First Steps in Indiana Forestry.

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It is not meant by the title chosen to intimate that much preparatory work along forestal lines has not been done in the state. The work of awakening popular interest in forestry has been well done, it not, perhaps, overdone. In the schools by direct instruction, through the stimulus of arbor day exercises and by the wise and vigorous activity of the Indiana Forestry Association, practically every community has been reached. Upon the Forest Reserve the State Board of Forestry has conducted a large series of experiments and has collected a vast mass of data touching practically every phase of wood-lot management. Its reports and press bulletins, together with its educational contests, have served to increase and intensify interest in the movement for the conservation of our remaining forests. I suggested that perhaps this preparatory phase of the work had been over-accented, for there is such a thing, on the one hand, as spending so much time on preparation as to leave none for accomplishment, and on the other, by overstimulus to incite to ill-considered and poorly planned efforts. In Indiana the latter has been the case. An examination of the facts shows a very large number of instances of tree planting; plantings running up to the hundreds in number, into the thousands of acres in area and containing hundreds of thousands of trees. A review of the inspection of plantations as given in the reports of the State Board of Forestry reveals an activity in tree planting that is positively marvelous and almost incredible when the returns or rather lack of returns are taken into account. It is a sad fact but a true one that approximately 70 per cent of these plantings are total failures. In them, the total crop sold at the highest price would not equal the cost expended upon them. The remaining 30 per cent can only be regarded as partially successful. Only in a small fraction of the cases can the stand be regarded as representing the full capacity of the area. The schools also have had arbor day exercises for years, exercises which have doubtless been helpful and stimulating in many ways, but

the school yards in the main are as destitute of trees as they were before arbor day was projected.

All of this shows interest; it further shows a willingness to expend time and effort and money in tree planting, but it also shows with equal clearness that there has been enthusiasm without knowledge, and that in Indiana the first steps in forestry from the standpoint of results are yet to be taken. Incidentally it may be remarked that tree planting is not necessarily forestry, it is merely a single phase of forestry.

For the purpose of this paper we may omit the consideration of ornamental plantings, whether of streets or lawns or parks, and confine the discussion to the wood-lot and to the denuded area which is to be reforested. In the management of the wood-lot from the standpoint of conservation three things are sought: (1) The largest amount of timber per acre that the land will carry; (2) the best quality of timber possible; (3) the production of this maximum quantity and optimum quality in the shortest time possible. If these ends are accomplished there is evidently need of a technical knowledge which is usually not possessed by the landowner, and which in the multiplicity of his activities he has no time to acquire. If the largest quantity and best quality possible is secured from a given area it will be because those species of trees are selected which are adapted to the conditions of soil, of moisture, and of climate. It will also be in part because of species equally adapted to a given locality, those which make the more rapid growth, are more immune to insect and fungus invasion, which are less sensitive to unfavorable climatic conditions, have been chosen for encouragement. In a general way conditions which make for a vigorous and healthy growth make also for the best quality of timber, whether we consider weight or strength or direction of fibre or beauty of grain. In the large range of species available, in the variety, indeed, found in the average wood-lot, how many landowners have a sufficiently accurate knowledge upon these points to enable them to select species for encouragement with such certainty as to insure profitable returns? Taking the plantings referred to above, the failures came from lack of knowledge, not from lack of interest or enthusiasm. Most of the plantings were of black locust or hardy catalpa, planted, probably, with the purpose of short rotation management for post or tie stuff; but very often locust was planted on ground which in all reason should have been planted to catalpa and catalpa was planted on ground far better suited to locust. The result, of course, has been failure more or less complete, with loss of

money and time and use of land and, worst of all, loss of faith in the possibility of forest improvement. The argument is that this knowledge is strictly technical knowledge, the property of the specialist. It is not within the knowledge of the landowner, nor would he be justified in taking the time required for acquiring it from his other work. This is a very summary and incomplete resume of some of the silvical factors entering into the problem of securing maximum quantity and optimum quality in the shortest time.

The wood-lot, also, if it serve its purpose must yield its owner reasonable returns upon his investment and yield such returns at regular intervals. If it fails to do so its maintenance is bad business. If the wood-lot is regarded as an investment, perpetuity must always be in mind. It is then not merely securing a return at some given period of time, it is insuring by sufficient reproduction the harvesting of similar crops at future periods. How much shall be cut? How often shall cuttings occur? What relation shall the time of cutting bear to the time of regeneration? What species in the stand shall be encouraged and what species eliminated? How shall the amount cut be known to equal the amount grown between cutting cyles? These are a few of the factors entering into the problem from the standpoint of management, which is after all applied economics. Here again the knowledge is expert knowledge, it is not in the possession of the landowner nor has he time to acquire it. Yet because these factors are not considered ultimate failure is bound to result.

