

BLACK ROCK FOREST PAPERS

HENRY H. TRYON, DIRECTOR

IMPROVEMENT CUTTINGS IN MIXED HARDWOODS

By

H. H. TRYON

R. F. FINN



CORNWALL-ON-THE-HUDSON, NEW YORK

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Location and Description

THIS project (Ctg. 1d) lies along the west edge of Compartment II. It is a long, narrow, 13.5-acre strip, bordering the east edge of the Old Continental Road.



PLATE 1. The area just east of Ctg. 1d following a careful light cleaning. Chief species are white oak, white ash, red oak, hemlock and sugar maple. This affords a good idea of the conditions in Ctg. 1d previous to the 1927 thinning.

The slope is gentle and generally to the north. The soil is somewhat heavy with an adequate supply of moisture most of the year, thanks to the run-off from the adjoining slopes of Block Rock Mountain.

In 1927 this was an uneven-aged stand of mixed hardwoods and hemlock, defined by Raup¹ as "mixed hardwood, swamp phase." While the term "swamp" is not an exact fit, the entire area is traversed by transient brook beds which often show an active flow following even a slight shower. It is unusually well watered. The crown canopy being heavy and well interlocked, the ground was well shaded. Despite this, the leaf-litter deposit seldom totalled more than one year's leaf-fall. Middens revealed the presence of earthworms. The advance growth was fairly dense with commercial species in the majority. Notable was the amount of small hemlock which ranged from 2" to 6' in height. In some areas, counts showed this species to run as high as 11,000 stems per acre in the very small classes.

The overwood included a scattering of mature hemlock from 8"-16" d.b.h. The hardwood species were chiefly red, white and chestnut oak, red and sugar maple, white ash, black and yellow birch, an occasional yellow poplar (usually of good size and form), a few black gum, beech, aspen and gray birch. The hardwoods averaged 60-80 years; the hemlock about 100 years.

¹ Raup, Hugh M., October, 1938: Botanical Studies in the Black Rock Forest, Black Rock Forest Bulletin No. VII.

The hardwood advance growth included white oak, hemlock, sugar maple, red and chestnut oak, with some white ash. Ironwood, hornbeam and dogwood were plentiful in the underwood.

History

Stump studies showed that in 1866 the area was cut hard, practically everything being taken down to 4"-5" stump diameter excepting white oak and some of the hemlock. In 1896 another cutting was made which for some reason left many of the larger white oaks and, so far as we can judge, all of the hemlocks. No hemlock stumps whatever were found. It seems likely that these white oaks were left because they were too large to make satisfactory brick-yard wood, while throughout this section there has long existed a strong prejudice against hemlock as fuel.

The First Treatment

Marking and felling began in the late fall of 1927. As the advance growth was only of fair density, and since the overwood was practically all mature hardwood and hemlock, it was planned to carry out a combined reproduction and release cutting—an operation which would:

- partially release the existing advance growth
- stimulate increased seedfall and germination of both hardwoods and hemlock
- reduce the percentage in the overwood of commercially inferior species, or of species unsuited to the site conditions.



PLATE 2. The spring following the 1927-28 thinning; an increment plot.

In general, the following species were favored; Red and white oak, and an occasional chestnut oak of excellent form; white ash, yellow poplar, sugar maple,

hickory, hemlock, with here and there a black gum or red maple of good form and thrift.

The first few square rods at the north end of the strip were cut rather heavily—too much so, as will be brought out later. As the operation progressed southward, the

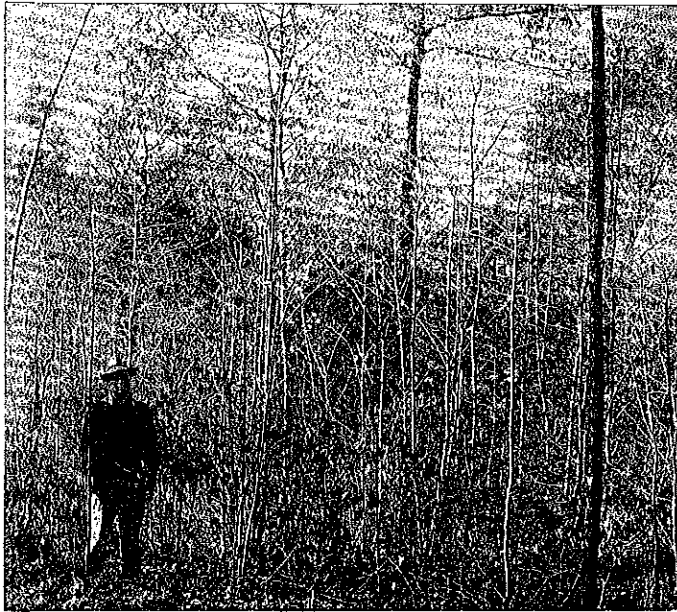


PLATE 3. Showing a good setting of seedling hardwoods including white ash, sugar maple, yellow poplar and some red maple. Nov., 1935.

