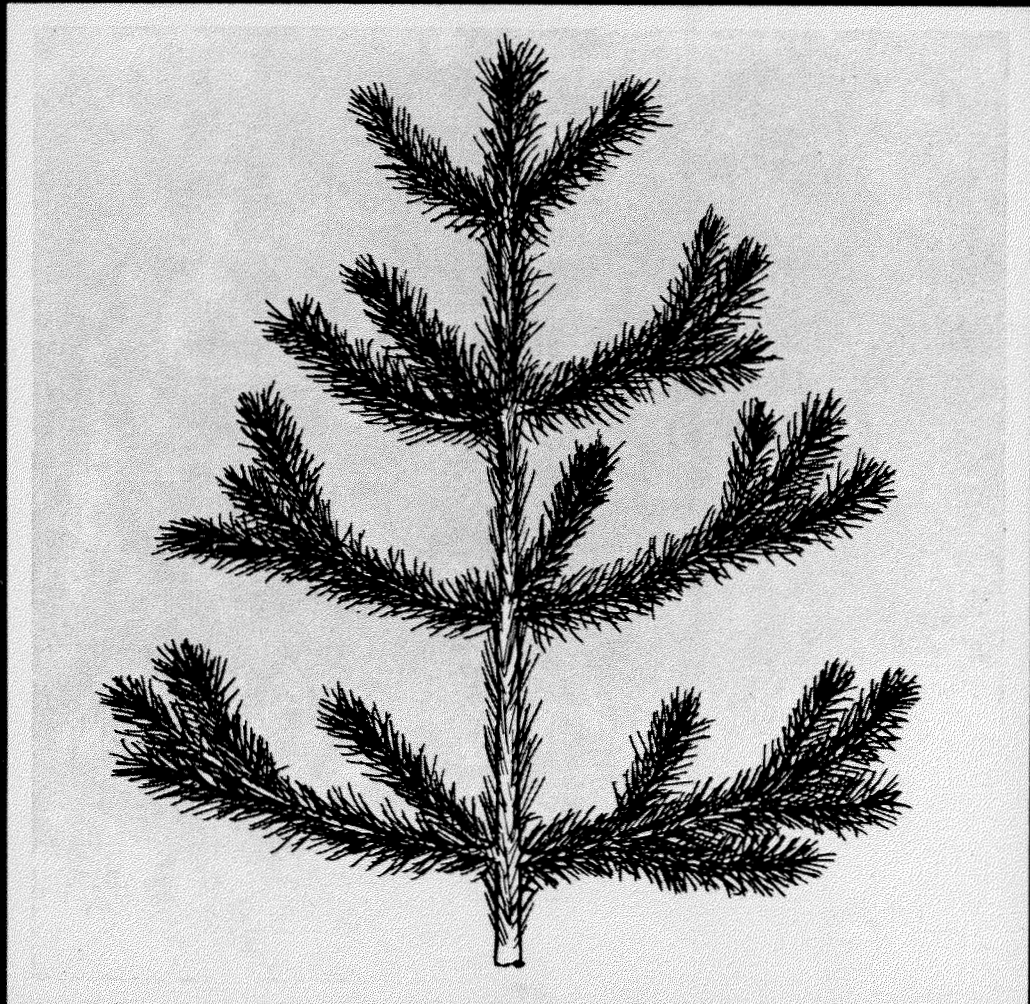


# JACK PINE

In Southeastern Manitoba

A COMPENDIUM OF RESEARCH 1967-197

INTRODUCTION  
BY R.C. DOBBS & E.T. OSWALD



JACK PINE IN SOUTHEASTERN MANITOBA; A COMPENDIUM  
OF RESEARCH, 1967-1970

I. INTRODUCTION

by

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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 under way.

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 "co-ordinated" means of reporting the results of Jack Pine Problem Area studies consistent with the group's aim: "To direct co-ordinated 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, Director of the Winnipeg Lab., 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)

## INTRODUCTION

### The Study Area

The reports of this series are based on research conducted in the Rainy River Section (L.12) of the Great Lakes - St. Lawrence Forest Region (Rowe 1959) within Manitoba. This area, covering approximately 3,000 square miles, lies east of Steinbach and mostly south of the Trans-Canada Highway (Fig. 1).