It seems that we have an inevitable deduction. Provision should be made as a part of the force under control of the State Board of Forestry for an *expert field agent* whose duty it should be to furnish working plans to the wood-lot owner which will give direction and certainty to his efforts to secure the largest quantity and the best quality in the shortest time possible. Each tract should be inspected carefully before the working plan is outlined in order that local conditions, which are of the highest importance, may be taken into account. Along constructive lines, the lines of securing results, the appointment of a trained field agent is absolutely the first step. Until such an office is created forestry work will be as ineffective and futile in the future as it has been in the past. Advice as to cleanings, thinnings, reinforcement, control of noxious insects and injurious fungi would naturally be among the functions of such a field agent.

Before any very great measure of success can be hoped for, provision

must be made of such a character that the landowner may secure the needed supply of seedlings, true to species and at a reasonable price. Under present conditions this is practically impossible. Nurseries as at present organized deal in forest trees mainly to supply the demand for street and ornamental planting. The placing of an order for a given species running up into the thousands or perhaps tens of thousands of seedlings is practically impossible except perhaps in the case of black locust and catalpa. Indeed it is not probable that nurserymen would care to undertake to meet such demands. The cost of collecting the seed, the additional area and labor involved, taken in connection with the fact that such orders could only be expected occasionally and that there would be no possible method of estimating the average annual demand for each of the species, would make such an enterprise one of very doubtful profit under favorable conditions and of very certain and large loss under unfavorable conditions. This means the establishment of a state nursery or nurseries, by the State Board of Forestry under expert direction, from which needed material for future plantings may be secured.

The experimental work at the reserve has gone far enough to indicate what species should be encouraged in reenforcement and new plantings, to demonstrate the best time for planting as well as the best method of planting, to show clearly enough the proper care and treatment after planting and to furnish a fair estimate of the expense involved in a correct practice. It is well within the law under which the board was created, that it should now take the next logical step, namely, the furnishing of suitable material for such plantings at practically the cost of production. Under the very best conditions from 3 to 6 per cent. is the best dividend that can be expected in forestal enterprises, so that any marked increase in the initial cost precludes all possibility of profit. The distribution of this material should be carefully controlled. It should be supplied only for afforestation or the reenforcement of existing wood-lots and never for street or ornamental purposes. The experience of the state nurseries in Connecticut, Massachusetts, and other states shows that this control offers no difficulty and that a demand is met which the nurserymen cannot meet and do not care to meet. Indeed it has been shown that since the establishment of state nurseries the sale of forest tree stock by nursery firms has largely increased, although it may be questioned whether the relation is a causal one. It is certain that the Board of Forestry by establishing such nurseries would accomplish much in the way of improving existing wood-lots and in

the afforestation of denuded and waste lands. It cannot be too strongly emphasized that in such work the state is not entering into competition with nurserymen, but is merely endeavoring to meet exceptional needs which lie beyond the field of ordinary nursery organization and purpose. It would of course be better if a series of nurseries could be established so located as to give not merely the best conditions for the growth of the seedlings, but also to meet the needs of different localities. This refinement of method is perhaps beyond the bounds of reasonable expectation, but certainly the supply of desirable species true to type at the minimum cost is another step in a constructive forest policy. Apparent difficulties cannot be considered in this connection, but in the main they will be found to concern details capable of a fairly easy adjustment; none seem to be fundamental.

A third step in a constructive forest policy would be the organization of a series of cooperative plantings. In this case the landowner and state cooperate. The proper official selects and furnishes the young trees, personally oversees their planting and gives direction for their future care. The landowner pays transportation charges on the seedlings and furnishes the labor involved in the planting; he also agrees to follow the directions for after care and to make report upon the planting at specified times. The advantage is two-fold: the constructive work of the Board of Forestry covers a large part of the state, while the landowner secures expert advice and material in return for his labor and care. This plan has been in successful operation in Ohio for a number of years with extremely satisfactory results in the majority of cases. Of course in this as in all other cooperative enterprises an occasional man fails to keep faith. Practically the same plan prevails in all agricultural colleges. Purdue University has cooperative plats in all parts of the state bearing upon every form of crop from alfalfa to apples. Such cooperation would involve but little expense if the office of field expert in Forestry were created and a state nursery established. Indeed, the expense involved in the salary of a field expert, in the establishment and maintenance of state nurseries for furnishing tree seedlings and in the institution of a series of cooperative plantings taken together would seem absurdly small when compared with the interests involved.

Successful tree planting, which is only another name for successful forestry, is in a certain sense an essentially local proposition. So much de-

