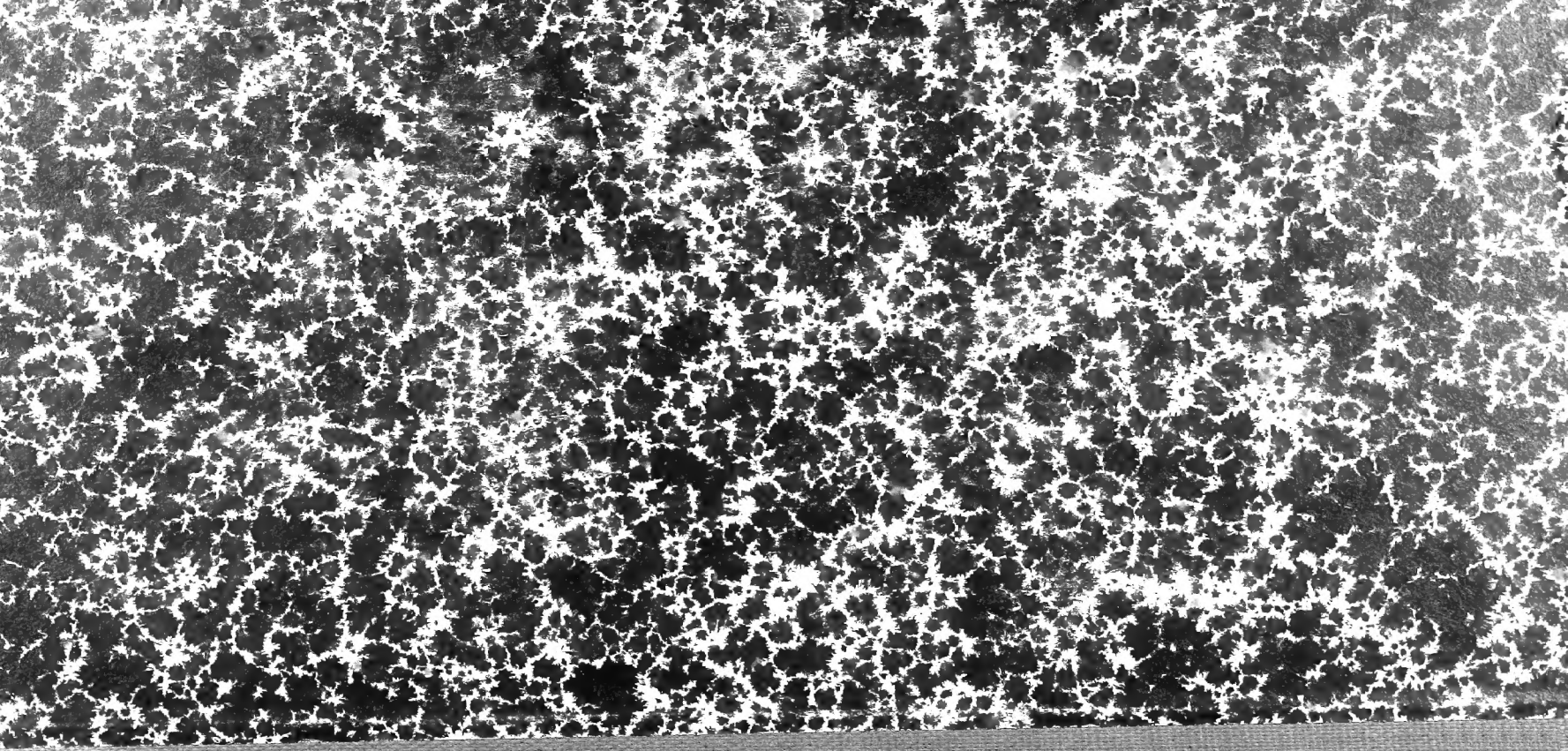

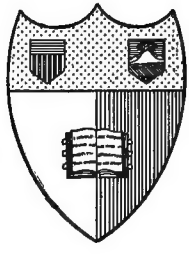

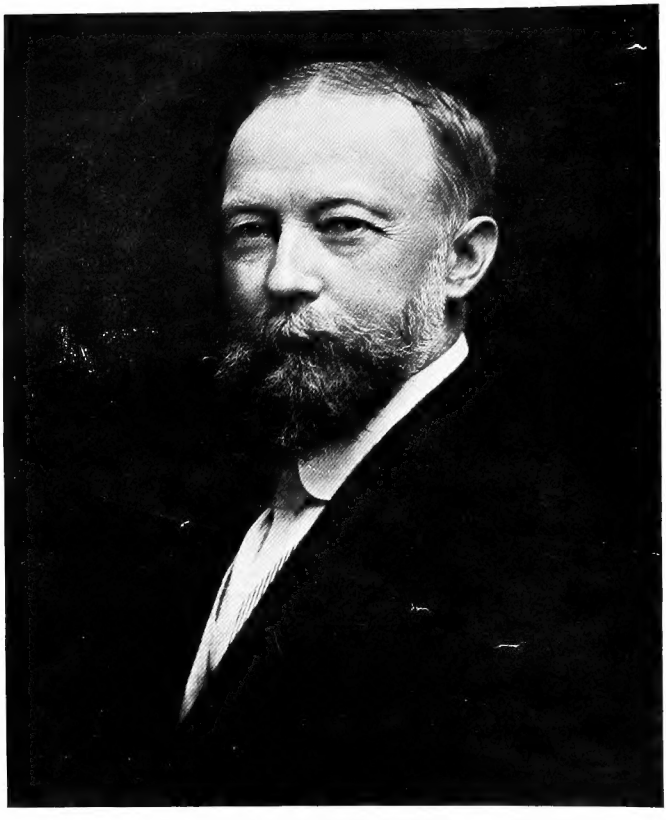

MR. CHARLES LATHROP PACK

President of the Fifth National Conservation Congress, who was unanimously re-elected at the Congress on Thursday, November 20, 1913

REPORT

of the

FORESTRY COMMITTEE

of the

FIFTH NATIONAL CONSERVATION CONGRESS

at

WASHINGTON, D. C.

NOVEMBER 18, 19 *and* 20, 1913

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The Forestry Committee and the Sub-Committees

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CHARLES LATHROP PACK, *Ex-officio,*
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PUBLISHED *by* AUTHORITY *of the*
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FIFTH NATIONAL CONSERVATION
CONGRESS, NOVEMBER, 1913

Apology is made for the fact that owing to lack of space, the book having to be confined to the allotted number of pages, it is impossible to give in full the discussions at the forestry sections on the reports of the sub-committees.

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FOREWORD

FORESTERS and lumbermen having long desired an investigation of various phases of forestry and lumbering problems, by committees of competent men, it became apparent, when the Fourth National Conservation Congress was in session at Indianapolis in 1912, that such investigation was part of the work of any organization encouraging forest conservation.

Accordingly, at that time, members of the American Forestry Association together with lumbermen and others interested, all being delegates to the Conservation Congress, discussed measures for doing the work and raising the funds necessary for it.

The outcome was the appointment by Mr. Charles Lathrop Pack, after he had been elected president of the Congress, of a Forestry Committee composed of four directors and one vice president of the American Forestry Association, with Mr. Pack, also a director of the Association, as a member ex-officio. The committee appointed ten sub-committees, topics were assigned to them, and after several thousand dollars had been subscribed for carrying on the work the investigations started.

The subscribers to the fund were Mr. Charles Lathrop Pack, W. R. Brown, of Berlin, N. H.; Lehigh University Forestry Fund through Dr. Henry S. Drinker; Capt. J. B. White, of Kansas City, Mo.; and Robt. P. Bass, of New Hampshire.

Having selected the sub-committees with great care, choosing both theoretical and practical experts, and enthusing them with the earnest desire to secure the best information possible and compile the most valuable report on each subject assigned that had ever been made, the Forestry Committee pushed the work along so vigorously that when the Fifth National Conservation Congress convened in Washington, D. C., on November 18, 1913, for a three-day session, the report of each committee was ready in pamphlet form, for distribution and discussion.

Every man present at the forestry section meeting of the Congress when these reports were made and discussed was impressed with the great value of the work which had been done, and particularly with the necessity of continuing it in the future. Several of the committees reported upon only one phase of the forestry and lumbering problem submitted; other phases equally important still need similar investigations, and reports upon them will be of equal value. Each year new problems arise, each year a thorough study and recommendations upon existing conditions will be of a value difficult to calculate. The work should go on, year after year. Each year there should be a great gathering of foresters and lumbermen to hear reports of their committees and to exchange opinions. There are forestry associations and lumbermen's organizations and what is now needed is a gathering of the men interested in each in order to work out, as far as their knowledge and ability goes, the problems of forest conservation. There should be closer relations between foresters, lumbermen

and timberland owners. They can work together to great mutual advantage. Various individuals and corporations are now endeavoring to work out some of the chief problems. How wise it would be, how much more could be achieved if all who are interested could meet once a year and exchange opinions, how valuable it would be to have committees of experts reporting each year the result of their investigations.

It was the sincere wish of every one who attended the forestry section meetings of the Congress, and of all who have received the reports of the committees, that the work should be continued year after year.

These proceedings, as a matter of permanent record, are published under the auspices of the Forestry Committee, and are entirely separate from the water power proceedings of the Congress which it is understood the Congress will publish separately.

Copies may be secured from the American Forestry Association, Washington, D. C.

ADDRESS OF PRESIDENT CHARLES LATHROP PACK

At the opening of the Fifth National Conservation Congress, the New Willard Hotel, Washington D. C., November 18, 1913.

IT is with unusual pleasure that I welcome you all, ladies and gentlemen, delegates to the Fifth National Conservation Congress. At any time and in any place it would be a privilege to greet a body of men and women of this character, so truly representative of the best spirit and the best endeavor of America, men and women unselfishly devoted to the practical altruism of conservation.

At this particular time in Washington the pleasure is intensified. This is true for the reason that the cause of conservation is face to face the coming winter with the most serious fight in its history. Your presence at the seat of the Nation's government will afford the best possible opportunities for gaining counsel from those in authority and for making our own message widely heard by the American people.

As you all know, this is the first great gathering of conservationists held in Washington since the year of the epoch-making Conference of Governors at the White House in 1908. It was at the White House Conference that the conservation movement first assumed concrete, definite and tangible form. To those of us who were privileged to be present, that gathering was an inspiration. To all it was historic. Its counsels were led by the President of the United States, and its deliberations and activities had the benefit of the constructive energy and talents of such men as Gifford Pinchot—(Applause)—the late Dr. W. J. McGee, of splendid memory—(Applause)—Mr. Frederick H. Newell, Honorable Walter L. Fisher, not to mention others.

From the first day of the White House Conference, there has never been a moment's doubt as to the ultimate success of the best conservation ideals. The cause was right. As a further fundamental, it commanded the confidence, the friendship and the enthusiastic support of the American people. It is obvious that a righteous cause with the backing of the public can never fail. There may be differences of judgments, there may be moments even of conflict and there may be delays, but there will be no defeat. Truth loses some battles, but no wars. The main battle for sane and constructive conservation has moved steadily onward, making definite progress with each succeeding year, until now it is recognized as an essential part and parcel of good government. (Applause.)

The White House Conference was followed by other work for the cause. It was in 1909 that the National Conservation Congress was formally organized at a general gathering of public spirited men in Seattle. This assemblage and its far-reaching consequences were the general result of the previous meetings here in Washington, and the direct result of the wisdom, foresight and energy of the

noble band of workers of the Northwest in the common cause known as the Washington Forestry Association. The step was typical of the men of the great Northwest and illustrative of the spirit that has enabled them to build an empire and has made them at all times such forceful and valuable allies in the fight for conservation. This body held a convention in November, 1908, at which it was arranged that a Conservation Congress of national scope should be held in Seattle during the Alaska-Yukon-Pacific Exposition.

From the beginning thus made has grown this Annual Meeting or Congress in which we all take pride. The Seattle Congress devoted itself to Forestry and Water Power. A year later, the St. Paul sessions were largely taken up with consideration of the conservation of public lands, one of the most important phases of the work involved in the scope of the organization. At Kansas City, in 1911, Soil Fertility was the primary problem on which the talents, scholarships and practical experiences of the delegates were concentrated. Last year, in Indianapolis, we devoted our thought largely to the conservation of Human Life, questions to which some of the Nation's most earnest, conscientious and highly developed minds have given constructive thought with results that command our admiration.

This year we return to the seat of Government and to Forestry and Water Power, where we can anew synchronize the place and the subjects with which the conservation movement found its birth and its first development. Since 1908, large results have been achieved in the conservation and proper utilization of these fundamental resources of the greatest, richest and most fortunate nation in the world. Let me emphasize the statement that the growth of conservation has been coincident with the growth of proper utilization of these resources. Conservation and utilization are synonymous. They cannot be divorced. Our opponents—sometimes we call them—would like to make it appear that conservation means reservation and the locking up of resources for the benefit of future generations at the expense of the present. We know that this is not true. We know that without proper utilization there can be no conservation worthy of the name. We know that perpetuation can be best achieved by present use along scientific lines, and it is to this policy that we stand committed. (Applause.) It is a policy which must be protected by constant vigilance—fought for when necessary.

But one should not make the mistake of assuming that at all times all the laws and regulations that have been passed or made in connection with the handling of our public resources are all right and fit the situation, because it is not the fact. No one knows this better than those who have had actual experience. What people like ourselves stand for are the underlying principles and the frank correction of errors and amending of laws when found to be wrong. We are for the truth!

Another phase of combat arises from the insistence with which some interests strive to make it appear that there is popular clamor for State control of the great Government properties in forest and stream. The growth of conservation does not please everybody. It is an economic problem. There are those who

prefer a return to the old order of things, wherein wasteful gain was the keynote. It is inevitable that with these people true conservation should be unpopular. We must all recognize this even though such recognition forces us to feel we love conservation for some of the enemies it has made. Thus recognized, the enemy is half defeated. We must spare no effort, however, to insure complete defeat. That we can do it we all know. That we must do it is obvious.

I greet you all most cordially as my fellow workers in the vineyard that shall yield perpetual fruitage for the use and good of the entire American people. (Applause.)

FORESTRY COMMITTEE ORGANIZATION

THE REPORT OF THE FORESTRY COMMITTEE.

WHEN the present Forestry Committee was appointed, following the meeting of the Fourth National Conservation Congress at Indianapolis in 1912, several of the public spirited men who had followed the developments took up the question of the most effective organization to represent the mutual forestry and lumbering interests involved. The desirability of such an organization was emphasized by the presence at Indianapolis of a number of men who were no longer in need of the general educational propaganda relative to the conservation of natural resources, but attended the Congress for the purpose of meeting progressive men in their own and related lines and securing specific information helpful in the solution of their own problems.

The need for a working organization and a rallying point, where mutual and more or less technical problems may be discussed, is felt particularly by the forestry and timber interests. The Conservation Congress was originally founded on forest conservation, and while the importance of other conservation subjects is realized the time seems to have come for specific forestry work at popular national meetings, in addition to the general publicity and education. It is merely a frank admission of the facts to say that the attendance and support of the forest conservation interests would have been lost to the Congress if it had not returned to the original theme; and not only this but the active workers in forestry desired an opportunity to exchange views on technical problems, so as to take home tangible information in return for their time and expense in attending.

The Forestry Committee of the present Congress was organized with the view of meeting, to some extent at least, the conditions which existed. The Conservation Congress offered the first essential in the way of a recognized national organization, with which active forestry committee work could be associated. The second need was financial, and this was promptly met by the American Forestry Association, which provided the necessary funds. There then remained only the necessity of perfecting the proper organization of the forestry committee itself.

Various precedents have been established by older organizations for carrying on the character of work deemed most effective in this case. The plan which has given good results and is in general use is that of standing committees or sections assigned to various subjects. The American Railway Engineering Association and the International Congress of Applied Chemistry are good examples of this form of organization. The National Educational Association has carried the idea still farther, to the point of having various independent sections, each with its own president and program. A central organization in each case holds the sections or standing committees together for the common cause. The needs of the Forestry Committee for this year seemed best met by the appointment of subcommittees to investigate and report on the more important forest conservation subjects.

As soon as this plan was decided upon ten sub-committees, with four to eight members each, were appointed. The subjects covered the more important technical problems of forestry and lumbering, and broad national questions involving legislation and regional public interests. The chairmen and sub-committee members were selected on the basis of their experience and ability to contribute new knowledge on the subjects assigned, or to compile the old in workable form. The list of committeemen is in itself sufficient evidence of the seriousness and high character of the investigations undertaken. Several topics were suggested under each sub-committee subject, and the more important selected for this year's report. Practically all details of text and arrangements were left to the sub-committeemen. It is striking evidence of the importance and public interest in forest conservation that fifty busy men should freely give their time and thought to work of this kind.

The printed reports, therefore, as presented to the Congress are not the views of rhetoric of any individual, but the mature conclusions of a body of experts, who represent all regions and all phases of forest activity. The necessary publicity to the sub-committee's findings will be given by printing and distributing the reports, by wide circulation through the AMERICAN FORESTRY MAGAZINE and lumber journals, and by distribution among trade, technical and public service organizations.

By presenting these reports at forestry section meetings and giving ample opportunity for discussion, further information will be gained and that available will be disseminated. Those who attend will receive the benefit of the information given, and, in turn, by taking part in the discussions, will contribute to the fund of available knowledge, and add facts for use in the present or future revision of the reports. Most of the subjects will continually develop new phases, and what is up to date or advanced thought or information to-day may be obsolete to-morrow. At the same time, there are fundamental principles which remain unchanged, and basic methods which when once applied need revision only in detail. No one has any thought of being able to settle at once and for good and for all the many complex conservation problems. Recognizing, however, the evolutionary nature of the development, it is apparent that the broader and better the knowledge and the closer the harmony among the various interests, the sooner will come security to the nation's timber resources and provisions for maintaining the needed supply.

It is not fitting for the Forestry Committee to pass judgment on its own work nor to outline plans for the future. It is a temporary body which will go out of office automatically at the close of the coming Congress; while as to results, the accomplishments of the year will speak for themselves in the sub-committee reports and in the forestry speeches before the general Congress. It may not be out of place, however, to say that the form of organization adopted is in general effective, and that the results are even better than was anticipated. It is unfortunate that the present officers of the Conservation Congress, who have so consistently supported the work, and the Forestry Committee have a tenure of service so short that they can little more than inaugurate work of the kind which has been attempted.

From the standpoint of developing and establishing basic policies, and in perfecting and applying technical methods in the various fields of forest activity, an organization along the line of the present Forestry Committee is certainly needed and promises to be effective. At the same time, such work cannot be undertaken without a central national organization to lean on and funds to prosecute the work. Granting that a strong national organization is needed to carry on popular educational and publicity work, it would seem that the more specific and technical field could best be covered by a properly organized forestry committee, supported by and affiliated with the non-technical central organization.

Whatever the supporting organization and clearing house, it is certain that there exists a well-defined desire for an annual national forum of forestry and lumber interests, such as provided this year in connection with the National Conservation Congress, where views can be exchanged and problems of mutual interest worked out to practical conclusions. It would not necessarily be a large gathering, but essentially one of ways and means to accomplish many desirable things. The best basis for such a meeting would be a permanent organization for investigation and report, probably through standing committees which would be directed by a central body, either an administrative committee or the directors of the parent organization.

If specific mention was made of the individuals who have made possible a creditable showing this year, it would have to include every man on the Forestry Committee, every sub-committee chairman, and most of the sub-committee members. Mr. Charles Lathrop Pack, in his function as President of the Congress and outside of it, has given the strongest possible support to the Committee, and to him and to Col. W. R. Brown, Dr. Henry S. Drinker and Capt. J. B. White is due the credit for the financial arrangements, through the American Forestry Association, which made the work possible. For the large amount of valuable Pacific Coast data, and for cordial co-operation in all the work the Committee owes its thanks to Mr. E. T. Allen.

SYNOPSIS OF SUB-COMMITTEE REPORTS

The following is a brief summary of the work of the Forestry Committee, and its sub-committees, for the Fifth National Conservation Congress.

COMMITTEE 1

PUBLICITY

Chairman, E. T. Allen.....Forester, Western Forestry and Conservation Association, Portland, Ore.
T. B. Wyman.....Secretary, Northern Forest Protective Association, Munising, Mich.
F. W. Rane.....State Forester, Boston, Mass.
P. S. Ridsdale.....Secretary, American Forestry Association, Washington, D. C.
Overton W. Price....Vice-president, Treasurer, National Conservation Association, Washington, D. C.

TOPICS ASSIGNED

1. Publicity at the meetings of various popular and technical organizations.
2. Publicity of the forestry work of the Conservation Congress, both of the general congress and of the Forestry Committee.
3. Publicity through the press, looking particularly to the arousing of public interest in fire protection, taxation, and State forestry.
4. Publicity methods and devices useful to fire associations and other forest protective agencies.

The full report of this committee as printed, covers the four topics assigned. An introductory chapter presents in a new way the necessity for publicity since: "Public education is the chief measure of progress in forestry."

Some of the conclusions of the committee are that:

1. Progress in forestry depends more on what the public will permit than upon foresters and lumbermen. Consequently, public education is of primary importance.
2. Education is a matter of publicity and publicity is a trade in itself. It cannot be practised intuitively.
3. Since no one else has the interest or the requisite forestry knowledge, foresters and lumbermen must learn this trade.
4. It is not forests, but the *use* of forests, that we seek to perpetuate. Therefore, to be sound and convincing, educational publicity must include the lumber business. So long as the public believes forestry good and lumbering bad, there will be confusion and no real progress.

In addition to presenting a full report, the sub-committee assisted during the year in preparing the forestry program and arranging section meetings, and in giving publicity to the forestry features of the congress.

COMMITTEE 2.

FEDERAL FOREST POLICY

Chairman, Jos. N. Teal----------Chairman, Oregon Conservation Commission, Portland, Ore.
Hon. A. F. Lever----Congressman, Lexington, S. C.
Robert P. Bass------Ex-Governor New Hampshire, Peterboro, N. H.
E. G. Griggs---------President, St. Paul & Tacoma Lumber Co., Tacoma, Wash.
F. E. Olmsted-------Consulting Forester, Boston, Mass.

TOPICS ASSIGNED

1. Needed legislation in national forestry.
2. National versus State control of national forests.
3. Economics of timber supply in relation to production and consumption.
4. Details of national forest administration.

The first three topics as above listed are covered by separate sections in the report. The subject is one of the broadest and most important before the

country today, and is likely to become a matter of legislation which will vitally affect public interests. The whole report is a timely contribution to public knowledge on the subject.

Most of the criticism against the Forest Service concerns conditions beyond its control, which result from lack of authority or inadequate funds. The first section on "Needed Legislation in National Forestry" outlines the needed changes and increases in Congressional legislation and appropriations which will enable the Forest Service to administer the National Forests with full efficiency. It is stated that "the legislation which is needed in national forestry is primarily to extend the principles already recognized by Congress and to enable the executive authority better to put these principles into practice."

Another attempt, to wrest the national forests from public control for private exploitation, is imminent, this time under the guise of arguments and legislation for State control. Section II of the Federal Forest Policy report, on "National versus State Control of National Forests," should dampen the powder of the States' rights advocates before they reach the firing line. The facts and evidence, stated by a man like Jos. N. Teal, who is, himself, a resident of a public lands State, are conclusive and irrefutable. One of the opening sentences summarizes the incentive at the bottom of the whole States' rights movement for control of the national forests as follows: "In reality knowledge of the facts and consideration of the arguments used to substitute State for national control show that the underlying motive of the propaganda for State control has for its object the *elimination* of public forests, State or national. This fact should be known, and the issue accepted and fought out in the open instead from ambuscade."

Section III, on "Economics of Timber Supply in Relation to Production and Consumption," was written by Mr. E. T. Allen at the request of the sub-committee. It deals with the neglected topic of forest economics in a way which brings out many new and striking facts, particularly in relation to the sale of timber from national forests. As an indication of the character and soundness of this chapter the following is quoted: "It follows that the maximum cut from the national forests should be assured, *not during the existing period of stored and excessive virgin supply, or during the permanent future which will begin when adequate forest crops have had time to mature, but during the closing years of an intervening transition period.*"

COMMITTEE 3.

STATE FOREST POLICY

Chairman, W. T. Cox.....State Forester, St. Paul, Minn.
F. A. Elliott.....State Forester, Salem, Ore.
C. R. Pettis.....Superintendent, State Forests, Albany, N. Y.
H. H. Chapman.....Professor, Yale Forest School, New Haven, Conn.
J. E. Rhodes.....Secretary-Manager, National Lumber Manufacturers' Association, Chicago, Ill.

TOPICS ASSIGNED

1. Established principles in framing, passing and enforcing State forest laws.
2. Acquirement and management of State forest reserves, with special reference to cutover lands.
3. Co-operation between States, between the States and the Federal Government, and between States and private agencies.

The rapid development in State forest organizations, based on new and old legislation, and the important part each forested State must play in the administration of our forest resources, makes this one of the most important subcommittee subjects.

The report this year is largely confined to the first topic, "Established Principles in Framing, Passing and Enforcing State Forest Laws." The established principles are stated and discussed as a basic policy, followed by a model State forest law embodying these principles in more detail. Obviously any model or skeleton law must be modified materially to meet the conditions in various States and regions, but if there is a general understanding as to fundamental principles, adaptation to local conditions becomes comparatively simple.

Owing to the large amount of valuable detail submitted by the committee, and the great interest in State legislation, which will probably lead to many suggestions and recommendations during the section meetings, it is possible that the report will be printed only in synopsis, and the revision for final printing made after consideration of the report at the section meetings.

COMMITTEE 4.

FOREST TAXATION

Chairman, Gifford Pinchot--President, National Conservation Association, Washington, D. C.
Acting Chm'n, E. T. Allen------Forester, Western Conservation Association, Portland, Ore.
F. R. Fairchild---Professor of Political Economy, Yale University, New Haven, Conn.
Dr. H. S. Drinker-President, Lehigh University, South Bethlehem, Pa.
E. M. Griffith----State Forester, Madison, Wis.

TOPICS ASSIGNED

1. Existing tax laws and their influence on forest management.
2. Basic principles of wise forest taxation, with definite suggestions for legislation.
3. Forest taxation in other countries.
4. Bibliography for students of forest taxation.

While several individual investigators have gone far into the subject of forest taxation, and a few of the States have passed progressive tax legislation, this is the first time a body of experts has undertaken a summarized compilation of existing knowledge, with working recommendations for forest tax legislation.

The four topics listed are covered under separate chapters or sections in the report.

If there is any doubt anywhere existing as to the urgency and importance of reform in forest taxation it should be dissipated by reading the following introductory paragraphs in Section II: "Next perhaps to war, taxation is the most powerful instrument of government, capable, if unwisely used, of destroying individuals, communities and industries. Few government functions are less studied by the average citizen. Probably none of its branches is less understood than forest taxation. * * * It is everywhere recognized by foresters, tax experts and political economists that the general property tax applied to forests in the United States is unscientific and discouraging to conservative management."

Forest taxation has too long been considered purely academic and theoretical, whereas it really is a problem which vitally affects the capital invested in timber, the price of lumber to the consumer, and the prosperity of States. The report states that * * * "There are two distinct influences upon the rise of timber prices. One is a true rise of intrinsic value, due to diminution of supply and growth of consumption. This alone affords any basis of profitable investment. The other is the accumulation and compounding of carrying costs which, without investment profit, *must be continually added to the selling price to prevent actual loss* * * * The general property tax upon timber, then, has an alarming tendency to become excessive and it is exceedingly difficult to meet because it is imposed annually while revenue with which to meet it is deferred. * * * From the community standpoint it threatens rapid wasteful cutting of mature timber, penalizes the growing of new timber, and for both these reasons hastens the cessation of all revenue from forest taxation and the consequent imposition of the entire burden upon other forms of property."

The basic principles of wise forest taxation are considered under the two separate heads of Taxing New Forest Crops and Taxing Mature Forests, and lead up to definite suggestions for legislation. The report is exhaustive in its treatment and specific in its recommendations, and could well be used as a working basis for legislative action in any State. In fact, there is now available for the first time, a compendium to which any State interested in the subject can turn for sound adoptable recommendations.

An important chapter discusses "The Danger in New Tax Theories" "the adoption of new systems framed without forestry in mind," of which conspicuous examples are "the diametrically opposed income tax and single tax."

Owing to the pressure of other duties Mr. Gifford Pinchot was unable to direct the details involved in the compilation of the report, and Mr. E. T. Allen served as acting chairman.

Committee 5.

FOREST FIRES

Chairman, C. S. Chapman------Secretary-Manager, Oregon Forest Fire Association, Portland, Ore.

D. P. Simons-------Manager, Sound Timber Company, Seattle, Wash.

F. H. Billard_____Forester, Berlin Mills Company, Berlin Mills, N. H.
J. S. Holmes_____State Forester, Chapel Hill, N. C.
Coert DuBois_____District Forester, Forest Service, San Francisco, Calif.

TOPICS ASSIGNED

1. Fire prevention by States, by the Federal Government, and by private interests.
2. Forest fire association work, with special reference to the possibility of co-operation and standard practice between the various protective associations.
3. Forest fire insurance.

One of the most hopeful developments of recent years is in the line of forest fire prevention, hence the work of this sub-committee is of prime importance, since without fire protection there can be no forestry. The report covers fully the first topic in fire prevention by States, by the Federal Government, and by private interests. The general situation, including the definite results from systematic fire prevention by private associations and other organizations, comprise the main body of the report. This is followed by a detailed discussion of the fire protection work being done in various States.

"No phase of forest work has been so actively taken up or made such marked progress as that of forest fire prevention during the past ten years.

"During the past five years there has been an increase of *over 3,000 per cent* in the area of privately owned forest land patrolled against fire; while in addition to this, 92,000,000 acres of private land has been systematically looked after and an area of some 187,000,000 acres of timber land patrolled by the Forest Service.

"Forest fires in the United States, according to the most conservative estimates since any records were available, have caused an average annual loss of 70 human lives and the destruction of merchantable timber to the amount of $25,000,000.00."

COMMITTEE 6.

LUMBERING

Chairman, R. C. Bryant_____Professor of Lumbering, Yale University, New Haven, Conn.
G. M. Cornwall_____Editor, *The Timberman,* Portland, Ore.
J. B. White_____Lumberman, Kansas City, Mo.
J. F. Clark_____Forest Engineer, Vancouver, B. C.
F. A. Silcox_____District Forester, Missoula, Mont.
Adam Trieschmann__Crossett Lumber Company, Crossett, Ark.
C. S. Martin_____Saginaw Timber Company, Aberdeen, Wash.
W. R. Brown_____Berlin Mills Company, Berlin, N. H.

TOPICS ASSIGNED

1. The basis of lumber costs and stumpage values.
2. The application of scientific management to lumbering operations.

3. Reports on log and lumber measures, with recommendations for standard scales.
4. Forest engineering.

The report for this year is confined mainly to the second topic listed. An appendix is submitted in the form of an excellent preliminary report on "Efficiency in the Logging Industry in the Pacific Northwest," by C. S. Martin.

This is a committee representing particularly the manufacturing end of the lumber business, and since many widely diversified problems are involved the chairman calls attention to the fact that a complete report could not be prepared in one season. Although the committee was composed largely of lumbermen and dealt exclusively with lumbering questions, little co-operation or assistance was received from those who should be most interested. Apropos of this situation is Dr. C. A. Schenk's truism that "the new turn in lumbering methods cannot be brought about from the outside. It will be necessary for the rejuvenation of lumbering, for the forester to become full fledged lumbermen." If outside help will not be accepted, and less than 5 per cent of the insiders in the lumbering business who were asked for information show any interest, how can anything be worked out? After all, the theorist, considered as "a man who tries to think what he is doing" is usually the one who worked out the reforms ultimately welcomed by the "practical" man who is too busy to help.

There is a very large field for profitable investigations under the several topics named, but to carry on the work satisfactorily the co-operation and assistance of the lumbermen is a first essential. Moreover, funds should be available for the employment of a competent field man to study and compare conditions and methods and personally obtain information from operators. The various phases of forest utilization could properly be handled under the same subject heading.

COMMITTEE 7.

FOREST PLANTING

Chairman, E. H. Clapp——Forest Service, Washington, D. C.
Acting Chm'n, S. N. Spring——Professor, Forestry Department, Cornell University, Ithaca, N. Y.
T. T. Munger——Forest Service, Portland, Ore.
S. B. Detwiler——Superintendent, Chestnut Blight Commission, Philadelphia, Pa.

TOPICS ASSIGNED

1. Conditions under which commercial planting is desirable.
2. Nursery methods.
3. Field planting methods.
4. Natural versus artificial regeneration.

While a large amount of forest planting has been done, much of it might be classified as sporadic or experimental. In most planting operations too little attention has been paid to the purely commercial aspects of the question.

The sub-committee's report deals entirely with the commercial conditions

under which planting is advisable. It summarizes both for technical and regional conditions, and for various classes of owners. The startling statement is made, and substantiated by figures, that $65,000,000 is lost annually through allowing denuded and potential forest lands to remain unproductive. The urgent need of a definite financial plan for the acquirement and reforestation of denuded lands by the Federal and State Governments, and for assistance to private owners, is pointed out. Several plans covering these points are outlined.

To the main report is added an appendix, which treats in detail of the commercial conditions under which planting is commercially feasible in various regions.

Owing to the absence of Mr. E. H. Clapp on official duty in the West, Prof. S. N. Spring, of Cornell University, served as acting chairman and prepared the main body of the report.

COMMITTEE 8.

FOREST UTILIZATION

Chairman, R. S. Kellogg_____Secretary, Northern Hemlock and Hardwood Association, Wausau, Wis.
Bruce Odell_____Cummer-Diggins Company, Cadillac, Mich.
W. C. Miles_____Manager, West Coast Lumber Manufacturers' Association, Tacoma, Wash.
E. A. Ziegler_____Professor, Mt. Alto Forest Academy, Mt. Alto, Pa.

TOPICS ASSIGNED

1. Closer utilization in logging.
2. Closer utilization in manufacturing.
3. Closer utilization in marketing.
4. The preservative treatment of timber.

This subject, in common with lumbering, properly requires field study by a paid man in order to procure and compile satisfactory data, and the two lines of investigations could be combined.

The report of the sub-committee for this year describes clearly the economic limitations to the closer utilization of timber, and to some extent touches on the unapplied possibilities in the line of utilization. The actual developments are contingent on commercial conditions and also influenced to some extent by lack of information. Apropos of the latter, the synopsis of the report states that "The lumber industry needs more information than is yet available upon the merchantable products than can be obtained from trees of various kinds and sizes. Further investigations should be made of the costs of manufacturing many by-products, and of the conditions under which such operations are successful. The effect of unrestrained competition in timber exploitation upon our forest resources should receive serious study."

The portion of the report dealing with the conditions which prevent closer utilization is in effect a reply to the unjust popular opinion that the lumberman is responsible, either deliberately or otherwise, for the wastage of 50 per cent to 75

per cent of timber which he handles. It is pointed out that the conditions which make possible closer utilization in logging and manufacturing are: (1) Ready markets; (2) Cheap transportation; (3) Character of timber; (4) Efficient management; (5) Proper equipment. The last two are reforms which are usually within the power of the lumberman to correct, but the first three and many other conditions are due to influences entirely beyond his control.

This report should give the laymen and general public a much clearer conception of the difficulties in the way of complete, or even close, utilization of timber.

COMMITTEE 9

FOREST SCHOOL EDUCATION

Chairman, J. W. Toumey------Director, Yale Forest School, New Haven, Conn.
Walter Mulford-----Professor, Forestry Department, Cornell University, Ithaca, N. Y.
C. H. Shattuck------Professor of Forestry, University of Idaho, Moscow, Idaho.
George S. Long-----President, Washington Forest Fire Association, Tacoma, Wash.
W. B. Greeley------Assistant Forester, Forest Service, Washington, D. C.

TOPICS ASSIGNED

1. Forest school education; its strength and weakness.
2. Courses or methods of teaching needed to better fit men for practical work in lumbering.
3. Secondary forest school education.
4. Function of schools in technical investigations.

Within recent years the question of technical forestry education has been thoroughly discussed at conferences called for the purpose, hence the report of the sub-committee on the general subject is confined this year to the third topic: "Secondary Forest School Education."

The need for a body of trained rangers and woodsmen has been felt ever since forestry became a national necessity, and the report deals in considerable detail with the question of the school courses, and form of training best suited to prepare men for this class of work. The teaching of forestry in public schools, and short courses in forestry for farmers and agricultural students, are also discussed.

COMMITTEE 10.

FOREST INVESTIGATIONS

Chairman, Raphael Zon--------Forest Service, Washington, D. C.
F. B. Laney---------Geological Survey, Washington, D. C.
Walter Mulford-----Professor, Forestry Department, Cornell University, Ithaca, N. Y.
C. G. Bates---------United States Forest Service, Denver, Colo.
A. G. McAdie-------Director, District Weather Bureau, San Francisco, Calif.

TOPICS ASSIGNED

1. Subjects demanding investigation.
2. Responsibility for investigative work; correlation and avoiding duplication.

The report deals fully with the relation of forests and water, and while in part a compilation of established facts and theories, contains some new and interesting matter. The new feature concerns the effect of forests in broad continental valleys upon precipitation over continents. If this new theory is correct, as it seems to be, it provides even a greater justification for forest conservation than the accepted view of the relation of forests to stream flow. This theory has been discussed more specifically in an article entitled "The Relation of Forests in the Atlantic Plain to the Humidity of the Central States and Prairie Region," by the chairman, Mr. Raphael Zon, in *Science,* under date of July 18, 1913.

From the summary we learn that "the facts brought out in this report clearly show that there is an intimate relation between the forests, the climate, and the regularity of the flow of water in the streams.

"There are no accurate means of determining the extent of forest land necessary for the regulation of stream flow and the protection of the soil against erosion. *From the study of conditions, however, existing in other countries, it may be inferred that, in order not to disturb the natural balance, the proportion of forest land to other kinds of land must be not less than one-fifth of the total area of the country.*"

OPENING OF THE FORESTRY SECTION OF THE CONGRESS

THE opening session of the Forestry Section of the Fifth National Conservation Congress was held at the New Willard Hotel, Washington, D. C., on the morning of Monday, November 17, 1913, one day in advance of the Congress in order to give ample time for hearing and discussing the reports.

Mr. Henry S. Graves, chairman of the Forestry Committee, presided throughout the two days' sessions.

In opening the meeting, Mr. Graves said: "I think that any lengthy introductory remarks by me are unnecessary. You must all have understood the reason why we have organized a special section of forestry at this convention. I think that everyone who has attended the previous conservation congresses has felt that the time had arrived when we should have meetings which would enable the discussion, by men from different parts of the country, of specific, practical problems. In forestry, at least, we have gotten beyond the stage of discussion of whether it is desirable or not, and our great task now is to determine methods of getting forestry into practice and that is why we are here. We are here for business and we have a very full program. Therefore, I am going to push the meeting as hard as I can, and hold down discussion where it seems to be extending beyond the immediate subject in hand, because I think we have, if anything, more than we can do.

I want to say at the beginning that the reports of the different sub-committees have been published and will be ready for distribution. I believe that there are, altogether, twelve different reports. We have had a committee of some fifty odd men from different parts of the country working on these reports this summer and fall, and I think it is a pretty good record to have gotten reports from all of them through in time for publication for this meeting. These men have worked splendidly and have co-operated, not only with the different chairmen, but with the other members. Representing, as I do, the central committee, and also on behalf of the Conservation Congress itself, I want to say that we appreciate very warmly what these gentlemen have done. I want particularly to speak of the work done by Mr. E. T. Allen and Mr. E. A. Sterling, who have really borne the brunt of this big task of working up these reports and getting them ready for this congress.

We will begin, without further discussion by the chair, by calling on Mr. E. T. Allen to discuss the final subject of our meeting the question of publicity in the promotion of practical forestry."

Mr. Allen presented the following report:

PUBLICITY

By the Sub-Committee on Publicity.

Chairman, E. T. Allen, Portland, Ore.

T. B. Wyman, Munising, Mich.
F. W. Rane, Boston, Mass.
P. S. Ridsdale, Washington, D. C.
Overton W. Price, Washington, D. C.

Presented by Mr. E. T. Allen, Monday Morning, November 17, 1913.

PUBLIC education is the chief measure of progress in forestry. Perfection of methods applied in the woods is essential and a great deal of good is being done by those who know how and are willing to spend the money. But a minority is never fully successful. The certainty and speed of any accomplishment upon human action are measured by the extent of desire for this accomplishment and of knowledge how to achieve it.

If every citizen, in whatever capacity, fully realized all that is involved by the waste or preservation of forest resources; fully knew his own relation to it, and what conduct of his would best serve his welfare and the community's; fully understood the economics of forest industry and what governs the conduct of its members, and fully comprehended the power and responsibility of the commonwealth in protecting the interests of its constituents, there would be little need of forestry associations and congresses. The reason why publicity for most forestry topics is vital is that they are given proper consideration by a very inadequate proportion of those whose conduct is involved.

Government, State, and private forestry workers are accomplishing a great deal. Yet what one of us does not often have the baffling feeling that we are battering at a wall far too strong for our facilities, while this is at the same time the reason why our facilities are inadequate? We cannot hope to have the industries dependent upon the forest fostered and protected as they deserve until public and legislators regard them as they do agriculture, for example, and have equal understanding of their governing conditions and needs. They will not attain such understanding unaided, the aid is limited by their demand for it, and they will not demand it because they do not understand the need.

It looks like a deadlock, yet deadlocks can usually be broken. If lumbermen and foresters would realize the need to devote as much study to the technique of public education in forestry as to the technique of forestry practice, the deadlock would break. And the movement would gain in geometrical ratio as knowledge of forest economics creates a thirst for more knowledge.

This is not conjecture. It has been proved. Progress differs locally almost exactly with the degree in which propaganda has been skilful. And skill has been proven to lie largely in the realization by propagandists that forestry is business, not merely an abstract problem of public or private conscience, and in their consequent application of business advertising principles. There are two methods of attack. The old way works about as follows: "You are partly responsible for lack of forest protection. Forest destruction is bad for the country. Badness is wicked. Therefore you are wicked. You need a sermon

and we'll preach it." The new way works more like this: "Do you want to make more money as well as do your duty? Then stop the other fellow from destroying dollars you would otherwise share. We have a bargain-price insurance policy that you can't afford to be without. Look over our prospectus and invest."

Now forest preservation *is* insurance and insurance is good business. We are offering the public a commodity that must be paid for in money and careful conduct, and we must convince the public that it is worth the price. We must arrest attention, which is being sought by plenty of competitors. We must hold interest when we get it and make good with our argument. All of this involves a knowledge of exactly the same elements of human nature, of the same principles of psychological appeal, that must be the foundation of every successful contest against the inertia of humanity, from the wiles of the side-show barker to the trained persuasiveness of the insurance agent and the publicity devices of the modern advertising genius. We may reach the thoughtful minority by calm logic or appeal to public spirit, but it is the thoughtless majority that we are really after. What we say to these must be not only what "he who runs *may* read," but what he *will* read, *will* remember, and *will* act upon.

The average man does not want mere logic. But if you *can* stop him a moment, and photograph an idea upon his mind in spite of him, you not only have the idea there where he cannot get away from it, but he is favorably disposed toward the idea itself. For in his mind is also a feeling that it was probably his idea all the time, else he couldn't have responded so quickly—a feeling you don't get when you have to hold a man a prisoner in a corner until you force him to admit rather unwillingly the correctness of your argument.

This is not a plea against dignified, scholarly appeal to reason, nor against appeal to high motives of citizenship and responsibility. It is merely the plea that to get a large proportion of our population interested in forest affairs we should adopt methods that experience has proved most effectual in getting its interest in anything else. It is to modern business and political campaigning that we must look for the last word in the psychology of appeal to human ignorance and indifference. Apply the methods that experts in these lines employ, improving them if you can, and you are probably putting the hardest possible punch behind forest propaganda.

Then if our first premise is true—that public interest and understanding are essential to satisfactory forestry progress—it follows that technical training and ability in publicity is a necessary part of the equipment of forest workers. What does it avail you to devise a perfect forest law if you have not the knowledge of legislative manipulation to get it passed? Are even perfect fire-fighting organization and methods as valuable as reducing the number of fires to find and fight? Why learn how to manage forests properly unless you can convince owner and public that it pays? Why be a public forest official when you cannot tease enough funds out of the community to do satisfactory work? Why take four years out of a boy's life to fit him for a forestry job and teach nothing to help him create a demand for his services? Why devote a forestry convention to

discussion of needed laws and practice and go home with no more knowledge of how to make your community let you apply them?

Nothing more clearly indicates the neglect of this subject by American foresters than the difficulty met by this subcommittee in finding material for compilation in its report. Hardly any writers have discussed it in a comprehensive way. Publicity devices are borrowed and changed more or less, but few men are giving them much original thought. Forest legislation is notoriously retarded by lack of skilful, well-financed campaigning. So-called press bulletin work is growing in popularity with forestry organizations, public and private, but is often defeating its own strength by failure to present real news in newspaper form. Cartooning, the greatest modern educative medium, is employed the least. The purpose of this report, however, is not to discuss past failures or past achievements, but to outline the main directions in which forestry publicity should be developed.

PUBLICITY AT MEETINGS OF POPULAR AND TECHNICAL ORGANIZATIONS

THIS topic embraces forestry meetings of all kinds and also other meetings where forestry is touched upon to some degree but over the arrangements of which forest workers do not have control. We have little excuse if the former are not successful educative mediums. With the latter we must do the best we can.

The publicity value of a forestry meeting is affected by its earliest preliminary arrangements. If there is choice of meeting place, it should be with a view not only of attendance but also of local advertising values. A town with economic connection with the subject, or with historical or other attractions, is better than one with no point to exploit. Other things being equal, local press facilities are important. A town too small to have its own press notices recognized elsewhere, or so large that it minimizes the importance of its own happenings, is not as likely to help as one that will seek to make the meeting advertise it. It is often unwise to select a place where another and more locally or generally important convention is to be held simultaneously. Your meeting is overshadowed by the other.

Another early factor is the program. There is not much publicity in the mere announcement that there is to be a meeting. There must be a basis for continued interest. This requires organization well in advance down to the last detail. Choose several live, interesting topics, advertise good speakers, intimate the probability of newsy facts or controversies—all this early and often. If possible announce innovation in subject, treatment, or organization. Bear in mind always that publicity cannot be given to plans that do not exist. Merely to invite people to come together and meet rarely accomplishes a successful constructive convention. It never accomplishes a well-advertised one. Finally, having made the program practical and constructive in scope, be sure it is not overloaded. In this you are looking ahead to publicity at meeting time, which is always fostered by discussion and controversy. With the time completely filled by set papers, you cannot stage any fireworks.

With place and plan carefully determined in ample time, certainly months before the meeting, the campaign should have two objects—to get out attendance, and to give the meeting public prominence which will advertise forestry in general and give weight to the meeting in particular. In some ways both objects can be served at once, in others they cannot be.

There should be a mailing list of all the real workers in forest affairs whose presence is especially desired, to receive continued forecasts of the meeting that will stimulate their interest. These forecasts, seldom of more than 200 to 400 words, should appear to be announcing decisions and developments as soon as arrived at. In this way they can also serve for press use. One may announce meeting place, another the program, another request advice from the recipient as to some phase of the meeting, another mention possibilities of dangerous conclusions if the faithful are not on hand, another the character and amount of interest being taken in the meeting, etc. The views or preliminary reports of speakers and committees should be collected and used both to excite the interest of delegates and for newsy material for the press. When considering the former in all this, try to bring out two things: that the meeting will supply just what they want to get out of the time and expense devoted to such a trip, and that if they stay away something distasteful to them may be done.

Such of this material as is suitable should go to all lumbering, farming, mining and engineering trade journals. The first sent should be accompanied by a letter inviting them to take part in the meeting and to send representatives. By asking them to signify their interest by reply, so you can make arrangements to supply them with copies of addresses, etc., enlist their friendship and make their notices more than perfunctory. Supply them with something frequently, to give their readers the impression that the meeting and its topics are important enough to make such journals keep in touch with progress.

If the meeting is a fairly important one, its executive officials should early get in touch also with United and Associated Press representatives in their home towns and explain that from time to time there will be news worth telegraphing. Get an understanding on this, then follow it up. The value of anything to these agencies is in its newness. "It has been decided today" or "a report received today" is what they want. Remember that some minor thing delivered to a man before anyone else has it may carry reference to your project over the wires when to wait until it has been discussed by other officials or some committee will spoil it. Such use of interesting developments of the approaching meeting, or of affairs to be discussed thereat, offer the very best means of getting publicity through very short telegraphic items. Everyone connected with the meeting should send in ideas for this. Each should be handled singly. Newspapers will know that many such points do not develop simultaneously and be suspicious, if they are bunched, that some are not new. In the preparation of material for the press, remember that nothing will more effectually discourage its use by correspondents than the attempt to make it a medium for laudatory mention of individuals. Newspaper men have a highly developed dislike for "boost" stuff.

