

"A BRIEF OUTLINE OF FORESTRY."

By

Hartley B. Holroyd.

I. Definition.

II. Introduction.

III. Effects of the Forest on the country.

IV. Management of the Forest.

V. Utility of the Forest.

VI. Regeneration of the deforested areas.

VII. Advantages of mixed over pure woods.

The science of forestry treats of the care, purpose, and utilization of the forested areas of the earth, together with the best means of regenerating the deforested areas.

At one time the greater part of the earth was covered with a sylva differing in variety according to the climate and soil of the several countries. Through the careless and injudicious utilization of these areas, they became greatly reduced and the soil in many cases greatly deteriorated. With this factor came the necessity of action toward a more economical use of the resources given us by nature. So the science of forestry, in its different branches, gradually grew into prominence.

The various questions arising under forestry have been economically and scientifically dealt with for many years in India, Germany, Switzerland and England but it is only of late years that the science of forestry has shown a marked development in the United States. In order to obtain the most economical results, the control of forests should, with a few exceptions, be under the supervision of the government. In state forestry the interests of the private individual are brought into harmony with the interests of the community as a whole and both derive a mutual benefit. This is exemplified in case of protection forests which are maintained on account of their influence upon the welfare of the community of a large expanse of country. For example, forests which are maintained to prevent denudation, land-slips, to prevent erosion and the silting up of fertile lands at the foot of hills, as a protection where shifting sand occurs, and the preservation and regulation of the water supply in springs and rivers. State forests are considered as a suitable source of public revenue as the income is regular, sustained and safe, and it is a source of income, the payment of which, is not a burden upon the people. They also act in the capacity of a reserve fund which is available for the security of bonds or other pledges. Forestry is the more profitable when conducted on large areas, requiring therefore a larger outlay of capital, which only in exceptional cases is at the disposal of the individual. The state, we suppose, lasts forever and the cost of utilizing the forests will be reimbursed even after the lapse of considerable time even if the rate of interest be small on the capital invested. The hearty cooperation of state and individual is gaining great precedence in the United States. Private persons rarely have the necessary knowledge to conduct a systematic management and are inclined to favor their own momentary interests by converting growing stock into

money to the detriment of those concerned. This is averted by the supervision of the state.

The forests exert a great influence upon the temperature and moisture of the air and the soil. Evergreen trees with a dense foliage have the greater effect while the thin-crowned deciduous trees have a lesser effect. The reduction of temperature inside the forest is greater in summer than in the winter and also higher in the night time than in the day time. A person passing through a forest region and crossing from a cut-over portion to the virgin part will notice a very perceptible change. The excess of rain fall in forested regions over that of open country has been found to range from 1.25 per cent at sea level to 43 per cent at an altitude of about three thousand feet, showing an increase in rain fall in elevation. The forest canopy breaks the force of the falling water and leaves only 77 per cent to reach the ground, 23 per cent being given back to the surrounding atmosphere, this falling water on reaching the forest floor is caught as it were, by the layer of humus which has a great absorptive power and slowly percolates down into the ground where it becomes available for the feeding of springs. The United States government has now taken up this question in the case of California where the extensive cutting of the forests have lessened the regular flow of water through the valleys. The forest is perhaps, the most important factor in the fixation of shifting soils. The area now occupied by the Golden Gate Park at San Francisco was once shifting sand dunes. The refuse matter of the city is hauled to the park and there is used as fertilizers. Judicious planting of trees and shrubs of all kinds has given California one of the finest parks in the United States. In sections of the country where towns are endangered from avalanches forests are grown as a protective measure.

The effects of the forest on the hygienic qualities of a section of country is very great. It has been found that forest air is very much richer in ozone and oxygen than air in the open. Stagnant water and organisms of disease are rare in the forest; for instance, in the dismal swamp of Virginia the water is healthful while in the surrounding burnt over lands malaria is very common. I have found that where the forest has been cut over several years ago there was more water to be found on the surface trickling along than on the uncut portion of the forest. This water was impure, it being only surface drainage while in the uncut virgin forest what few springs were found were of cold water coming from a greater depth. In many instances the forest

furnishes clear, pure, water to large cities. In south-western France before the planting of pine forests it was a very unhealthy locality while to-day it is a health resort. In summing up the various effects of the forest on the country the aesthetic qualities should not be overlooked. The many parks and places of resort testify to its aesthetic qualities.

As yet little has been done towards the proper management of our forests owing to the lack of interest of the lumbermen in providing for sustained yields. The normal forest should comprise age gradations from the veterans to the seedlings and there should be a normal proportion amongst the several gradations. It can then be worked according to the system of a sustained annual yield. The most economical workings of the forest is maintained through the rotation of crops. As the merchantable trees are removed for commercial purposes the second age gradation is brought to fuller enjoyment of light. At the time of each cutting a few seed trees should be left to perpetuate the species. The cutting should not exceed the increment for that period else the forest will gradually depreciate. Too much stress cannot be laid on this point. The writer has had the opportunity of observing the destructive lumbering as carried on in the pine regions of the west, where there is little left to represent the once dense growth of virgin forest. Proper thinnings should be made at intervals in the forest growth to stimulate the increment and wherever a gap appears it should be closed up by artificial planting.

Fire is perhaps the worst enemy the forest has and proper protection should be taken against its ravages. This is accomplished by establishing fire lines or cleared roads at different points through the forest and keeping some one on a constant watch. This is one of the duties of the forest rangers. Among some of the other enemies of the forest are to be found snow, rime, fungoid diseases and insects. As the forest reaches maturity a heavy thinning or partial clearance is often to great ^{advantage as} ~~advantage as~~ it tends to produce a marked increment in girth and in case of ~~these~~ ^{these} that have grown rather conical in shape it will tend to make them increase in diameter more toward the crown than lower down, giving a more cylindrical form to the bole of the trees, which form, is the most valuable for conversion into lumber.