marking became gradually less severe. The crowns of all potential hemlock seed-trees were very carefully released. The yield was 171.5 cords. (12.7 per acre.) The brush was burned at a cost of about 50c per cord—a practice now rarely followed here.

Subsequent Developments and Treatments

The area has since been given considerable careful, periodic scrutiny. The first complete re-examination, made in July, 1929 revealed that the expected sprouting had developed, with the heaviest growth at the north end where the cutting had been most severe. Red oak, sugar and red maple were the leaders with an average height of about 5 feet. The hemlock advance growth appeared unchanged either as to condition or quantity. The hard drought of this summer (1929) had apparently caused no perceptible loss. In general, no tremendous invasion of sprouts was noted except in the north portion. The white ash advance growth had responded and was rather more in evidence than previous to the cutting. Dense tangles of wild grapevines were appearing.

By July, 1931 the sprout population had made great strides, with the large red and chestnut oak stumps producing huge, sprangled clusters. The hemlock advance growth was sturdy while here and there were dense patches of dogwood sprouts originating from small stools cut in the thinning operation.

Beginning in May, 1931 the entire area was given a careful weeding, using an 18" Collins machete. The

method of "nicking and breaking" devised by Professor R. T. Fisher was employed. White ash, yellow poplar, white, red and some chestnut oak and basswood and chestnut were favored. During this operation, large numbers of ash sprouts were found, nearly all straight and clean, and originating from sound, small stumps. Here and there were occasional oak sprouts of suitable origin. A few solitary basswood and several nice thickets of yellow poplar seedlings were seen. It was found advisable to search carefully in the dogwood sprout thickets, as the ground beneath these was frequently dotted with many fine, straight, small ash whips which were released. Also during this treatment, a number of thick clumps of lusty sprouts of good species, which had originated from sound stools not over 5" diameter were weeded in selective fashion, leaving 3 or 4 straight stems per stool. The balance of each of these clones was set back either by cutting clean or by nicking and breaking.

By August, 1932, the results of the sprout weeding of the previous year were becoming apparent. A nice hardwood understory containing a high percentage of white ash was beginning to form. Of the weed species which had been cut back, dogwood was easily the most aggressive. It was clear that this vigorous tree would need further attention. The seedling yellow poplar thickets were making excellent height growth. The moment was judged to be about right, silviculturally speaking, for the removal of the old overwood. But economic conditions were adverse; the wood market was weak; there was still some space between the young leaders and the lower limbs of the old stand, and this operation was postponed.

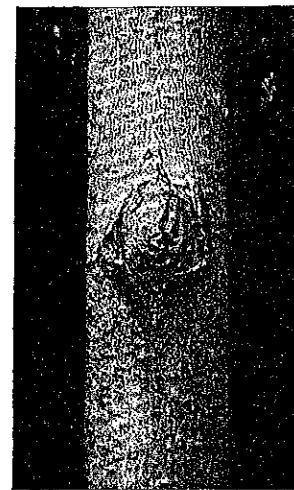


PLATE 4. A young white ash, pruned close in 1933. Photographed Sept., 1935.

Also in this year a portion of the area for some 400 feet south from the north end, was carefully pruned, using machetes with keen, thin edges and employing a sharp, decisive upstroke. Several white ash and yellow poplar trees were pruned leaving short, but clean-cut stubs, others were pruned flush with the bole. Such practice, even if skilfully done with properly prepared

tools, requires quite a little more time per acre, especially on the oaks and hickories.

During the summer of 1933 it was thought wise to girdle certain isolated members of the old stand. The young trees under such individuals were making such good height growth that mechanical injury to the new leaders by the lower branches of the held-over standards was imminent.

In many cases, where the crop trees had reached 10-15 feet, it was deemed wise to bend the weeds down and lop some 3-4 feet from their leaders.

