

**BULLETIN NO.18. U. S.
DEPARTMENT OF AGRICULTURE.
DIVISION OF FORESTRY.
EXPERIMENTAL TREE PLANTING
IN THE PLAINS**

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Planting in the Plains by Charles A. Keffer

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CHARLES A. KEFFER

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DIVISION OF FORESTRY.

EXPERIMENTAL TREE PLANTING IN THE PLAINS.

BY

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INTRODUCTION.

Forestry has to deal with forests. Forests subserve two purposes: supply of a most necessary raw material, and amelioration of the conditions of climate and water flow.

In the semiarid and arid regions not only is tree growth established with more difficulty and expense, but except where irrigation can be had in full supply the trees will grow slowly after the vigorous juvenile period of twenty or thirty years, and remain of small dimensions, short bodied, and fit only for firewood.

Protection, then, amelioration of climate, is the principal object of forest planting in these regions. Wood supply is the secondary consideration.

The forests which furnish the enormous quantities of wood material used in this country, amounting in value to \$1,000,000,000 in round numbers per year, grow in the humid regions, and will always grow there, because they are more favorable to tree growth, developing larger and better timber, more rapidly and cheaply, and that, too, on nonagricultural soil.

The first interest, namely, our lumber supply, being so infinitely more important, most of the attention of the Division of Forestry was immediately taken up with problems affecting the rational use of our existing forest resources and their recuperation, somewhat to the exclusion of the questions which interest the tree grower of the West.

The only way in which the division could have made itself useful in the latter direction seemed to be in field demonstration, namely, by establishing experimental plantings in which the adaptation of species to the climate and methods of using the same might be tested and object lessons exhibited. Practical difficulties of various kinds and deficiency of funds prevented the inauguration of such work until a plan of cooperation with the State agricultural experiment stations removed at least a part of these difficulties, and the abandonment of other important work furnished sufficient means to attempt this field work. This has now been carried on for three years under many drawbacks, the most detrimental of which is the difficulty of securing properly selected satisfactory plant material delivered in good condition, and of adequate personal superintendence at the various stations during planting time.

While the professors of horticulture who have kindly volunteered to take charge of these plantations unquestionably devote themselves

to this voluntary duty as zealously as to any other, and have our sincerest thanks for their interest in the same, we are aware that, especially at the planting season, they are so overcrowded with work that only a passing attention can be given to this outside matter; and at the same time wherever directions for field work are to be given from a central office far away from the 10 or 12 stations, all differently situated climatically, the full measure of success can not be expected. The difficulties surrounding the procurement of plant material have been discussed at length by Mr. Keffer in this report.

The objects of these experimental plantings may be briefly stated as follows:

1. Testing adaptability of various native and exotic species in the several regions.
2. Finding methods of establishing such species as seem well adapted, but are difficult to start.
3. Testing the behavior of various species in mixture, and their influence upon one another, as a basis for selecting proper mixtures (mixed planting being recognized as superior).
4. Developing methods of cultivation, more successful or cheaper than those in use.
5. Finding methods of securing plant material most cheaply.
6. Testing influence upon hardiness of locality from which the seed is secured.
7. Demonstrating forestry methods in tree planting.

In spite of the difficulties mentioned, the experiments have been fairly successful and instructive and will become more so as the trees grow. Nor should it be overlooked that, in experiments, failures are just as instructive—provided their cause is discovered—as successes.

More liberal appropriations to place this work upon an adequate basis, commensurate with the interests involved, would produce more satisfactory results.

B. E. FERNOW,
Chief Division of Forestry.

EXPERIMENTAL TREE PLANTING IN THE PLAINS.

INTRODUCTION.

An effort has been made in this bulletin to bring together a record of experimental plantings, not yet sufficiently extended to be more than suggestive, which have been conducted by the Department of Agriculture during the last two years. It seemed in this connection desirable to give also a brief discussion of conditions affecting tree growth, with special reference to those encountered in the Western plains, where the plantations are mostly located.