Utilization relates to the process of harvesting, converting and disposing of forest products. The direct utility of the forest is due to the produce which it yields, the amount of capital which it

represents and the amount of work which it provides. The various uses and great demand for wood make it the principal product. The more general introduction of substitutes for fire wood has drawn attention to the production of timber in preference to fire wood and at the same time new demands for wood have sprung up; for example the preparation of wood pulp for the manufacture of paper. Beech which was formerly a staple fire wood is now used for floors, pavements, furniture, packing cases, etc. The minor forest produce includes all the other products besides timber and fire wood such as bark, which is used for tanning purposes, turpentine, resin, gutta percha, and numerous dye stuffs. Besides the maple syrup industry there are many others, auxiliary to, and depending upon the forest produce, all of which the forester should be informed upon.

There are two methods of regeneration of a deforested area - i. e. - the artificial formation of woods and the natural formation of woods. The former is more expensive and as a rule does not extend over so large an area as the latter. Artificial regeneration is accomplished either by direct sowing of the seed or raising seedlings in a nursery and transplanting them on reaching a suitable age. Both of these latter methods have their advantages. Sowing broadcast is very expensive as it requires a great amount of seed and in most cases requires the cultivation of the sowed area. Artificial planting is very expensive also as it involves an immense amount of labor while on the other hand planting is specially adapted to those species which are tender in youth and could not survive the external dangers to which they would be subjected in sowing. Sowing may be accomplished in a variety of ways; in strips or furrows, in patches, in trenches, or on mounds. The choice of one of these ways depends upon the character of the locality. The sowing in strips or furrows is generally resorted to in case of a steep hillside or in case of heavy seeds where they are sown in the furrows and covered. Sowing in patches is generally chosen in rocky soils and localities which still contain the stumps of former trees. It is less recommended for wet soils as the water is likely to collect on the seed beds. In wet localities having a heavy soil the mound method is used while in a locality of opposite character the trench ^{method} ~~method~~ is preferred. It is very often the case that a combination of two or more methods is necessary; for example where the character of the locality changes from place to place, as where dry spots alternate with swampy ground or where free soil

alternates with stony soil. The distribution of plants over an area to be planted is either regular or irregular. The former method is the one generally used and consists of geometrical figures, the more usual ones being the square, the equilateral triangle, equidistant lines or rows and the quincunx forms.

Natural regeneration by seeds may take place under shelter woods or may take place from adjoining woods, in which case the mother trees are alongside the cleared area. The conditions of success of this system depends upon the agencies which carry and distribute the seed over the open area. The principle agent of distribution is the air currents and in some cases running water or the seeds may roll down a slope by their own weight. It has been found that Birch and Elm seed will be carried four to eight times the height of the mother tree, Spruce and Scotch Pine three to four times, Maple and Ash two to three times, while Beech and Oak scarcely beyond the reach of the crowns. In case the mother tree stands at a higher elevation or the clearings are made in strips not to exceed in width the height of the mother trees, the chances of success are much greater. Owing to the uncertainty, however, of the seeding and the injuries to which the young plants will be exposed, this system cannot be recommended only under very favorable conditions of locality and in case of hardy and quick growing species.

Natural regeneration under shelter woods has been nature's primeval mode of perpetuating the species. In this system new generations spring up on the area sheltered by the seed bearing trees. With man's application of knowledge it has been modified into various systems which have their modification according to the conditions of the locality.

The Selection system is exemplified in the removal year after year of the merchantable timber and the culling out of all undesirable trees, followed by the springing up of the new growth in groups or by single trees. Under this system it will be seen that no part of the forest is ever at rest but the forest as a whole is being utilized to a good advantage. In case of a large area the forest is divided into blocks one or several being taken in hand every year.

Under the Group system a wood presents a varying picture some parts of it being wholly regenerated while others are more or less so, giving as a whole, all gradations of regeneration. In this system the age classes are distributed over the forest in groups of greater or less extent, the older groups being regenerated first, the second oldest next and so on until the whole forest has been gone over.

In the Compartment system the regeneration occurs approximately at the same time over the whole wood, which is called a compartment. In this system the old wood is replaced by young even-aged wood, supervision is easier and more satisfactory and cheaper means of transportation is facilitated as the work is not scattered over a number of disjointed strips or groups.

In summing up, suffice to say that neither the artificial nor natural method of regeneration is the best under all circumstances. A consideration of the local condition must be taken into account in each case, care and attention being given to the kind of species to be grown, conditions of the locality, available funds, and the general objects of management.

A mixed wood consists of two or more species grown in common, while a pure wood is one consisting of only one species. It is much easier to manage the pure woods as there is only one species to be considered. The fitness of a species to be raised in the pure woods depends on its capacity to preserve or improve the factors of the locality or if the wood is to be treated under a short period of rotation, or where only a certain locality is fit for a certain species.

Mixed woods admit of more complete utilization of the factors of a locality and consequently produce a greater amount of wood if the species are properly arranged. They enable the forester to meet the various demands of the market while at the same time many of the other species yield valuable minor produce. If there are any mistakes made in the selection of species it will be easier to rectify them in the case of mixed woods where the undesirable ones can be removed in thinning. In case of mixed woods it is easier to modify or transform the crop at any time to meet the future requirements of the market and it has been found that mixed woods are not as liable to the ravages of disease as pure woods. In the mixture, care should be exercised that each species be given the growing space required for its best development and that ^{light} the demanding species will not be shaded by other trees but if mixed with shade enduring trees are either faster growers or are given a start over the shade enduring species.

The circumstances of each case must decide whether the species should be mixed by single trees, groups or in strips.