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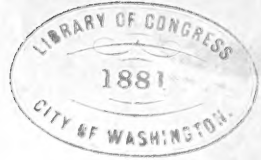
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With the Compliment of
FRANKLIN B. [redacted] H.,
Lowville,



[FROM THE PROCEEDINGS OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT
OF SCIENCE, Vol. XXIX, Boston Meeting, August, 1880.]

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REPORT OF THE COMMITTEE UPON FORESTRY.

At the meeting of this Association held at Saratoga, in August last, a Resolution was introduced, and referred by the Standing Committee, to the Committee upon Forestry, in which, in view of the great importance of the matter of Forest-protection and Wood-culture, the desire was expressed, that some Report looking towards definite action be received from this Committee, at the next meeting of the Association.

Your published proceedings show, that two reports have already been made by the Committee upon Forestry; but in order to present the subject in a connected form, we will here briefly review the action that has been taken in pursuance of the object mentioned.

At the session held at Portland, in 1873, it was

“Resolved, That a Committee be appointed by the Association, to memorialize Congress and the several State Legislatures upon the importance of promoting the cultivation of Timber, and the preservation of Forests, and to recommend proper legislation for securing these objects.”

It was understood at the time, that an amendment was adopted, directing this Committee to enter into correspondence with Forestry Associations of other countries, with the view of more effectually promoting the interests involved in this subject, but the proceedings as published do not show this fact.

A few days afterwards, a preliminary meeting was held at the house of Mr. George B. Emerson, in Boston, at which a majority of the Committee was present, and an interchange of views was had, as to the best means for carrying into effect the wishes of the Association, in the matter under their charge. As the interests involved concern no particular State, but pervade the whole coun-

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try, it was thought proper to bring the subject first before Congress ; and a sub-committee consisting of George B. Emerson and F. B. Hough was appointed to give personal attention to this duty.

A memorial was prepared and sent in printed form to each member of the Committee, and to other persons known to feel an interest in the subject, inviting their suggestions, and asking them to propose any modifications in the memorial that they might deem proper.

In January, 1874, this sub-committee repaired to Washington, and for preliminary consultation, a meeting was held at the Smithsonian Institution, at which several members of Congress and others attended.

As the result of this conference, it was thought best to ask for the appointment of a Commission, similar to that previously created in the interest of Fisheries, for the collection of facts, and the publication of information upon the subject.

This being cordially approved by the President, the memorial of the sub-committee was transmitted by him to both Houses of Congress, with the strong approval of the Commissioner of the General Land Office, and of the Secretary of the Interior.

This special message of the President was referred in each House to the Committee on the Public Lands,¹ and an arrangement was made between the Chairmen of these Committees, to the effect that the Committee of the House should first examine the subject in detail, and that the Senate Committee should reserve its action until the former had reported.

At this stage of the proceedings, the senior member of the sub-committee was recalled by private affairs,—the other member remaining until near the close of the session.

After unforeseen delays, caused by other business having precedence in the Committee, an opportunity for a hearing was given, and the question was referred to a sub-committee, consisting of Messrs. Dunnell of Minnesota, Phillips of Kansas, and Herndon of Texas. These gentlemen, having faithfully examined the subject in detail, adopted a Report which, being presented to the general Committee and approved by them, was laid before the House with an accompanying Bill, on the 17th of March following.²

¹ Senate Ex Doc., 23; 1st sess., 43rd Cong.

² Report No. 259, H. R.; 1st sess., 43rd Cong. An extra edition of 5,000 copies of this Report was ordered by Congress.

Agd. July 9, 12

A hearing was afterwards given by the Senate Committee, but the subject did not reach them for their action, which would doubtless have been unanimously in its favor,—judging from the opinions expressed in conversation by each of the members.

In this Report of the House Committee, they say :—“ That they have given their attention to the subject, and learn that the memorial above referred to was prepared by a Committee of the American Association for the Advancement of Science, as the result of a discussion induced by a communication read before them at their annual session in Portland, Maine, on the 21st of August, 1873, on ‘ the Duty of Governments in the Preservation of Forests. ’

“ A subject endorsed by an Association, embracing within its membership the highest scientific talent of the country, must commend itself to our notice as worthy of attention. More especially is this notice due, when their action takes the form of a recommendation to Congress, upon a subject alleged to involve the duty of the Government, upon questions that vitally affect the interests of the whole country, and especially those of Agriculture, Manufactures and Commerce.

“ When it is further affirmed, that without timely provision of law, these great agencies of civilization and elements of wealth, will, in the near future, be materially impaired, we cannot hesitate to give the recommendation a most careful examination, to the end that, if well founded, the measures best calculated for averting these injuries may be devised, and the remedies most effectually applied.

“ After as full an investigation of the question as present opportunities allow, we are convinced that the statements of the memorial are substantially true, and that it is the duty of the Government to take immediate measures for ascertaining the condition and prospects of our timber supply, to the end that the future wants of the country, with regard to these great interests, both in their scientific and practical relations, should be thoroughly investigated and made widely known.”

The Bill accompanying this Report provided for the appointment of a Commissioner of Forestry, and afforded facilities for his researches, but failed at that session to become a law. It was not opposed in any manner, but was simply laid aside by the pressure of other measures then before Congress.

