

should depend upon these business considerations, upon a desire to make the most of the land. The welfare of the country is best served when each man makes the best permanent use of his land. I think that the best permanent use of the land is to have a part of it under timber and well managed. I haven't a doubt but that if a wood-lot is not well cared for the land should be cleared and cultivated. It is as necessary to use brains in the wood-lot as on the remainder of the farm.

Of course when scrubby timber is cut it will produce rough fuel. That is one reason why it should be cut first, so that it will not go on growing larger to produce a still greater proportion of undesirable wood. Selection in wood-lots has been in the wrong direction. The best trees have been taken, so after that only the worst are left. The first step in improvement must be to get this inferior stuff out, and either by the encouraging of existing valuable species or their artificial introduction to give the wood-lot a new start. Also, when mature trees of valuable species have done their duty in seeding up the ground they should be cut, both because their removal will give young ones more chance, and because if they have reached the limit of their development and the price of lumber is not increasing faster than the interest charges, they have reached the period at which they can be most profitably sold. After all such trees are removed there will be a period of years during which there will be no annual income, excepting perhaps fuel and wood for farm purposes, but if the wood-lot is well stocked, every year will see one or more cords of wood added per acre, and if the trees are of valuable timber-making species, a correspondingly larger value added to the price of the land. When the timber reaches the pole stage thinnings may be made at small profit, care being taken to always leave the best trees. The chief value of a thinning lies in the improved condition and more rapid growth of the remaining timber. Pruning is very seldom worth while; the trees should be close enough together to prune themselves.

Nearly all Ontario trees will successfully seed in on even heavily-sodded ground if stock and fire are kept out. There can surely be no farmer in Ontario who has not seen the heavily-sodded ground under old elms, maples, oaks, black cherries and pines covered with young seedlings. Of course the sod is an obstacle, many of the young trees are choked out, and much better progress is made if the turf is broken, but even without this, in the long run the trees win out. The only difficulty is that trees with heavy seeds do not scatter their seeds very far.

A shelter belt around the wood-lot begins to keep the leaves from blowing out of the wood-lot as soon as it reaches a height of three or four feet. Whether a shelter belt is necessary or not depends altogether upon the configuration of the land and the amount of underbrush beneath the trees. It is only necessary where sweeping winds blow the leaves away and prevent a surface mulch from forming.

It is not to be expected that the matter of wood-lot improvement or farm forestry will develop rapidly until its advantages have been demonstrated. Fortunately, the Ontario Government has now under forest management waste lands that will before long show that what foresters claim is not an idle theory, but actually a productive department of human activity.

I shall conclude with this well-authenticated instance of profit from a wood-lot, as quoted in the New England Farmer. It is to be noted that the soil in this case was very poor, that the forest conditions for tree growth are not so favorable to white pine in Massachusetts as is much of Ontario, and that the trees were planted so far apart that they were hardly likely to make economical height, growth or produce clear lumber.

"Daniel Seaver, of Tewksbury, Mass., recently sold the pine growth on three acres of land for \$500.00; or at the rate of about \$166.66 per acre. These pines were set out by his father some forty-five or fifty years ago. Mr. Seaver's land consists in part of rich bottom land, and the north of this bottom land abruptly terminates on the borders of a sandy plain.

"At the time his father set the trees this plain land was nearly destitute of soil. Mr. Seaver's father commenced setting pines on this barren waste to prevent the sand from blowing onto his productive fields, which it did when strong northerly winds prevailed. The pines were set in straight rows, about forty feet apart between the rows, and much thicker in the rows. As the trees became too thick they were thinned out for wood.

"After the elder Seaver commenced to set trees, in the course of four or five years, as he could find time, he set out from ten to twelve acres. The larger part had been cleared off, and the three acres recently sold was the last of the growth. Mr. Seaver says his father did not realize any personal benefit from his labor, but he gratefully appreciates the benefit he has derived from it.

"Mr. Seaver has about two acres of land of the same kind, from which the timber was cut several years ago, with the exception of three or

four large pines which were scattered over the lot. He says these pines have seeded the land, and young pines have sprung up sufficient to set 1,000 acres of land. This seems to make it clear that in clearing a pine lot it is well to leave a large pine occasionally to seed the land."

H. R. MacMILLAN.

Dominion Forest Service.

Reforestation.

By Prof. A. W. Kneeland, M. A., D. C. L.

It seems to me that surely the day has gone by when it needs argument to convince anyone that the question of reforestation is one of the most vital questions before this country, as it is to a still greater degree before the old countries of Europe.

Devastating floods, denudation of soil, destruction of life and property, failure of water supply for domestic and manufacturing purposes, diminution of rainfall, and the consequent lessening of land products, are but some of the evils directly traceable to the cutting down of our forests, and that in these days over vast areas of land that can never be utilized for cultural purposes, such as rocky hillsides and swamp land that cannot be drained.

One has but to journey across the continent to find hundreds of such barren localities, that but a few years since were supporting dense forests of



In a Eucalyptus Forest.

Near Los Angeles, showing 25 years' growth.

valuable timber, now become a prey to the flames or the woodman's axe, while the soil that supported this life and stored up unbounded supplies of water for the plants below, is being washed away, leaving but the bare rocks turned up to a pitiless sky.

