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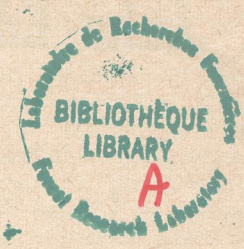

Partial Cutting With Diameter Limit Control in the Lake Edward Experimental Forest, Quebec, 1950 to 1956

(Project Q-44)

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FOREST RESEARCH DIVISION

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Introduction

Among the most productive forests of Quebec are those in the Laurentian Section (L-4a) of the Great Lakes-St. Lawrence Forest Region. This section is a 50- to 70-mile-wide belt along the north shore of the St. Lawrence river extending from Montreal to Quebec City, about 7,600 square miles in area. It includes part of the St. Lawrence lowlands, largely a settled area, and extends northward to include the lower slopes of the Laurentian mountains.

Logging up to about 1900 removed only the large-sized spruce and pine for sawtimber. These operations were followed by pulpwood cutting that generally removed much more of the spruce and fir. This heavy cutting of softwoods, especially on the rich mixedwood sites, initially favoured the hardwoods and led in places to an upsurge of shrubs and weed species.

Logging in 1910 at Lake Edward, P.Q., in Section L-4a, under the Provincial regulation diameter limits, left a residual stand that provided another good cut in 1950 although a large amount of mortality occurred in the 40-year interval. Clear cutting can provide a young forest well stocked with conifers as shown by the neighbouring Creek MacLaren area but does not permit the adoption of a short cutting cycle and uneven-aged management which may be desirable for this forest. Also, there exists the danger of shrubs and weed species taking over, particularly on the better sites. Thus a cutting method was sought whereby these dangers would be avoided and a short cutting cycle would be possible. Growth data, collected on the area between 1910 and 1946, were analyzed to determine the most suitable system of logging.

This report describes an experimental cutting planned by the Forestry Branch and conducted as a commercial operation by the Consolidated Paper Corporation in the 4,200-acre Lake Edward Experimental Forest in Laviolette County, Quebec, between 1950 and 1957.

A method of partial cutting of softwoods and hardwoods, controlled by stump diameter limits, was designed to reduce the danger of over-cutting the softwoods, to favour spruce over fir, and to reduce the cutting cycle from 40 to 20-30 years. Experience gained in the Lake Edward forest during the previous 30 years, complemented by discussions with Corporation foresters, was of considerable value in the investigation.

Details are given of the logging method and cutting systems, the condition of the residual forest in 1956, and a prediction of growth for the next 10 and 20 years. Initial results indicate that, barring a catastrophe, the residual softwoods will at least maintain their relative position in the forest, and that another cut of pulpwood equal in volume to the recent one, will be possible in 25 years. However, the future of yellow birch, the most important hardwood, is not as clear. The cutting method is now being used by the Corporation in the adjacent forest of the management unit.

The Area

Forest Description

The Lake Edward Experimental Forest is approximately six square miles in extent and is located six miles west of the St. Maurice River and 20 miles north of Grand'Mere, Quebec. The area extends east and west of Lake Edward and has a range in elevation from 900 feet at the lake to almost 2,000 feet on the mountain tops. The rolling topography is dotted with small lakes and broken by connecting streams, ridges and rock ledges. Lake Edward drains east to the St. Maurice River via Lac la Peche. A description of the geology was given by Heimburger in his report of 1941 (1).

The most important tree species

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are red spruce (*Picea rubens* Sarg.), balsam fir (*Abies balsamea* (L). Mill), and yellow birch (*Betula lutea* Michx. f.). Sugar maple (*Acer saccharum* Marsh.), red maple (*Acer rubrum* L.), white birch (*Betula papyrifera* Marsh.), beech (*Fagus grandifolia* Ehrh.), black ash (*Fraxinus nigra* Marsh.), white pine (*Pinus strobus* L.), hemlock (*Tsuga canadensis* (L.) Carr.), eastern white cedar (*Thuja occidentalis* L.), white spruce (*Picea glauca* (Moench) Voss), and black spruce (*Picea mariana* (Mill.) BSP.) are associate species of much lesser importance.

A practical system of site classification for the Lake Edward forest was described by Heimburger (1) and applied by Ray (2). Three site types comprise 89 per cent of the area. They are the Cornus or Co (softwood) 9 per cent, the Oxalis-Cornus or O-Co (soft-hardwood) 60 per cent, and the Viburnum-Oxalis or Vi-O (hard-softwood) 20 per cent, in ascending order of quality.