At the Hartford meeting of this Association, held in 1874, a Report, signed by a majority of your Committee, was presented by Mr. George B. Emerson, and will be found to give the above proceedings in fuller detail.³

Early in the 44th Congress, the Hon. Mark H. Dunnell, who had taken particular interest in this subject, introduced upon notice, a similar Bill, which received the same reference as before. An opportunity for a hearing was given, but no report was made. Before the end of this session, this gentleman, however, secured the adoption of an amendment to an act making appropriations for the current expenses of the Government, in which the Commissioner of Agriculture was directed to appoint a person for prosecuting these inquiries relating to Forestry, his powers and duties being similar to those specified in the Bill just mentioned. This appointment was given to Dr. Franklin B. Hough, and on the 8th of December, 1877, he presented to the Commissioner of Agriculture a Report upon a part of the subjects specified in the act under which this appointment was made. It was transmitted to Congress by the President on the 13th of December, and referred to the House Committee upon Agriculture.

An edition of 25,000 copies of this Report was ordered, but with a restriction introduced by the Printing Committee, which limited its extent to 650 pages, and compelled the omission of a part of the Report.⁴

At the meeting of this Association held at St. Louis, in 1878, a second Report, prepared by the Chairman of your Committee, was presented, in which further details are given of these proceedings.⁵ It also embodies his views concerning the subject of Forestry, as applied to the United States, and recites in detail the measures already adopted in various states for the encouragement of planting, with such suggestions as to him appeared most effectual for the promotion of these interests.

The Commissioner of Agriculture, deeming the authority granted under the act above mentioned, as sufficient, gave directions for a continuance of these inquiries, and found means from the funds under his control for defraying the expenses. A second

³ Proceedings of A. A. A. S., 23d meeting, Aug., 1874, pp. 36 to 45.

⁴ Report upon Forestry, prepared under the direction of the Commissioner of Agriculture, pursuant to an Act of Congress, approved August 15, 1876. By Franklin B. Hough. 8vo. pp. 650.

⁵ Proceedings of A. A. A. S., 27th meeting, St. Louis, pp. 29 to 40.

Report was presented in January, 1879, and transmitted to Congress by the President early in February of that year. From various causes, wholly foreign to the subject, but chiefly from the occupation of the members of the Committee upon Agriculture (to which it was referred), in other business more urgent, no session was held by the Committee, at which a hearing could be obtained, from the time when this Report was laid before them till the end of the session. In fact, the Committee met but once for business during this time, and then it was wholly occupied upon another subject. The Report was therefore withdrawn at the last moment of the session, and returned to the Department.

Early in 1880, a Resolution was introduced in Congress, calling for a return of the Report above mentioned, and it was again transmitted by the President, and at once ordered to be printed.

The Committee upon Agriculture, to whom it was referred, gave the subject a prompt and attentive hearing, and agreed unanimously to recommend the publication of 100,000 extra copies. This resolution was still pending when Congress adjourned, and lies over till next session. In the meantime, the stereotyping has been going forward to completion, making a volume of 618 pages.

By the terms of law under which these labors have been done, the Commissioner of Agriculture was directed, among other things, to cause a Report to be made upon the "Importation and Exportation of Timber and other Forest Products;" and the second Report upon Forestry will be found to embrace an exhaustive statement of the subject in its commercial aspect. It gives a complete summary of the exportation and importation of forest products and wood manufactures, through the period of ninety years, beginning with the government in its present form in 1789, and coming down to the close of the last fiscal year, June 30, 1879, as reported annually by the Secretary of the Treasury from the returns of Collectors of Customs. The arrangement of the tables will be found as uniform as the data would permit, and ample summaries, percentages and deductions from these tables have been prepared.

The intimate relation between the timber interests of the United States and of Canada, scarcely allows us to consider one without taking into account the other. It is well known that for many years, the lumber products of Canada have found an extensive

and ready sale within the United States, and at the same time, that a large amount of the hewn timber from within the United States, in the country bordering upon our northern lakes, and intended for foreign markets, has been taken down the lakes and the St. Lawrence, for shipment at Quebec. In fact, there has always existed a certain community of interest in the forests, between the inhabitants of the United States and of Canada, and it may be reasonably predicted, that, so long as lumber and timber are produced in either of these countries, they will go to supply the wants of both.

It has therefore been deemed advisable, in presenting a full view of the commerce in wood-products for the United States, and in order that this branch of the subject should be as complete as possible, to enter upon a careful study of the Canadian timber trade from data published by the Dominion and the Provincial Governments, beginning with the date of Confederation in 1867, and coming down to the end of the last fiscal year. In some branches of this inquiry, the statistics are carried back to an earlier period, especially in regard to the passage of timber through the government slides and canals, and the inspection of lumber in the timber-market of Quebec.

A careful analysis has been made of the results of inquiries instituted in recent years by committees of the Dominion Parliament, with the view of ascertaining the condition and future prospects of the timber resources of the country, and the means best adapted for maintaining these supplies, and for economizing their use.

A full account is also given of the systems of management, with respect to the timber upon the Crown Lands, the results of experience in former methods, and the modifications which this experience has pointed out, in perfecting the systems now in use. In this we may find suggestions applicable in some instances to the public lands of the United States, in the methods of conservation and management that may be hereafter adopted upon our public domain; in fact, from a similarity of circumstances, we have more to learn from the experience gained in American forests than from the Forest Administrations of Europe, where the tenure of the lands, the systems of government, forest servitudes and the rights of communes and of individuals, are so widely different.