In this same year (1935) a study of the pruning work done in 1932 showed excellent results where the cuts were made clean and snug to the bole. The scars were completely healed, or nearly so, and with no sign of infection. Where the short stubs had been left, these



PLATE 5. A good stand of young white ash, red oak, yellow poplar, white oak and sugar maple. This has just been released, the weed species such as red maple, hornbeam and ironwood being lopped back as shown. Oct., 1936.

By January, 1935, several of the mature hemlock, chiefly in the 6"-9" d.b.h. classes, had died, presumably from parching due to over-exposure. Very little mortality was noted amongst the smaller classes.

In the late autumn of 1935 a second machete treatment was applied. This lopping was for the most part rather light, but was very careful and well-considered. The method employed was much the same as in 1931, except that while the good species were given full headroom, their greatly increased total height made it possible to cut the weeds at a higher level than before, leaving them tall enough to continue to function as "trainers" for some time longer. In general this meant cutting them back to about the two-year-height level.

had become hard and dry, the callus was forming out around them, and it was clear that such work would cause black knots.

Of the clones which had been selectively weeded in the 1931 operation, the released stems had shot up into straight, well-cleaned saplings. Very little evidence of butt-rot infection from the parent stump was observed; and the cut stems had bushed out in such fashion as to do a good job of pruning.

Large numbers of seedling reproduction of white ash, yellow poplar, black gum and some red and white oak ranging from 12"-24" in height were noted in 1935. Since these were far below the general crown level, no attempt was made to release them save in occasional

instances where they were located under a thin stand of wood species of no great height, and where there were no tall crop species standing near. Under such conditions a thorough releasing was effected.

Observations thus far show that dogwood can be well employed as a trainer. The sprouting capacity is high; and if this species be pollarded with shrewdness, the resulting bushy head of sprouts will often prove effective aids to natural pruning. In applying this suggestion, it should be borne in mind that on good sites here, this species is capable of making 36" height growth annually.



PLATE 6. Seedling stand of sugar maple, white ash and yellow poplar (the latter are tagged) with hemlock trainers. Nov., 1939.

Following the releasing in the fall of 1935, as damage to many of the young leaders was again threatening, an additional number of the isolated standards were girdled. It should be noted here that a number of the trees girdled in 1933 were still quite vigorous, especially white ash and dogwood. In many cases, where girdling had been done with a chain saw (making a cut about 5/16" wide) or with the machete but in superficial or incomplete fashion, these species frequently bridged the cut in several places in one growing season. The chain saw has been discarded, as it requires two men and its work

is not permanent. A light axe (2½ pounds to 3 pounds) seems to be the best tool.

A few more of the larger hemlocks had died by this time. Trees in the younger age classes which had been released either by the 1927 machete treatment or by the 1933 girdling operation showed excellent thrift and a much greater annual height growth than is usually the case hereabouts, indicating a strong response to the liberation cutting.

Several of the thrifty broad-leaved standards were bored for ring counts. These showed, on these few trees at least, that the radial increment had been stepped up from three to seven times the figure prevailing previous to the 1927 cuttings. By 1936 the new growth was in very promising condition, with a great deal of straight white ash and yellow poplar 8'-15' in height. There was also present an amazingly large array of seedlings of these species mixed with a good deal of red and white oak, both running around 2'-3' high.

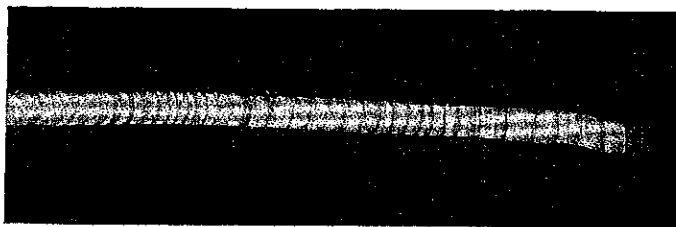


PLATE 7. Increment core from released hemlock taken the fall of 1935 eight seasons after thinning.

At this point there seemed to be little need for any further machete work, as the young crop species had their heads well in the clear and were, in some portions, beginning to shade out the weeds. The girdled stems were gradually winking out, though the tenacity of some species, especially ash, was still surprising.

Three years later (December, 1939), the general condition was showing a general steady improvement, with the vigorous young crop rapidly overtopping the weeds. There were present several small areas very heavily set to pure stands of ironwood, dogwood, black gum or black birch. But few commercial species were found in these stands.

Here and there, owing to irregularity in marking, were occasional rather well-stocked islands of the original cover. These were thinned in the 1927 operation, but evidently with insufficient severity, for, while quite good reproduction had come in, its height growth had been far below what had appeared where the first thinning was heavier. The stunting effect of the shade cast by these islands was very marked.

