Measuring Plant Frequency

I. **Definition** - Frequency is the number of times a plant species is present in a given number of quadrats of a particular size or at a given number of sample points. Frequency is usually expressed as a percentage and sometimes called a *Frequency Index*. The concept of frequency refers to the uniformity of a species in its distribution over an area. No counting is involved just a record of species present.

II. **Uses of Frequency Data.**

A. Frequency is most often used to compare plant communities and to detect changes in vegetation composition over time.

B. Used to describe the distribution of a species in a community.

C. Often used in combination with density or cover estimates.

D. Used to measure trend or condition.

E. Shouldn't use frequency to compare abundance of different species.

III. **Advantages:**

A. High repeatability can be obtained.

B. Fast and easy to measure.

C. Frequency of rooted plants is less sensitive to fluctuations in climatic and biotic influences; especially for perennial vegetation.

D. Can describe distribution of species in a community.

IV. **Limitations:**

A. Frequency is highly influenced by the size and shape of the quadrats used.

B. Highly sensitive to changes resulting from seedling establishment.

C. Sensitive to abundance and changes in pattern of distribution in the sampled area.

D. Frequency cannot tell which parameter has changed: canopy, cover, density or pattern of distribution.

E. Hard to interpret frequency data due to no definite relationship between frequency and density for non randomly distributed plant population.

V. How to Determine If a Species Is Present or Absence:

A. First, specify what constitutes a plant species being present. Any of these will work as long as the technique is documented.

1. Rooted inside the plot or runners?

2. Shoots or whole plant?

3. Overhang inside the plot or rooted only?

B. Rooted Frequency - the plant of interest must be rooted inside the sample plot in order to be counted. This is the most commonly recorded measure of frequency.

C. Shoot Frequency - any runners, shoots, leaves, and/or overhang, etc. that lie inside the plot allows the plant to be counted.

VI. Frequency Is Influenced by Plot Size and Shape.

A. If the sample plot is small, the chances of the plant species of interest being recorded is small, causing a low frequency.

B. If the plot is too large, the plant species of interest will be in almost all the plots. This will cause a high Frequency Index and will not show the plant distribution in a community.

C. Suggested empirical sizes (Cain and Castro 1959.)

Moss layer	. 01-.0 m^2	
Herb layer	1-2 m^2	
Tall herbs and low shrubs	4 m^2	
Tall shrubs and low trees	10 m^2	
Trees	100 m^2	
Other commonly used units	1 m^2	(1x1 m or 2 x ½ m)

Remember: ***Frame size must be uniform in order to use for comparisons between species!***

VII. Dr. Karen's Collection of Guidelines

A. Plot size should be such that frequency for the important species fall between 10% and 90%.; or, if possible between 20% and 80%.

B. Plot size may change depending on species measured. Plot size should be 1 to 2 times as large as mean area of most common species.

C. Include max. number of species (big enough plot to include many species).

D. There is a math equation to help determine size of plot using a logarithmic relationship between frequency and density (refer to Bohnam 1989).

E. 25 plots randomly located or 25 randomly located transects should give satisfactory results within a homogeneous plant community.

F. If frequency is 100% for the plant species in interest, reduce the frame size (Daubenmire 1969).

G. If plant species of interest is not present in <u>most</u> of the samples taken, increase plot size.

VIII. Frequency measurement methods:

A. Frequency measures can be accomplished by random or systematic locations of plots.

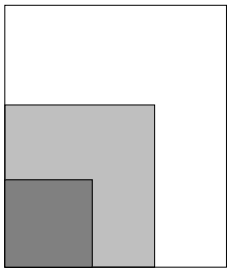
B. Plots

1. Count and record the number of individuals of each species in a each plot

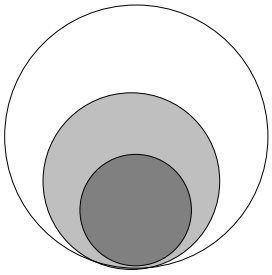
2. $$\%\ \text{freq. Spp}_1 = \left[\frac{\#\text{of plots in which Spp}_1\ \text{occurs}}{\text{Total \# of plots examined}}\right] \times 100$$

3. For example. If 200 plots were examined and *Festuca idahoensis* occurred in 34 of the plots then, % Frequency of *Festuca* is 17% = (34 ÷ 200) × 100

C. Nested Plots



3 Square Nested Plots



3 Circular Nested Plots

1. A series of 3 -5 plots nested within each other

2. Record plant nested in smallest plot, then in successively larger plots

3. Presence of a plant in smaller plot = presence in larger plot

4. Estimate Frequency for each plot separately (equation given above)

5. Look at data to see which plot size most appropriately estimates each important species. The advantage of this technique is that one does not need to determine in advance which plot size is going to best represent each species.

D. Points - sampling or step-point (Also, used for cover measurements).

1. At each point, record the species at the tip of the boot or the plant nearest to that point.

2. $$\%\ \text{freq. Spp}_1 = \left[\frac{\#\ \text{of hits of Spp}_1}{\text{Total \# of step-points}}\right] \times 100$$

IX. Important Reference for Estimation of Fequency.

Bonham, C.D. 1989. Frequency 90-96p. Measurements for Terrestrial Vegetation. John Wiley and Sons Inc. New York, NY pp. 90-96.

Cain, S.A. and G.M. DE O. Castro. 1959. Manual of Vegetation analysis. Harper, NY pp. 325.

Daubenmire, R. E. 1968. Plant communities: A textbook of plant synecology. Harper and Row, New York. pp. 300.

Mueller - Dombois, D. and H. Ellenberg. 1974. Aims and Methods of Vegetation Ecology. John Wiley and Sons Inc. New York, NY pp. 74

Smith, S.D. S.C. Bunting and M. Hironaka. 1986. Sensitivity of frequency plots for detecting vegetation change. Northwest Science. 60:279-286.