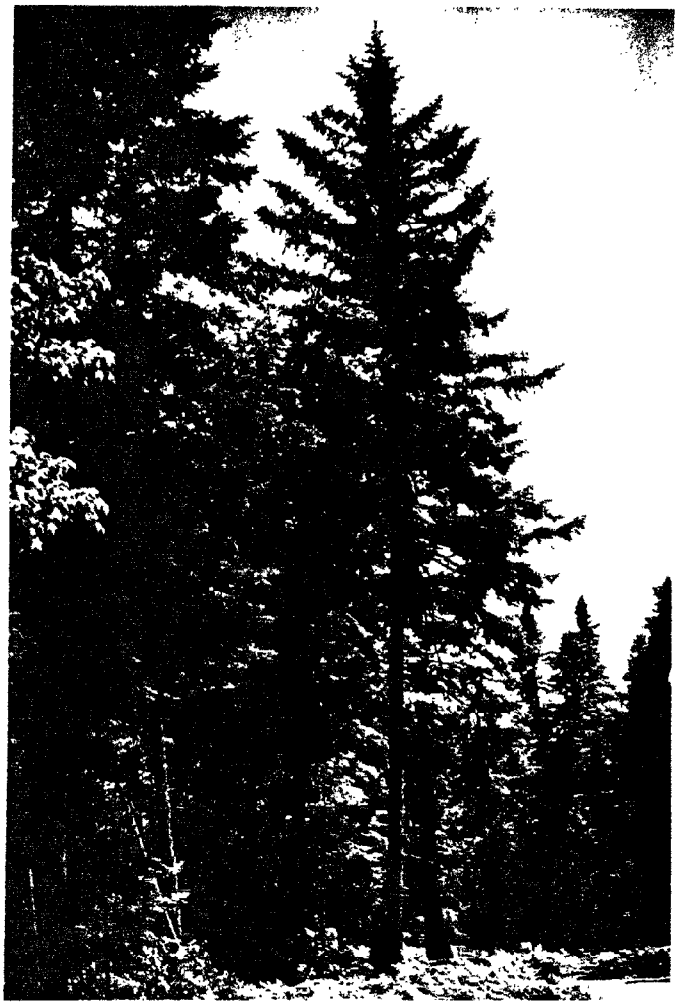
Proceedings of the SYMPOSIUM ON INTENSIVE CULTURE OF NORTHERN FOREST TYPES



USDA FOREST SERVICE GENERAL TECHNICAL REPORT NE-29
1977

FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE
NORTHEASTERN FOREST EXPERIMENT STATION
6816 MARKET STREET, UPPER DARBY, PA. 19082

FOREWORD

THE NORTHERN FOREST TYPES constitute a vast natural resource for the United States and Canada. For instance, in the eastern United States there are more than 10 million acres of commercial forest land supporting spruce and fir types alone. The magnitude and variety of this resource is such that treating it in any detail at a 3-day meeting was impossible. Rather, the idea that germinated and developed into this symposium was to present a broad picture of the extent of our knowledge of intensive cultural techniques, the status and trends of our research in the northern forest types, and some actual experiences in managing this resource; and to explore those factors that affect our use of the intensive cultural techniques we have at hand.

There is no doubt that we face a new era in the management of northern forests. The production of wood products is no longer the primary objective of many owners, and increased pressure for the social values of our forests is being felt by all landowners. We must recognize these other forest values, which in turn dictates intensification of all aspects of forest management if we are to meet the future demands of a wood-hungry society.

The enthusiastic efforts of the symposium sponsors—the School of Forest Resources, University of Maine; the Maine Bureau of Forestry; the Maine Forest Products Council; and the U.S.D.A. Forest Service—and the individuals behind those efforts, should be commended. Special thanks are due to Great Northern Nekoosa, Inc., and Brooks B. Mills for their help in providing interesting field trips, and to the Casco Bank and Trust Co. for sponsoring the symposium brochure. Also, without the enthusiastic participation of the experts invited to present papers, and the moderators of each session, the Symposium could not have taken place.