The principal species in the Co type is red spruce; others of less importance are balsam fir, cedar and white birch. Hardwoods, mainly white birch, account for less than 20 per cent of the total volume. This type is found on steep hillsides and ridges, on borders of swamps, streams and lakes, and in swampy draws.

The O-Co type is generally found on level to moderately sloping ground where the soil is fairly well drained and moist. On the average, conifers make up 60 per cent of the volume of the stand, but it may vary from 25 to 75 per cent depending on previous cutting. Balsam fir attains optimum growth in this type and has a greater volume than spruce. Yellow birch amounts to 30 per cent of the stand, but defect is high.

The Vi-O type, usually found on the upper slopes, is about 75 per cent hardwood. Yellow birch, sugar maple and beech are all of better quality than on other sites. There is more red spruce than balsam fir and although the type is favourable for conifers, it is more so for hardwoods.

History

The Lake Edward area was cut-over twice previous to 1950. In 1890, there was a light cut for white pine and spruce sawlogs; in 1910 a patchy cut was made for pulpwood over approximately one-half the area, using a diameter limit of 10 inches for spruce and 7 inches for fir. A large amount of merchantable wood, particularly fir, was left standing. The combined volume removed from both operations was about 700 cubic feet per acre, mostly spruce and fir with some white pine and cedar (2).

Between 1912-20 the spruce budworm was active in the area but apparently did not cause heavy mortality. In 1946 and 1947 its presence was again noted, and in 1956 severe defoliation and some mortality occurred in stands of nearly pure balsam fir along Creek Gelinas, at the head of Creek Marchand, and in patches on the east side of the lake.

In 1946 the forest was ready for another cutting. Much of the fir was deteriorating and prone to attack by the spruce budworm, and many large spruce were either mature or overmature. Yellow birch and other hardwoods had reached a large size and were beginning to deteriorate. It was therefore considered imperative to begin cutting in order to avoid a large loss of wood.

The partial cutting began in 1950-51 and ended in 1956-57. Spruce and fir were removed for pulpwood, yellow birch for saw and veneer logs, small quantities of hemlock, white and red pine, maple, beech, ash and white birch for saw logs, and cedar for poles. Spruce and yellow birch were cut to a stump diameter limit of 16 ins. and balsam fir to 8 ins.

The Logging Operation

Planning

Discussion of the experimental cutting began in 1948 and arrangements were made with the Corporation and Veillette Inc. to start cutting in the fall of 1950.

The management plan of the Corporation for this district provided for cutting the Lake Edward area approximately 10 to 15 years after 1946. This plan was amended to permit the partial cutting experiment. The yearly contracts specified different stump diameter limits for spruce, fir and yellow birch as recommended by the Forestry Branch and imposed penalties for cutting infractions. Partial responsibility for cut supervision was assumed by the Forestry Branch. No fines were imposed for cutting infractions although several cutters were discharged for failure to observe cutting diameter limit regulations.

Logging which started in the heaviest stocked stands on the west side of the lake continued for 6 cutting seasons. Cutting did not take place in 1954-55 when the hardwood market was poor.

Cutting Control

The partial cutting of softwoods and hardwoods as controlled by diameter limits was based on a knowledge of growth and mortality of the residual stands after the 1910 pulpwood cut. The objectives were to demonstrate and obtain results from a cutting method that would be practical for an operation, be silviculturally sound over the largest area possible, and require a minimum of supervision.

In setting the stump diameter limits, four objectives were considered, namely 1) between 5 and 6 cunits of pulpwood would be cut per acre to make the operation economically feasible, 2) the cutting would meet the silvicultural requirements of the O-Co type, 3) less spruce than fir would be cut, and 4) cutting in yellow birch would be restricted to the large trees only.

Less spruce was cut than fir because it is longer lived, more windfirm and less susceptible to butt rot and insect attack. Fir suffered high mortality after the 1910 cut when so much of it above the existing limit of 7 inches was left standing.

For the first cutting season the diameter limits were set at 10 in. for fir and 14 in. for spruce and yellow birch at a stump height of one foot. Inspection during the season revealed that too many mature fir were being left and too many thrifty, fast-growing spruce and yellow birch were being cut. Consequently for the second season the limits were changed to 8 ins. for fir, and 16 ins. for spruce and yellow birch. At first the jobbers resisted the change but the cut of pulpwood was increased by the additional fir.

