



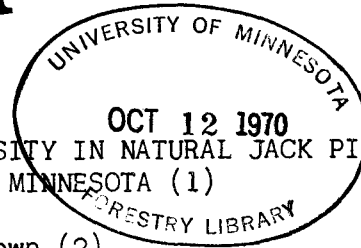
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FACTORS RELATED TO UPLAND-BRUSH DENSITY IN NATURAL JACK PINE STANDS
OF NORTH CENTRAL MINNESOTA (1)

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The jack pine (*Pinus banksiana*, Lamb.) forests of Minnesota constitute a renewable resource which is of great value in its economy. However, there is evidence to indicate that the regeneration of jack pine is far from adequate. A recent forest survey (3) reports a total of 1,425,400 acres of grass-upland brush type in the 16 northeastern counties where forestry is the resource base of many communities. This forest condition demands research directed toward the basic factors involved. An investigation was undertaken to ascertain what stand conditions and site factors are related to the development of "brush" populations in natural undisturbed jack pine stands. "Brush" is defined as all woody vegetation other than commercial tree species which at maturity is two feet or more in height.

Field data were collected from 101 sets of concentric plots (1/10, 1/100, 1/200 acres). From these data determinations were made of the stand basal area, stand age, site index, brush density, brush age, silt plus clay content of the 3 to 6 inch layer of the soil, and average stand diameter. On this basis the results reported earlier (4) have been substantiated and analyzed statistically.

The brush density (number of stems per unit area) has been used to evaluate the influence of the dynamic factors of the site. In this study, counts of the number of stems of brush per unit area ranged from 1 to 892. A logarithmic transformation of the number of stems per unit area was made to utilize the methods of linear regression.

Regression analyses of the linear relationships of these data indicate, within the range of the variables tested, unstratified by site quality or stand composition, that the standard error of estimate is the smallest for the regression of the logarithm of brush density on the silt plus clay content of the 3 to 6 inch layer of the soil. The analyses of these gross relationships show that the

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 - (3) Guilkey, P. C., B. Granum, and R. N. Cunningham, 1954. Forest statistics for Minnesota 1953. Lake States For. Exp. Sta. Paper No. 31.
 - (4) Brown, B. A. and H. L. Hansen - 1955 - Preliminary analysis of factors related to upland-brush density in Minn. pine stands. U. of Minn. For. Note #35.

logarithm of brush density is a highly significant and linear function of the stand basal area, average stand diameter, and site index. There is also a highly significant curvilinear relationship between the logarithm of brush density and stand age, brush age, and number of brush species per plot. These relationships indicate that the number of stems of brush per acre is a function of the productive capacity of the area. The precise relationships are somewhat obscure because of interactions and the size of the sample. Although this study was not designed to utilize correlation analyses, it is felt that the trends indicated lay the ground work for more widespread investigation.

In the interpretation of these data one must keep in mind the fact that this study was restricted to natural, undisturbed jack pine stands and also that the analyses indicate only the basic relationships among the variables and do not estimate the frequency distribution of the random variables in nature.

Summary of the regression equation and the standard error of estimate for regressions of the logarithm of brush density on each of the independent variables.

Independent variable - X	Regression equation	Standard error of estimate
Silt plus clay	$\log Y = 2.99 + .0410 X$	0.654
Basal area	$\log Y = 3.12 + .0150 X$	0.682
Average diameter	$\log Y = 2.66 + .2061 X$	0.695
Site index	$\log Y = 1.99 + .0340 X$	0.724
Stand age	Non-linear	Not Computed
Brush age	Non-linear	Not Computed
Number of brush species per plot	Non-linear	Not Computed

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