The Crown Lands of Manitoba and of the Northwestern Territories of Canada belong to the Dominion Government and are in care of the Department of the Secretary of State, in a branch of which there is a "Dominion Lands Office."

In other parts of Canada, the Crown Lands belong to the Provinces in which they lie, and separate systems of management are provided. In Ontario and Quebec these lands are in charge of a Commissioner of Crown Lands; in New Brunswick they are under the Surveyor General; in Nova Scotia, under the Attorney General; and in British Columbia, under a Chief Commissioner of Lands and Works.

In perfecting the Report, application was made personally, or by correspondence, to the several Departments of the general and local governments of Canada, having official cognizance of the subject, and full series of every class of Reports bearing upon the forest-question were collected from them all. More than this, substantial assistance was furnished in several cases, in the way of copies of documents not published, and manuscript statements explanatory of the reports. In short, these inquiries met with the most courteous attentions, indicating the great interest which the question of timber-supply is awakening in Canada, and affording the ground for hope, that effectual measures will ere long be realized in that country for turning their remaining resources to the best account.

If they will go a step farther, and secure adequate means for re-production, the wants of the future will be assured. As an indication that one of the means most certain to secure this desirable end is well understood, we may mention, that in the Province of Quebec, it is no longer permitted to cut pine trees upon the public lands, measuring less than twelve inches in diameter at the stump. If they could, besides this, secure adequate measures for the prevention of forest fires and other waste, and apply the reservations to other kinds of timber, and especially the spruce, they would have a useful system of Forestry in operation.

For this second Report that we are describing, a series of graphic illustrations was prepared by a skilful draftsman at the time when the statistical tables were first submitted to the Department. They would fill about a hundred pages, and it was intended to reproduce them by a photo-engraving process. The addition of three more years, since made to these tables, would render it

necessary to reconstruct these drawings, which cannot now be done, at least for the first issue of the Report.

Besides the statistical details and generalities above mentioned, the Report under notice embraces the recent legislation of the General, the State and the Territorial Governments, upon the subject of timber-planting and other interests of Forestry, with statements relating to the operation of these laws.

It is a significant fact, that in the three States where planting is perhaps of greatest need, viz. : in Kansas, Nebraska and Iowa, the premiums formerly offered for planting trees upon prairie lands were, after a few years' experience, wholly or in part, withdrawn. This should not be regarded as a sign that the interest in this subject is declining—but rather that a realization of the necessity for plantations is increasing; and that, in fact, it has become so evident and convincing, that it does not need a motive, beyond the pecuniary interest of the owner of the land.

Furthermore, these acts, intended for encouragement, have everywhere led to fraudulent claims for premiums and exemptions, the work of planting being often done in the most superficial and indifferent manner, by those whose chief object was to secure the present benefit of these laws, rather than the more remote but substantial profits of a successful timber-growth.

In the state of Nebraska, after repealing a law extravagantly liberal in its provisions, and remaining some years without any, the Legislature has recently enacted a new statute upon this subject which, after the experience of the past, may be presumed to approach more nearly the standard of greatest utility at the least expense. It is entitled "An Act to encourage the Growth and Cultivation of Timber in the State of Nebraska," and was approved February 27, 1879. Its leading provisions are as follows:

The sum of three and one-third dollars per acre is to be paid annually for five years from the county treasury, to the extent of not more than three acres, planted in belts of six rows of trees running east and west, along the north or middle section lines. The trees are to be four feet apart in the rows, and the rows eight feet apart, the whole being under cultivation and in good condition during the time this bounty is paid.

We deem this act altogether too specific; for it assumes that shelter is needed only on the north side of lands, and that there is no diversity in this need. It is quite evident that the aspect

and circumstances of some localities might render protection desirable from other points besides the north, especially in the remote prairie states, that often suffer from the dry and heated winds from the southwest.

It would be better to leave the direction and density of these timber-belts to the discretion of the planter, as his circumstances might indicate.

By another statute of recent date, the State of Nebraska, in pursuance of the authority expressed in its Constitution, now exempts, from taxation, the *increased value* of lands by reason of live-fences, fruit and forest trees grown and cultivated thereon, without regard to the area planted, or the time that the plantation is maintained. We deem this a simple and effectual mode of encouragement, well worthy of careful trial in the prairie states; but there should evidently be some limit to the period of exemption, to prevent the public burdens from bearing unequally upon property, for otherwise there would eventually arise a just cause of complaint from other interests. The limit might perhaps be extended to the time when the plantation would begin to bring a revenue to the owner.

We may here remark, that this accumulation and comparison of experience in the legislation of the country, for the benefit of forest-culture, may prove one of the most effectual means for bringing about that uniformity and that degree of excellence that secure the best results. We should profit from experience, where it leads to error, not less than when it is crowned with success.

Without further notice of this second Report, which will soon be before the public, we will only add, that Congress at its late session, after due deliberation, made provision for the continuance of these labors;—that plans for special investigations in several departments of Forestry are in progress, and that a third Report is in course of preparation.