—BARTON M. BLUM
Symposium Chairman

PUBLISHER'S NOTE

This report is published by the Northeastern Forest Experiment Station as a public service. The papers it contains are published as received from the authors. Any questions or comments about these papers should be directed to the authors.

Proceedings of the SYMPOSIUM ON INTENSIVE CULTURE OF NORTHERN FOREST TYPES

held 20-22 July 1976 at Nutting Hall, University of Maine, at Orono.

SPONSORED BY:
- School of Forest Resources, University of Maine
- Maine Bureau of Forestry
- Maine Forest Products Council
- Forest Service, U.S. Department of Agriculture

Symposium Committee Members

Barton M. Blum, USDA Forest Service, Orono, Maine.
Ralph Griffin, University of Maine, Orono.
Gordon Baskerville, University of New Brunswick, Fredericton.
Tom Corcoran, University of Maine, Orono.
Bart Harvey, Great Northern Nekoosa, Inc., Millinocket, Maine.
Dick Arsenault, Lavalley Lumber Co., Sanford, Maine.
Joe Lupsha, Maine Forest Products Council, Augusta.
Tim O'Keefe, Extension Forester, University of Maine, Orono.
Ed Giddings, University of Maine, Orono.
Robert Frank, USDA Forest Service, Orono, Maine.
Ken Hendren, Maine Bureau of Forestry, Augusta.
Jack Bulger, Maine Bureau of Forestry, Ellsworth.
Bill Adams, Maine Bureau of Forestry, Old Town.
Jonathan Ford, J. M. Huber Corp., Old Town, Maine.

Moderators

Fred Knight, School of Forest Resources
University of Maine: 20 July 1976, morning session.

Fred Holt, Maine Bureau of Forestry (retired): 20 July 1976, afternoon session.

Ray McDonald, Casco Bank & Trust Company: 21 July 1976, morning session.

Dick Kennell, USDA Forest Service, State & Private Forestry: 21 July 1976, afternoon session.

C. D. Hartley, Valley Forest Products Ltd., Canada: 22 July 1976, morning session.

CONTENTS

EVEN-AGED INTENSIVE MANAGEMENT
TWO CASE HISTORIES

by Harold M. Klaiber, Forestry Manager, Northeast Operations, Scott Paper Company, Winslow, Maine.

INTRODUCTION

In 1967 Scott Paper Company merged with the S. D. Warren Company and S. D. Warren became a division of Scott. In 1969 the S. D. Warren timberlands in the Bingham, Maine area were transferred from the Warren Division to the Northeast Operations of Scott. Included in this transfer were approximately 700 acres of tree plantations which had been established in the 1920's and early 1930's. A wide variety of both native and exotic species were planted. These included Douglas-fir, Norway spruce, European larch, Austrian pine, red and white spruce, and red and white pine.

As case histories to illustrate the practice of even-aged intensive silviculture, I have selected one plantation consisting of native red pine and white spruce in alternating rows, and one plantation of exotic Norway spruce as a pure stand.

TUSCON PLANTATION

The red pine (Pinus resinosa Ait.) and white spruce (Picea glauca Voss) plantation is located in Bingham, Maine and is commonly called the Tuscon plantation. The plantation contains 31 acres, of which 14 acres are alternating rows of red pine and white spruce. The planting site was an old field that had not been mowed and weedy vegetation occupied the site. Planting was done in the fall of 1930 at a cost of $10.40 per acre.

Initial spacing was 6 feet x 6 feet.

The white spruce planting stock was 3-1, and the red pine stock was 2-1.

In 1948 and 1949 the red pine was pruned. The stand was also thinned on an individual stem selection basis. The records do not indicate how much volume was removed, but report a profit of $31 per acre over and above the actual thinning cost, so some merchantable volume must have been removed in the thinning.

In 1971 increment borings on the red pine which had almost completely over-topped the white spruce showed that the red pine grew at a maximum of 5 rings per inch, but by 1971 had slowed to 10 rings per inch.

Also in 1971, measurements on 3 sample plots showed the following:

Species	Volume in Cords/Acre	Basal Area per Acre
Red pine	54.2 Cds.	186 sq. ft.
White spruce	7.3 Cds.	31 sq. ft.
Combined	61.5 Cds.	217 sq. ft.