Had the ruthless fires and the cutter's axe spared all the small timber of these areas, the future of this country would have been different from what it will be, both as to climate and financial destiny, but something can still be done to repair the almost hopeless damage that has been done, and that something must be reforestation, according to some well-considered, persistent scheme that will once more clothe our barren and drifting sand lots and rocky hillsides with growth and beauty.

It may be thought by some that barren, desert sand cannot be made to produce trees, and that it will not pay to make the attempt, even should it be possible. I hope to show in the course of this letter that it is not only possible to recover our mountains and swamps with valuable timber, but that it will pay to do so, even within this generation.

Perhaps the most hopeless, barren, rainless desert tract in the world is that known as the Great Desert of North Africa, and perhaps the least likely nations of the world to conserve natural resources and discover new ones are these nations of semi-barbaric people occupying the narrow fringe of fertile land along the northern coasts of Africa, yet these nations have become so seduced with the value of floss, both in relation to their direct returns and to the influence upon general conditions, that, prior to 1884, once green-gold date palms had been artificially introduced to the borders of the Great Desert, and it has been found that, when once rooted, these trees have been able

neath all the moisture needed for their growth, each becoming in a small way a distributor of moisture to the dry and superheated atmosphere of what was a hopeless desert, and so changing for all time to come the climate of that region.

From the experiments already successfully made it is inferred—correctly, no doubt—that the whole of the Great Desert can be covered with food-producing and timber-producing trees, each worth directly in food-producing power at least five hundred dollars to the country wise enough to make the investment, and indirectly of incalculable value in its influence upon soil and climate.

In Southern California, Spanish-Americans gave but little heed to the comparatively scarce timber supply, as they built adobe houses and churches, and needed almost no fuel, but, with the coming of settlers from the Eastern States, Canada, and Central and Northern Europe, timber became more of a necessity, and the few forests along streams and in mountain valleys were cut away to the great loss of that region.

Among the descendants of the old Spanish-Americans was one Adolph Sutro, who made a fortune in draining the Comstock Lode, by the largest and most costly drainage tunnel in the world.

This fortune he invested in barren hills, broken-down mountains and sand-dunes about San Francisco, California. These hills were almost entirely crumbling rock, and the sand-dunes were supposed to be hopelessly devoid of the means of supporting vegetation; yet, Sutro saw in them mines of gold, not to be dug out of rocks and sand by pick and shovel, but to be coaxed up from the depths by growing trees, which would also cast their benign influence over the whole neighborhood.

Accordingly, in the year 1880 he began planning these wastes with trees, covering about one-half of the whole, which was about 3½ miles.

One man, with helpers, planted, in three years, from 1880 to 1883, about four million young trees, at a cost of about \$120,000, or three cents per tree planted. The trees were of four species of fir and two of eucalyptus.

The trees were planted twenty feet apart; 95 per cent. of them grew, and still flourish, and new trees are springing up everywhere, until there is a thick growth of tall, handsome trees, of great value.

Now for results. Twenty acres of this land have been donated to the University of California, and the "United Colleges" now stand on these grounds; broad avenues have been cut through the forest, and sites for residences have been cleared, so that the original forest has been made very much smaller. But one million dollars were recently offered for the standing timber on the residue, and refused.

As evidence of the great value of these trees to-day, permit me to state that I saw many being drawn down into the city, a distance of four or five miles at most, for which \$5 each was paid for haulage alone, and a team could draw five, and make two trips a day.

The land was almost valueless thirty years ago; to-day it is valued at \$12,000 per acre at a moderate valuation, and the whole 3½ miles, less lands sold off or turned into streets and avenues, is estimated to be worth \$7,000,000.

If this were all, my tale would be hardly worth telling; but it is not for, on entering the forest to-day, one is struck with the deepening soil, moist and black, and with the drip from the long leaves of the moisture condensed thereon at night, which is beginning already to find a way out into the light, in the form of springs at the base of the hills.

To a considerable degree this forest has changed the climate of the locality, and has been a veritable gold mine to its owner.

But some will say that these cases are from afar, and are, therefore, not applicable to our own conditions. Let me now refer to cases that are applicable, and first of all to that of Tully Mountain, near Orange, Mass. In the winter of 1877-8, my brother was one of a gang that cleared one side of Tully Mountain of its timber, cutting everything in sight, even down to saplings small enough for barrel hoops. The area cleared was about 100 acres. The land was worthless for agricultural purposes, and was sold after clearing for \$1,100.

Reforestation in this case was that which nature will effect almost everywhere in our latitude, if fire and beast are excluded; hence, without cost, this area grew up to a dense growth of white pine, chestnut, oak and white birch, testifying to the leanness of the rocky soil and to the aridity of the heart of nature.

After holding this lot for about 30 years, its present owner, though large quantities of timber had been cut out in the thinning process in the meantime, has sold the standing timber, reserving the land, for \$15,000, a very fair return on an investment of \$1,100 for thirty years, especially when one remembers that good interest had been drawn from the lot all along the years, from the sale of the thinnings aforesaid.

In the case above and I must leave the most interesting, subject to others.

When 25 years ago, when the series of the Great Desert was being rapidly filled in by settlers