment that you will need. Read below and make a list before you leave the lab.

5. Field teams will be rotating through the four sampling method stations noted below. Decide before you leave for the sampling site which groups will do which stations and in which order, to reduce confusion.

FIELD LAB INSTRUCTIONS

The following exercises must be performed by each field team, in orderly rotation:

1. A 10m X 10m area has been set up for the plot sampling. Use the "over the shoulder toss" method to identify a random quadrat location in this plot. Use a 1m X 1m quadrat for this exercise. In this quadrat, determine plant species composition using both the Braun-Blanquet and count methods. Remember to identify one member of your group who will consistently identify the B-B codes all day. Within the quadrat, be sure to measure water depth, soil depth, and any other environmental variables that you think are important (remember your hypotheses!).

2. A point-quarter sampling "anchor post" has been established in the Hennington Pond wetlands. Using the random numbers table on p. 246 of your lab manual, identify a compass heading for your first sampling (if the number from the table is ≤360, this is your heading; if not, then subtract 360 from it until you have a value ≤360). Use the last digit of the next random number in that row to determine your distance. Measure this distance off using a Keson tape and following your compass heading. At the end of this distance, place a 1m X 1m quadrat and determine plant species composition using both the Braun-Blanquet and count methods. Remember to identify

one member of your group who will consistently identify the B-B codes all day. Within the quadrat, be sure to measure water depth, soil depth, and any other environmental variables that you think are important (remember your hypotheses!).

3. A cross-wetland transect has been identified for you. First, measure the total length of the transect using a Keson tape. Now, using the random numbers table on p.246 of your lab manual, identify two distances from one end of your transect to be sampled. Use the last 2 digits of the number for these, in meters, and if the number is too large, continue across the row to the next random number. At the first of these distances along your transect, place a 1m X 1m quadrat and determine plant species composition using the Braun-Blanquet method. Remember to identify one member of your group who will consistently identify the B-B codes all day. At the other distance location, place a 1m X 1m quadrats and determine plant species composition using the count method. Within each quadrat, be sure to measure water depth, soil depth, and any other environmental variables that you think are important (remember your hypotheses!).

4. Plant species biomass will be sampled three different ways—and with varying degrees of destructiveness. In the area set aside for biomass sampling, randomly locate a 25cm X 25cm quadrat (see #1 for how to do this). Within this quadrat: 1) sample biomass nondestructively by counting the number of individuals of each species then haphazardly selecting 10 individuals of each species and measuring their height with a meter stick. Your haphazard selection of individuals to measure should encompass the entire size range you observe in your quadrat. Thus, height is your surrogate for biomass. 2) now haphazardly select 10 individuals of each species and clip them at the soil level. Measure their length and record it. Tag each individual with labelling tape and return it to the lab to be dried and weighed (making sure you can later identify the height and weight of each separate individual plant). You now have a haphazardly selected subsample of your population on which you can get actual weights, then extrapolate this weight to your plant counts. 3) Now completely harvest the plants in your quadrat and place all of the clipped plants carefully into a garbage bag. Mark the bag to identify where you harvested it, and return it to the lab to be dried and weighed. This, of course, will give you actual total biomass. Within your quadrat, be sure to measure water depth, soil depth, and any other environmental variables that you think are important (remember your hypotheses!).

5. Hand in all of your group's field notes to your TA at the end of the lab. She/he will combine them with those from the other groups and return a compiled dataset to you next week (this is an excellent reason to take clear and copious field notes!).