Logging Method

The logging method differed from the usual procedure as cutting was controlled by stump diameter limits. Most of the pulpwood was cut and skidded in tree lengths to the truck or sled roads. The first two years, cutting and skidding 4-ft. bolts in bundles was common but this was prohibited in 1952 because of the damage caused to reproduction and saplings.

The pulpwood bolts were stacked in piles of any convenient length and height. The wood was scaled in cunits and every bolt was measured and end-stamped. Hardwood logs were scaled using the Roy rule.

The progress of operations from 1950 to 1956 included the rapid change-over from buck saw to power saw. This resulted in lower stump heights, in many cases to a level flush with the ground.

Most of the pulpwood was loaded manually although a machine loader was used in 1952. Hardwood logs

were loaded by crane or else by trucks equipped with side-arm loaders.

Almost 17 miles of winter truck roads were built within the experimental area. For the first four seasons all wood was hauled south through the depot at Lac La Peche. The last two years, pulpwood was backhauled over a height of land to the St. Maurice river 8-10 miles distant.

Supervision

During the first five cutting seasons, Forestry Branch personnel usually spent 2-4 weeks each year supervising the cutting. In 1955-56 when the cut was large, additional supervision was provided. No supervision was necessary during the last year as the jobber was experienced and the operation small.

Inspection was primarily concerned with the enforcement of the diameter limits and assurance that patches of merchantable wood were not left uncut. The supervisors covered the area thoroughly, spoke with the cutters, and brought any irregularities to the attention of the jobbers and the Corporation inspectors. The Corporation also provided general supervision through their scalers and inspectors who made regular trips to the area.

Volumes Removed

The estimate of total wood cut compiled from stump tallies agrees well with the scale records for actual quantities removed. The total volume of wood cut into pulpwood estimated from stumps on the line-plots is 22,790 cunits (no deduction for stumps, tops and waste). The Corporation figure for scaled volume removed is 20,180 cunits, or 11.5 per cent less. Much of this difference between gross total volume and net merchantable volume is accounted for in stumps and tops; utilization was good and wastage low.

In addition to the pulpwood, 12,000 cubic feet of softwood logs were cut including some cedar poles. Yellow birch saw and veneer logs amounting to 321,000 cubic feet (about 1,600,000 FBM) were also cut, plus 5,900 cubic feet of other hardwood logs.

Assigning a value of $26 per cunit of pulpwood at the mill, and $75 per M for hardwood logs at Lac La Peche, the total value of raw material produced amounts to roughly $524,600 for pulpwood and $126,300 for hardwood logs, which is equal to $165 and $40 respectively for each acre cut.

The Residual Forest

All of the experimental area has been logged except certain stands of unmerchantable softwoods, mostly in the Co type, and a few small patches in the O-Co and Vi-O types where softwood volumes were low. Three thousand one hundred eighty-seven acres or 75 per cent of the total acreage (4,248 acres) were cut, three thousand forty acres being in Co, O-Co and Vi-O types and one hundred forty-seven acres in Viburnum, Sphagnum-Oxalis and Kalmia-Ledum types.

Patches of uncut forest located during the post-cut survey were, if possible, added to the next seasons contract area. The Corporation, contractor and jobbers were diligent in cleaning these up.

In three areas where rough terrain made logging difficult, the limit for spruce was lowered to 12 inches and that for fir was waived entirely. The higher volume available for cutting under these reduced limits was an incentive for the cutters and these patches were at least partially cutover. Thus the residual forest does not present the patchy appearance it reportedly did after the previous cut.

Residual Growing Stock

In general, the residual forest consists of thrifty trees evenly distributed. There are small clear cut areas due to the overlimit size of most of the original trees, and to cutting infractions, but their occurrence is not widespread Some overlimit fir remains which should have been cut. All these trees at present are not decadent but it is doubtful whether many will survive for 20-25 years until the next cut. Some undoubtedly will blow down and others succumb to the spruce budworm. In stands where hardwoods predominated, many large, malformed yellow birch and maple remain to the detriment of their thriftier neighbours.

The cutting removed 50 per cent of the total spruce-fir growing stock which was exactly as planned. There are now approximately 11 cunits of spruce and fir per acre in the Co, 8

TABLE 1

Volume of Spruce and Fir and Yellow Birch, 1946 and 1956, and Volume Removed, 1950 to 1956.