In the 41 years since planting, merchantable volume growth averaged 1.5 cords per acre per year. This figure does not include the volume removed in the 1948-49 thinning because no record of the actual volume removed is available.

BRAZIER PLANTATION

The Norway spruce (Picea abies (L.) Karst.) plantation that I selected for the second case history is located in Brighton, Maine and is commonly known locally as the Brazier plantation. The total plantation is 27 acres, of which 10 acres are pure Norway spruce. The planting site was an old field with heavy grass cover. Planting was done in the spring of 1921.

Initial spacing was 6 feet x 6 feet.

The planting stock was 2-1.

In 1928 at plantation age 7 years, the Norway spruce were released from alder and grey birch competition which are typical volunteer species on old fields in this location.

In 1941 at plantation age 20 and again in 1948 at plantation age 28, individual crop trees were pruned.

In 1955 at age 34, the plantation contained a volume of 30 cords per acre. A thinning removed every 6th row of trees completely and removed individual stems on a marked tree basis in the 5 residual rows. Approximately 20% of the total merchantable volume was removed leaving a residual volume of 24 cords per acre for the entire 10 acres.

The year following this thinning, in 1956, a permanent 1/4 acre sample plot was established. The results of 20 years of measurements on this plot are shown in Table 1, covering the period from July 2, 1956 to June 30, 1976.

Table 1. BRAZIER PLANTATION - NORWAY SPRUCE

Date	Cords/ Acre	Basal Area (Sq.Ft.)	Avg. DBH (in.)	Avg. Height (ft.)
7/2/56	31.3	133	8.95	46
11/59	36.8	162	9.85	50
12/3/65	43.3	184	11.30	58
6/16/70	52.7	211	12.00	69
11/17/71	55.5	225	12.20	71
9/26/73[a].	44.9	175	10.30	71
6/30/76	48.5	187	10.40	71

a. After thinning.

In 1971 the plantation averaged 55.5 cords per acre with an average DBH of 12.2 inches. In early 1972 additional thinning was done with individual trees removed on a marked tree basis. Removal in this thinning averaged 10 cords per acre.

Based on the 1976 remeasurement of the permanent plot, the present stand volume is 48 cords per acre. The two thinnings have removed 15 cords per acre making a total net merchantable growth of 63 cords per acre for the 54 years since planting. This averages 1.2 cords per acre per

year for the 54 years.

During the 16 year period between thinnings (1956 to 1971) the net merchantable growth was 24.3 cords per acre or an average of 1.5 cords per acre per year for each of the 16 years.

EVEN-AGED GROWTH POTENTIAL

In both case histories cited, the intensive management consisted only of:

1. Species selection
2. Control of initial spacing
3. Early release from volunteer hardwoods
4. Thinning at infrequent intervals

One can only speculate what the growth potential of even-aged stands would be if initial planting stock were selected for superior growth capabilities, if the stand were fertilized perhaps 2 or 3 times during the rotation, and thinning was done at more frequent intervals. I believe these two case histories demonstrate that with some modest increases in the intensity of our management it is extremely likely that a minimum growth of 1.5 cords per acre per year over the entire rotation could be attained on considerable acreage in Maine.

SILVICULTURAL SYSTEMS - UNEVEN-AGED MANAGEMENT

by Morris R. Wing
Manager - Maine Woodlands
International Paper Company
Jay, Maine

Uneven-aged Management, to me, indicates some form of partial cutting, perhaps selective cutting or diameter limit control in the harvesting cut, which, in most cases, removes the larger diameter, more mature trees and leaves a residual stand composed of healthy, fast-growing, well-spaced second growth timber, with a good number of trees in the 6" - 12" diameter class.

My whole forestry background has been largely oriented towards some form of partial cutting, having been brought up in a logging family that believed strongly in this method of handling timberland. In fact, my own experience, gained from over 40 years of working with and observing the forests of Maine, has done nothing to shake my original belief that some form of selective or partial cutting is best suited for a high percentage of Maine forest land and, most particularly, for the spruce-fir type. Natural regeneration and good stocking is no problem here and nature needs only a little help to improve growth rates markedly.