In the meantime have similar arrangements with daily and association press

representatives in the convention town to turn loose through them everything that will *not* suffer by the delay required to do this instead of releasing it in the officials' home towns. Their interest in advertising their own city will make such press representatives use stuff that others may neglect. Follow the same tactics with chamber of commerce, commercial club, or any like mediums in the convention city.

In this connection, get the widest railway excursion rates to the meeting; do this early, and get the railroads as well as the mediums mentioned to help give them publicity. Show up interesting features aside from the meeting and get people to planning the trip.

In one of the communications sent the list of desired delegates, suggest that they get some local press mention of the meeting, based, perhaps, on their proposed attendance.

Several months before the meeting arrange for clipping bureau service informing you of all approaching meetings of people at all likely to be interested in forestry or lumbering. There are also published lists of convention dates, issued monthly, which are valuable in this connection. Send to each such meeting, to be read by its secretary, a message of greeting with invitation to your own and a forecast thereof.

When the meeting approaches tell newspaper men you will see to it that the real news is sifted out of everything for them. We often hear complaint of the press reports of semi-technical conventions. The reason is usually that reporters cannot recognize the news in topics foreign to them. Someone should be assigned to this and keep it written up to the hour, in form that permits using as much or little as is wanted without destroying its force. Resolutions, papers and synopses should be mimeographed in ample numbers and photographs of speakers obtained and provided. Desirable trade journals not represented should not be neglected, but provided with sets of everything with a brief running account. This thoughtfulness may win their interest after all. You can often stimulate the publication of forestry material, particularly in Sunday papers, by giving out good photographs illustrating the particular topic, along with information concerning it. In selecting photographs, remember that those which show action appeal particularly to newspaper men, as for example, men fighting fire, building trails or telephone lines, lumbering, tree planting, and the like.

The above outline does not include every device that will suggest itself to a fertile meeting promoter, but indicates the systematic manner in which such affairs must be handled to get the best results. Publicity is not automatic. It must be fostered assiduously.

Meetings Other Than Forestry.

There are meetings on scores of subjects other than forestry which afford unusually good opportunity, because the people who do not understand forest problems are just the ones who should be reached. While we cannot lay down a program for these, we should use every chance they afford. Conventions, congresses, chautauquas, granges, association and club meetings, unless of the

most narrowly technical kind, usually have an opening for the introduction of some phase of forestry in some degree. If neither forestry nor conservation along general lines, it may be in connection with lumbering, fire prevention, taxation, or some even more remotely associated question. The W. C. T. U. was once induced to consider fire prevention, and to work for the detail of United States troops for this purpose, by being shown it would remove the boys from the temptation of army posts.

Among the most obviously needed activities in this field of opportunities are:

1. Systematically learning in advance the nature and date of all public gatherings in the territory involved.
2. Establishing relations with their governing authorities.
3. Having place made for forest topics on the program if possible.
4. Providing speakers or furnishing material for their own speakers.
5. Preparing resolutions to be presented.
6. Arranging for attendance, with credentials, if necessary, by some one who will look out for forest interests in discussion, on resolutions committee, and with the press.

There is not much to be added to these suggestions except that in negotiating for place in the program of a mixed meeting, where forestry talks are to be popular rather than technical, it usually is best to have them come just after or better still just before those by prominent speakers on other subjects, so as to obtain a large audience. If forestry appears more than once, better spread it through different sessions, in the same way and for the same reason, than to have a strictly forestry session which permits outsiders to escape and reaches only those already in sympathy.

PUBLICITY OF THE FORESTRY WORK OF THE CONSERVATION CONGRESS

A PRELIMINARY report, covering suggested organization and advertising of both sectional and general forestry programs, was submitted last spring. Some of the suggestions concerning forestry meetings, discussed in the foregoing pages, were applied particularly to this convention.

In addition it suggested that the entire congress be modeled somewhat after the annual conventions of the National Education Association, which has but one general session a day in which all factions participate. Each branch holds two sessions a day, in halls or hotel assembly rooms scattered about the city, treating its own topic exclusively and as technically as possible. All join at the daily general session, in some large auditorium, to hear men of national prominence on subjects of common interest to all, and also, for the broadening of outlook, to hear each others' topics presented in a comprehensive, popular way designed for unfamiliar hearers rather than for those who deal with the same topics in their own section meetings.

Such a plan might tend to make the congress less of a medium for inspiring laymen who attend out of general interest only, but would be far more appealing to the actual workers in every branch of conservation who in the past have had the minimum of opportunity to deliberate with fellow workers in different States.

Could it become publicly established as such, it would afford every advantage of the ordinary technical convention, with the addition of cheaper fares, opportunity to come in contact with other lines of work, and tremendously greater publicity and influence. Nor is it by any means certain that it would appeal less to the public, for most laymen have some favorite subject, and, gravitating to the section attracting them, would get more out of it than at a promiscuous convention.

Obviously the other branches as well as forestry would have to adapt themselves to this plan. It could hardly be established for this congress, but its possible adoption hereafter should be given consideration.

There remains to be discussed the subsequent publicity to be given the forestry proceedings of this congress. Since all committees go out with this meeting, to be superseded by those appointed by the incoming president, we can do no more than recommend. It is our belief, however, that they are worthy of more space and circulation than can be afforded by the usual publication of the proceedings of the congress as a whole, and that steps should be taken before this meeting adjourns to provide for separate publication in ample numbers to permit comprehensive distribution.

PUBLICITY THROUGH THE PRESS

THIS topic, as assigned to the subcommittee for report, concerns "Particularly the arousing of public interest in fire protection, taxation, and State forestry." As a matter of fact, all forest problems are so related, and the improvement of public sentiment toward any is so much a matter of education in forest economics, that discussion must be of the principles of general forest campaigning in the public prints.

Probably all foresters and lumbermen appreciate fully the power of this medium. Its aid is widely sought. Its counter-influence, through attacks due to misunderstanding, is correspondingly deplored. Nevertheless, forest industry has not developed anything like the systematic and skilful use of newspaper and magazine publicity that is employed so successfully by other industries. The ingenuity of theatrical, railroad, political and individual press agencies is proverbial. Activities of this kind are now regarded as a business necessity. They are needed and legitimate nowhere more than in forest propaganda, which has nothing to conceal but everything to teach and all for the public good.

To get the maximum co-operation of the press in the work we are doing requires equally intelligent co-operation on our part. The conduct of newspapers and magazines is a highly organized business with its own rules and necessities. It is reasonable to suppose they are founded on experience and that failure to comply with them is bad business, which in this instance means smaller circulation and consequently less value as a publicity medium. Then is it not profitable for us, as well as only fair to the press, to approach this work with the fullest possible undertsanding of the technique of the newspaper business as well as of our own which we seek to exploit? It is unreasonable for forester or lumberman to complain when the newspapers take a wrong viewpoint through

ignorance of forestry or lumbering while he makes no greater effort to present his side with an intelligent insight into the exigencies of publishing.

If, as we contend, forest affairs are of vital importance to the public, press and public *want* the facts. Everybody wants to know about things that affect him. If the public and the press do not demand any essential or interesting information we have to impart, it is because we do not know how to present it in the form that publishing experience has proved necessary. And that is all there is to it. If we sincerely believe the spreading of this information is desirable, it is our duty to learn how to adapt it to established mediums.

A newspaper wants news. This means something not previously known to its readers. It wants it while it *is* news, which means that it has not been printed elsewhere, even for other readers, and also that it has not lain long unprinted. These are the essential principles for the layman to grasp. He must not forget that even unpublished information loses value with every hour it is delayed, because this convicts the paper of the newspaper crime of sluggishness in news-gathering. But it is even more unforgivable to take advantage of an editor's unfamiliarity with the subject to foist onto him, as news, something that has been printed already.

A newspaper will also use some things that are not news if they are interesting. But it wants to know this and handle them accordingly. Moreover, things that are news differ in value with the universality of their interest. A discovered fact of high importance, but only technically, is worth less than one of smaller importance in which everyone is interested. Finally, incomplete information that is news is more valuable, as a rule, than the same information delayed for completion or verification which does not carry any essential difference of idea.

Perhaps the foregoing remarks seem trite, but the publicity efforts of foresters and lumbermen often show slack compliance with the principles outlined. The first study should be the classification and valuing of your information from a newspaper standpoint.

With such a classification, we are equipped to approach the next problem—presentation. Effective publicity work usually requires systematic furnishing of written material. This must comply with newspaper practice. Any good textbook on newspaper writing will be far more useful than such brief discussion as is practicable here. But correct practice must be followed. If the story can be sent out as sharp timely news, under a date-line, it should be written like telegraphic reports and not spoiled with "editorial" interpolations. If it cannot possibly be made news, do not betray intent to deceive by writing it as such, but put it in interview, report, or column-filler form. And write everything so the essentials are presented in the first few lines or paragraphs, so excess length can be dropped to suit the editor without spoiling what remains or requiring rewriting.

Now, as to what should be given publicity, what can be given it most easily, and the systematizing of distribution. Since these points fall into group relations between subjects and mediums, they can hardly be discussed separately.

Perhaps the best way is to consider the foregoing pages as a sort of introductory preface and continue the report in the form of a suggested outline for a general publicity campaign.

Office Organization.

Arrange mailing list so material reaches proper hands. Address editors of small papers and trade journals personally; with city papers, address news editor. Seal and use letter postage. Mimeograph material, rather than print, since it looks fresher. Use date-line and show corresponding release date to assure editors material is not used by others earlier. The supplying of heads is amateurish. Every paper has its own head rules.

For bulletins that must be up to date, like fire news, arrange with correspondents throughout territory and send them identical guiding question-lists, to be filled out and returned by all *on the same date.* This gives consistent news. Have them also suggest matters that should be given publicity, in this way keeping in touch with current field needs in this respect. In other words, organize and direct sources of information.

State Press.

Base bulletins chiefly on needs of the country weekly, which is more powerful collectively than the daily because more carefully read. Since you cannot establish personal relations with these, much depends upon impression carried by copy. Make point of uniformity in make-up, so copy will be recognized immediately as giving an actual news service unobtainable elsewhere. Fire news, during season, is probably the best opening for this. Actually collect and compile definite information as to numbers, damage and causes of fires, preventive work in progress, and arrests and convictions. Send out *immediately* it is received, under date-line, to be used as telegraphic news. Work in precautionary advice, as reports from field on urgently needed conduct.

With reputation for being an accurate, practical news bureau thus established, gradually work up the use of similar bulletins which are succinct, pithy news reports of happenings and statistics of timber, lumber and forestry business in the State. Slowly this true news service can be made to carry implied needs of forest industry, its value to the community at large, and, lastly, interviews with prominent men on issues involved. If practicable, classify papers and specialize the bulletins. Where forest industry predominates give brightest and strongest features of news affecting this industry, also gossip lumber and timber workmen will appreciate. For agricultural districts, try to show relations to farmer, orchardist or stockman, and for mining districts its relation to the mining industry. Weeklies will use material adapted to their constituents if it is strictly up-to-date and newsy. Facts and figures can thus be dinned continuously until they become truisms in every home.

Daily Press.

Perhaps send some material prepared for weeklies, but also work up local bearing, studying trend of sentiment in each and combating where necessary.

Go in strong for local commercial aspects and figures of forest industry. See that every meeting, report, or visit of outsiders, in any way connected with forest industry, is reported as local news and carries desired points. Educate lumbermen and foresters to collect and supply such information. Above all, try to have some one man on each paper handle this material, thus educating him to do so properly. Show him the value of this as stock in trade for him. If possible, get one or more prominent dailies to run a forest and lumber column, just as many do a shipping column, pointing out how this will insure circulation in lumber districts and aiding them to push such circulation.

Collect photographs to carry frequent feature articles in the magazine sections of the dailies.

Trade Papers.

Classify lumber, agricultural, and other technical trade papers and furnish with specially adapted regular news letters. Regularity is important to impress with importance. Make them newsy enough to get space, yet always weave in the importance of forest industry. It is well to cultivate distant trade journals, as well as those in the region involved, so as to use in local argument their interest and endorsement of work in hand.

Patent Publications.

Opinions differ as to the value of these, some authorities believing that the compliment of special communication to country editors, and the printing on the live news side of the sheet, outweighs the certainty of "patent insides" or "boiler plate." But they are certainly useful as auxiliary, and sometimes to carry cartoons. Their co-operation requires full understanding with the publisher as to space, policy, and interests of his patrons.

Magazines.

Get as many articles as possible about timber, lumber, fire prevention and forestry printed in the magazines. Even better than acceptance of your own is to furnish the material to well-known staff writers whose statements are considered unbiased. There is a wealth of material in the hands of forest workers that would be welcomed by such writers. Whenever successful in getting such a "flash," send marked copy to every local paper of any importance suggesting quotation and citing it as convincing evidence of the importance of the subject.

Interviews.

Keep in touch with prominent workers in forestry and lumbering, whose statements are considered technically reliable and worth space, and urge them to prepare or lend their name to interviews on suggested topics. Do the same with well-known authorities *not* in the industry and consequently considered unbiased. Use these frequently, also keep several in reserve to be available when needed in any particular crisis.

Clubs, Societies and Meetings.

Reference to these has been made under another heading. It may be recalled here that many such of no particular value through reaching the audience assembled may afford opportunity of getting press publicity for statements or resolutions endorsing work in hand, and this almost as often to show approval by uninterested and unbiased elements as to show that by allied elements.

Criminal Trials.

Every prosecution of violators of forest law, especially when conviction results, affords opportunity for press work to deter similar offence. Its importance should be emphasized, news value being augmented by skilful reference to some peculiarity of circumstance, and if possible the judge should be induced to comment in a way adapted to quotation.

Seried Articles.

Have some forest official or prominent professor of forestry or kindred subject, write a series of simple lucid articles for popular education and instruction. Get a strong farmer's publication, or syndicate house supplying the country press, to advertise and feature these as its achievement to serve its patrons. Such a series could well take up the study of useful trees and their qualities, planting and culture of woodlots, prices and transportation of lumber, the factors governing growth, protection and manufacture of lumber, etc., and constantly work in the principles which it is most desirable to inculcate generally, locally, or in view of timely need.

The Underlying Tone.

In all the efforts suggested above the aim should be not only to indicate reform methods, as for example precaution with fire by the public or legislation by the State, but even more to show the *need* of reform. There is no better way to do this than to hammer continually on the importance of *forest industry,* moreover, it affords a mine of interesting matter and an appeal to local pride that is good newspaper stuff. The timber cut, the men employed, the pay-roll distributed, the dependent industries supported, the taxes paid, the part played in stimulating railroad extension and general development—in short, all the community benefits of the greatest manufacturing industry in the United States—can and should be exploited until every citizen regards its fair treatment, fostering and perpetuation as desirable, as a matter of course, as that of the most valuable industry in his home town. The only reason he does not so regard it now is that he is not equally familiar with its facts and figures. At every opportunity the commercial importance of forest industry, as well the losses by its destruction and means of their prevention, should be presented in *telling parallels with other industries that are better understood and appreciated.*

Cartoons and Editorials.

While we can hardly systematize any way to obtain help through editorials and cartoons, such help is often generously given if asked. It may be of tremendous value. During campaigns for forest laws it exerts great influence upon legislators. Most dailies readily recognize the topical appropriateness of forest fire cartoons during unusually dangerous weather, and there is probably no instrument so effective in promoting public precaution. Often their own artists will make them, but few will be offended by the offer of sketch ideas or even finished drawings.

PUBLICITY METHODS AND DEVICES OTHER THAN THE PRESS.

THE simplest introduction of this topic is to say that the promotion of forest business can utilize to advantage practically all the devices used to promote any other business. Excepting the dishonest and prejudicially vulgar, there is hardly an idea successfully applied to modern advertising and sentiment-moulding that cannot be adapted, with suitable modification, to arresting and directing the public mind in favor of forest conservation. The problem is to select from these, or develop new ones, so as to get maximum results from the money and effort available.

This involves both ingenuity and considerable knowledge of mechanical technique. The forest propagandist should either employ experts or devote considerable study to an art usually quite foreign to his training. As a rule, unfortunately, he has done neither, and what effort he has made has been in borrowing ideas from the very few who have given the subject study or in using his original ideas very imperfectly.

Probably the commonest attempts are along the line of posters, circulars and like special publications. A collection of these issued throughout the United States will show general weakness in two directions. One is a tendency to borrow instead of to originate. The other, and more inexcusable, is the spoiling of good ideas by neglect of the first laws of presentation. Only recently has it been realized that the personal welfare and pride of the reader, rather than ultimate good to the community, is the strongest line of attack. Brevity, clearness, and the compulsion of direct personal appeal instead of the impersonal statement of fact, are still much neglected. But the greatest ignorance is shown concerning the mechanical make-up of the finished product. The vigor of color schemes, the carrying power of different sizes and styles of type, the weight of contrasting backgrounds and borders, the balancing of type and picture designs, the mailing weight and durability of paper stocks—all these and many other points have been reduced almost to laws by expert advertisers outside of forestry, but forest propagandists seem hardly to know there are such laws.

Confinement to the commonplace printed mediums mentioned, with all originality devoted to giving them new dress, is another evidence of our lack of publicity sense. Wholly new inventions are as useful here as in advertising town lots or merchants' wares. And the most successful publicity agent of all is the one who, besides creating opportunities, keeps the most watchful outlook to turn

those created by others to his own advantage. One of our famous ex-presidents, whose remarks get the front page of every paper, on a western trip, decided to make his first talk in a certain State at a small town reached soon after passing its border. Obviously the speech would go over the wires nearly verbatim. The manager of this State's forest fire association, shrewdly guessing that the great man would welcome suggestions for localizing his talk and showing familiarity with conditions, wired him enroute to speak of local timber wealth and dwell upon forest fires and their suppression. He did so, and at no cost but for the telegram the most effective publicity punch in the United States was concentrated and localized for forest protection in that State. It reached every newspaper reader in it within a few hours and was available for quotation indefinitely. This was sheer publicity genius, but everyone of us has many such opportunities.

It follows that effort should be to do new things, rather than copy old ones, but some suggestions may lie in an outline of plans already tried or proposed.

Posters and Warnings.

The best examples omit laws, penalties and long arguments. Terse epigrammatic appeals and striking statements appear in large type and bright colors, readable at considerable distance. Cartoons and symbolism are increasingly employed. Series of different posters, each devoted to a single idea, are often effective on long roads or trails. Present tendency is away from cloth or metal posters, once preferred for durability, and toward a jute tag-board or fibre which takes coloring work well. 150-lb. stock (24x36) is about right. Thinner paper is weak, thicker is expensive to mail and breaks when folded. Most experts agree that complete change of design each season is better than durability.

The warning poster is rapidly advancing from general woods use to special fields, such as reminding smokers in railroad trains not to throw burning material from car windows, and around logging camps to convey fire rules endorsed by proprietors. If prepared and distributed by forest protective agencies, such special warnings will be signed and posted by many business institutions.

Circulars.

Effectiveness in circular "literature" depends, even more than upon good writing, upon attractive make-up and skilful distrubution. Unless you reach people not already converted, and get past their indifference bred of over-circularizing by countless advertising agencies, the expense is wasted. Either there should be different series to present special appeals to different vocations and localities, or all material should be carefully prepared with this in mind. It is easy to prejudice one class by what is strongest with another toward which it feels antagonism if, as is most effective, your argument to the latter is on a personal business basis rather than upon patriotic generalities.

Preparation of mailing lists wholly outside our own sympathizers, which is where material should go, involves great care to have names correctly spelled and addresses up to date. Those in position to aid as sub-distributors, like county and town officials, teachers, ministers, lumbermen, and business houses, should

be supplied by a carefully worked-out system to use material to advantage and without waste. Hotels, game license officials' desks, sporting goods counters, trade organization secretaries, and county officials' correspondence are excellent mediums. Rangers and fire wardens should receive suggestions to develop local methods. The ranger who sees that every picnic or Fourth of July ground is posted with warnings, drops circulars in every free delivery box, and keeps clean copies of fire laws and circulars suspended by a string near the delivery window of his postoffice, soon gets to inventing other such plans.

The circular itself should be bright, novel, and, above all, distinctive. It should look different and interesting at first glance, unread. Put yourself in the recipient's place. You are repelled by cheap advertising, but respect anything with a little better paper, neater type, cleverer color scheme, and compelling pictures than you are accustomed to receiving. If money is an object, make a smaller issue and work harder to put it in the right hands. It will get you more money next time.

Put most thought on your cover. Make people pick the thing up and look at it. Then break up your text so it wont look discouraging. Lead the reader on with contrasting colors and type, bold-face, under-lines, pictures—anything to make him see something different just ahead of him.

Be brief. Be concise. Make argument direct, personal, positive. Back it with facts. State them in terms of comparison. What layman cares how many feet of timber we have or burn up? Show it in houses, train-loads or miles of board-walk. Put it in taxes, in pay-rolls, in wheat. And remember that every story tellable in a cartoon or diagram is ten times better so told than in text. It punches harder; takes less paper. Study the cartoon magazines and the graphic and chart methods of health and civic welfare propagandists.

Gummed Stickers.

This is the cheapest kind of direct publication that approaches permanency. Besides for use on stationery, it is suitable for walls, posts, signs and like objects seen by many people. Its two principles of effectiveness are brilliant color scheme and boldness of design. Close text or detailed picture od not get attention. There should be a phrase or symbol that is comprehended with no effort whatever. Closer material may be combined with this, however, if not detractingly.

Devices For Children.

Schools, Boy Scout and Campfire Girl organizations, etc., are highly important channels. Children are soon citizens. They also carry their new ideas home to their parents. Educational authorities are among our most willing co-operators.

Shortly before the close of the spring term but early enough to catch the short-term country schools, a new device for every season should be put in the hands of every public school pupil, with the aid of the school authorities. This project has been highly developed by the Pacific northwest fire associations, which supply every teacher with a number based on the average daily attendance rec-

ords, accompanied by instructions from the State superintendent. Printing in such large quantities insures a comparatively cheap rate, but the complicated distribution requires early and careful systematizing.

Such material must in no way offend parents or teachers, must teach its lesson emphatically, and interest children of all ages. Among successful devices have been a catechism of questions and answers, a fiction story taking an individualized tree through a life of adventures, and a paper cup pattern whose successive folds develop text and pictures showing the growth of a forest fire.

In most States Arbor Day ceremonies are suggested by a bulletin from the superintendent of instruction. This may be made to include much regarding forests and lumbering, with a drill for the pupils in precaution with fire.

Larger pupils, particulary in high schools, will learn and disseminate much information in preparing essays on forest topics for money prizes. No great investment is required to keep schools and homes buzzing with these topics for a considerable period each year.

Public Folders and Directories.

Railroads, telephone companies, summer resorts, and other enterprises that do much printing for public reference, can often be induced to give short fire matter conspicuous place. They thus bear all cost of a wide distribution. Railroad time-folders and telephone directories are especially useful. Occasionally manufacturers, as of logging machinery, for example, are glad to insert interesting forest information to insure retention for reference.

Moving Pictures.

Astounding statistics are given concerning the attendance at moving picture houses. They are now in the smallest towns. Already several excellent films are on circuit showing the inception, growth and results of forest fires, but the possibilities are almost limitless. And in addition to the pictures there should be inserts giving facts about forest industry, the fire evil, etc., from a local viewpoint. During the dry season, even if no fire pictures are on, slides of this nature can be included, at a price, with the advertisements shown on the screen between reels.

Miscellaneous Devices.

There is no limit but that if ingenuity and expense to the ways common conveniences can be made to carry forest information. Rangers for the Pacific coast patrol associations distribute to campers and settlers met on their beats hundreds of gross of boxes of safety matches bearing labels that remind the user to be careful with matches, tobacco and camp fires. Cheap whetstones or any other pocket article useful in the woods can be utilized in the same way. Perhaps, were all city and underwriters' agencies to co-operate with all forest agencies, match and tobacco manufacturers might be induced to have a word on fire danger in or on all their retail packages.

Cards bearing game laws on one side and forest material on the other; special cards for garage and livery patrons, giving road information; road maps or

country maps bearing corner inserts arranged for with the publishers—these are old ideas capable of indefinite extension. Guide-boards, fence signs advertising local stores, calendars, etc., can carry a line at small or no cost.

Stationery and checks have both been used to popularize epigrammatic mottoes like "Timber makes pay checks; burned timber pays no wages," or "You get this money because Oregon has timber," until they become unforgettable. Nor are these confined to stationery and checks. A few hundred rubber stamps, with accompanying ink pads, in the pockets of industrious friends throughout the State, will improve an astonishing number of objects, fixed and portable, before they wear out.

Fairs and exhibitions of all kinds afford space for models, cards, charts and pictures. Holiday and festival processions admitting business floats will certainly welcome one exploiting forest industry and protection. Fairs may also be made to impress the public with the essential part of forest industry in community life by getting up contests similar to the well-known plowing contests or the rock-drilling contests familiar in mining regions. Log-rolling, chopping and sawing, loading and unloading, etc., are spectacular and would also add to the effect upon those unfamiliar with the industry by collecting the lumber workers in a way to illustrate their numbers.

Speaking and Writing.

Aside from the newspaper and magazine work discussed elsewhere, the information for which all private and official forest agencies are repositories should be made available for the many people who can use it publicly. Their numbers, their geographical distribution, and their influence make such people far more effective distributors than the original collecting agency. Consequently the latter should make a point of cultivating such distribution and of getting a reputation for willingness to provide anything, from notes to a written speech, without any retention of credit. Club speakers and committee chairmen, boards and commissions, and public men and women generally are not averse to showing broadness and technical familiarity through our help if assured that we will protect them thoroughly.

Public speaking ourselves is effective largely in the measure that we realize how to add to what we actually say to the actual audience. The fact that we are on any program is a recognition of the importance of our business and our topic that should be made to impress those who do not recognize this importance. So what we say, and the fact that we said it, should be given the utmost publicity. It is well to prepare our own synopses for newspapers, bringing these things so as to count the most in fewest words, and to keep close watch on any publication of proceedings by the meeting itself. Very often, if the space accorded us is limited, it is preferable to use practically nothing of our real talk, but to make our appearance on the program carry something we believe more effective upon the ultimate reader.

CONCLUSIONS

IT is obviously impossible to make this report a complete text book. Its aim has been to present a few suggestive examples leading logically to certain conclusions. Summarized, these are:

Progress in forestry depends more on what the public will permit than upon foresters and lumbermen.

Consequently public education is of primary importance.

Education is a matter of publicity and publicity is a trade in itself. It can not be practised intuitively.

Since no one else has the interest or the requisite forestry knowledge, foresters and lumbermen must learn this trade.

It is not forests, but the use of forests, that we seek to pertetuate. Therefore, to be sound and convincing, educational publicity must include the lumber business. So long as the public believes forestry good and lumbering bad there will be confusion and no real progress.

DISCUSSION OF THE REPORT OF THE COMMITTEE ON PUBLICITY

IN opening the discussion on this report, Mr. E. T. Allen said:

The moral of this whole report is, that the forester and the lumberman knows very little about publicity; he is an amateur at it, he does not study it, and does not get results, and is generally about the poorest propagandist publicity artist of any industry in the United States. What the committee has attempted to do in its report is rather to get up a brief, concise worded manual of suggestions for the lumberman, or forester, or the worker along any of these lines, who wants to get his business and his needs before the public and does not know how. Of course, such a manual containing detailed suggestions we cannot read as it is too long.

I would like to say that personally, and I think this committee believes also, that this Conservation Congress will do a great deal more if it is built up of sections of this kind. Let there be a dozen of them, including water power people, welfare people, and others working in the same town, and not in one great big general inspiration meeting, because we are afraid that will die, but do think that a series of such meetings as I have outlined could be kept running perpetually and the results would be of a great deal of benefit.

It is not forests, but the use of forests, that we seek to perpetuate. Therefore, to be sound and convincing, educational publicity must include the lumber business. So long as the public believes forestry good and lumbering bad there will be confusion and no real progress.

I firmly believe from the work that we have done on the coast, and that we have watched elsewhere, that you can absolutely measure the progress of forestry, and forestry protection in any community, not by the skilled foresters, and not by what they learn at the forest schools, but by their ability to do the same kind of advertising they use in life insurance, soap, or anything else. In other words, we have a sort of commodity to put before the public, you might call it prosperity insurance, if you will, and one way we can get that over is to put it before them in business like and convincing language, to use all the art of the side show barker, the real estate agent and the newspaper man. It is forestry, and it is just as dignified as anything else we do. You will find in the regions where that sort of thing is studied and applied intelligently, that it is where you get appropriations to fight fires, that it is where you get lumbermen to work for you, that it is where

the thing slides along smoothly. It is a subject we do not touch in the forestry school, but it is a thing the forester and the lumberman has to learn, or he will not be successful.

The Chairman—With regard to the promotion of forestry, I have frequently referred to the influence of one man, the possible effect of the work of one man, in the case of Doctor J. T. Rothrock, of Pennsylvania. The work that Doctor Rothrock has done is wonderful, and we have a great deal to give him credit for in our expansion of forestry afterwards as a result of the work he did in the early days and since then in Pennsylvania. We would be glad to hear of the way different men have accomplished things. Doctor Rothrock is here and he has accomplished probably more than any other man in his locality, and I would like to call on him.

Doctor J. T. Rothrock, of Pennsylvania: I think the one thing in this very interesting report that appeals most strongly to me is the possible use that we can make of the moving picture fad. The moving picture has immense possibilities for good as well as for bad. In 1893, I went before the Pennsylvania Legislature with an illustrated lecture, having traveled over the State for two years with a buckboard and a camera for the purpose of obtaining information that I could put in picture form. After the lecture was over, a gentleman, who had been prominent in the opposition, came to me and said, "You may as well go home, young man, you are of no further use here. The legislature cannot kill the bill that you have been asking for the appointment of a forest commission. You have won fifty votes on the floor of the House of Representatives today by that illustration."

Now, if we could accomplish such work as that when forestry was simply a fad, a lunacy, if you feel inclined to so call it, there is an immense amount of good which can be accomplished by the moving pictures today. Today, forestry is started and I believe if we were to take up this question of going over the State, our own States, with the illustrations that we can derive from every State, attending agricultural meetings, etc., and giving illustrations as to what the actual condition is, a vast deal of good could be accomplished.

Mr. Leonard Bronson, of Illinois: We have been trying to teach the lumbermen, and I do think we have made headway in that respect.

The lumber paper has not had much of a chance to go into publicity, but it has been able to go to the lumbermen, to the timber owner and the saw mill men and persuade them that there is something in this game for them. That is one reason why in publicity work in the lumber business the foresters stand so close, elbow to elbow, working hand in hand with the lumbermen today. That has been done, not by these methods that you have to use to reach the general public, but by figures, by cost sheets, and everything of that sort.

Mr. J. E. Rhodes, of Illinois: It is my opinion that the most effective publicity agency is the daily newspaper, and there are methods of reaching the public through the columns of the daily newspapers without subsidizing them. The trade papers, of course, are doing a splendid work, but they do not reach the general public, which it is so necessary to reach in order to educate the people to the things we want them to know.

So far as magazine articles, and that sort of publicity are concerned, I have always found that the free use of photographs, and illustrations, will carry almost any article with it. The American Forestry Association is publishing the American Forestry Magazine, and from my observation of it I think it is having an increasing influence. The magazine is well illustrated, and the articles are generally of a popular nature, which I am glad to see more widely quoted and copied than they once were. This is a very important work, in fact, necessary for the promotion of forestry and one to which we cannot give too much attention.

Every forester, every lumberman, and every person interested in the promotion of forestry should study publicity means and methods by which the public can be acquainted with what we are trying to bring about.

Mr. E. M. Griffith, of Wisconsin: One valuable thing that can be done will be to get the press associations to visit your forest reservation, or wherever you are working in the State and let all the editors see the work that is being done. In other words, educate the editors on the ground and they, in turn, will take your material and put it in proper form.

Mr. W. R. Brown, of New Hampshire: One thought has occurred to me which has not been taken up, and it is that co-operation is a good benefit to publicity, but before you can get universal publicity you all want to think alike. I am extremely glad to see so many people here who are talking this matter over so that we can decide on very many things that come up in forestry, that we will think alike about those things, that we will formulate a plan, and that by talking this plan over together through the country at large, we will reach a greater number of people.

Dr. J. T. Rothrock, of Pennsylvania: In regard to lobbying, our experience in Pennsylvania a few years ago was that the best thing to do was to go ahead of the lobby, and when we had any particular plan in mind, it was always talked over in the Forestry Commission a year or two before we talked it over in the Legislature. Before it got out every county paper in the State of any influence was induced, by some means or other, to have a nice little editorial in favor of that particular project. Then, when the measure came up before the legislature, we would go to the particular lobby of any county and say we want your support for this bill. They would say they would be glad indeed to support it if they were sure they had the influence of their constituents back of them, and we could say your constituents have already supported it, here is an extract from a paper, and we would bring out a paper with an editorial in favor of that movement. That was a little simple device, but I can tell you it has accomplished great results.

Dr. Hugh P. Baker, of New York: I like Mr. Allen's idea of getting at the people. We have been going out to the high schools throughout the State in illustrated talks, and we find that the children are much interested in pictures and will go home and talk and the parents will listen to the children when they might not listen to someone else about forestry. We are also trying to go a little bit further than simply interesting children in pictures and talk; that can be overdone, it gets old after a time. There is a great deal of indifference on the part of the older people, they have their interests and even though good work is being done here and there, ninety per cent of them will not know about it. Therefore, we have gone this step further with the children; we have gotten some schools interested in planting a bit of waste land in the vicinity of the school. We believe if we can get the boys in the high school to go out and plant a few trees in the vicinity of the school on waste land, they will go out and watch those trees grow and in that way we think we have made quite a step towards the solution of the various problems.

We are also getting out some little cards. While we are not original in this matter, we are trying to present it in an original way, answering some of the common questions about forestry. These cards are going out to the high schools and to the grangers and the farmers are greatly interested in them. We have also found there is a large amount of timber in the wood lots in the State and the grangers are ready to take what we have. Last year we talked in something like 170 communities in the State and we found universal interest, and this year we have applications from about 200 communities in the State to give them talks. People are interested, and it is a constant surprise to me to find the way they take the gospel of forestry.

Mr. Harris R. Reynolds, of Massachusetts: In this connection I should like to tell you what the Massachusetts Forestry Association is trying to do. I think the plan we have been following in Massachusetts is somewhat different from any thing that has been brought out in the matter of getting publicity and putting through legislation. We believe the only way to properly educate public opinion and public sentiment is to put yourselves in touch with men who know forestry. Newspaper work is all right, but, as a matter of fact, a great deal of it is bosh. We are putting out over the State young men who have been trained in our forest schools. The forestry association has had this year from an average of from six to eight young foresters from various schools, Harvard, Yale, Penn State, Syracuse, and Amherst, and these men solicit members for the association and answer questions, besides giving free advice to anyone who wants it along forestry lines. When one of these men goes into a business man's office he will frequently find that he is not welcome. But if he is properly coached he will soon interest that man in what ought to be done for his own trees. It is the dollars and cents idea that has to be brought forward, and as soon as a man feels he will get something out of it himself, he is willing to contribute to an organization of this kind that will give him support.

We are organizing in various towns branch associations and through these branches hope to get support in matters of legislation. We have tested that scheme out pretty thoroughly and it has worked. As soon as a representative finds that fifteen or twenty of his best citizens in his home town want a certain thing, he is going to vote for it because he wants to get back in that job another year, and that is the way in which we are attacking the problem in Massachusetts.

Mr. J. H. Foster, of New Hampshire: I have just been requested by Mrs. Avery, who is here representing the conservation commission of Louisiana, to say that we should not overlook the fact that the womens' clubs of this country are doing a good deal of work along publicity lines. Mrs. Avery has just told me that in Louisiana it is the practice of all the women's clubs of the State to have one paper each winter on forestry, and in addition to that, they are offering prizes to the different grades of school children throughout the State each year, and in that way they develop an immense amount of interest among the children on the subject of forestry.

Other gentlemen who participated in the discussion were: Mr. W. T. Cox, of Minnesota; Mr. Filibert Roth, of Michigan; Dr. B. E. Fernow, of Canada; Mr. Philip W. Ayres, of New Hampshire; Mr. W. O. Filley, of Connecticut; Mr. F. W. Kelsey, of New York; Mr. Geo. H. Rhodes, of California.

THE CONDITIONS UNDER WHICH COMMERCIAL PLANTING IS DESIRABLE

By the Sub-Committee on Forest Planting.

Chairman, E. H. Clapp, Washington, D. C.

Acting Chairman, S. N. Spring, Ithaca, N. Y.

T. T. Munger, Portland, Oregon. S. B. Detwiler, Philadelphia, Pa.

Presented by Mr. E. H. Clapp, Monday Morning, November 17, 1913.

SYNOPSIS

THE conditions under which commercial forest planting is desirable is the topic considered by this sub-committee. The commercial basis for an investment in planted forest includes safety of investment, suitable regional conditions, a ready market, low initial cost of land and planting, and satisfactory returns at maturity. Fire, insects, and fungi need not be considered insurmountable obstacles to such an investment. If species suitable to climate and soil, which have good annual growth, and which meet market demands are chosen, favorable returns may be expected.

An investment in planting offers the least incentive to private owners since returns do not come within a short period, and money must be invested for 50 to 100 years. An exception is the planting of quick-growing species or of slow-growing trees for utilization when small, as for post production, where regional or market conditions are favorable. Here returns come earlier and are proportionately higher. Long-lived corporations and communities have a much greater incentive to plant forests than individuals. Most of all, a long-time investment like planting is feasible for the States and the Federal Government.

The report shows the great necessity for an adequate plan of commercial planting by States and the Federal Government. More than $65,000,000 worth of wood is lost annually while the available lands remain deforested. The Federal Government, in co-operation with the States, can wisely expend millions in order to dull the edge of timber famine when it comes.

The following summary ends the main report of the Committee, which is further supplemented by an appendix containing a condensed discussion of forest planting in each of the natural forest regions.

(1) Although interest in forest planting is increasing, the actual area planted each year is very small in contrast to the millions of acres which require reforestation.

(2) An investment in planting should be made relatively safe from loss, especially by fire. Organized fire prevention and control have minimized losses from this source. Adequate fire protection is sure to come if extensive planting is undertaken.

(3) Successful commercial planting depends upon a good future market, lands of low value on which to plant, a choice of species suited to the needs of the market and to the conditions, local and regional, relative freedom from sources of damage, a low initial cost of planting, and a return on the money invested equal

at least to a fair rate of interest. Many examples of successful plantations exist which meet these conditions.

(4) As an investment forest planting is not attractive to the small private landowner excepting where other valuable considerations exist, such as appreciation of land values or early returns from quick-growing species. The long-time nature of the investment makes planting more feasible for federal, State and local governments or long-lived corporations than for the individual or small company.

(5) The problem of reforestation of denuded lands should be met squarely by entering upon a comprehensive plan covering at least a fifty-year period. Such a plan should include adequate federal and State appropriations, an extension of State forests to include more waste lands, federal aid for States, State aid for counties, cities and towns, and encouragement of private planting.

(6) Sixty-five million dollars, at least, are being lost annually because denuded forest lands remain unproductive. Reforestation will go far toward lessening the severity of the coming timber famine, provided it is done on a large scale and begun at once.

INTRODUCTORY

THE topic selected for discussion by the sub-committee on planting is the conditions under which commercial forest planting is desirable. Interest in this work has been increasing during recent years. The total acreage annually planted, however, is utterly inadequate to bring into productiveness within a reasonable period the very great area which requires reforestation. It will require Federal, State, private and corporate planting on a large scale, annually, to reforest denuded lands so that the United States may receive the benefit of additional timber supply when the period of great scarcity of timber begins.

It is chiefly the purpose of the report to point out the fundamental facts concerning commercial planting, its drawbacks and its advantages. A discussion of commercial planting in the various forest regions is appended to this report as a compilation of available data and a basis for consideration of its recommendations.

COMMERCIAL BASIS FOR FOREST PLANTING

Safety of Investment

IT is essential that a commercial enterprise be relatively safe from loss or destruction. Danger from forest fires has been regarded in years past as sufficient to render an investment in planting wholly impracticable. In general, this danger has been greatly exaggerated; yet it does exist as a local problem and must be taken into account in determining protective measures for each prospective planting. Fire in a young planted forest of conifers usually kills the trees; in hardwoods it may kill or seriously injure them. Organized work in fire fighting and more effective prevention of fires in many of the forested States has minimized losses from this cause. Thus, in the record of Connecticut* planting, less than one per cent of the total planted area was destroyed by fire

* Rept. Conn. Agri. Exp. Station, 1912.

in 12 years. In this thickly settled region the causes of fires are numerous and the number of fires large. Protection of planted as well as natural forest lies, primarily, in the hands of the State and Federal Government, and must be assured to the people in each State where the danger exists. Adequate fire protection is sure to come if extensive planting is done.

Measures of prevention rest not alone, however, with the State, but must be supplemented by the efforts of individuals and of corporations who undertake planting. Local protection by fire lines and by other means has proven adequate to protect planted forest adjoining railroads and which was open to danger from other causes of fires. A decade of educational work and organized fire prevention has removed, to a large degree, this objection or stumbling block to the planting of forests.

The danger of losses due to insects, fungi and other injurious agencies does not necessarily render an investment in planting unsafe. Careful judgment in the selection of species and mixtures, as well as subsequent economic measures for preventing losses or reducing the damage, are reasonable safeguards in this respect.

So far as taxation is concerned, there is steady progress in legislation to do away with injustice arising from repeated taxation of the forest crop. Taxation of the land alone annually at a low valuation and a tax on the crop when cut seems to be the plan most favored. It is reasonable to expect that future planted forests will not be unreasonably burdened with taxes. Laws granting exemption from taxation on planted lands for longer or shorter periods have entirely failed to stimulate reforestation.

Regional Conditions.

If planting is to have a sound commercial basis, both regional and local conditions require careful consideration. A study of regional factors may determine at the outset the advisability or inadvisability of planting.

Climatic factors, temperature and rainfall, determine broadly the possible species in natural forest regions from which selection may be made for reforestation. A consideration of temperature may be sufficient to eliminate consideration of a given species, as, for example, eucalyptus in regions whose minimum temperature falls below 25° to 30° Fahr., or, catalpa, which is often recommended for commercial planting, in regions where it is subject to frost injury. In the extension of a species to the extreme limit of its possible planting range the shorter growing season may so reduce its average yield or conditions may so affect its form as to make it unprofitable for planting.

Topography and soil are the important factors which determine forest types, hence, in forest regions these factors must be considered in deciding the practicability of forest planting and in the preparation of plans for commercial reforestation of waste or denuded lands. A safe basis for decision is assured if areas are mapped and the physical types of land located with reasonable accuracy. Full notes of local conditions are needed upon which the determination of suitable species may rest. Important details of site are included under slope,

aspect or exposure, altitude, soil in respect to kind, depth and moisture, underlying rock, etc. Other facts are essential in planning large operations, but the considerations named are fundamental in reaching decision as to species on lands formerly well forested and where the presumption is reasonable that they may again be made productive. If similar sites in forest may be studied within the locality, facts will be secured to substantiate the observations of the physical nature of the deforested lands. If species are planted which are poorly suited to locality, the chance of a valuable crop at the end is gone at the outset. Briefly, then, an intimate knowledge of regional and local conditions is absolutely necessary as fundamentally affecting the commercial success of reforestation.

In regions not naturally forested as in the prairie and plains country, data concerning climate and physical factors of locality are even more essential, coupled with a knowledge of the silvical characteristics of forest tree species.

An accessible market within the region and a reasonable certainty of a steady future demand is necessary to any form of forest management. The species chosen for planting must meet market requirements in addition to being suitable for the sites on which it is to be set. Its rate of growth and relative freedom from insect damage must be known.

Initial Cost.

In commercial forest planting a small initial cost is demanded if full profit is to be taken at the maturity of the crop. Since the investment covers a long period, it is desirable that the cost per acre of forested land be as low as possible without menacing the successful establishment of the forest.

Initial cost comprises value of land, cost of trees and all expenses attendant to setting them. Natural forest land without timber is available at low prices. An arbitrary upper limit might be set at $25.00 per acre, and this too high save under exceptional conditions. Most of the land held or acquired for forest planting in the Eastern United States has been much less than this, ranging generally well under $10.00 per acre. The cost of trees has been brought within reasonable limits by development of State nurseries and by the establishment of private nursery companies.

Cost of setting trees varies greatly, depending upon local conditions of site and availability and quality of labor. It is not difficult to plant successfully at a low figure and this has been done by many classes of owners under varying conditions. A general figure of cost in Eastern forest planting is a cent a tree set. It has often been lower than this, occasionally higher. With a 6′ x 6′ spacing this would amount to approximately $12.00 per acre. An average figure of $11.86 per acre was secured in compiling data of the total cost per acre of private forest planting in Connecticut. Planting on a large scale by the New York Conservation Commission in the Adirondacks has been done at a much lower figure.

Excepting on lowlands affording favorable conditions, plains and prairie planting with its additional two years cultivation to ensure initial success costs from $15.00 to $25.00 per acre. Eucalyptus planting costs in California may

be set at $25.00 per acre, including preparation of site. Federal forest planting in the National Forests has varied widely in cost according to the conditions under which it has had to be done. Its purpose is more than commercial production, since much of the work includes water conservation by forest planting. In large operations on accessible sites presenting no unusual difficulties, the cost per acre is about the same as in planting expenses in Eastern forest regions.

Returns.

A high rate of return cannot be expected from an investment in forest planting. It is generally reckoned at 4% to 6% on the investment, with a small net profit per acre. Further than this, in the great majority of cases the return does not come within a short period of years. Eucalyptus within its limited planting range will be merchantable in one to two decades and yield higher returns than those given above. Fence post species yield their crop within 15 to 25 years at a considerable profit. The shortest period for timber production is, in general, 35 to 40 years, and for large timber 60 to 100 years. Such long deferred returns as the latter are not attractive in themselves to the investor, but there must be and there are in many instances other considerations in commercial forest planting. By itself as a business venture, forest planting does not hold the position which short time business investments do. It does not generally appeal to the private landowner from this standpoint. Such an investment does, however, assume an important position when it directly affects capital already invested or properties that are to be held perpetually for timber production.

COMMERCIAL FEASIBILITY OF FOREST PLANTING AS DETERMINED BY OWNERSHIP AND OTHER CONSIDERATIONS

Private Individuals.

PLANTING of quick growing species suitable for domestic purposes and for sale is feasible wherever the return is not less than from other possible uses of the land. This applies particularly to the resident owner who will thus secure his own supply, fence posts for example, and can sell the balance to advantage. In view of this he may even be willing to accept a lower return from the soil than it might otherwise bring. In many instances, however, inferior land will be used for this purpose. In wind-swept regions the protective influence of a shelter belt brings higher money return in increased crops on land adjoining the forest.

The short period for growth encourages such planting and other useful results add to its desirability. Commercial planting of this kind is much to be desired in farming regions that are treeless, or in woodlot regions where wood is scarce through continued cutting, and the prices of needful farm materials have become high.

Although reforestation for timber production is not often attractive to the private owner, many small plantations are being set yearly, especially in the

eastern United States. Planting by individuals is often a matter of personal interest in such work for the purpose of improving property so that no part of the land is idle, and with no idea on the owner's part that he himself will harvest the timber. He simply sees his property improved and enhanced in value, more easily sold or left in better condition for his children.

As an investment timber planting by private owners must be considered in connection with the steady appreciation in value of forest products and in the price of land. There are many localities in the Eastern United States where waste lands are remarkably cheap. These are non-agricultural, but with the increase of values for other types of land in the locality the price of these lands is rising. Good roads and transportation by automobile have put extensive areas within reach of larger and smaller cities for country residence. This line of development will continue. Planting on such lands will add distinctively to future sale values.

The purchase of land by non-resident owners and setting it with forest trees is relatively infrequent. Such planting must be viewed purely from an investment standpoint and offers little to the private individual as compared to other business ventures.

Private Corporations: Corporations, lumber companies and wood working industries which depend upon buying stumpage for their supply and own practically no woodland have no incentive for forest planting. When supplies are exhausted locally the plant is removed to new territory or abandoned. Many of these small corporations are comparatively short lived, and do not wish to invest further capital which cannot be released except after many years. Such companies also may not have capital available for such purposes.

