

SCIENCE

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FRIDAY, DECEMBER 28, 1900.

PROGRESS IN FORESTRY UNDER STATE CONTROL.*

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IN the steps that are now being taken by the State of Michigan looking towards the establishment of a permanent forest policy the recent experience of other States cannot fail to be instructive. In the development of a great public movement in which so much is untried and unforeseen, mistakes are certain to occur, but the chance of their occurrence may be lessened by taking account of the history of similar movements elsewhere. Accordingly, the forestry laws of several States have been reviewed by the writer, and an attempt has also been made, from a comparison of these and a consideration of conditions there existing, to gather such hints as may be available in our own State. It has been thought best to limit this study to the five States, New York, New Jersey, Pennsylvania, Wisconsin and Minnesota, both because they approach Michigan more closely than others in physical conditions and because by far the greatest progress in the development of a forest policy has been made in those States.

The conditions in New England and the Southern Atlantic States are so far different from our own as to be valuable chiefly in a general way rather than in the solution of special problems; the great agricultural

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* A review of forestry legislation and conditions in the Central and Northern States, prepared for the Michigan Forestry Commission.

States, Ohio, Indiana and Illinois have nothing to offer in this direction, while the Western prairies and the Pacific slope have their own peculiar and difficult problems, with which we are not immediately concerned. It is with the group of Central and North Central States that our lot is cast by nature, and though behind all of them in our care of the forest, we are nevertheless fortunate in being able to draw on their experience, albeit experience that has not passed the experimental stage.

NEW YORK. EARLY LEGISLATION.

The State of New York has been a pioneer in American forestry. In 1885 a law was enacted by the Legislature providing for the appointment of a forest commission with power to appoint a forest warden, forest inspector, a clerk and other agents. Provision was also made by the same Legislature for a forest preserve consisting of all the lands then owned or thereafter to be acquired in certain counties lying in the Adirondack and Catskill regions "to be forever kept as wild forest lands, not to be sold or leased, or taken by any person or corporation, public or private."

The forest commission was given control and superintendence of the forest preserve, and it was made its duty to maintain and protect the forests on the preserve, to promote as far as practicable the further growth of forests thereon, and in short to have charge of the public interests of the State with regard to forests and tree planting, and especially with reference to forest fires. Supervisors were made *ex-officio* protectors of lands in their townships, the forest commission having power to require, when necessary, that the supervisor appoint one or more forest guards to aid in the control of fire and otherwise.

The commission was also charged with preparing circulars of information and advice for the care of woodlands upon private

lands and the starting of new plantations on lands denuded, exhausted, or injured by fire * * * or waste and unfit for other use, * * * these publications to be furnished without cost to any citizen of the State. The commission was unpaid, but the sum of fifteen thousand dollars was appropriated for the purposes of the act.

Considering the early date of this legislation, its comprehensiveness and the extent to which its main features have ever since been retained are alike remarkable. In the first place, the creation and maintenance of a forest preserve as the property of the State but controlled by a forest commission has from that time to this, for a decade and a half, been a central principle. Again, the forest commission, while charged with general responsibility, was expected to appoint officers who should be in immediate charge of actual forestry operations. This feature then embodied in the appointment of forest protectors is still retained in the far more developed system of the present time, in which the commission, not composed of experts, is represented in actual forest administration by the superintendent of forests assisted by other officials and employees. A third feature of the legislation of this early period was the attempt to utilize the services of persons already filling township offices in the enforcement of law, the supervisors, as already stated, being made *ex-officio* protectors of lands in their respective townships.

Subsequent experience, naturally enough, showed the necessity of certain changes even in legislation that embodied so much of permanent value. The provision for the control of forest fires, for example, was inadequate. Making supervisors *ex-officio* fire wardens could not, in the nature of the case, be made operative without strong pressure from a higher authority, and the employment of a commission without compensation, and accordingly without obligation to

devote their entire time to the duties of their office, has given way to the more economical and productive policy of employing and paying men of trained efficiency in the administration of this branch of the public service. In still other particulars it has been found desirable to amend and extend the forestry law of 1885, as will appear in what follows.

Taxation, Sale and Purchase of State Lands.