The number of small hemlock had shown a sharp increase. It began to look as though it might be necessary later on to remove some of these, since a crop chiefly of hardwoods was desired.

The clones which were selectively weeded in 1931, and which showed good response by 1935, were, in 1941 in very good shape. It is interesting to record that the pollarded stems, after 3-4 years successful service as

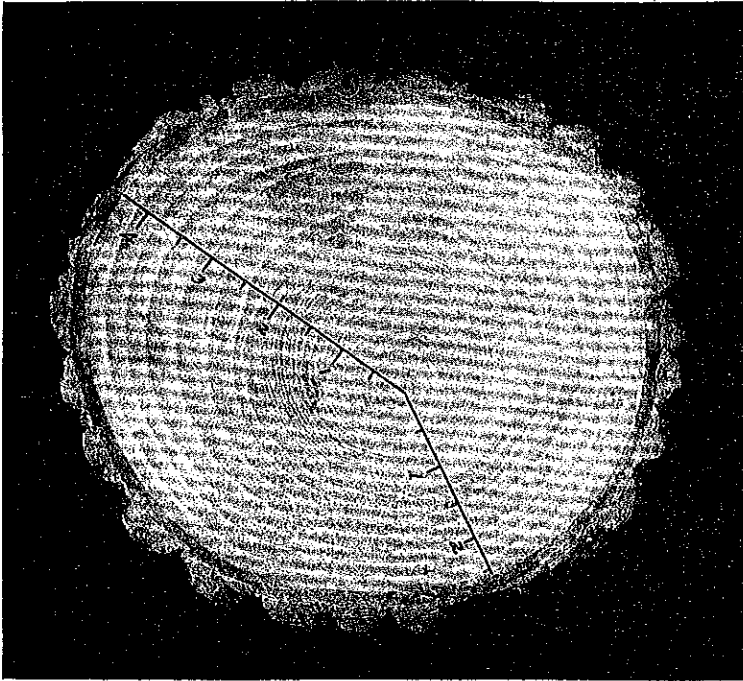


PLATE 8. Section of white ash, Nov., 1935, showing the increased ring growth following thinning.

bushy trainers had died from suppression by the vigorous good stems.

In the autumn of 1941 the wood market was strong, and this was done. The felling and skidding was handled as carefully as possible, and breakage of young growth was held to a pleasingly low figure. This operation (Ctg. 15a) yielded 330 cooperage billets, about 13 m.b.f. of saw logs, 150 cords of fuel, and a couple of loads of hemlock skids for the mill-yard.

Summary of Conditions of Today

There is now present a most promising young stand of hardwood and hemlock. Barring damage by a fire or severe ice-break, this should produce a valuable timber crop. The high percentage of white ash and the several thickets of yellow poplar, black gum, black birch, dogwood, hornbeam and ironwood (all either secondary or pioneer species here) are clear evidence that in some areas the initial thinning was too severe—i.e., the sere was set back too far. A lighter preliminary operation, or perhaps two such, followed by a final cutting would now appear to have been the better treatment.

While this condition is not ecologically ideal, the future prospects are by no means dismal. In the light of such knowledge of local plant successions as is now available, the present composition on this area calls for such management as will bring the young stands of secondary or pioneer species to commercial size as rapidly as possible that they may then be removed to release the climax understory of red and white oak, sugar maple, hemlock and occasional beech already present in large numbers, which can be assuredly relied

upon to "take over" when the present overwood is harvested.

Of the species now forming the main canopy, white ash is probably the most valuable, with yellow poplar second. Every effort will be made to keep the former species growing under such conditions as to produce straight, clean logs. Similar treatment will be accorded the poplar, but ash should have the first call. The other species will be managed chiefly on a fuel wood basis. Their presence will be welcome as trainers; but they cannot be favored at the expense of the far more valuable ash or poplar.

The prophecy may be hazarded that this present young stand should receive its first thinning when the stand has reached such a size that the yield will cover the costs. This should probably be followed by one more thinning which should yield both wood and small, clean logs. While it is difficult to make exact forecasts at this period, it now seems reasonable to expect that these two preliminary operations should leave the area ready for a final cutting of the secondary species. Following this the climax species now forming the understory should make prompt response to their releasing. It is quite possible that the second thinning may not be necessary; only careful, periodic field examination will determine this.