There are other corporations and small companies that own some timberland and also buy stumpage to supply their industries. Such corporations have held their own timber for the time being uncut, as a reserve to prolong the supply, cutting only the purchased stumpage. From this stage the idea has developed of buying young woodland and lands where natural growth of the desired species has become well established. A further practical extension in application of this idea in one case has been the purchase of cheap lands suitable for growth of the species needed and the reforesting of them artificially. Such a plan worked out fully where circumstances permit means a continuous supply for the local industry concerned, provided reproduction is secured either naturally or artificially.

Another class of corporations are those holding a large acreage of forest land. They are permanent in character and the problem before them is how to make certain an annual cut to supply their mills perpetually. The paper and pulp companies in the spruce region of the Northeast exemplify this class. Their problem is one of forest organization. In such cases the viewpoint of forestry is presented, namely, continuous crops of timber from the same land. Natural regeneration will most probably be given first consideration by the employment of silvicultural methods. Forest planting will supplement natural reproduction, and may also be applied to waste, cut-over lands and burned areas to bring them into productiveness. Forest planting becomes simply a rational part of forest

management by the corporation. There is every incentive for such corporations to utilize planting where it is practicable and such expenditures are an increase of capital to develop property. Capital is usually available and the long time nature of the investment is not an obstacle.

Public Utility Corporations: The future annual supply of railroad materials, especially cross-ties, is essentially important to every railroad corporation. It is estimated that 15 to 20 per cent of our annual timber consumption is railroad materials. The working out of the problems of a future supply may or may not have any connection with forest planting. The location of the railroads in reference to forest regions, together with the climatic and physiographic characteristics of these regions, the present land holdings of the company, the advisability of using treated ties, etc., are some of the factors entering into the problem. It is no solution of the problem merely to say that if railroads need ties, let them plant trees which will furnish them; a statement once made in this respect. For one thing, trees planted now for ties will not mature soon enough to meet the shortage of cross-ties which is surely coming. A hundred million planted trees under 6 inches in diameter would not help a railroad in the cross-tie crisis of fifteen or twenty years hence; yet this is no reason why they should not be planted to furnish ties forty years from now.

So far as the region is concerned, if a railroad traverses a treeless prairie and plains region, such as the Middle West, a policy of planting trees for tie production in that region is not fundamentally sound, and experiments already tried do not seem to warrant further attempts. A treeless, windswept prairie country does not offer, silviculturally, advantageous sites for successful tie production because of limitation as to species and their growth, as well as other factors. One such railroad which extends to the Pacific coast is experimenting in the planting of eucalypts in Southern California for tie production. This is a possible exception to the general principle just stated, but in this case eucalyptus planting within its limited planting range offers at least a reasonably sound basis for such an experiment, although present indications are that the work will not be extended.

The source of tie supplies and other railroad material must, then, be our natural forest regions. If a policy of timber land acquirement by a railroad is found to be practicable, or if a railroad owns forest land, planting of forest takes its usual place in the organization and management of the railroad company's forest.

Lands which have been cut over and burned so badly as to require restocking to secure valuable growth should be planted, and all open lands within the company's holdings made productive in this way. The object of such planting is profit, the highest return per acre possible. Species which will yield material suitable for treated or untreated ties may be selected if adapted to the region and to the sites, but such need not be the ruling factor in making the choice. The object rather is to plant what will bring the best returns, not disregarding, however, the maintaining or improving of the fertility of the site. Railroads with medium to high earning capacity can afford to increase capital account to

make their lands yield a return instead of paying taxes annually and letting them lie unproductive. As in the case of any other long-lived corporation an investment covering a long time is not an obstacle to the company.

With coal companies the problem of future supplies of mine props and other material is chiefly connected with the length of time the coal owned or controlled by a given company will last. Extensive planting may be desirable, or it may be determined that the regional supply of timber will be sufficient or can be supplemented by planting. Planting of surface owned by the company is the simplest use to which it can be put. If such planting occupies land in a bituminous coal region where open coking ovens are used, its general success may be lessened materially or prevented by the effect of sulphurous gases.

The feasibility of planting by water companies is apparent by a brief survey of conditions and opportunities. Large areas have to be owned to protect the purity of supply. Such lands offer the best protection if forested. Even though the water may be filtered before use, benefit is derived from forested watersheds. Lands acquired on watersheds usually include many open farm lands which should be planted. Much of this work has already been successfully done by New England water companies and each year additional acreage is being set with trees. It is the most satisfactory crop for the lands considering their purpose and an excellent future profit is assured owing to nearness of market in nearly every instance.

Community Forests: What has been said in reference to private companies furnishing water supply for cities and towns applies to the feasibility of forest planting for cities and towns which own and manage their own water systems. Areas owned are sufficiently large to yield ultimately a high money return to the community. Once established, such forests will furnish regular crops of timber which can be used for city purposes or sold. In either case taxes will be reduced or the water rate can be lowered to a minimum figure. Some States* have recently passed laws permitting counties, cities, towns and villages to acquire forested lands or areas suitable for tree growth for the establishment of community forests. Such forests have many uses, among which are water protection, timber supply, park forests, etc. Their future value will be very great and they will provide useful material at a future time of local and regional scarcity of timber.

Some communities are in a position financially to carry these laws into effect and need only to be shown the possibilities and opportunity. The majority, however, cannot undertake an extensive program of forest planting without State aid. The city of Seattle has recently planned a very extensive planting operation in its large watershed. This is independent of State aid and while involving heavy expenditure promises very definite and high returns.

State Forest Planting: Is it advisable for States to enter upon an extensive plan of commercial forest planting? The policy of State ownership and management of forest lands is now recognized by many of the States. In New York and in Pennsylvania a million to a million and a half acres have been acquired under

*New York and Pennsylvania.

such a policy. Development of forest management under this policy implies forest planting to restock denuded and burned areas within the State forests and to protect sources of stream flow. Massachusetts* has a policy of purchasing private waste lands and has provided a small appropriation annually for their reforestation by the State. Such lands, however, can be repurchased by the owner subsequently. Nine hundred to one thousand acres are being planted annually under this policy. No States at present are planting over one thousand acres each per year and few attain that figure.

The State can well afford to go much farther and enter into a plan of commercial forest planting for the sake of future industry and supplies for its citizens. The State does not enter into competition with private investors since timber production by forest planting is not sufficiently attractive to induce extensive private planting.

The State has the power to secure and appropriate funds for such work, which is comparable with other public work, such as road building, swamp drainage and irrigation. Non-agricultural forest lands now denuded must be made productive to meet future demands. This is just as important as making farm lands of higher productive value through the building of good roads, or an increasing of farm areas by drainage or irrigation, initiated and financed by the State. The more extensive the area requiring forest planting, within the States, the more advisable is the immediate commencemnt of such work.

Federal Reforestation: The Federal Government has nearly 190 million acres in the National Forests which are under management for the purpose of protecting stream flow and producing continuous crops of timber. Protection of these forests from fire and the proper cutting of mature timber so as to provide for another crop of valuable trees on sale areas are given a place of first importance in the federal policy. Next to this is placed the task of starting forest growth on a vast area of denuded lands.† It is estimated that 7½ million acres of such land in National Forests require reforestation. The government policy places planting for watershed protection first and commercial planting on lands which produce heavy stands of quick growing species, second. Under present plans, 30,000 acres are to be reforested annually. Planting is more difficult on the whole than in the Eastern United States and continued experimentation is required. Climatic factors and physical conditions of planting sites offer complex problems. Planting for commercial profit will be impossible in many portions of the National Forests. Gain will come to the nation through protection of stream flow and in the re-establishment of forest growth on denuded lands to augment future local supplies of timber. The Federal Government can carry out this work in National Forests to better advantage than individual States could. There should be no lowering of the present standard of annual planting or the amount of funds available for this purpose each year. Increase in the National Forest planting budget should be made as fast as experimental work indicates satisfactory methods.

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*Reports of the Massachusetts State Forester, 1908-1912.

†"Reforestation on National Forests," by W. T. Cox. Bull. 98, Forest Service, U. S. Department of Agriculture, 1911.

NEED OF FEDERAL AND STATE AID IN REFORESTATION ENTERPRISES

The Opportunity

THE National Conservation Commission in 1909 conservatively estimated denuded lands in the United States in need of planting to be 65 million acres, including that in natural forest regions and in treeless regions. Unless reforestation on a large scale is entered upon, there will be but little diminution in this area of denuded land in a hundred years. Each year's delay in making the investment means a money loss represented by the growth planted forest could be making on this immense area. At an estimated return of only $1.00 per acre per year, this annual wood growth amounts to a yearly loss of 65 million dollars to the nation. Within fifty years our virgin timber will be gone and much of our second growth. To meet future needs of timber denuded lands must be brought into productiveness. Reforestation on a large scale is absolutely essential to the Nation's welfare. Both Federal and State action is necessary to place reforestation on an adequate scale. Federal aid should apply to States within natural forest regions having denuded and waste lands. Planting within prairie and plains regions serves almost wholly to benefit the individual owner through furnishing domestic supply of farm materials and by protection to the owner's crops.

The Federal Government has adopted a definite policy in forest conservation by creation, administration and management of the National Forests created from public lands and more recently acquired in the East by purchase under the Weeks Law. It has further provided for protection of stream flow, and thereby incidentally for future timber supplies by financial aid to the States in protecting forests on important watersheds from destruction by fire.

The acquisition of waste lands by the Federal Government for National Forests should be greatly extended and the present restriction limiting the acquisition of such lands to the watersheds of navigable streams removed, on the broad basis of the public need for greatly increased wood production for the future, regardless of State lines.

The acquisition of similar lands by States should also be greatly extended.

Federal aid should be extended to the States requiring it on the same plan as it is for fire protection under the Weeks Law, namely, that the State appropriate an equal sum for forest planting under a co-operative agreement with the Government. Expenditures should be restricted to the planting of non-agricultural lands which have been classified by competent authorities.

A 50-Year Plan for Nation and States

A definite policy should be adopted both by the Federal Government and the States for the next 50 years for reforestation on a large scale under as many as possible of the plans outlined. Appropriations for this purpose may be regarded truly as a valuable investment by the nation and the States, both of which, because of their credit and the low interest rates obtainable, are able to enter upon a long-time investment which cannot be undertaken by private capital on any extensive scale.

The following schedule of appropriations by the Federal Government and by co-operating States is suggested, the amounts being made relatively small at the outset to ensure a normal development and effective continuance of the planting policy.

DECADES	Federal Appropriation	Total amount granted by federal government	Total amounts contributed by co-operating states
	Dollars (Annual)	Dollars (Per decade)	Dollars (Per decade)
1914-1923	500,000	5,000,000	5,000,000
1924-1933	1,000,000	10,000,000	10,000,000
1934-1943	2,000,000	20,000,000	20,000,000
1944-1953	3,000,000	30,000,000	30,000,000
1954-1963	4,000,000	40,000,000	40,000,000
		105,000,000	105,000,000
Grand total in years			$210,000,000

Such a co-operative undertaking successfully carried out would ensure the planting of over 20,000,000 acres, or over 50 per cent of our natural forest lands now denuded and incapable of being regenerated naturally. The cost for 50 years is less than that for maintaining our military and naval organizations for one year. Such extensive planting would encourage planting by long-lived corporations and by private owners. Counties, towns and municipalities can be assisted by the State. This would undoubtedly add several million additional acres to those planted by the Federal and State governments.

Planted forests of the next two decades would yield returns by the end of the 50-year reforestation period. Eventually, under a rational forest management, this 20,000,000 acres would yield 6,000,000,000 board feet per year, estimating the annual yield per acre at only 300 board feet, a conservative figure. Such returns would be of inestimable value to the whole nation during the last half of this century when scarcity of wood will be most keenly felt.

What the States Can Do.

The policy of acquiring forest lands by the State, or denuded areas of non-agricultural lands suitable for forest growth, is well established in many of our States. An extension of that policy to other States in natural forest regions and within States where it now exists is much to be desired. Such an extension requires a more thorough classification of land and a more advanced forest policy. States should ensure future supplies of timber by owning and managing large areas and by reclaiming waste and denuded lands on a large scale. Federal aid, whether by direct appropriation divided among co-operating States as indicated above or in the form of a Federal loan, should be applied to extensive planting on State lands. Federal and State work must be further supplemented

by county, town and municipal planting. There are several methods that suggest themselves for State aid of community planting.

(1) Legal permission by the State to local governments (county, city, town, village) to bond themselves or raise money by loan for the purpose of acquiring and planting denuded lands. (A measure already in law in New York State.*)

(2) Same provision as (1) in reference to bonds or loans, but State to furnish plant material free of charge to counties, cities, towns and villages.

(3) State loans with interest at 3% for a 50-year period to county or local community for use in acquiring land and planting it; to be secured by a lien on the first timber returns. (†This plan was suggested by Dr. B. E. Fernow in an address delivered at the annual meeting of the Society for the Protection of New Hampshire Forests, Lake Sunapee, N. H., July 23, 1913.)

(4) County, town, city or village having or acquiring land for reforestation to give deed to the State which reforests the land and manages it. Within a given period the land may be redeemed upon payment by community of reforestation costs with interest at 3%, provided the forest is thereafter managed in accordance with a working plan prepared by the State Forester and under his supervision.

The States should continue present encouragement of private planting by furnishing advice and planting stock at cost where such is not available from private nurseries at reasonable prices. It is very doubtful if financial aid to private individuals, associations, companies or corporations either in the form of free plant material or money subvention is advisable. The State's own reforestation work and State aid, as indicated above, on a large scale would prevent any assistance of this sort.

SUMMARY AND CONCLUSIONS

(1) Although interest in forest planting is increasing, the actual area planted each year is very small in contrast to the millions of acres which require reforestation.

(2) An investment in planting should be made relatively safe from loss, especially by fire. Organized fire prevention and control has minimized losses from this source. Adequate fire protection is sure to come if extensive planting is undertaken.

(3) Successful commercial planting depends upon a good future market, lands of low value on which to plant, a choice of species suited to the needs of the market and to the conditions, local and regional, relative freedom from sources of damage, a low initial cost of planting and a return on the money invested equal at least to a fair rate of interest. Many examples of successful plantations exist which meet these conditions.

(4) As an investment forest planting is not attractive to the small private landowner excepting where other valuable considerations exist, such as appreciation of land values, the protection of crops by wind breaks, or early returns

* Chapter 74, Laws of New York, 1912.

† "A Plan to Meet Our Needs for Wood Timber," AMERICAN FORESTRY, Vol. 19, No. 8, page 521.

from quick-growing species. The long-time nature of the investment makes planting more feasible for Federal, State and local governments or long-lived corporations, than for the individual or small company.

(5) The problem of reforestation of denuded lands should be met squarely by entering upon a comprehensive plan covering at least a 50-year period. Such a plan should include adequate Federal and State appropriations, an extension of Federal and State forests to include more waste lands, Federal aid for States, State aid for counties, cities and towns and encouragement of private planting.

(6) Sixty-five million dollars at least are being lost annually because denuded forest lands remain unproductive. Reforestation will go far toward lessening the severity of the coming timber famine, provided it is done on a large scale and begun at once.

APPENDIX

FOREST PLANTING BY REGIONS*

Northern Forest

THIS region includes the greater part of New England, New York, Pennsylvania and the Lake States, extending also in a narrow strip along the Southern Appalachian Mountains to Georgia. The greatest area of denuded lands in the United States requiring reforesting lies within this region. Private and corporate ownership exceeds government holdings. New York, Pennsylvania and the Lake States each have a considerable area of State forests which include much land that is at present unproductive. The Federal Government is acquiring land under the Weeks' Law for national forests in the White Mountains and in the Southern Appalachians and has national forests in the Lake States. All of these federal holdings, however, amount as yet to a relatively small area when compared to that of the whole region.

North Woods.

The broad divisions of the forest in the Northeastern United States are the spruce region, northern hardwoods and the white pine region.

The Spruce Region is one of natural forest soils, not suited to agriculture. Its topography is rugged. Red spruce is the predominant conifer, growing in nearly pure stands or in mixture with hardwoods and with other conifers. Hard maple, beech, and yellow birch are the principal broad-leaved deciduous trees. Spruce forest covers the larger part of northern New England, the Adirondack section of New York State, and this species is to be found on the highest elevations in the Southern Appalachian Mountains. The forests occur in almost continuous areas, and the region is little settled. The extent of individual holdings is on the average large, and some paper and pulp companies have very extensive holdings.

Generally speaking, natural reproduction in spruce forest is good under average conditions. Fire has destroyed the valuable species on large areas, and

* Classification in general according to map "Natural Forest Regions of North America," Forest Service, U. S. Department of Agriculture, 1910.

clean cutting in a portion of the region has denuded mountain slopes, for example, in the White Mountains of New Hampshire. Natural seeding of poplar and birch has produced valuable forests of these species on burns in this region, but repeated fires have created waste areas. Forest planting in the spruce region is not at present considered practicable as a general method of reproducing forests, since natural reproduction is abundant. For the most part, therefore, natural seeding will be depended upon to secure a new crop.† Planting is, however, advised in the old field spruce type, one of the subordinate types, as the best means of reproduction.

Forest planting finds its principal use within this region for stocking burned lands that are not reproducing with valuable species. Since native spruce is not rapid in growth, the introduced Norway spruce is recommended. Its use in the United States has been chiefly for ornamental planting, but there have been instances in which it has been planted for commercial purposes. Its rate of growth is shown to be very rapid in a small planting, 34 years old, on the Billings' estate in Vermont. This plantation is estimated to have grown an average of a cord and a half per year. Tests of trees from this plantation have proved that the wood makes a good quality of paper. It is not a difficult tree to propagate in the nursery. The average cost of raising the trees and making a plantation with four-year-old transplants of Norway spruce, spaced 6 x 6 feet apart, is approximately $10 per acre.* An objection to the Norway spruce has been pointed out, namely, that it seems to deteriorate after 50 years. Owing to its rapid growth, this does not hinder its use in commercial planting for the production of pulp wood, but may affect its value as a large timber producer.

The Northern Hardwoods Region adjoins the spruce region, and is hilly rather than mountainous. The principal species are those mentioned above, including also a small percentage of white ash, basswood and red oak. The soils are of good quality, and the region is generally more settled. The forest is not continuous, but woodland forms a part of nearly every farm, ranging in area from a few acres to several hundred. Woodlots have a larger average area in northern New England than in the southern part. Planting at present is applicable to open farm lands not needed for agricultural purposes. It will also be useful in the conversion of inferior hardwood forests into a more valuable coniferous type.† The region contains no extensive areas of sandy waste lands. The purpose of planting is chiefly the production of commercial timber, and should largely be carried out by farm owners in the region, individually, or by communities, Species of value for planting are white pine, red pine, European larch, Norway spruce, white ash and basswood.

‡ *The White Pine Region* of the Northeast has been so named from one of its chief species of trees. White pine is to be found in the spruce region and associated with trees of the northern hardwood region. It is not, however, a

† "Forestry in New England," by Hawes and Hawley, 1912.
* "How to Grow and Plant Conifers in the Northeastern States," by C. R. Pettis, Bull. 76, U. S. Department of Agriculture.
† "Forestry in New England," by Hawes and Hawley, 1912.
‡ Ibid., 1912.

prominent part of these forests. To the south and southeast of these regions in New England this species is typical of the forest, occurring in nearly pure stands on inferior soils and associated with hardwoods on better soils. In New York it was associated with hardwoods and still occurs in mixture. Its principal associate in Pennsylvania forests was hemlock, and it formed a greater or less percentage of the hardwood forests in that State.

In the New England region, second growth stands have been very numerous on abandoned fields. Second-growth lots have usually been cut clear when merchantable, and large areas have, as a result, been occupied by inferior species or by brush. Fires have added to this area. The region is well populated and the land owned, for the most part, in small lots by private individuals. State-owned land amounts to a small total area. Second-growth white pine occupies a less prominent place in Pennsylvania forests than original growth. It has given place to hardwoods on many sites. Fires which followed cuttings in Pennsylvania have been chiefly responsible for the formation of extensive waste areas requiring reforestation. Pennsylvania* has acquired nearly a million acres of State forest land and has reforested approximately 4,000 acres thus far.

Species most important for reforestation in the white pine region of the Northeast are white pine and red pine. Scotch pine may prove useful for the poorest lands. Hardwoods, such as white ash and red oak, deserve use on sites to which they are suited.

Several million acres require reforestation in the whole region. Unprofitable farm land, poor pastures, brush land and sandy wastes comprise some of the chief types of land for forest planting. The estimate of the National Conservation Commission in 1909 for New England alone was 2,500,000 acres requiring planting, a conservative figure, to which must be added a large area for New York and Pennsylvania. In the management of forest lands it will, in many instances, be practical to cut inferior woodland clean and reforest with pine.

Initial cost of planting generally ranges from $8 to $12 per acre, usually approaching the latter figure if three-year transplants, which are to be preferred, are used. The cost of labor usually ranges from $1.50 to $1.75 per day. Trees are commonly spaced 6′ x 6′ apart. Older plantations indicate a profitable yield.

The following table gives the yield of several of these:

No.	Location	Species	Age	No. Trees Per A	Total Yield per Acre Bd. Ft.	Mean Annual Growth Bd. Ft.	Quality of Site
1.	Connecticut	White pine and Eur. larch	22	1312	12,280	558	Medium
2.	New York	White pine	28	1200	23,000	857	Good
3.†	Connecticut	White pine	31	1200	15,052	486	Poor
4.‡	Connecticut	White pine	50	276	41,720	834	Medium
5.	Connecticut	White pine	75	524	60,360	862	Poor

* Report of the Forest Commission of Pennsylvania, 1912.
† Dense stand by seeding—too dense for normal development.
‡ Natural stand, not planted; here introduced to indicate yield at that age.

Estimating the stumpage value of Nos. 1 and 3 at $5 per M bd. ft. and Nos. 4 and 5, in which the timber is larger, at $7 per M bd. ft., the following table shows the financial value of the standing trees per acre:

No.	*Value of stumpage per acre.*
1	$61.40
2	115.00
3	75.26
4	292.04
5	422.52

Although conditions are especially favorable for private commercial planting in the Northeastern United States, its progress if judged by area is relatively slow. Probably more interest exists in forest planting within this region than in any other of the natural forest regions of the United States.

LAKE STATES

THIS part of the northern forest region is level to hilly in topography and occupies the greater part of Michigan, Wisconsin and Minnesota. Broadly the forest types are swamp, pine and hardwood, respectively. *The swamp type* varies in composition and character, but includes among its principal species spruce, cedar and tamarack. The composition of such swamp types may be one of these only, as tamarack swamps, or it may be spruce and tamarack, or cedar. Within this type, which occupies moist and wet lands, there is no field for commercial forest planting. Growth is very slow.

The pine type occupies sandy loams and sand soils. The principal species in the pineries are white pine and red (Norway) pine. On the poorer soils the red pine and Jack pine are the chief trees. Most extensive areas in need of reforestation are to be found in this type. The rate of growth is medium. In Michigan, on the higher, more northern lands and on pure sands, it is slower.

The hardwood type occupies good soils, generally agricultural in character, excepting rocky hills. Pine originally formed a small per cent of the forest, and is still found in mixture. Hemlock also occurred in this type in portions of the Lake States. The chief hardwoods are yellow birch, beech, sugar maple, white ash and basswood. Forest planting on this type occupies a minor position and will probably always be of less importance than the planting of pine lands. Its place will be somewhat similar to that which it has in the northern hardwood region of the Northeastern United States. The same species will be useful for reforestation.

Ownership of land is generally private, reforestation lands in the Lake States being held in areas of considerable size by lumber companies, by development companies and by individuals. An active State forest policy is in effect in Wisconsin and Minnesota by which non-agricultural cut-over lands are being acquired for eventual reforestation. There is also commendable State activity in Michigan. The Federal Forest Service has begun planting on national forests in both Minnesota and Michigan. The States are at present just entering upon this work.

The total planted area, federal, State and private, is known to be small, although no census of it has been taken.

Forest planting in the Lake States is commercially feasible, judging by the increasing market for pine and hardwoods and by the available statistics of natural growth. Species for planting in the pine type are white, red, Scotch and Jack pine. The last mentioned is useful on the poorest sands, and a stand may be secured by spreading cones on newly burned lands, a method both cheap and effective for this species. Good transplants of white pine and red pine must be used in the reforestation of pine lands with these species. Professor Roth, of the University of Michigan, recommends good, sturdy stock and wide spacing, 10 feet or more, since clearing up the lands is too costly and this money can to much better advantage be used in protection from fire during the two months of greatest danger. Planting can be done at as low a figure as $6 per acre, and will pay. He estimates the area within Michigan requiring reforestation at 10,000,000 acres. In Wisconsin it is estimated at from two to three million acres. No estimate is available for Minnesota.

The present standing timber of value will be gone within a relatively short time. In Michigan it is estimated by the timber owners as a decade: in Wisconsin it will be a little longer and in Minnesota State Forester Cox estimates about thirty years for the present saw timber to last.

Such facts point to the necessity of an immediate and extensive plan of reforestation for the great area of land, incapable under present conditions of reproducing valuable species naturally.

CENTRAL HARDWOOD REGION

THIS forest has its principal extent in Ohio, West Virginia, Indiana, Kentucky and Tennessee, a large part of the watershed of the Ohio River and its tributaries. To the west it occupies the southern portion of the Lake States, extending to the prairies, the central part of Missouri and the northwestern part of Arkansas. It dips down into Mississippi, Alabama and Georgia, occupies the Piedmont Plateau east of the Southern Appalachians and extends northeastward into southern New England. For convenience of treatment, that portion lying in the Southern States is discussed with what pertains to the Southern Forest Region.

The Central forest contains the principal supply of hardwood timber and almost all of our broad-leaf, deciduous trees find their best development there—oaks, hickories, ashes, walnut, cherry, tulip poplar, etc. A full description of forest types and forest conditions is not pertinent to a statement concerning commercial planting. Ownership is almost entirely private, much of the timber being in woodlots, excepting in the more thinly settled hill and mountain portions of the region. Exploitation of valuable species, fires and grazing have caused deterioration of the forest on a very large area. Lands have been cleared and farmed that now need reforesting, since their value is greater in forest than as farm land. Interest in commercial planting is greatest in the northeastern part of this region and in Ohio, to a less degree in Indiana and the Lake States, and little interest, if any, in the rest of the region.

SOUTHERN NEW ENGLAND AND MIDDLE ATLANTIC STATES

MARKET conditions in this part of the hardwood region are excellent and, in the aggregate, there is a large area of non-agricultural lands, either open land, brush covered, or occupied by worthless tree species. The chestnut bark disease has killed many chestnut stands, the renewal of which with valuable growth is largely dependent upon planting. Activity of State foresters has brought about a large amount of planting by private owners. The species chiefly used are white pine and some other conifers, on account of their higher yield per acre. Results of some of these plantations have been cited under "Northern Forest" (see p. 14). Timber production is the chief object of planting, growing of fence posts and like materials has been only incidental.

Massachusetts,* under its policy of accepting deed to private lands at a purchase price not to exceed $5 per acre and reforesting them, has planted 1,000 acres a year since 1906. Such lands may be redeemed by the owner within 10 years on payment of original price, plus the amount expended in improvements and maintenance, with interest at the rate of 4% per annum on purchase price.

The State Forester of New Jersey emphasizes care and proper management of woodlands rather than extension of wooded areas by planting.† The following table, compiled from State Forester Gaskill's report, is a conservative statement of species recommended, and shows their commercial possibilities. A few additional notes have been added.

Species.	*Yield per Acre Bd. Ft., etc.*	*Age Years.*	*Site for Planting.*	*Purpose of Planting.*
‡White pine	30,000	50	All soils except poor sand	Timber
¶Red (Norway) pine	30,000	60	All soils	Timber
Scotch pine	25,000	50	Any soil, especially for poor soils	Timber
Austrian pine	(Yield less than W. P.)		Poor limestone soils	Timber and box boards
Norway spruce	30,000	60	Cool site, fairly strong soil, not dry	Paper pulp and timber
Douglas fir (Rocky Mt. seed)	25,000	60	Fair soils	Timber
European larch	20,000	60	Fair soils, well drained	Posts and poles
Red oak	700 railroad ties	40	Fair soils	Railroad ties
White ash	10,000	25	Fair soils (moist)	Tool handles
Shellbark hickory	15 cords	25	Moist soil	Vehicle material, tool handles
Pignut hickory	15 cords	25	Drier soil	Tool handles
Tulip poplar	30,000	50	Good, well-drained soils	Finishing lumber, fine box boards
Basswood	Yield less than tulip poplar		Good, well-drained soils	Finishing lumber, fine box boards
‖ Black locust	2,000 posts	15	All soils except poorest	Posts

* Massachusetts, Chapter 478, Acts of 1908.

† "Forest Planting in New Jersey," by Alfred Gaskill. Reports of the Forest Park Reservation Commission of New Jersey, 1913.

‡ Massachusetts and Connecticut planting indicates possibility of higher yield.

¶ Will probably yield nearly as high at 50 years as white pine.

‖ Subject to attack locally by borers, which often ruin a plantation.

Catalpa is not recommended for New England and New Jersey. It needs good soils and a milder climate.

Trees for planting are preferred to direct sowing of seed on the site. The total average costs given by State Forester Gaskill are $7.38 per acre for planting one-year-old deciduous species and $9.09 for three-year-old conifer transplants; spacing 6′ x 6′, and cost of trees $3 per M for the former and $4 for the latter. Examples of expected profit are figured to be 5% or 6% on money invested.

Planting is recommended in Delaware on farms having no woodlots and for protective purposes.* The species recommended are chestnut, red oak and pin oak, tulip poplar, hardy catalpa and black locust. No data of plantations are recorded.

The known area of forest plantations in Maryland is very small. Planting has been recent and principally for the production of fence posts, using catalpa and locust. In one 50-acre plantation† set in 1882-1884, yellow poplar, black walnut, chestnut, red oak, white ash, maples, white pine and a few other species were planted. The cost of planting, if home-grown stock is used, is estimated at $8 per acre. Commercial forest planting has a small place as yet in this State.

Ohio Valley

Under this may be included Ohio, Indiana and Northern Kentucky. One may distinguish in general (1) upland forests, containing oaks, hickories, sugar maple, white ash, tulip poplar, basswood, walnut, cherry and beech; (2) lowland forests of elm, red maple, black ash, sycamore willow, gums, etc. The region is predominantly agricultural, and, for the most part, the forest is found in small detached parcels. Much planting for production of fence posts has been done successfully. The chief species planted have been catalpa, locust and Osage orange. This planting has been profitable, yielding good returns in a short period of years. Climatic conditions are more favorable for growth than in similar operations in the prairie region of the West. Values of land are high, and hence but small areas on farms in the best agricultural sections can be devoted to such planting. Interest in quick-growing species has been stimulated by co-operative assistance of the Agricultural Experiment Station. This has been done with the purpose of creating an interest in the planting of long-lived species for timber production and of encouraging care of woodlots.

‡ The following table gives the average returns from 12 catalpa plantations in 4 counties in Ohio, spacing and site conditions varying much. Their ages ranged from 18 to 28 years.

Number of posts per acre	2,710
Per cent first-class posts	70
Per cent second-class posts	30
Value per acre	$198.59
Average annual increase in value per acre	8.54

* Bull. 82, Report on Forest Conditions in Delaware. Delaware College Agricultural Experiment Station, Newark, Del., 1908.

† Report of the Maryland State Board of Forestry. 1910-11.

‡ Bull. 204, Forest Conditions in Ohio. Ohio Agricultural Experiment Station, Wooster, Ohio, 1909.

The greatest production was 4,780 posts per acre, value $412.80; average annual increase in value, $18.76. The lowest was 1,134 posts, value $97.24; average annual increase, $4.86. The ages of these stands were 22 and 20, respectively.

In southeastern and southern Ohio the topography is more hilly and much waste land is to be found. Planting can be done for commercial production and to hinder erosion on steep hillsides. Southwestern Pennsylvania, southeastern Ohio, West Virginia, Kentucky and Tennessee are underlain in part by bituminous coal. In the localities of the coal mining, the demand for mine props is great, and the local supply is diminishing rapidly in eastern Ohio and southwestern Pennsylvania. Planting of hardwoods, both rapid-growing and longer-lived, together with improved treatment of woodland, is essential to meet future demands. Some expermental planting indicates its commercial value.

Conditions found in southern Indiana are quite similar to those in the southern counties of Ohio. Woodlot management should be encouraged and planting confined to barren hillsides. The Forestry Department of the Ohio Experiment Station is furnishing planting stock for reforestation. The principal species in the Station nursery are white pine, red pine, Norway spruce, bald cypress, red oak, white ash and tulip poplar.

KENTUCKY AND TENNESSEE

THE plateaux and mountains of the eastern portion of these two States have extensive forests, and the problem is one of conservative management. All of our principal hardwood species are to be found in the region. To the west is the central highland region, in which the timber consists of woodlots, wooded slopes and ridges and woodland along streams.* According to R. C. Hall, 32 per cent of the area in this portion of Kentucky and Tennessee is wooded, the chief species being oaks, yellow poplar, beech, chestnut, hickory and red gum. He says: "Forest planting may sometimes be profitable in the central highland region, either to start a new stand or to replace one that has been ruined by heavy logging and repeated fires, or perhaps to utilize old fields and washed lands. On all typical old fields, except those with poorly drained or acid soils, white ash, red oak, and yellow poplar will be found the best trees to plant. On rich, fresh, and moist soil hardy catalpa will do well, and will also furnish a very durable wood. On poor, thin soils black locust is the only tree producing durable wood that will thrive."

The Nashville Basin and the Blue Grass region have 10 to 15 per cent of woodland. No commercial planting is required.

The Mississippi Valley region of Kentucky and Tennessee contains large bodies of forest, but the soils are mainly agricultural, and forest planting will never have much place in the development of this portion of the two States.

Other States

The hardwood region of the Lake States is agricultural in character. Like Ohio, it is a region of woodlots attached to farms. Reproduction is fair and

* American Forestry, Vol. XIX, No. 8, pp. 533-543.

well-managed woodland is a profitable adjunct to the farm. Planting is chiefly applicable to inferior lands, less valuable or unsuited for agriculture. As a State problem it is minor when contrasted with extensive areas in the northern forest region of the Lake States. Little planting has been done. Both conifers and hardwoods may be utilized. Experimental planting has been done both at the Michigan Agricultural College and at the University of Michigan.

Conditions in southern Illinois are like those of southern Indiana and Ohio, the problem of planting being the same. At present there is no opportunity for commercial planting in that portion of Missouri, Oklahoma and Arkansas occupied by hardwood forest.

SOUTHERN FOREST REGION

THE problem of forest planting in the South can best be considered under the heads of (1) the upland or Piedmont region; (2) the Atlantic and Gulf Coastal Plain, and (3) the semi-tropical region.

Upland or Piedmont Region

The conditions of the upper, or Piedmont, country extending from Virginia to northern Georgia and westward to the Mississippi River are in several essential points different from those of the coastal plain, comprising a strip approximately 100 miles wide along the shore of the Atlantic and Gulf.

The region is characterized by short-leaf pine forests mixed with oak and hickory, in contrast to the forests of the lower or coastal region, which are essentially of long-leaf and Cuban pine, with a mixture of loblolly pine. This difference is due mainly to climatic and soil conditions, which are dissimilar in the two regions.

The Piedmont, or short-leaf pine, belt comprises the tobacco lands of Virginia and the great cotton-producing region to the south. Throughout this whole region a marked change has taken place in the past 50 years in respect to natural seed regeneration. In former times abandoned fields seeded up fully and rapidly from adjacent seed trees, whereas at present practically all of the first or virgin stand has been cut and the second growth is too young or dense to produce normal seed crops. Abandoned fields are frequently overrun by grass, briars, or underbrush before sufficient pine seed enters. Natural reproduction is consequently much poorer than it was 20 to 50 years ago.

The region is everywhere hilly, and soil erosion due to surface run-off is often excessive and very destructive of the higher valued soils. Natural reforestation of pine, which would otherwise occur, is thus often prevented owing to the lightness of the seed. As a result, tracts of land are not infrequently taken by slow-growing hardwoods of slight or no commercial value. A real forestation problem in preventing excessive soil denudation is present. Furthermore, second-growth pine timber has had practically no stumpage value until within the past five or eight years, hence there was no financial incentive.

Protection to navigable stream courses and conservation of the soil on eroding slopes can best be accomplished by planting the native pines and other

commercially valuable forest species. The planting of several species of native pines and hardwoods on deforested and denuded tracts has been very successful during the past 20 years on the Vanderbilt estate near Biltmore, North Carolina. These trees have made vigorous growth and constitute the best proof of the feasibility of forest planting in the South. White pine and short-leaf pine, hard maple, red oak, cherry and other species have been planted either pure or in mixture. The Biltmore estate has approximately 4,000 acres planted with conifers, and 800 acres with hardwoods, a total of 4,800 acres. Planting has been very successful in soil protection, but financial results are yet to be determined.

Lands needing reforestation are not large in the aggregate. Planting is practical and being urged by the State Forester of North Carolina (Holmes) for:

(1) Utilizing abandoned fields, particularly reclaiming eroded fields. The latter is of considerable importance in the hilly uplands of central western parts of the Carolinas.
(2) Protection of watersheds supplying water for towns and cities.

The results to be obtained by such planting are:

1. Production of readily marketable timber, such as pulp wood, or even small saw timber, and material necessary for domestic use, such as fence posts and fire wood.
2. Utilization of otherwise unproductive land.
3. The improvement of land by the prevention of erosion and by the addition of plant food as by planting locust.
4. The protection of the headwaters of streams which are to be used for city water supplies.

There is really an incentive for private planting under these conditions. Short-leaf pine is the one species to be recommended for this region. It is readily handled by direct seed sowing, at a cost of about $4 per acre.

Old field stands in North Carolina yield 10,000 board feet in 30 to 40 years, and 20,000 feet in 45 to 55 years. On average quality sites a conservative calculation shows financial yields of 5 per cent gross, or 4 per cent net profit from plantations. Secondly, the planting of black locust for fence posts on idle or waste lands is practicable.

Private planting will probably not be on an intensive scale as in New England for at least 30 years or more. The State of North Carolina is furnishing advice to private owners in planting, in reference to suitable species, plant material, methods of planting and probable returns.

Coastal Plain

A large per cent of the Coastal Plain is forested, although there is very little virgin timber left and second growth mainly composes the forest cover.

Owing to the highly siliceous nature of the soil and lack of mineral plant food, the greater part of the land in the Coastal Plain is more valuable for timber production at the present time than for agricultural purposes. Natural reproduction is prolific, and when fires are excluded for a few years, the young trees reach a height out of danger of further fires. The region is characterized

by the long-leaf and loblolly pine flats and hardwood and cypress swamps. The forest problem is chiefly that of protection against fire.

In some instances where close logging and severe fires have left very few seed trees, if any, large tracts may have to be reforested. Loblolly pine grows vigorously throughout this coastal belt and appears to be very successful from direct seeding. The cost of restocking by direct seeding, exclusive of protection, will probably average about $4 per acre. Co-operative experiments started in March, 1912, indicate good results from loblolly and from maritime pines, although the warm winter of 1912-13 was not a satisfactory test for the latter species. Sufficient time has not elapsed to enable definite conclusions to be drawn from these reforesting experiments. The Forest Service has shown that maritime pine (*Pinus maritima*), the pine of the Landes of the western coast of France, is well adapted to central and northern Florida. Experiments are now being conducted to test its adaptability to the Atlantic Coastal Plain in South Carolina and in New Jersey.

Very little indeed is being done by the States, except the co-operative experiment by South Carolina, and general advice to private owners by North Carolina.

The Semi-Tropical Region

The semi-tropical region actually includes only the southern half of the peninsula of Florida, but, in its broader meaning, as used here, practically the whole State is included. The original forest cover included chiefly Cuban and long-leaf pines among its commercial species, and many small evergreen species of both broad leaf and conifers. Excessive cutting followed by fires, repeated almost annually, have largely reduced the forest cover on large areas to low brush with scattering trees. The soil is characteristically sandy and generally low in humus.

There is great need of reforesting, but the problem at present is the immediate need of adequate protection against fires.

The climate is sub-tropical, and some of the more exotic tree species of value commercially are well adapted to this climate. The cork oak (*Quercus suber*), yielding the commercial cork, the camphor tree (*Camphor officinalis*), and a considerable number of species of eucalyptus rank first in importance of the valuable exotic trees which have been found by test to thrive well in this region.

Eucalypts and camphor have been widely planted by private owners during the past quarter century for ornamental or shade purposes, although no commercial plantations are known to have been attempted prior to 1907.*

At the present time (1913) there is a very general interest among the settlers in central Florida as far south as Tampa in the forest planting of eucalypts as a present asset to their property from a landscape standpoint, and for future returns in wood of durable and useful qualities. It is impossible to estimate what financial returns may reasonably be expected owing to uncertainty of conditions, particularly market. There can hardly be any such local need of a heavy,

* Forest Service Bull. 87, "Eucalypts in Florida," by R. Zon. U. S. Department of Agriculture.

durable wood as exists in southern California, because of the favorable conditions in Florida for native forests of pine, oak, and cypress timber.

Eucalypts of many of the hardier species thrive well over all of the Florida peninsula, or north to about the parallel of 30° latitude. Growth is rapid and plantations will furnish large yields of durable wood suitable for ties and posts and of high heating value for fuel. Blue gum (*Eucalyptus globulus*), which is extensively planted in southern California, is not adapted to Florida, except the extreme southern end, on account of its susceptibility to the hard frosts which occur every few years. The most hardly and promising species for Florida are red gum, gray gum, manna gum, red mahogany, red gum tree, and swamp gum.

The camphor tree (*Camphor officinalis*) thrives on the better classes of land in all parts of Florida. If conservative methods of securing the resin for commercial purposes are used, the tree should be planted closely in hedge rows clipped for the by-product. If, however, the custom at present prevailing in Japan is followed, of utilizing the entire tree, the camphor may be shown to be suitable for extensive reforestation of badly denuded tracts.

The introduction of cork oak into Florida dates back many years, but the Forest Service in January, 1911, on the Florida National Forest near Pensacola, established the first forest plantation of cork oak in the State. The trees in two seasons from the acorn have reached an average height of 5 to 8 feet, outstripping the rate of growth of all native American oaks. In the unique properties of the bark and much wider climatic range, the cork oak probably has a much greater future commercially than the eucalypts. An experiment in reforesting the higher soils of the coastal plain of South Carolina is under progress by the State in co-operation with the Forest Service. The trees wintered well in 1912-13, and may be found to thrive that far north.

Maritime pine (*Pinus maritima*), the turpentine-producing pine, which the French successfully used in afforesting the sand dunes of the Landes in western France, grows thriftily in nearly all parts of Florida. The oldest plantations were started on the Florida National Forest in the spring of 1910, and the Forest Service now has between 150 and 200 acres of young forest of this pine. It is proposed to increase this acreage during the next two years to about 600 acres in order to make a thorough test of the rate and character of the growth during the first five or ten years, and of the practicability of extensive reforestation with this species. Several thousand acres of burns in the scrub pine forest region on the National Forest in eastern Florida could be converted from a waste area into forest producing high yields of turpentine. The Landes of France in 30 years rose from a value of less than $2 per acre to an average of about $200 per acre by the planting of maritime pine. The original cost of reforesting with maritime pine is probably the lowest in the United States, because of the very small cost of the seed, cheap labor, and the loose sandy character of the soil. In France pine stands are tapped at 25 to 40 years of age, and during the next 20 to 50 years of intermittent cupping yield large net revenues from turpentine and resin. Afterwards, the timber is logged and manufactured. The rapid, vigorous growth of the maritime pine and high resin productivity give it great superiority over the native long-leaf pine for use in artificial reforestation.

THE PRAIRIE REGION

THERE are better opportunities for commercial forest planting in the prairie region than in any other section of the United States except, possibly, New England. This is due, primarily, to the excellent market for fence posts, telephone poles, cordwood and other products. In most portions of the prairie region suitable sites can be found and there are a number of species which are hardy and of rapid growth, and well adapted to be grown on a short rotation for the products chiefly in demand in the region.

There are two general types of planting sites in the prairie region, namely, the Uplands, consisting of exposed, rolling prairies or plains, and the Lowlands, or the bottom lands and slopes of the valleys. The opportunity for commercial planting on the Uplands throughout the region is practically limited to wind-breaks and small groves around the farm-stead.

In general, the land is well adapted to farming and is too costly for profitable timber production, except where wind-break protection increases agricultural yields sufficiently to pay for narrow strips of land devoted to shelter belts. Single wind-breaks are less effective and less profitable than belts of deciduous trees 75 to 150 feet wide, or of conifers 50 to 75 feet wide. The direct financial returns from the products of wind-breaks and shelter belts vary widely, according to climatic and soil conditions, the species planted and the care given the plantation, especially during its earlier years. Recent investigations in Nebraska showed that wind-break protection from south winds increased the yield equal in amount to the yield of a strip from an area as long as the wind-break and twice as wide as the height of the trees. The trees in this case were 38 feet high; therefore, a strip of land 75 feet wide could be devoted to a shelter belt at no cost for the land, and the yield of timber from the area would be clear profit, which, in this instance, was $5.39 per acre per year.

In the Lowlands, the better conditions of soil moisture are more favorable to commercial planting than on the Uplands, except where the soil is extremely alkaline through seepage. Frequently there are areas in the Lowlands of considerable size which are not adapted to agriculture and are, consequently, low in price—as, for instance, steep bluffs and bottoms subject to frequent overflow. Accordingly, it is in the bottoms that we find the best opportunities for commercial forest planting on a large scale.

The species recommended for planting, the care of plantations and the returns differ considerably in various portions of the region. Details can be obtained for a particular region through numerous publications issued by the U. S. Department of Agriculture, or by the Agricultural Experiment Stations of the several States. Briefly, the Prairie Region consists of three principal divisions, viz:

The Northern Prairie Region, including eastern Montana, the Dakotas, southern and western Minnesota, and northern Iowa.

The Middle-West, including southeastern South Dakota, Iowa, Nebraska, Kansas, eastern Colorado, and western Illinois.

The Southern Plains, including western Oklahoma, southwestern Kansas, northwestern Texas, and eastern New Mexico.

The Northern Prairie Region

On the Uplands in the Northern Prairie Region there should be a shelter belt along the northern border of every 160-acre farm, another along the western border and two extending from north to south at intervals of 60 rods from the west side. The species recommended for the best soils are European larch, cottonwood, white willow, Scotch pine and western yellow pine. On poor soils or in very exposed situations, western yellow pine, Scotch pine, white spruce, green ash, white elm, hackberry, and box elder are the most desirable. Under-planting with Black Hill spruce or Colorado blue spruce 15 years after the shelter belt is established will be profitable, principally because it increases the efficiency of the wind-break. Mixed planting is recommended, although it must be done with caution; for pure planting, the use of conifers is advised. A spacing of 4 x 4 or 3 x 6 feet for conifers, 5 x 5 or 4 x 6 for the slower growing deciduous trees, and 6 x 6 feet for cottonwood is recommended. Thorough cultivation is necessary until the ground is entirely shaded. Every four or five years after the sixth or seventh year, the smaller and less promising trees should be cut out, but such thinnings should be very light, to prevent the growth of grass and weeds. The trees in the shelter belts will not seriously encroach on the adjoining cultivated land until they are 35 to 40 years old. At this time they will yield a large amount of material suitable for box boards, rough construction lumber, telephone poles, fence posts (for creosoting) and fuel. If the value of the land is not charged against the plantation, the annual return per acre will range from $5 to $15 per acre per year.

The Lowlands of the Northern Prairie Region offer excellent opportunities for forest planting for the production of fuel on account of the severe climate and the high price of fuels transported into the region. The deep porous soils of the Lowlands are well adapted to all of the species recommended for the Uplands. The best species for commercial planting in the Lowlands of the Northern Prairie Region are: cottonwood, European larch, Scotch pine, silver maple, white willow, Austrian pine and white pine. Cottonwood, on account of its rapid growth, high yield and great variety of uses is undoubtedly the tree best adapted to bottom lands, particularly overflow lands. On a rotation of 35 years cottonwood should yield at least 25,000 feet, board measure, per acre and, in addition, a considerable quantity of cordwood. A good quality of overflow land can be purchased at from $5 to $10 per acre; at this figure, the returns from planting cottonwood should be from 5 to 7 per cent, according to conditions. White willow and silver maple are also adapted to planting on overflow lands and will yield good returns if managed on 15 to 20 year rotation for fuel and fence posts. The average annual net return from eight groves of white willow for fence posts and fuel was $24 per acre, no interest on the investment being calculated. On the same basis, European larch and Scotch pine produce, respectively, a net annual return per acre of $11.93 and $13.35. For the production of fuel and fence posts for creosoting, a spacing of 4 x 4 to 5 x 5 feet is best. For cottonwood a spacing of 6 x 6 feet is recommended. Cultivation must be given until the ground is well shaded, except in particularly favorable locations on overflow lands when

it is sometimes not absolutely necessary, although at all times desirable. Thinnings should begin early and should be much heavier than on the Uplands.