The area was inhabited by Indians of the Cree Nation when the first white explorer, Pierre La Verendrye, established a fur trading post at the Northwest Angle of the Lake of the Woods in 1732 (Gill, et al., 1956). The first use of the forests in southeastern Manitoba occurred in the 1870's following settlement in the Red River Valley (Smith, et al., 1964). There was considerable settlement in the area between 1900 and 1930, leading to heavy clearing of jack pine (Pinus banksiana Lamb. = P. divaricata (Ait.) Dumont) by fire and cutting; few undisturbed stands remain (Smith, et al., 1964). Today, the area is sparsely populated and economically depressed. Wood cutting is a major source of income.

Southeastern Manitoba has hot, moist summers and cold, relatively dry winters. Monthly average temperatures recorded at Sprague (Fig. 1) range from 18C in July to -19C in January (Smith, et al., 1964). Diurnal and daily fluctuations about these means tend to be quite large. There are between 2,700 and 3,000 growing degree-days above 5C (Bougner, 1964). The area has an average

annual precipitation of 56 cm, which about 70% falls as rain during the period April to October and about 30% as snow from November through March; the average annual snowfall is 137 cm (Mueller-Dombois, 1964; Smith, et al., 1964).

The surface geology of the study area has been principally determined by the action of continental glaciers and associated melt water (Smith, et al., 1964). The area was covered by glacial Lake Agassiz until about 10,500 years B. P. (Elson, 1967). During the ensuing period, the Campbell phase, beaches formed on moraines which protruded above the surrounding lake (Kupsch, 1967). These beaches, modified by wind and water erosion, comprise most of the area presently covered by jack pine. Various drift deposits and some subsequent alluvial deposits, windblown sand and organic deposits formed the parent materials from which the soils have developed.

Relief of the area is quite low; topography is mostly flat to undulating, ranging in elevation from 275 to 400 m. Surface drainage is generally poorly developed, and large, swampy tracts occur. The upland portions of the area, which support the pine stands, are characterized by well-drained water-washed tills, outwash sand and beach deposits (Smith, et al., 1964).

Jack pine is the predominant tree species on the sandy uplands above 330 m. Scattered pure and mixed red pine (Pinus resinosa Ait.) stands occur in the southern and eastern portions. The substantive wet lands support black spruce (Picea mariana (Mill.) BSP.),

tamarack (Larix laricina (Du Roi) K. Koch), and eastern white cedar (Thuja occidentalis L.), as well as willow and alder scrub (Rowe, 1959). Trembling aspen (Populus tremuloides Michx.) and, to a less extent, white birch (Betula papyrifera Marsh.) are found throughout the area. Relatively small amounts of white spruce (Picea glauca (Moench) Voss), balsam fir (Abies balsamea (L.) Mill.) and eastern white pine (Pinus strobus L.) also occur.

Mueller-Dombois (1964) delineated forest habitat types in southeastern Manitoba according to soil moisture and nutrient status. Jack pine occurs on five habitat types and two subtypes which are described below.

Very dry (vd) - this occurs only on high dunes or dunes blending into sandy recessional moraines. Jack pine is the only tree species occurring on this habitat. Much of the forest floor is barren needle cover. Lichens (Cladonia spp.) are the dominant undergrowth vegetation. Forest productivity is very low; the site index (50 years) for jack pine is  $40 \pm 4$ .

Dry (d) - this is geographically an extensive type occurring on sandy recessional ground moraines, on glacial outwash, and on the knolls or crests of high beach deposits. The water table normally occurs at about 250 cm in the spring and drops below 300 cm by the end of the growing season. Predominant ground vegetation is low ericaceous shrubs, e.g. Arctostaphylos uva-ursi (L.)(Spreng bear berry) Vaccinium angustifolium Ait.

(Sweet bilberry). Forest productivity is low; the site index for jack pine is  $46 \pm 3$ .

A drier subtype (d+) is also recognized. This subtype is often found on low dunes or on crests of recessional moraines. It occurs frequently as an historic variant following repeated or severe ground fires. The site index for jack pine is  $42 \pm 3$ .

Oligotrophic fresh (of) - this occurs on sandy beach

deposits lower outwash and sandy ground moraines. The water table is normally at approximately 100 cm in spring and may drop below 200 cm in later summer. Numerous shrubs and herbs are well developed. Pure stands of jack pine predominate and have a site index of  $51 \pm 6$ .

Oligotrophic moist (om) - this type is usually found on the

margins of beach deposits adjoining black spruce bogs. Normally the water table occurs within 30 cm of the surface in the spring and may drop to 150 cm by the end of the growing season. Ledum palustre L. ssp. greenlandicum (Oder) Hnlt. is a significant indicator, since this is the only upland habitat on which it occurs. Jack pine ssp. stands often contain a black spruce understory. Site index for jack pine is the maximum for the area,  $54 \pm 4$ .