At an early date the difficult problems connected with taxation, sale and purchase of State lands for forestry were taken up. The laws of 1886 provided that forest lands belonging to the State in the counties of the forest reserve should be taxed at the same rate as other lands, and that the tax should be paid by crediting the sum on the taxes due from each county in which they are located as State taxes.

In 1887 an Act was passed providing for the sale of detached portions of lands belonging to the State or their exchange for lands adjacent to land belonging to the State, and in 1890 the forest commission was authorized to purchase land within the counties including the forest preserve, for purposes of a State park, at a price not to exceed \$1.50 per acre. During this time and for a period of several years thereafter the right of the State to much of the land belonging to the forest preserve was contested by parties having real or supposed claims, but the final decision of the highest court of appeal has left the State in possession with a title no longer open to question.

Parks.

In 1887 an Act was passed to establish parks for the propagation of deer and other game upon lands belonging to the State situated in the Catskill region, the forestry commission being authorized to set apart three tracts there for the purpose named, and by an Act of 1892 the Adirondack Park was established within the counties of the

forest preserve lying in that part of the State, which it was provided 'should be forever reserved, * * * and cared for as ground open for the free use of all the people for their health or pleasure, and as forest lands necessary to the preservation of the headwaters of the chief rivers of the State and a future timber supply.' In both cases appropriations were made for the provisions of these acts, and the policy of State ownership and control of land for public parks, for sanitary purposes and water supply, and for raising timber as a function of the commonwealth was thus emphasized and confirmed.

Constitution and Duties of the Commission. Changes.

By an Act of 1893 the number of members of the Forest Commission, previously three, was changed to five. The commission was still unpaid, but was now empowered to employ a paid superintendent, two inspectors of forests, a secretary and clerks. Something further was now attempted in the way of fixing responsibility for the control of forest fires. The supervisors, besides being made town protectors of lands and *ex-officio* fire wardens, were required to report fires. But the uncertainty of promptly locating and extinguishing fires by means of untrained helpers, with other inherent difficulties that have been felt until the present time, prevented this system from accomplishing all the good for which it was intended.

In 1895 a change of considerable moment was made, the former commission being superseded by a Fisheries, Game and Forest Commission, consisting of five commissioners appointed by the Governor, their term of office being five years. The duties of the commission were now of far wider scope, and it was, of course, impossible for any member of it to be an expert in all of the various interests committed to its charge. A division of responsibility and

labor, therefore, became at once necessary, and provision was accordingly made for the appointment of an engineer, 35 fish and game protectors and foresters, and various other officers and assistants.

Whatever advantage there may have been in this change as regards the general administration of these various interests, it would seem that at least in regard to what had formerly pertained to the forestry commission there was need of more specific provision for certain duties, and the following year (1896) an amendment was made to the law so as to provide for the appointment of fire wardens, one in each town, and the step thus taken towards the separation of the duties of game protectors from those of fire wardens has recently been carried still farther on the ground that more will be accomplished by this arrangement.

Forest Preserve Board.

Still in the direction of fixing responsibility for the performance of special duties, the law of 1897 provides that the Governor shall appoint three persons from the Forest, Fish and Game Commission and the commissioner of the Land Office as 'the forest-preserve board.' The duty of this board was to acquire for the State lands in the Adirondack Park as they might deem advisable for the interests of the State. Power was given to this board to enter on and take possession of any land, structures and waters in the territory embraced in the Adirondack Park as it might deem advisable for the interests of the State, with authority to adjust claims, and allow cutting of timber, with certain restrictions, by way of compensation; to take means for perfecting the title to lands held by the State, and to vigorously follow up and punish trespass of whatever kind.

For the purposes of this act the expenditure of one million dollars was authorized. In all, the State of New York has now ex-

pended about three million dollars in the purchase of land, making the forest preserve board the responsible agency for the purchase, validity of title, and, in short, the entire business connected with the bringing of these lands into the possession and control of the State. An indication of the long and vexatious struggle with claimants to State lands and the determined policy of the State with reference to these lands is seen in the law of 1898, which again gives the forest preserve board full authority for the State to determine the title to lands in the Adirondack Park, or the forest preserve, claimed by persons or corporations adversely to the State.

Forest, Fish and Game Law of 1900.