I can think of only two future changes that could greatly alter my thoughts along these lines. One would be the development of some fast-growing softwood species or "super tree" that could be, hopefully, planted cheaply and would grow several times faster than natural regeneration. The other break-through would be some method wherein pulp mills could utilize bark-on softwood chips that would permit commercial and profitable thinnings of softwood thickets that normally occur after clear-cutting procedures.

When thinking of partial cutting, there comes quickly to mind several distinctive benefits to the landowner:

1. Better and more continuous growth rate (no raspberry stage).

2. Less exposure to a disastrous fire.

3. Better conservation of both soil and water.

4. Better control of desirable species mix in the residual stand and the natural regeneration that follows harvesting.

5. The control of species mix helps to reduce susceptibility to future insect epidemics; i.e., spruce budworm.

6. Improved wildlife habitat (for the public).

7. Higher return per acre because of increased stumpage values from sawlog quality, larger diameter trees.

8. Maintaining a constantly high resale value of the land, due to the ever-presence of a residual merchantable stand.

9. More frequent and continuing stumpage returns, with the escalation of stumpage value staying closer to the ever-increasing expenses of supervision and logging.

I did not mention in the above listed advantages the subject of aesthetics, but, surely, this is uppermost in the minds of some, and cannot be wholly discounted.

It is my strong belief, in view of rapidly rising cost of supervision and land taxes, that a forest landowner in Maine can no longer afford clear-cutting, in most instances. In this land of long, cold winters, the landowner cannot lose a single growing season. It is true that the landowner may gain in lower logging costs at the time of cut, but the continuing annual expenses of administration, protection, and taxes will

will surely eat up the money saved in logging expense before he can return to cut again on the same parcel.

It is apparent that it is becoming increasingly difficult to perform selective cutting in large commercial operations. It is also true that most mechanical logging systems on the market today do not lend themselves well to a system of partial cutting. It is my belief, however, that just around the corner, in Maine, there will be a need for more intensive forestry and, with this approach, the demand for machines oriented toward partial cutting will manifest itself. Heretofore, in Maine, wood supply has not been a problem and the demand has been for a machine to (1) replace labor, and (2) to log more cheaply, although it is sad to contemplate that this has not been achieved. It is obvious that the timberland base is going to remain about the same in this State and, somehow, more intensive forestry must be practiced if the growth rate is going to meet the demand.

Twenty years ago this spring, in 1956, International Paper Co. commenced the first large-scale marked wood operations in Maine. I think it will make more sense to you if I confine my remarks to spruce-fir management in northern Maine and I would like to use Twp. 16 Range 9 as an example of what one might expect as a result after some 50 years of partial cutting. I chose this town particularly because the cutting history of this land is typical of many land ownerships in northern Maine. T 16 R 9 is located fairly close to the confluence of the Allagash and St. John Rivers, with the township draining northerly into the St. John and easterly into Fish River. Company ownership in this town commenced by purchasing 1/4 interest in common and undivided in 1917. Over the years, the Company has acquired additional interest in this town until the present ownership is 65/72 I-P and 7/72 Pingree Heirs. This is a full size township comprising 23,340 acres, with almost exactly 80% of the land area in either mixedwood or softwood type. Although there are small volumes of white spruce and black spruce in the softwood mix, the major species, by far, consist of red spruce and balsam fir. In our Maine lingo, Foresters would refer to T 16 R 9 as a "good growing town", meaning a good site,

well drained, and definitely better growth than experienced on some other towns.

I think I should start the story on this town with a Company cruise in 1927 as made by John Marsh under the direction of Charles King. This cruise was made immediately after sawlog operations were completed, with most timber being cut to a stump diameter of about 12". This 1927 cruise found a residual stand of 144,000 cords, or 6.2 cords per acre. Some comments in this 1927 cruise report may be of interest to you.

The cruiser referred to two small sawmills that had been operating on the town during the 1920's and both of these mills had machinery for making shingles as well as lumber. He also commented that the sawlogs were hauled to the mills by log haulers and that the town had been cut hard (in his opinion) during the last 15 years.