Mesotrophic fresh (mf) - this type includes various combinations

of parent materials, but is almost always associated with



soils having a Bt horizon that allows storage of snow melt water. Numerous shrubs and herbs thrive here. Jack pine occurs in pure stands or mixed with white birch or aspen. Pure stands or hardwoods also occur. Site index for jack pine is  $50 \pm 4$ .

A drier subtype (mf-) is also recognized. The soil characteristics are similar to those of the main type, although the Bt horizon is less developed. Species composition is intermediate between the d and mf habitat types. Site index for jack pine is  $44 \pm 5$ .

#### Ecology of Jack Pine

Jack pine has the widest distribution of the pine species in Canada, and is only exceeded in distribution by three other conifers: tamarack, white spruce and black spruce. The range extends from the Mackenzie River and northern Rocky Mountains to New Brunswick, southward to northern New York, northern Minnesota, and sporadically to south-central Wisconsin, northeastern Illinois and northwestern Indiana. It is primarily a boreal species and occurs in pure stands or in mixtures of black and white spruce, balsam fir, trembling aspen and white birch, among other boreal tree species.

In most areas, jack pine is a shade intolerant, small to medium-sized tree and attains its best growth on fresh to slightly moist well-drained sites. It occurs on dry excessively drained sites and on very moist imperfectly drained sites, but the growth rate is reduced on the latter. It occurs primarily as a pioneer species in

cutover, burned or otherwise disturbed areas, especially if the disturbance exposes mineral soil and removes the vegetative cover.

Cone production occurs every year on mature trees, although good crops are produced at 3- to 4-year intervals. Cones, which require two years to mature are produced by trees as young as 5 years of age (Anon. 1948). The cones are mostly serotinous and require temperatures in excess of 50C to open. Temperatures sufficient to open cones are attained within one foot of the soil surface in open areas, especially areas blackened by fires. Closed cones containing viable seeds may remain on trees for at least 25 years. Usually, however, some cones open every year. Some genotypic varieties are almost nonserotinous (Anon., 1948) and the cones of trees less than about 20 years old tend to open more readily than those on trees 40 or more years old (Walker, 1965).

In the absence of fire, seeds are generally dispersed in the autumn shortly after maturation of non-serotinous cones, although a few may be dispersed throughout the year. Squirrels store caches of cones and thereby facilitate dissemination. Birds and rodents also aid in the dispersal of seed.

Natural germination usually occurs during the first spring after dispersal and is best on mineral soils. Following fires, however, germination may be very abundant on wet sphagnum and fibrous bogs. The germination percentage is variable but is usually satisfactory without pretreatment, although stratification hastens and improves germination (Anon., 1948). Seeds from trees approximately 20 years old usually germinate faster than seeds from 40-year-old trees although the percentage is about the same (Walker, 1964). After seeds are moistened,

germination requires at least a brief exposure to light. The recommended temperature regime for germination is 30C (day) and 25C (night). (Anon., 1948).

For comprehensive reviews of jack pine silvics, refer to Cayford, Chrosiewicz and Sims (1967) and to Rudolf (1958).

#### Research on Jack Pine in Southeastern Manitoba

A small amount of forestry research, including some on jack pine, was carried out in the Sandilands Forest Reserve (Fig. 1) of southeastern Manitoba between 1924 and 1930 (Cayford, 1960). In 1930, administration of Crown land in the area was turned over to the Province of Manitoba. No further forestry research was initiated in the area until 1946, when a nationwide regeneration survey was carried out by the federal Forestry Branch.

Since 1949, there has been a steady increase in the volume of jack pine research conducted in southeastern Manitoba. Throughout the 1950's and early 1960's the emphasis was placed on cutting methods, thinning, and natural and artificial regeneration. Reorganization of the federal Forestry Branch in 1964 brought a number of entomologists and pathologists to the Winnipeg headquarters, with ensuing development of research in these disciplines.

By 1967, a substantial amount of forestry research was concentrated in southeastern Manitoba and the need for interdisciplinary co-ordination became evident. Accordingly, a Jack Pine Problem Area Group comprised of research scientists from several disciplines was formed. The aim of this group was "..... to direct co-ordinated research

to those problems which pertain to (1) the management of jack pine sites and (2) the establishment, management and use of jack pine."

Initially, several pre-existing studies were brought into the purview of the Jack Pine Problem Area Group. The Group aim was advanced through evolution of these studies and by early development of a co-ordinated multi-disciplinary study of jack pine stand development.