It will be seen from the foregoing, that prominence has been given, in the Report now in press, to the practical interests of the lumber trade. Although the question of supply is one of vital importance to the country,—the one wherein most is demanded, and the only one in which the country generally will take great interest; it should be steadily borne in mind, that the best service

for the promotion of the material interests of Forestry can be rendered through the aid of science. The prominent duties of the branch of the public service, having charge of this subject, should therefore be to advance, by every means of inquiry and research within its power, our knowledge of the laws of nature concerned in forest-growth, and carefully to investigate the various circumstances that lead to best results. We should have definite knowledge of the casualties that may happen, and the means by which they may be mitigated or avoided, and upon all occasions seek to utilize the discoveries of science, wherever they can be applied.

In the national census of the present year, provision is for the first time made for a special investigation of our forest resources, and in the hands of Professor C. S. Sargent and his assistants, we may expect that this work will be well done.

The only State Forestry Association, yet organized, is that of Minnesota, which is doing good service in the promotion of tree-planting in the prairie regions of that State. The project of a School of Forestry has been proposed in Minnesota, and a land-grant for its endowment has been asked from Congress,—but hitherto, as we understand, without success.

We deem it of the first importance that a better knowledge of the principles of arboriculture should be more widely diffused. It remains a question of the future, as to how far a special education in this branch of applied knowledge would, at present, find adequate remuneration, unless associated with capital, and sustained by an intelligent appreciation of the importance of forest culture, by those having money to invest in this enterprise, which is as yet too seldom found.

In speaking of the results of associated effort, in the interest of sylviculture, we should not fail to notice our State Agricultural and Horticultural Societies, many of which now recognize the importance of this subject, and admit discussions bearing upon tree-culture, at their meetings and in their published Transactions. This is particularly the case in Iowa, where much prominence is given to questions relating to the planting of groves and hedges, and premiums are offered tending to improvements in management, and extension of amount done. In some of the older States, and especially in Massachusetts, much attention has been given,

in recent years, to this subject ; but in none of the states have we seen statistics of the results obtained by the offer of these premiums of the later period.

Within the last three years, the Secretary of the Interior, in whose Department is vested the care of the Public Lands, has been making commendable efforts to arrest the unlawful cutting of timber upon these lands. In this he has met with great opposition from interested parties, through the political and other influences that they have been able to bring in Congress, and from delays in the courts.

The shameful extent to which these deprivations have been going on, through a long period of years, and in fact, until the practice had gained from long indulgence the semblance of a right, will hereafter be looked upon as a striking evidence of the barbarism of the age.

These efforts to repress a criminal practice, long sanctioned by custom, have led to recent legislation in Congress upon the timber question, some of which will tend to increase rather than prevent the waste we have described. We refer particularly to an act passed two years since, granting to the inhabitants of certain regions, where conservation is of the first importance, the unrestrained use of timber upon the public domain, for all mining and domestic purposes, without so much as the pretext of a report as to the amount taken, the least check upon its limit, or the least payment for the privilege.⁶

Among these recent statutes relating to our public domain, we still look in vain for the first indication of a policy tending to provide for future supplies by reservation of timber lands—except to limited extent and for naval use alone. We find no limitation in the cutting of small trees, and no protection of lands with the view of affording a new growth of timber, where it has been taken away ; much less do we yet find any measures for planting upon the public lands, or any stipulations requiring this to be done by settlers, except in the still recent timber-culture acts, that have as yet scarcely passed through the trial of experience.

The first of these timber-planting acts was passed in 1873, and amendments have been since made, as deemed necessary. If faithfully administered, the law cannot fail to prove of inestimable

⁶ "An act authorizing the citizens of Colorado, Nevada and the Territories, to remove Timber on the Public Domain, for mining and domestic purposes." Approved June 3, 1878.

value to the prairie states. According to this act as it now stands, a man may acquire the absolute title to a quarter-section, or 160 acres of land, by planting and cultivating ten acres of timber, there being not less than 2,700 trees to the acre. The patent is not issued until eight years after the claim is entered. The mode of preparation of the land is prescribed, and proof of successful planting must be shown.

According to the latest Reports, 5,157,681 acres had been entered under this act within three years, chiefly in Kansas, Dakota, Nebraska and Minnesota. Undoubtedly some of these lands have been taken up for speculative purposes, and as little labor as possible will be spent upon them in the way of planting and improvement, while in many other instances, the undertaking is assumed in good faith, and with a desire to realize as much profit as possible from the cultivation.

Passing from these statements relating to American Forestry, let us notice some facts of interest bearing upon the subject in Europe. As is well known, every government of continental Europe has now in operation a system of forest management, the best of which provides (so far as concerns the forests owned by general and local governments, and by institutions) for a perpetual supply, to the full limit of their capacity for timber-growth.

From this grade of excellence, requiring a special education and thorough training of agents for its maintenance, fully equal to that for any branch of the public service, we have various degrees of efficiency down to that of a mere police regulation for the prevention of fires, and the restraint of waste upon timber on the public domain. Yet these systems, however they may differ in details, agree in this:—that unless the public interest is concerned, the owners of private estates are generally allowed to cut or plant upon their own premises, as their interest decides. The exceptions to this rule are,—along a frontier, where woodlands are needed for the public defence, the banks of a river liable to inundation—where materials should be at hand for the construction of barriers,—upon mountains liable to erosion of torrents, or on drifting sands on the seashore. There may be a few other exceptions, but as a general rule, the government does not often interfere with the timber upon private estates, even where it requires a notice of intention to be given before clearing is begun.