By this law the forest preserve is definitely limited, as are the Adirondack Park, the St. Lawrence reservation, and, less exactly, the deer parks of the Catskills. The powers of the commission, still composed of five members appointed by the Governor, include all the powers vested in the commissioner of the State land office and the Comptroller, on May 15, 1885, as well as those delegated in succeeding years to the forest commission and the forest preserve board, among which may be specially mentioned purchases in the Adirondack Park, actions for trespass, appointment of fire wardens and provision for instruction and popular information on the subject of forestry.

The office of superintendent of forests is made one of special responsibility, the incumbent being charged with the care and custody of the forest preserve, the prevention of forest fires and the general supervision of the forestry interests of the State. He is required to make an annual report to the commission showing the annual timber product of the Adirondack and Catskill forests, and also the extent of forest fires and losses, * * * with such other reports as

may be necessary for the information of the commission. The duties of fire wardens and the prevention of fires along railroads and elsewhere, are entered into in much detail, and an evident necessity is provided for in requiring the appointment of a chief fire warden to have supervision of the town fire wardens, and by every available means to secure the prevention and the putting out of forest fires.

In reviewing the law of 1900 one is particularly impressed with the fact that it has been found necessary to entrust one man with the direct superintendence of the forest interests of the State, at the same time holding him responsible to a board of commissioners for the intelligent and faithful discharge of the duties of the office, also that for the control of fires one man is again held responsible, the chief fire warden having this as his special and single function. This definite fixing of responsibility can hardly fail to produce more satisfactory results. It is further noticeable that appointments to the commission are still for the term of five years, thus securing a permanent and consistent policy, and that the State now pays for this service as liberally as for other public work. In short, in the State of New York forestry has now become a recognized and permanent branch of the public service. Subsequent experience will doubtless suggest changes in methods of administration, but no interest of the State is more securely entrenched in law or more heartily sustained by public opinion.

School of Forestry. Practical Forestry in the Adirondacks.

New York has been the first State to establish a school of forestry. In 1898 a law was enacted providing for the establishment of a College of Forestry at Ithaca, in connection with Cornell University. Thirty thousand acres of land in the Adirondacks,

for which the State paid \$165,000 (including buildings), were set apart to be controlled by the university for a period of thirty years, at the end of which time the land is to become again the property of the State as part of the forest preserve. The sum of \$10,000 was appropriated for the maintenance of the school, and liberal appropriations, namely, \$30,000 for each of the first two years, have since been made for it. The trust was accepted by Cornell University, and Dr. B. E. Fernow, at that time chief of the Forestry Division of the U. S. Agricultural Department, was appointed director of the school. The school was promptly organized, instructors were appointed, and a course of instruction entered upon which has since been extended. Practical forestry operations have been conducted in the college forest since May, 1899, and students of the school are required to spend there a certain part of at least two vacations in the practical study of forestry.

The amount of work that has been accomplished in the college forest in less than a year and a half is surprising and in the highest degree encouraging. A survey of the property has been made, buildings have been erected and remodeled, a nursery has been established in which upwards of a million seedlings have been raised, the planting of a tract of burnt land with young pine and spruce has been completed, important experiments, such as planting in avenues opened in the forest, are in progress, and minute records are carefully kept as a basis for future study and practice. Most interesting of all, however, is the fact that extensive logging (by rail) operations have been begun under forestry principles, to remove the old hard-wood crop and replace it by a more valuable softwood crop in mixture with the hard woods. The thorough utilization of all the wood cut down to the mere brush, for all of which a mar-

ket has been secured, is a novel feature of this logging, besides the care with which all young growth is saved. Moreover, the director expects that no further appropriations will be required, and that the experiment will at once become self-supporting through the profits from the logging operations.

It is too early to form a judgment regarding much of the practical work now in progress. The methods of European forestry are for the most part inapplicable here, and direct experiment becomes therefore the only means of determining the correct treatment of the forests. Mistakes must inevitably occur in a field where all is so new, and it is fortunate for other States that New York has organized such an experiment on so liberal a scale. None the less, it is certainly incumbent on the States with great forest interests of their own to provide for similar experimental study as soon as may be. Conditions vary; a method applicable in the Adirondacks may fail on the sandy tracts of Michigan or Wisconsin, and men must be trained on the ground in direct touch with the peculiar problems and difficulties that each section of the country presents. The New York College of Forestry is now equipped for the training of young men in the principles of forestry and in their practical application in that State, but their training must be supplemented by long-continued study of local conditions, and for this, as a least responsibility, the States interested should provide.