(total cubic feet per acre, 4" d.b.h. and up)

	Site Type			
	Co (12 plots)	O-Co (187 plots)	Vi-O (57 plots)	Average
Spruce and Fir				
1946	1,693	1,542	701	1,377
Removed				
1950-56	726	894	290	753
1956	1,118	825	370	737
Yellow Birch				
1946	88	782	1,742	914
Removed				
1950-56	0	132	738	262
1956	52	566	862	608

TABLE 2

Stand Composition, 1946, 1956

(per cent of total volume, 4" d.b.h. and up)

		Site Type		
Species	Year	Co	O-Co	Vi-O
		Per Cent		
Spruce	1946	55	26	14
	1956	64	30	13
Fir	1946	25	32	9
	1956	17	19	8
Yellow Birch	1946	4	29	58
	1956	4	34	47

cunits in the O-Co and 4 cunits in the Vi-O types, an average of 7 cunits per acre. Table I shows the volume per acre of spruce and fir, and yellow birch in 1946 and 1956 and the volumes removed 1950-56, for the three site types.

Although the Co type had the largest spruce-fir volume before cutting, the amount removed per acre was greater in the O-Co type. In the former type there was a preponderance of trees below the diameter cutting limit.

Approximately 28 per cent of the yellow birch growing stock was cut, 40 per cent of it being removed from the Vi-O type.

The changes which have occurred in species composition due to the cut are shown in Table 2.

The increase in the proportion of spruce in the Co and O-Co types, and of yellow birch in the O-Co type, reflect the heavier cutting of fir rather than an increase in spruce or yellow birch volumes. If a considerable infraction of the spruce diameter limit had not occurred in the Vi-O type, its proportion would have increased there as well.

Mortality

No data are given for mortality since 1946 or since the cut. A few trees which died just previous to the cut were probably utilized and thus were missed. Cutting took six seasons to complete and the dead trees tallied could not always be related to a definite period.

Table 1 indicates that mortality between 1946 and 1956 was greater than the growth for spruce and fir in the Vi-O type and for yellow birch in all types, where 1956 growing stock plus volume removed is less than the 1946 growing stock. However, it is possible that these differences are due to the difficulty of accurately converting stump diameters to breast height diameters when the trees are cut much lower than the standard height of one foot.

The spruce budworm has been feeding in near-pure stands of fir but little mortality has occurred so far. Mortality from the budworm may or may not be related to how the forest was cut, but in any case budworm mortality will in future be tallied separately from that attributable to wind or logging damage.

Stand Structure

The stand profiles of spruce and fir for the three main site types in 1925, 1946 and 1956 are shown in Figure 1. Most of the volume reduction which occurred between 1946 and 1956 is in the diameter classes greater than 7 ins., the breast height equivalent of the fir stump limit, and for the O-Co and Vi-O types, the volumes up to 7 ins. d.b.h. after cutting are greater than in 1946.

For both the Co and O-Co types, the residual stand profiles show higher volumes than in 1925 which was 15 years after the previous cut. In the Vi-O type the 1925 profile is only slightly higher than that of the present residual stand.

Reproduction

In general, reproduction of spruce and fir is considered satisfactory and a summary of stocked quadrats is shown in Table 3. The survey was made soon after the cut and additional seedlings are expected to become established in the next few years. Reproduction includes saplings up to 3 in. d.b.h.

One noticeable result is the low per cent stocking of spruce in the Co type where it usually makes a very good