Yet upon these private lands, large forests are sometimes grown

for profit, and their management is often placed in the care of agents who have received the highest grade of special education for this particular service. Except in Great Britain, we believe that facilities have been provided for this special instruction in every country in Europe, either in academies where Forestry is taught alone, or in institutions where agriculture and other practical industries receive a share of attention.

It may be proper to notice here a change that has been taking place in recent years, in the organization of these Schools of Forestry in Europe. In Austria, a first class School of Forestry at Mariabrunn was, after more than forty years' existence, merged in 1875 in a High School of Agriculture and Forestry in Vienna. In Bavaria, the Central Forest Academy at Aschaffenburg, still older than the one above mentioned, has been more recently united with the University of Munich, and discussions tending to further changes with the view of consolidation are now in progress in other forest academies. In Prussia, the two institutions at Eberswalde and at Münden still maintain a separate existence, and the former has recently commemorated the fiftieth year of its history.

In looking at the organization of these institutions, we notice a marked change in their plan, particularly in Germany. In the preparatory studies, and especially in the natural sciences and in physics, so far as they in the least concern the forester, we find a more careful division of labor, and a more earnest purpose to make these sciences to their whole extent available in their profession, instead of the elementary studies in chemistry and botany which formerly satisfied the requirements for graduation.

In all of these institutions, excursions and practical exercises form a regular feature in the course of education, and microscopic studies now receive much more attention than formerly.

The science at present receives a substantial support from various experimental stations in Germany, Austria, France and other countries, in which both practical and scientific questions are carefully investigated, and the results published. Among these we may prominently mention the Foresters' Experimental Union in Germany, and the experimental labors of the Austrian Ministry of Agriculture, under the direction of Baron von Seckendorff.

In recent years much interest has been manifested among in-

investigators in Europe, in determining by instrumental observations, made at comparative stations in the open fields and in the forests, the influence of the latter upon the atmosphere in their vicinity, and upon the climate of the country generally.

That forests tend to render the climate of a country colder and more humid, has been known from general observation for many centuries; and the climate of Gaul, as described by Julius Cæsar, compared with that of France at the present day, has been often cited as an instance of this fact. Yet it is only within a very recent period that anything like a full and systematic comparison has been attempted by instrumental observations.⁷

In selecting the location of these stations, one set of instruments is placed in the open fields, and the other in the woods, the former being as much as possible free from the influence of the forest, and the latter fully under its protection. Care is taken that the soil, altitude and other circumstances, except the forest-shade, are alike.

Their outfit generally consists of open-air thermometers—psychrometers—rain and snow gauges, barometers, wind-vanes, and instruments for observing the evaporation from surfaces variously covered as compared with a free water surface—the percolation of water through various soils, ozone records, and observations upon the periodical phenomena of animal and vegetable life generally, so far as influenced by the seasons. In some cases the temperature of the interior of trees is recorded, and in some of the later systems of observation, it has been proposed to ascertain the temperature and humidity not only at the level of the tree-tops, but at a considerable height above them, the latter being obtained by the aid of masts, and by captive balloons that admit of the elevation of instruments.

Without going into details of the results of these observations, we may here remark, that records more or less complete in their plan have been established as follows:—

In *Saxony*, since 1862–3, under the direction of Professor Krutzsch, of Tharand, at nine stations, embracing records of temperature, humidity, rain, snow, etc.

In *Bavaria*, since 1868, seven stations have been established

⁷An account of investigations in this line down to 1872 was published in that year by the Baron von Löffelholz-Colberg, under the title of “*Die Bedeutung und Wichtigkeit des Waldes.*”

under Dr. Ernst Ebermayer, who in 1873 published very fully the results of four years' records,⁸ and in 1876 another work upon the formation of soil from the litter of woodlands, and the chemical statics of forest culture.⁹ It was his intention at the end of ten years to publish the results of that period in more extended form, but his recent removal from Aschaffenburg to Munich has apparently postponed, if it has not disappointed, this expectation.

In *Prussia*, a system of observations, nearly similar to those in Bavaria, was begun in 1874 under Professor A. Müttrich, of Eberswalde, and now includes fourteen stations in Prussia, Brunswick and Alsace-Lorraine. The results are published monthly¹⁰ and annually,¹¹ and a careful study of so much as relates to the temperature of the soil has recently appeared.¹²

In *France*, observations upon the rainfall in the woods and open fields were made under the direction of Marshal Vaillant, in 1866, near Paris, and published in the *Atlas Meteorologique* of the Imperial Observatory of Paris for 1867. In the same year, observations of more extended character were commenced at two forest stations and one agricultural station in the vicinity of Nancy, near the eastern border of France, by Professor A. Mathieu of the school of Forestry at Nancy, and have since been continued. A summary of eleven years' observations was published in 1878.¹³

Upon a general suggestion of the Congress of Agriculturists and Foresters at Vienna, in 1873, M. Fautrat, a sub-inspector in the French Forest Service, with the approval and aid of the Department, established two stations for comparative observations, one in the deciduous forest of Halatte near Fleurines, and

⁸ Die physikalischen Einwirkungen des Waldes auf Luft und Boden, und seine klimatologische und hygienische Bedeutung, 1 Vol., 8vo, pp. 266' and 251, (with an atlas). Berlin, 1873.