NEW JERSEY.

In New Jersey a considerable body of law has been enacted, especially with regard to forest fires, but without making special provision for its enforcement. As a result of this and of other causes the State has suffered greatly from fires. The coastal plain, where the fires have been most frequent, presents certain points of resem-

blance to the 'plains' of Michigan, and the extended study of that region which has been made in connection with the State Geological Survey is both instructive and suggestive.*

The 'plains' of New Jersey include approximately 20,000 acres of land lying in the northern extremity of the Atlantic coastal plain which extends from here to southern Florida. These plains are covered with a low bushy growth, much of it consisting of pitch-pine coppice (*Pinus rigida*) mixed with various other species. These plains are reported to have always been treeless, but there is every reason to suppose that this condition is due to repeated fires, since on the surrounding pine barrens may be observed all gradations from a healthy forest to scrubby plains. The soil of the plains, as indicated by chemical analysis, is richer than that of much of the surrounding region where good timber grows. Fire, therefore, is the agency that has rendered large tracts of land, as far as its present state is concerned, unfit for the raising of timber, and is even now converting other land into the same ruined condition. Just what course should be pursued with regard to lands that have already reached this condition is a problem in New Jersey as well as in Michigan. Meantime, the matter of immediate concern is to prevent further extension of such areas.

The means of suppressing these fires are discussed by Dr. Gifford, from whom I have already quoted. His most important suggestion is with regard to the multiplication of fire lanes, which experience has shown to be a successful barrier to ordinary fires. The good-roads movement is very strong in New Jersey, and every good road that is kept properly cleared becomes an effective fire lane. The same is true of railroads

* Gifford, 'Forestal Conditions and Sylvicultural Prospects of the Coastal Plain of New Jersey,' Munich, 1899.

along which combustible materials are kept cleaned up. In addition to this a suggestion with regard to 'forest farms' shows how the southern part of the State might be to a large extent divided up into farms in which the cultivated portion of each would surround a body of timber, which would then be isolated by a wide fire lane from other woodland, thus almost entirely obviating the danger of extensive fires. Suppose a person possesses one hundred acres of woodland out of which he wishes to make a combination forest and farm. The first step is to clear a fire lane around the whole of it, at least two hundred feet in width. This lane should constitute the cultivated portion of the farm. * * * If the hundred acres referred to is perfectly square, a fire lane two hundred feet wide around it would contain about thirty-five acres, as much as one man can comfortably till. There would be left in the center a forest containing about sixty-five acres. * * * If the whole area of woodland in southern Jersey were treated in this way, sixty-five per cent. would be left in wood and the whole would be cut up in such a way that extensive fires would be impossible.* The plan here suggested is apparently as capable of application, in a modified form, in Michigan as in New Jersey.

PENNSYLVANIA.

The history of the forestry movement in Pennsylvania is particularly instructive, since the conditions in that State are in various important particulars similar to, if not identical with, those prevailing in Michigan. Without attempting a complete review of earlier legislation in Pennsylvania, it is desirable to consider in some detail such important features as those pertaining to forest fires and forest reservations.

Early Legislation. Forest Fires.

As early as 1860 the setting on fire of

* Gifford, l. c., p. 45.

woods or marshes to the loss of any other person was made a misdemeanor punishable by fine and imprisonment, and penalties were also provided for the cutting and removal of timber from the land of another. Failure to fix responsibility, however, made the law a dead letter, and it was followed by disastrous fires and by laxity of public sentiment in regard to them. An attempt was made in 1870 to remedy this by the enactment of a law requiring the commissioners of the several counties of the commonwealth to appoint persons under oath whose duty it should be to ferret out and bring to punishment all persons who either wilfully or otherwise cause the burning of timber lands, and to take means to have such fires extinguished, the expenses to be paid out of the county treasury, the unseated land tax to be first applied to such expenses.

Laws of 1897.

