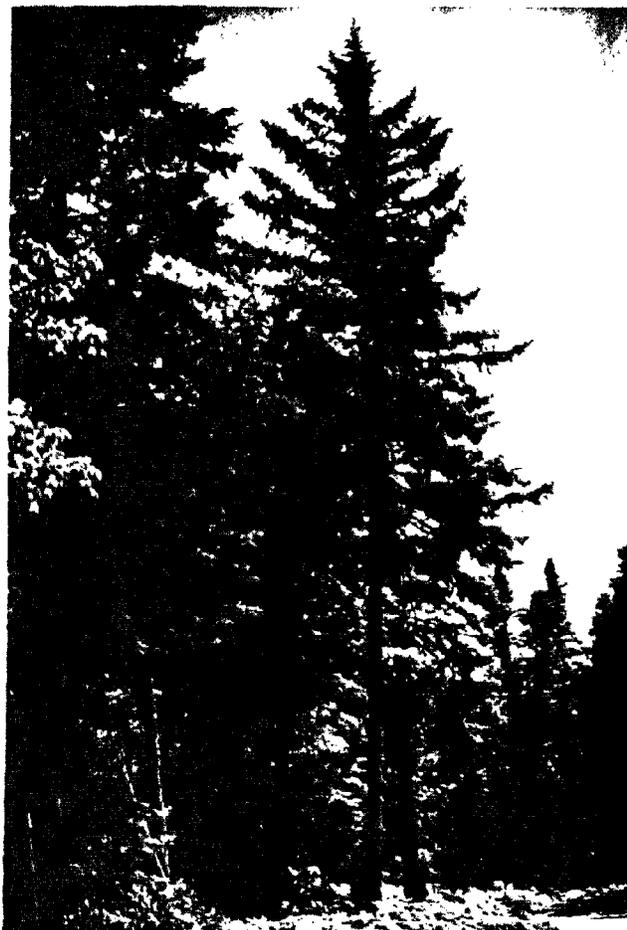


**Proceedings of the
SYMPOSIUM ON
INTENSIVE CULTURE OF
NORTHERN FOREST TYPES**



**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.*

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FIELD EXPERIENCE SILVICULTURAL CLEANING PROJECT IN
YOUNG SPRUCE AND FIR STANDS IN CENTRAL NOVA SCOTIA

by: Theodore C. Tryon, Chief Forester, James W. Sewall
Company, Old Town, Maine; Vice President, Atlantic
Resource Consultants, Ltd., Debert, Nova Scotia and
Thomas W. Hartranft, Chief Forester, Atlantic Resource
Consultants, Ltd., Debert, Nova Scotia.

Abstract

Silvicultural cleaning production varied from .15 to .34
acres per man day using light weight chain saws in young
Spruce and Fir stands in Central Nova Scotia.

Direct labor and saw costs, in cleaning young softwood
stands in Nova Scotia, can be expected to range generally
from \$55.00 to \$90.00 per acre, depending on crew experi-
ence, stand density, and equipment used.

Many of you are aware that the James W. Sewall Company,
in 1970, opened an affiliated Canadian office in Truro,
Nova Scotia, and in 1974 purchased, renovated, and moved
into a former military building in the new Debert Air
Industrial Park in Debert, Nova Scotia, being on land of
the former Canadian Forces army camp, commonly referred to
as Camp Debert. We are now located about ten miles West
of Truro.

You may possibly be asking yourselves how we became
involved in a project of this nature. As you can appreci-
ate, operating and expanding a new based forestry and
surveying consulting business offers headaches relative to
maintaining experienced and reliable staff through periods,
where business volume fluctuates considerably from one
month to the next. In an attempt to keep trained cruisers
and instrument men on our payroll during slack times, we
reached an agreement with the Nova Scotia Department of
Lands and Forests, in which we contracted to silviculturally
treat approximately 50 acres of young Spruce and Fir thickets
by 'cleaning', referred to as "spacing" by some. This agree-
ment contained no stringent time constraints, allowing us
to work on the project while not engaged in our normal
consulting work, and most importantly enabled us to keep
our experienced men for when we needed them for cruising

and surveying.