In 1970, the Group was disbanded as a consequence of a government decision to close the Canadian Forestry Service Laboratory in Winnipeg. However, many of the studies which were under way have since been completed or have reached a stage where publication of results is feasible. The results of many of these studies will be presented in the Information Reports to follow in this series. The series is initiated with this Introduction and will be concluded with a Summary and Recommendations report. Intervening reports will cover various aspects of jack pine silvics, silvicultural practices, protection problems, ecology and plantation development.

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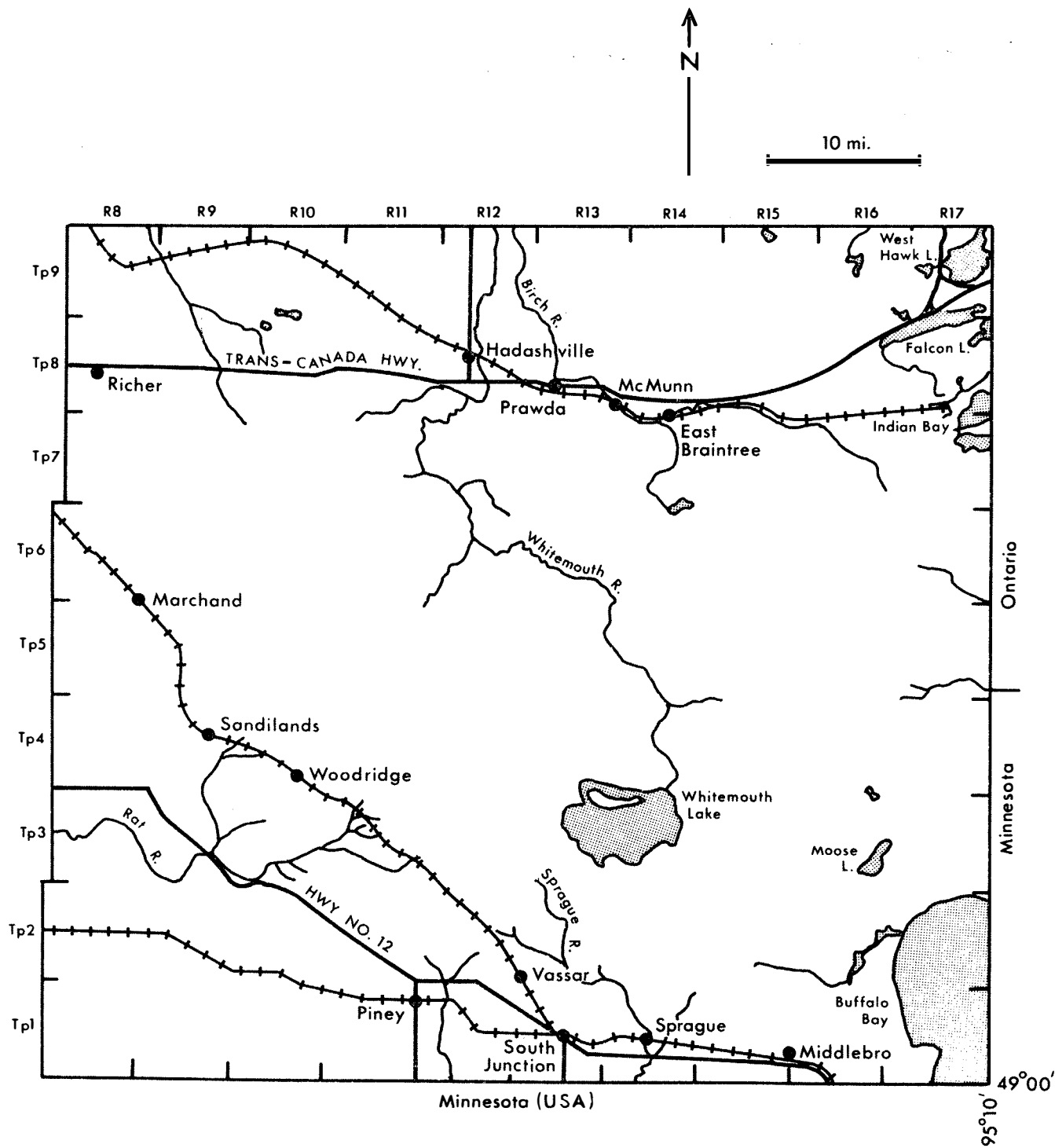


Figure 1. The study area.