POINT-QUARTER SAMPLING

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PURPOSE

Now that we have developed the ability to identify the native trees of the Blackstone River, we will make use of this knowledge in characterizing the structure of the forest. We will examine the density, frequency of occurrence and dominance of each tree species present, and draw conclusions about the nature of this forest habitat. We will do this for canopy and understory trees in order to gain some perspective on the direction of forest succession.

DESCRIPTION

Point-quarter sampling is a plotless method (a method that does not involve laying out a measured grid) for gaining information about the nature of a forest. From point-quarter sampling, you may learn facts like the density of individual tree species, how dominant tree species are, and how important particular tree species are in the forest ecosystem. We will learn to gather the data to make these determinations:

METHODS

1. Establish a straight line transect through the forest. Choose a compass bearing and head along it in a straight line.
2. Establish sample points. At intervals along the transect (say, 20 paces), establish sample points to gather data about trees. Each point should be statistically independent. That is, trees at one sample point should not be the same ones measured at the next point. Mark each sample point with a stick or colored flagging.
3. Establish four quadrats at each sample point. Draw on the ground a line perpindicular to the transect line to establish four sample quadrats. Quadrat one is in front of you (as you look down the transect line) and to the right, two is behind you and to the right, three is behind you and to the left, and four is in front of you and to the left.
4. Starting at quadrat one, measure the distance in meters to the nearest canopy tree (tree that reaches to the top of the forest). Also measure in centimeters the diameter (**not the circumference**) of this tree. Repeat the procedure with quadrat 2,3,4. Do the same for understory trees (those that do not reach the canopy but that are at least 2 m tall and have a single trunk).
5. Sample 10 total points. Move 20 paces or so down the transect line and establish a second sample point. Set up four quadrats and proceed as above. Do this for 10 total sample points. By the end of your sampling, you will have made measurements on 40 canopy and 40 understory trees. The data on distances and diameters are what you will analyze in the laboratory part of this investigation.

ANALYSIS

1. Divide your field data onto separate sheets for each tree species you encountered. **Make sure all your data are recorded in the same units** (centimeters, for example). Then calculate the following for canopy and understory trees:

2. **Mean Distance (D):** Add all the distances you measured for all trees at your 10 sample points. This is the **Total Distance.** Divide this total by the number of quarters you sampled (4 quarters each at 10 sample points = 40 quarters).

$$\mathbf{D = Total\ Distance/40}$$

3. **Absolute Density (AD):** Calculate this for a 100 m^2 area, by dividing 100 by the square of Mean Distance calculated in (2):

$$\mathbf{AD = 100/D^2}$$

4. **Total trees per species:** Add the number of individuals you encountered for each tree species

5. **RELATIVE DENSITY (RD):** Take **Total trees per species** and divide it by 40. Do this for each species:

RD = Total trees per species /40

6. **Number of Trees per Species/ 100 m^2** Multiply **RD** by **AD** to find the number of trees/ 100 m^2. Do this for each species:

Number of Trees per Species/ 100 m^2 = RD x AD

7. **Basal Area (BA):** Convert the diameters you measured for each tree into **Basal Areas** by finding the area of a circle:

$$BA = 3.1416 \times (diameter/2)^2$$

8. **Average Basal Area (ABA):** Add **BA** calculated in (6). Divide this by **Total trees per species** calculated in (4). Do this for each species:

ABA = BA/ Total trees per species

9. **Absolute Dominance (ADO) :** Take the **ABA** you calculated in (8) and multiply them by **Number of Trees per Species/ 100 m^2** calculated in (6). Do this for each species:

ADO = ABA x Trees per Species/ 100 m^2

10. **Dominance Sum (DS):** Add all the ADO calculated in (9).

11. **RELATIVE DOMINANCE (RDO):** Divide the **ADO** calculated in (9) by the **DS** calculated in (10) and multiply their quotient by 100. Do this for each species:

RDO = (ADO/DS) x 100

12. **Total Frequency (TF): A**dd the number of **points** (not the number of quarters) at which the species occurred. Do this for each species:

13. **Absolute Frequency (AF):** Divide its **TF** by the number of points you surveyed (12), and multiply the quotient by 100. Do this for each species:

AF = (TF/10) x 100

14. **Frequency Sum (FS):** Add the **AF** for all species.

15. **RELATIVE FREQUENCY (RF):** Take the **AF** you calculated for each tree species in (13), divide them by **FS** calculated in 14, and multiply the quotient by 100. Do this for each species:

RF = (AF/FS) x 100

16. **IMPORTANCE VALUE (IV):** Add **RD**, **RDO**, and **RF**. Do this for each species:

IV = RD+RDO+RF

17. Rank the tree species you sampled from highest to lowest **IV.**

INTERPRETATION

Once you comp ile and analyze your data, you must determine what your data mean. Consider the following as you write your lab report:

1. What is the overall density (number of tree trunks/hectare) and basal area (area actually covered by trees) of trees in the forest studied?
2. What are the most important tree species in the forest? By looking at literature on tree habitat requirements (e.g. from books, on the internet), why do you think that these species are the most important?
3. What problems did you encounter while conducting this investigation that may have affected your results?
4. How did your findings compare with the findings from other lab groups? Were the same tree species most important on their transects? How would you account for the similarities and differences in both of your results?
5. Do all the understory trees encountered grow to canopy size?
6. For those species that do grow to canopy size, how do the importance of understory trees compare to canopy trees? What might this mean in terms of forest succession? What, therefore, might the composition of the forest be in 100 years?
7. What types of disturbance occur within the floodplain forest? How might these disturbances influence the direction of succession in this community?