The Middle West.

The best opportunities for commercial planting in the Prairie Region is in the eastern portion of the Middle West, on account of favorable climatic conditions and excellent markets. As in other portions of the Prairie Region, windbreaks and shelter belts will prove commercially profitable on practically every Upland farm because of greater agricultural yields. The best field for strictly commercial planting is offered in the production of fence posts and fuel, although low-priced, fertile bottom land can be used profitably for the production of ties, telephone poles and lumber.

The Uplands. Dual purpose trees for shelter and the production of fence posts and fuel recommended for the most fertile Upland soils of the eastern two-thirds of this region are hardy catalpa, European larch, cottonwood, Osage orange, while pine and white willow. Osage orange and hardy catalpa are not recommended for use north of Central Iowa. With the exception of Osage orange and hardy catalpa, fence posts of the species recommended for commercial planting will have to be creosoted. For sandy lands in the western part of the region the species recommended are Jack pine, Scotch pine, Western yellow pine and red cedar. On better soils in the extreme western part of the region honey locust, Russian mulberry, Osage orange, red cedar, western yellow pine, Austrian pine, Scotch pine, green ash and while elm are recommended.

In the Nebraska national forests western yellow pine has proved the best for the ridge and bottom types; Jack pine for south slopes and Scotch pine for north slopes. Austrian pine for ridges, south slopes and bottoms, and Norway pine for north shopes are still under test. On the Kansas national forest yellow pine is the most promising conifer for all sites with red fir and Jack pine not thoroughly proved, and Austrian pine under test. Of the hardwoods, green ash and cottonwood are the most hardy tried. Honey locust holds more promise than the black locust, Osage orange or walnut.

Lowlands. Throughout practically the entire region (except northern Iowa) hardy catalpa and Osage orange will prove profitable when grown for fence posts on well-drained, fertile bottomlands. For lumber, pulp-wood, box boards, staves, fence posts (creosoted) and fuel, the most profitable species is undoubtedly cottonwood; for fuel alone, white willow and silver maple. The three last named species will do well on overflow lands not adapted to agriculture. The returns from commercial planting of cottonwood for lumber from bottomland valued at $5 per acre is estimated at 7 per cent per annum.*

* "Cottonwood in the Mississippi Valley," Bulletin of the U. S. Department of Agriculture, No. 24.

ESTIMATE OF RETURNS FROM A COTTONWOOD PLANTATION.

Rotation 35 years. Yield per acre 29,000 ft. B. M.

Expenses Per Acre.

Interest on investment in land, 7% on $5	$48.38
Taxes, 2c on dollar, 0 first, $4 second, and $5 third decade	10.31
Preparation of site and cultivation of plantation $4.25, 35 years at 7%	45.60
Planting stock and planting $4, 35 years @ 7%	42.71
Total cost	$147.00
Returns—29,400 ft. B. M. @ $5 per M	$147.00

A recent study shows that the greatest returns from cottonwood for lumber production is obtained at the age of 35 years. Cottonwood is coming into favor for the manufacture of paper pulp. The greatest yield of peeled pulp wood per acre is at 13 years, when an average of 3.6 cords per acre per year may be expected, or a total of 47 cords. At 6% the returns from a cottonwood plantation on 13 years rotation for pulpwood are estimated as follows:

ESTIMATE OF RETURNS FROM A COTTONWOOD PLANTATION.

Expenses Per Acre.

Compound Interest on land, $50 per acre, 12 years, @ 6%	$50.60
Intial outlay (preparation of soil $2, stock $150, planting $2.50) $6.00, 12 years at 6%	12.07
Cultivation and pruning $4 per year (for 2 years) $8 @ 6%	15.62
Thinning 8 years $2, 4 years @ 6%	2.52
Taxes 2% on one-half value, 50c per year, 12 years 6%	8.43
Total Cost	$89.24
Returns 47 cords pulp wood at $2 per cord (stumpage)	$94.00

European larch, while pine, black walnut and black cherry, and in the southern portion of the region, Russian mulberry, may prove profitable in commercial plantations in the valleys. It is doubtful, however, whether any species but the cottonwood can be profitably grown on a long rotation for lumber production.

In forming plantations cultivation is essential during the first two to four years after planting. Spacing, in general, should not exceed a distance of 6 x 6 feet and should not be closer than 4 x 6 feet, according to the species used and the site conditions. Thinning should begin early and should be made every five years or oftener.

While the conditions in the Middle West are much more favorable than in either the northern or the southern prairie region, the profits in planting will depend very largely on the selection of the species, and the care which is given the plantation. The cost of establishing a plantation is secondary to choosing the right species and the proper site, since the success of the venture depends largely upon the rapidity of growth. It is evident, however, that the rental of

the land and the cost of planting must be kept within reasonable bounds, depending somewhat on the advantages which the site possesses in relation to transportation and market conditions.

The Southern Plains.

In the southern portion of the Prairie Region, the annual precipitation is so unevenly distributed, and wide areas suffer so frequently from prolonged drouth, that commercial forest planting is limited to favorable sites in the Lowlands. Great care must be exercised in the selection of planting sites and in the choice of species. Protective plantings are even more desirable than in the Northern regions, and will prove highly profitable from the protective standpoint alone. In this region there is practically no native timber to draw upon, and successful plantations for fuel and fence posts have proved to be highly profitable, although the returns varied greatly according to the conditions. Successful forest planting in this region where rainfall is light and irregular and evaporation great, depends very largely upon the proper tillage of the soil.

The Uplands. The southern and western sides of each quarter section should be protected by shelter belts from the dry southwest winds, with belts running east and west at intervals of from thirty to forty rods. Where very low windbreaks are used the distance between the hedges should be reduced.

In the more humid eastern portion of the region cottonwood, green ash, Russian mulberry, Osage orange and white elm will thrive. In certain sections the black locust is practically free from the destructive borers and makes an excellent growth on uplands, and is highly profitable for fence posts. It must be planted with caution, however.

In the very dry western portion of the region there are no species that can be depended upon to survive the occasional prolonged drouths, although dry farming methods of cultivation will do much to assure success. Osage orange appears to be a desirable species for this region, although it should be planted with caution until its adaptation to the particular planting site is determined. Trees of less commercial value which may be planted with a reasonable prospect of successful growth are green ash, red cedar, white elm, black locust, honey locust, Russian mulberry and western yellow pine.

The Lowlands. Better conditions of soil moisture are more favorable to commercial planting in the lowlands, except where the soil is extremely alkaline through seepage. Throughout the region, thorough cultivation for a long period is absolutely essestial to profitable growth, and the products from commercial plantations are apparently limited to fence posts and fuel, since lumber can be transported into the region more cheaply than it can be grown.

The most valuable species for plantations in the Lowlands of this region are hardy catalpa, Osage orange, black locust (in certain regions) and Russian mulberry. The prices of fence posts of these durable woods are such that net profits of from $20 to $25 per acre per year (not reckoning interest on investment) may be expected where the proper sites are chosen. However, with the success of creosoting assured there is a possibility that more rapid growing

species of woods adapted to the creosote treatment will prove more profitable. The species best suited for this purpose is cottonwood.

A mixture of species is advisable although with thorough cultivation this is not absolutely essential. The trees should be pruned during the first five years after the plantation is formed. A rotation of 20 years, with thinnings every three to five years, after the seventh or eighth year, appears advisable.

On account of greater expense for cultivation, plantations in this region, under the best conditions, cannot be expected to pay over 5 per cent on the investment, if all items of cost are figured at compound interest.

THE ROCKY MOUNTAIN REGION

THE Rocky Mountain region includes a large portion, or all, of Montana, Idaho, Wyoming, Colorado, Utah, Nevada, Arizona and New Mexico. In the valleys precipitation is insufficient to maintain forest growth. Under dry farming methods, wind-breaks may be grown in some of the wider non-irrigated valleys, where they are needed. This will be a distinct aid to agriculture, but cannot be regarded in any sense as a commercial venture. The irrigated lands are too valuable to be devoted to forest growth except to a very limited extent for shade and shelter.

There is an abundance of low-priced land in the mountains, not well adapted to grazing, that can be profitably used only for the production of forests. However, stumpage prices have not advanced sufficiently to warrant private capital engaging in commercial planting, particularly as planting methods are not yet sufficiently worked out to be certain of results, and the cost of planting is at present prohibitive. The large supply of easily accessible virgin timber means a slow advance in stumpage values, and in the future, government forests will undoubtedly help to maintain stumpage prices at figures too low to be considered by the ordinary investor as offering sufficient returns from planting.

There are many deforested watersheds near the larger centers of population in this region that should be reforested, on account of the necessity of conserving the water supplies and also because these waste lands should be producing revenue. All of the species adapted to planting in the region are of such slow growth, however,—requiring from 125 to 200 years or more for the production of saw timber,—that the returns from reforestation can be expected to pay only a very low per cent on the investment. Even under the best conditions it is not likely that more than 3 per cent on the investment can be obtained on any planting done at the present time, and under adverse conditions planting will be done at a loss. It is therefore a function of the government, both State and National, to finance planting enterprises in the Rocky Mountain region until such time as cheap and satisfactory planting methods have been developed and data is obtained that will justify private capital in investing.

On watersheds close to large cities where the transportation facilities are favorable and the markets for the products are the best, it will undoubtedly be profitable for municipalities to reforest the areas from which they draw their water supply. Municipalities can afford to have money invested for a long

period at a low rate, if direct financial returns are sure, and in addition the indirect value of the forest will make it a highly profitable form of investment to them.

In planting watersheds the sites adapted for planting, in order of their desirability, are:

(1) Recent Burns (non-restocking).
(2) Old non-restocking burns.
(3) Scrubby Aspen.
(4) Brush areas, oak, maple, cherry, etc.
(5) Sage brush.
(6) Open grassland.

Owing to its mountainous character and the variation in climatic conditions, it is advisable to consider the broad forest types of the region rather than geographic sub-divisions. The principal forest types in the Rocky Mountain region may be classified as (1) Alpine, (2) sub-Alpine, (3) Lodgepole pine, (4) Red fir, and (5) Yellow pine. The Alpine type comprises the timber line forest at the upper extremity of tree growth. The forests of this type have little or no value except for protection purposes. The sub-Alpine type is the uppermost zone of merchantable timber growth. The chief tree is Engelmann spruce. Growth is so very slow in this type that the returns from forest management are necessarily extremely low. Therefore, like the Alpine type the chief value is for protective purposes, and cannot be considered from the strictly commercial standpoint, since it is the duty of the government to manage such forests for the general welfare, even at a loss.

The Lodgepole pine type occupies chiefly the middle altitudinal zone. Lodgepole pine grows with fair rapidity and scientific management in this type will probably yield a small profit in localities close to good markets. The strip system appears to meet the silvical requirements in this type, although the ease with which natural regeneration is secured makes it practical to use the clear cutting system in many localities. Since 180 years may be regarded as an average rotation for the Lodgepole pine, even natural regeneration under the best conditions, offers little inducement to the average investor.

The Red fir type occupies the lower zone of timber growth in the Rockies, in association with the Yellow pine type, although extending to a somewhat higher altitude. Red fir is a tolerant tree and makes excellent growth on northern exposures, even near the lower limit of tree growth where the precipitation is very light. The wood is durable and has a wide range of uses for posts, mine timbers, ties, lumber, etc. Red fir grows more rapidly than Lodgepole pine and responds more quickly to management. It has been planted successfully by the Forest Service, and on the more favorable sites the seed has been sown successfully. For lumber purposes the red fir requires a rotation of about 150 to 200 years; for railroad ties and fence posts a rotation of 75 to 150 years is required. Near a good market and under exceptionally favorable conditions on a low-priced site, the planting of red fir on a short rotation may appeal to the investor, in the not distant future. However, at the present time, natural re-

generation of red fir, by either the selection system of management, or the single seed-tree method, is cheaper than planting, and secures satisfactory results. The cost of various methods of securing adequate reproduction of red fir is estimated as follows:

Planting, $10.25 per acre.
Seed spot sowing, $4.25 per acre.
Single seed tree method, $4.25 per acre.

The yellow pine type, next to the lodgepole, is the most extensive type in the Rocky Mountain region. Commercially, yellow pine is the most important lumber-producing tree of the Rocky Mountains. This species grows naturally under more unfavorable conditions of soil moisture than any other commercial species of the region. It is of fairly rapid growth and does well in plantations, and under very favorable conditions is successfully established by artificial seeding. However, it does not offer the possibilities for commercial planting in this region that are offered by red fir, and therefore its planting on a strictly commercial basis can only be done by the government.

It is possible that the planting of Western white pine in the northern Rocky Mountain region can be considered as a strictly commercial proposition on a par with other forms of long time investment. Commercial planting of white pine is restricted to a very small portion of the Rocky Mountain region, and it is only on very carefully selected sites and under exceptionally favorable conditions which have been fully determined by preliminary investigations that planting of even this species can be considered by any but governmental agencies. It is believed that a mixture of western white pine and western cedar will pay best in the white pine region, although the soil of the region,—owing to the greater annual precipitation in the northern Rocky Mountain region—is very productive and will produce high yields of any of the species which will grow there, including Douglas fir, larch, spruce, yellow pine and lodgepole. Protective plantings, as such, are scarcely needed in the white pine region, which is already well forested. The same is true of the fir-larch region. In the lodgepole region of Montana, however, watershed protection is desirable; for this purpose lodgepole pine is recommended.

The possibility of artificial reproduction in the white pine region is shown in the following estimates, based on data collected by the Forest Service, and compiled by Mr. D. T. Mason.

TABLE

Financial Aspects of Artificial Forestation.

The Lodgepole Region Compared with Other Regions.

Part 1.

REGION	Annual cost per acre administration and protection	Reforestation Cost of success in securing 1200 growing plants per acre	Yield per M. B. M. at 100 years average site	Present stumpage value per M. B. M.	Rate of interest actually earned
Montana—					
Lodgepole	5¢	$9.00	10.9	$3.00	1 %
Arizona—					
Yellow pine.....	3¢	10.00	6.0	3.00	4 %
Idaho—					
White pine.....	10¢	7.00	60.0	5.00	3½%

Part 2.

REGION	Interest rate	Total cost of production per acre	Cost of production per M. B. M.	Gross Money Yield	Net Money Yield per acre	To earn given rate of interest can afford to spend to plant	Figure to which stumpage must advance to earn interest rate stated in Column 1
Montana—							
Lodgepole -----	2%	80.80	7.42	32.70	48.10	2.36	7.42
	3%	203.20	18.62	32.70	170.50	.12	18.62
Arizona—							
Yellow pine----	2%	81.76	13.62	18.00	63.76	1.19	13.63
	3%	210.20	35.03	18.00	192.20	0.00	35.03
Idaho—							
White pine-----	2%	81.80	1.36	300.00	218.10	37.20	1.36
	3%	194.90	3.25	300.00	105.10	12.45	3.25

Part 3.

Results on a Million Acre Forest under above Conditions.
Rotation 100 years. Annually cut and reforest 10,000 acres.

TYPE NATIONAL FOREST	Total annual cost administration and protection	Total annual cost planting	Grand total annual cost	Gross annual revenue	Net annual revenue	Net annual revenue per acre
Montana—						
Lodgepole ----	$50,000	$90,000	$140,000	$327,000	$187,000	18.7¢
Arizona—						
Yellow pine---	30,000	100,000	130,000	180,000	50,000	5¢
Idaho—						
White pine----	100,000	70,000	170,000	3,000,000	2,830,000	2.83

In the planting work conducted by the Forest Service it has been found that it is not profitable to plant trees less than 3 years old, one year transplanted. The trees are closely spaced. The planting is done either in holes or by the "slit" method. After planting the trees receive no further care until thinning is required, except that sheep and other grazing animals are excluded from the areas and fires kept out. The cost of planting varies from $7 to $12 per acre for the large projects; on smaller ones it may be much greater.

In some sections excellent results have followed direct seeding, but success by this method is very variable. In the Rocky Mountain region wherever there are seed trees present, natural regeneration is cheaper than artificial regeneration. The only exception to this rule is in the lower forest zone where precipitation is very light, and it is extremely difficult to get adequate reproduction. This applies especially to the yellow pine type in the southern Rocky Mountains.

THE PACIFIC COAST REGION

Douglas Fir Type

PRACTICALLY all of the territory west of the Cascade Mountains in Oregon and Washington—the Coast Range, the bottom lands, the foothills, and lower western slopes of the Cascade Mountains—belongs to this type. It was originally, and much of it is still, covered with a solid and very dense forest consisting largely of Douglas fir. With it in greater or less

abundance are associated such commercially important species as western hemlock, western red cedar, Sitka spruce, amabilis fir, and grand fir. These species will occupy a minor place, and the management of Douglas fir receive first attention from the forester. This type is now being exploited by lumbermen more than any other type, and is sure to be for many years the most active lumber manufacturing district in the country.

A good deal of the land originally occupied by the heavy forests of this type has been cleared for agricultural use, and still more will be. But there yet remains an enormous area, possibly 10,000,000 acres, in western Oregon and Washington, which is ultimate forest land, i. e., it is too steep, or too stony, to be worth clearing. This area has tremendous possibilities for timber producton, and it is a most important public duty to see that this ultimate forest land be kept perpetually at its maximum degree of forest productivity.

About a third of the ultimate forest land of this type is under the control of the Federal Government and the balance is in the ownership of lumber companies, both large and small, railroads, and individuals. The future of this great region, therefore, devolves quite largely upon the private owner. It is to be expected that the area controlled by the Federal Government will be kept forested so as to produce the maximum amount of forest crops perpetually.

In this region there is an abundance of wood for domestic uses on farms; there is no particular occasion for artificial wind-breaks and shelter belts, and there is no afforestation of naturally treeless land to do. The problem, therefore, is merely to reforest in the best possible fashion the ultimate forest land, as fast as the virgin timber is removed by fire or logging, with a view solely to timber production.

The exigencies of logging with donkey engines in the Douglas fir type are such that some form of clean cutting is quite essential, and this system fits in well with the requirements of the species for an opportunity to germinate in the open on a mineral seed bed, and to develop a pure, even-aged stand. Clean cutting is practiced, therefore, in cutting in this type and usually the slash is burned afterward.

On the private lands now being logged no attention is paid to securing a second crop, and the land is usually abandoned to fire and brush. Sometimes it becomes reforested from solitary cull trees which were left standing, or from adjacent green timber; often it is run over by a second or third fire which effectually prevents it from restocking. On the National Forests this type is so cut as to assure its reforestation by natural means.

All things considered, natural regeneration seems to be preferable to artificial, wherever it can be practiced. Under the following conditions, however, it cannot be used successfully and artificial methods are indicated.

"1. In very decadent stands, where the Douglas fir is past the seed-bearing age and the forest is given over to hemlock, grand fir, and other secondary species not desired in the next crop, artificial methods must be resorted to in order to secure a second crop of the desired species, Douglas fir. A good many such stands exist in western Washington.

"2. In areas where seed trees are very liable to be wind-thrown if left solitary, it is wisdom to artificially reforest rather than to run a large risk of losing the seed trees before they have seeded up the area. Such areas are not common, but they do occur on certain kinds of soil and in certain exposed situations.

"3. Where *all* the trees in the stand are sound and high grade, and where *every* tree has a high merchantable value, it may be economically more profitable to log every tree and artificially restock the areas than to leave trees of high merchantable value as seed trees. Such a condition as this is rare in the Northwest.

"4. Where it is important to secure a cover at once and it is not policy to wait even a year for the natural reproduction, as on a city watershed, or where the competition of brush is feared, or where erosion is to be guarded against, some method of artificial reforestation, preferably planting, must be resorted to."*

Although reforestation may be accomplished by seed sowing in spots at an average cost of $4.25 per acre, planting is a much surer method. Direct seeding is uncertain and chances for failure are great.

Planting can be done in the most favorably situated localities in such a way as to be successful for $8.50 per acre, but the cost will be greater when the transportation charges for plants and labor are high. The cost per acre on an average accessible tract in this locality will be about as follows, assuming that 681 trees are planted per acre—i. e., that they are spaced 8 feet by 8 feet, the spacing now used on the National Forests:

	Per thousand plants	Per acre 8x8 feet
Nursery-grown 1-1 transplants ready for shipment	$4.00	$2.72
Transportation, nursery to planting site	.75	.51
Labor of planting	7.00	4.77
Supervision	1.25	.85
Total	$13.00	$8.85

"The practicability of planting is, of course, contingent upon the possibility of securing plants. For large operators or for the Forest Service, which raises its own trees, the cost of the trees is lower than it would be for the small operator who has but a small tract to reforest each year and must buy his planting stock of a commercial nursery, and must run the risk of not being able to get any locally grown nursery stock when he wants it."*

Douglas fir will ordinarily be used pure, except in special cases where it is desirable to use some red cedar, Sitka spruce, white pine or noble fir with it.

In addition to the cut-over areas that require artificial reforestation, there are burns in this type, denuded by severe crown fires, that need artificial treatment. Douglas fir shows a remarkable ability to re-establish a stand after fire, but it is chiefly the second or third fire at short intervals on the same ground that makes artificial planting necessary. The burns will be reforested in the same method that is applicable on cut-over land. It is usually best to plant up a burn

* "Natural vs. Artificial Regeneration in the Douglas Fir Region of the Pacific Coast," by Thornton T. Munger. "Proceedings of the Society of American Foresters," VII, 2.

as soon as possible, before the brush, which might be a handicap to the plants and to the planting operations, becomes rank.

Though there seems to be a well-nigh inexhaustible supply of virgin timber in the Douglas fir region, and present stumpage prices are very low, yet the field is very attractive to the forester and commercial planting will undoubtedly be profitable, provided a reasonable rise in the value of stumpage is assumed. The following table† indicates the yields of merchantable material that can be expected from the better classes of forest soil in this region (only trees over 12 inches in diameter being included.

Age, Years.	*Feet B. M. per acre.*
50	28,000
60	41,000
70	51,700
80	61,100
90	70,300
100	79,800
110	90,300
120	101,500
130	113,000

A rotation of 60 to 100 years should produce timber of fair size for general purposes, and an even shorter rotation will give good round timber in abundance. The longer rotation would probably be used by the government, while the shortest practicable period would be chosen by the private owner. Periodic thinnings are possible and practicable, provided market conditions are satisfactory, in Douglas fir stands from the time they are 35 or 40 years old.

The following table, quoted from "Practical Forestry in the Pacific Northwest," by Mr. E. T. Allen, is a useful guide in determining the profits from the growing of Douglas fir. It is prepared from the yield table above allowing five extra years, to make it conservative, for the stand to become established:

	Cost per M of growing Douglas fir resulting from every $1 per acre originally invested		Cost per M of growing Douglas fir resulting from every 1 cent per acre of annual carrying charge	
	At the end of		At the end of	
	60 years	80 years	60 years	80 years
At 4%	$0.30	$0.41	$0.068	$0.098
At 5%	.53	.88	.101	.172
At 6%	.94	1.87	.152	.309

If the original investment is $10.00 per acre ($7.50 for the planting and $2.50 for the land), and the annual carrying charges are 10 cents an acre, this plantation would have cost its owner at the end of 60 years $6.31 per M feet if he figures his investment at 5% ($ .53 x 10 + $ .101 x 10). Hence if he can sell his crop at the end of 60 years, and there is no doubt that he could, for $6.31 per thousand, he would make 5% on his investment, and in addition have the land and the returns from the periodic thinnings.

† From Forest Service Circular 175.

The Sugar Pine Type

This is the characteristic type of central and northern California and extreme southern Oregon on the Sierra Mountains, on the Coast Range, and on the cross ranges, and comprises the important timber zone where the moisture and temperature are favorable to a coniferous forest. Not excepting the redwood type it is the timber type of California. Its distinctive component is sugar pine, which occupies from 15% to 50% of the stand. With the sugar pine are found in an exceedingly irregular mixture, western yellow pine, Jeffrey pine, incense cedar, Douglas fir, white fir, and several other species.

Its forests are usually uneven-aged, rather open, and rather brushy. Except for a somewhat different exterior appearance due to the prevalence of sugar pine and incense cedar, the forest resembles strongly the yellow pine type in its silvical characteristics and requirements, and at its geographic limits and on all dry situations within its range it grades into this type imperceptibly.

A considerable proportion of this type, certainly a half of it, lies within the National Forests. The remainder is under private control.

The silvicultural management of the sugar pine type will be very similar to that used for the yellow pine type, i. e., a selection method of cutting with natural reproduction. Ordinarily artificial reforestation will not be necessary in the management of this type, even as an auxiliary to Nature, except on badly deforested burns.

The burns, which are the only field for artificial reforestation in this type, present a difficult problem to the forester on account of the brush or "mock-chaparral" with which they are covered. The brush fields, of which there are in need of reclamation in northern California and southern Oregon, certainly 200,000 acres, are the result of repeated fires which have successively decreased the chances of natural reproduction and increased the density of the brush. There are so many difficulties in reforesting this type that the only method which promises real success is the planting of nursery-grown stock.

This is rather a slow-growing type, probably not exceeding at best 250 board feet per acre per year. Planting, therefore, for the purpose of growing timber would not be a profitable investment for private capital under present economic conditions; artificial reforestation in this type will be practiced only by the government in order to restore waste areas to productivity.

Western Yellow Pine Type

This is one of the most widespread timber types in the country, and in addition to being found in the drier Pacific Coast forests it occurs throughout the Rocky Mountain States. In the Pacific Coast region proper it occurs on the east slopes of the Cascade Mountains in Oregon and Washington, on the interior mountain ranges of these States, on the drier exposures within the white pine region of northern Idaho, and on the California mountains on situations too hot and dry for the sugar pine type. On the east slope of the Cascades it forms a solid belt of timber with an altitudinal breadth of 1,500 feet or so, extending

from the desert, or "dry timber line" to the upper slopes, where it gives way to the fir type.

This yellow pine type is the important commercial type within its range, for yellow pine is one of the most useful of the western conifers. In places the stand is practically pure western yellow pine over large areas; in other places there is a varying amount of Douglas fir, lodgepole pine, white fir, grand fir, western larch, and incense cedar. Usually the forest is very uneven-aged, and an abundance of seedlings and saplings, in groups, fills up the gaps in the loose canopy of the older trees. This type occupies a region in which the climate is unfavorable to most tree species and in which growth is ordinarily slow even for yellow pine.

Some of the land within this type is agricultural, but the majority of it is so dry or so cold, or so rocky, or so steep that it should remain forested perpetually and be one of the Nation's sources of lumber. Possibly a half of this type in the Pacific Coast region is within public ownership in the National Forests and Indian Reservations. Most of the rest is held by large lumber companies, and a little is held as a part of ranches or woodlots.

The method of silviculture which is indicated for this yellow pine type, and which is now being put into practice with good success on the National Forests, is a selection method of cutting. As in the sugar pine type, there is practically no occasion to use any method of artificial reforestation in the yellow pine type proper, for the selection method of cutting meets so nicely the silvical requirements of the tree. This type, moreover, is singularly free from disastrous fires, so that seldom is so large an area devasted that it does not become reforested naturally.

Land Bordering the Yellow Pine Type

In the naturally treeless land of central Washington and Oregon, bordering the yellow pine belt, is a ranching region. Here small blocks of trees are very desirable to supply fuel, posts, etc., for local use, to act as wind-breaks, and for their scenic effect. These shelter belts, or woodlots, must be located where they may be irrigated or sub-irrigated, for the climate is usually too dry to grow trees without artificial help. Severe winters and occasional late frosts compel the use of fairly hardy trees. The only practicable method of starting these plantations is by planting nursery-grown stock (or cuttings, in the case of poplars and willows). The spacing will, of course, depend upon the object of the owner and the species to be used. For wind-breaks it would not be wider than 4 x 4 feet, while for fuel purposes with rapid-growing species it might be as wide as 7 x 7 feet. The climate is so variable in this region that the choice of species must be decided locally. In general, frost-hardy, drought-resistant, rapid-growing hardwoods only are desirable. The following seem to meet the requirements of the region—if they can be watered enough to get a start—green ash, box-elder, various species of poplars, black cherry, white willow, white elm, and red oak. In the warmer parts of the Pacific Coast region in southern California, eucalyptus will be used. The usefulness of such planting is very evident, but the profit cannot be estimated. Returns will depend greatly upon local site conditions.

Redwood Type

Though geographically a small and local type, the redwood forest must be considered separately, for it is economically very important and silvically is unlike any of the other types of the country. It occupies a narrow strip along the California coast north of Monterey County and within the "fog belt," i. e., within 25 miles or so of the shore line. Redwood trees which reach a diameter of 5 to 15 feet and sometimes a height of over 300 feet, dominate the stand, though on slopes particularly such species as tanbark oak, white fir, Douglas fir, and western hemlock are numerous.

Redwood produces a good all-purpose wood of ready merchantability. Its stands are extremely heavy and offer an attractive field for the lumberman in spite of the difficulties of handling the giant trees. Logging has been in progress in this type for many years and quite a proportion of the virgin forest has been cut over. A good deal of the original forest land in this type is suitable for farming and will in time be cleared for cultivation or pasturage, but much of it is too steep for agricultural use and should be kept forested. Practically all of the redwood type is in private ownership and most of it is in the hands of large lumber companies. The future of this type, therefore, depends upon the care given it by these private owners.

The customary method of logging redwood is extremely destructive of the forest and leaves it in very bad condition for natural regeneration. After the trees are all felled, the area is burned over by a hot slash fire. The logs are then bucked and hauled out by donkey engines. This process kills most of the young trees, and subsequent uncontrolled slash fires are apt to kill any reproduction that might start later. A very few companies are cutting their timber conservatively and protecting the cut-over land with a view to securing subsequent crops of timber.

Redwood is one of the few conifers that coppice from the stump, and its sprouts are vigorous and will mature into good trees. This characteristic is the key to the forester's management of this type. If logging methods can be modified and fires controlled, the regeneration of the forest after logging can be secured in this way by natural means at low cost. In some stands, however, the original redwood trees are so scattered that the sprouts would be too wide spaced to make a good quality of second growth.

Artificial means, therefore, are in such cases necessary to fill in the gaps. This will be done by planting nursery-grown trees. Redwood is probably the most desirable of any of the native trees for this purpose; one lumber company is using eucalyptus. The number of trees to be planted and the cost of the work will depend wholly upon the number of sprouts already present.

There are also cut-over areas within the redwood type which have been so completely denuded by logging and fire that they must be reforested artificially in order to bring them back to productive condition. Eucalyptus is suggested for this purpose, but it cannot be said yet whether it will be ultimately successful or not.

In "Practical Forestry in the Pacific Northwest," Mr. E. T. Allen says of the

redwood type: "Government studies on the northern California coast prove conclusively, however, that this is our most rapid growing native commercial tree. In thirty years, on fair soil, it will produce a tree 16 inches in diameter, 80 feet high, and some 45-year-old stands run 20 to 30 inches on the stump, and about 100 feet high. There is little question of the profit of growing redwood provided the difficulties described elsewhere of getting a dense crop started are overcome." Conservative forest management in this type by any reasonably cheap method of natural or artificial reforestation should be financially profitable to the private owner assuming that the value of stumpage will constantly increase. Second crops of redwood should be of good size for the sawmill in 50 years, and if eucalyptus can be successfully grown on these lands the new forest would be merchantable in even shorter time.

Western White Pine Type.

Most of northern Idaho and adjoining small portions of the States of Washington and Montana on the west side of the Continental Divide are occupied by the white pine forest region, and about a half of this area belongs to the white pine type. This forest type occupies the lower slopes of the mountains, which, with its humid and rather mild climate, is pre-eminently adapted to the growth of western white pine. This tree is perhaps the most valuable of the important western conifers, and its propagation will therefore control the forest management in this region. It forms in the virgin woods at least 50% of the stand over large areas, though it is by no means everywhere the dominant tree. Douglas fir, western larch, western red cedar, Engelmann spruce, western hemlock, lodgepole pine, and western yellow pine all occur in greater or less abundance in this region, and on the drier sites a mixture of larch, yellow pine, and Douglas fir takes the place of the white pine type proper.

The white pine forests are usually rather dense, rather uneven-aged, and are composed of trees of medium size. The climate is favorable, and hence growth is rapid, as in the Douglas fir type west of the Cascades.

Quite a large proportion of this type is on land which will eventually be cleared for agricultural use, but a good deal of it, especially most of that within the National Forests, is ultimate forest land. Probably over half of it falls within the National Forests, and the rest is privately owned, except for a few hundred thousand acres within an Idaho State Forest. This region is now the scene of very active logging operations, and it will undoubtedly always be an important timber producing district. This region has the capacity to produce such a large quantity of high value timber that here intensive forest management should be profitable to the individual owner (i. e., the large, stable companies that are in business for an indefinite time), as well as to the government.

Artificial reforestation should be used to supplement natural, and is required for burned lands of which there is a considerable area. The method of artificial reforestation recommended for white pine is like that for the Pacific Coast types—planting of nursery-grown stock. Direct seeding has been so unsuccessful as not to be advisable, and one of the chief causes for its failure seems to be the high mortality the first year during the hot, dry weather.

White pine is the species recommended for general use wherever it naturally reaches good development. With it should be planted a 25% to 50% mixture of other trees as fillers and for an understory—western larch, Engelmann spruces, and western red cedar—since white pine is too intolerant to do well in an absolutely pure stand. The white pine and larch stock should be either 1—2 or 2—1 transplants, while the Engelmann spruce and red cedar should be 2—1. A spacing of 8 x 8 feet is probably ideal for this type when both cost and silvicultural results are considered. If 60% of the plants are white pine and the balance of the other species there would be 408 white pines per acre. An estimate of the cost of establishing such a plantation of mixed species is as follows:

	Per thousand plants	Per acre 8 x 8 feet
Nursery stock ready for shipment, mixed species	$4.25	$2.89
Transportation, nursery to planting site	.50	.34
Labor of planting	6.50	4.42
Supervision	1.25	.85
Total	$12.50	$8.50

It is estimated that this white pine land is capable of producing at least 600 board feet per acre per year. The length of rotation necessary to give timber of a fair commercial size is 120 years, so that plantations made now should yield 75,000 board feet after 120 years. Thinnings would, of course, yield returns somewhat sooner. But even at the relatively large initial cost of planting, the planting of white pine on ultimate forest land is a profitable investment for a long-term concern, when it is considered that its stumpage is steadily and rapidly rising in value. This is one of the few forest types of the West of which this may be said.

The volume growth of white pine stands is probably somewhat less than that in the Douglas fir type, but its wood is of higher value. Therefore the monetary yield from the white pine type should be comparable with that from the Douglas fir type. The tables showing the cost of growing Douglas fir may be used also to determine the profit in growing white pine.

Fir Type

The upper slopes of both sides of the Cascade Mountains of Oregon and Washington, the upper slopes of the Sierra Mountains of California above the zonal ranges of the commercial sugar pine forests, and the upper slopes of the Blue Mountains of eastern Oregon, are occupied by a forest which may be called the fir type, because it consists largely of various species of Abies—A. nobilis, amabilis, concolor, lasiocarpa, shastensis, and magnifica.

Practically all the land embraced within the exterior limits of this type was originally and still is forested. Since the most of it lies above the highest climatic contour at which agriculture can be practiced successfully, this type is practically all ultimate forest land. For this reason it is of the greatest economic importance.

Denuded burned lands require reforestation and planting may be occasionally practicable after logging in the place of natural reproduction. Growth is slow in this type and initial cost of reforestation large, hence planting cannot be considered financially profitable. Its chief importance rests upon the necessity of protecting the flow of important streams.

Sub-Alpine Type

There is no commercial forest planting in this type. It is purely a protective forest composed principally of lodgepole pine, Alpine fir, mountain hemlock and white bark pine. It occurs on the high mountains throughout the Pacific Coast region above the fir type and the zone of timber of commercial size.

Afforestation of Treeless Land with Eucalypts

Most of southern California and a considerable proportion of the low-altitude valleys of northern California are naturally treeless, yet these regions, particularly southern California, are very much in need of trees for several purposes—for timber, for fuel, posts, poles, ties, and lumber; for watershed protection on the mountain sides, for wind-breaks, and for scenic effects about ranches. The problem here, therefore, is the afforestation of desert lands, and it is a problem which has baffled foresters for a number of years and which is still far from being satisfactorily settled. There are several types of treeless land in this great region—chaparral-covered mountain sides at both high and low altitudes, almost vegetationless desert plateaux, and deep-soiled valley land, both irrigable and non-irrigable. No one method of afforestation is, of course, applicable to all these types of land, and care must be exercised to apply the proper treatment on each tract.

The small annual precipitation, its great irregularity, the heat and dryness of the atmosphere, all combine to make the operation of afforestation extremely difficult here. To attain success good judgment in the choice of species and methods and care in the selection of the planting stock are essential. Eucalyptus has been the favorite genus to use in this region in the past few years, and its merits have been advertised widely by commercial real estate and nursery companies. Phenomenal yields have been ascribed to it, and its hardiness and adaptability have been much exaggerated.

At low altitudes throughout California, various species of eucalyptus are planted for shade and ornament, and in southern California are a good many thousand acres of commercial woodlots and of wind-breaks, chiefly of blue gum (*E. globulus*). Eucalyptus planting in California is therefore by no means wholly in the experimental stage. The question is on what sites and under what conditions is it practicable and profitable, and what methods should be used.

First, it may be said that eucalyptus should not be planted where a temperature below 26° F. is experienced, or, to be still safer, where 30° F. is the minimum. Eucalyptus is really successfully planted only where it can be cultivated or irrigated at the start, except possibly in the humid coastal belt or in sub-irrigated valleys. Where it is not irrigated, the water table must be within 12

feet of the surface. This limits the range for commercial planting in arid regions practically to agricultural or semi-agricultural areas. It is a mistake to believe that successful plantations can be established on dry rocky mountain sides. The planting of such sites and of the chaparral-covered slopes has usually met with failure, after repeated attempts with a variety of species.

Even after a favorable site for planting is found, the establishment of the plantation requires more skill and money and consequent care than an ordinary coniferous plantation in a forested region.

Methods: The only method of establishing a plantation is by planting nursery-grown stock. Direct seeding is entirely out of the question. Since many species of eucalypts are good sprouters, subsequent crops will start from the coppice sprouts, so that a plantation, once established, may be kept forested indefinitely.

It is best to grow the plants in seed boxes or flats for a few weeks until they are about two inches tall, then transplant them to individual pots in which they are left for a few months more. They will then be 5 to 7 inches tall, but may be set out in the planting site without disturbing their root systems. This method of pot planting implies that the nursery is close to the planting site. Where it is not, the plants will be transplanted in the nursery in the usual manner.

A year before the field planting is done, it is very desirable to plow the area to get the soil in good condition for the plants. The setting of the trees is done in the usual manner after danger of frost is over and when the ground is moist between January and April. A spacing of 8 x 8 feet is usual for woodlot planting, and 4 x 4 feet in a double row for wind-breaks. The plantation should be cultivated during its first year, as any agricultural crop is, so that it may survive until the roots reach subsoil moisture, and so that it may not be handicapped by weeds. In woodlot plantations Monterey cypress is often used with eucalyptus with good success; otherwise the plantations are usually pure.

Species: There are hundreds of species of eucalypts, but of these five are particularly worthy of attention by the forester in this region—the blue gum (*E. globulus*), sugar gum (*E. corynocalyx*), red gum (*E. rostrata*), grey gum (*E. tereticornus*), and manna gum (*E. viminalis*). "Whenever the selection of species lies between blue and sugar gum, the kind of product desired and the amount of soil moisture present must determine the choice. If firewood, piles, or dimension stuff is desired, the blue gum should be selected, especially if there is no marked deficiency of soil moisture. If poles, ties, or a wood of unusual durability and strength is desired, the sugar gum should be chosen, particularly if the situation is rather arid. The sugar gum is the more drought-resistant, but the blue gum is the more rapid growing. Outside the planting range of the blue and sugar gums, the red gum commends itself, owing to its frost hardiness and the durability of its timber. In frosty or swampy locations it should receive first preference. The uses of its product are limited, however, by the fact that it is inclined to a crooked, brushy form. It is of rapid growth, and furnishes a product which is very durable in contact with the soil. The grey gum is equally rapid in growth, but is somewhat less frost hardy than the red. It grows in good

form, especially in plantations, and furnishes a very durable timber. Manna gum grows very rapidly, but it is hardly worthy of consideration, since it is but slightly more frost hardy than the sugar and blue gums, while its timber is inferior to that of either species."*

Yields and Returns: On proper sites there can be no doubt of the profitableness of commercial eucalyptus planting, contingent, of course, upon a reasonable initial investment for land and planting, intelligent management, and accessibility to market. Areas suitable for eucalyptus planting, that is, near transportation and where the minimum temperature is not less than 24° F., can be purchased for about $30 per acre. The cost of preparing an acre of ground for planting does not ordinarily exceed $6. Seedlings can be purchased for $6 per thousand. The planting of 1,000 trees (enough for an acre) costs about $4. The cost of cultivating and caring for a plantation for two years does not usually exceed $7 per acre, including the purchase of trees to fill blanks in the plantation. Any thinnings made up to the time of the first cutting should pay for themselves. The cost of establishing a plantation and carrying it through the first two years, excluding the cost of land, is therefore about $23 per acre.

Taxes on the class of land used for growing blue gum amount to about 30 cents per acre per year. Ten cents per acre per year should be expended in protection from fire. These two items represent a fixed annual charge per acre for the 10-year period before the first cutting. Discounted at 4 per cent, this amounts to a present investment of about $3.25 per acre. The total investment involved in establishing 1 acre of plantation is, therefore, about $56.25.

Actual measurements show that an average yield of about 6.4 standard cords, or 8.5 California cords, per acre is produced by the best blue gum groves in the State. Individual groves have occasionally done better. One grove was found which produced 185.9 standard cords in 25 years, or about 7.4 cords per year. Another produced over 59 cords in nine years, or nearly 6.6 cords per year. On the other hand, three groves under average conditions, with fair soil and the water table not more than 25 feet from the surface, show an annual growth per acre of only 4.05, 3.9, and 3.7 cords, respectively. Under unfavorable conditions, with a deep water table or with hardpan near the surface, the annual growth in two cases has been as low as 1.6 cords and 1.1 cords per acre. An annual yield of 6.4 cords per acre, or 64 cords per acre in 10 years, may therefore be accepted as a fair estimate of what may be obtained upon the best sites under the methods of management heretofore used.

Assuming a stumpage price of $2.50 per standard cord, this yield would return $160 in 10 years from the wood alone. This represents nearly 13% compound interest on the original investment of $56.25. Out of that amount $30, the cost of the land, may be considered as restored to the investor with the harvesting of the crop, and is, in effect, an additional return.

Since blue gum sprouts rapidly, the same return of 64 cords, worth $160, should be obtained periodically at the end of every 10 years for at least several

* "Handbook for Eucalyptus Planters," by G. B. Lull, Circular 2, California State Board of Forestry.

rotations. In this case, however, no additional expenditure is necessary for establishing or caring for the plantation. The amount invested is, therefore, $33.25 ($30 for land and $3.25 for capitalized taxes and protection). A return of slightly more than 19% would thus be realized in growing each of the sprout crops following the first, or planted, crop. This is assuming that the value of the land remains unchanged and that this amount is re-invested periodically after each crop is harvested.

In the figures just given it is assumed also that the operation is handled by the individual investor on an area large enough to be managed economically. This should be not less than 50 acres.*

Eucalyptus planting has not solved the problem of the afforestation of the treeless southern California hills, as the more optimistic hoped it would. No tree is superior to the eucalypts for the better class of arid land. The unfavorable chapparal-covered hillsides, however, which have so far resisted all attempts to reforest them with eucalypts and with conifers must probably long remain forestless.

THE DISCUSSION ON THE REPORT OF THE SUB-COMMITTEE ON FOREST PLANTING

THE Chairman: The very admirable report presents an exceedingly important question, analyzing, as it does, the situation and making it clear that forestry is not all planting as it used to be thought.

Professor J. W. Toumey, of Connecticut: What has interested me the most in recent years has been the growing tendency for the artificial establishment of forests by corporations and municipal organizations, where I think there is a great outlook in the future. Even in the State of Connecticut, a public corporation, the New Haven Water Committee, has nearly 10,000 acres of land, and that company is planting some 3,000 trees a year. The whole forest is organized, and it is a sufficiently large body of land that it can be maintained as a working circle and handled progressively with somebody in charge of it. The Hartford Water Company has a forest which protects its water shed, which is an admirable illustration of what can be done in the artificial establishment of forests. The water company of the city of Bridgeport has several thousand acres.

In the aggregate, these public corporations, water companies and municipal organizations which control the water sheds from which they derive their water, are going to be, in the near future, an enormous factor in the East, and it is going to extend elsewhere. Those are the people who will promote the regeneration of forests, and it seems to me almost better than any other body of men, except where it is done by the State and by the nation.

Furthermore, as expressed in the report, there is a great need for the different States to undertake systematic reforestation of certain portions of those States that are absolutely non-productive at the present time. For instance, where a State like Connecticut, I am bringing these things down to the specific cases, can put up a million dollars to build good roads, it can put up some money to improve waste lands, and where Connecticut will now put up $1,000,000 to build State roads and only $2,000 to improve her forests, that is entirely out of proportion. What Connecticut ought to do and what the other Eastern States ought to do is to put up money, not by $2,000 and $1,000 and $3,000 amounts, but by $50,000

* "Yield and Return of Blue Gum in California," by T. D. Woodbury. Forest Service Circular 210.

and $100,000 amounts. The thing that we want at the present time is these Eastern States particularly is to have a definite notion in each State of what is potential forest land and what is potential agricultural land.

Mr. Alfred Gaskill, of New Jersey: It is literally a crying shame that we cannot develop, whether through plantations or through remnants—I prefer the latter in most cases—the maintenance of forest remnants as parks to serve our cities and communities. I might go a step farther and ask Professor Toumey if he would seriously advocate any organization unit in this country deliberately spending money, raising it by bond issue or in whatever way you please, for the establishment of a forest plantation or even any investment in a discarded forest property. To my mind, municipal financing to invest public money in such a project would be very questionable. Lots of people would come back to us and say this: You say, by your admission, you cannot make two or three per cent on that and we can put our money in plenty of things. That is only by way of a little illustration, but there is something behind it.

The thing that I really have in mind is the application of this planting idea to specific conditions. I feel pretty strongly that in a large part of our forestry work it is a good thing and will apply generally, but when it comes to a question of forest planting, I want to know specifically whether—I do not care whether it is a public corporation or private individual—there is enough behind it that is material, or whether it is purely sentimental, to justify the undertaking; if there is, go ahead. If it is simply a question of forest planting, I do not think we have made quite enough discrimination with respect to the kinds of trees to be planted, having in mind our local conditions and our market. I think there is a disposition amongst all of us to fly to what is natural, to put in more and more things that are thoroughly at home, or else to fly to the other extreme and try experiments.

Mr. Elwood Wilson, of Canada: Mr. Chairman, for the last eight years I have been face to face with this problem of whether commercial reforestation was a profitable thing, and there is at least one branch of industry using wood as a raw material which must come around to the point of view of reforestation and that is the pulp and paper industry. The quantities used are so large, and the areas which are covered in order to get the necessary amount of raw material are so immense, that the time will inevitably come when the mere harvesting and delivery of the crop to the mill will be more than the product will justify. After very careful consideration, and some experimenting, I am convinced that it will pay the paper companies and pulp companies to plant up their own forests, and, briefly, for these reasons: In the first place, those companies are always situated where water power is cheap; they are generally in an out of the way place where surrounding lands can be picked up at small prices. The result is that by careful planting and laying out plantations, a great many things can be taken care of which will ultimately lessen the cost of the product. For instance, if you buy lands reasonably near your mill, you decrease wonderfully your drive costs, the cost of getting your material to the mill, you decrease the cost of floor products, you decrease the cost of administration and you decrease the cost of lumbering, because you do not have to carry your provisions so far, you do not have to depend on any specific time of the year for your cutting and you are much more able to easily get labor. We have undertaken—of course it is only in embryo as yet—to lay out sections of land and plant them, with the specific idea of harvesting crops in the future. We are planting so as to be near the mill, planting so as to be near the streams where it is necessary, and I am fully convinced that as the prices of timber rise, and the need for wood becomes more and more acute, that all of the pulp and paper companies will be driven or forced into planting for their own protection. They have large investments in wood, it is the only thing

they use, and in all probability it will be the only thing they will use for years, and they will have to plant up waste lands for those purposes.

