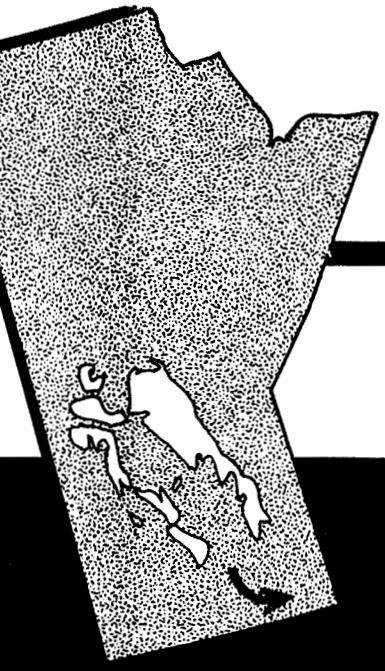
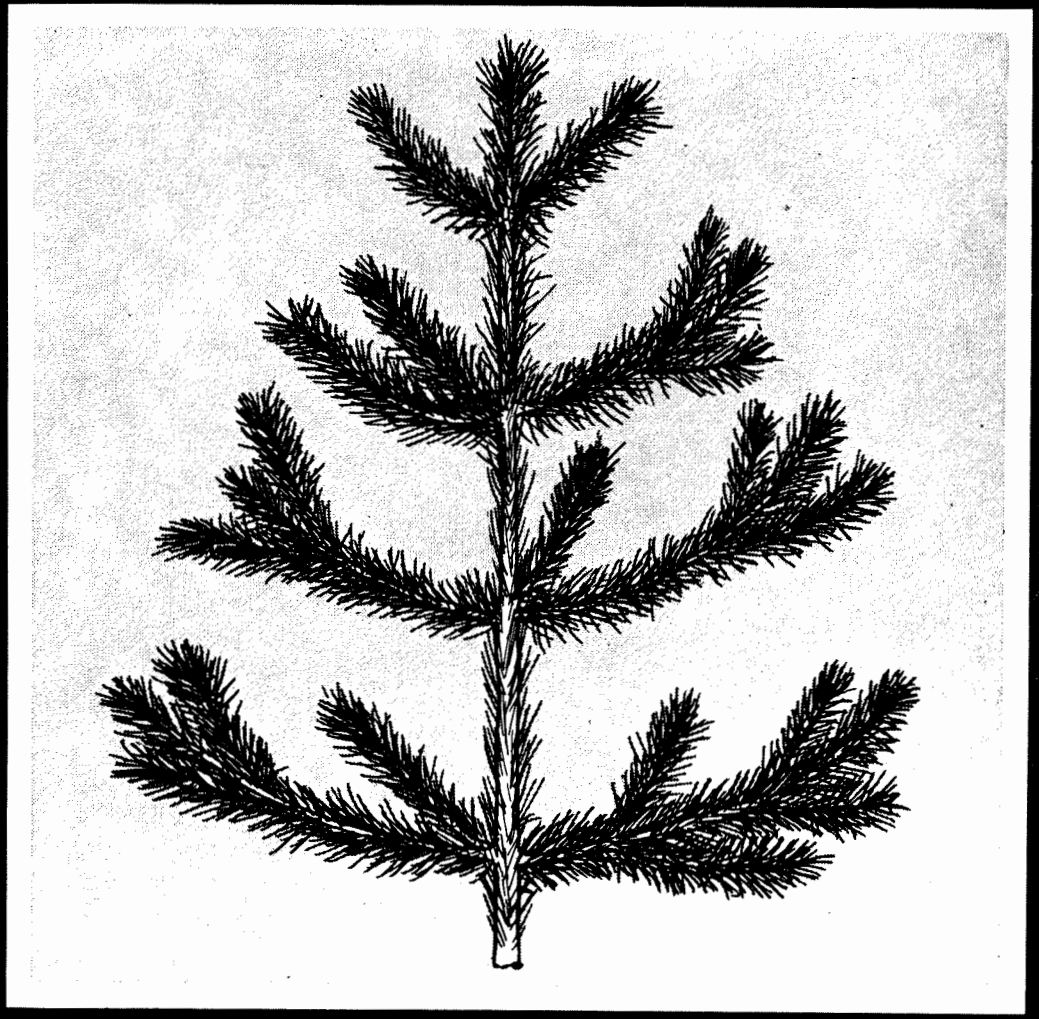


JACK PINE
In Southeastern Manitoba

A COMPENDIUM OF RESEARCH 1967 - 1970
SOIL FERTILITY OF PLOTS DIFFERING
IN RED PINE MORTALITY

Y. P. KALRA



Northern Forest Research Centre ● Edmonton, Alberta ● Information Report NOR-X-50F

JACK PINE IN SOUTHEASTERN MANITOBA:

A COMPENDIUM OF RESEARCH, 1967-1970.

VI. SOIL FERTILITY OF PLOTS DIFFERING IN RED PINE MORTALITY

by

Y. P. Kalra

NORTHERN FOREST RESEARCH CENTRE
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CANADIAN FORESTRY SERVICE
ENVIRONMENT CANADA
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FOREWORD

In 1967, research on problems related to the establishment and management of jack pine (*Pinus divaricata* (Ait.) Dumont = *P. banksiana* Lamb.) was intensified at the Forest Research Laboratory, Winnipeg, Manitoba, with the formation of an interdisciplinary Jack Pine Problem Area group. The group's attention was first turned to southeastern Manitoba where several new field studies were added to those already underway.