⁹ Die gesammte Lehre den Waldstreu, mit Rücksicht auf die chemische Statik des Waldbaues, 1 Vol., 8vo, pp. 300 and 116. Berlin, 1876.

¹⁰ Beobachtungs-Ergebnisse der im Königreich Preussen, im Herzogthum Braunschweig und in den Reichslanden eingerichteten forstlich-meteorologischen Stationen, 1 bis 5 Jahrgang, 1875-1879.

¹¹ Jahresbericht über die Beobachtungs-Ergebnisse der im Königreich Preussen und in den Reichslanden eingerichteten forstlich-meteorologischen Stationen. 1 bis 4 Jahrgang, 1875-1878.

¹² Beobachtungen der Erdbodentemperatur auf den forstlich-meteorologischen Stationen, in Preussen, Braunschweig und Elsass-Lothringen. Von A. Müttrich. Separat-Abdruck, aus der Festschrift zur 50 jährigen Jubelfeier der Forstakademie, Eberswalde. 4to. pp. 33. Berlin, 1880.

¹³ Météorologie Comparée, Agricole et Forestière, 4to, Paris, pp. 70. Published by the Forest Administration, in connection with the Paris Exposition of 1878.

the other in a forest of the *Pinus sylvestris*, near the village of Thiers. The former began in February 1874, and was continued four years; the latter began in June 1875, and was continued three years. The results have been published by the French Forest Administration.¹⁴

In *Switzerland*, observations were established in 1868 at three stations, by the Forest Administration of the Canton of Bern, and the results have since been published monthly in detail.¹⁵ One of these stations is in a forest of beech, another of fir, and another of larch. The observations upon periodical phenomena, made at numerous stations in the Canton of Bern, under the same auspices, are published annually.¹⁶

In *Austria*, a plan of observations in Forest Meteorology has been prepared by Dr. Jos. R. Lorenz, and adopted as a part of the experimental system of researches under the general direction of Baron von Seckendorff, and under the authority of the Ministry of Agriculture. The plan is very comprehensive and includes some features not found in other systems.

In *Sweden*, two scientific stations have been established by the government, one at Upland in the southeastern part, and the other at Skaarsborg. They have been in existence some three or four years, but we have not met with any publication of the results.

In *Italy*, similar observations are being made at one or two stations under the direction of Dr. di Beranger, Director of the School of Forestry at Vallombrosa.

In *Bohemia*, a system of meteorological observations has been recently established under the auspices of the Bohemian Forest Society; and mainly in the interests of Forestry, which is very comprehensive in its plan, embracing a wide range as to elevation and exposure. So far as published, these records relate to the rainfall only, the observations being made by employés of the Forest Administration of the country.

The number of stations at the beginning in January, 1879, was 570, and at the end of the first year, it had increased to 689. In February of the present year, the number was 712. The results

¹⁴ Observations Météorologiques. Faites de 1874, à 1878, par M. Fautrat. 4to, pp. 4 (with eight pages of plates).

¹⁵ Beobachtungs-Ergebnisse der im Kanton Bern zu forstlichen Zwecken errichteten meteorologischen Stationen.

¹⁶ Klimatologische und Phänologische Beobachtungen (Observations climatologiques et Phénologiques) im Canton Bern, 4to.

are published monthly in detail,¹⁷ but as yet without attempt at generalization beyond the monthly means and totals. The system is under the care of Dr. Emanuel von Purkynê, a professor in the Forest academy of Weisswasser, and cannot fail of proving valuable to the country and to the world, by making us better acquainted with the laws that govern the rainfall in a wooded country, and the circumstances that determine the amount.

Special investigations concerning the temperature of the earth at different depths below the surface, and under various conditions, have been made in Russia and elsewhere. These have more or less relation to forest-meteorology; and in several of the experimental stations now in operation, the results will contribute to a further knowledge of this important subject.

We regret that hitherto so little has been done in our own country for the determination of the relations between the forests and the climate by direct comparative observations. With the exception of a few desultory records of temperature and rainfall, we are not aware that anything has yet been attempted for this object, at any institution, or by any observer in America. The greater general dryness of our atmosphere, and differences in our prevailing winds, appear to render the application of any general laws derived from European records very unreliable with us, and we never can have a certain knowledge of these laws as they operate in our country, until they shall have been determined from observations of our own.

The International Statistical Congress held at Budapest in September, 1876, the Meteorological Congress at Rome in 1877, and various conventions held by Agriculturists and Foresters in recent years, have had under discussion questions relating to the agricultural and industrial interests dependent upon climatic changes, and the extent to which these are modified by the woodlands of a country, and it is to be hoped, that effectual coöperation in these researches will ere long be rendered by American investigators.