This law, like the former one, remained inoperative, or at least insufficient, until in 1897 it was amended so as to make the commissioners of the several counties responsible to the commissioner of forestry for compliance with its provisions, and prescribing a penalty of fine or imprisonment for failure. The expenses incurred in the employment of detectives were to be borne one-half by the county in which they were employed and one-half by the State. With this definite and not easily evaded responsibility, followed up by most determined and persistent effort on the part of the commissioner of forestry, real progress has been made. Offenders are lodged in jail with as great publicity as possible, and it is safe to say that public sentiment with regard to forest fires has never before in the history of Pennsylvania been formed so rapidly.

The same year, 1897, an act was passed making constables of townships *ex-officio* fire

wardens for the purpose of extinguishing forest fires, and requiring them to report to the court of their respective counties all violations of "any law now enacted or hereafter to be enacted for the purpose of protecting forests from fire" * * * with penalties for neglect of this duty. As before, the expense of carrying out its provisions was apportioned one-half to the county and one-half to the State, the limit under each act being \$500 for any one county.

This legislation is of such recent date and the whole matter is so complicated and of such acknowledged difficulty, that it may well be questioned whether the best method of treatment has yet been attained; certain it is, however, that the present law marks a great advance upon preceding legislation and that its tendency, if enforced for a period of years, will be to more and more restrict both the number and extent of forest fires.

Forest Reservations.

In regard to forest reservations the legislation of 1897 includes two important acts. One of these authorizes the purchase by the commonwealth of unseated lands for the non-payment of taxes, for the purpose of creating a State forest reservation, requiring the commissioner of forestry to examine the location and character of the lands in question, and authorizing him to purchase them for the commonwealth if in his judgment they are available for the forest reservation. The other act provides for a commission of five members to locate three forestry reservations of not less than forty thousand acres each upon waters draining mainly into the Delaware, Susquehanna and Ohio rivers respectively, each of the reservations to be in one continuous area as far as practicable, and at least 50 per cent. of each reservation to have an average altitude of not less than six hundred feet above the level of the sea. The

commission is empowered to take by right of eminent domain and condemn the lands as State reservations, the procedure in case of claim for damages being the same as already provided for the taking of land for the opening of roads in the respective counties in which the property is located.

Growth of Timber by Farmers.

A third series of enactments appearing in amended form in 1897 is designed to encourage the growth of timber by farmers. It is provided that in consideration of the public benefit to be derived from the retention of natural forest, the owners of land having on it forest or timber trees of not less than fifty trees to the acre, each measuring at least eight inches in diameter at a height of six feet from the ground, shall be entitled to receive annually during the period that the trees are maintained in sound condition a sum equal to eighty per cent. of all taxes annually assessed and paid upon said land, the eighty per cent. not to exceed 45 cents per acre, provided also that no one property owner shall be entitled to receive this sum on more than fifty acres.

In commenting upon this legislation the Commissioner of Forestry, Dr. J. T. Rothrock, says: "It should be readily perceived that these measures are directly in the interest of the farmer. In the first place, it is a partial removal of tax from land upon which he receives no revenue. In the second place, it is leading up to a lucrative timber crop at a minimum of expense to him, and in the third place, such land, when on a farm, is often on the highest and roughest part, overlooking the cultivated fields, and from its decaying leaves and humus a renewal of fertility is constantly washed down to the lower fields. * * * All of the above laws concern the individual more than the commonwealth. They are to make it possible for him to aid the State

and at the same time to serve himself. Those which follow (with reference to forest reservations) mark a new era in our legislation. They reverse what has hitherto been the established policy of the State and aim at acquisition of timber land instead of sale of it. This change grows out of the now well-established fact that so long as the important watersheds of Pennsylvania are wholly under individual control there is serious danger to the interests of the community, and that, to safeguard these, the State must again possess itself as promptly as possible of these grounds."

With regard to the public sentiment that has made such legislation possible the commissioner adds: "There were grave doubts as to the passage of the bill (authorizing direct purchase of timber lands). But these soon disappeared, and it then for the first time became evident how strong and how general the sentiment in favor of the most active forestry legislation had become. The bill was passed by a large majority. It is clear that the State has at length earnestly entered upon the work of preserving its lumbering industries. The question is no longer whether it shall be done, but how it is to be accomplished. It is noteworthy that all political parties joined in this legislation, and also that the lumbermen, who once looked upon all forestry agitation as an interference with their business, have come to be among the warmest friends of the movement, which is intended to perpetuate, not to limit, their vocation."