Leading into a more in-depth discussion on our field experience, I feel it appropriate to take the time to give you a little background regarding silviculture programs in the Province, which will serve as a partial explanation for the high-cost, long term investments having been and presently being invested in softwood land in Nova Scotia.

In 1965 and 1966 the Nova Scotia Department of Lands and Forests initiated a stand improvement program, and since that time have silviculturally treated roughly 50,000 acres of which some 10,000 acres have been "cleaned" or "spaced". In 1975 they "cleaned" 767 acres and have projected completing the same on 1000 in 1976.

In 1958, the Nova Scotia Pulp Company, now called Nova Scotia Forest Industries, with a pulp and newsprint mill in Point Tupper, Nova Scotia, entered an agreement with the Province of Nova Scotia and agreed to build a pulp mill in Eastern Nova Scotia, sell as much of their product on the local market as possible, and prepare within five years of the start of the mill a forest management plan for the lands from which they were to receive their wood. In return the Province gave them cutting rights on all Crown Lands in the seven Eastern counties of Nova Scotia.

N.S.F.I.'s forest management plan is called "Silviculture" and is directed toward producing harvestable pulpwood volumes in treated stands within 45 years as opposed to 60 years in untreated stands. This program is largely funded through an agreement with the Province by which Nova Scotia Forest Industries pays the Province \$2.75 per cord of softwood cut from the lands, of which \$1.75 is channeled into a silviculture fund and is spent on the silvicultural improvement of the lands.

Since 1971, Nova Scotia Forest Industries have silviculturally treated an estimated 30,000 acres of leased Crown Land of which about 9,000[±] acres have been "cleaned". They plan on "cleaning" about 3,500 acres this year.

Also; a federal-provincial agreement under the Agricultural and Rural Development Act (ARDA III) has terminated this past March (1976) and a similar agreement, now being negotiated, hopefully will be in effect in the near future. The new program is to be called the General Development Agreement (GDA) and supposedly is to offer private land forestry assistance similar to the previous (ARDA III) program. Presently, while only an interim situation, there is no forestry assistance to private land

owners in Nova Scotia other than windfall recovery assistance.

To give you an appreciation of the availability of government monies I want to comment briefly on the mentioned (ARDA III) program. I realize I'm getting away from the subject of interest but we must recognize and realize the role these government assistance programs have played in not only silviculture but other areas of forest management as well.

Anyone owning forest land in Nova Scotia under the past (ARDA III) program, could apply for government financial assistance in the following areas of forestry. In addition to this financial assistance, the landowner is provided professional and technical forestry guidance from the Provincial staff.

I. Woodland Road Construction:

Offered assistance up to 60% of bulldozing and grading costs to a maximum of \$900.00 per mile. Assistance of \$1.75 per cubic yard of gravel to a maximum of 800 cubic yards per mile. Maximum assistance would be \$3,300.00 per mile.

II. Boundary Lines:

Offered assistance at a rate of 60% of the survey costs up to a maximum of \$300.00 per mile of boundary line cut and surveyed.

III. Silviculture:

- a. Site preparation - Up to \$25.00 per acre
- b. Forest planting
 - Open root stock Up to \$30.00/M trees
 - Container stock Up to \$20.00/M trees
- c. Acquisition of planting stock
 - Open root stock
 - Nursery Up to \$40.00/M trees
 - Wildings Up to \$40.00/M trees
 - Container stock Up to \$20.00/M trees
- d. Cleaning
 - Long term \$50.00/acre
 - Short term \$40.00/acre
- e. Thinning Up to \$30.00/acre
- f. Pruning Up to \$15.00/acre

Many private land owners recognized full advantage of the road and boundary assistance but response to the

silviculture assistance was less than originally hoped for.

