



FIG. 1 (BEAL). YOUNG PINE TREES GROWING UP UNDER OAKS WHICH FOLLOWED ORIGINAL PINE, OF WHICH THE STUMP IS A RELIC.

SOME DISCLOSURES CONCERNING NATURAL FOREST SEEDING.

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In many portions of Michigan, from Montcalm county northward, it frequently happens that oaks, red maples, basswoods, cherries, ashes, elms, and some other kinds of trees quickly spring up and occupy the land after a forest of pines and other evergreens have been removed. In cases like this the entire absence of evergreens is so noticeable that people of these neighborhoods are wont to conclude that such must always be the case.

My explanation for this condition of things is as follows:

After cutting the merchantable pine, dry weather followed and fire not only licked up the dead tops, but killed all young evergreens, and very likely all the trunks of the scattering broad-leaved trees in the vicinity. Our pines never send up sprouts when cut or burned to the ground. They are dead throughout, below ground as well as above. Not so with all of the other kinds of trees named above. When burned to the ground they are all capable of sending up a vigorous second growth in the form of sprouts from the living roots or stumps below the surface of the ground. In many instances for large areas there is not a single evergreen or broad-leaved tree left alive in the neighborhood capable of furnishing seeds for a new crop. There is no chance for more pines, because all the trees were killed, the roots will not sprout, and all seeds were killed by burning.

But, some one may say, the entire area was formerly covered by a dense growth of pines, and no hardwoods were to be seen among them. It has been my privilege to examine many extensive areas thickly covered with pines, but I have yet to see the first grove that was entirely destitute of broad-leaved trees. In many places these trees existed in the form of low stunted bushes, many of which were very old. The tops had usually been killed again and again by fire, but successive crops of sprouts kept the species alive, ready to occupy all the ground as soon as the pines were out of the way.

Where small blocks of pines, consisting of forty to two hundred acres, have been removed and the rubbish burned, woody growth of other kinds of trees springs up rapidly. If the fire is then kept out for a few years, the light winged seeds from neighboring tall pines will be blown for long distances and scattered among the young growth of other plants. Seeds of white pine and Norway and hemlock will not grow in our climate unless the ground is shaded for a few years.

Figures 1 and 2 illustrate this point most admirably. Some years ago both of these pieces of land were covered by a fine growth of pines. When they were cut off, vigorous sprouts came up in great abundance. A few years later the pines began to appear, the seed coming from neighboring mother trees, and these pines, where thick on account of their superior ability to grow in the shade, must eventually overtake and smother many of the broad-leaved trees.

On account of frequent fires and pasturing by cattle, these green oases of thrifty young pines, I admit, are discouragingly few and scattering in many portions of northern Michigan. This summer I saw two remarkable groves of pines, mostly Norway, twenty to forty acres in