Mr. Philip W. Ayres, of New Hampshire: Mr. Chairman, before we adjourn I want to make one spontaneous suggestion. It seems to me that we represent the forestry industries of the various States throughout the United States, and we have our Canadian friends with us. We are happy in having this meeting presided over by you, and we are glad we are here with you, as we feel you are doing a great big work, that you are not afraid of things because they are big and that you are not afraid of them when they do not yield return, and in discouraging times we want you to feel that we are with you. (Applause.)

Others who participated in the discussion of this report were: Mr. S. B. Elliott, of Pennsylvania; Professor William R. Lazenby, of Ohio; Mr. N. P. Wheeler, of Pennsylvania.

ESTABLISHING PRINCIPLES OF FRAMING, PASSING AND ENFORCING A STATE FOREST LAW

By the Sub-Committee on State Forest Policy.

Chairman, William T. Cox, St. Paul, Minn.

F. A. Elliott, Salem, Ore.
C. R. Pettis, Albany, N. Y.
H. H. Chapman, New Haven, Conn.
J. E. Rhodes, Chicago, Ill.

Presented by Mr. William T. Cox, Monday Afternoon, November 17, 1913.

THE preliminary report of your committee has been recast along somewhat different lines, in order that it may meet the criticisms made and perhaps furnish a broader working basis. Most of the criticisms were based on legal construction, or on methods. To avoid debate on such matters, which necessarily differ for different States, it has been deemed advisable to treat the subject in three parts or divisions, setting forth the principles involved in each part, and showing by a brief discussion, the relation of these principles one to another. The model State forest law contains much detailed information that should be of valuable assistance in actually framing a law, and it is submitted as an appendix to this report.

Part I.

FRAMING A FOREST LAW

THE established principles in framing a law naturally fall under three headings: The principles on which a forest law should be based, the principles determining the form of organization, and the principles determining the effectiveness of the law and organization.

Principles on Which a Forest Law Should Be Based.

The State is interested in all forests, public or private, and should have a voice in the matter of handling even private forest lands, because the forest is a limited natural resource which must be cared for and maintained continuously for the public welfare, and because the individual has but a passing interest in it.

Protection of Forests.

The first thought of a forester is for the protection of existing forests, and under the heading of protection we can properly group the measures which may be taken to insure against direct loss the mature forests and such timber resources as are being provided through natural conditions.

Protection from fire is of chief importance, and second comes protection from attacks of insects and fungi. There are other phases of forestry work, protective in a certain sense, but logically, and for the sake of convenience, they can be grouped under the head of maintenance of timber supply. The first basic principle of a forest law is forest protection.

Maintenance of Timber Supply.

The second principle is *to establish a timber supply on a permanent basis.* To accomplish this purpose, work must naturally begin with a *classification of the land,* determining as closely as possible what lands are agricultural in character and what lands are non-agricultural and should therefore be devoted to the growing of timber. This classification should be carried out by the State irrespective of the ownership of the land classified. Theoretically, this work should precede attempts at reforestation, afforestation, application of silvicultural methods of cutting, attempts to equalize the tax on timber and timberlands, or State ownership of lands used for forestry purposes. However, in practice it has been found expedient to develop forestry work along such of these lines as the public understands and is ready to accept. Nevertheless, non-agricultural lands must be determined, and the classification agreed to by the people, before one can consider forestry as established on a permanent footing in the State.

Reforestation should be carried on by the State not only on its own lands devoted to forestry purposes, but also in cooperation with private owners. The part which the State should play in its cooperation should be commensurate with the interest which the State has in maintaining the timber supply. The same may also be said of *afforestation,* but in the majority of cases this work will be State cooperation in woodlot and windbreak planting.

The application of silvicultural methods to logging operations is one of the chief factors in establishing and maintaining the greatest timber supply. The proper method of brush disposal approaches in a degree to a silvicultural method, although such disposal may be considered chiefly as a fire protective measure. This has been practically accepted as a regular part of logging throughout the northern half of the United States; and it is but a small step in advance on the part of the State to require the leaving of a certain number of sturdy, thrifty seed trees on every acre of non-agricultural land logged, or, where this method is not practicable, the State might require the timber to be removed in a series of two or three cuttings, so as to insure the renewal of a forest on lands which can be used only for tree growth. Or, for some States, the best cutting method might be to require the logger to replace the trees cut, by planting an equal or larger number of desirable species. The State's interest in the forest is paramount to the interest of all others, and if it is to properly guard the public welfare some such means of perpetuating the timber supply must be used.

Under the *system of taxation* of timber and timber lands which is in practice in most of the States at the present time, the application of silvicultural methods to logging would undoubtedly work somewhat of a hardship on the lumbermen. The tax is not equitable, and no forest law is complete unless it makes some provision for correcting the plan of taxation which is used in most of the States. On account of the long time involved in growing a timber crop on forest land, the tax is really on the annual increment of the forest, but the amount of the tax is based on the entire stand. The law should provide for taxing the timber crop on the basis of its value when cut, and there should be a tax also, as a matter of expediency, on the forest land itself.

The *purchase of non-agricultural land by the State* naturally follows as a means of utilizing such forest lands as probably will not be handled by private corporations, by protecting the headwaters of navigable streams, by providing public recreation grounds, and by putting into practice the forestry methods which it advocates.

PRINCIPLES DETERMINING THE FORM OF ORGANIZATION FOR FORESTRY WORK.

The form of administrative departments of the several States is based on principles derived from the English or French systems of government, or from our own Federal system. For use in State administration these principles are modified in various ways, often to such an extent that their original purpose may be lost. In framing a law, the form of organization should provide for accurate, skillful, economical and efficient consummation of the principles which are the purposes of the law.

The Governing Body to be Removed from Direct Responsibility to Political Parties.

To carry out the basic principles for which forestry stands, the organization must be free from direct responsibility to political parties. More than any other administrative department of the State, the forestry work should be free from interruption and disorganization arising from the change in political and personal administration of the State. While it is, perhaps, necessary that the administration of forestry matters should be responsive to the will of the people, it is very essential that they should not be subject to the whims and ill-advised action which is sometimes taken by a State Legislature. No continuous and progressive forest policy can be carried out in a State where such interference may arise, and it would be far better if the organization of the forestry department were almost entirely removed from responsibility to the will of the people, as is the case with our judiciary at the present time.

Civil Service.

To further safeguard the continuity of the forest policy, civil service regulations should govern in the employment of practically all grades of officers in the forestry department. The advantages of having civil service requirements are obvious.

Representation of Groups of Industries Directly and Indirectly Concerned with Forestry. (Ex-officio.)

It has been the custom to assign the administration of forestry matters in the State to a board or commission. It frequently happens that the men who are appointed to these boards or commissions have little or no knowledge of the work which is assigned to their care, and often the appointment is conferred on them for political or personal favors. As a result, the executive in charge of the real work of the department may be hampered by their periodic attempts to grasp the details of the work and to prescribe the course of procedure. The law should provide for a board or commission, the members of which are directly concerned with the welfare of the forests. These men should be ex-officio members of the forestry board or commission. To illustrate, it should consist of the head of the forest school, if there is one in the State, the head of the agricultural college, and the secertary or similar officer of the State lumbermen's associations. These officers represent the main considerations in forestry, but there might be additional members, representing the fish and game protective association, and the agricultural, forestry and water power associations. The membership of the board should not exceed five in number. The executive head of the department, with such a board, would have the benefit of their advice on matters of policy. This method of making up the governing body will practically eliminate the risk of having the organization disrupted or the board's policy radically changed by a legislature which may act hastily and without full consideration.

Provision for an Executive Head Who is Fitted by Training and Experience.

Having provided for the make-up and personnel of the governing body or commission, the next step is to require the board to select an executive head who is fitted by training and experience for handling the State forestry work.

Provision for Ample Discretionary Power.

The law should give the executive head or forester ample discretionary power. It is important that this power should be in the hands of the forester, because of the practical impossibility of framing into law the detailed forms and methods of administrative procedure. The State legislatures invariably attempt to eliminate discretionary power in the administrative offices by piling up legislative provisions and enactments covering all phases of all lines of work. We all know of cases where this tendency has resulted in seriously handicapping effective administrative work. In the framing of a new law and the organization of a new department, it is very essential that details should be left to the executive and after he has had time and opportunity to prepare and work out the methods of procedure they can, if necessary, be readily incorporated as part of the law.

Provision for Delegating Discretionary Power.

For the same reason that legislatures do not commonly delegate discretionary power to the administrative officers of the State, the tendency is to limit the executive when it comes to delegating such power to subordinate officers. His authority to do this should not be limited, for obvious reasons.

Provision for an Efficient Field Organization.

An efficient field organization should be made possible by the law. This may be insured in part by the personnel of the forestry board, by the enactment of civil service requirements, and by the qualifications required in the State forester, upon whose judgment the selection of the right kind of men will rest.

Provision for Settling Controversies as a Part of the Administrative Work.

In all administrative work there are controversies arising over the interpretation of certain provisions of the law, or the enforcement of regulations prescribed by the forester in pursuance with his authority under the law to prescribe such regulations. This is distinctly a judicial function, but nevertheless the function in such cases is subordinate to administration, and therefore comes in as one phase of administrative work. The law should provide that decisions by the forester or forestry board on matters which do not obviously come within the jurisdiction of the court should be final. This form of procedure is quite largely followed even now, although no direct reference to it may be found in the statutes. The administrative officer will consult the office of the attorney general of the State when in doubt, and be guided by his advice.

PRINCIPLES DETERMINING THE EFFECTIVENESS OF THE ORGANIZATION.

Having outlined in the law the principles on which forestry work is based, and the form of organization to carry out these principles, its effectiveness will depend, in the first place, upon the *funds* which are appropriated for the work. Its effectiveness will also depend in a large degree on the *efficiency of the force,* the proper *equipment* of the force, and such *permanent improvements* as telephone lines, trails and canoe routes as it may be possible to provide. There must also be provision for the prompt punishment of violators of the law. Great care should be taken in wording such provisions, in order that action may be quickly taken and penalties duly administered. The field officers of the department should have *police power,* in order not only that violators of the law may be brought to justice, but also that they may with due authority take steps to prevent the loss or destruction of property in their care or within their jurisdiction.

SUMMARY OF PART I.

Principles on Which a Forest Law Should Be Based.

The State is interested in all forests, public or private, and should have a voice in the manner of handling even private forest land, because it is a limited natural resource which must be maintained continuously for the public welfare, and because the individual has but a passing interest in the forest.

1. Protection of forests.
   Fire protection by State and by cooperation.
   Diseases and *insects.*

2. Maintenance of timber supply.
   Classification of land.
   Reforestation.

Afforestation.
Silvicultural methods.
Taxation.
State ownership.

Principles Determining the Form of Organization for Forestry Work.

1. The governing body to be removed from direct responsibility to political parties.
2. Civil service.
3. Representation of groups of industries directly and indirectly concerned with forestry. (Ex-officio.)
4. Provision for an executive head who is fitted by training and experience.
5. Provision for ample discretionary power.
6. Provision for delegating discretionary power.
7. Provision for an efficient field organization.
8. Provision for settling controversies as a part of the administrative work.

Principles Determining Effectiveness of the Organization.

1. An adequate fund.
2. An efficient force (Equipment and Permanent Improvements).
3. Prompt and effective penal provisions.
4. Police power.

PART II.

PASSING A FOREST LAW

EVERYBODY is interested one way or another in forestry. Despite this fact, it is not an easy matter to get a legislature to enact good forest laws. In a State where there is much forest there will be a lumbering industry. Through the representation coming from lumbering districts a great deal can be accomplished, for they want the timber protected from fire. Legislators representing farming districts are interested in tree planting, and from that viewpoint may be induced to favor a comprehensive forest law. Sportsmen generally understand the importance of the forest in serving as game cover, and may be counted upon to lend their aid toward proper conservation of forests through enacting a suitable law. Women's Federation Clubs and similar organizations. and all who have or want summer homes by wooded lakes, are natural friends of good forestry bills and may be enlisted in efforts to get proper legislative action.

In conducting a campaign looking toward the passage of any forest law, the first essential is the proper advertising of the proposed legislation, setting forth in detail the results it proposes to obtain.

As all laws are passed with a definite object in view, it is natural that any law pertaining to forestry will emanate from some person or persons who are interested in the preservation of the forests. This interest may be for different reasons, and this fact must be borne in mind and the several viewpoints given careful consideration.

The preparation of a forestry bill or any part of it should be performed by a committee composed, if possible, of the various interests affected, if such a bill should become a law. Therefore, the first step, and a very important one.

should be to call a meeting of interested persons and appoint from their number a live executive committee. Too much care cannot be given to the appointment of such a committee, as upon it will fall the framing, advertising and the representation before legislative committees of the desired legislation.

There should, if possible, be represented on this excutive committee, foresters, agriculturists, lumbermen, railroad officials and sportsmen, all of whom have a direct interest in their particular line in the preservation of the forests.

Expert legal talent, the favorable expression of the press and the public, and the services of some person or persons familiar with legislative committee work, will all be necessary to secure the passage of a forest law.

Before any proposed law is given publicity, its constitutionality should be given careful consideration. The principles which the law is to follow and the form of expressing these principles and methods to make them effective should be in quite definite form before presentation to the public.

The power of the press, and the encouragement and formation of associations and societies whose object is the furtherance of a forest conservation policy, are factors that are of the highest importance and should be used to their fullest extent.

Carefully written articles appearing in the newspapers will tend not only to give publicity, but will also call forth an expression of opinion which may be favorable or the reverse. Such an expression will show better, perhaps, than any other way, just how public opinion stands with regard to the proposed law. A classified list of individuals interested in one phase or another of forestry, provides a means of getting results from direct appeals to them. There is no better means for gauging the public sentiment and keeping its active support.

In the compilation of any article or pamphlet pertaining to the desired legislation, the writer should endeavor to cover his subject in all its phases. The fact that our lumber industry would be in some measure affected, would immediately arouse the interest of lumbermen. Sportsmen should be considered, as they realize better, perhaps, than any one else, the importance of a forest cover for the perpetuation of a game and fish supply. Women's clubs and similar organizations, and all who have or want summer homes by forest-sheltered lakes, are natural friends of good forestry bills, and they are always willing to do all they can to secure proper legislative action.

The existence of a State forestry association or similar organization, offers an excellent opportunity to place the proposed legislation before the public and the legislators. The efforts of such an organization need not be confined to meetings or conventions only, but should be enlarged to cover such work as the issuance of a magazine devoted to forestry. If this forestry association is affiliated to some other society, numerically stronger, and arrangements are made for dual membership, a commensurate amount of support will be gained.

In some States, sportsmen have founded what are known as Game Protective Associations, whose members, apart from the excitement of the hunt, are seeking the forests and streams for relaxation from business worries. These clubmen, as a rule, are broad-minded, and their support can always be depended on when any good forestry measures are pending.

In States where a Forest Service is already in operation, the personnel comprising it will affect new legislation to a marked degree. It is not intended to convey that their political associations will be responsible for this, but rather the results they have obtained by the forest law, the provisions of which it has been their duty to enforce.

Advantage should be taken of any special days usually set aside by proclamation of the governor, such as Arbor and Fire Prevention Days. The issuance on these days of topical literature is advisable. This might take the form of pamphlets and be distributed in the schools. To reach the parents through the school children is one way, and a mighty convincing one, of getting the information where you need it.

After all this preparatory work has been performed, the actual presentation and discussion of the bill by the legislative committees is in order.

In all States, there is bound to be a majority of the members of the legislature representing districts which will be directly affected by the proposed law. It should, therefore, be an easy matter to secure their attention, and, provided the measures proposed are right, their support.

The presentation of actual facts and figures to legislators is necessary, if the desired law lends itself to that kind of demonstration. This matter should be handled by one whom, for the want of a better name, we shall call a "lobbyist." He must be prepared to debate the measure, and must be thoroughly posted on forest statistics, if the bill is purely forestry, and, if prairie protection with a view to reforestation or the promotion of woodlots is contemplated, he must also be in a position to explain the requirements in that direction. The introduction of statements by disinterested enthusiasts who might be recruited from such organizations as game protective associations will carry much weight.

When the bill is to come before the legislature, it is a wise provision to circulate information among the members, so that each and every one can be acquainted with the purposes of it. Having progressed thus far with the proposed law, it is up to the law-makers to do the rest, and, almost invariably, if the publicity and information work has been well done, the results are favorable.

Part III.

ENFORCING STATE FOREST LAW

HAVING provided by law for the general plan of organization, it remains to determine in what way its various parts will operate. The formal character of a law does not clearly show how its various parts will work out. Its real character is determined not only by the operation of these parts, but also by its operation in conjunction with laws with which it is supposed to act. These laws often have more influence than the parts of the law which are supposed to regulate its action. These are factors in splitting up the administration of a law into more or less separate and distinct branches. There is still another factor which has a tendency in the same direction, and this is the maintenance of the administrative organization in proper relation with the legislative body.

In a broad sense, the principles of enforcing a law are administrative, and administration, naturally, separates into three methods of executing the will of the State. These are:

1. Enforcing the law.
2. Reducing administrative processes to rules, which later may become or have the effect of statutes.
3. Deciding controversies.

Enforcing the Law.

The enforcing of the law has to do merely with the execution of the State will as expressed by the statute. The need for enforcing it arises when there is opposition, and in case of resistance, force must be met with force. The forest law or other laws provide the means, and the officers may follow the prescribed steps in handling the cases. If a law cannot be enforced, and if it represents the State's will, sufficient local opposition must be won over by educative means so that the purpose of the law may be accomplished.

Since the legislative body, which gives expression to the State will, must have control over the administrative body, and since this control should be extended only so far as is necessary to produce harmony between the making and enforcement of the law—that is, expression and execution of the State will—it is of great moment that the administrative body do its part to maintain harmony. If the legislative body extends its control too far, *e. g.,* seeks to perpetuate the existence of a particular party organization, it really hinders instead of aids the expression of the public will, and hampers its execution. On the other hand, if the administrative body overrides the State will in the enforcement of a law in a too arbitrary and summary manner, then there is a counter-action which may at least restrict the administrative authority within narrow limits and hamper its efficiency.

To bring about the desired harmony, there must be the fullest cooperation between the administrative force and the public, because in the execution of the law the public passes final judgment on its expression; *i. e.,* the people decide whether it is a good or a bad law. It is only when the public is in sympathy with a law that it can be enforced, and to enforce it arbitrarily against a community is certain to result in friction. This will ultimately have its effect on the legislative body, and tend to bring about an extension of legislative control beyond what is desirable.

Because our people know as little about forestry as yet, cooperation should at first be along educational lines. When a man has been shown just how the law benefits his own particular interests, as well as the interest of the State at large, he will be ready to assist in enforcing it. No individual, firm or corporation is without some direct interest in the perpetuation of the forest and the chief duty of the executive officer in enforcing a forest law is to show how this law will benefit the various industries. Having done this much, he must go beyond and develop means whereby their interest shall take the form of active cooperation. The importance of cooperation is clear. How far it can be attained depends upon the executive officer and the administrative force.

Reducing Administrative Processes to Rules.

When first put upon the statute books, a forest law will seldom be specific enough for complete administration. The details or processes of executing the law must be left to the executive. This is particularly necessary in the case of a forest law, because conditions vary so widely, both as to the character of work to be done and the methods of doing it. These processes of administration which thus arise to supplement the established factors for executing the law, become in practice as effective as the law itself.

Deciding Controversies.

Settling controversies is a part of the executive work of increasing importance; but there is a wide difference in the different States in the matter of handling controversies, which are on the border-line between administrative and judicial functions. Since the forestry movement in this country is comparatively new, there is even more difficulty in determining to what extent the final settlement of controversies may be left to the excutive head. In its present state of development, therefore, it will be advisable to keep well within the limits of executive duties in the matter of settling or adjudicating controversies. The courts can be relied upon to handle the more complex problems and such violations of the law or of regulations devised by the administrative authority by direction of the law as require summary or drastic action.

APPENDIX

MODEL FOR A STATE FOREST LAW

SEC. 1. STATE BOARD OF FORESTRY.—(The advancement of forestry is impossible unless this work is entirely free from political influence and in the hands of trained foresters. The experience of several states has indicated that this result may be attained in the following way): There shall be created a state board of forestry, composed of five members (not over seven). The president (or dean) of the state college of agriculture and the director of the state college (or department) of forestry (or the professor of forestry at the state college) shall be members ex officio. Of the other three (or five) members one shall be nominated by the Lumber Manufacturers' Association (or most representative association of lumber interests), one by the states ——— association (the association best representing fish and game protection or park and forest protection) and one by the ——— association (any other strong state association representing interests affected by forestry). Upon receiving the nominations of these associations the governor shall appoint the said nominees as members of the State Forestry Commission, and in absence of authoritative nomination he shall nevertheless make the appointments of the required number to complete the board. (On boards of seven men the governor may be allowed to appoint two or one member of his own choice.) The members shall serve for a term of four years

* Owing to lack of time to print it a very full and complete model State Forest Law prepared by the Committee could not be used with this report and this shorter model law prepared by two members of the Committee was substituted.

(or longer) (and the law should provide, in case of nominated members, that the terms of the individual members overlap to prevent the replacement of more than one or two members at one time). The board shall serve without salary, but shall be allowed their traveling and office expenses in performance of their official duties. The board shall elect its own chairman and may, if deemed necessary, elect an executive committee and delegate to them such authority over administrative details as will facilitate the transaction of business. The chairman shall hold office for one year and until his successor is elected.

SEC. 2. MEETINGS.—The board shall meet at intervals of three months upon a day determined by them and at other times when called together by notice from the chairman or upon the request of (———) members.

SEC. 3. APPOINTMENT OF STATE FORESTER.—The State Forestry Board shall appoint (or employ) a State Forester (the governor is, under no circumstances, to make this appointment), who shall act as secretary of the board (unless multiplicity of work makes it advisable to employ a secretary in addition to the forester). (The State Forester shall *not* be a member *of the board.*) He shall be a technically trained forester, a graduate of a forest school which offers entire four years' undergraduate or two years' post-graduate course in forestry, and shall have had (at least two and preferably five) years' experience in the practice of forestry, lumbering, or other practical subjects. His salary shall be ($2,500 to $4,000) per year. The forester shall serve at the option of the State Forestry Board (since this board is free from political influence; experience has indicated that it is unnecessary to prescribe a term of office or other civil-service requirements for the State Forester). He shall be furnished with suitable offices (at the state capital) and allowed all reasonable traveling expenses.

SEC. 4. EXECUTIVE AND CLERICAL SERVICE OF FORESTER'S OFFICE.—The State Forester shall, subject to the confirmation of the board, appoint an Assistant State Forester (or Assistant State Foresters), who shall be graduates of forest schools of the same standard as required for the State Forester and shall, subject to the confirmation of the board, determine their compensation. They shall be allowed reasonable traveling expenses while in the performance of their duty.

The State Forester shall, subject to the confirmation of the board, employ such clerical assistance as is necessary to perform the duties imposed by this act, including the auditing of fire accounts, and shall determine their compensation.

SEC. 5. FOREST FIRE SERVICE.—The State Forester shall divide the area of the state (or the forested area) into districts (the number to be determined by the appropriations available for salaries and the size of the area to be protected) and appoint over each a district ranger (or superintendent), who shall have entire charge of the enforcement of the forestry laws in his district and shall be responsible to the State Forester. The Forester may remove him at any time and appoint his successor. (Should there be danger that either the board or the Forester would be actuated by political motives in making such appointments, it would be better for such rangers to receive appointments as a result of competitive civil-service examinations and hold office during good behavior. But a

fire-fighting force should be chosen on merit and capacity to fight fire and handle men, and the above arrangement, in proper hands, is preferable.)

The district ranger shall select and, subject to the confirmation of the State Forester, appoint rangers (patrolmen) and assign them to definite subdistricts. District rangers and patrolmen shall receive ($50 to $150) per month and expenses while traveling on state business. (These men are employed on an annual or monthly basis.)

To supplement the state ranger force thus created the governing body of each organized town (township supervisors, etc.) shall appoint a town fire warden, subject to the approval of the State Forester (or District Ranger). The State Forester shall have the power to remove the town fire warden and request the township board to appoint a successor. On failure of said board to appoint a fire warden or fill a vacancy created in any manner, when requested to do so by the State Forester, the Forester shall make said appointment. (The nomination of existing town officials as fire wardens is a complete failure.) The town fire warden shall, with the advice of the district ranger, divide his town into divisions and shall appoint a division fire warden in charge of each of these divisions, subject to the approval of the district fire warden. Town fire wardens shall serve for one year and until their successor is appointed. District fire wardens shall serve during the term of office of the town warden by whom they were appointed. The town warden shall have power, subject to the approval of the district warden, to remove any division fire warden and appoint his successor. Town and division fire wardens shall be paid by the town for services actually rendered (and, in addition, shall receive an annual salary of $10 to $25). (In organized districts these town wardens shall be replaced by the appointment by the district warden of local residents as fire wardens. The purpose of the town and local warden force is that of a resident or stationary patrol, since in no instance will it be advisable even to attempt to handle the fire problem exclusively by the employment of rangers and patrolmen on state salaries. In sparsely inhabited regions, with private cooperation in funds and men, patrol may be developed to a point where it will take care of the problem. In most regions stationary or local wardens should be appointed in numbers twenty to fifty times as great as the force of state rangers.)

SEC. 6. POWERS AND DUTIES OF STATE FORESTER AND SUBORDINATES.—1. The State Forester, and during his absence the Assistant State Forester, shall have direct charge of, and be held responsible by the board for the execution of, all work assigned to him by them, together with the enforcement of all laws or rules contained in this article.

3. He shall purchase necessary equipment for forest fire prevention or extinguishment as may be required.

4. He shall prepare, print, post, or distribute necessary posters, pamphlets, or circulars as public interest requires.

5. He shall construct, equip, maintain, and operate any lookout mountain stations, telephone lines, or other structures as may be established by order of the board.

6. He shall have necessary power to enter into agreements with private owners or public telephone companies with regard to establishing or operating any portion of the forest fire protective system.

7. He shall have authority to construct new roads, trails, or other routes or improve existing ones in order to secure necessary fire protection.

8. He shall establish, operate, and maintain nurseries for the production of trees either for reforesting state or privately owned lands. Such trees may be planted on such parts of the forest preserve as may be necessary, supplied free to state institutions or sold to private owners at not to exceed cost of production.

9. He shall have the power to make investigations in any part of the state and examine into any question in regard to forest, conditions, reforestation, fire protection, growth of timber.

10. He shall have the power to make necessary surveys, prepare maps, and otherwise determine boundaries of any lands constituting the forest preserves.

11. He may assign any assistant to the preparation of publications, lecturing, or otherwise disseminating information in regard to forestry which will be of public interest.

12. He shall enforce all laws in relation to forest preserves and the other provisions of this act.

13. The forest rangers, district forest rangers, foresters, inspectors, or employes of this department shall perform such duties as may be assigned to him by the State Forester, and all such officers shall be responsible to the State Forester for faithful performance of their duties.

SEC. 7. POWERS OF FIRE SERVICE.—State rangers and patrolmen (and town fire wardens) shall have the power to arrest without a warrant anyone detected in the act of violating any provision of the State Forest Law or the rules and regulations of the State Forestry Board and take such person before a peace officer having jurisdiction.

State rangers and patrolmen (and town fire wardens) shall have power to summon any able-bodied male person and to requisition teams, tools, or other property of such forms to assist in extinguishing any forest fire. Any person who fails to obey such summons, or fails to remain at any such fire until excused, or does not render faithful service, shall be liable to a penalty of ($10 to $25) for each and every day during which he fails to obey such summons. Any such officer in order to suppress fires shall have the power to enter upon any lands and take the proper steps to extinguish the same, and for so doing no action of trespass or damage shall lie.

Any official authorized to extinguish fire shall have the authority to employ men and teams and to make any other reasonable expenditure for that purpose. Employees shall receive (15 to 25 cents) per hour for time actually employed.

SEC. 8. STATE FOREST RESERVES.—State forest reserves shall consist of lands now owned by the state, which may be classified as State Forest Reserves, and of other lands which may be acquired hereafter for forest reserves.

The State Forestry Board shall have power to purchase lands (at a maximum valuation of ——— per acre), to accept gifts of land, or to acquire land by condemnation proceedings for the purpose of state forest reserves.

The Board shall have authority to sell such timber, under such rules and regulations as to cutting, as the best utilization and perpetuation of the forest demand.

The Board shall have power to provide for the full realization of all the resources of the forest reserves for the best interests of the public. Such resources shall include grazing when not incompatible with forest growth, mining, rights of way, development of water power, camping privileges, and all other uses.

The Board shall have power to formulate rules and regulations to govern the use of the resources of the state forest reserves, protect them from damage, preserve their productiveness, prevent waste, and secure to the fullest extent the objects for which they were established.

Any rule so made shall have the effect of law after being recorded in the office of the secretary of state and published in not less than two newspapers having a rural circulation in the locality for not less than two weeks.

The State Forester shall be the executive officer of the State Forestry Board and shall have direct charge of the State Forest Reserves, enforce all rules and regulations, employ all necessary assistance, and carry out all directions of the Board with respect to the management of State Forest Reserves, the enforcement of fire laws and other forestry laws, and all other matters over which the Board has jurisdiction.

SEC. 9. FINANCES.—There shall be created a State Forest Fire Fund, for which purpose there shall be annually appropriated ——— dollars. This sum shall be used to pay the salaries and expenses of enforcing the state fire law, including the salaries of state rangers and patrolmen. Any surplus unexpended at the close of the fiscal year shall remain available for one year succeeding as an emergency fund for payment of expenses incurred in fire fighting, after which it shall be credited to the Forest Reserve Fund.

There shall be created a State Forest Reserve Fund, for which purpose there shall be annually appropriated ——— dollars. This sum shall be used for the purchase of lands to be added to the State Forest Reserves and for the improvement of lands within the forest reserves, for their protection, and for the salaries of state employes engaged in such work. Any surplus remaining at the close of the fiscal year shall be available until expended.

(In a state law provision must also be made for regulation of the fire risk caused by railroads and engines and for the control of other fire risks. Penalties must be provided for offenses against any fracture of the forest laws. Provision must be made for protection of forests from insects and fungi and for the burning of slash, the control of the use of fire in clearing proper taxation, and court procedure against offenders. The above outline has omitted these points for the sake of brevity. The essential fact in a forest law is a clearly defined policy and a non-political and efficient organization. Given these essentials all other features of the law will in time be developed by the suggestions and advice of the state forestry force which the law has created and empowered.)

DISCUSSION OF THE REPORT OF THE SUB-COMMITTEE ON STATE FOREST POLICY

MR. J. G. PETERS, of Washington, D.C.: Mr. Chairman, I cannot find any reference in Mr. Cox's report to the question of assisting forest work in the States, separate from other lines of work. Perhaps it is noted in the report, but I would like to have a word from Mr. Cox about that phase as it has come up within the last couple of years, and it is a very important point, really a very important point.

Mr. W. T. Cox, of Minnesota: That subject was covered in our draft of the law, but that has not been printed as yet, in full, and I will say briefly that it was the feeling of the committee that forestry should be kept entirely separate, even from such related subjects, in a sense, as game and fish preservation.

Mr. Peters: Do you remember the reasons you gave for keeping it separate?

Mr. Cox: No; I do not; no, there are so many of them.

The Chairman: I think that is a very important question in State organization, and I think if Mr. Cox will express the feeling of himself and the committee on that point, it will be very enlightening. I have no doubt that every time the question of State organization is brought up, the question comes up as to whether it should be separate from game and fish preservation, or not.

Mr. Cox: In my own State of Minnesota, we have a young State forest service, and we have all the work we can possibly do along legitimate forestry lines; furthermore, the work of game protection in the back districts, where we feel that our forest work is most important, is not in good favor. A game warden is not looked upon with favor in most any of the wild parts of the State, and if our rangers were related to the game and fish work, that is, if they were deputized as game wardens, they would find it very much to their disadvantage in doing our own work and they would be handicapped in every conceivable way. We have found that to be true because we have tried it, and, as I say, there is plenty of work for a force of forest field officers to do in their own particular line. Politics come in there, too, because the game and fish commission is political in Minnesota, while the forest service is not political.

Mr. Ferris J. Meigs, of New York: Mr. Chairman, referring briefly to that proposed New York State law, I might say that it embodies, to a certain extent, features that were outlined by Mr. Cox. However, it is not a compulsory State control or supervision, but aims at an optional State control or supervision, optional with the timber land owner and provides that if the lumberman or the timber land owner is good and comes in under the law, then he has certain privileges. In other words, the law proposes to pay him for being good, and among the privileges is exemption from taxation on the growing crop, and also reforestation of his denuded or barren lands at the expense of the State, which is repaid at the time the timber is removed. That, in brief, is the provision. I do not know that you want to hear my opinion as to the constitutionality of the State passing laws to control lumber on private lands; that is a matter for the lawyers; however, I do not think it is fair for a State to control lumber on private lands without compensation to the owner unless the commission that has charge of it for the State is absolutely non-political and non-partisan, and also that they are experts and know what they are talking about. If you realize that the owner of private timber lands is playing a long term game, his policy must not be one of one or two years, but one of forty or fifty years, and he cannot be made subject to changing commission or changing rules or changing points of view. The timber land owner must have some continuity in the plan of handling, he must carry out his work and therefore he must not be subjected to a change in commission which might change the rules. If he is paid the cost, he may be subjected to a

wide, scientific, non-political State supervision. That I do not think the timber land owners would object to, especially if it is optional with them and they have certain privileges in the way of compensation. Without compensation, I think it may be a question for the legal talent to decide whether or not it is constitutional.

Mr. James Whipple, of New York: I had not expected to say anything on this or perhaps any other subject, but you have raised a very important question and one which, if properly exercised by States, can be of greater service than the preservation of some kinds of forests or forestry area than any other thing, question or point that has been raised here today, so far.

I have always contended that it was the duty of the State, where denudation was taking place at the head waters of the stream, and especially navigable streams, in the interest of the general welfare of the people, for the people to control, to some extent, the cutting of timber upon private land. In my judgment as a lawyer—not a very good one, though—there is in the police power of every State, authority to do that and pay no compensation for preventing of the cutting down to a certain size unless, in the constitution of the State, there is something that prohibits that course being taken.

Mr. E. M. Griffith: In Wisconsin, we have several billion acres of denuded lands, which are going to cost the State millions and millions to reforest. Suppose we grant that it is the State's duty to do that. Someone has denuded that land, and does it not seem rather foolish for any State to buy up denuded land and then spend $5 or $11, or whatever the cost per acre may be, in reforesting that land at the expense of all of us, the public, and at the same time there are hundreds of thousands of other acres denuded.

I think I can see the lumberman's point of view perfectly clearly. They do not want their property confiscated, none of us would, but can they stop and think of any industry in the country where they would permit the same thing to go on? In other words, is it the business of any State or of the American public, as a whole, to sit idle and see millions and millions of acres denuded, and then have a lot of Foresters meet, as we have, and cheer the thought that the State should go in and buy up all that denuded land and plant it? That is a pretty big job for Uncle Sam or all of the States combined, and should it be done—personally I do not think it will—as Mr. Whipple has said, and as I know the Attorney General of Wisconsin has advised me in his opinion, a law which would limit the cutting of timber upon privately owned, is clearly constitutional. I do not think there is much question about that. It does seem to me that in some way the public should be made to bear that added cost, if there is any.

Just what I should propose is, say that a region like the Lake Shore Region, if the States of Minnesota, Michigan and Wisconsin should pass a similar law limiting the diameter, or providing that the timber should be cut under State regulations, and providing for slash burning, and that lumbermen may add that to their cost, it would distribute the cost of forest protection to everybody. I have thought of it a great deal, and as I can see it, something like that is the only practical solution, but in some way this country will come to the same conclusion that we must limit the cutting of timber on privately owned land, just as they do in Europe, I think is absolutely without a doubt.

Mr. J. B. White, of Missouri: I would think that the State would have just as much right to tell a farmer how he must treat his land. The farmers of this country have been depleting the soil, they cannot raise half as much wheat to the acre as they could twenty years ago on the same farm and if a State can pass a law saying that you must leave a certain tract of timber to grow trees on and you must not cut below a certain diameter, the State can say to the farmer, you must feed your soil, you cannot run that field any longer and continue to mine your soil instead of farming. It is a difficult proposition.

I am not much of a forester, and I will admit it, but I have practiced it in my weak way, and in something of a practical way, according to the laws that I was living under and I have done it in this way: During the month of October, the mills that I am interested in at Clarks, Louisiana, and Standard, Louisiana, where the Chairman has been with his forest students from Yale University, my lumber averaged in price upon the cars, f. o. b. at Clarks, Louisiana, and Standard, Louisiana, just $11.78 a thousand.

I have had the foresters of Yale Forest School and of different States down in our woods, and we have talked these matters over and we pick up everything that we can get anything out of and something that we do not get cost out of, and that reduces it down to $11.78 a thousand last month. I have some neighbors in the state—one mill in particular—who claim their average is a great deal more than that. The reason is they are leaving their tops, 20 or 25 per cent, in the woods. If there was some law passed by which it would be a crime, or an offense against the laws of the State, to permit waste, so that we would be obliged to pick up these logs and these tops and bring them into the mill and saw them and ship them out as lumber, they would not get that big price for their lumber and we would have lower prices and our lumber would last longer.

I will state another proposition while I am on the floor. I began in Missouri thirty-five years ago, and I was the first man in the South who made a number three, yellow pine board. I did get only $3 per thousand for it, at the mill; and later, when I could get $8 a thousand for the number three board, I made the first number four board and that only brought $1.50 the next year, and my stockholders grumbled. But that was conservation, I was bringing it in, I was conserving the best I could under the laws of the State of Missouri. Then lumber got up so that I got $6 or $7 for my number four boards, but a great many of my neighbors made a great deal more money. I was figuring up yesterday, looking over the accounts and seeing what dividends we have paid, and I found this, that we put in a half million dollars into the lumber in Missouri thirty-five years ago, and that half million dollars, if put out at compound interest forty years ago, at six per cent, would amount to a great deal more than we have gotten out of that timber. If the lumberman leaves his stuff in the woods and sells the upper grade, he can make greater dividends and get a great deal more money out of the timber. I took the other course and therefore I am going to say that in the investment of that one-half million dollars in the State of Missouri, in forty years—we have only been using it thirty-five—at compound interest at six per cent, my stockholders would have had more money if they had let the half million dollars out at six per cent interest. But we practice conservation in just that way and the first time that a forest school ever sent anybody out into the woods that I know of, they came to my woods down in Missouri.

Just a few years ago when there was a great talk about a lumber trust, because I was trying to be a conservationist under the present laws, I said I was not in any trust, but I wish you would go down and find out if I am. I got Mr. Herbert Knox Smith to send three men to our mills in Missouri and Louisiana and look over our accounts and all our books, and those three men asked if I had any objection to their boxing them up and sending them to Washington and I told them not a bit. They brought them up here to Washington, a thousand pounds of that kind of stuff and they did not find that I was in the trust. (Laughter.)

I do not think any of you fellows would be in the trust if you make lumber for $11.78 and put it on the cars in Louisiana. I do not think it is possible, but I do think that we ought to have enough from our lumber to pay for the cost of growing it.

I am interested with Mr. Alexander and the Honorable Mr. Hartner in their

efforts to get laws passed in the State of Louisiana so that the practice of forestry can be made profitable and be made enduring, and I think it will be, and I do hope that there will be some law passed that will prevent committing of waste, and of leaving top logs in the woods to burn up. There is no law now. If I want to pay big dividends I can cut half the tree and leave the other half in the woods, but that is wrong and there ought to be a way of stopping it. I thank you. (Applause.)

Others who took part in the discussion were: Mr. M. L. Anderson, of Louisiana; Mr. Alfred Gaskill, of New Jersey.

The Chairman: I am sorry that the time has expired for the discussion of this subject and I think we ought to pass on now to the next subject of the program, that of taxation of timber lands. Unless the meeting votes to the contrary, we will introduce that subject. The Chairman of the sub-committee on forest taxation, Mr. Pinchot, has been obliged to spend the entire afternoon working on another committee on water power. I am therefore going to ask Mr. Allen, who is a member of the sub-committee and has done a good deal of work on this report to introduce that subject.

FOREST TAXATION

BY THE SUB-COMMITTEE ON FOREST TAXATION.

Chairman, GIFFORD PINCHOT, Washington, D. C.

Acting Chairman, E. T. ALLEN, Portland, Ore.

F. R. FAIRCHILD, New Haven, Conn.

H. S. DRINKER, South Bethlehem, Penn. E. M. GRIFFITH, Madison, Wis.

Presented by Mr. E. T. Allen, Monday Afternoon, November 17, 1913.

SECTION I.

THE PRESENT STATE OF FOREST TAX LEGISLATION

THE following is a brief summary of the present statutes in force in the various states of the United States relating to the taxation of forests together with a brief analysis and criticism of the principal features of these laws. This section is reprinted from the article by Fred Rogers Fairchild in AMERICAN FORESTRY, October, 1912, p. 653.

"The taxation of forests is a matter of State and local revenue. There is no taxation of forests by the National Government. The legislation is all State legislation. The basis of local revenue everywhere in the United States and of State revenue in very many of the States is the general property tax. Everyone is familiar with the principal features of the general property tax. As a rule all property, real and personal, tangible and intangible, is subject to taxation, unless specially exempted by law. Forest lands are subject to the tax the same as any other kind of wealth. The law requires that the actual market value shall be assessed, which in the case of forests means the full value of land and trees. Of course it is a matter of common knowledge that the laws are not enforced as regards the requirement of an assessment at full market value. The tax is collected annually at whatever rate is required to raise the necessary revenue for the town, county, State, and other public bodies depending upon the general property tax.

"This, in brief, is the normal tax system to which forests are subject in the United States. Only where there has been special legislation are forests treated differently from other kinds of wealth. Of the forty-eight States of the United States, thirty-four tax forest lands under the general property tax in exactly the same manner as other lands.

"The other fourteen States have enacted special legislation affecting the taxation of forests. These States are Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, Alabama, Michigan, Wisconsin, Iowa, Nebraska, North Dakota, and Washington (to which Pennsylvania has since been added). The idea in the legislation of all of these States has been to encourage the planting and cultivation of trees or the general practice of forestry by offering special inducements in the way of reduced taxation. These conditions take the form of entire or partial exemption from taxation, rebates of part of the taxes, or bounties to be deducted from the taxes. The method usually employed is that of tax exemption. The plan of a rebate is used in New Hampshire; North Dakota uses bounties, while Wisconsin uses both exemptions and bounties. In some of the States there are two or more distinct laws, not always entirely consistent with each other. In most cases the statute is limited to plantations, and in five States the forest must be established on land that is not wooded at the time.

"The commonest form of tax concession consists of a complete exemption from taxation on both land and trees for a definite period of time, ranging from five to thirty-five years. The exemption begins either immediately after the land has been planted or set aside for the growth of trees, or after a certain period, measured either in years or in the growth of the trees. In other States the concession is by means of a rebate of part of the taxes for a certain number of years, as in New Hampshire, or by means of a bounty of so many dollars per acre to be deducted annually from the taxes on the land, as in North Dakota and Wisconsin. Usually the owner is required to manage the forest in accordance with regulations specified in the statute or under the direction of some State officer or board.

"Only two States depart materially from this general plan. These are the States of New York and Michigan, whose legislation, enacted in 1912 and 1911, respectively, will be considered in more detail below.

"Four States, Illinois, Kansas, Minnesota, and Wyoming, undertake to encourage the growth of trees by offering bounties. Since these bounties, however, have no relation to taxation, I have not included them in this discussion. Likewise, I refrain from discussing the laws of Massachusetts and Vermont, which provide for the offering of annual prizes to encourage the planting and cultivation of trees; these prizes also have nothing to do with taxation.

"The general type of forest tax legislation which has been followed by our States until very recently has failed to produce any appreciable results. Of this fact there cannot be the slightest question. It is important to determine the causes of this failure. In the first place the laws contain many technical defects. The common limitation to plantations or even to land other than woodland, largely

defeats the purpose of the laws at the outset. The regulations regarding planting, thinning, etc., are often faulty from the point of view of scientific forestry. Often the number of trees required to the acre is too large. The list of species designated is not always well chosen.

"A more serious defect is the injustice to the locality where the exempted forest happens to be located. The only justification for a concession to the forest owner is the resulting advantage to the State as a whole. Yet the particular town or county where the land is located is called upon to bear the whole or the principal part of the burden of a diminished revenue. This tends, first, to lead certain assessors to try to get even by adding enough to the assessment of some other property of the timber owners to make up for the reduced taxes on his forest lands. In the second place it prevents many owners from taking advantage of the law, since they dislike to arouse the hostility of their neighbors or of the local authorities by an apparent attempt to get out of paying their share of local taxes.

"Another vital reason for failure is that the actual financial consideration is not ordinarily very great after all. The exemption is limited to a fairly short period, after which land and trees are again subject to the general property tax. The abatement comes, of course, at the time when the trees are small, and the taxes would not be very heavy anyway.

"Finally the whole principle on which these laws are based is, in the writer's opinion, a false one. The idea has been to give some concession, some special favor. This is not what is needed. There is no sound reason why the owner of forest lands should not pay his just share of taxation. And if forestry is going to be profitable at all, it can well afford to pay its just share. What is needed is simple justice, and nothing more. The general property tax acts as an obstacle to forestry, for reasons which cannot be entered into here. What we want is a new system, which shall avoid the evils of the general property tax by a change in method, but which shall still call upon the forest owner to bear his full share of the burden of supporting government.

"Within the past two years four of our States have taken the first step, somewhat faulty and timid to be sure, toward a sound method of forest taxation. Michigan passed a law in 1911, New York three laws in 1912. Pennsylvania passed three laws and Connecticut two laws in 1913. Without going into details, these laws provide for a separation of land and trees for purposes of taxation, the land either exempt entirely or assessed at a low value, and the trees taxed only when cut, and then at a certain percentage of the value of timber cut The Connecticut law is the most scientific application of the principle of the yield tax to growing forests thus far passed by any State. The operation of these laws will be awaited with great interest by all those who are interested in forest tax reform."*

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* For a more complete analysis of State legislation, with abstracts of all the laws in effect in October, 1908, cf. "The Taxation of Timberlands," by Fred Rogers Fairchild, Report of the National Conservation Commission, Vol. II, pp. 581-632. The abstracts of State statutes are on pp. 588-589. All of the laws there described are in force at the present time. The following legislation has been enacted since then: Connecticut, Laws of

SECTION II.

BASIC PRINCIPLES OF WISE FOREST TAXATION, WITH DEFINITE SUGGESTION FOR LEGISLATION

INTRODUCTION

NEXT perhaps to war, taxation is the most powerful instrument of government, capable if unwisely used of destroying individuals, communities and industries. Few governmental functions are less studied by the average citizen. Probably none of its branches is less understood than forest taxation. Yet it is of the highest importance to all, for forest industry ranks fourth in the United States and is by far our greatest manufacturing industry, while every citizen is vitally interested in forest preservation from many other viewpoints. It affects the holding and care of all private forests, which constitute the great proportion, involving future and existing crops. By so doing, it influences hardly less directly the success of State and Federal forestry.

It is everywhere recognized by foresters, tax experts and political economists that the general property tax applied to forests in the United States is unscientific and discouraging to conservative management. It remains tolerable only so long as good management is no object or while the tax rate or the ratio of assessed to real value is extremely low. At best it is peculiarly whimsical and irregular in actual practice, defeating the primary principle of its own doctrine that there should be uniformity in the treatment of any given class of property. Owners of forest land in different counties or States, but with similar manufacturing and market conditions, are handicapped or subsidized, as the case may be, in their competition with each other.

Disregarding for the moment the serious lack of uniformity, and averaging the tax burden upon forest land in all States, perhaps it can hardly be said that it has been, up to the present time, greater than this class of property should bear. It is this fact, together with a general sentiment that being presumably a good speculation timber can well afford to bear a comparatively heavy share, which has obscured the really important point—that whatever the general result in the past, the system is rapidly approaching a point when changing conditions will make it untenable.