At this point I should clear up one point regarding forestry terminology and explain that in Nova Scotia the term "cleanings" is used to describe "weedings" as well. Many treated areas, according to definition, are comprised of "cleanings" and or "weedings". For the benefit of those of us who studied Silviculture decades ago, Smith defines a "cleaning" as: "A cutting made in a stand, not past the sapling stage, in order to free the best trees from undesirable individuals of the same age, which overtop them or are likely to do so". He defines "weeding" as: "A term that denotes the removal of all plants competing with the crop species, regardless of whether their crowns are above, beside, or below those of the desirable trees". While we have used the term "cleaning", we recognize that the area we treated was for the most part "weeded". Michaud, with the Nova Scotia Department of Lands and Forest states: "The cleaning operation is one in which the stem number per acre of a desired species, generally of young stands (i.e. six to 12 feet high, 15 to 20 years old) is reduced to a number more closely approaching that of a mature stand".

Some advantages to "cleaning" and basic concepts we've all been exposed to over the years are:

- a. Shorter rotations through increased growth rates by concentrating growth potential on fewer stems per unit area.
- b. Reduced harvesting costs through production of larger future crop trees of more uniform size.
- c. Species composition regulation.
- d. Longer growing season effect through exposing young stands to sunlight penetration.
- e. Promotion of well formed crowns and root systems.

Many softwood stands in Nova Scotia, between 12 and 20 years of age support between 10,000 and 50,000 stems per acre. Opinions are that at this age, stand density should not exceed 1000 stems per acre. Studies in Nova Scotia, New Brunswick, and New Foundland indicate that by opening dense stands from 10-20 years old to a spacing of seven to eight feet (700-900 trees/acre) will reduce rotations by as much as one third. Nova Scotia Department of Lands and Forests personnel suggest that a good site with a stand at age 15 and spaced to 700 trees per acre may average a cord per acre per year over the length of the rotation, which may

be in the order of 45 years.

Our project called for the "cleaning" of some 50 acres of Spruce and Balsam Fir saplings from an estimated 10,000 to 20,000 stems per acre to an approximate 8-foot x 8-foot spacing or about 680 stems per acre. Seventy-five percent of the stems were Balsam Fir, 24% Red Spruce, and 1% Hardwoods. Heights varied from 4 to 14 feet with average height of eight feet. We spaced, changing the stand composition to as heavy a component of Spruce as possible, achieving a residual stand of approximately 60%-70% Spruce.

(The technical aspects of the basic "cleaning" operation will be presented in a slide presentation in a few minutes.)

We started with a crew of six cutters and a general foreman, the foreman reporting to our forester in charge. The foreman's responsibilities were to lay out and assign segmented working areas to each cutter, to keep records regarding each cutter's weekly production, and to maintain quality control.

In laying out these working compartments, he used a device called a "topo-chain", (See picture) which lays down a fine string, simultaneously giving a reading of the distance laid off. This device enabled the foreman to lay out and measure the working areas unassisted. His records simply consisted of a general map illustrating the location and acreage of each compartment plus a weekly listing of completed acres per cutter. The foreman inspected the works daily and periodically with Lands and Forests personnel, carried out a detailed quality control inspection. During this inspection they measured 1/50th acre plots as a check on residual spacing.

Cutters worked in only the areas assigned, thus keeping out of each others' way, yet being close enough to render assistance should someone get hurt. Fortunately we experienced no bad accidents other than one or two slight nicks with the saws. I might add that operating the type of light weight chain saw that we did, or any other type chain saw for that matter, can be very dangerous in these softwood thickets. Our men were outfitted with safety pants, boots, gloves, safety glasses, ear protection, and hard hats. Also kept on hand were first aid supplies and fire fighting gear. Not so dangerous are the more expensive brush saws, which cost over twice the price of a light weight chain saw but by some are considered more productive for this work. Nova Scotia Forest Industries claims excellent success with the Swedish brush saws called "Husqvarna". (See picture)

All spacing was left to the discretion of the cutters, followed by the previously mentioned inspections by the foreman. They did an excellent job of maintaining a residual stand of the desired number of stems per acre and likewise the overall quality of their work was outstanding. Their instructions were to cut all trees low and below the live green portions of the crowns, thus discouraging the development of new trees from lateral shoots. They were additionally required to fell medium sized hardwoods, large dead stubs and to girdle the larger hardwoods.