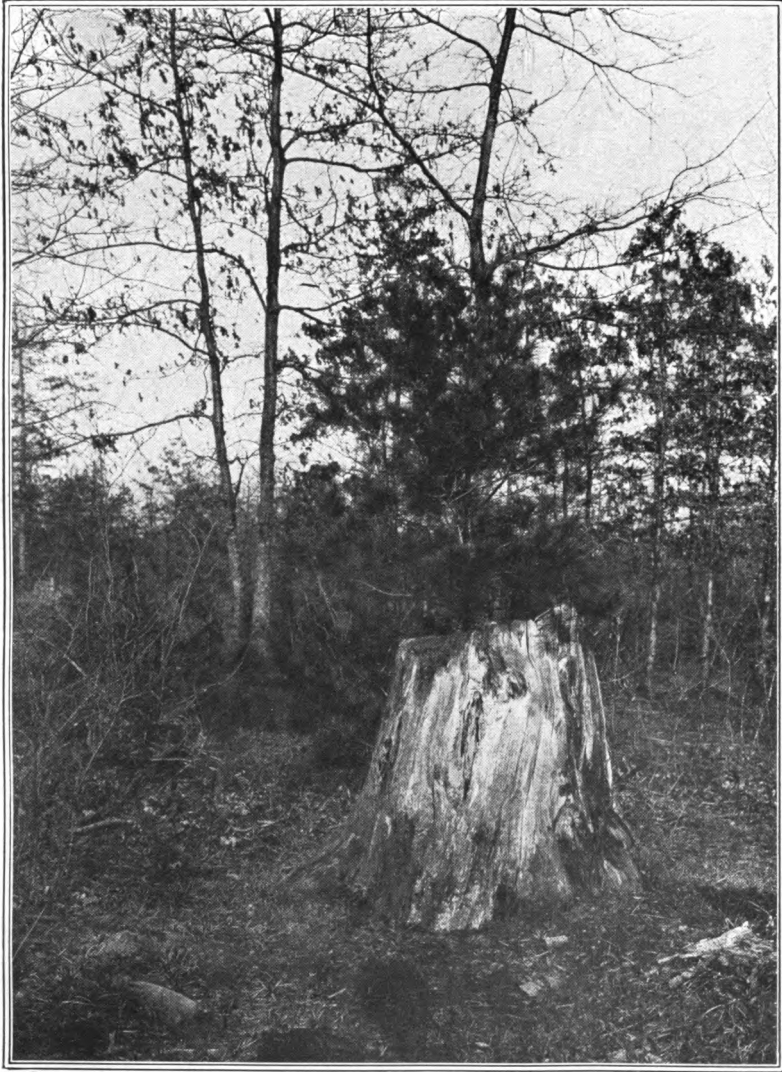


FIG. 2 (BEAL). OAK AND PINE FOLLOWING ORIGINAL PINE, AS SHOWN BY THE STUMP IN FOREGROUND.

extent. The trees were thick enough to cover the ground and were making a fine growth. They ranged from the height of two feet up to ten. One of these groves was northwest from Grayling about half a mile; the other was perhaps five miles to the northeast, if I made no

mistake in keeping my bearings. Both of these large groves and others that were smaller, belong to Salling, Hanson & Company, who, I am very happy to say, intend to continue trying to keep the fire out for the purpose of encouraging these young pines.

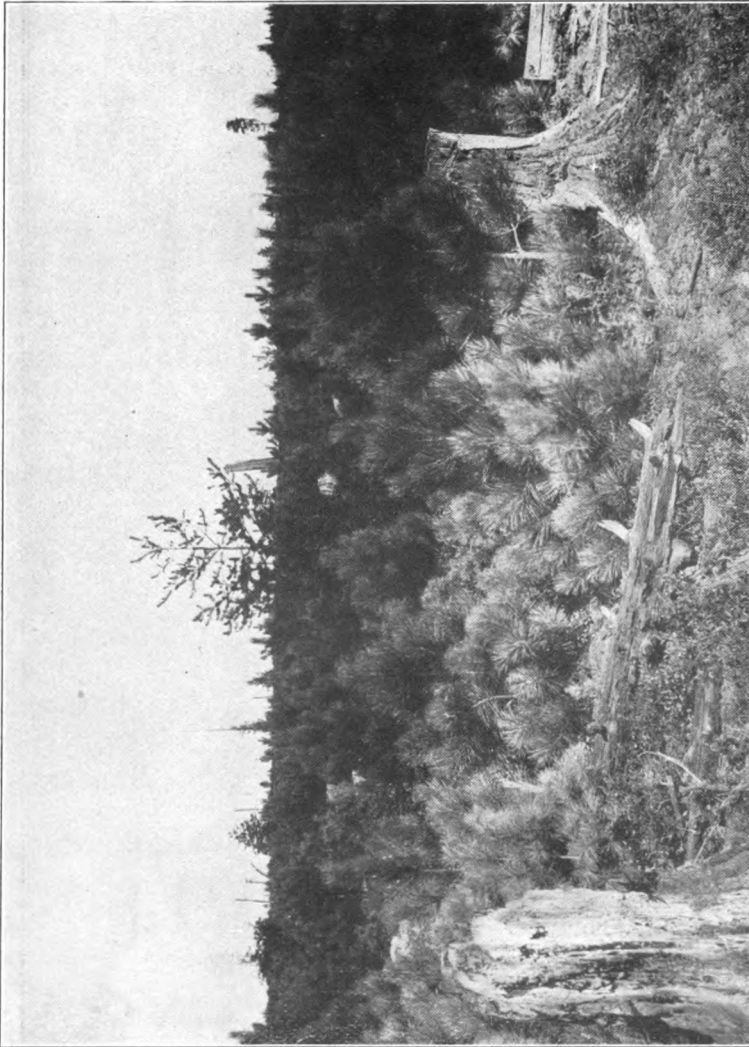


FIG. 3 (BEAL). A GROUND COVER OF NORWAY PINES. FOLLOWING A PINE FOREST.

Figure 3. A glimpse of Norway pines following immediately a pine forest, and Figure 4, a group of white pines 25 years old, illustrate my contention.)