Discussion

Of the original objectives listed under "The First Treatment" (v.s.) the first and third have been carried to a satisfactory degree. The existing advance growth (a) has by now been well released and is showing evidence of a high degree of thrift; (b) seedfall and germination of both hardwoods and hemlock have unquestionably been stepped up, though the catch of the

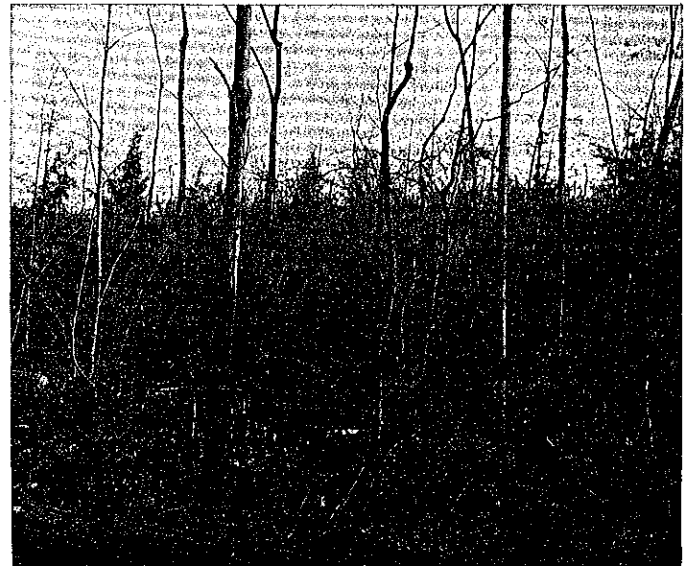


PLATE 9. April, 1942, following the removal of the overwood; showing the number of hemlock trainers.



PLATE 10. A good example of the hardwood and hemlock mixture after the final cutting.

former was hardly of the composition hoped for; and (c) the species mixture of the overwood, following the first thinning, was in general decidedly better fitted to the site conditions than was much of the original stand.

Since (a) and (c) have already been discussed in what would appear to be sufficient detail, the writer wishes to dwell at some length on the second objective and the degree to which it has been carried. There is no question regarding the amount of natural reproduction induced by the first operation; but there is present a grave question as to its silvicultural value. The heavy invasion by white ash into the heavily thinned areas, and the comparative paucity of good seedlings under the more conservatively-treated portions indicate that parts of the original marking were wide of the mark. The average yield of 12.7 cords per acre, was clearly too heavy for what we would now call good results.

The profuse appearance, following the first operation, of other pioneer or secondary species such as yellow poplar, black birch and black gum here is indisputable evidence that portions of our first treatment were too drastic. Other, and more conservative operations in similar stands, notably Cutting 13b directly adjoining where a cleaning totalling not over 5-6 cords per acre was made in 1939, have fared far better. Adequate natural reproduction of desirable species can in general be easily obtained here by one or two light thinnings made in good mast years. Over-cutting, with the resulting over-exposure of the soils will set the sere so far back in the succession that valuable time will be lost in bringing the inevitable crop of secondary species through to commercial size.

The technique of selective weeding in young mixed hardwoods with the machete (by far the best tool we know) will seem somewhat complicated at first. Familiarity with the species represented—their fitness to the site, their growth rate, tolerance, origin, and their

serviceability as trainers, and especially their place in the local successions, must all be instantly available as each new area is scrutinized. Such work may be accurately designated as "releasing." It is a form of thinning from above in quite young stands.

The practice of "nicking and breaking"—i.e., of partially severing the stem of an undesired sprout and bending the top down to the ground in the hope it will gradually die out does not work well here save perhaps in stands averaging 8 feet or more in height. Under such cover it may produce good results, but the added time required amounts to such a considerable item that the practice has been generally discarded here except in the case of our exceptionally skilled men. Furthermore, this method often makes travel conditions very difficult in later operations—a most unpleasant situation in country where yellowjackets are common.

The question of origin of sprouts has to do chiefly with the size of the parent stump. Here it is possible to count on good results from low stools up to 5" in diameter. The results obtained over much of this operation bear this out. In this same connection it now appears possible to obtain 3 or 4 thrifty, well-formed stems from a dense clone originating from a 5" stump by pollarding all sprouts save the few to be kept. The cut stems will usually bush out in rather profuse fashion for perhaps 2-3 seasons, thus providing excellent side shade for the good stems; at the end of this period sprouts so treated usually die out.