Among the recent researches concerning the influence of forests upon the amount of water in wells, rivers and streams, and inci-

¹⁷ Ombrometrische Beobachtungen der vom Böhmischem Forstvereine in den Forsten Bohmens in verschiedenen Seehöhen und Expositionen errichteten Stationen. Herausgaben von der Forstlehranstalt Weisswasser. Zusammengestellt und redigiert von Dr. Emanuel von Purkynê, Professor an der Forstlehranstalt Weisswasser. Prague, 4to (in monthly parts).

dentially the effect of woodlands in maintaining the amount, we may notice as particularly worthy of attention, the publications of Counsellor Gustavus Wex,¹⁸ overseer of the works of improvement in the Danube, at Vienna. These memoirs are not only of interest from the facts that they embody, but also for their citations, to other works, making them in some degree, a bibliography of the subject. They have been referred to commissions appointed by various academies of science, and the conclusions that they present have been approved by the highest authorities. They in fact confirm, by numerical statements, the observations of every one who has had an opportunity to notice the amount of water flowing in streams before and after the clearing of the district in which they rise, and through which they run. This amount affects the interests concerned in the hydraulic power of the larger streams, the supply of water to cities, and the navigation of rivers and canals.

As this diminution of water-supply is the result of man's acts, so also in a great degree is the remedy of control within his power, and by means of planting and with reservoirs he can often recover and maintain the advantages lost, perhaps as fully as they existed under the primeval forests.

Among the means for the advancement of forest-science in Europe, we might mention as worthy of notice, the growing interest in various societies and associations, formed for the discussion of new questions as they arise, the comparison of experience, and the promotion of that personal acquaintance so conducive to the general welfare. These meetings are usually enhanced in interest by excursions to forests affording an illustration of methods, or other subjects of practical interests. The more important of the essays and discussions, which these meetings call out, are published with their official proceedings, and through the medium of these publications, and the various journals of forestry, the more important discoveries become widely known.

Returning to the original resolution under which the Committee upon Forestry was appointed by this Association, in 1873, there

¹⁸ *Ueber die Wasserabnahme in den Quellen, Flüssen und Strömen, bei gleichzeitiger Steigerung der Hochwässer in den Culturländern*, von GUSTAVUS WEX, K. K., Ministerialrath und Oberlantier der Donauregulirung bei Wien. 4to, pp. 43, with 7 plates.

Zweite Abhandlung, etc., 4to, pp. 30, with 6 plates.

There are separate imprints from the *Zeitschrift des österreichischen Ingenieur- und Architekten-Vereins*, 1873 and 1879.

remains to be considered one subject that claims our careful consideration.

With the exception of a communication from its chairman to the New York Legislature,¹⁹ and one of like import by Col. Whittlesey, another member, to the Ohio Legislature, no action has thus far been taken by this Committee towards bringing the subject to the attention of our State Legislatures. This delay has in part arisen from an uncertainty as to how far a State Government may, with any prospect of success, enact laws tending to secure efficient planting upon private lands.

In European countries where forest systems have been in full force for centuries, it is only within a quite recent period, that the owners of a minority interest in a large and connected body of woodlands, could be compelled to join a controlling majority, in assisting to maintain a system of management under one direction, the costs and profits of forest management being shared in proportion to the proprietary rights. It is still almost invariably the rule, that the owners of private woodlands have a full right to manage them as their interests lead, excepting in cases where the public welfare is concerned, and it is the universal experience of all countries that the owners of the soil are jealous of interference with what they regard as their rights, in the cultivation of their own land.

This is particularly true in our own country, where "*Liberty and Independence*" have been the watchwords from the beginning, and where the widest range of freedom is allowed in the enjoyment of every kind of property, provided only that no injury is done to the public, or to the rights of others.

We cannot therefore entertain the idea of an edict that every man shall plant a given portion of his land with forest-trees. Our people must be educated to a knowledge of the situation, and familiarized with the means by which benefits may be gained, or injuries avoided. With the great majority, the effect of scarcity upon the market prices of lumber will be of more interest than the influence of forests upon the climate; and the public generally will give more attention to questions of gain or loss, than to all that science teaches about the hidden causes that produce these results.

We accordingly deem it best only to recommend a series of measures tending to familiarize our people with ideas of the im-

¹⁹ Senate Document, 82, 1875.

portance of forest culture, and to make them better acquainted with the means by which its advantages may be secured. It may be reasonably hoped, that public opinion will by these means be led to sustain such other measures as further experience may warrant or suggest.

The following form of a Memorial is therefore submitted for your consideration. If approved, we would suggest that it be forwarded in duly authenticated form, as the recommendation of this Association, to the chief executive officer of each State and Territory of the United States, with a request that the same may be submitted to the several Legislatures.

And your Committee, having now served for seven years, and performed their duty to the best of their ability and opportunity, ask to be discharged.

FRANKLIN B. HOUGH.

LEWIS H. MORGAN.

ASA GRAY.

CHARLES WHITTLESEY.

MEMORIAL.

To His Excellency

The Governor of

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, at its meeting held in Boston, on the 30th day of August, 1880, having considered and adopted the following Memorial, has instructed the undersigned to transmit the same to Your Excellency, and respectfully ask that it may be laid before the Legislature of your State, at its next session.

Memorial of the American Association for the Advancement of Science, in relation to the Need of Attention to our future Forest Supplies.