In most parts of the three or four southern tiers of counties of Michigan, evergreens are entirely absent or very scarce. On settling that portion of the State, pioneers found great forests consisting of oaks,

maples, elms, hickories, walnuts, cherries, tulip-trees, beeches, fifty or more species in all. In many places, hurricanes swept down strips of the timber for the distance of a mile or more.

After clearing pieces of such land, sometimes it was allowed to remain without cultivation. Whether the timber was blown down or cut down, it made no difference, a vigorous growth soon occupied the ground

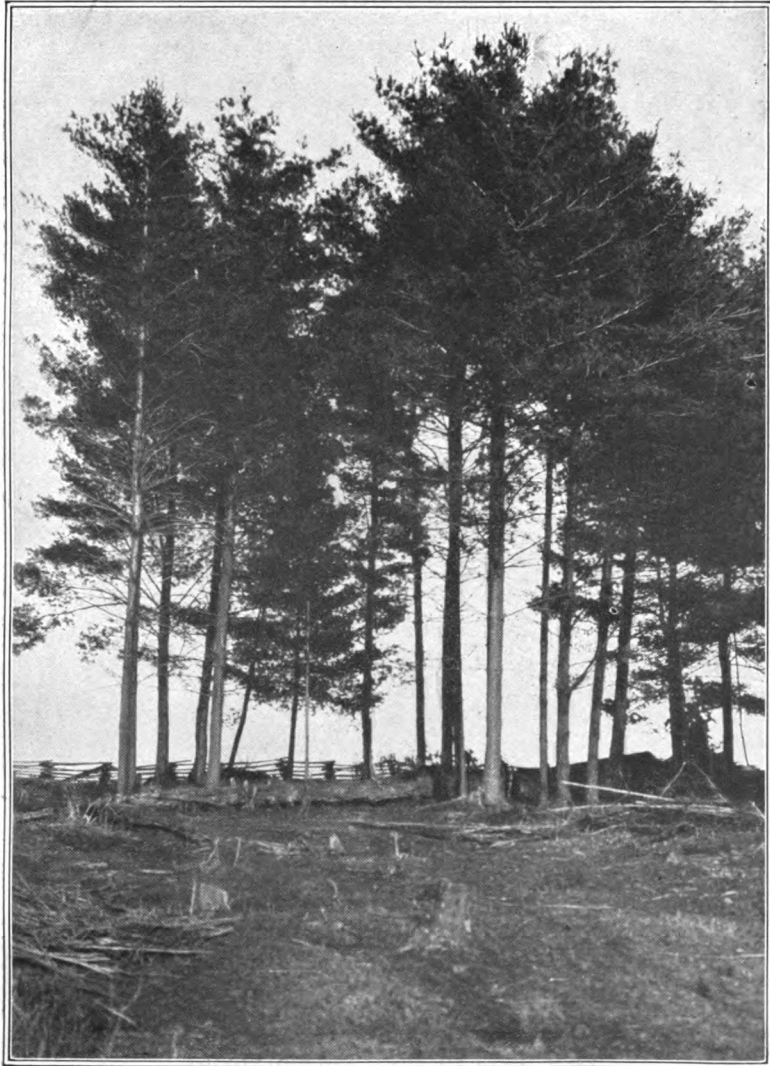


FIG. 4 (BEAL). SECOND GROWTH PINE, 25 YEARS OLD.

unless the farmer cultivated or pastured the soil. The second growth of timber came from sprouting stumps or seeds of neighboring trees. No evergreens appeared in such places, unless bearing trees were found

in the vicinity. The second growth sometimes varied more or less from the primitive growth, depending largely upon the kinds of seeds that grew in the vicinity.



FIG 5 (BEAL). A YOUNG GROWTH OF MIXED BROAD-LEAVED TREES IN AN OPEN SPOT IN UNPASTURED WOODS.

In Fig. 5 we have a picture of a young growth of mixed broad-leaved trees which occupy the ground in an open spot in unpastured woods.

The picture was taken in western Lenawee. Not an evergreen tree or shrub can be found among these young trees. Hundreds and hundreds of like examples can be found.

There is still an occasional person who believes that when one form of life has been destroyed and something springs up not before noticed by him, that these plants do not appear from seed or sprouts in the ground, but the germinal principle was in the ground waiting for the proper conditions to develop it. Such persons believe in spontaneous generation, a view which is not entertained by any person well trained in the science of today.