WISCONSIN. PRESENT STATUS.

Still nearer to Michigan, both in point of physical conditions and in the extent to which the forestry movement has crystallized into an active call for efficient legislation, is the neighboring State of Wisconsin. Climate and soil conditions are in many respects identical with our own. The northern half of the State has been lumbered ex-

tensively, has again and again been visited by destructive fires, and thousands of square miles have been left in what is apparently an utterly hopeless condition as regards agriculture and with a discouraging outlook as regards forest restoration. In a recent paper* the secretary of the State forestry commission has given a concise statement of the situation from which the following is reproduced.

Among the lessons to be learned from the history of the forestry bill of 1899, one of the most important is this, that there is no longer much danger of opposition to the principle that it is the duty of the State to provide for the permanency of forests by appropriate legislation, even to the extent of going into the business of conservative lumbering. Ten years ago such a proposition would have met with not a little hostility and ridicule. It would have been called impracticable, socialistic and un-American. In 1899 not a member of the Legislature, with a single exception, but admitted the desirability of such legislation. Even those who voted against the bill did so avowedly on the ground of expediency for the time being.

Even less opposition than within the Legislature is to be met with among the people of the State. Of course, there is a great deal of indifference and not a little misunderstanding of the aims and objects of forestry reform. In a State situated like Wisconsin, where the question of maintaining a water supply and preventing over-erosion is of subordinate importance, the great body of the people cannot be expected to feel the same direct interest in forest preservation as for instance in southern California, where the existence of agriculture is dependent on the maintenance of the mountain forests. In Wisconsin the

* Bruncken, 'On the Legislative Outlook for Forestry in Wisconsin.' Read before the American Forestry Association, July, 1900.

class most directly interested is that engaged in forest industries and manufacturing enterprises deriving raw material from the woods. It is very gratifying to the State that as a general rule men of this class are stanch friends of improved forestry, and some of the most energetic promoters of this cause, both in and out of the Legislature, are among the great lumbermen.

Of course, it cannot be expected that entire unanimity should exist as to the best means of reaching the desired end. In particular, the policy of placing considerable areas of forest land under State management is apt to encounter objections from the residents of the counties in which these forests will necessarily be located. They fear, on the one hand, that the reservation of those tracts will hinder the progress of settlement, and on the other hand, they desire to see all land in private hands, so that they may be taxed for the support of local government and improvements. Both these objections are, to be sure, based on imperfect knowledge, and are short-sighted enough. Yet they are made in good faith by men of intelligence, standing and influence. They must be overcome by practical reasoning and the spread of correct information.

Perhaps the most serious problem to be solved in Wisconsin, as well as its neighboring States, is what shall be done with the immense areas of denuded timber lands which are now growing up into vast wildernesses of worthless scrub, subject to the ravages of fire, and a constant menace to the standing timber adjoining. There are no physical obstacles to the reforestation of these tracts. But the financial and political difficulties are enormous. Most of these lands are the property of the lumber companies which harvested the timber. Not a little of it, however, has been sold for taxes and bid in by the counties. These do not

know what to do with those lands, and from time to time sell them to speculators at nominal prices, sometimes for less than a dollar forty cents. Now there can be no question that much of the land of this kind is fairly good agricultural land, although it cannot be compared in quality with the hard-wood lands where the timber is still standing. But the greater portion is barren sand just good enough to bear a fair crop of pine, but unfit for agricultural crops after the slight accumulation of humus is exhausted. To persuade ignorant settlers to locate on such lands and to try to make them into farms is little short of a crime.

The great mass of the people of northern Wisconsin are well-meaning, upright folk, and they know well enough that much of this land is unfit for settlement. But it is not possible to draw a hard and fast line between the fit and unfit land, and the temptation is great to find invariably that the really unfit land is just beyond the boundaries of the next township. So the settlers continue to take up these sand barrens, with disastrous results to themselves and no permanent benefit to the community. The only feasible way to put these lands to the use for which they are adapted, and by which they can ultimately yield a profit, would be to place them in the hands of the State for rational forest management.