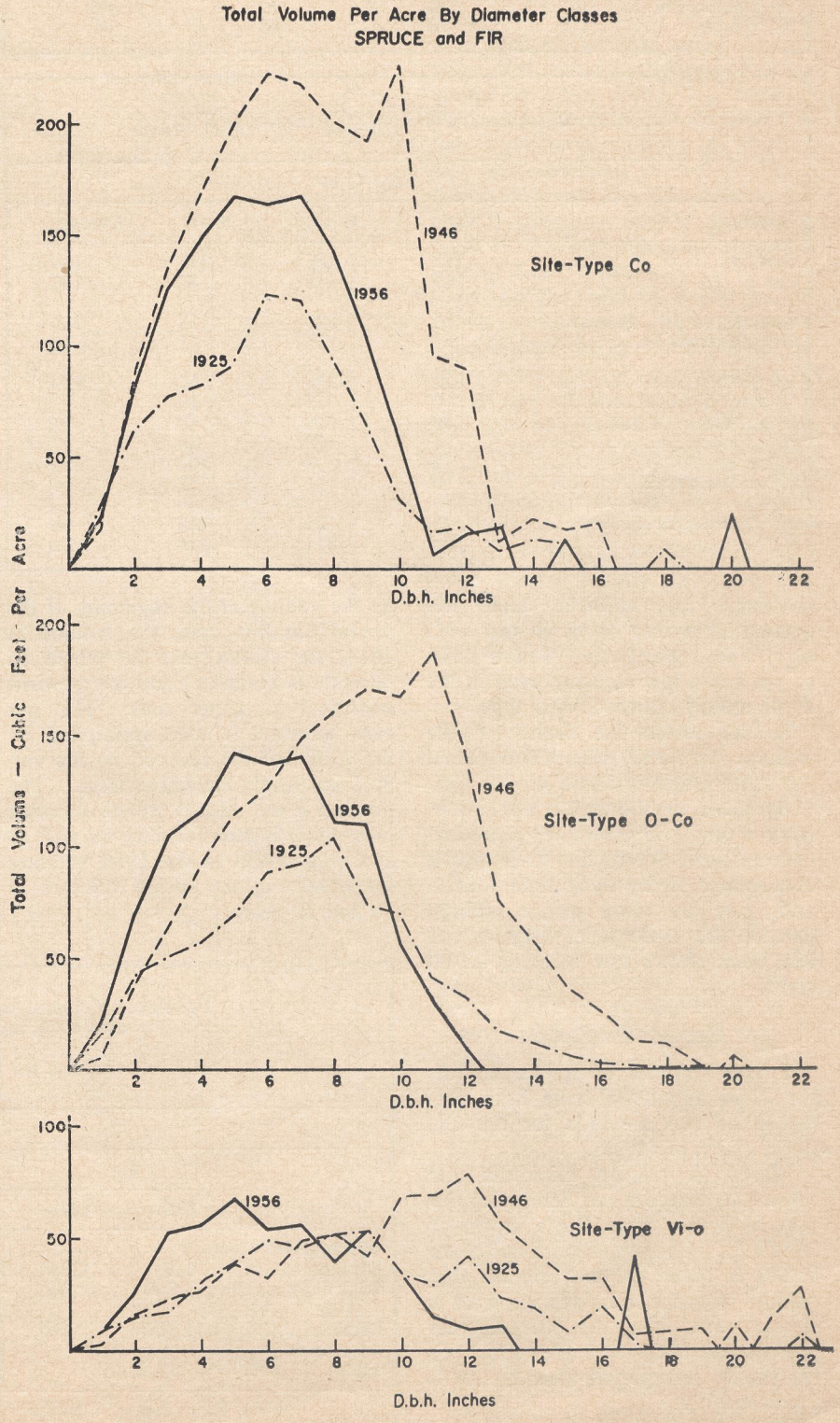

Fig. 1. Lake Edward Stand Profiles.

TABLE 3

Per Cent of Stocked Quadrats

Species	Site Type: Co (200 quadrats)	O-Co (3,540 quadrats)	Vi-O (1,120 quadrats)
Spruce	8	21	19
Fir	56	68	36
Spruce or Fir	60	74	50
All Softwoods	60	76	51
Yellow Birch	14	20	11
Sugar Maple	0	3	32
All Hardwoods	30	40	60
All Species	70	88	87

TABLE 4

Number of Saplings Per Acre, 1-3 Inches D.B.H.

Species	Site Type: Co	O-Co	Vi-O	Average
Spruce	167	105	116	110
Fir	267	115	37	105
Spruce and Fir	434	220	153	215
Other Softwoods	92	13	1	14
All Softwoods	526	233	154	229
Yellow Birch	0	10	10	9
White Birch	39	16	2	14
Red Maple	4	12	35	17
Sugar Maple	0	2	100	24
Other Hardwoods	0	1	17	4
All Hardwoods	43	41	164	68
All Species	569	274	318	297

showing. The relatively high proportion of spruce to fit in the Vi-O type is very gratifying. Yellow birch as yet has a low stocking even in the dominantly hardwood Vi-O type.

Similar results are found for the saplings per acre, summarized from the stand tables in Table 4.

Spruce in the Co type is not as low, relative to fir, as shown for reproduction in Table 3. In the Vi-O type it outnumbers fir by more than 3 to 1, and there are more spruce saplings than in the O-Co type. Again, yellow birch shows low stocking in all types.