Timber returns no annual revenue. It is a crop to be realized only after many years of outlay. But carrying costs accumulate with all the acceleration of the well-known laws of compounding interest. They not only require that sale value must increase rapidly to prevent actual loss, but, obviously, if the period is long enough, will actually surpass any possible sale value. The period

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1911, ch. 205 (a more liberal exemption law). Laws of 1913, ch. 58 and ch. 108 (referred to in the text). Maine, Laws of 1909, ch. 136 (amending Laws of 1907, ch. 169, by reducing the number of trees required per acre); Laws of 1909, ch. 193 and 230 (providing for a special tax on wild forest lands, the proceeds to be used for fire protection). Massachusetts, Laws of 1909, ch. 187 (special exemption relating to land stocked with white pine seedlings). Michigan, Laws of 1911, ch.—— (referred to in text). New York, Laws of 1912, ch. 249, 363, and 444 (referred to in text). North Dakota, Laws of 1909, ch. 50 (slightly amending the previous statute). Pennsylvania, Laws of 1913, ch. 269, ch. 270, and ch. 284 (referred to in the text).

required to make them do this is wholly fixed by the carrying cost and, while also shortened by other charges against the crop such as interest on the purchase price and cost of protection from fire, is greatly affected by the burden of annual taxation.

Few people realize, when discussing the rise of stumpage values and the popularly estimated profits of timber holders, that under compound interest stumpage must actually double in from six to twelve years, according to circumstances, to afford any profit at all. In some regions of excess stored supply it is quite probable that much must remain uncut until such accumulated costs amount to more than the timber will be worth to anyone. Certainly they will in many regions enforce cutting ahead of American consumption, meaning foreign export of what we will later need badly ourselves. Taxation is by no means wholly responsible for this, but it is one factor and to the extent that it is unjust or excessive is unprofitable to the public because it hastens loss of both timber and tax revenue.

In other words, there are two distinct influences upon the rise of timber prices. One is a true rise of intrinsic value, due to diminishing supply and increasing consumption. This alone affords any basis of profitable investment. The other is the accumulation and compounding of carrying costs which, without investment profit, must be constantly added to the selling price to prevent actual loss. To tax that portion of this increase due to interest on purchase price and fire protection is bad enough, but to assess also an increase created by nothing but past payment of taxes is clearly unfair. Taxation cannot possibly create value. And it is a process of astonishing progressive ratios, comparatively insignificant when assessments are low, but building fictitious value by taxation, for taxation, with great rapidity as assessment ratios are raised. At the full assessment theoretically contemplated by the general property tax it might very quickly be absolutely confiscatory.

The general property tax upon timber, then, has an alarming tendency to become excesive and is additionally difficult to meet because it is imposed annually while revenue with which to meet it is deferred. From the individual standpoint it threatens injustice or even confiscation. From the standpoint of the public good it threatens rapid wasteful cutting of mature timber, penalizes the growing of a second crop, and for both these reasons hastens the cessation of all revenue from forest taxation and the consequent imposition of the entire burden upon other forms of property. As stated in the report of the National Conservation Commission, it is far better that forest land should pay a moderate tax permanently than that it should pay an excessive revenue temporarily and then cease to pay at all.

The general property tax upon forests has been abandoned by all countries that practice forestry. It has been superseded by systems varying in detail with conditions of locality and development, but recognizing the underlying principle that timber should pay its main tax when it produces the revenue with which to pay. Any other system means one of these things: That a portion of the property must be sold to pay taxes upon the rest; or that the forest owner must engage

in some other business and succeed in it, to produce revenue with which to carry his timber, which is not demanded of other forms of business; or that he must cut his timber, whether or not this is desirable from any standpoint, as soon as the tax burden becomes excessive. Above all, it means the destruction of the forest, instead of the perpetuation of the forest, by use.

Consequently, in countries that have considered the subject thoroughly, some form of what is called yield tax has been adopted as far as the forest crop itself is concerned. The land itself may or may not be taxed annually, according as there is needed for fixed regular revenue from this source. Most frequently, if land chiefly useful for forest growing is taxed at all annually, it is taxed upon its value for this purpose, as wheat land is valued by its earning capacity for producing wheat, but in this valuation no consideration is given the particular forest crop upon it. The crop is a thing apart, which may be increased by growth, decreased by cutting, or destroyed by fire or insects without attaining any taxable value. By taxing its yield only, both community and owner are stimulated to bring about the greatest production, the best protection, and the fullest utilization. Under such a system the time and manner of cutting mature timber are fitted to economic needs upon a parallel with the handling of any other commodity, and the fostering and protection of new growth is not discouraged. The tendency is to perpetuate a needed resource, a population-supporting industry, and a source of tax revenue on lands otherwise likely to become non-tax-producing.

The substitution of such a system, or a modified approach to it, for the general property tax has been the chief aim of American forest tax reformers. Recent legislation in Pennsylvania, Connecticut and other States indicates that the beginning has been made. But while encouraging in showing that the public can be taught the necessity of action, the few successes already attained by no means afford a completely satisfactory precedent. The greater the relative importance of forests and forest industry in any State, the more serious are the problems of adjusting new revenue systems to the needs now largely met by the annual taxation of such sources of revenue. A measure acceptable in a State like Massachusetts, where forest taxes are a trifling part of total local and State revenues, might be fiscally impossible in a State like Oregon where they are the chief reliance. A law applicable even in a forest State where the effect in each county would be similar, might not work where some counties are cutting fast, some have not begun, and some are cut over or treeless. Again we have a tremendous practical, if not theoretical, difference in the problems of mature timber being held for speculation and those of reforestation on denuded lands. Consequently there is much need for analysis of these several situations separately, grouping conclusions to prevent misapplication and their further discussion in this report will be so classified under two main heads, Taxing New Forest Crops and Taxing Mature Forests, each sub-divided under Eastern conditions and Western conditions.

TAXING NEW FOREST CROPS

UNDER this head we are dealing only with new forest crops, grown by the effort of the owner, and assuming that the virgin timber which remains after fire or logging is not sufficient in amount to be considered under our later head of "Mature Timber." We are considering deforested land, presenting a distinct problem to the owner, and that whether he has made money on the original crop has no bearing, nor has his being rich or poor, resident or alien.

All sound authorities agree that the forest crop should not be taxed until harvested. They disagree somewhat as to the degree to which the land tax also should be deferred in order to insure the desired result, as to the extent to which reform should be based on conditions under which the forest owner contracts certain performance, and as to concessions of theory to expediency generally. A consensus of opinion, however, is that the following objects should be sought:

1. The perpetuation of forests in private hands by wise use.
2. Greater permanent revenue to State and county than is possible under the present system of destroying the taxable source.
3. Assurance that the total burden of taxation will have a fair relation to the income obtained, making the tax burden on forest growing as nearly as possible proportional to the burden borne by other kinds of useful industry.
4. Assurance that the owner will do his share to make and keep the land productive.
5. Assurance to the owner that future action by the community will not confiscate any property resulting from his effort.
6. Division of risk, so both owner and community will seek highest production and safety from fire.
7. Simplicity in adoption and operation.

Practically all forest tax reform along these lines, whether already adopted in Europe or this country or now being agitated, fall under the following classification or are combinations thereof:

1. Annual taxation of deforested land, solely upon its land value unenhanced by any growth thereon, with no taxation of the crop when harvested or at most only at the rate then prevailing for personal property.
2. No annual taxation of the land, but a yield tax upon the harvest at a compensating rate specified now by law (from 15 to 20 per cent is usually suggested).
3. A compromise between the two above by applying both an annual land tax and a yield tax, each reduced accordingly. Various ways of reducing the annual tax are proposed, a common one being a flat assessment prescribed by law, suggestion varying from $1 to $4 an acre. The best authorities seem to favor fixing it at about half the prevailing rate and restricting the yield tax to 10 per cent.

Each of these plans is usually accompanied by the requirement of the practice of forestry by the owner. Usually in America they are proposed as optional with the owner, who may continue under the general property tax if he desires, and also with the State, acting through its forestry officials, who may decide the land to be unsuitable for forest-growing. Consequently, they presuppose a com-

petent forestry administration. In certain States, Pennsylvania for example, partial exemption of the land is obtained without loss of local revenue by including the land in so-called auxiliary forest reserves, the State itself paying the tax.

Either of the three plans outlined is logical. Their relative merit is a question of expediency, taking into account the time at which the community most needs the tax and the time at which the forest grower can best pay it. The ultimate amount paid would be the same in all, if the yield tax is scientifically based on the productive value of the land, which is the only correct basis. A distinction sometimes overlooked is that there is no true justice in taxing a crop at all, whether timber or agricultural, if the land has been taxed at its full value, especially if other forms of taxation reach the owner's profits by its disposal. A yield tax is not properly upon the crop, but the latter may be made to pay a deferred tax upon the owner's wealth represented in land capable of producing it. It is then a form of land taxation, deferred, for justice' sake, to await revenue with which to pay it. Or it may be a form of income tax, the crop merely indicating the income. Expediency may, however, require some degree of annual taxation. In the one case this will be land taxation and any additional yield tax should be only sufficient to complete it. In the other, it is a premature realization of the expected income tax and the yield tax should but complete the latter. It is also possible to combine land taxation and income taxation, but to do so fairly requires a reduction of each so that the aggregate will not exceed what either would be alone, and the crop must not be additionally taxed after this is done.

Consequently none of the three accepted methods, or of any logical combinations or compromises between them, can be called more just than another without considering circumstances; and it is necessary to describe their variation in some detail in order to enable local application. While geographical classification cannot be exact, or decision upon any two systems be without possibility of greater local merit in some change of either, the confining of this report to a reasonable limit has suggested discussing one plan combining the most logical features of new crop taxation in the eastern and like States and one most widely suitable in the extreme west. Either east or west may present exceptional local conditions largely typical of what we have given opposite classification, while the southern and Rocky Mountain States must choose again from conclusions which best suit their premises.

EASTERN CONDITIONS (Taxing New Crop—Continued)

COMPARED with those we are to discuss later as western, eastern conditions present the widest range of variance within themselves. In forest types, in local government units, in dependence upon forest land for revenue, and in advance of popular understanding of the issues involved, they by no means offer a universal problem susceptible of a single correct solution. Nevertheless, they do have a common difference from the extreme west in higher and more stable stumpage values due to nearness to lumber markets; in having

no vast stored supply, in excess of any near-future demand, which *must* be held whether the owner prefers or not; in a lower land tax burden due to greater development of other forms of taxable wealth, and a relatively less burden on the tax payer of today because, being older, many pioneer expenses such as for constructing roads and public buildings—have been met by past populations and expenses now are only for up-keep and for government. On the whole, although perhaps with local exception, they also depend less upon forest taxation, consequently can alter this with less fiscal disturbance, and have a less marked difference between virgin timber and new crop problems because cutting may often be more in the nature of thinning rather than clean cutting.

Under such conditions a compromise between exclusive land taxation and exclusive income taxation certainly seems surest to satisfy all requirements. It is the attempt of laws already passed in New York, Pennsylvania, Connecticut and Louisiana, and of the measure sought in Wisconsin, with which tax students are familiar. All of these measures, however, have been adapted to individual conditions to an extent which may prevent them from being ideal models for other States. It is our belief that this report should, while advising study of each of them, present an outline for a plan which contains the most scientific and practical foundation principles, free of any purely local necessity. We should offer a frame-work which is fundamentally sound, has general approval, and, while not relieving the local student of studying the public need of some change to fit his State, does relieve him of studying those points required only by some other State. Consequently we offer the following:

PLAN OF FOREST TAXATION FOR EASTERN AND NEIGHBORING STATES WHERE MATURE VIRGIN TIMBER IS NOT THE DOMINATING TYPE.

IN presenting the following outline your committee has purposely avoided going into minute details as to the tax system or its administration. Such details must always be made to conform to local conditions and must, therefore, vary from State to State. Our purpose has been to present, in somewhat general terms, the outline of a sound plan of forest taxation for the region under consideration.

Where exact figures are used in the following plan, to specify tax rates, age of timber, intervals of assessment, etc., the figures selected are those which appear to be adapted to general forest conditions. Your committee does not intend, however, to insist upon the exact figures in any case. They are presented largely for illustration, and the principle of the proposed plan may be carried out while substituting other figures as conditions require.

1. *Lands subject to special taxation.* The special forest tax should apply to all lands on which forests are growing and which are handled and protected in accordance with the methods of practical forestry, as defined in general in the law, which should be administered by the commission, board or officer entrusted with the direction of State forest work.

Lands subject to the special tax shall be valued at not over — dollars per acre. (This value should be fixed so low as to exclude lands better suited for

other uses than forestry.) Lands shall be separately classified and brought under the system at the owner's option. Owners desiring special classification may make application to the State forester, accompanied by a certificate of the local assessor stating the value of the land, valuing separately the different parcels if so directed by the State forester. The State forester shall examine the forest and if he finds it meets the legal requirements shall certify the forest for separate classification and taxation.

Lands thus separately classified shall remain so as long as the forest is properly conserved as determined through inspection by the State forester. Lands may be withdrawn from such classification at the option of the owner on paying the tax provided below.

2. *The tax.* Forest lands when separately classified for taxation shall be subject to a special method of taxation.

Two methods are proposed, depending on whether the forest is a "new forest" or an "established forest."

By a *"new forest"* is meant lands stocked with forest trees, the majority of which are not over 10 years old, provided that the older trees do not add to the assessed value of the property and that the forest meets with the other requirements of the law. This may include land fully stocked with trees under 10 years of age but containing also scattered older trees, or lands partially stocked with trees under 10 years of age when planted with a sufficient number of additional trees to bring the forest to the standard set by the law, or open land planted with trees to meet the standard of the law. Such forests, when accepted and classified, shall be taxed by the following method:

The land shall be assessed by the local assessors at its value as bare land, no account being taken of the value of the trees. This assessment shall be repeated at intervals of 20 years until the prevailing age of the trees reaches 70 years. Upon the value thus determined the land shall be taxed annually at a rate equal to one-half of the rate of the general property tax of the locality, but in no case to exceed 5 mills. This limit of 5 mills is chosen on the assumption that 10 mills is probably slightly in excess of the average rate of the general property tax upon true value throughout the United States. In any State where it appeared that the prevailing rate of the general property tax was appreciably higher or lower than 10 mills this rate might be correspondingly changed. This explanation applies equally to the limit of 10 mills proposed below for the tax upon forests over 70 years of age and upon "established forests."

Whenever any timber is cut or other forest product taken from the land a yield tax of 10 per cent of the stumpage value of the timber cut or the actual value of other forest products shall be paid to the State. Forest products cut for domestic use, which shall be limited to fuel and the construction of fences, buildings, and other improvements upon the property of the owner or of a tenant with the permission of the owner upon property subject to taxation in the same town as the timberland, shall be exempt from taxation.

Whenever trees are cut before reaching the age of 70 years and provision is made for planting new trees or otherwise perpetuating the forest according

to the standard fixed by law and to the satisfaction of the State forester, the land may continue separately classified and subject to the special tax indefinitely until the timber reaches the age of 70 years.

When the timber reaches the age of 70 years there shall be an assessment of the value of both land and trees, which assessment shall be repeated every 10 years (or oftener), and upon this assessment an annual tax shall be imposed at the rate of the general property tax in the locality, but not to exceed 10 mills, which tax shall continue until the trees are cut. When the trees are cut the yield tax of 10 per cent shall be assessed. From the amount of the yield tax shall be deducted the amount of the previous payments of the annual tax upon land and trees since the trees reached the age of 70 years. If the amount of such previous payments equals or exceeds the yield tax upon the timber cut, no such yield tax shall be due. If after cutting provision is then made for planting or otherwise satisfactorily reproducing the forest, the lands may remain under special classification and taxation, as previously provided for "new forests."

If the owner desires to clear off the timber before it has reached a profitable age for cutting, he shall be at liberty to do so upon paying a tax determined as follows: The value of the timber shall be assessed and a tax computed amounting to 1 per cent of said value multiplied by the number of years since the forest was classified and made subject to the special tax. To this shall be added an amount equal to the total taxes paid upon the land alone during the period since the land was separately classified, and this sum shall be the amount due from the owner. The property shall then become subject to the ordinary property tax. The same procedure shall be followed in any case where the owner fails to maintain the forest according to the standard set by the law as determined by the State forester.

3. *Administration.* Under this system the collection of all taxes on land and trees except the yield tax would naturally be in the hands of local officers and the revenue would go into the local treasury without further concern on the part of the State. The yield tax, on the other hand, and the tax collected as a penalty for removal of the land from classification or abandonment of the forest should be administered so far as possible by State officers, presumably by the State forester and the State tax commissioner in cooperation. The proceeds of the yield tax and the penalty tax go into the State treasury, either to remain there or if thought best to be distributed back to the towns and counties where the timberlands are located. This distribution might be made according to any one of four or five possible plans. (See Proceedings of the Sixth Conference of the National Tax Association, pp. 385-389.) Your committee recommends, as probably best suited to the conditions of most States, that the distribution be based upon the areas of forest lands separately classified for taxation in the several local jurisdictions respectively.

In all cases the owner should be required to furnish a sworn statement annually of the amount and value of forest products cut during the year. It might also be well to require advance notice of all cuttings. Large owners, lumbermen, loggers, saw-mill owners, and so forth, should be required to keep

regular books giving a record of their cutting. Their books and accounts should be open to State officers and more elaborate reports could be required of them. In the case of small farm wood-lots it would not probably be worth while to require special books or elaborate reports. The sworn statement of the owner would ordinarily be sufficient. In all cases there should be some examination of logging operations, either by State or local officers, to check up the accuracy of reports and to prevent fraud. In the case of all large cuttings the owner or operator should be required to furnish a bond sufficient to cover the amount of the tax that will become due. The tax should also be a lien upon the land, but not upon the timber cut.*

WESTERN CONDITIONS (Taxing New Crop—Continued)

THE five Pacific forest States, from Montana to California, contain our most magnificent standing forests and also, having a combination of favorable climate and rapid-growing species, offer great natural advantage for growing new forests on a tremendous scale. They are also very similar in their forms of State and county government and in the great importance of forests and forest industry in their economic affairs. Consequently, although they present varying tree species and acreage values, they group readily in a classification of conditions suggesting methods of forest taxation.

This group of States, however, presents a more marked distinction between mature timber and reforestation than affects the taxation problem elsewhere. It has vast areas which will remain uncut for many years, yet which are regarded as necessary sources of a large proportion of the total tax revenue. In some counties standing timber now pays 80 or even 90 per cent of all moneys raised. Any form of yield tax upon *mature timber* that will meet this situation must be sound beyond criticism. Mere experiment cannot well be afforded. On the other hand, logging is largely clean-cutting, resulting, together with past fires, in large areas of no value for any purpose but forest-growing, incapable of paying any but a nominal annual tax and for this reason now lying idle and a menace, at a sacrifice to the community of millions which might be earned were their better care not penalized. Reforestation of such lands is of the highest importance and can be encouraged by tax reform which does not apply to mature timber and which can scarcely fail, if availed of at all, to be better for the community than the present system.

The owner of deforested land on the Pacific coast may or may not hold such land for a time under the present system, in the hope of selling it or of tax reform, but he will seldom, if ever, take steps to insure reforesting which cost money because to do so is too likely to be at an actual loss. In the first place, its sale value represents an investment. He may sell and reinvest the money in any business which looks inviting. Presumably he can get

* For a fuller account of the problems of taxation of growing forests in the eastern part of the United States and a more detailed discussion of plans of reform see "Suggestions for a Practical Plan of Forest Taxation" by Fred Rogers Fairchild in Proceedings of the Sixth National Conference on State and Local Taxation; Madison, Wisc., National Tax Association, 1913.

ordinary business returns, 6 per cent or more, and continue to reinvest these returns. Therefore, if he leaves this money in forest land for 50 years without return, for every dollar so tied up he must get $18.42 at the end of that period if he is to make 6 per cent compound interest on the investment. And this applies not only to the present value of the land, but also to any added expense he incurs in modifying the cutting methods, or in replanting, in order to insure reforestation. If both together amount to $5 an acre, he must net $92.10 at the end of his 50 years in order to make 6 per cent.

So far no complaint can be made. But if the land is to produce a second crop it cannot be left to take care of itself, as it might were it being held for speculative purposes only. It must be protected from fire and trespass. And since the interest and principal invested will amount to so much for so long a period and be totally lost in case of destruction, the protection must be adequate, practically amounting to insurance. The annual cost will vary greatly according to locality, class of timber, and the enforcement of fire laws, but will be from 1 cent at the minimum to 15 cents an acre at the maximum in bad seasons. If all cost of protection and administration is placed at only 5 cents annually, for the sake of illustration, this represents another investment constanly increasing and compounding which, at the end of 50 years at 6 per cent, will amount to $14.51 an acre. Consequently, adding that to his original investment which will have become $92.10, he must net $106.61 to make his 6 per cent.

Let us now consider the influence of taxation. We have assumed the land to be valuable for forest growing only, and in calling his investment $5 an acre included some cost of insuring reforestation. Place this at $2 and leave a land value of $3, to be fully taxed at 30 mills for both State and county purposes, which is, perhaps, a fair average. This represents the third form of his investment, or 9 cents an acre invested annually and left unavailable for 50 years, and will amount at the end of that time, at 6 per cent, to $26.13. He has now to clear $132.74 an acre, besides being always in danger of total or partial loss from fire, *and during all this time has to have the money, made in some other way, to meet all the annual payments.* But no injustice appears, for he has been taxed on an equal basis with other producers. If his acre yields 20,000 feet (the maximum to expect) worth $7 a thousand, he has made his 6 per cent, the community has gained a resource, and every one is satisfied. His land has been taxed fairly and as he now has a crop to sell he can perhaps even afford to pay a tax on it also, although, if the land has been fully taxed, there is no just reason why he should have to do so, any more than does the farmer on his potato crop. Strict and logical justice requires either that he shall pay no annual land tax, but a fair yield tax; or a fair land tax and no yield tax; or both taxes correspondingly reduced.

But this is just what cannot legally be done under the general property tax. *By failure to recognize that the growth produced is a crop, distinct from the land, grown at the owner's effort and expense, and returning no revenue until ripe, the law now compels the repeated annual taxation of the owner's effort to an extent very likely to amount to confiscation.* It has been seen that even under the fair system outlined in the preceding paragraph, forest growing is not more than

ordinarily inviting and involves considerable risk and capital. Yet it assumed only a fair annual tax on the land. Under our present system, logically carried out, here is what would happen:

The first year the tax would be the same. The second year a fiftieth of the total fifty-year crop, which we have assumed worth about $140, or $2.80, would be added to the land; therefore not $3, but $5.80, will bear the 30-mill levy, and not 9 cents, but 17 cents, actual tax will be paid. The third year the tax will be 25 cents an acre; at the twenty-fifth year it will be over $2 an acre. We have seen that even a 9-cent tax amounted to an investment of over $26 an acre in order to produce the crop. The continual increase of this according to growth would make the investment run into many hundreds of dollars if the same interest is calculated, and in any case would make reforestation financially impossible.

In actual practice, the increased valuation would probably not be made by the assessor in the manner just described. Instead of determining the rate of growth scientifically and applying it annually, he now makes an ocular reappraisement at considerable intervals. In most cases there is no increased value, for the land does not reforest but is continually reburned. Where it accidentally does reforest, he makes a rough calculation of the value of the second growth, based upon no particular system and seldom alike in different counties. But the principle remains the same and the result differs only in degree. The land owner, instead of being encouraged to establish and protect a new forest, is actually penalized, for he must assume that its expectation value will be taxed annually, perhaps on an exorbitant basis, as soon as it becomes apparent.

CHOICE OF REFORM METHODS

IN considering which of the three fundamental plans of taxing new crops to apply to the foregoing Pacific coast situation, we must analyze its elements of difference from that outlined in the preliminary paragraph of our discussion of eastern conditions. In the older parts of the United States the relative value of any tract for forest production and for other uses is fairly well established, and so is its taxable value. Such classification in many parts of the West would be most conjectural. In a new and rapidly settling region, with land quality and clearing costs both uncertain, it may be impossible to say whether land assessed at $3 today will in five years be worth $10 for grazing, $50 for agriculture, or but $2 for forest growing and nothing else. A pioneer community, especially if poor in any other taxable wealth, is more dependent on an annual land tax than one already provided with roads and schools. A region still rich in forests is less likely to forego a present tax in favor of a future population than one which already feels the pinch of shortage. One in which neither forest science nor adequate market has developed exact information about growth of the crop or price it will bring cannot deal so exactly by statute; therefore safety from error requires leaving more to future study and experience. One where fire hazard is greatest must depend least upon the yield tax.

While the measure we have previously outlined as suggestive for eastern conditions would also be good in the West if it could be passed and maintained for a

time in succesful operation, it is likely that Western States would consider more favorably a simpler plan and one which, while collecting about the same aggregate tax, realizes more of it annually. Such a plan is the first of the three fundamental ones originally mentioned. It is theoretically somewhat the least favorable of the three to the forest owner, but easily understood and much more encouraging than the present general property tax.

A Just Plan for Taxing Deforested Land on the Pacific Coast or Elsewhere When a Heavy Yield Tax on Such Land is Inexpedient.

1. Any land in this State which has been practically denuded of the merchantable timber thereon by cutting or by fire but is adaptable for growing new forests may, at the option and request of the owner, be separately classified under the title of reforestation land and when so classified shall be taxed in the manner set forth in this act, in lieu of all other taxes except such as may be imposed by law upon improvements other than forest growth.

2. Classification of land under this act shall be by the State forester, who shall determine whether all or part of any land covered by application therefor is suitable for reforestation and prescribe for all lands separately classified for this purpose such regulations as shall be necessary to insure the growing and protection of new forests thereon.

3. Application for such classification shall be made to the State forester upon blanks by him provided and contain such information as he requires, including a legal description and plat of the tract or tracts and a guarantee to pay the reasonable expenses of any further examination he may direct.

4. In case the State forester shall find that any or all of the land covered by an application is suitable, he shall be empowered to enter on behalf of the State into a contract with the properly authorized owner of the land which shall condition its separate classification as reforestation lands, and its continuance under such classification, upon compliance with regulations for fostering and protecting forest growth on lands so classified and with all other provisions of this act. Such contract may be without time limit except it shall be provided that, if the State forester shall at any time find the timber upon the tract or part thereof sufficiently mature and merchantable to be either cut or more properly taxed laws then existing for the taxation of mature timber, he may require the owner to elect between its cutting and taxation under this act within two years or its re-classification under said laws for the taxation of mature timber.

5. Upon acceptance and execution of such a contract, the land covered thereby shall be separately classified as reforestation land by the State forester, who shall certify to this effect to the owner and to the assessor of the county wherein the land lies, forwarding the latter a plat and description thereof. Upon such certification to the county assessor, said land and the forest growth then or thereafter thereon shall be separated for purposes of taxation as long as said separate classification continues. The assessor when making the annual assessment shall assess only the value of the land alone, not enhanced by reason of any forest growth thereon, and upon no higher basis than upon which he assesses contiguous or nearby wild unforested land of the same character not separately classified under the act. No tax shall be paid upon the timber until it is cut, when it shall be assessed and taxed upon its full stumpage value at the rate then applied to general property in the same county.

6. Before the owner of such land cuts or permits the cutting of any forest material thereon he shall notify the county assessor of the extent and duration of the proposed cutting and the assessor shall determine and advise him as to the necessary frequency and dates of such reports of the cutting as may be required

for proper assessment of the timber cut. In compliance therewith the owner shall as required make or cause to be made to the assessor sworn statements of the kind, quality and quantity of material cut, and, unless shown to be in error, such statements shall be the basis of assessing and taxing its stumpage value as hereinbefore provided. If there is reason to believe that any statement of timber cut is incorrect or incomplete or there is failure to make such statement, there may be required from the owner or his agents such further information as may be deemed necessary and in event of inability by the county assessor to arrive at a correct assessment the State forester may, upon request, designate an agent to conduct an examination who shall have access to any books or papers bearing upon the matter. Any person or corporation who shall fail to file any sworn statement required by this section shall be liable for the cost of any such examination thereby necessitated and shall also pay, in addition to such cost and the tax found to be due, 10 per cent of the stumpage value of the material determined to have been cut, and if any person shall wilfully falsify or cause to be falsified any statement required by this section he shall be liable for the costs of examination and the full value of the material cut and also be guilty of perjury and liable to indictment and punishment therefor under the laws of this State.

7. All taxes due under this act shall be due and collectible as other taxes in the State and subject to the same liens and processes of collection. Taxes due thereunder upon forest material shall be a lien upon all the owner's land and timber classified thereunder, until paid, and in event of the possibility that removal of forest material upon which taxes due are not paid may leave insufficient security therefor, the assessor may, if he deems necessary, require sufficient bond to insure their payment.

8. Failure on the part of any owner of lands separately classified under this act to comply with any provision thereof or of the agreement upon which its classification is conditioned shall be cause for cancellation by the State forester of the certificate of classification, in which event the State forester shall notify the county assessor and the timber shall be at once taxed in a sum equivalent, as far as this may be determined, to the accumulation of the taxes it would have paid if not separately classified; provided, that this section shall not prevent dissolution of the contract and re-classification of the land without penalty at any time by mutual consent of the owner and the State forester on behalf of the State.

9. To the end that cutting of standing timber shall be conducted so as to place the land in the best condition for reforesting, uncut forest land may be subject to examination, plan and contract as provided for by this act and the separate classification of the land for taxation shall take effect within one year after the standing timber is cut and removed in full compliance with the terms of said contract.

It will be seen that this plan differs little in the aggregate tax imposed from the plan proposed in this report for eastern conditions and those already adopted by several eastern States. They minimize the annual tax and collect it again by a yield tax. This collects it all annually and adds one more tax—that on the crop at general property rates. The latter, while theoretically unnecessary for justice, is a means of collecting the community's share of any speculative increase of value beyond that due to the forest grower's effort while at the same time acting as a deterrent to speculation.

We are perhaps more familiar with proposals to encourage the forest grower by minimizing or removing his annual burden on land as well as timber, compensating the State therefor by a correspondingly heavy yield tax. These seek

to satisfy him now, while making sure that he does not escape eventually, at positive expense to other tax payers of today and positive gain to tax payers of the future. It is quite as logical to reverse the process and give him equal satisfaction while also satisfying the other tax payers of today, and accord tax payers at the time of cutting no subsidy beyond assurance that they may tax any values added to the product without effort by the forest grower and upon which he has not fully paid. This assurance is provided by the single tax on the crop and the clause permitting reclassification after maturity.

This system does not reduce present revenue as much as would exemption or merely nominal taxation of the land, consequently does not add to other pioneer tax payers of today a burden for which they receive no return. Leaving justice to the forest grower out of consideration for the moment, our chief object is to provide the future with forest products, industries, and revenues. In other words, future tax payers are to profit by the exploitation of the forests it is sought to grow. When the present community is a pioneer one, with the heaviest burden of up-building and the maximum dependance on land for tax revenue, as on the Pacific coast, it is only fair that they should forego the majority of the tax in its favor, for the many benefits they are to receive will fully compensate.

There is certainly a strong practical advantage in having no percentages to calculate upon uncertain premises. The annual land tax can be imposed with current justice. The yield tax will take exactly its just proportion, compared with the current taxation of other wealth, of any measure of value which future conditions or speculation by the owner have added to the crop whenever cut.

Under such a system the community would get no less tax revenue, but presumably more, than it does under the present system. In either case the owner will really pay annually only upon the land value, not upon the growth; the only difference being that under the proposed system he would not be asked to, while under the present system either there will be no growth to tax, or, if there is, he cannot afford to pay and the land will revert.

It must be borne in mind that while much cut-over land on the Pacific coast is being held under the present system, it has seldom grown anything yet. No expense has been incurred to establish a crop, accidental growth is almost always destroyed by fire because it does not pay to protect it, and if it is not so destroyed it has not yet been accorded the expectation value which the assessor will be obliged to recognize in the early future if he really observes the present law. The inevitable tendency of the present system is continuance to pay on the land with speculative value for purposes other than forestry but abandonment of land valuable only for forestry, *with destruction of the forest growth in either case*, by purpose or negligence, because it means added cost of holding with no possibility of profit. Since the owner cannot be compelled to grow timber to be taxed at his net loss, no timber tax at all will be received by the community and *its annual land tax will be confined to land worth holding without timber for purposes other than timber growing.* Under the proposed system, the latter class would pay the same annual tax, the annual tax revenue from strictly forest land would be greater, and in addition to both would be the small yield tax upon the crop.

A possible superficial criticism may be that, leaving the land out of consideration, the proposed yield tax at a property valuation of the crop means that but one year's tax is to be paid upon the timber, while a house, for example, is taxed annually. The fallacy of this, however, will be seen when it is remembered that unlike a house, which affords revenue annually, it is a crop produced from nothing by the owner since his acquisition of the land and while he was paying taxes upon his land upon its value for productive purposes throughout the entire period just as any other crop grower does, and affording revenue only when cut. He is taxed on this and must still pay upon any wealth into which he converts it. It is not unearned speculative increment. To tax it annually is exactly equivalent to taxing an agricultural crop 50 times during its growing period. We have seen elsewhere that justice does not require taxing a crop at all. The proposed plan, therefore, errs on the opposite side in favor of the State, for it does tax the annual production fully, although not until the crop is produced, for taxing its full value when grown is the same as taxing each year the increment added since the preceding year. If it is worth $150 an acre, after 50 years from seed, a 3 per cent yield tax would be $4.50. Each year since the first must have produced a fiftieth of the ultimate value, or $3, and had this been taxed at 3 per cent, or 9 cents, the same aggregate revenue of $4.50 would have resulted. While such a tax is not essential to justice, it is incidental to the plan proposed for insuring taxation of speculative values through applying a property tax to all values in the crop where cut.

When the essential difference of the two systems is grasped—that the crop is distinct from the land and the latter is still fully taxed—it will be seen that but one tax upon the crop, at the rate other property pays, is all that is just and all that can possibly be paid in a competitive commercial business. The case is not analogous with our present system of taxing mature timber, in which land and timber together are assumed to constitute inseparable realty, stationary in production and increasing only speculatively in value, therefore the comparison with one year's taxation under our present system has no weight. Nor is it like that of a yield tax applied to timber which has been relieved of annual taxation.

Nor does the proposed system by any means either subsidize the forest grower or assure him a profit. It is less attractive to him than the yield tax proposed for the East, because he must pay when without revenue and such payment will compound heavily. It does, however, without reducing tax revenue today, protect him from intolerable double taxation later, and merely puts on a basis similar to that of other enterprises a business more greatly handicapped by long-deferred returns, risk of loss, uncertainty of future prices, and continued current expense without current revenue. Only escape from fire and high future stumpage prices will permit profit at best. And the community is guarded against any future circumstances unduly in his favor by the clause permitting requiring him to cut the timber or have it reclassified.

TAXING MATURE FORESTS

THERE is no economic reason, theoretical or expedient, why any community should not at once adopt some such system as those we have described for deforested land. Revenues will not be perceptibly disturbed and are certain to be increased eventually. There cannot fail to be public economy in producing forests where they will not be produced under the present system.

With regard to uncut virgin timber the problem is much more difficult. To a large extent it represents wealth not produced by the owner. To an extent the opposite is true, for carrying costs may accumulate to equal the value of the timber. To find the proportion in each case is a most delicate task. In some regions mature timber may be uneconomically held out of use for speculative reasons. In others the tendency is to uneconomical cutting in advance of true need for use. While a yield tax on the timber itself is logically the only correct tax, it may increase current revenues in a region of heavy cutting or decrease them where cutting is slight. In the heavily-timbered State where wise taxation will do the most good because there is more material to be favorably affected, there is also the greatest difficulty in changing existing systems.

So here again we are under the necessity of considering local conditions, yet without space to classify them too nicely. About the only classification practicable is the same adopted in discussing new forest crops—separating from the others the extreme Pacific States having over half our virgin supply and constrained to hold much of this long uncut.

EASTERN CONDITIONS

THE problem of taxation of mature forests in the eastern part of the United States is far less serious than in the States of the Pacific coast. It is only in the States of the Pacific coast and in some parts of the South and extreme Northeast that large areas of mature virgin forest are the prevailing forest type. In these parts of the country very much of such timber would not naturally be cut and should not properly be cut for many years to come. Throughout the greater part of the country, however, this is not the prevailing condition. Under these circumstances the taxation of mature forests is not such a serious problem. In fact, the plan already suggested for the taxation of "new forests" might be adapted with slight changes so as to include also mature forests. Certain practical difficulties, however, may be avoided by adopting a somewhat different plan for the taxation of mature and partly grown forests. The following plan is proposed. Many features of this plan are identical with the corresponding parts of the plan already suggested for the taxing of "new forests." In some cases we have repeated these sections and in other cases reference is made to the previous plan.

1. *Lands Subject to Special Taxation.* The special forest tax should apply to all lands on which forests are growing and which meet certain conditions to be specified in the law.

Lands subject to the special tax shall be valued at not over — dollars per acre. (This value should be fixed so low as to exclude lands better suited for other uses than forestry.) Lands shall be separately classified and brought under

the system at the owner's option. Owners desiring special classification may make application to the State forester, accompanied by a certificate of the local assessor stating the value of the land, valuing separately the different parcels if directed by the State forester. The State forester shall examine the forest and if he finds it meets the legal requirements shall certify the forest for separate classification and taxation.

Lands thus separately classified shall remain so as long as the forest is properly maintained. The forester shall make occasional examinations to make sure that the forest is being properly maintained and the conditions of the law lived up to. Lands may be withdrawn from such classification at the option of the owner on paying all taxes then due.

2. *The Tax.* Forest lands when separately classified for taxation shall be subject to a special method of taxation.

Two methods are proposed, depending on whether the forest is a "new forest" or an "established forest."

A "new forest" has already been defined as lands stocked with forest trees the majority of which are not over 10 years old, provided that the other trees do not add to the assessed value of the property. All other forests which meet the requirements of the law are defined as "established forests."

By an "established forest" is meant, therefore, lands stocked with forest trees according to the standard set by the law, but which contain trees the majority of which are over 10 years of age, or which contain trees over 10 years of age which add to the assessed value of the property. Such forests, when accepted and classified, shall be taxed by the following method:

The value of the land and trees shall be assessed by the local assessor, and this assessment shall be repeated at intervals of 20 years until the trees are cut in such manner as to bring the the forest within the definition of a "new forest," as provided in the law, or until the forest ceases to be maintained according to the standard set by the law. Upon the value thus determined the forest shall be taxed annually at the rate of the general property tax of the locality, but not to exceed 10 mills.

Whenever any timber is cut or other forest product taken from the land a yield tax shall be paid to the State. This tax shall be a percentage of the stumpage value of the timber cut or of the actual value of other forest products, which percentage shall be as follows: If cut not more than 5 years after classification, 1 per cent; if cut more than 5 years and not more than 10 years after classification, 2 per cent.; if cut more than 10 years and not more than 15 years after classification, 3 per cent.; if cut more than 15 years and not more than 20 years after classification, 4 per cent.; if cut more than 20 years after classification, 5 per cent.

Whenever the trees are cut so as to bring the forest within the definition of a "new forest" as provided in the law, and the forest is then planted or otherwise reproduced so as to meet the standard of the law, the forest shall be classified as a "new forest" and be taxed thereafter by the method provided for "new forests."

Whenever the forest is given up or is not maintained according to the standard set by the law as determined by the State forester, the property shall then become subject to the ordinary property tax, after all payments of yield taxes due have been made to the State.

3. *Administration.* The discussion of administrative problems which has already been given in connection with the plan for taxing "new forests" applies equally to the plan here proposed for taxing "established forests."

WESTERN CONDITIONS (Taxing Mature Forests—Continued)

THE most notable peculiarity of the Pacific coast mature timber problem, in addition to the relative great dependence upon forest taxes of such heavily timbered States, is the existence of huge supply that cannot and should not be logged for American consumption for a long time to come. It is not needed yet and the cost of its transportation to the main centers of demand makes its competition with nearer supplies exceedingly limited at present. But carrying costs are so great that much of this timber seemingly cannot be carried until needed without a cost beyond what lumber will be worth. The welfare of the consumer demands not that this timber should be manufactured prematurely but that it be held, while the tendency of unwise taxation is to hasten wasteful cutting for the highest grades only and for foreign export.

While it is becoming apparent that carrying charges are soon to enforce wasteful and premature cutting in Pacific coast forests unless stumpage prices advance more rapidly than they promise, there are serious local obstacles to the adoption of the theoretically remedial yield tax. Chief of these are the immense storage of timber in excess of true demand, the irregular distribution of cutting, and the necessity of fixed revenue where cutting is small. However practicable the yield tax may be when in general and permanent operation, it is essential, to bring about the transition without too great disturbance, to bridge the lean period while cutting is still mostly in the future, and to equalize between counties with greatly differing cutting rates at present. For some time to come there must be expedients to solve these difficulties and it would seem that these must:

(*a*) Make the transition gradual by having it optional with the forest owner whether he continues the present system or adopts the new, under an arrangement which properly protects the community and gives relief on the class of forest land needing it most—that not to be cut soon.

(*b*) Let the State act as equalizer and banker between the forest counties, affording a medium by which the heavily cutting counties of today contribute the excess above their needs to the counties whose present revenue is reduced by the system, in turn receiving assistance when they are cut out and the now unexploited counties become the chief collectors of yield tax.

(*c*) In case the above plan still leaves shortage of revenue for a few years, due to insufficiency of cutting to make a total yield tax equal to the total received under the present system, let the State issue bonds annually to the amount required to make up the deficiency, these bonds to be paid at such future time as the yield

tax becomes large and by the population that has more to gain from forest conservation than has the present population.

Even with these expedients, however, there remain several essential points of principle and detail which must be settled more by practicable compromise than by nice adherence to theory. Mature timber of the West today is not wholly the product of the owner as the second crop of the future will be or as the mature forests of Germany are. His carrying charges entitle him to some absolution as a producer, but not complete absolution also for the stored natural values he originally acquired at small cost. Moreover, the revenue requirements of growing States and the difficulty of meeting them by a struggling population tend against any highly radical reduction of tax burdens upon any class other than the poorest and most numerous, even though it may be theoretically just or for the good of the entire community in the long run.

Of the ways suggested for fixing the amount of the proposed future tax, two seem simplest. One is a yield tax on the timber similar to that we have discussed for eastern conditions, either with or without deferring the usual annual tax on the land. If the latter is partially deferred, it must be added to the yield tax. The latter is made a certain percentage of the value of the crop, arrived at by a comparison of an average general property tax rate with modern income tax ideas, and increasing by a sliding scale, until a maximum is reached, to avoid hardship in case of early cutting. Such fixing of an arbitrary yet generally just percentage yield tax is not a particularly difficult financial calculation if cutting is not necessarily deferred until after a certain maximum tax is reached. Then complication appears. A sliding scale that will work plausibly up to a miximum reached at say 20 years, must then either remain uniform, which will discriminate between timber cut at 20 years and 40 years, or continue stepping up until it destroys values. Consequently such a tax which might be desirable where holding is purely speculative and undesirable might be undesirable where holding is for community good and not for the owner's good.

A suggested alternative for Pacific coast conditions is abandonment, as long as the stored excess supply continues, of the theoretically correct yield tax basis and adoption of an expedient which does not change the present tax but postpones its payment until the crop supplies the money. Instead of fixing a percentage on accepted general laws, it calculates the accumulation of the present burden in each State, by using fair averages, but does not collect till the timber is cut.

This also is a fairly simple process. Take as a basis the average assessed value of accessible timberland and the average rate thereon. Reduce the latter to a rate accomplishing the same taxation on the same timberland at its average full valuation (should assessment average about half the true value now, the rate also would be halved). This rate would obviously be an equivalent yield tax on timber cut immediately, except that it is based on both land and timber. Next find a fair present proportion for the land as separate from the timber, easily done by comparing present taxation of similar cut-over land, and reduce the rate accordingly. It is then only necessary to provide for taxing the land

fairly every year, without considering the growth thereon, and to apply the rate arrived at above, multiplied by the number of years ensuing before cutting, to the actual value of the crop when cut.

The owner is relieved of annual taxation on the timber, although not on the land. The community gets a sustained land tax and later the present rate applied to the actual value at time of cutting, thus exactly and automatically getting its full share of increased values. If stumpage goes up it gains greatly because this final rate and value applies to every previous year during which values were less and less could have been collected under the general property tax. This loss is compensated to the owner to some extent by his relief from interest on taxes paid annually. Were such compensation exactly equal, both community and owner gain equally at the expense of the money lender. In all probability the community will gain more than the interest, through increase of stumpage values, while the owner will profit, in spite of losing this difference, by not being forced into sacrificial management and financing and by being relieved from uncertain jumping of his valuations by the assessor from time to time.

There still remains to be provided some safeguard against accumulation of taxes beyond the ability of the crop to pay and against altered relations to other taxation due to possible change of public sentiment affecting the latter. If, for example, increase of income, franchise or corporation taxation, increase of assessment values, or other causes, result in lowering the community's property rate, the forest owner continuing the old rate on a full valuation would be unjustly taxed. Nor is it likely that a yield tax even on virgin timber, after land taxation has been met annually, should ever go much higher than 10 per cent, which would be reached in 25 years by a rate of 4 mills stepped up annually. Consequently there should be provision for periodic adjustment, say every 10 years, never to raise the rate, for this will be unnecessary, but to lower it if requisite to compare fairly with other taxation or to postpone somewhat the date at which an unbearable percentage will be reached. This latter point might also be met by a limit specified in the law, as is commonly provided in eastern plans, but it would seem that where the relation of desirable or enforced cutting period to carrying costs is uncertain, it might more wisely be left somewhat to tax commissions and receive legislative adjustment in perhaps 25 years.

The plan of taxing mature timber just described is less sound theoretically than totally dismissing the general property tax and striking out boldly on grounds of strict justice. While remedying one error of the present system—exaction of tax before there is revenue with which to pay—it perpetuates another grave error in unequal taxation. If timber cut in 10 years is worth no more than other timber cut today, it will pay 10 times as much tax on the same timber value. This is an injustice under both present and proposed systems which tends to hasten cutting and is hard to remedy except by an absolute income tax.

One of the most serious problems in any yield tax plan on the Pacific coast, usually minimized elsewhere because there is less cutting, is the determination of amount and value of the harvest. Three plans are usually proposed: assessment by the usual local officials, assessment by State forest officials for the sake of

technical competence and uniform policy, and sworn statement by the owner subject to check and heavy penalty for fraud. The first is simplest, the second is ideal in result, but either of these two would require expensive machinery where cutting runs into billions of feet a year and is continuous. It is hard to see how the frequently proposed plan to notify officials of proposed cutting a given number of days in advance, with tax payment prior or immediately following, would work where the owner is continually installing railroads and camps, opening up new areas, shifting cutting to get quality grades conforming to the market, perhaps suddenly salving fire-injured material, and generally conducting the complicated operations required to get out a hundred million or more feet a year. Apparently there must be an annual accounting after the timber is cut, except perhaps in certain classified small operations, and the owner's books afford the best means of accuracy. This is the plan used in collecting the New Zealand income tax and is reported to be satisfactory. Probably a sworn statement in requisite detail, with access to the books for a check and severe penalty for fraud, is the most feasible method of dealing with continuous operations.

It has been pointed out that doubt as to what land will not be used for agriculture, as well as the exigencies of a large and none too profitable lumber industry and inadequate State facilities, render doubtful the insistence on the Pacific coast that mature timber tax reform be contingent upon State supervision of cutting to obtain forestry practice. Nor is it as necessary as elsewhere, for the usual cutting methods are less antagonistic to forestry practice. On the other hand reproduction does depend largely upon fire prevention. It is practicable enough to have a contract requiring both protection of the uncut timber and precaution in logging. Such stipulations are easily made and understood in advance. Compliance can be watched by the existing fire force.

SUMMARY OF PLAN

1. Owners of mature timber may apply to State forester for separate classification, agreeing in event of approval to cooperate in fire prevention and apply precaution in logging to a specified extent as long as classification continues.

2. Certification of classification made by State forester to owner, county assessor and tax commission. Assessor thereafter includes only land value in annual assessment. Land tax paid annually.

3. Forest material taxed only when cut, at rate (determined as previously described), amounting to present rate on full value applied to full value at time of cutting and multiplied by number of years since classification, provided that in 10 years and every 10 years thereafter tax commission with advice of forest board may readjust this rate if necessary to prevent from becoming excessive.

4. Provision for establishing value of cut and preventing fraud.

5. State treasurer keeps account with each county, debiting or crediting each, and drawing from or paying to county treasurer, as necessary to equalize excesses or deficiencies due to yield tax system and its dependence upon quantity cut locally. If, due to insufficient development of lumber industry, total yield tax fails to permit satisfactory equalization between counties, State issues bonds to meet deficiency, payable after increased cutting, stimulation of forest preservation, etc., permit placing burden on chief beneficiaries.