The question, "how soon should the first releasing be made?" is important. This work may cost as much as \$4.00-\$6.00 per acre; and experience here has shown, with disagreeable clarity and emphasis, that it is well to restrain that impulse to start such cultural work too soon after the advance growth and the competing sprouts have begun their struggle. Bear in mind that such sprouts are nearly always capable of making considerably faster height growth than the good seedlings; hence,



PLATE 11. A dense patch of young black gum, very characteristic of the areas where the 1927 operation was too drastic. Nov., 1935.

the practice of cutting them back too soon is very apt to be time thrown away. The ideal situation would be to delay such releasing until the seedlings have reached such a height that the sprouts, when cut back, will be subjected to such a handicap in the form of partial or complete suppression that they will never again overtop the good stems. But this situation is seldom encountered. Generally it is not practical to wait this long, as the various forms of competition offered by the undesirable sprouts over such a period will often stunt or deform or even kill off the good growth. Hence, two treatments are usually needed. It is generally conceded that in this locality, on a rather good site such as is now under discussion, the first releasing should occur after 4 or 5 seasons. No hard and fast rule can be laid down; the successful selection of the correct moment can be determined only by careful scrutiny of the stand conditions. The operator should refrain from any cutting just as long as is compatible with the health and form of the crop species. The latter should not be held under suppression to the point where the leaders are too badly deformed or their general thrift is lowered to the point where profitable response to releasing will not occur. It is a nice point to determine, and one which it is difficult to set forth clearly on paper. Careful periodic field examinations are the best guide.

The question of the value of pruning in young hardwood stands is as yet unsettled here. Without doubt it will raise the value of the final crop, but it does require added man-hours per acre. For the present it is believed that such work can be profitably applied only to the very best of the crop trees—and, as these are not always easy to select in such stands, it seems best to omit the pruning until the final releasing. For such work it is desirable to grind that 4" of the machete blade lying next to the handle to a much thinner edge than is generally practicable for the distal balance of the blade.

Summary

1. In general, very good natural reproduction can be obtained here, on such sites, by one or more, usually two, light thinnings yielding not over 5-6 cords per acre each. Such treatments should be made in good mast years.

2. Too drastic thinnings are to be avoided as they will

set the sere so far back that much valuable time may be lost in re-establishing the climax association.

3. Successful and efficient selective weeding in young mixed hardwoods demands thorough familiarity with the silvicultural characteristics and the place in the local successions of all species likely to be encountered.

4. "Nicking and breaking" of undesired stems can be profitably done only by highly skilled men. Such practice makes travelling difficult in later operations.

5. In this region good hardwood sprouts may be obtained from very low stumps not over 5 inches in diameter. Such sprouts must start very close to the ground line.

6. Initial selective weedings or releasings in young mixed hardwoods should be withheld for at least 4 or 5 seasons following the first thinning in the overwood—and sometimes for longer.

7. Pruning in young hardwoods can perhaps be profitably carried on if applied during the final releasing, and only then with reference to the very best of the crop trees.

8. The 18-inch machete is the most efficient tool for such selective work.

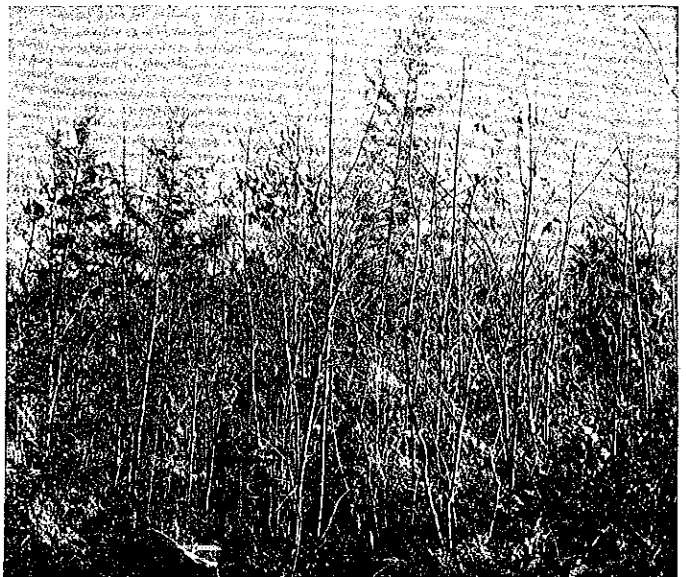


PLATE 12. A fine hardwood stand, chiefly sugar maple, red and white oak, white ash and yellow poplar with hemlock trainers. Mar., 1942.