I believe the significant thing here is that there was a residual stand left of some 6.2 cords of spruce-fir per acre, with 56% of the softwood volume in trees 10" d.b.h. and larger.

For the next 20 years, through the depression era, there was very little cutting of any kind taking place on this ownership and the next inventory figures available on this town were developed from a joint cruise by Great Northern Paper Co. and International Paper Co. in 1946. This cruise indicated a total stand of 213,000 cords, with an average stand per acre of 8.88 cords of spruce-fir. A few comments made in this cruise report might also be of interest.

I note that the cruiser is still making observations in 1946 about a road system that needs corduroying. He also mentioned extensive damage to white and yellow birch by the bronze birch borer. He also stated that in spite of heavy logging prior to 1929, "there is a good stand of spruce-fir on this town, due no doubt, to the fact that at the time of operating, the smaller diameter trees were not considered merchantable". The cruiser found no evidence of epidemic infestation of insects; so apparently this town missed the earlier spruce budworm epidemic.

Shortly after this cruise and in 1949, we commenced extensive operations on this town, with 179,000 cords being removed during the next 12 cutting seasons through 1960. All of these operations were on some type of a partial cutting basis, with the period 1949 through 1955 on diameter limit controls, and with the period 1956 through 1960, for the most part, marked wood on an individual tree selection basis. Since 1960, little cutting took place on the town until the spring of 1975 when nearly 5,000 cords were salvaged as a result of the spruce budworm epidemic. The total volume removed from the town, 1947 through 1975, and before the 1975 cruise, was 185,000 cords.

This township was re-cruised again last year (1975) which is some 15 years after large-scale operations ceased. The 1975 cruise revealed a total stand of 226,000 cords of spruce-fir, with 51% of the volume in sawlog quality trees 10" d.b.h. and larger. I might mention that the 1975 cruise indicated a stand of 11 cords per acre in the softwood plus mixedwood types and 13.6 cords per acre in the softwood type only which comprised almost exactly 50% of the total forested area. Of this volume above 10" d.b.h., 55% is spruce and 45% is fir.

Now, bear in mind that this present stand of timber on T 16 R 9, comprising 13.6 cords per acre in the softwood type, is now ready to cut again, even though 185,000 cords of softwood were removed from this town between 1949 and 1975. A comparison of the 1927 cruise with the 1975 cruise indicates that land classified as softwood had increased from 38% of the area to 49.8% of the forested area. It is true that some of this difference could be caused by a variation in cruising techniques, but it is obvious that the partial cutting procedures had at least maintained, and probably increased substantially, the acreage in softwood type.

There are many ways of expressing growth and growth rates on forest land. However, a factual examination of the growth data on this town between 1946 and 1975, based on actual cords removed and cords now standing in 1975, indicates a growth rate of .353 cords of spruce-fir per acre per year on the mixedwood plus softwood types together (18,327 acres).

Of course, if the rate of growth could be identified separately on just the softwood type, it would be considerably more than the .353 cords per acre aforementioned.

I would like to have you bear in mind that the results on this town were obtained with no added expense of site preparation, planting, or the incumbent costs associated with artificial regeneration. The only extra costs involved here were some 22¢ to 30¢ per cord for tree marking spent on approximately one-half of the volume that was removed. The cutting operations were on a large-scale, commercial basis, with the cutters all paid on piecework. The operations were nearly 100% horse yarded. During the cutting operations, we were blessed here with a Woods Superintendent who had an intense desire to see the land handled well, two cooperative woods contractors, and two thoroughly experienced Scaler-Inspectors. Pulpwood from this town is expensive, at a long freight rate, and our new mill at Jay had not yet been built at the time of these operations. In fact, at that time, we were hard pressed to market the allowable cut. However, it is my belief that if conditions had permitted the expenditure of a few dollars more per acre to further improve and control the harvesting, we could have increased the growth rate per acre on the residual stand even more than has been experienced.

Time has permitted me only to sketch briefly the history on this one township in northern Maine, which is surely not the worst land owned by International Paper. I believe you can agree, from the facts presented, that with only a little care exercised in the harvesting, you can "have your cake and eat it too" in the spruce-fir type of northern Maine.