6. Penalties for bad faith.

STATE ACQUIREMENT IN LIEU OF TAXATION

WE have hitherto discussed taxation of mature timber solely as a project of tax reform. There is, however, a growing interest in the possibility of affording needed tax relief on timber in return for the land after the timber is removed. Many people believe reforestation must be chiefly a State rather than a private function. This is undoubtedly true of land whose chief value is for protection, and not for the production of commercial timber. Probindifferent owners. State ownership of such cut-over land is often desirable. ably also much land that would afford good returns under forestry will have Devices for securing it without purchase, in lieu of taxes, are particularly worthy of attention, if they do not seriously interfere with revenue, because they may be made to insure leaving it in good condition for reforestation.

It is hardly likely that complete State assumption of forest land for this purpose will be practicable in States largely forested. The burden would be tremendous for many years. Concession of taxes to the original owner would be at immediate sacrifice, even if at later profit; consequently would require bonding or some other form of carrying this cost. Nevertheless a very considerable engagement in forestry by the State is always desirable.

There are various ways of accomplishing this through taxation, all based on contract or classification under which, for partial or complete remission of taxes, the State acquires eventual title. A somewhat different suggestion has been made to tax the land annually and let the county issue timber-tax certificates, bearing interest which it collects annually with the land tax, and secured as a lien against the property. These certificates are to be sold to investors, who receive the interest from the county. If accumulation of certificates against the property approach too closely its security value should the timber be destroyed accidentally, bond must be provided.

When the owner desires to cut he must pay all accrued taxes, when release will be given, but the State, at its option, may pay such indebtedness, plus the assessed value of the land, and acquire ownership after cutting. The amount of the timber tax is not an essential part of this plan, for it may be either the present general property tax levy or an automatic stepping-up of an originally determined rate such as we have discussed elsewhere. Without careful safeguard it would tend to be even more excessive and unjust than under the present system.

It is hardly within the province of this report to discuss such plans at length, for they involve much else than taxation, but if adopted guardedly to prevent too great State obligation they may be of high importance in settling many tax problems.

IMPROVEMENT UNDER EXISTING LAWS

WHILE the general property tax is both theoretically and practically wrong when applied to wealth which yields irregular income, and especially so when the income is so long deferred as in the case of timber, the degree of its injury is so variable with variations of practice as to show a great field for reform within the system even when it can not be changed.

Inequality in assessment, unsteadiness of policy in fixing ratios and levies, multiplication of unnecessary taxation districts or units, and, above all, extravagance and incompetence in public expenditure—some or all of these evils afflict nearly every forest property, yet are theoretically apart from the system and curable. They deserve immensely more determined and organized effort which, if it can not remove them wholly, should at least limit them to some certainty which would enable more intelligent consideration of forest investments. It is the utter uncertainty that, rather more than degree now, confuses all calculations. Foresters and timber owners should campaign as vigorously as they do for more direct forestry legislation for laws putting the entire machinery of gathering and spending taxes on a business basis.

Levies should be only to support a budget carefully prepared and given ample advance publication to call forth approval or disapproval.

Local improvements should be made only after competitive bids for the work.

All public accounts should be standardized in method, subjected to frequent expert inspection, and periodically published in condensed form.

Waste through unnecessary or poorly performed work on roads, bridges, and buildings is tremendous. The employment of competent engineers for surveys and construction is as necessary in the taxpayer's interest as it is in building a railroad.

The business organization of our counties, towns, school districts, and like units of local government varies in form and efficiency with every State. This is an era for improving city government. There is no less need for studying and installing the most economical and efficient forms of other local administrations, securing competent expending authorities and placing responsibility where it can not be evaded. The number of disbursing authorities, particularly, should be reduced to the minimum, both to render easier fit selection and to make it practicable to check all expenditures more frequently. A multitude of road, school, town and county authorities, each with its tax-raised funds wholly at its own disposal under countless systems, is practically beyond control.

Expense and trouble of every kind is multiplied in some States by inexcusable protraction of the tax-gathering process. Under some laws it is nearly two years from assessment until taxes are paid without becoming delinquent.

Unnecessarily extravagant bond issues are frequently voted after insufficient consideration and at unrepresentative elections.

Taxation and bonding districts are often gerrymandered with most unfair and unwise boundaries, usually because there is no organization for effectual protest.

One of the cardinal injustices under the general property tax is unequal assessment, due either to ignorance or wilful discrimination. If to the former, much can be done by systematized representation of facts; if to the latter, by assurance that it will be resented. Changing and conflicting policies as to the relative merits of low assessments and high levies, or vice versa, result in confusion, accentuation of inequality, and extravagances. In most States these evils need legislative control and in all States they need organized systematic attention by taxpayers.

From a forestry standpoint so-called "home rule" in taxation, which permits conflicting local policies to affect a product which has general market and competition, is almost always dangerous and discouraging. Forestry more than almost any other industry requires stable and consistent tax treatment.

All of these evils fall roughly under two classifications: those requiring remedial legislation and those requiring better execution of laws in themselves satisfactory. In both cases the need is urgent for all who are interested in forest management to study the situation at home and elsewhere and to work for improvement individually and collectively. It is as much forestry as is anything else. It should be a function of forestry associations and official forestry departments, which are less likely to have their motives misconstrued than are forest owners, but the latter should also organize themselves, or join existing taxpayers leagues, to improve conditions permanently and to forestall every individual case of extravagance or injustice.

Section III.

THE TAXATION OF FORESTS IN EUROPE

THE following is a brief summary of the methods of taxing forests in the principal countries of Europe, by Fred Rogers Fairchild, reprinted from the report of the Special Commission on Taxation of Woodland of the State of Connecticut, Hartford, 1912:—

(A part of the following discussion of European forest taxation was delivered in an address before the Fifth Annual Forest Conference at Bretton Woods, N. H., July 19, 1912.)

The European Tax System in General.—There is a tendency among the progressive states of Europe toward agreement upon the general outline of tax system. As a rule the tax systems of European states are based primarily upon income, rather than upon property as in the United States. The general income tax is normally the basis of the system; the tax is usually progressive, the rates increasing with the size of the income. There is always a minimum income exempt from taxation. Supplementing the income tax there is apt to be a property tax, or a system of yield taxes, the purpose of which is to place an extra burden of taxation on what we may call funded incomes, that is, incomes derived from invested capital as distinguished from incomes due to personal service. The above is, of course, a very general statement, and numerous exceptions will be found.

Forests in Europe are ordinarily subject to state taxation and to local or communal taxation. As a rule, forests are subject to one or more of three important taxes: (1) the income tax, (2) the ground tax, and (3) the property tax.

The Ground Tax.—The ground tax is a yield tax (Ertragssteuer). It is based upon the productivity of the soil and is measured by the yield which is normally to be expected in view of the general character of the soil and the use to which it is devoted. It is not based upon the actual income received from any particular piece of land. No account is taken of peculiarities either in the management of the property or in the personal situation of the owner. Having

determined the quality of the soil and the general character of the forest stand, it is assumed that the management is the same as normally prevails in that region. Also when the prevailing kind of wood and management have been decided upon, no account is taken of peculiarities in the condition of a particular forest. The owner who, by careful management, keeps his forest in unusually good condition, pays no extra on account of the increased yield resulting. On the other hand, the decrease in yield due to neglect, bad management, or other causes brings no reduction in the normal yield tax. In determining the money value of the yield use is made of the average prices of timber and other forest products which have prevailed during a number of past years.

The yield which is taxed is in some cases the gross income. In most cases, however, certain reductions are made for costs. Account is taken of intermediate yields as well as major cuttings, but there is frequently no account taken of incidental incomes, which in some parts of Europe are a matter of considerable importance. Certain more or less arbitrary deductions are ordinarily allowed for loss of yield through accident, though in certain important states no such deductions are permitted.

The ground tax is administered by means of a cadaster. There is a careful survey of all of the lands subject to taxation. In the case of forests it involves the determination of the area, the kind of timber, and the general character of the stand. It also ascertains the prevailing method of management in the particular region and the average prices of forest products during a number of past years. Based upon these facts, the yield which is normally to be expected from a unit of land of each particular class is determined, and this normal yield becomes the basis of taxation. Obviously, the construction of the cadaster is an undertaking involving enormous labor and expense and requiring many years to complete. Moreover, when once completed the cadaster tends soon to become obsolete. Changes in method of management, changes in the character of the forest stand, changes in prices of wood all tend sooner or later to bring about a wide divergence between the assessed yield of the cadaster and the yield actually being obtained. The time and expense involved in making a new cadaster are so great that the old cadasters have always been allowed to remain in force long after they have ceased to conform even approximately to actual conditions.

The ground-tax cadasters of European nations were established at various times during the nineteenth century. Practically all of them are today obsolete. Many are from 50 to 100 years old. No great state today, however, seriously considers the making of a new cadaster, being deterred by the enormous expense and labor involved. As a rule the result has favored the forest owners. Forest conditons have generally improved since the cadasters were made, and in particular the prices of forest products have risen enormously, with the result that the tax is today a far lighter burden than was originally contemplated. With this result, however, goes a tremendous amount of injustice and inequality on account of the change of conditons since the establishment of the cadaster. The rates of the ground tax vary greatly, but are not usually very heavy.

Another disadvantage of the yield-tax system lies in the fact that when a

new forest is established the tax must be paid at once, and continues annually in spite of the fact that for many years there is no yield from the forest. Some states make allowance for this by providing that new forests shall be exempt from the ground tax for a definite period of years, averaging from twenty to thirty years as a rule.

On account of the difficulties inherent in the ground tax this form of taxation has gradually declined in importance. In only a few states today is the ground tax the principal method of taxing forests. In most progressive states the ground tax remains only as a supplementary tax in a system based primarily upon other methods of taxation, or else has been given up entirely as a state tax. As the basis of local taxation it is still important and will doubtless long continue.

The Income Tax.—Most European states have as a more or less important part of their revenue system a general income tax. This is a tax upon incomes from certain specified sources, which include pretty much all important sources of income. The income from forestry is subject to the income tax where such a tax exists. As a general rule it may be stated that all receipts, either in money or in kind, are subject to the tax. This includes major cuttings, intermediate yields, and incidental uses, and includes also ordinarily the money value of any forest products taken by the taxpayer for his own personal use. The taxable income is normally the net income, deductions being made for the ordinary costs of administration and management. Deductions are also allowed for interest upon debt and to some extent for depreciation of the capital. Costs of reforesting cut-over areas are regarded as expenses and deducted. Costs of establishing new forests, however, are ordinarily not considered expenses, but rather investment of new capital, and are therefore not deducted.

The income tax, unlike the ground tax, is a personal tax. Instead of assuming a certain normal income, as is done under the ground tax, the income tax takes account of the actual income received by the individual in question from the particular source specified. In administering the tax, account is taken also of the personal circumstances of the taxpayer, and abatements are allowed where special circumstances have impaired taxpaying ability. In the case of forestry some allowance is ordinarily made for irregularities of income by providing that the taxable income in any year shall be the average of the incomes of the forest for the past three years. Deductions likewise are made for the average administrative expenditures of the past three years.

The rates of the income tax vary with the size of the income and are different in different states. It is seldom that the maximum rate exceeds 5 per cent.

In many of the European income-tax laws the attempt is made to distinguish between income on the one hand and yields which cause reduction of the capital on the other hand, the general rule being that the taxable income is only such as can be obtained without a reduction of the capital source from which it comes. Obviously this distinction is very difficult to apply in the case of forestry. Much confusion and disagreement among authorities has arisen over the application of this part of the law. In some states no attempt is made to make such a distinction, but all forest yields are treated alike as forest income subject to taxation.

The Property Tax.—The property tax in European countries is to be distinguished from the general property tax with which we are familiar in America. The general property tax is a tax levied upon practically all kinds of wealth at a uniform rate. This sort of tax has long ago been abandoned by most European countries. Switzerland is the one nation where the general property tax is still important. Property taxes, however, in the sense of taxes levied upon the capital value of certain specified kinds of wealth, still continue to occupy a position of more or less importance.

The basis of the property tax is theoretically the actual value of the property in question. This means the market value, or the value which corresponds to the average customary price at which property of the character in question is sold. In the case of forests it is, of course, obvious that the intention of the law is not easily carried out, since sales of forests are of infrequent occurrence. Where it is impossible to determine the actual selling price of forests it becomes necessary to fall back upon some other method of determining the value. The method usually chosen is to ascertain the normal yield produced by a given forest and then obtain the proper value by capitalizing this yield at some specified rate of interest. This, of course, makes the property tax quite similar to the ground tax, though with this great difference: the property tax is based not on an ancient cadaster but upon assessments frequently made and revised. This procedure also introduces serious theoretical questions and administrative difficulties. There is, for instance, much dispute among German foresters over the proper rate of interest for capitalizing forest yields. The property tax has, therefore, shown itself subject to many of the difficulties pointed out in the case of the ground tax. Outside of Switzerland no important European country makes the property tax its sole or principal tax. Where it exists it usually serves the purpose of a supplementary tax for the purpose of placing an extra burden upon funded incomes.

The rates of the European property taxes vary greatly, but are normally very much lower than we are familiar with in this country.

The Tax Systems of the Principal European States.—Very few states use all three of the above-described taxes. The typical modern system consists of the income tax as a principal tax, with either the ground tax or the property tax as a supplementary tax for the purpose of placing an extra burden upon funded incomes, and upon wealth yielding no income. As has been indicated, the ground tax is today falling into disuse, and the property tax is coming to be the leading supplementary tax. For example, in the German Empire the important states of Prussia, Hesse, Baden, and Bavaria make use of the general income tax with the supplementary property tax. Saxony, Würtemberg, and a considerable number of less important states use the general income tax with the supplementary ground tax. A still smaller group of states uses either the ground tax alone or a combination of all three, income tax, property tax, and ground tax.

Austria uses the general income tax with a supplementary ground tax. In Switzerland the property tax occupies a position of greater importance than anywhere else in Europe. The income tax is also of importance. In some cantons

we find the one, in some the other, the principal member of the tax system. Where the property tax is the main source of taxation, the income tax is apt to be used also as a supplementary tax, and vice versa where the income tax is the principal tax.

Local Taxation.—The foregoing discussion has related to state taxation only. It is impossible to form a true idea of European forest taxation without taking account also of the taxation of the local bodies districts, counties, communes, parishes, and so forth. The local organization of European countries is so diverse and their systems of taxation so varied, that it is entirely out of the question to give anything like an adequate account within the limits of this chapter. The following is nothing more than the briefest and most general outline of the subject. As a general rule the local bodies of European countries obtain their revenues, (1) from various contributions from the state or other higher political bodies; (2) from communal property and public industrial enterprises; (3) from various fees, licenses, and so forth; and (4) from taxation. Taxation is ordinarily relied upon to make up whatever deficit remains after the revenue from the other sources has been applied to cover expenditures. The taxation of the local bodies as a rule consists in additional rates imposed upon the principal state taxes, in somewhat the same way as the states, counties, and towns share in the general property tax in this country, the chief difference being that in Europe the tax is a state tax and the administration in the hands of state officials, the local bodies merely adding their necessary rates. Where a state obtains its revenue, for example, from the income tax and the property tax, local bodies may add their own additional rates to one or both of these taxes. It should be mentioned also that in many states where the ground tax has been given up as a state tax it is still commonly kept in force as a basis for the addition of local rates, and so continues to be a source of local revenue. The rates of the local taxes on income, property, and soil show the utmost variety. Many of the communes impose no taxes whatever, securing all necessary revenue from the other sources named. Among those communes which impose taxes the rates vary all the way from almost nothing to three or four times the state rate. Maximum limits are often fixed by state law.

Conclusion.—In general the methods of taxing forests in Europe, while decidedly superior to the American system, are still far from having attained perfection. European foresters have been for years engaged in more or less bitter controversy over alleged theoretical defects of their tax systems as applied to forests, as well as over practical rules of administration. While we have much to learn from European experience, no one familiar with the subject would think of suggesting that any European system be introduced bodily here. Knowledge of European experience will not relieve us of the necessity of developing a system of taxation of our own suited to American conditions.

SECTION IV.

BIBLIOGRAPHY OF FOREST TAXATION

THE following is a list of the most important works in English upon the subject of forest taxation together with a few of the important German publications. No attempt has been made to give a complete list of foreign publications.

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Bissell, J. H.—Notes on forest taxation. Report of the Michigan Forestry Commission, 1905-6.

Bullock, Chas. J.—Practical application of taxes to forests. In "Taxation of Forests," issued by the Society for the Protection of New Hampshire Forests, 1912.

Chittenden, A. K., and Irion, Harry.—The taxation of forest lands in Wisconsin. Published under the direction of the Wisconsin State Board of Forestry in co-operation with the United States Forest Service, Madison, Wis., 1911.

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Fairchild, Fred R.—Taxation of timberlands. Report of National Conservation Comission, vol. II, pp. 581-632.

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Foster, J. H.—The taxation of forest lands and the efficiency of the fire laws in New Hampshire. Report of the New Hampshire Forestry Commission, 1907-8, pp. 49-119.

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Maryland State Tax Commission.—Taxation of woodlands, 1913.

Massachusetts Tax Commission.—Report, 1909.

Michigan Forestry Commission, 1905-6.—Taxation and tax lands.
National Tax Association Proceedings.—Discussion on forest taxation, vol. II, pp. 99-110; vol. VI, pp. 394-401.
Taxation of wild lands in Maine, vol. I, pp. 467-470.
Assessment of timber land in Washington, vol. III, pp. 335-336.
Society for the Protection of New Hampshire Forests.—Discussions in "Taxation of Forests," 1912.

A large number of short articles and notes on forest taxation have appeared in the various forestry and lumber trade journals of the United States during the past five or six years. No attempt is made here to list all of these articles.

The principal German works on the subject are Weber, Die Besteuerung des Waldes (Frankfurt a.M., J. D. Sauerländer's Verlag, 1909) and the chapter on Waldbesteuerung in Endres' Handbuch der Forstpolitik (Berlin, Verlag von Julius Springer, 1905). A great number of articles on the subject have appeared separately.

THE TAXATION OF FOREST LANDS, FOREST COUNTY, WISCONSIN

THIS study was made covering the tax year of 1912 for the purpose of determining the actual effect upon taxes to owners of forest lands of the exemption of growing timber both under present conditions of local assessments and under ideal conditions of assessments at full valuation.

It should be remembered that in the tax scheme in Wisconsin, as of most of the American States, the tax on real estate forms the so-called elastic element. Licenses, taxes at fixed rates, etc., furnish a certain basic minimum of revenue. The balance must be extended against the general property and against real estate in particular on a sliding rate. It follows that any reduction in the value or quantity of property subject to taxation must be met by a corresponding increase in the tax rate. This applies both to the tax to meet local expenditures and to meet State and county requirements.

This inquiry covers three points.

First. What is the present tax burden of forest lands in this country?

Second. What would be the effect on such lands and all other property of an exemption of growing timber, other conditions remaining as at the present time?

The third inquiry was on the same basis as the second but assumed assessment of all property at its full value.

The first big result indicated by the investigation is that the mere exemption of timber on forest lands is not a solution of the problem. The reason for this lies in the sliding rate. The proportion of forest lands to the total taxable property of the district bears a direct relationship to the increase of the tax rate resulting from the exemption of growing timber.

In the theoretical case of an assessment district containing nothing but forest lands there would be no reduction to the owners on such lands in taxes through the exemption of growing timber for the reason that the total tax would remain the same and the rate would be increased to offset the lowered valuation.

In Forest County as a whole the exemption of growing timber on forest

lands would have reduced the tax in 1912 from $52,417.16 to $18,331.33 assuming a full value assessment. In other words approximately $34,000 or over 70% could be cut from the total taxes on forest lands by the exemption of timber at the present time. If timber were now being assessed at its real value in Wisconsin, the result would be still more startling.

The point made above with respect to varying proportions saved to taxpayers is illustrated by two extreme cases. The town of Crandon contains 9.64% in the valuation of forest lands and the town of Alvin 63.77% in such valuations. In Alvin the saving to the forest land owners in taxes is 56%, in Crandon 82%.

"SINGLE TAX" A DANGER TO FORESTRY

FORESTERS and others interested in forest taxation reform are, of necessity, obliged to give considerable attention to taxation proposals not primarily based upon forestry problems, but affecting them indirectly. It was accordingly suggested that the report of the sub-committee on forest taxation to the Forestry Committee of the Fifth Conservation Congress should include a discussion of new tax theories dangerous to forestry, and such a discussion was included in the report as originally approved by a large majority of the sub-committee and the entire Forestry Committee. In view of some objection in the former, however, it was thought best to omit it from the report and present it to the forestry section of the Congress for determination as to its value and inclusion in the printed proceedings. It was overwhelmingly approved in full by the forestry section of the Congress as follows:

We have discussed desirable changes in tax systems and possible improvements under old systems. There remains a contingency little considered but fraught with great danger to consumer as well as producer of American forests—the adoption of new systems framed without forestry in mind. A growing social unrest with a tendency to feel that in taxation lies the remedy for part of the unsatisfactory distribution of wealth, is giving rise to many proposals of which the diametrically opposed income tax and "single" tax are but conspicuous examples. It is possible that somewhat revolutionary experiments will be made in many communities.

While without quarrel with any of these insofar as they are attempts to improve social conditions, foresters are responsible for informing the public when measures advocated by those ignorant of or indifferent to forestry threatens the pertetuation of forest resources. An example of such is single tax. We may leave to political economists to advise whether or not it is just to regard land as the only means by which capital exploits labor or seizes the unearned increment, or whether single tax would prove a panacea for many social ills. But it is clearly a matter of moment to us when, having learned unmistakably by experience at home and abroad that adequate forest crops will not be grown without deferring most of the tax thereon until maturity, we are confronted with a proposal actually to penalize good management by making the annual burden much heavier than it is already. It is a complete reversal of the principle adopted by forest-growing

countries and urged here without a single exception by all foresters and economists familiar with forest conditions.

The single tax, applied to forests, forces cutting regardless of demand. This means the utter waste of all but the choicest part of the tree; the export to foreign countries, hence the loss to us, of the surplus above our present wants; and the early destruction of a source of tax revenue which should be stable and enduring. It also means the wrecking of the great-majority class of lumberman—the small independent men who have no great financial backing—and placing the control of lumber prices with those who are in position to take advantage of the situation without the slighest benefit to the consumer or any desirable effect of distributing forests among small hands, such as is argued by single-taxers in the case of farm lands. It means only over-cutting and, to accomplish this as economically as possible, only by the largest and perfectly organized operations such as require great capital. With respect to the growing of new forests, to supply the future consumer, continue a tax revenue, and preserve streamflow, the result would be even more suicidal, for destruction of the project would be attended with no salvage whatever. The forests simply would not be grown.

The only alternative to these evils, under single tax, would be to separate forests from land absolutely, regarding the former as improvements, a distinction impossible to arrive at justly and practically under conditions grading from virgin forest to purely man-grown reproduction with even the former existant to a certain but unmeasurable degree because of fire protection afforded by the owner. It is wholly unlikely that the public would seriously consider exempting all speculatively owned forests from taxation. To continue regarding them as land, under single tax, would have the destructive effect described. To exempt them but compensate by increasing the tax on the land which bears them would require over-taxing identical land, now denuded but which should be reforested, so that reforestation would be impossible. Consequently, should single tax ever be considered seriously in any forest community, it will be highly necessary to exempt forest lands wholly from its application, either by continuing them under the old general property tax or preferably placing them under a yield tax system which, in effect, applies the income-tax principle to this class of property.

In the foregoing paragraphs single tax has been treated at some length merely as an example of the danger of social propaganda which, because forest economics have as yet been given little general study in America, may easily be supported by well-meaning people who consider only general application and fail to recognize the peculiar situation of the forest crop. Every new tax measure should be studied from the same viewpoint.

The above action by the forestry section of the Congress was corroborated by the resolutions committee of the main Conservation Congress itself, which emphatically rejected a resolution implying approval of single tax.

DISCUSSION ON THE REPORT OF THE COMMITTEE ON FOREST TAXATION

Mr. G. N. Ostrander, of New York: The subject of taxation of our woodlands in New York State is becoming a very serious one with us. The expense

of running our forest towns is increasing very rapidly with the problem of highways and other improvements until last year in some of the towns we paid as high as fifteen cents an acre in taxes. We are therefore very much interested in this subject. Naturally, as the report was being read I was endeavoring to apply it to our conditions and I would like to ask the gentleman who made the report how the plan which your committee has recommended through fixing a constant value over a series of years in the town where the woodland owner was paying 75 or 80 per cent of all the taxes would operate to relieve the tax payer. In other words, it takes two things to make your taxes, valuation and a rate. If the valuation is kept down, naturally the rate must go up, a certain sum of money must be raised every year to support the government in these forest towns and I rise principally to ask for the benefit of suffering New York State woodland owners, if the Committee can inform us whether this plan which is so clearly recommended, can be applied to the towns where the condition I have stated exists.

Mr. E. T. Allen, of Oregon: This proposition was that the timber owner was now paying upon both land and timber and we suggested paying it upon the land but deferring his paying a tax upon the timber until it is cut. My only suggestion of fixing the rate was in fixing the rate which he would pay as a yield tax, not by the ordinary method of figuring out a theoretical yield tax at so much per cent, by starting it in and basing it on taxation today so it would be easy to put over.

Mr. Ostrander: I still do not see how the woodland owner is relieved if he has to foot the bills?

Mr. Allen: You mean to pay the bills of the town while that is going on?

Mr. Ostrander: Yes.

Mr. Allen: No, sir; it cannot be done. The only answer that is made is that in a region dependent upon revenue from forests, the yield tax is only going to work in one of two ways, either cutting must be so steady and continuous so that it maintains as much through yield tax as it would through an annual tax, or else that community's revenue must be banked by some other community. In other words, that problem is more difficult in a new state than in an old state. It would be almost impossible for us to keep up with our yield tax in that state at all. Imagine a State in which the total cutting would bring by yield tax as much as the annual timber tax; then you would still have a county here that is not cutting at all. Surely you would have trouble there, and I think that every advocate of a yield tax would think so. It cannot be done unless a State keeps a set of books with each county and the one that is paying in excess is given credit for that and in course of time the new county comes in and pays back the county which is cut out to help it along. It has to be one or the other. Your cutting must be enough to keep up the same revenue or you must bank it between regions.

One thing I did not bring out in my report which I think I should have is this: There is certainly a growing feeling that the States should go into reforestation and that they should not do it by buying lands, having to appropriate for the purpose, but that they might get such lands by relieving timber owners of taxation under some contract by which the State acquired the land. There have been many schemes devised for that purpose, but none of them are very perfect because if it amounts to much the State has to forego the revenue of the timber owners. We have discussed that to some extent in the report. We discussed one scheme which was suggested of using certificates against the timber, and those certificates are not much more than warrants and pay six per cent. The timber only pays interest on the certificates and when the owner cuts timber he pays the certificate and it is released to him, but the State in the meantime has the right to purchase the certificate ahead of him. That is rather one ingenious scheme which has been proposed and which might be worked out.

I would like to say that the Committee think this whole problem of forest

taxation might be helped some, or we should at least look into the question of acquiring State lands by exemption of taxation along practical lines.

I do not believe any State will take care of all the cut-over lands in it. As to the purpose of acquiring State forests in a located area, it is well worth looking into. The details of the whole debate on this forest taxation subject are many. As I say, it is a big one, but after all I am only a member of the committee and the Chairman is not here and Professor Fairchild is not here, and it is mighty easy to tangle me upon it. We have a good many people who have been thinking on this question, Doctor Drinker and Doctor Rothrock among them, and I would be glad to have a question asked of those people who are trying those things in their State.

Mr. W. R. Brown, of New Hampshire: I was very much interested in one point Mr. Allen brought out, and that is what we can do at the present time in regard to taxes, and in looking into this matter in New Hampshire we found out that the question of the survey of land, the running of lines, the determination of the timber on the land, the way by which timber should be scaled at the present time and in the future, that the determination of that scale and the continuance of a scale were fundamental questions which would have a great deal to do with the taxation question, whatever system we might adopt in the future. In looking over our small State of New Hampshire we found if we made these surveys and established lines and determined the amount of timber in our State, it would cost about $1,000,000 to do that in one year, so any reasonable system of taxation ought to take into consideration the determination of areas and of values and of the scale rule which will last during the time. This is one thing which we can do to begin with: We can get the State to take up this work, we can get the towns to determine their land and what they have, and we can get it in shape for taxation which will come later.

Mr. T. B. Walker, of Minnesota: The thing that should be appropriate and proper would be to limit the unfair, unjust, frontier custom of increasing continuously the system of taxation until it becomes confiscatory of the value of timber in the course of years. Let it always be understood that the lumberman, in providing for the establishment of lumber mills, must provide a tax of timber large enough to last him from thirty to fifty or one hundred years. A lumber plant is a very expensive thing; it costs a large sum and the money invested in it must be returned and the money invested in the timber must be returned with the carrying charges of interest and taxes. This charge of interest and taxes doubles the value of stumpage every eight or nine years, so that when most men who have entered into the lumber business to a large extent in past years have started in with a valuation in the timber of at least $2 a thousand, and even that would be larger than the stumpage value charged by the State or by the Government, in eight or nine years that value is $4, in another nine years it is $8; then it is $16, and when it arrives at the point of 55 years, which is about the minimum time in which a milling plant can be established with any prospect of success in the enterprise, it will take not less than 55 years, or perhaps the expected life of the person establishing it. At that rate the stumpage runs up at the end of that time, by means of these carrying charges for taxes and interest, and you would have to pay $120 a thousand for the lumber in the course of 55 years. Speaking of this question of confiscation by taxation and interest charges, we also have to bear in mind that the lumber men, as a general proposition, have had to pass an excess rate of interest on money that they use in business. If the lumberman had sufficient money of his own he did not have to be a lumber man. Ninety out of one hundred who have gone into the lumber business in the West have gone into bankruptcy.

Mr. Arthur Goadby, of New York: Mr. Chairman and Gentlemen: I think the subject that has been opened up this afternoon will cause you to realize that

the question of single taxation is a serious one which has to be settled on scientific principles. I understand at this minute a serious question has arisen on the Pacific Coast, that they are proposing an amendment to the Constitution whereby the single tax there should be introduced, and as that applies to the question of forests, I assure you gentlemen it will cause the destruction of all those beautiful forests out there, and I therefore request that the report which was read by Mr. Allen, that part which was caused to be expurgated, be reintroduced and placed in the regular report of this committee and printed in the proceedings. I make that motion, Mr. Chairman.

Mr. C. S. Chapman, of Oregon: I second the motion.

The Chairman: It has been moved by Mr. Goadby and seconded by Mr. Chapman, that this conference go on record as approving that portion of the report which was not printed and which Mr. Allen read a short time ago touching on the question of single tax, and that it be made a part of the proceedings.

Mr. W. O. Filley, of Connecticut: If I understand the motion, if passed, it will simply mean that we print the opinion of the committee in regard to the single tax as applied to forests, is important enough to be on record, it is not a question of whether we approve the opinion of the committee or disapprove it, but it is simply the fact that the portion of the report which was omitted from the printed record we want included in the record for our own reference in the future.

The Chairman: That is it precisely. This short chapter was not included because the sub-committee was not entirely agreed upon it, and, in order to present a published report on which the entire sub-committee and the forestry committee did agree, this omission was made in order to see whether this conference would like the rest of the report to be put on record.

(The motion, on being put to vote, was carried.)

Henry S. Drinker, of Pennsylvania: Mr. Chairman, there is one thing I think ought to be said and said plainly, and that is what we think of Mr. Allen's work in this report, we who know what he has been doing. His work is beyond all praise. We have been hearing from him all summer. I know in Pennsylvania I received from him, nearly two months ago, the first draft of this report. It was so able and comprehensive that I was afraid to try to pass upon it, and I asked my old friend here, the leader in age and in forestry, Mr. Elliott, and Dr. Rothrock, to go over it. They did so with care and sent it back with their suggestions to him. Then I got back from Mr. Allen again a re-draft of that report and that has been going on, and the amount of the splendid work this man has been doing is beyond all power of commendation. Mr. Allen properly said, when he was trying to answer the various questions that were put to him, that he would like some of us from Pennsylvania and Connecticut, who have been putting into legislation the yield tax, to answer some of them, but the trouble was, he answered the questions as well as we could answer them ourselves. Here is Mr. Elliott, whom you all know, and at the beginning of this session he showed me some notes he proposed to give to you, and he turned to me after Mr. Allen had finished and said that he had nothing to say, Mr. Allen covered it all. Therefore, I want to express the thanks of the co-members of this Committee to Mr. Allen.

The Chairman: I am very glad indeed that Dr. Drinker has taken this matter up.

Mr. W. O. Filley: Mr. Chairman, I have had some experience, so far as it concerns the East, but no practical knowledge as it concerns the West, and I was amazed at the clear presentation of the subject by Mr. Allen, his explanation of the laws already drafted in the East and the general principles underlying it. I would not have attempted to give such a statement myself, I know I could not give it as clearly as Mr. Allen, and I am glad that I was not called upon to answer.

Dr. J. T. Rothrock: I would like to say that this report was the finest piece of analytical work I ever saw in my life.

The Chairman: Is there any further discussion on this subject?

Mr. J. B. White: I move a rising vote, as a compliment to Mr. Allen.

(The above motion, being duly seconded, carried.)

The Chairman: It may be desirable, in order to get some resolutions in regard to forestry in concrete form, not to leave it entirely to individuals, but to have a committee which we can appoint from this meeting to formulate resolutions regarding forestry, which of course does not in any sense prevent any individual from formulating his own resolutions and presenting them to the committee. However, in order to make sure that there will be some resolutions prepared, I will appoint Mr. E. T. Allen, Mr. Wm. T. Cox, Mr. J. E. Rhodes and Mr. E. A. Sterling as members of this Committee, with Mr. Allen as Chairman, and authorize him, if he needs any assistance from anyone else, to call upon them.

Mr. E. T. Allen, of Oregon: It seems to me if this is the time for appointment of committees, and they will have to report again before many days, that there must be some provision made here for our future, then, perhaps, for carrying on the work we have done, in the way of printing proceedings and all that sort of thing.

We five of us, who have been working on this end as a forestry committee, will disband, and there will be a new President of the Congress, who will probably appoint a forestry committee. Whether we will hold another meeting of this kind again, whether we perpetuate ourselves in any form, must be decided by somebody, and it cannot possibly be decided here because we do not know what the new Congress will do, whether we will be encouraged or invited to continue.

At this same time last year our committee was appointed to report back, just as Mr. Graves appointed a committee now to report back tomorrow, so that we may have some idea of what we are going to do next year. That committee arranged for this committee to carry forward its views to the next Congress, and that is why we are here. Therefore, there should be a committee appointed for discussing views and carrying those views forward.

The Chairman: I should explain what I believe to be our status as an organization, just how much power we have, and if I am not right, I will ask Captain White to correct me. There is a formal forestry committee, and there has been, since the organization of the Conservation Congress. This Forestry Committee has this year been authorized to appoint some ten sub-committees to assist in drawing up these reports, and the American Forestry Association has joined with the Conservation Congress in meeting in this work, so that this group meeting, this sectional meeting, really represents the forestry part of the Conservation Congress meeting jointly with the American Forestry Association. Is that right, Dr. Drinker?

Henry S. Drinker: Yes; that is right.

The Chairman: I do not suppose that this body has any authority to indicate what the Conservation Congress should do in the matter of its committees. It can, at least, express the opinion of the foresters in the meeting here as to what these men would like to do, whether they approve of this plan or some other. Does anyone care to bring this subject up at all in order to get an expression as to the general plan of meeting?

Mr. J. B. White, of Missouri: Mr. Chairman, I supposed that the proceedings of this meeting would be published and presented with the proceedings of the National Conservation Congress. As this Committee has its power, and was appointed by the Conservation Congress, I suppose the proceedings will be published with this and the other proceedings of the Congress, and I haven't any doubt but that such a good committee would be reappointed by the new Congress.

The Chairman: The American Forestry Association has already published each individual report.

Mr. Cox: In view of the fact that there is some unfinished business in connection with the work of the different committees, I was wondering if it would not be advisable for the various sub-committees, as well as the forestry committee itself, to continue on, instead of automatically going out of existence—that is, continue on until superseded?

The Chairman: They would have to be reappointed. I think that automatically our committee expires, and the only thing you could do on that would be to act as advisor to the incoming organization of the Congress.

[From this point on there was considerable discussion over the form of a resolution expressing appreciation of the work of the committee and the hope that it would be continued in power, and it was finally agreed that the meeting express appreciation of the work of the committee and that the chair appoint a committee to discuss organization for the future.]

SECONDARY FORESTRY EDUCATION IN THE UNITED STATES

By the Sub-Committee on Forest School Education.

Chairman, J. W. Toumey, New Haven, Conn.

Walter Mulford, Ithaca, N. Y. — Geo. S. Long, Tacoma, Wash.
C. H. Shattuck, Moscow, Idaho. — W. B. Greeley, Washington, D. C.

Presented by Prof. J. W. Toumey, Monday evening, November 17, 1913.

INTRODUCTION.

THE first attempt in this country to standardize forestry education was in December, 1909, when, through the initiative of Gifford Pinchot, a conference of forest schools and departments of forestry in American educational institutions was called at Washington, D. C., to consider the scope, grade and length of curriculum that would afford the best training for foresters of the various grades. A committee was appointed, consisting of H. S. Graves, Chairman; B. E. Fernow, R. F. Fisher, Gifford Pinchot and Filibert Roth, to prepare and report upon a plan looking forward to the standardization of forestry education in this country.

In December, 1911, a second conference was called to consider the report of this committee. Sixteen of the more important forest schools and departments of forestry in American educational institutions were represented at this conference. The provisional plan prepared by the committee was discussed in detail and action taken on such important questions as requirements for admittance, courses to be included in the curriculum, and the number of hours in each course.

The committee was authorized to prepare a final report embodying the conclusions reached at the conference and the action taken. This report was published in the Forestry Quarterly for September, 1912.

It was believed by the committee and the representatives of the institutions present that at least four different grades of training in forestry should be recognized. These grades as published in the report of the committee are as follows*:

1. Advanced professional training, to include not only a substantial general education but also a well-rounded course in all branches of technical forestry.

2. Instruction for forest rangers, requiring merely a common school education, and conducted mainly along thoroughly practical lines.

3. General instruction in forestry supplementary to a course in agriculture, and designed to assist owners in the handling of their own woodlands.

4. General course in conservation and forestry designed for those who wish, as a part of their general education, to have some information on the economic problems involved.

Although these various grades of training were recognized by the conference,

* Forestry Quarterly, Vol. X, p. 342.

the work of the committee and its final report were confined to formulating the standards and requirements for advanced professional training. Secondary forestry education was briefly discussed, but no definite action was taken by the conference. The committee was continued by the conference with the power to call meetings at its discretion. This committee, however, has not been called together since the last general conference in December, 1911.

Early in May, 1913, a Sub-committee on Forestry Education was appointed by the Forestry Committee of the National Conservation Congress, to present a report at the October meeting. This report is the result of the Sub-committee's work on the topic selected.

Based upon criticisms and suggestions received from members of the Sub-committee and from others interested in forestry education, it was deemed best to confine the investigation this year to the third subject assigned by the Committee, namely, "Ranger Schools and Short Courses for Woodsmen and Farmers and the Teaching of Forestry in the Public Schools," but modified to the slightly more comprehensive term, "Secondary Forestry Education in the United States."*

This subject was believed to be the one of most immediate interest in forestry education in this country and the one that could be most fully investigated and most completely covered in the short time before the meeting of the Congress. Furthermore, it would be of great value to the Committee of the Conference of Forest Schools in preparing a report on this subject to submit to a future Conference.

Although the great importance of public education in forest conservation and the field occupied by National, State and local forestry associations, popular forestry journals, public lecture courses and field demonstrations by National, State and private foresters is fully appreciated by the Sub-committee, this subject is left untouched in the report. The other subjects assigned by the Committee must also remain for some future report.

THE DEVELOPMENT OF SECONDARY FORESTRY EDUCATION IN THE UNITED STATES.

IT is impossible at the present time to draw a hard and fast line in this country between the various grades of training in forestry. The Conference of Forest Schools not only recognized the need of at least the four grades already noted, but recognized that the grades which do not include a substantial general education and a well-arranged course in all branches of technical forestry, must be considered as secondary. The Conference placed itself on record in reference to professional training in forestry in the following words†:

"The educational requirements for training in professional forestry should be at least equal to those for the other learned professions, such as civil and mechanical engineering, law, medicine, etc. At the conference the need of a

* In this report the term "Secondary Forestry Education" embraces all training in forestry that falls short of full professional training as defined by the Conference of Forest Schools.

† FORESTRY QUARTERLY, Vol. X, pp. 343 and 344.

thorough foundation in subjects of general educational character was clearly realized. The representatives of the conference advocated a collegiate training in history, economics, English and foreign languages, as well as in botany, geology, and other auxiliary scientific subjects."

"Since it is impossible to give an adequate training in these subjects and in technical forestry in less than four years of collegiate work, the conference placed itself definitely on record that the technical schools should be of collegiate grade and of a rank equivalent to that established by the Carnegie Foundation. It was agreed that the course should comprise at least four years of undergraduate work. In the case of post-graduate schools, there should be at least one year of post-graduate work in technical forestry, making a five-year course altogether; and no post-graduate degree should be granted to a student who has not had at least two years' work in technical forestry either in the graduate course or the graduate and undergraduate courses combined."

Forestry education in the United States has developed to its present position in the past fifteen years. Within this period twenty-two educational institutions have organized forestry schools or departments of forestry and give four-year undergraduate courses or graduate courses that lead to a degree in forestry.† Within the same period ten institutions have developed undergraduate courses covering from one to three years in forestry subjects, and thirty have developed ranger courses, short courses for special students, or have added some subjects in forestry to their agricultural or horticultural courses, or as optional in their courses in the arts and sciences.

From the examination of the latest catalogs of the various American institutions where forestry is taught, it appears that the institutions named in Table I offer a four-year undergraduate course in forestry, or are partly or wholly engaged in graduate work. They are either graduate schools, with a faculty of specialists in the various departments of forestry or are departments of universities and agricultural colleges. In the former all the work is of a technical nature, the general educational requirements having been fully covered in the undergraduate work required for admittance. In the latter the work in general education and technical forestry go hand in hand and cover an undergraduate course of four years. Some of these institutions offer a year of post-graduate work in technical forestry, making a five-year course altogether, in which there is at least two years' work in technical forestry in the undergraduate and graduate work combined.

We find that the institutions offering professional training as interpreted by the Conference of Forest Schools are as follows. The table shows the institutions in which the work is wholly of a graduate character, those in which it is wholly undergraduate, and those which offer both undergraduate and graduate courses.

† This does not include the institutions which give a degree in forestry for less than four years of undergrduate work.

TABLE I.

Name of Institution	2 yrs. graduate course without undergraduate course	1 yr. graduate course with 4 yrs. undergraduate course	4 yrs. undergraduate course
Colorado Agricultural College			x
Cornell University		x	
Colorado School of Forestry		x	
Georgia State College of Agriculture			x
Harvard University	x		
University of Idaho			x
University of Indiana			x
Iowa State College of Agriculture and Mechanic Arts			x
University of Maine			x
Michigan Agricultural College			x
University of Michigan		x	
University of Minnesota			x
University of Missouri			x
University of Montana			x
University of Nebraska		x	
Ohio State University			x
Oregon Agricultural College			x
Pennsylvania State College			x
New York State College of Forestry		x	
State College of Washington			x
University of Washington		x	
Yale Forest School	x		

From the above table it appears that twenty-two institutions in the United States meet the requirements of the Conference of Forest Schools, so far as may be judged from the catalogs issued. Of this number, however, only eight offer work beyond the bare requirements of the undergraduate course. The fourteen other institutions in the list vary between wide limits in the amount of technical work required and in general educational requirements. In some of them the technical courses are covered by a single instructor in forestry subjects, in others the faculty is as large as in some of the institutions offering graduate work. In this formative period in American forestry education, it would be unprofitable to attempt to classify these institutions in reference to their work and how fully it meets the requirements set forth by the Conference of Forest Schools.*

In the early development of forestry education in the United States, the demand made upon the schools was for professional foresters, trained to develop methods of forest management suitable to American conditions and apply them in actual practice; to develop far-reaching policies in constructive management of national, State and private forests; and to educate the public to the need of forest conservation. This demand for men trained to formulate the principles and do the constructive work in American forestry, forced the rapidly increasing number of schools to the almost impossible task of meeting this demand. In recent years, however, it is becoming more and more apparent that the demand for men of the highest educational attainment and thoroughly trained in all the branches of technical forestry is limited and that the multiplicity of schools and departments to supply this class of training is a waste of resources, if not detrimental to the best interests of professional forestry.

* There is a feeling at the present time on the part of many practising foresters that "full technical training" as defined by the Conference of Forest Schools does not sufficiently emphasize business training and forest economics. They believe that the training of professional foresters should be put on a wholly different basis, viz., that of the economics of business and greater familiarity with existing conditions.

It is now evident that the present need is better facilities for secondary forestry education; an education which will ultimately reach every man who plans to devote his life to work in the woods and has charge of labor, concerned with both the production of the forest and with its harvest. Also a training which will provide the great body of public school pupils and college students with a clear idea of forest economics and the place that forestry occupies in the development of the country.

Contrasted with the field of technical education of the higher order, the field of secondary forestry education is almost unlimited. This field is now developing with considerable rapidity in this country, but without any definite aim as to the direction that the training should take in its various departments. While technical training of a high order is largely concerned with fundamental principles and their general application, secondary education in forestry is chiefly concerned with empirical methods and their local application. It does not require as a foundation as high an order of general educational attainments.

American institutions offering secondary forestry education are universities, agricultural colleges, academies, ranger schools and public schools. At present the work is largely conducted under the name of ranger schools and short courses in universities and agricultural colleges. The introduction of secondary forestry education into the public school system of the country has scarcely begun, but the field is particularly inviting, especially as relates to the agricultural high schools of the Middle West.

American institutions which provide secondary forestry education may be placed in two general classes*:

1st. Those which offer one to three years' work in forestry, but do not meet the requirements of the Conference of Forest Schools, in the matter of general education or in full technical training.

2nd. Those which offer ranger courses or short courses in forestry of usually less than a year in length or incorporate some forestry subjects in courses in agriculture and horticulture, or in the arts and sciences.

The following table shows the character of the course and its approximate length in the ten institutions which fall under the first of these two classes:

* These two classes do not include public schools and institutions that confine their training for the most part to tree surgery, management of street and park trees and landscape gardening.

TABLE II.

NAME OF INSTITUTION	Forestry subjects confined to 1 or 2 years of the required horticultural or agricultural course.	Courses in farm forestry and dendrology confined to 2 years of the agricultural course.	Forestry subjects elective during the last 3 years of the college course in general science.	1 to 3 years course in general forestry and auxiliary subjects, etc., based upon high school training or its equivalent.
Massachusetts Agricultural College	x			
Mississippi Agricultural and Mechanical College		x		
New Hampshire Agricultural College	x			
Purdue University			x	
Spokane College				x
University of Vermont	x			
University of West Virginia	x			
Wyman's School of the Woods				x
Pennsylvania State Forest Academy				x
Biltmore Forest School				x

The institutions including universities, agricultural colleges, ranger schools, academies, and boys' schools, which confine their work in forestry to ranger courses, short courses, or special forestry subjects in courses in agriculture, etc., do not permit of accurate classification. The amount and character of the work is extremely variable in the different institutions. In some the subjects offered are highly specialized in some particular field of forestry, as illustrated in the course in forest ecology in the University of Chicago; in others to a ten days' course in popular forestry, as in the Sharon Summer School of Forestry and Horticulture.

The following, however, is an attempt to classify these institutions in reference to the courses offered and their length. Nine institutions which offer a four-year undergraduate course also offer ranger courses or training. Where such is the case, the name of the institution appears in Table III as well as in one of the other of the previous tables.

TABLE III.