The view is occasionally advanced that the soil becomes exhausted by growing some kinds of trees and that a change is necessary, not knowing that in Germany certain forests have borne beech, fir, and spruce for 1,000 years in succession. Foliage, dead limbs, and trunks enrich the land year after year by returning a good share of the most important materials to the soil. If not often burned over, the soil in a forest grows richer instead of poorer. It is different with farm crops. Wheat contains of potassium five times as much as the beech, and nearly ten times as much as the pine; of phosphoric acid, five times as much as the beech, and ten times as much as the pine; of sulphuric acid, fifty-seven times as much as either tree. These three substances are the most apt to be rapidly reduced by heavy cropping. Of lime, however, the beech requires more yearly than the wheat, but lime is seldom lacking in the soils of Michigan.

In the first report of the Michigan Forest Commission, published in 1888, fourteen years ago, I made some statements concerning the succession of forests. I quote a few paragraphs, as the report may not now be in the hands of the readers of this paper.

"On digging a few of these slender oaks in the dense growth of pines, we find some of them come from clumped roots, or 'grubs' of various sizes, showing that the present growth is the first, second, third or fourth sprout which has apparently come in succession from the same foundation; some of these old sprouts are now represented only by dead stumps, some of which are charred near the ground. By counting the rings of growth in the last sprout, or if small, the bud rings, we may tell very accurately how long since a fire killed the former sprout."

"The marks of bud rings show that they may be four to ten years old. On examining some near the ground, we shall find a part of them are the first, second or third sprouts from a small clumped root or grub. It is not difficult to find white oaks under eighteen inches high that are twenty or more years old, and then, this may be the second, third or fourth sprout that has followed in succession, so it is not improbable, that in some cases seen, the parent root or grub was sixty to one hundred years old and the whole not an inch in diameter anywhere above the ground. Then what shall we say of the age of some grubs that weigh thirty to fifty pounds each? Slender red maples are rather common in this forest."

"Some of these pigmy oaks and maples have old charred stumps near the surface of the ground. In like manner we find the other species above named, except that the young hemlocks and pines show no dead charred stumps with living sprouts beside them."

"About August 1st, 1887, the following sprouts were seen coming up from old stumps, large or small, or from root stocks. To give the complete list of those seen growing in this clearing would be to repeat the list seen growing in the woods near by, except that no pines nor hemlocks were seen on the burned stump lands. On the latter piece were

discovered some dog-bane (apocynum), one or two wild roses, a milk weed, a dwarf willow, a bush honey suckle (diervilla). These were not mentioned in my list found in the forest, but they are now evidently growing from old rootstocks."

"Let us now turn our attention for a few moments to a very different state of things—a study of the sandy barren plains known as pine barrens, or jack pine plains."

"About seventy-two species of flowering plants are very uniformly found on these plains. Of this number, sixty-eight are perennials, including a dwarf willow, three dwarf cherries and many other low shrubs."

"The number of trees in this list is a small one, including two aspens, three oaks, and one pine, with occasionally two other pines."

"I need now speak only of *pinus divaricata* (ait.) Sudw. popularly known as jack pine, gray pine or scrub pine, to show how admirably it is adapted to living on these sandy plains. In many places it is about the only tree growing, and always on these plains it is found in large or in small numbers."

"We often see cones of this species which are to all appearance perfect, that are ten or fifteen years old, and yet the scales have never spread to liberate their seeds. Unusually dry weather, the death of the tree from the fire running over the ground, cause many of these stubborn old cones to open and allow the seeds to escape. This often happens after the fire has killed every green thing above the surface. In a little time the seeds of jack pine are freely sown over the surface and are ready to start on the approach of warm weather of the succeeding spring. During the past summer I picked from a single jack pine tree a lot of cones which were, according to my judgment, from two to four years old. They were placed in a black iron dish under glass and exposed to the sun. The cones all opened and many seeds were obtained. These were sown in sand in the laboratory and in five days began to come up. In a short time, 120 out of 125, or about 95 per cent, germinated."

"At the same time, from the same trees, I selected old cones which I believed to be from four to six years old at least. From these, 225 seeds were sown, 191 of which germinated, about 85 per cent."

Unlike seeds of white pine, Norway pine or hemlock, the seeds of jack pine start freely in the open, where there is no shade.

Lodgepole pine, *pinus murrayana*, of the Rocky Mountains, resembles the jack pine of this State in many particulars, in the quality of the timber, the ability of seeds to start and thrive in the open; the fact that many of the cones remain on the tree unopened for years, unless exposed to unusual heat.

"I feel confident that in an hour or two spent in certain favorable places, I could fully satisfy any intelligent person, unless he is unusually stubborn, that it is an easy matter to prove that new forests spring from seeds or the stumps of the old."