pends upon the quality and character of the soil, upon the water level of the soil, upon the climate, exposure, topography and a host of other factors, that what might be good practice upon one tract would be bad practice upon another possibly but slightly removed. All of which means that deductions drawn from the study of a single area cannot be safely applied over the area of a state. Concretely, the deductions drawn from the experimental studies at the Forest Reservation are applicable only to like areas, that is to those with similar escological conditions. They are not applicable to the conditions prevailing in the central counties and are of little significance so far as the sand-dune regions of the state are concerned. So much depends upon the soil character as regards the health and vigor and rapidity of growth of the tree that it must always be taken into account. In an area such as Indiana, elevation and climate are so nearly uniform as to be negligible, but the soil is in different case. As each species has its optimum soil any constructive forest policy will provide for demonstration areas so located as to represent every type of soil found in the state. This would involve the purchase of land unless arrangements could be made to utilize some of the holdings of properly located state institutions. That the acquisition of land by the state for forestal purpose is regarded as sound economic policy is plainly shown by the large and constantly increasing area of such holdings in New York, Pennsylvania, Michigan, Minnesota, and other states. The tracts need not be large for the accomplishment of the desired purpose, so that the entire amount required would probably not exceed 200 or 300 acres. For the success of such work absolute control of the tracts should be vested in the State Board of Forestry, a fact which makes purchase more desirable than a use by sufferance of the lands of state institutions. An attempt to carry out the suggestion of former Governor Marshall that such demonstration plats should be operated upon county farms showed the extreme difficulties attending the very first steps in such joint control.

If we consider the problem of the recovering of denuded and waste areas the necessity of the expert field agent becomes more apparent. What to plant in any given locality is a problem involving a very wide range of factors running from silvical requirements to economic conditions. Yet a consideration of all of these factors is absolutely essential if the work proves at all profitable. From the merely silvical standpoint it is perhaps natural to infer that the species that have grown upon any given area, having proved their fitness for the particular locality, are the ones

that in afforestation operations would give the greatest promise of success. As a matter of fact such a conclusion is more often incorrect than correct. The region has lost its forest floor with all its far-reaching influence in maintaining soil fertility, moisture and porosity; it has been subjected to the desiccating and compacting effects of sun and wind; by drainage its water level may have been decidedly lowered; it has lost the protection of adjoining forests and is therefore more sensitive to adverse climatic conditions such as changes of temperature, wind, etc.; many of the trees in the original forest may have been of species which can only find their normal development and growth rate when sheltered or partially sheltered. Indeed it is very rarely the case that the original forest can be restored. Its place must be taken by one composed of species adapted to the new conditions. Just what species these new conditions indicate it is difficult for the expert to determine; it is entirely beyond solution by the average landowner save through the expensive school of experiment. In afforestation more definitely and vitally than in reinforcement and improvement do we find that the imperative need in forestry in Indiana is the field expert.

Incidentally much remains to be done in the way of education. Relatively few species are of sufficient economic value to promise profitable returns. Each of these species has its optimum conditions, each has advantages and disadvantages arising from its silvical properties. Careful studies should be made of these available species and of their requirements for the most rapid growth and healthiest development. These studies should be supplemented by others which definitely locate the areas in the state where these optimum conditions for the various species are to be found or if the specific locality is not given, of the type of soil furnishing these conditions. If this were done the landowner in Hancock or Elkhart or Gibson county would have in his possession the data needed for the formulation of a rational management of his wood-lot. The preparation of such a series of studies would take time, but the good accomplished would be immeasurable. The old prophet cried, "The people perish through ignorance," which we may paraphrase to read, "Our forests perish through ignorance."

Back of all this and in a certain sense fundamental is a classification of the soils of the state. Any true conservation demands that every resource be utilized for its highest values. This is as true of soils as of gas or gold. In Indiana certain soils give and always will give their highest values in the form of ordinary field crops, or horticulture. Other soils always have and always must yield their highest return from tree crops.

Some intermediate conditions may indicate that a part of a given area should be devoted to crops, part to trees. It is necessary that the absolutely agricultural, the absolutely forestal and the intermediate soils be accurately delimited. When this is done the soil can be managed in such a way as to yield its highest returns. Until this is done we shall continue to have the economic anomaly of trees upon agricultural land and of crops upon forestal lands. The United States is far behind other countries in this classification of its soils and the devotion of each type to its highest form of utilization. Until such classification is made little constructive work of a permanent character can be done.

Summarizing: There is no lack of interest and enthusiasm; indeed they have far outrun knowledge. Enough data bearing upon the subject are in hand to justify constructive work. To insure success six things are necessary.

1. The Field Expert at the service of landowners.

2. The state nurseries for furnishing material true to species at the minimum price.

3. Cooperative plantings extended until they reach every county in the state.

4. Demonstrations plats so located as to represent fairly every soil type in the state.

5. Definite instructions as to available species for given localities or at least for given types of soils.

6. A classification of soils.

The consideration of a constructive policy which would produce results in the way of improved forest conditions, of a rapid and rational reclothing of denuded and waste areas would naturally include many topics not discussed in this paper, not because of their lack of pertinence, but for a very apparent lack of time. In the case of the tens of thousands of acres of waste and wasting lands, in the southern hill region, in the northern sand-dunes, in undrainable lowlands, can the individual afford afforestation work, or is the problem one for the state? If it is a problem for the state, how is the land to be acquired and what shall be the nature and control of such tracts after their acquirement? Personally, I have some very decided views upon the points which I hope to present at some other time. At present I merely suggest them as an evident part of any comprehensive constructive forest policy, though not perhaps to be regarded as among the first steps in its initiation.