Extreme summer heat, flies, hornets and mostly the inexperience of our crew, resulted in a much lower than expected level of production. Their production was .15 acres per man day. We previously, through discussions with Lands and Forests personnel, anticipated a man could "clean" about .40 acres per day. In all fairness, our crew's production included an orientation process. After allowing adequate time and giving the crew the full benefit of the doubt, we realized we were in trouble at this rate of production and subsequently curtailed the project until such time as we could come up with a solution yielding production hopefully of the magnitude of .40 acres per man day.

We were paying the men \$70.00 per acre while Lands and Forests, at that time, were paying their crews on a pro-rated price, proportional to stocking per working area. That is, they paid \$70.00 per acre for the most densely stocked areas and considerably less for lesser stocked stands. We paid \$70.00 per acre across the board, as a partial recognition of our crews' inexperience.

Because of our unusual working arrangement, we were required by law, to make up the difference if the cutter's piece rate amounted to less than minimum wage. I'm not suggesting that these men were lazy but perhaps that they were smart enough to realize their inexperience and desire would not allow them to earn much over the minimum wage, regardless of their expended effort. In any event, we were temporarily out of the "cleaning business", and our "cleaning" project was 'in the red'.

Our forester in charge, seeking advice, spent an interesting afternoon with Oscar Selin, whose advice was for us to investigate the possibility of using Marden Choppers or similar equipment, for creating regularly spaced, cleared corridors throughout the area, and hand clearing between these corridors. We located the equipment but were denied permission to use by Lands and Forests, until they had evaluated the systems' effectiveness. Their main concern, being the percentage of trees in and on the edge of the

corridor that would not be totally killed, thus regaining stature and competing with residual crop trees. This corridor concept makes real sense to us and I believe warrants further investigation in Spruce and Fir thicket spacing.

We additionally investigated the possibility of recovering part of our costs by marketing Christmas trees from the area; this to be integrated with the normal "cleaning" process. We were again denied this option as this was in contradiction with Lands and Forests policy regarding Christmas tree production on Crown Land. Admittedly, in dense softwood thickets many trees are unacceptable as Christmas trees, but many of the interspersed, less densely stocked areas will yield Christmas trees of some standard.

Shortly thereafter, we were approached by four woodsmen, who had just come off powerline right of way clearing, needed work, and were willing to give this a try. After looking the area over, they figured they could earn sufficient money. To avoid the previous situation we were in, we subcontracted the remaining acreage at \$90.00 per acre. This crew averaged .34 acres per man day on a completed 15 acres. However, because they were discontent with the work and our supervision and transportation costs still held us over the break-even point, both parties agreed to end the project.

Those of you who ever asked a nurseryman the cost of raising 1,000 seedlings found that comparing his figure to another nurseryman's was like comparing apples to oranges. Not that they're not good figures, but it seems each nursery figures this a little differently. I'm sure the same situation prevails when you go to find out what it costs to "clean" an acre.

In our situation, we got down to where our supervision, transportation, and direct labor was costing us about \$142.00 per acre. We were realizing a mark-up on our supervision costs only. Our direct labor cost at this level was \$90.00 per acre.

The Department of Lands and Forests cleaned 767 acres last year for \$86.93 per acre. This includes a foreman, without the time of the supervising forester being included.

Most impressive are Nova Scotia Forest Industries' figures. They averaged .75 acres per man day on 1,000 acres, with chain saws, and .96 acres per man day on 1,500 acres, with the brush saws. They are projecting their direct labor and saw costs to be in the order of \$55.00 per acre for this year. This does not include a field foreman or salaried supervision and planning.

As a closing comment, the number of stems per acre dictates, to a large degree, production rates and should be ascertained by several classes. Good sites that have not been densely stocked by natural regeneration, warrant consideration when selecting areas in which to practice "cleaning".

This talk is supposed to be on our "field experience" and an "experience" it was. What we lost in dollars we charged to "experience".

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