A number of owners of large tracts of land of this class have expressed their willingness to cede their holdings, which are practically valueless to them, to the State, if it will take proper care of them. It is probable that the solution of the problem will be approached from this direction. But in order to make this possible, some legislation will be needed, and for that purpose the friends of forestry in Wisconsin look forward to the meeting of the Legislature during the coming winter. There is the best possible reason to believe that a

bill for the establishment of a rational forestry system will be passed by the next Legislature. It will be devised substantially on the lines laid out in the bill that failed of passage at the last session, with certain modifications, required by the rise of a new factor since the Legislature adjourned. The State University of Wisconsin has now under consideration a plan for the establishment of a forestry school as nearly as possible on the model set by the schools at Cornell and Yale. For this purpose the express authority and aid of the Legislature will probably be sought, and it is obviously proper to bring the State forest department and the State forestry college into as close relations as the difference between administrative and educational functions will permit.

MINNESOTA. FIRE WARDENS.

Minnesota has made very substantial progress in forestry legislation, especially in the direction of controlling forest fires. A most commendable feature of the law which has been in operation for five years, is the definite fixing of responsibility by the appointment of a chief fire warden who has general charge of the fire warden force of the State, and who is authorized during the dangerous season to use such means as he sees fit to prevent or suppress fires, the sum of \$5,000 being available for this purpose. Supervisors of towns, mayors of cities and presidents of village councils are constituted fire wardens, with authority to arrest without warrant any person setting fire to woods or prairies to the danger of property, the wardens themselves being liable to penalties for neglecting the duties of their office. Under the vigorous administration of the present chief fire warden, much has been done to promote the growth of a correct public sentiment and not a little has been accomplished in the actual prevention and suppression of fires. Warning notices in

great number have been posted and the intelligent cooperation of a large force of assistant wardens has been secured. During the drought in the early summer of the present year, over 300 fire wardens were in correspondence with their chief, reporting precautions taken, and otherwise showing their interest and activity. The system is doubtless capable of improvement, but in its inception and reasonably successful working a great step has been taken, and by so much Minnesota is well in advance of Michigan and Wisconsin.

Forest Reserves. State Forestry Board.

By the Legislature of 1899 an Act was passed designating as Forest Reserves lands set apart by the Legislature for forestry purposes, or granted to the State by the United States Government, or by individuals for such purposes, and creating a State Forestry Board to have the care and management of the forest reserves and to represent the State in all matters pertaining to forestry.

The constitution of the board has evidently been arranged with a view to making it non-political and as efficient as possible. It consists of nine members, including the chief fire warden, *ex officio*, the professor of horticulture in the State University, three persons recommended by the regents of the University on account of qualifications that are specified, and four to be recommended by the following bodies, namely: The Minnesota State Forestry Association, The Minnesota State Agricultural Society, The Minnesota Horticultural Society and the State Fish and Game Commission.

In creating such a board, authorized to accept lands for forestry purposes and to conduct forestry operations in the name of the State, including the sale of forest products, Minnesota has fully recognized forestry—not only from the protective, but

also from the commercial point of view—as a proper function of the State. It is safe to say that this advanced position has the practically unanimous approval of the men in this country, few in number, to be sure, who are entitled to rank as forestry experts, and of other thoughtful students of the problems connected with this subject.

CONCLUSIONS.

From the foregoing review a number of suggestions may be drawn in regard to forestry problems in Michigan.

1. Necessity of legislation and State control.—There is no way in which satisfactory progress can be made until the State assumes responsibility. New York, Pennsylvania, and Minnesota have fully recognized this responsibility, and in each of them an efficient forestry service is maintained by the State. It should be noted that, especially in New York, where this service has been most developed, this fulfillment of its duty by the State, even at considerable expense, has the practically unanimous approval of its citizens. The opposition of selfish and irresponsible parties has been overcome and the State is to-day in peaceable possession of great forest areas of inestimable value, not merely for their timber, but as conservators of a pure water supply. The principle, therefore, has been fully established in this country as well as in the Old World that the protection and development of its forest for the benefit of its citizens, present and future, is a proper function and obligation of the State.

