

## Plant Ecology Laboratory

# Forest Vegetation Sampling & Point-centered Quarter Sampling Method

### Introduction

The point-centered quarter (PCQ) method is one of the most frequently used distance methods employed to sample plant communities (particularly forests). After a random point has been located, the area around each point is split into four 90° quarters (quadrants—NOTE the "n"), and the nearest tree (DBH  $\geq 10$  cm) sought in each quarter. Each tree is identified to species, the distance from the point to the tree is recorded, and the DBH is recorded. To gain insight into overstory/understory relations, one can also seek out the nearest sapling (DBH  $> 2.5$  &  $< 10$  cm) in each quarter and record the same information as for trees.

For the purposes of this lab, we will address two questions: (1) Is the upper slope forest community different than the lower slope forest community? (2) In the future, when the overstory finally senesces or is disturbed, will the subsequent community at each slope position be similar in composition to the present community or different?

### Field Methods

- 1) Establish a 100 m transect along the elevational contour. There will be two or three (depending upon the number of field teams) parallel transects, spaced 25m apart, on the upper slope and two or three transects on the lower slope (4-6 transects total).
- 2) Place a PCQ sample unit 5 m out from the transect line at 0, 20, 40, 60, 80 and 100 m. To enter an element of randomness into your sampling, flip a coin to determine whether you go 5 m to the left or 5 m to the right of the transect to establish each point.
- 3) Identify and measure the distance & DBH of the 4 nearest trees and 4 nearest saplings as described above (use data sheets provided).

### Analytical Methods

- 1) Provide and interpret various estimates of diversity (methods of your choice).
- 2) From the summarized raw data, determine the absolute and relative values for density, dominance, and frequency, together with the importance value for each species, using the equations shown on the next page of this handout.

### Results

Provide separate tables summarizing vegetation data for the upper and lower slope. Provide a nested bar graph with 2 bars per species depicting abundance at upper and lower slope positions. Include any other tables or figures that you deem appropriate. Briefly survey the eastern North America hardwood forest literature for papers you think are relevant to forest structure and dynamics, effects of topography on species distribution, and forest succession.

To summarize your PCQ data proceed as follows (*do separate analyses for trees and saplings*):

**1. Calculate the mean point-to-plant distance** for the entire sample, regardless of species, and record the value.

This value squared gives the mean area per plant. The density of plants in the area sampled is then obtained by dividing the mean area per plant into the unit area on the basis of which density is to be expressed (e.g., 1 ha). Since the same units must be used in both the numerator and denominator, change 1 ha to 10,000 m<sup>2</sup>.

Thus, the Average Density (AVGDEN) = 10,000 / (mean distance in m)<sup>2</sup>.

**2. Determine density by species.** Count the number of individuals in your sample for each species and record. Determine the total number of individuals counted (4 times the number of points sampled). Thus, for each species,

Relative density (RELDEN) = (no. of indiv. of a sp. / total no. of indiv.) x 100  
and  
Density (DEN) = (RELDEN/100) x AVGDEN

**3. Determine basal area by species.** Start by converting diameter measures into basal areas (BA =  $\pi r^2$ ). Calculate the mean basal area for each species (AVGBA). Thus, for each species,

Basal area (BA) = DEN x AVGBA  
and Relative basal area (RELBA) = (BA / TOTBA) x 100

where TOTBA is the total basal area for all species (sum all BAs).

**4. Determine frequency.** For each species,

Frequency (FREQ) = (no. of points at which sp. occurs / total no. of pts. sampled)  
and  
Relative frequency (RELFREQ) = (FREQ / total FREQ for all spp.) x 100

**5. Calculate an importance value (IV) and relative importance value (RIV) for each species.**

Where IV = RELDEN + RELFRQ + RELBA;  
RIV = (RELDEN + RELFRQ + RELBA)/3

**Caution:**

- 1) The number of quarters sampled is *not* important for calculations, only the *number of points*.
- 2) Round all calculated values to 2 decimal places. Round all relativized values to the nearest whole number. Check that columns with relativized numbers sum to ca. 100.