In 1970, the Jack Pine Problem Area group was dissolved as a consequence of a government decision to close the Winnipeg Lab. Some of the group's studies were terminated and others have since been brought to conclusion.

This series of Information Reports provides a "coordinated" means of reporting the results of Jack Pine Problem Area studies consistent with the group's aim: "To direct coordinated research to those problems which pertain to (1) the management of jack pine sites and (2) the establishment, management and use of jack pine".

We dedicate these reports to Mr. C. C. Thomson, former Director of the Winnipeg Forestry Laboratory, who promoted the interdisciplinary research concept, encouraged group participation and individual criticism, and generally provided the milieu which allowed researchers of varied discipline and background to pool their talents and work together on forest research problems in Manitoba and Saskatchewan.

Additional copies of this, and other reports in the series, are available from:

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(EDITORS)

SOIL FERTILITY OF PLOTS DIFFERING IN RED PINE MORTALITY

by

Y. P. KALRA*

ABSTRACT

Fertility status of a mini ferro-humic podzol under an 8-year-old red pine plantation was studied in relation to four levels of tree mortality. Analysis of soil samples showed that variation in mortality was not related to soil fertility. This observation and the fact that there was no indication of damage due to an infectious disease, insects, or browsing suggests that mortality was possibly due to summer drought.

In the Sandilands Provincial Forest of southeastern Manitoba, pure jack pine (Pinus banksiana Lamb.) stands occupy most of the drier sites. Red pine (Pinus resinosa Ait.) seldom occurs naturally on what are generally considered "dry" sites, but it is sometimes planted there along with jack pine. During the 1967 growing season many red pine plantations that appeared vigorous in previous years had turned reddish brown, and severe top-killing and mortality occurred throughout the region.

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* Head, Soils Laboratory, Northern Forest Research Centre, Canadian Forestry Service, Department of the Environment, Edmonton, Alberta, T6H 3S5.

Relationship between nutrient level of soil and mortality of red pine has been reported. Shirley and Meuli (1939) observed that increasing the nitrogen content of the soil in which the red pine seedlings were planted consistently resulted in an increase in damage due to drought. However, increasing phosphorus, either alone or in combination with nitrogen, improved drought resistance. An investigation was, therefore, conducted to determine whether the more recent top-killing and mortality in Southeastern Manitoba were associated with nutrient status of the soil.

Soil conditions under a red pine plantation six miles east of Marchand, Manitoba were investigated. The plantation was eight years old and showed varying degrees of tree mortality
The soil was a mini ferro-humic podzol (Canada Department of Agriculture, 1970).

A 3.2-acre sample plot within the red pine plantation was divided into four sub-plots, A, B, C, and D on the basis of differing tree mortality, < 25, 25-50, 50-75 and >75%, respectively. Ten sampling locations were selected at random in each sub-plot and soils were collected from the 0-6 inch depth in July, 1968. The samples for each sub-plot were combined and analyzed for texture, pH, organic matter, total nitrogen, easily extractable phosphorus and exchangeable cations by standard laboratory procedures (Kalra, 1971).

It was found that the fertility levels of the four sub-plots (Table 1) were quite similar and could not account for the differences

in tree mortality within the plantation. Field inspection showed that there was no indication of damage due to an infectious disease, insects, or browsing. These observations and the fact that precipitation during May-September 1967 (Weather Station at Sprague, Manitoba) was 30% less than normal (Department of Transport, 1967) suggest that summer drought was the possible cause of tree mortality.

ACKNOWLEDGEMENT

Thanks are expressed to H. Phillips for his help during the course of this study.

LITERATURE CITED

Canada Department of Agriculture. 1970. The system of soil classification for Canada. Ottawa, Ontario.

Department of Transport. 1967. Monthly Records (meteorological observation in Canada), Meteorological Branch, Department of Transport, Toronto, Ontario.

Kalra, Y. P. 1971. Methods used for soil, plant, and water analysis at the Soils Laboratory of the Manitoba-Saskatchewan region, 1967-1970. Can. For. Serv., Dept. Environ. Edmonton, Alberta. Inf. Rep. NOR-X-11.87 p.

Shirley, H. L. and L. J. Meuli. 1939. The influence of soil nutrients on drought resistance of two-year-old red pine. Am. J. Bot. 26: 355-360.

TABLE 1: Results of analysis of soils from the study area

Sub-plot*	pH	Silt plus clay (%)	Textural class	Organic matter (%)	Total N (%)	Easily extractable P (ppm)	Cation exchange properties (me/100 g)					
							Ca	Mg	K	Na	H	CEC
A	6.1	7.6	Sand	1.38	0.03	25.7	1.50	0.48	0.12	0.09	2.01	4.30
B	6.2	8.1	Sand	1.67	0.04	14.6	1.51	0.48	0.12	0.07	2.11	4.23
C	6.3	7.7	Sand	1.47	0.04	19.4	1.46	0.46	0.14	0.06	2.20	4.90
D	6.2	10.1	Sand	1.35	0.03	17.8	1.34	0.43	0.12	0.06	2.08	4.70

* A: Tree Mortality < 25%

B: Tree Mortality 25 - 50%

C: Tree Mortality 50 - 75%

D: Tree Mortality >75%