TO THE HONORABLE THE LEGISLATURE
OF THE STATE OF

We would earnestly invite the attention of your Honorable Body, to the great and increasing importance of providing by adequate Legislation, for the protection of the existing Woodlands

of the country against needless waste, and for the encouragement of measures tending to the more economical use, and the proper maintenance of our Timber Supply.

It is evident that the consumption and waste of the Forests of the country much exceed their restoration by natural growth, that the native supply of Timber of the better qualities is rapidly becoming less, and that the demand for building purposes, manufactures and other uses, is rapidly increasing from year to year.

This decreasing supply, and growing consumption, must unavoidably lead to serious inconvenience, and may, unless seasonably prevented, occasion great public injury, by leaving the future without adequate supplies.

We deem it an established fact, that the interests of Agriculture are promoted by the presence of a due proportion of Woodlands in a country, and that they suffer when clearings are carried to excess. The protection which they afford appears to mitigate, in a sensible degree, the vicissitudes of Climate, and to maintain the supply of water in springs, rivulets and wells. They shelter a country from injurious winds, and may be made practically useful, in preventing the drifting of snows and sands, in preventing or diminishing damages from torrents, and in limiting unhealthy emanations from marshes. Their influence in connection with questions of water-supply for cities, and the maintenance of hydraulic power, and of navigation in rivers and canals, where these may be affected by droughts, deserves serious attention.

But it is especially to the Woodlands, as a source for supplying materials of first necessity to the country, that we would respectfully invite the attention of your Honorable Body; and here we would remark, that a realizing sense of the importance of this subject has long since led the principal governments of Europe to enact laws, and establish regulations for the maintenance of a due proportion of Forests upon their Public Domains, and upon the lands belonging to Local Municipalities and Public Institutions.

We are aware that wide differences exist, in the tenure of land, in the United States, as compared with those of Europe, and that the titles to landed property are here very generally vested in their owners, without any conditions whatever as to Timber Culture.

It is also true that, in most of the older, and in some of the

newer States, there are no lands whatever, adapted to this use, now belonging to either the State or the Local Governments—the whole being owned by private citizens, and subject to no conditions, but such as their Representatives in a Legislative capacity may establish for the general welfare.

It is to the Owners of the Land, that we must therefore look for the adoption of measures tending to avert the injuries in prospect; and in furtherance of this end, we deem it within the province of a State Legislature to encourage the enterprise, which may be done in a good degree in the following manner :

1. By a Law protecting Trees planted along the Highways, and by encouraging such plantations by deductions from Highway Taxes. It may, in particular cases, be proper to require such plantations to be made at the public expense, with the view of protecting roads from drifting snows, or for other local benefits, and in a manner best calculated for securing these objects.

2. By a Law that shall exempt from taxation the increased value of land, from the planting of trees, where none were growing, for such period as may appear proper, or until some profit may be realized from the plantation.

3. By the appropriation of money to Agricultural and Horticultural Societies, to be applied as premiums for tree-planting, regard being had to greatest areas planted, and the most successful management. Reports should be required, giving details of the methods found most effectual in obtaining these results.

4. By prizes for the best Essays and Reports upon subjects of practical Forest-culture, to be awarded by competent Judges, and those approved, to be published for distribution among those who would be the most benefited by this information.

5. By encouraging Educational Institutions within the State to introduce a course of instruction, having reference to practical silviculture. This object may be promoted by the aid of Collections, and by correctly labelled Plantations of the various species of Forest Trees adapted to the soil and climate. At Agricultural Colleges, and at higher Institutions of Learning, stations might be advantageously established under State patronage, for experiments and observations in cultivation and acclimatization. The distribution of seeds and plants affords a direct and efficient aid, in the promotion of an interest in this subject.

6. By laws tending to prevent Forest-fires, by imposing penal-

ties against the wilful or careless setting of such fires, and by enlarging and defining the powers of Local Officers in calling for assistance, and in adopting measures for suppressing them. The waste from this cause, in some years, greatly exceeds the amount of timber used, and there is no question connected with forest supplies, that demands more serious attention. Our main reliance appears to depend upon vigilant precautions, enforced by adequate penalties, and sustained by a strong public sentiment.

7. Under favorable circumstances, Model Plantations might be established and maintained by a State Government, under the care of persons specially trained to the profession of Forestry. Their location should be chosen with a view of affording convenient opportunity to those who might wish to learn approved methods of management, by the study of a work worthy of imitation.

8. The appointment of a Commission of Forestry under State authority (analogous to the Commission of Fisheries in many of the States) might prove of great service in promoting efficient measures for the advancement of this interest. The Members of such a Commission, who would doubtless be selected on account of their influential standing, and their known intelligence upon this subject, would be able to study the conditions and requirements of their State, and devise means for most effectually securing the object in view.

In the questions arising upon this subject, we depend much upon the intelligence of our fellow citizens, who are generally not slow to appreciate advantages, or to foresee a real danger where the indications are apparent. When this danger is fully realized, we believe that no time will be lost in seeking to apply the remedy. The measures we recommend will tend to awaken an interest in the subject, and lead to an intelligent understanding of the means for meeting the dangers that may arise from undue exhaustion of our forest supplies. They will diffuse the benefits gained by experience, for the good of all, and educate public opinion to a degree that will sustain more energetic measures, as their necessity may be hereafter more fully known.

Chairman of the Committee,

A. A. A. S.

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