Growth Prediction

Future volumes of spruce and fir for 1966 and 1976 have been predicted by two methods for the Co, O-Co and Vi-O types.

Method 1 predicts minimum and maximum volumes per acre using *net* growth figures from Ray's report of 1956 (3). Computation of minimum values is based on the premise that neither spruce nor fir will grow at a *slower rate* than the 40-year net growth rate 1910-1950 (See (3)), or for the 40-year period after the 1910 pulpwood cut.

This annual growth rate is divided by the volume at the beginning of the period (in this case, the volume in 1915, the closest year for which an estimate is available) and the quotient expressed as a per cent. This per cent increase is then multiplied by the 1956 volume reduced by the volume of visibly defective trees. The product is the annual growth in cubic feet which is multiplied by 10 and 20 and then added to the 1956 volumes for predicting the future volumes in 10 and 20 years.

Maximum values for Method 1 are calculated because the heavy mortality of fir which occurred after the 1910 cut is not expected to be repeated in 1956-66 as much material above the 7-inch limit had been left uncut. The fir growth rate 1925-46 is therefore used, along with its 1925 volume, for arriving at the maximum values.

Method 2 is the stand table projection method described by Chapman and Meyer (4), and discussed at some length by Wahlenberg (5). *For each diameter class,* the number of trees in 1956 which are expected to survive to 1966 are calculated by reducing the 1956 number by a mortality per cent computed from the 1925 stand table and the amount of mortality 1925-36.

From diameter increment borings taken in 1936 for the period 1926-36, change in diameter classes is found using the formula $e = t\ (g/i)$, where e = number of trees entering the next highest diameter class, t = number of trees in present class, g = diameter growth in inches and i = diameter class interval in inches. Using this formula, the stand tables in 1966 and 1976 are calculated and volumes computed for the growth predictions. In this method, the predicted diameter of fir exceeds 15 inches, the maximum size found in mature stands in the area. Thus fir over 15 in. is deleted at the end of the calculations. Table 5 presents the results of the calculations with the estimated volume of spruce and fir in 1950.

The graphs for the three site types presented in Fig. 2 show spruce and fir volume removed per acre in 1890, 1910 and 1950-56, volume in 1915, 1925, 1936, 1946 and 1956, and predicted volumes. The volume removed in 1890 is set beside and below the top of the 1910 cut to indicate that growth occurred between 1890 and 1910.

For the Co type the predictions for

TABLE 5

Predicted Volumes of Spruce and Fir in 1966 and 1976, and Volume in 1950.

(total cubic feet per acre, 4″ d.b.h. and up)

	Site Type: Co		O-Co		Vi-O	
	1966	1976	1966	1976	1966	1976
Method 1						
Minimum	1,670	2,240	1,080	1,340	383	418
Maximum	1,740	2,380	1,170	1,520	407	466
Method 2	1,700	2,490	1,310	1,900	505	713
Volume in 1950*	2,170		1,790		783	

*From Ray's report, 1956(3)

than any previously recorded and they are believed to be somewhat high. The volume for this type in 1925 is much lower than that of 1956, indicating a lower stand density. The increased density latterly would have the effect of slowing down growth rates, a factor not accounted for in the predictions. There is little doubt that the volume cut in 1950-56 will be replaced within 25 years.

In the O-Co type, only the 20-year prediction of Method 2 shows a larger volume than 1950 whereas both minimum and maximum predictions of Method 1 are lower. However, within 25 years, the additional 5 years growth will surely increase the volume to the amount equal to, or greater than, that obtained before the cut.

The situation in the Vi-O type is somewhat less certain but even here in 25 years the spruce-fir volume will probably not be much, if at all, smaller than before the cut. The beneficial effect of the hardwood cutting on the softwoods will be greatest in this type, a fact not provided for in the predictions.