2. Form which legislation should take.—From the experience of other States, it would seem that one of the first steps to be taken would be the location, under the advice of competent experts, of such tracts of land as are better suited for forestry than for agricultural purposes, followed by proper measures for the acquisition of so much of these lands as may be deemed advisable.

As large areas are already abandoned and have practically come into the possession of the State, the procedure, in many cases, would consist mainly in securing a valid and permanent title. The State of New York, as already pointed out, has a forest preserve board of three members specifically charged with the duty of acquiring lands for the State, with authority to take possession of lands, to adjust claims, and to take measures for perfecting the title of lands held by the State. In Pennsylvania a commission of five members has substantially the same duties, which are also shared by the Commissioner of Forestry. In this matter there is probably nothing better for Michigan than to follow in a general way the method adopted by these two States.

The control of forest fires presents one of the most difficult subjects with which Legislatures and forestry commissions have had to deal. In New York and Minnesota the appointment of a chief fire warden, who is paid for his services and is held responsible, marks a distinct advance, and the policy of Pennsylvania, of imposing and inflicting severe penalties for the setting of forest fires, has thus far been followed by good results. In any case the essential thing is the fixing of responsibility and provision for the execution of laws relating to fires. The first can only be attained by the appointment of responsible persons, and the second by paying for service rendered. None of the three States in which this has been done is likely to abandon this advanced policy for the more expensive one of allowing fires to sweep unchecked over its territory.

Thieves in some quarters of the State are worse than fires. An efficient trespass agent with adequate authority is the proper agency for holding the nuisance in check until it can be more radically dealt with. The repeal of the homestead law, earnestly

advocated by those who have carefully studied the question, is apparently a necessary step in the suppression of this evil.

3. The utilization of educational institutions in the development of a rational system of forestry.—In this, again, New York is well in advance, although Connecticut has followed in the establishment of a school of forestry at its leading university, and in calling in the services of a trained forester whose work will be carried on in connection with the State experiment station. There can be no doubt that institutions of learning, endowed by public funds, owe to the State the best that they can contribute towards the solution of such problems of public interest, nor is there any doubt that these institutions, permanent in their nature and to a great degree free from political influences, are the best fitted to fulfill a duty in which a consistent policy and continuity of action are indispensable. Both the University and the Agricultural College of Michigan have recognized this duty and have cooperated in rendering such service as they have found practicable. There is still every reason for the continuance of this cooperation and for the enlargement of plans for further work. Should we follow in this the lead of Connecticut, which is similarly situated in the separation of the institutions directly concerned, there would fall to the University the establishment of a department of forestry devoted largely to investigation, while upon the Agricultural College would naturally devolve the care and further development of its experimental forestry stations. Should either or both institutions come into possession of extensive tracts of cut-over lands, with which it has been proposed to entrust them, these new possessions would furnish a series of problems the solution of which is quite as likely to prove of financial value to the State as to themselves. Profits must necessarily be relatively remote, but it is a

matter of encouragement that the director of the New York School of Forestry, with but 30,000 acres of land on which to operate and the work barely under way, is confident that hereafter the forestry operations of which he has charge will be self-supporting, and it is the judgment of experienced lumbermen, as well as of scientific foresters, that in Michigan the conditions are such as to insure to the State, or to institutions that can afford to wait, a substantial profit from practical forestry.

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*GEOLOGY AND GEOGRAPHY AT THE
AMERICAN ASSOCIATION.*

THE joint session of Section E of the American Association and the American Geological Society was opened on Monday, June 25th, in Schermerhorn Hall, Columbia University, to listen to the address of Vice-President Kemp, of Section E, on the 'Precambrian Sediments in the Adirondack Mountains.' This address, which has already been published in full in *SCIENCE*, July 20, 1900, was an exceedingly valuable and lucid contribution to the geology of this complicated but interesting region.

The first paper before the regular session of Tuesday morning was also one by Professor J. F. KEMP on the 'Local Geology about the City of New York,' which during the past several years has been studied in considerable detail by Dr. F. J. H. Merrill and others. This paper was given at the request of the 'sectional committee' and was preliminary to the three geological excursions arranged for and participated in by the members of Section E and of the Geological Society on the three following afternoons.

The second paper of the Tuesday morning session was by Mr. E. O. HOVEY, on the 'Geological and Paleontological Collections in the American Museum of Natural His-