The forestless region of America includes all the States between the Mississippi River north of the Ozark Mountains and eastern Texas, and the Rocky Mountains, together with the plateau west of the Rocky Mountains. The possibilities of forest growth in this vast area are yet to be proved. Roughly speaking, any species that thrive in the adjacent wooded regions can be grown in Iowa, the Red River Valley of Minnesota and North Dakota, the Sioux Valley of South Dakota and the eastern counties of Nebraska, and in the more southern States. We know that difficulties of cultivation increase rapidly as one goes westward, but we can not say where the western limit of successful tree culture is. We can not even define the limits of successful agriculture in the plains, for with increased facilities for irrigation splendid crops are now produced where only a few years ago it was thought desert conditions would forever prevail.

It is admitted that forest planting, as a financial investment, will probably be profitable on the plains only in a limited degree. Favorable sites may enable the profitable raising of fence posts and other specialized tree crops, but the growing of timber on a commercial scale can hardly be expected. The quick and sure returns of agricultural crops warrant the farmer in supporting expensive irrigation works in the semiarid West, but we can hardly foresee a time when even an approximate expenditure for the maintenance of a forest crop would prove profitable except for the protection afforded by it. While this is probably true, there yet remains for demonstration the limitations of tree culture within the possibilities of the Western farmer—what species are adapted to his land; what methods give promise of success; what can he do to improve conditions and so make possible not only the growth of useful timber, but also a greater variety of agricultural operations. As has been intimated, the difficulties of tree growing

increase greatly as one proceeds northward and westward from the eastern forest area. In the eastern border of the plains the planter has almost as great latitude in his choice of varieties as has the dweller within the forest, and he may select timbers of the highest economic value, choosing several kinds, each adapted to specific uses, and planting with them others whose only purpose is to promote the growth of his select trees. As we go westward the possibilities of choice become more and more restricted, until in western Kansas and Nebraska, in the upper Missouri Valley and the high plains of Texas, New Mexico, and Colorado very few species can be relied upon, and these will have to be nurtured and cared for to a degree not dreamed of by the Eastern farmer. The exact limits of choice have yet to be determined. Thus far we must deal largely with generalities and inferences, which become more and more problematical as we proceed westward.

The experimental plantings herein described in detail are given not only as a record of the beginnings of an important work, but as indicating what are believed to be useful mixtures of trees for planting in the West. Sufficient time has not elapsed, even in the oldest plantings described, for final conclusions to be drawn; but the notes on kinds will be found of interest in connection with the experiments, and the whole is believed to afford a basis for selection of trees for the various States included in the treeless area.

While this bulletin has to do primarily with Western planting, it may be found a safe guide in many directions for forest planting within the timbered regions of the country, especially as to general principles involved. Experiments in planting in cut-over lands in the pineries of Minnesota and Pennsylvania have been begun by the Department, but are not yet sufficiently advanced to warrant even a progress report.

CONDITIONS AFFECTING TREE GROWTH.

In common with all plant life, trees require a certain amount of heat, light, and moisture for their development. These elements are so interdependent in their effect upon tree growth that it is almost impossible to consider one without keeping in mind the influence which the other two are constantly exerting. Thus, if we discuss the effect of heat upon tree growth, we are at once reminded that the action of heat and light are inseparable and that the result upon the same species in a moist and a dry region is quite different. It must be remembered that these elements are never dissociated in their influence on plant growth.

Most trees have a wide range of endurance of heat, light, and moisture. The Red Cedar is a striking illustration of adaptability to a great range of conditions. It is found in the swamps of southern Florida, furnishing wood for pencils; on the dry, exposed foothills of the Rocky Mountains, where it is reduced to a mere shrub; along the Platte River Valley in Nebraska, in the northern forests of Maine, and reaches its best development in the limestone soils of eastern Tennessee—an