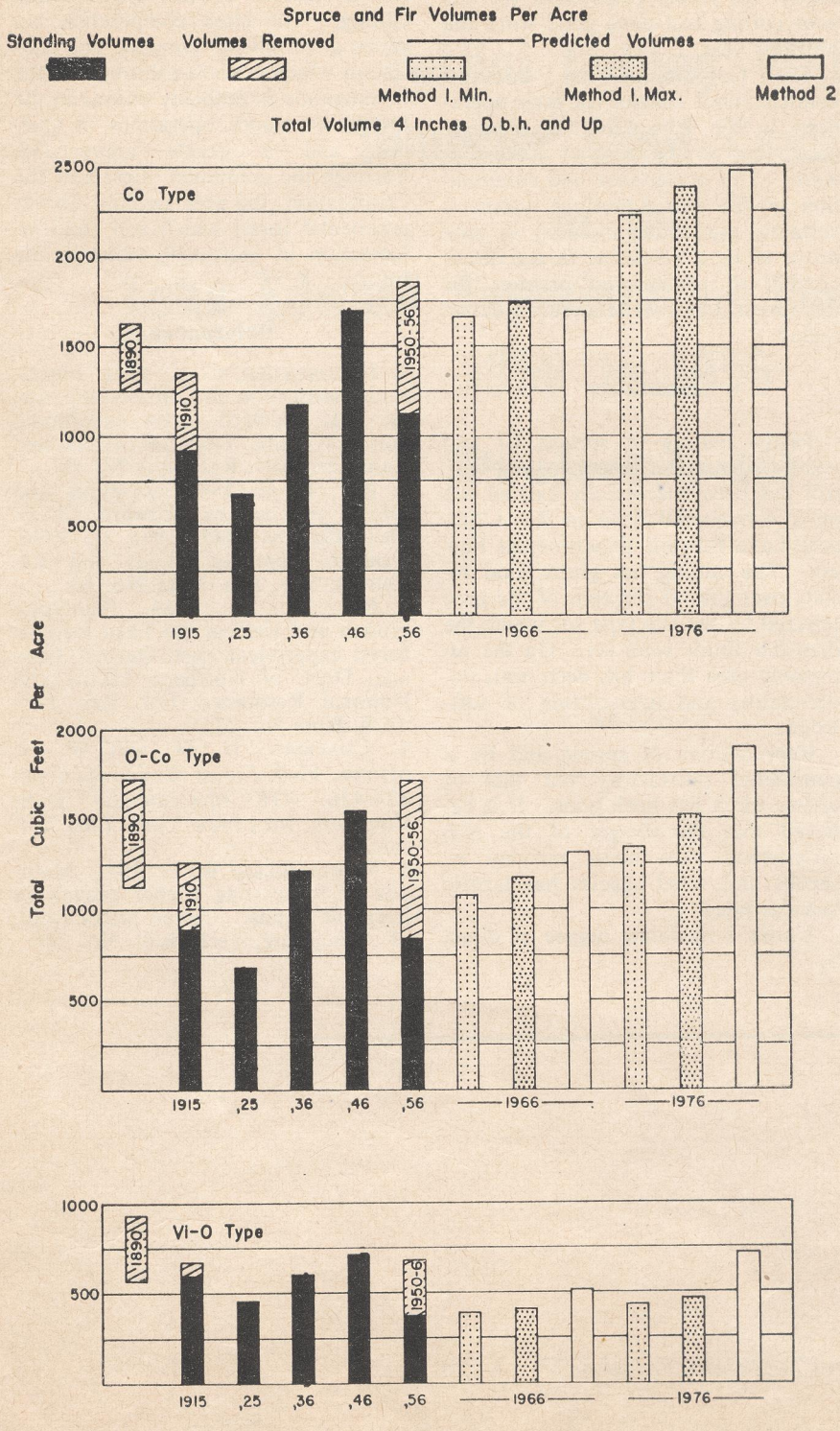

Fig. 2. Lake Edward experimental area.

Discussion

The partial cutting gave good results in the O-Co type. In the Vi-O type the cutting of softwoods was rather heavy and in the Co type where unmodified, it was inadequate.

Spruce was cut too heavily in the Vi-O type, mostly because of infractions of the diameter limit. A few poor-quality spruce and a good number of fir above the limit should have been cut. Fir does not generally grow well in this type and it occupies space that would be better utilized by spruce or yellow birch. The diameter limits here should be supplemented by tree marking to remove all overmature and defective softwoods. It is understood that the Corporation has already adopted marking as a supplement to diameter limits in operations east of Lake Edward.

In the Co type the limits did not prove satisfactory in the young, even-aged stands where spruce does not often reach a large size. There is little danger of hardwood invasion in this type and in future therefore, the limit on balsam fir should be removed and that of spruce reduced to a diameter where about half the volume is available for cutting. This type covers only 9 per cent of the area and usually is defined clearly by topographic features. Areas to be cut under different limits could be easily delineated and their boundaries blazed or painted.

