

An Evaluation of the Quadrat Method in the Blackjack-post Oak Forest

COPPOCK, R. K., C. A. ELY, R. W. FICKEN and MARY GAYLE SMITH,

University of Oklahoma, Norman

A complete census of a blackjack-post oak forest in Cleveland County, Oklahoma, was made in the spring of 1954. In an attempt to find a sampling technique which was more rapid and required less equipment than the quadrat method, this forest was then sampled by the variable-radius and paired-tree methods (1). This stand was sampled by the quadrat method by the plant ecology class under the direction of Prof. Penfound, in late September and early October of 1955. On the bases of accuracy, equipment needed and time of sampling, it was concluded that the quadrat method was the least satisfactory of the three techniques utilized.

This stand of the blackjack-post oak forest was described in some detail by Rice and Penfound (1). Since their study it had neither been burned nor grazed up to the time of the quadrat sample in the autumn of 1955.

METHODS

In the quadrat analysis, forty quadrats of two square rods each were laid out in pairs, in such a manner as to obtain subsamples throughout the entire stand. In sampling, all woody plants with a DBH of three inches or more were counted and measured. From these data the frequency, density and basal area completions were made. A total of 16 man hours was required in obtaining the sample. More time was spent in laying out the quadrats than in taking the data.

After considerable discussion it was decided that the most important items in determining dominance were relative frequency, relative density, relative basal area and importance percentage. The relative data are obtained by dividing the frequency, density or basal area of a given species by the sum of the frequencies, densities or basal areas of all the species encountered in the stand. The importance percentage is a summation value derived by adding the relative frequency, relative density and relative basal area of a given species and dividing by three.

RESULTS AND DISCUSSION

On the basis of frequency, density, basal area and importance percentage, blackjack, *Quercus marilandica* Muenchh. was the dominant species (Table I). Using the same bases, post oak, *Quercus stellata* Wang. and black hickory, *Carya texana* Buckl. were secondary species and black oak, *Quercus velutina* Lam. was a very minor species (Table I). According to the census, however, the dominants were blackjack and post oak (1). In both the complete census and the quadrat analysis, the post oak exhibited a very low density but a comparatively high basal area indicating relatively few but large trees (Table I).

In comparison with the census data too few blackjacks and post oaks and too many hickories and black oaks were recorded (Table II). According to the quadrat method the basal area was much too low for blackjack and post oaks and somewhat too high for hickory and black oaks. Furthermore, the total basal area was much too low when compared to the census data (Table II). These facts suggest an unequal distribution or an insufficient number of quadrats.

According to Rice and Penfound (1) the sampling time for 40 points was five man hours in the paired-tree method and six man hours in the

variable-radius technique. The sampling time for 40 quadrats, however, was 16 man hours. Presumably the sampling time in the quadrat method might be reduced somewhat with additional field experience. However, it is probable that more sampling time would always be required in the quadrat method than in either the paired-tree or variable-radius techniques.

SUMMARY

1. A blackjack-post oak forest in Cleveland County, Oklahoma, was sampled by using forty 2 square rod quadrats.
2. On the bases of relative frequency, relative density, relative basal area and importance percentage blackjack was the dominant species. Secondary species included post oak, hickory and black oak.
3. In comparison with the complete census, the density and basal area data were too low for blackjack and post oak and too high for hickory and black oak. The total basal area was also too low.
4. On the bases of accuracy, equipment needed and sampling time it was concluded that the quadrat method was less satisfactory than either the paired-tree or variable-radius techniques.

LITERATURE CITED

1. Rice, E. I. and Wm. T. Penfound. 1955. An evaluation of the variable-radius and paired-tree methods in the blackjack-post oak forest. *Ecology* 36: 315-320.

TABLE I.

Frequency, density and basal area data, obtained by the quadrat method, in a blackjack-post oak forest.

Species	Relative frequency	Relative density	Relative basal area	Importance percentage
Blackjack	38	41	40	39.7
Post Oak	31	15	35	27.0
Hickory	17	28	18	21.0
Black Oak	14	16	7	12.3
Totals	100	100	100	100.0

TABLE II.

A comparison of density and basal area data, obtained by the complete census and quadrat methods, in a blackjack-post oak forest.

Species	Density Trees per acre		Basal area Sq. ft. per acre	
	Census	Quadrat	Census	Quadrat
Blackjack	110	78	23.3	15.5
Post Oak	48	28	22.0	18.7
Hickory	28	52	5.6	6.9
Black Oak	6	30	1.4	2.9
Totals	187	188	52.3	39.0