If the spruce and fir had been cut down to 4 in. d.b.h. the whole area would have yielded an additional 28,500 cunits according to the survey data. The Corporation estimated that under a clear cut system they would have cut an additional 32,000 cunits, which is in reasonably close agreement.

An estimated 3,650 cunits of spruce and fir, 18 per cent of the total, were cut from trees below the diameter limits. This is not considered an excessive amount considering that this was the first time diameter limit control had been attempted. Also, the first year of cut the spruce diameter limit was 14 ins., not 16, and this accounts for some of this volume. Wood cut from roads and yards would account for part. Several small areas of the Co type were cut-over with a 12-inch spruce limit, no limit on fir, which would also add to the total.

The disturbing aspect of this volume cut below the limits is that 91 per cent of it, 3,320 cunits, was spruce, and represents more than 40 per cent of all the spruce cut. There is little doubt that undercutting the

limit in spruce has occurred.

It is also apparent that there was very little infraction of the fir limit. On the contrary, about 4,000 cunits of overlimit fir were left on the cut-over area. The low limit of 8 inches was set purposely to utilize this volume and prevent its loss to wind, rot and the budworm before the next cut. Had this overlimit fir been cut, and the underlimit spruce been left, the pulpwood yield would have been about the same but the danger of high post-cut mortality lessened.

Spruce has not benefited to the extent envisioned when the diameter limits were set in 1951. Nevertheless, despite the fact that many spruce were cut below the limit and many fir were left above the limit, the proportion of spruce to fir has increased in the Co and O-Co types, that is, on 70 per cent of the area, and remained unchanged in the Vi-O type. Whether or not spruce maintains its increase will be determined by remeasurement.

Predictions indicate that the volume of spruce and fir removed will be replaced in 25 years. It is recognized that the application of a 40-year average growth rate to 10- and 20-year periods following a cutting might lead to large errors but this 40-year average includes similar periods following the 1910 pulpwood cut. Because mortality is not expected to be as high as after the last cut, it is believed that growth over the next 10 and 20 years will not be at a slower rate than the 40-year average. The spruce budworm may affect the predictions but at this time it is impossible to say how great the effect will be.

The quantities of good-quality yellow birch logs which were cut will certainly not be available again in 20 to 30 years. This species does not seem to be reproducing very well and its future at Lake Edward is not bright.

The acceptance of diameter limit control by the cutters was due partly to the threat of fines and the possibility of being discharged. The rapid change from buck saw to power saw between 1950 and 1956 was opportune in that it lessened the amount of physical labour required at a time when the cutters were obliged to partial cut rather than clear cut.

Supervision of the cutting was essential, especially at the beginning, but it was not performed on a large and costly scale. By far the largest infraction took place in 1956-57, the last year of operation, when supervision was at a minimum. Significantly, the jobber responsible for this poor cutting had done good work the previous year.

The Corporation has extended diameter limit control for their operations in the 80-square-mile management unit to the east of Lake Edward. This acceptance and continuation of the partial cutting system is certainly significant and may in time prove to be a milestone in the development of silvicultural practice for the Great Lakes-St. Lawrence forest region.

Summary

Partial cutting of spruce, fir and yellow birch under diameter limit control has been successfully carried out on a commercial basis in the 4,200-acre Lake Edward Experimental Forest. The cutting has given good results over the 60 per cent of the area covered by the site type for which the diameter limits were set. On the remaining area there has been both under-cutting and over-cutting of softwoods.

Reproduction of spruce and fir is considered satisfactory but that of yellow birch has been poor. It is believed that the danger of the rich mixedwood sites being invaded by shrubs and weed species has largely been avoided.

Under a moderate degree of direct supervision, 18 per cent of the 22,800 cunits of pulpwood removed was cut from trees below the diameter limits. Although it was not difficult to convert the cutters from clear cutting to partial cutting, the amount of infraction varied inversely with the degree of supervision.

Acknowledgement

The assistance and co-operation received from the Consolidated Paper Corporation and the contractor, Veillette Incorpore, has proved essential to the success of this experimental cutting. The close co-operation between government, company and contractor which prevailed throughout the investigation is probably unique in the history of woods operations in Quebec, and is deeply appreciated. Through the continued interest of the Corporation, the area remains an experimental forest which will yield information of increasing value in the future.

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