NAME OF SCHOOL.	RANGER COURSE					General and farm forestry for college students in agriculture or horticulture.	General and special forestry for college students in Arts, Sciences, Etc.	Popular short summer courses and elementary courses of high school grade
	6 weeks.	10 to 12 wks.	3 mos.	1 yr.	2 yrs.			
Colorado College Department of Forestry				x		x		
Cornell University							x	x
Georgia State College of Agriculture						x	x	
University of Idaho		x				x		
University of Missouri		x						
University of Montana		x						
Oregon Agricultural College	x							
Syracuse University				x	x	x	x	x
State College of Washington	x							
University of Washington	x	x					x	x
Alabama Polytechnic Institute						x		
Berea College						x		
University of Chicago							x	
Clemson Agricultural College						x		
Connecticut Agricultural College						x		
Delaware College						x		
Eric Forest School								x
Hampton Normal and Agricultural Institute						x		
Hobart College							x	
University of Illinois						x	x	
University of Indiana						x		
Kansas State Agricultural College						x	x	
Marathon County School of Agriculture and Domestic Science								x
Maryland Agricultural College						x		
Middlebury College						x		
University of Minnesota						x		
Mt. Hermon Boys' School								x
Murray State College of Agriculture								x
University of Nevada						x		
North Dakota Agricultural College						x		
North Dakota School of Forestry								x
Oklahoma Agricultural and Mechanical College						x	x	
Rhode Island State College						x		
Sharon Summer School of Forestry and Horticulture								x
South Dakota State College of Agriculture and Mechanic Arts						x		
University of Tennessee						x		
Agricultural and Mechanical College of Texas						x		
Agricultural College of Utah			x					
Wabash College							x	
Winona College of Agriculture						x		
University of Wisconsin					x		x	

From an examination of the above tables it appears that the present trend in secondary forestry education in the United States is in four directions, or, at least, it may be placed in four groups, namely:

(1) Forestry subjects for public schools and other schools of similar grade.
(2) Forestry subjects for college students in the arts and sciences.
(3) Forestry subjects for college students in agriculture and horticulture.
(4) Ranger schools.

It is the opinion of the Sub-committee that instruction in forestry in the first two of the above groups should have for its chief purpose the familiarizing of the student with the principles of forest economics and other fields of forestry most useful to the layman. The training should in no sense aim to prepare the student for the practice of forestry even in subordinate positions. When taught as a part of nature study in primary grades; in connection with geography, civil government, shop work and botany in grammar schools and high schools, when but a limited amount of time can be given to it, the training, first of all, should be of a character that will give the student accurate information in relation to forestry, or some branch of forestry, as a science. Elementary work in dendrology and silviculture can be made a part of practical field work. Beyond this it is doubtful if field work illustrating the actual methods of forest practice should be undertaken.

When forestry is taught as a separate subject in collegiate courses in agriculture and horticulture, more time should be given to it and the art or practice of forestry should be more fully emphasized in so far as it relates to the farm.

Instruction in the last of the four groups mentioned above differs fundamentally from that in the other three, in that its aim is to train men to practise forestry. Not only is a general knowledge of the science of forestry desirable but instruction in the art or practice of forestry should be made the major part of the training.

PUBLIC SCHOOLS

Forestry Subjects for Primary Schools, Grammar Schools, High Schools, and Other Schools of Similar Grades.

THE public and private schools, academies, and other institutions, through which the great body of American citizens receive their early intellectual training, should give more attention to forestry. We believe that the importance of forestry is such that it deserves attention in all grades of primary and secondary education. Due appreciation of the importance of forestry on the part of the public and the place that it holds in our economic development can best be developed in the primary and secondary schools. Although we believe that forestry should have a place in primary and secondary schools, it is only in agricultural high schools, agricultural academies and institutions of similar character that it should be taught as a separate subject.

In primary grades it should be taught as a part of nature study, as is now becoming the practice in some of the public schools of the country. In the grammar schools it should be taught as a part of geography and civil government;

and in public high schools, private schools, and academies of similar grade, it should be taught as a part of United States history, physical and commercial geography, botany, agriculture, and shop work.

During the past decade text-books covering the above subjects touch more and more upon the field of forestry and the part that the forest plays in the development of the nation. We appreciate more keenly than in any previous time the influence of the forest upon the economic, social and political development of the country. Although there is still need for greater emphasis being placed upon forestry in our primary and secondary schools, we believe that not a small part of public opinion as relates to forestry and forest conservation has been due in recent years to the indirect teaching of this subject in primary and secondary schools.

It is realized by the Sub-committee that most public school teachers are ill prepared to effectively teach the subjects as herein prescribed in connection with their other work. The present tendency, however, of incorporating more forestry in modern text-books for use in geography, civil government, economic botany and other grammar and high school courses will be of great assistance in giving our great body of public school students a better knowledge of forestry and its place in our National progress.

The following is an outline of subjects that can advantageously be taught by grammar school and high school teachers in connection with work in other subjects:

FORESTRY SUBJECTS THAT MAY BE TAUGHT IN CONNECTION WITH COURSES IN GEOGRAPHY.

A. The near-by forests:
   a. Distribution.
   b. Economic value—principal products.
   c. Their development and character.
B. Forests of the State:
   a. Economic importance—principal products.
   b. Their relation to industries in the State.
   c. Forest ownership—State forests.
C. Forests of the United States:
   a. Economic importance—principal products.
   b. Their relation to industries of the nation.
   c. Important forest regions.
   d. National forests.

FORESTRY SUBJECTS THAT MAY BE TAUGHT IN CONNECTION WITH COURSES IN CIVIL GOVERNMENT.

A. Forestry in its relation to National government:
   a. The use of land.
   b. Absolute forest land.
   c. Necessity for clearing agricultural land.
   d. Forest products in our industrial development.
B. Lumbering as an industry:
   a. The importance of the lumber industry.
   b. How to maintain the lumber industry.
   c. The movement of the lumber industry.

C. The development of the forestry movement:
   a. Historical work of societies, Arbor Day, etc.
   b. Forest legislation.
   c. Land policy of the United States.
D. The National forest policy:
   a. Origin and growth of the National forests.
   b. Purpose of the National forests.
   c. General plan of the administration of the National forests.
E. The State forest policy.
F. National parks.
G. The necessity for public forests.

FORESTRY SUBJECTS THAT MAY BE TAUGHT IN CONNECTION WITH COURSES IN PHYSICAL GEOGRAPHY.

A. The relation of forests to climate:
   a. The effect of the forest on precipitation.
   b. The effect of the forest on atmospheric and soil humidity.
   c. The effect of the forest on atmospheric and soil temperature.
B. The influence of forests on soil and water supply:
   a. The effect of forests upon soil fertility.
   b. The effect of forests upon soil stability.
   c. The effect of forests upon streamflow and seepage.
C. The influence of forests on public health:
   a. Influence on potable water.
   b. Influence on air purity.
D. The necessity for improving present conditions:
   a. Fixation of shifting sand.
   b. Maintenance of present forests.
   c. Seeding and planting.

FORESTRY SUBJECTS THAT MAY BE TAUGHT IN CONNECTION WITH MANUAL TRAINING IN WOODWORKING.

A. The important woods used in the industries and arts:
   a. The most important native species.
   b. The most important exotic species.
B. The logging and manufacture of wood:
   a. Methods of logging—conservative logging.
   b. Saw mills and their product.
   c. Waste in logging and manufacture.
C. Principal uses of wood.
D. The properties of wood:
   a. Structural.
   b. Physical.
   c. Mechanical.
E. Conditioning wood:
   a. Seasoning.
   b. Wood preservation.
F. The identification of the more useful species.

The manner in which forestry can be brought into high school courses in botany is extremely varied. Botany, aside from being a study of general culture, is important because of its intimate relation to agriculture, horticulture, and forestry. The forest is a plant society and as such is of first importance in studying plant ecology. The forest provides the botanical student with his chief

materials for studying the interrelation of plants, the effect of shade, the constriction of growing space, the distribution of seed and germination. A specific statement as to how much and what particular field of forestry should be studied in connection with high school courses in botany is undesirable because all instruction in botany is related in a greater or less degree to some field of forestry.

FORESTRY SUBJECTS FOR COLLEGE STUDENTS IN THE ARTS AND SCIENCES

TWELVE American institutions (See Tables II and III) of collegiate grade offer one or more terms' work in forestry as optional in certain courses in the arts and sciences. In some instances the work offered is identical or similar to that provided for students in agriculture and horticulture. It rarely includes more than two or three periods weekly for a single term.

To what extent forestry subjects should be included in courses in the arts and sciences, we are not prepared definitely to state. We are of the opinion, however, that the work offered should, for the most part, be quite different from that acceptable for students of agriculture and kindred subjects. It should, in the main, be of such a character as will give students a just appreciation of forestry in the economic development of the country. It should include a study of our forest resources and what is necessary for their future development. Special attention should be given to the development and practice of forestry in the United States.

It is recommended that the work be confined to a single general course of thirty-five lectures and recitations of one hour each, and that no field work be given.

The subjects covered in this course should be as follows:

1. Meaning and aims of forestry.
2. The place of forestry in the life of a nation.
    a. The products of the forest; wood substitutes.
    b. The indirect benefits of the forest; water, soil, climate, public health.
3. The forest regions and principal timber species of North America; the influence of climate, soil and other factors on forests.
4. Why our forests need care.
    a. Relation of supply, demand and growth.
    b. Means of bringing about a better balance between demand and growth.
5. The methods of forestry.
    a. The life story of the tree and of the forest.
    b. The elements of silviculture.
    c. The elements of protection.
    d. The elements of utilization.
    e. The elements of management.
6. The relation of State and individual to forestry; government ownership and control, taxation, fire laws, encouragement laws, etc.
7. Brief history of the development of forestry.
8. Present organization of forestry in the United States.
9. The day's work of a forester.

FORESTRY SUBJECTS FOR COLLEGE STUDENTS IN AGRICULTURE AND HORTICULTURE

TWENTY-FIVE American institutions, chiefly agricultural colleges and departments in agriculture in State universities, either require, or offer as optional subjects, a certain amount of forestry in the regular agricultural and horticultural courses leading to a degree.

There appears, however, to be no uniformity in the character of the work offered by the different institutions and the amount. So far as one can judge from the catalogs, the subjects taught in many instances are academic in character and only indirectly relate to technical forestry. In some instances the instruction is given by botanists, horticulturists or others without training in technical forestry and without the point of view of the forester.

The large number of institutions well distributed over the country offering instruction in forestry subjects to college students taking courses in agriculture or horticulture and the many students that avail themselves of this instruction warrant greater uniformity in the work in order that the training may be of more useful and practical value.

In more than two-thirds of the institutions (See Table III) which offer forestry subjects in connection with courses in agriculture and horticulture, the work is limited to a single term, and in some instances to a half-term of the junior or senior year.

It is recommended by the sub-committee that the work should cover approximately twenty weeks and consist of the following two courses:

a. Introduction to forestry.
b. Farm forestry.

The purpose of the first of these two courses is to give the student a general knowledge of the subject and the importance of forestry in the economic development of the country. The time devoted to this course should be only one-fourth that given to the course in farm forestry.

The latter course should be sufficiently comprehensive to cover all phases of forestry that relate to the production and utilization of timber on the farm. It should cover approximately fifteen weeks with one field exercise or laboratory period of three hours and two lectures or recitations each week.

It is desirable that the student of agriculture or horticulture should not be required to give more than this amount of time to the subject in order to get a general knowledge of the methods of handling woodlands. When possible, however, opportunity should be given students who wish to take additional work to do so. This extra work should be given in a supplementary course in which the work of the general course is amplified or else the work reduced to such special topics as are most important in the particular locality.

The following list of topics should be covered in the course in farm forestry:

1. Identification of the common forest trees of the vicinity.
   a. In summer condition.
   b. In winter condition.

2. Reasons for giving care to the woodlot.
   a. The need of care—Nature's wastefulness.
   b. How it pays—the value of the woodlot to the farm.
3. The life story of the tree and of the forest; how the forest is affected by climate and soil; the parts of the forest—ground cover, underbrush, etc.
4. How to care for the woodlot.
   a. The ideal tree; the ideal woodlot.
   b. Maintenance of proper forest conditions—forest floor, crown cover, etc.
   c. Protection from fire, grazing animals, insects and other enemies.
5. Starting new trees in the woodlot.
   a. Tree seeds.
   b. Starting new trees by direct seeding.
   c. Starting new trees by planting: nursery practice.
   d. Starting new trees by natural seeding; selection method, seeding from the side method.
   e. Starting new trees by sprouts.
   f. Choice of method.
6. Choice of species for the vicinity, and the important silvical characteristics of each.
7. Measuring the crop; amount, sale value.
   a. Felled timber.
   b. Standing timber.
8. Harvesting and selling the crop; uses of the principal timbers of the vicinity.
9. Identification of a few of the most common woods.
10. The use of land for cultivated crops, for pasture and for wood production.
11. Influence exerted by the forest.

RANGER SCHOOLS.

THE work of the ranger school should be clearly differentiated from that given in institutions where training in forestry is only a part of a general course in some other field. The purpose of the ranger school should be to train men to practice forestry, more especially to supervise labor in producing and harvesting the forest. In all countries where forestry has been practised for many years ranger schools have become an established part of the general system of forestry education in which the courses are as definitely organized as in the higher technical schools.

Ranger Schools in Europe.

In the Prussian and French schools mentioned below the courses are but one year in length and may be taken as models of the ranger school that experience has demonstrated as best suited to their conditions.

In Prussia there are fire ranger schools, of which number four are maintained by the government as state schools, one is a private school to train men for subordinate positions in private work.

In all of these schools the entrance requirements are rigid with special attention given to physical fitness. Thus the applicant must be at least five feet, three inches tall, with proportionate chest development. He must be free from organic or chronic diseases and able to see, hear and speak perfectly. The

intellectual requirements approximate those equivalent to the senior year in high schools in this country. The students usually enter the school at the age of eighteen but are required to spend a year before entering as apprentices on a forest under management, in order to become familiar with the woods and learn something of what forestry and forests mean.

The work in the various Prussian schools is very similar, the course covering but a single year. The instruction is elementary so that the student is thoroughly well grounded on the essentials and not given a smattering of many technical subjects which are not only beyond his need but for which he has not had the necessary scholastic preparation.

The course of instruction comprises the following subjects:*

1. Silviculture in connection with dendrology and ecology.
2. Lumbering and road-building.
3. Forest protection in connection with forest zoology and meteorology.
4. Forest mensuration.
5. Hunting.
6. Ichthyology (fish culture).
7. Agriculture, Horticulture, Bee-keeping.
8. Forest book-keeping.
9. Forest and hunting laws.
10. Insurance.
11. General training in culture courses and elementary sciences.
12. Physical training in gymnastics, swimming, shooting, etc.

As far as possible these subjects are illustrated by means of frequent excursions.

At the completion of the course a rigid examination is held and, in the government schools, those who pass can, after their period of military service, take the ranger examinations for the position of forester (ranger) as vacancies occur.

The sub-committee is indebted to Mr. T. S. Woolsey, jr., for the following translation from the curriculum of a ranger school at Barres, France. In this school the aim is to make the instruction practical. The students are expected to perform all phases of a ranger's work in the forest and make numerous maps and reports. The course covers but one year and the time is nominally divided as follows: 195 lectures or recitations of one and one-half hours each; 15 days of field work in typical forests; 70 half days of field mapping and office drafting; and 70 half days of manual labor in the forest (nursery work, transplanting, etc.). The course also includes sixty military conferences of one and one-half hours each.

The following is a brief summary of the subjects covered:

I. Forest botany:

The life of the tree in general; factors effecting vegetation; forest species (description, determining characteristics in winter and summer; principal species; secondary species, forest weeds).

* See Forestry Quarterly Vol. XI, pp. 50-51.

II. Silviculture, management, utilization and exploitation of forests:

Definitions, limits of production, climate, forest soil, species in mixture, the stands, forests, blanks, openings, cover, shade, cuttings, rotation, yield, trees from seed, sprouts, suckers, management, methods of treatment (simple coppice, coppice under standards, high forest), exploitation and sale of forest products (fuel, logs, bark, turpentine), and forest mensuration.

III. Conceptions of the law and duty of guards (rangers).

The organization of the forest service—offices and employees; franchises, responsibility, jurisdiction, disputes, prohibitions, leave, penalties, etc., relative to officers and employees; appointment of employees and miscellaneous advice; general law, administrative law and rural legislation; civil judicial courts, repressive judicial courts, court of appeal; criminal law suits; trespass and control of trespass; frauds; free use zones; inspection of logging; rights; clearing private and communal woods, encouragement of reforestation; destruction of insects; treatment of diseases of trees; private forest guards and laws relating to hunting and fishing.

IV. Mathematics:

Arithmetic through proportion, the metric system and plane geometry.

V. Topography:

Simple surveying and mapping.

VI. Forest betterments:

Miscellaneous units (day's work, linear, square and cubic meter, job, etc.); improvements (by the administration, by contract); miscellaneous work (lime, mortar, sand, cement, masonry); ranger houses (maintenance and repairs); fences, walls, ditches, lanes, pack trails, paths and walks (construction and maintenance); reforestation areas (denuded areas, clearings, landslides, etc.); artificial stocking (species, the collection, quality and storage of seed, direct seeding, nurseries, plantations).

VII. Hunting and breeding.

VIII. Fishing and fish breeding.

IX. The French language.

The excellent school at Bruck, in Stiermark, Austria, that prepares men for subordinate positions in the Austrian Alps, and the forest college at Dehra Dún, India, that trains men for subordinate positions in the Indian Forest Service, as well as for private practice, are excellent examples of schools in which the course extends over a period of three years. In these schools the training is not confined to forestry subjects as such but includes the various foundation subjects. The entrance requirements are strict, particularly as relates to moral and physical health. At Dehra Dún the candidate for admission to the school must be between eighteen and twenty-five years of age. He must present an acceptable certificate of health and a certificate signed by at least two responsible persons as to his respectibility and moral character. He must also present a certificate showing that he has passed the high school examinations or other evidence of at least equal intellectual attainments. The subjects of the first two years of the course with their respective weights are as follows:

I. Silviculture (500).

(Natural history of the forest; composition of forests, economic constitution of the forest; methods of treatment and tending of forest crops; artificial formation, regeneration of forest crops and protection of forests.)

II. Forest utilization (250).

(Harvesting and conversion of wood; utilization of minor forest products; organization of labor and modes of sale and disposal of wood and other produce.)

III. Working plans (25).

(Forest mensuration, preliminary explanations, preliminary work, the working-plan, the working-plan report, and the control of working-plans.)

IV. Surveying, drawing and estimating (300).

(Freehand drawing, geometrical drawing, surveying—lecture-room course and field-work course;—general principles of estimating and preparation of complete estimates.)

V. Engineering (300).

(Building materials, building, road-making, bridges, transport of timber, wells, water and river-bank works, demarcation.)

VI. Botany (400).

(Introductory course, external and internal morphology, special morphology and outlines of classification; physiology including forest ecology; vegetable pathology and economic botany.)

VII. Mathematics (200).

(Arithmetic, algebra, trigonometry, mensuration as applied to forestry, statics.)

VIII. Law (200).

(General law, forest law, criminal law as applied to the protection of forests and their produce in transit, the forest service.)

IX. Zoology (150).

(Elementary biology; systematic review of the animal kingdom; demonstrations and object lessons in the anatomy and life habits of animals and the breeding of insects; collection and preservation of specimens.)

X. Forest accounts and procedure (150).

(Cash accounts, general principles of book-keeping by single entry, forest produce and yield returns, general procedure.)

XI. Physical efficiency (200).

During the last year of the course students specialize in selected subjects. The cold and dry seasons are devoted to practical work in the forests.

The Sub-committee fully appreciates that ranger schools in other countries, when they are for the most part under government control, cannot be taken as models for similar schools in the United States. We believe, however, that the fundamentals as worked out after years of experience are useful in organizing similar schools in this country.

Ranger Schools in the United States

Ten American institutions (See Table III) have organized ranger schools or else have established ranger courses to fit men for secondary positions in

forest practice. The work in these institutions varies widely in the character and scope and in the length of time given to it. The requirements for admittance are usually extremely low. In some a grammar school or a high school training is required, but in others "the ability to carry the studies successfully" is the only requirement. The age limit is usually fixed at eighteen years. In two institutions the entire course is but six weeks in length and consists chiefly of informal lectures. In four, the course is from ten to twelve weeks in length and consists largely of lectures but with some field or laboratory practice. In one institution the course covers a period of twenty-four weeks, divided into a period of two terms given during the summer of successive years. Three institutions offer courses one year or more in length.

The sub-committee have carefully considered:

1. The character and scope of the work as now given in American ranger schools and in other institutions that offer ranger courses.
2. The character and scope of the work in a number of foreign schools that prepare men for secondary positions in forestry.
3. The opinions expressed and suggestions offered by a selected list of American foresters as to what should be the character and scope of the work in the American ranger school.

Our conclusions as to what is acceptable for ranger school instruction in the United States is chiefly drawn from the above. These are presented under the following heads:

1. The place of the ranger school in American forestry education.
2. The general character of the work as compared with technical training.
3. The requirements for admittance to ranger schools.
4. The location of ranger schools and their connection with colleges and universities.
5. The length of the ranger school course.
6. The subjects in the ranger school curriculum and the relative weight of each.

The Place of the Ranger School in American Forestry Education.

The ranger school should bear the same relation to professional training in forestry that the woodshop bears to research in technology or the business college to university instruction in economics and commerce. It is analagous to the trade schools or a system of apprentice training whereby men are equipped for the skilled trades. Its primary object is, indeed, to turn out skilled workmen capable of doing all of the less technical operations required in managing forest lands and of directing unskilled labor, as foremen.

Ranger school instruction must, therefore, aim to teach the art, or trade, of forestry practice, not the science of forestry. Its courses should be sheared down to those bearing directly on practice, on the things which the students are to be required to do, eliminating theory and all but the most essential of the underlying scientific principles. The method of instruction should be empirical, rather than deductive. It should take up specific problems or processes in the various fields of forest work and give the student specific answers and rule of thumb methods, with a minimum of deduction back to scientific causes and the application of scientific principles. The foregoing cannot, of course, be applied

too literally. It is meant, rather, to convey a conception of the underlying scope and purpose of ranger school instruction as distinct from the other kinds of forestry education.

The General Character of Ranger School Work as Compared With Technical Training.

The art or trade of forestry practice, as here used, includes all of the operations incident to the ownership and utilization of timbered lands. These may or may not include provision for the renewal of forest growth after cutting, without affecting the applicability of the term or the desirability of developing a practical type of training which will turn out skilled men fitted to do the specific woods work required in their own locality. The things to be done vary greatly in different parts of the United States, and there is an equal variation in the methods of doing them which are effective under the specific local conditions. The form and objects of ownership, as private, state, and national, introduce further variations into the specific equipment which the graduate of the ranger school should have.

In many states, ranger schools should aim primarily to train skilled workmen and foremen for the lumbering industry, men who are equipped for land surveying, cruising and the layout of logging operations, and who can handle men and teams and machinery in logging work. In other localities the dominant field of employment requires immediate expertness in protective duties, construction of forest improvements or silviculture. Elsewhere forest work must be combined with fish and game culture or with the care of public parks.

Ranger school instruction should be strongly localized, as far as practicable, it should be identified with the specific needs of the dominant form of forest ownership in each locality; or, indeed, in the case of State and National lands, with the requirements of but one owner. The Mont Alto Forest Academy, which trains men for the State reserves of Pennsylvania, and the Ranger School maintained by the University of Wisconsin solely for preparing men for work on the reserves of that State, are perhaps the best illustrations of schools which train a limited number of men for a specific occupation whose requirements are definitely known. The service of such a restricted field is not always possible or desirable. Nevertheless, it can be safely stated, as a broad principle, that the requirements of forest industries, or of local forms of public ownership, or other local demands equally specific will furnish the key for developing ranger school instruction, by relatively small local units, along the most effective lines.

The Requirements for Admittance to Ranger Schools.

It must be squarely recognized that the purpose of ranger schools is not to train professional foresters; and that their graduates are to occupy relatively subordinate positions at low salaries. The practical application of this is in (1) the standard of entrance requirements, and (2) the duration of the course, i. e., the expenditure of time and money which is required of students. Adapta-

tion to the local needs which the school is striving to meet should be the governing principle as to entrance requirements. The school should recruit from the best type of men available for the work which has to be done.

Experience in ranger school instruction in the United States clearly shows that, although in the past the applicants for instruction have been largely mature men, with considerable woods experience and low scholastic attainments, this condition is changing. Present conditions indicate that in the future the applicants will be chiefly men under twenty years of age with but a small amount of woods experience. We believe that with these men the admittance to ranger schools should be placed upon a high school training or its equivalent. Anything short of this will seriously handicap the pupil in carrying the subjects essential in ranger school instruction, unless a portion of the instruction be given to mathematics, English and elementary natural science, which we believe can better be handled in the public schools than in ranger schools.

Although high school training, or its equivalent, should be made the basis for entrance, each school should, under present conditions, accept the more mature applicants even if they cannot meet this requirement, provided they have had sufficient practical experience in woods work to compensate for this lack and are otherwise acceptable. As soon as conditions justify it, a high school training, or its equivalent, should be demanded of all applicants. It is recommended that more attention be given to the physical condition of the applicant and his moral character. A ranger's work takes him into the wildest parts of the country and subjects him to physical hardships and lax moral standards. As the ranger school in this country "does not determine the sphere of activity which the graduate may aspire to," particular attention should be given to the "kind of men" that are taken into it.

The applicant should pass a rigid physical examination and should be vouched for by at least two responsible American citizens. We believe that the average student under eighteen years of age is not sufficiently developed physically to carry the field work that is required with advantage to himself or to the school. Students should not be admitted under this age. It is also recommended that the applicant have at least one year of woods experience before being admitted to the ranger school.

The Location of Ranger Schools and Their Connection With Colleges and Universities.

Theoretically a ranger school should be located in each forest region of the United States that differs radically, either in character or method of management, from other forest regions, in order to train men for subordinate positions in the particular region. The place for such instruction is in the woods. As the apprentice learns to build brick walls by laying bricks, the forest ranger should be taught the things which he must do, as far as practicable, by actually doing them. Much that is currently accepted in academic standards and methods is not applicable to such instruction. At least such standards and methods must be frankly worked over and adapted to the fundamental aim of equipping men for the immediate practice of a trade.

Ranger schools conducted at colleges or universities are not desirable. While such a school may be included for purposes of administration in a university or college, it should have a separate plant in the woods, if possible, among the forest and industrial conditions which it is the function of the school to serve. Its standards, its faculty, its atmosphere, its morale should be its own, rather than merged with those of a larger educational institution. Its specific mission can be more effectually accomplished if it can thus develop its own individuality and be identified with the workshop where its students are to find their vocation. Its instructors should, if possible, be professional foresters so that the students may acquire a sympathetic understanding of forestry and breadth of view as to its scope and aims. Grasp of the practical application of the subjects taught is, however, essential; and the final test of the instructor must be ability to equip his students directly for practice, to make them efficient workmen.

The Length of the Ranger Course.

As the graduates of ranger schools are trained to occupy relatively subordinate positions with a comparatively low salary, the required expenditure of both time and money should be as little as consistent with adequate training to prepare the student for his actual needs. The investment which the average student can reasonably be asked to make in his preparation bears a direct relation to the position which he is to fill after the completion of his course. When the students enter the ranger school with the preparation recommended, the course should be restricted to a single school year of forty weeks. Under conditions prevailing in this country at the present time, this is as much as can be consistently given to ranger school training in most schools. It is believed, however, that in a limited number of schools, where the equipment and faculty are adequate, a second year's work is desirable, during which the students who remain for this work may be trained in the particular subject, largely through field work, in which they are later to be engaged. Where arrangements can be made that will permit students to combine remunerative work of suitable kind with the various studies, it permits the lengthening of the course to two or even three years. Thus the forest ranger's course in the University of Wisconsin, as at present organized, covers a period of two years. Through cooperation with the State Board of Forestry the students are employed and given remunerative work in which they obtain a large amount of field practice. At least one-half of the entire course is remunerative employment on the State forests. The Pennsylvania Forest Academy provides similar remunerative employment during the progress of the course.

Experience has already shown that at least in some parts of the country a course of one year is preferable to a longer one. Thus at the ranger school of the New York State College of Forestry, the course will probably be reduced from two years to one, as shown in the following communication from Doctor Baker:

"It is very probable that we shall limit the course to one year and shall require that the men who come in have a reasonable amount of experience in the woods. We shall increase the amount of surveying given and cut down somewhat upon the theoretical work in forestry. We shall pay a good deal of attention to forest

engineering, putting the men through practical work in road, bridge and telephone construction and will work them in actual logging and milling operations enough to give them a good working knowledge of our present methods of logging and lumbering. The results obtained by our efforts to give a two-year course have not been just what we had hoped. Too large a proportion of the men coming in for the two-year course come from cities and villages, and in the two years it has been necessary to encroach somewhat upon theoretical phases of the work and the result has been, in a way, to make the men half-trained foresters and not well trained woodsmen. The ideal, in a sense, is to have a school into which men who have had from one to ten years' experience in the woods may go, and by getting more of engineering and learning the species and structure of timber somewhat make themselves of greater value to lumbermen. We cannot take boys from New York City or from other large towns in the State and in a year's time make them good guards and rangers. However, I think our move to cut the work to one year and make it much more practical is a step in the right direction."

The Subjects in the Ranger School Curriculum and the Relative Weight of Each.

From what has preceded it appears that the subjects embraced in the ranger school curriculum, the method of treatment and the relative weight of each should vary widely in accordance with the local requirements which the student must be prepared to meet in actual practice after the completion of his course. A fixed standard is, therefore, neither desirable nor necessary. Although a course of study with specific recommendations as to the subjects taught, the method of treatment and the relative weight of each cannot be formulated, it is possible to classify all ranger school instruction under the following three heads:

I. Fundamental subjects.
II. Secondary subjects.
III. Special subjects.

Fundamental Subjects:—

The fundamental subjects are those essential in ranger school instruction in all parts of the country and should not, therefore, be eliminated from the curriculum of any school. They form the foundation which gives facility in the carrying out of correct methods in the caring for and harvesting of timber. These subjects are as follows:

a. Fire protection.
(The organization and equipment of patrol; outlook stations and other protective places, including suitable provisions for all preventive measures; methods, equipment and organization for fighting forest fires; disposal of logging slash; fire laws.)

b. Forest engineering.
(The construction and maintenance of ordinary forest improvements, with special reference to fire protection; such as roads, trails, bridges, telephone lines, cabins, lookout towers and fire breaks.)

c. Surveying.
(Use of compass, transit, chain, stadia and level; rough surveys by pacing and pocket compass; land surveys by compass and chain, and transit and stadia;

running of levels; determination of areas; location of lines and profiles of roads and trails; keeping of notes and plotting of surveys. Sufficient mechanical drawing must be included for accurate plotting, lettering, etc.)

d. Estimating and scaling timber.

(Accurate estimating of common forest products, saw timber, pulpwood, cordwood, railroad ties, poles, etc.; concise descriptive notes of merchantable condition and quality of timber; log scaling and measurement of other forest products with special training in allowance for defect; preparation and use of volume tables.)

e. Forest botany.

(Life of the tree in general, factors affecting forest vegetation; the winter and summer characteristics of local species leading to their identification.)

f. Elementary silviculture.

(Habits and characteristics of local forest trees; determination of their maturity and condition with reference to time of cutting; competition of species composing stands; local forest types; methods of treating local types and of renewing or improving them in connection with cutting, objects, rules for woods practice, etc.)

g. Lumbering.

(Prevailing methods of logging and manufacture in the region; layout and construction of common types of improvements; preparation of concise descriptive notes of logging conditions on forest tracts; common types of logging and milling equipment; costs of structures, equipment and woods and mill operations; determination of stumpage values. All of the more common forest products of the region should be covered.)

h. Preparation of forest maps.

(The collection of field data and drafting; type, stand, and logging maps.)

Secondary Subjects:—

The secondary subjects are also applicable in all parts of the country; they are all desirable but not essential. The incorporation of one or more of them into the curriculum depends upon the amount of time required for special subjects in the particular locality and their relative importance in that locality. These subjects are as follows:

a. More advanced silviculture.

(Habits and characteristics of more important American forest trees, not restricted to those of local occurrence; the types in which they occur and the forestal problems presented in their management; the more common silvicultural methods, not restricted to those of local application, their objects and rules for woods practice; thinnings; improvement cuttings, etc.)

(Seed collection, extraction and storage; forest nursery operations; field seeding and planting.)

b. More advanced lumbering.

(Principles, structures, equipment and methods, with detailed costs, in common use in the principal lumber producing regions; comparative merits of different methods and equipment under varying conditions of topography, forest stands, markets, climate, etc.; the place of the large and small operations; more intensive study of local machinery and methods.)

c. Forest insects and diseases.
(Identification of the more important local destructive varieties; their life habits; methods of control.)

d. Camping and woods transportation.
(Practical instruction in camping, packing, the care of animals, canoe craft, etc.)

e. First aid.
(Simple and easily applied rules for securing and maintaining health; what to do in case of emergency, accident, poisoning or physical disaster.)

Special Subjects:—

The special subjects are those which it is necessary to incorporate into the curriculum in order to meet local conditions. Although these subjects are numerous, in no two ranger schools are they likely to be the same or to be given the same relative weight in comparison with the fundamental and secondary subjects. It is impossible to give a complete list of special subjects from which those most useful in any particular locality can be selected. The most important of these subjects, however, are as follows:

a. Elementary business law.

b. State forest law and policy.
(Laws relating to the particular State or States served by the school.)

c. Federal forest law and policy.
(When the school trains men for the federal service.)

d. Elements of book-keeping, time-keeping and official accounting.

e. Local forest zoology.
(The identification and habits of the common birds, fishes and mammals of the locality.)

f. The protection and culture of fish.

g. The protection and breeding of economic wild birds and mammals.

h. Grazing and other secondary uses of the forest.
(Methods of developing and using minor forest resources; control of stock, and protection of forest growth; basis for charges, etc.)

i. Topographic surveying and mapping.
(Plane table and stadia surveys by the three point system; drafting of accurate topographic maps.)

j. Forest mensuration.
(Preparation and use of growth and yield tables.)

k. Elements of forest management.
(Layout of compartments and working circles; simple calculations of yield and determination of volume to be cut.)

l. Utilization of special forest products.
(Special studies of important products of the region, such as pulp and paper, distillates, naval stores, shingles, poles, railroad ties, and maple sugar; intensive study of methods and costs of production.)

m. Principles of agriculture.

(The production of timber in connection with farm crops; important crops of the locality and methods of culture.)

THE APPENDIX

IN order to obtain a general expression of opinion regarding the curriculum and other matters relating to ranger schools in this country, the following list of questions was sent to a selected list of American foresters:

1. What should be the character and scope of the work of the ranger school in the United States, and what particular positions should men trained in such schools be prepared to fill?

2. In what respects should the curriculum differ from that of the school of collegiate rank giving full technical training?

3. What should be the requirements for admission?

4. What should be the length of the course? Should apprentice work be a part of the curriculum?

5. Where should ranger schools be located in reference to working fields?

6. Should the instruction be under foresters actually engaged in the management of forestry property?

7. What is the present need of ranger schools in the United States?

8. Should the training be chiefly local in character?

The following replies are selected as giving the range of opinion and as most fully answering the questions asked. The sub-committee have taken the liberty to edit the replies and in some instances to rearrange and abbreviate them. In each case, however, special effort has been made to retain the original meaning without change.

"I enclose replies to your questions regarding ranger schools. I fear that you may find my opinions somewhat radical. However, I feel very strongly that we should not embark on a policy of educating men except for existing ranger positions, since I believe that the need for rangers in private employ will be small for some years to come."

1. "What particular positions should men trained in ranger schools be prepared to fill? Obviously, positions as rangers. But who needs rangers? Primarily the Forest Service, next the States having forest reserves, and lastly (to a very minor extent) certain corporations and private owners of forest properties sufficiently large and sufficiently valuable to warrant the employment of rangers. Rangers, then, are to be trained, and chiefly for the Federal service. The character of the work at school must correspond to the position filled at graduation. Rangers need training in the elements of forestry with special emphasis on field work, such as surveying, estimating, etc. Rangers do not need to know all the fine points of Forest Organization, Forest Valuation, etc.

2. "The curriculum should differ from the school giving a full technical training chiefly in being simpler and shorter and containing an even greater proportion of field work. Lectures are hard to assimilate for men untrained in taking notes. Recitations and quizzes are a better means of teaching this class, driving home the points by practical examples in the field.

3. "Requirement for admission should be a common school education.

4. "A twelve-month continuous course should suffice. The Prussian ranger

schools with their shorter course have proven better suited to the needs of ranger education than have the four-year courses in the secondary forest schools of Bavaria.

5. "The chief point in locating a ranger school is to have a suitable working field close by. It is not material whether it be *in* the forest or *out,* so long as the forest be readily accessible.

6. "I do not believe that foresters actually engaged in the management of forest property have, as a rule, sufficient leisure time to give students the proper training. Better results would be secured by making up a small faculty of men experienced in the work of the Federal (or State) Service.

7. "I believe that the need for ranger schools in the United States is practically confined to the Federal and State services. I am not qualified to judge as to the needs of the latter; for the Federal Service I am convinced of the need of ranger schools. The District Ranger is not educated up to his responsibilities as he should be to secure the greatest efficiency. More and more work is left to the ranger. I believe there should be at least three government ranger schools in the country. One on the Coast, say in Oregon; one in the Northern Rockies, say at Missoula, Montana; one in the Southern Rockies, say at Flagstaff, Arizona. If the work in the Appalachians develops to a sufficient extent, there should be a ranger school in that region, too. Attendance at these schools should be compulsory for all men who have passed the examination for Assistant Forest Ranger and should precede their appointment to take charge of a district. Men already in the service should be detailed to the school as rapidly as possible until all have attended. The government should defray the cost of educating rangers, paying their travel and subsistence. Each school should have a Director with the rank and pay of an Assistant District Forester in charge of an office. The school should be under the general direction of the District Forester of the District in which it is located and his Assistants should assist in instruction.

5. "The training in ranger schools should be chiefly local."

A. B. RECKNAGEL.

"I submit the following in answer to the questions in the circular letter sent me:

1. "The work of the ranger school should aim to educate woodsmen, men capable of taking charge of small tracts of timberland and of carrying out the suggestions of professional foresters. The course should aim to satisfy a growing demand for men who desire to live and carry on their work in the woods (rangers), and who will be satisfied with a modest salary. The ranger school should not aim to educate professional foresters, nor to fit men for the U. S. Forest Service through the Civil Service examinations for forest assistants, but rather to educate rangers and assistant rangers, for woods positions in the full sense of the term. The student would pursue such a course because of his preference for a life in the woods. He should be prepared to fill such positions as:—

Field manager under supervision of technical foresters.
Nursery foreman.
Ranger and guard.
Patrol work.
Woods foreman in lumber operations.
Tie and timber inspector.
Manager of small woodland estates, etc.

2. "In general, the course in the ranger school should cover the subjects taught in the technical forest schools, but in a more simple manner; greater weight should be given to the practical application of principles and to such

subjects as will best fit the student for the immediate work he is to undertake. The work should be nearer the character of work done in the trade school than in the technical school.

3. "An age limit, an evidence of a knowledge of the elementary branches to be determined by examination or by presentation of certificate; experience to count towards entrance requirements.

4. "The ranger course proper should cover two years of work. A preparatory year might also be given for those who enter the school with insufficient training in the elementary branches. Field work should form a higher ratio to recitation work in the ranger school than in the technical school. The nature of the work done should be practical in every respect, the aim being to put forth men capable or doing certain work because they have already done that work. During a portion of the second year of the course students might be placed as apprentices under competent forest rangers.

5. "The ranger school can best be managed in connection with a college or similar institution, but the school proper should be located at a distance from the college, preferably in the woods. Students could be brought to the college during a portion of each year for courses in special subjects.

6. "Foresters actually engaged in the management of forest property cannot be expected to give the time and attention to the instructional work necessary for a successful school. Their duty would lie in connection with their position on the forest rather than with the school. The advantage to the forest would be greater than to the student. Students could gain this practical training by being placed for a season under such foresters.

7. "There is need in this country at the present time for woodsmen to take charge of small wooded estates at a nominal salary. Many owners of forest land would employ rangers to care for their property if they could be secured, whereas they are not able to employ technical foresters because of the greater expense. Inquiries have already been received for such men. The United States Forest Service needs a class of trained woodsmen for the position of ranger and assistant ranger on the national forests. Many of the State forestry departments also require the services of such trained men.

8. "The training would necessarily be local in character; that is, it would be impossible to locate the school in different portions of the country during the year. The class of men who would enroll in a ranger school would be men of small means. This would not prevent, however, the course being developed on broad lines to acquaint the student with the forest conditions in different portions of the country. A thorough knowledge of the forest conditions in one locality should enable a man to carry on forest work in other localities without much difficulty."

J. A. FERGUSON.

"I submit the following reply to your questions relating to secondary forestry education:

1. "The work of a ranger school should be very practical and should cover but little theoretical work. It should, in a sense, be equivalent to the last year or two of work in a technical high school. The idea of the work should be to take men not prepared for college and by a year or two of practical training make them better able to take hold of woods operations of any kind in the capacity of guard, ranger, or manager. The men should understand at all times that they are receiving a practical training and not an education in forestry. Men trained in ranger schools, it seems to me, should fill positions of guards, rangers and managers of forest estates under the direction, at all times, of trained foresters. They should be able to go ahead with the carrying out of directions of trained foresters in estimating of timber, in fire protection plans, in utilization, etc.

2. "The curriculum of the ranger school should be very different from a school giving full technical training. There should be a certain amount of lecture work or school work in Dendrology, Forest Mensuration, Forest Engineering and Elementary Silviculture. With this work should go constant attention to the use of the English language and elementary forms of business law. In the field the men should live and work as woodsmen, understanding the use of woods' tools thoroughly, and should be given the attitude of the workman. That is, they should understand what a day's work in the woods means and how to handle men. I think the trouble with some of our ranger courses has been that as the simplest solution instructors have given too technical courses and have carried on too little field application of these courses.

3. "The candidate should be at least nineteen years of age, in good sound physical condition, and should come well recommended.

4. "The present status of the profession justifies a course of but one year. Field work should take up a considerable part of the year; that is, as much of the teaching as possible should be done in the woods and while actual operations are being carried out.

5. "I believe ranger schools should be located in the forest and the work given independently of technical institutions. My knowledge of the situation in Mont Alto and our experience in the State Ranger School here lead me to believe that it is a mistake to attempt to mix the two classes of students.

6. "The instructors in ranger schools should be foresters in charge of forest property, so far as possible.

7. "I believe there is use for a few ranger schools in the United States. I think that one or two in the East and perhaps two or three in the West should supply all the men needed for the next ten years."

HUGH P. BAKER.

"It is a pleasure to make some suggestions in reply to your list of questions, and I have made my answers correspond with the numbers you have used:

1. "In the first place, we cannot have a national ranger school without having a national forest school for higher forest training. I have discussed this matter with Mr. Zon, and he feels that, in this country, the poor and good schools are training men for any position that the graduates can attain through their own personal efforts. In other words, the school does not determine the sphere of activity which the man may assume. Consequently, Mr. Zon feels that we should lay particular emphasis on the kind of man who should be admitted to the ranger school rather than on the kind of training he should receive. In other words, the type of man to which the school should cater should be given very careful consideration, and there should be a more clear-cut distinction between schools for higher training and schools for ranger positions.

2. "The curriculum should be along the same lines as that of the higher technical forest school, but should be simplified and contain less advance technical material.

3. "I believe the requirements for admittance should be made as simple as possible and should be based on the affirmative answers to an ordinary high school education.

4. "Under present conditions, one year should be ample to complete the training. Later, the requirements must be made more extensive. A national ranger school, it seems to me, should include no apprentice work in the ordinary curriculum. This would not apply to a State school such as is maintained in Pennsylvania, which caters to its own needs.

5. "On account of the absolute necessity for field work, I believe that ranger schools should be located on or very near forests where practical field work can

be engaged in. If a working forest can be secured near a college or town, so much the better.

6. "It would certainly be preferable to have one member of the faculty actively in charge of the forest proper, where the students secure their training, but I believe the woods work should be part of the school routine. This, it seems to me, is better than to extend the course over a longer period by using the student as an apprentice.

7. "I believe that men should be trained, not only for ranger positions, but, if possible, also for logging work. This would mean that lumbering would play an important part in the curriculum. There is certainly need for ranger schools in the United States, and I believe they should be located chiefly in the West under present conditions, but would there not be a demand for private estates in the East for men thus trained? I would not attempt to state just where they should be located.

8. "The best results in British India have been secured by training rangers locally, in order to give them a more intimate insight into the work which they must take charge of. The keynote to the British India forest schools is that they are local in character. The same is true in Russia."

T. S. WOOLSEY, JR.

"I have put down a few ideas as they occur to me and send them to you for what they are worth:

1. "Ranger schools should, I think, give a less technical and a more practical course than professional schools. They should give a larger amount of field work, including logging and lumbering from both the buyer's and seller's point of view. At least one-half of the time should be taken up with field work. This field work should be scattered as much as possible throughout the course. The training should fit men for such positions as government rangers, guards, State fire wardens, patrolmen, lumbermen, logging contractors, and managers of woodland estates.

2. "Engineering, road building, surveying, etc., should be largely practical and manual rather than theoretical. The silviculture and management of forests might be restricted to American practice rather than going back to the European foundation of forestry.

3. "The requirements for entrance should be a high school education, together with a general knowledge of country life.

4. "A full one-year course would seem to me to be sufficient.

5. "Ranger schools for the present should be located near organized schools and colleges wherever these may be. The present demand for men with simply a forestry education is not sufficient to warrant the foundation of a school with competent men along all lines for this specific purpose, so that such a course will have to be carried on in connection with the other recognized courses of some institution. Probably the more ideal method to train rangers would be, as suggested in your questions, by apprenticing them on a forest tract under organization and management. At present there is no private estate on which a sufficient number of competent men can be gotten together to keep up such a school. The only possible way at present would be for the Government to conduct a ranger school in connection with the administration of the national forests. If such a school should be carried on at the district headquarters, enough technical men could be secured to furnish adequate instruction, and enough experience in lumbering and other operations might be secured on the adjacent national forests. Such a school would furnish the best possible training for government rangers, but it is doubtful whether lumbermen would consider such a school suitable for the training of logging or lumber experts.

6. "Having the instruction under foresters actually engaged in the management of forest property is, no doubt, the ideal plan for the ranger school.

7. "There is room for at least one ranger school in every State in which the forest interests are of any importance, though many of the States would furnish little or no demand just at present for men educated at such a school. The demand is growing, and there is certainly need for men educated along these lines.

8. "The training should not be *chiefly* local, though local conditions would have to be given a prominent place."

J. S. HOLMES.

"Following are my opinions in answer to your questions concerning ranger schools:

1. "The character of the ranger school should be distinctly secondary to the schools giving a full four-year professional course, and the instruction given should be elementary and confined as much as possible to the practical and immediately useful subjects. The school should train men to fill secondary positions such as ranger, fire patrol, lookout watchman, and warden. It should be distinctly understood and stipulated that such schools do not attempt or undertake to train men for filling higher and more responsible positions without further technical training.

2. "A large part of the work should be devoted to apprentice work, and the technical subjects should be treated in a way to make them useful to men with inferior preparation and little real knowledge of the classical and scientific fundamentals required in the higher schools. Field work, including apprentice work, should constitute from 60 to 75 per cent of the work.

3. "Special stress should be laid on the physical fitness of the candidate for admittance, and a high or grammar school education, or even simply the ability to read and write intelligently, might be sufficient.

4. "A course of this kind, in my opinion, should not cover more than two years at the most, and preferably only one year.

5. "I believe it is best to have such schools in the forest, under organization and management, rather than in cities and towns or in connection with colleges and universities.

6. "Wherever possible, it is best to have the men engaged in actual woods work, under the instruction and supervision of the forester in charge.

7. "There is a growing need for schools of this kind. They should be located in the regions where such men are most needed, particularly in the West and in a few of the Eastern States, and never more than *one* in a State.

8. "The work of such a school should be very largely local in character, and it should receive the support of the State and Federal authorities in the region in which it is located."

J. M. BRISCOE.

"In regard to your letter of the 22d, asking for my opinion about ranger schools, I would say that I feel very strongly that the whole matter of forestry education is being overdone. The thing has been looked at entirely from an educational standpoint, with very little reference to the jobs open to men when they get through. There are in Vermont, I know, almost no openings outside of the Forest Service for men of forestry training. It is too bad that this condition exists, but it unfortunately does, and is not peculiar to Vermont. The State appropriation is so small that we are unable to give salaries which would appeal to men of very much technical training. We are, therefore, obliged to pick up, for our rangers or patrolmen, either graduates of regular colleges or high schools, or native woodsmen. Most of these positions have been created through the Weeks

law in cooperation with the United States Government, and we pay a man from $1.75 to $2.50 a day. We find that a man's character, his willingness to work, etc., are of great deal more importance in this work than his technical training. In other words, I would rather have a man with no forestry training beforehand, who was a good hard worker and would stick to it, than a man who had been at a ranger school but was lazy or did not have ability to meet people. We believe that we can train men in the State Forest Service to do the kind of jobs we want, fully as well as if they attended a ranger school, and they are willing to work for less pay than they would be if they had been to such a school. Of course, this is looking at the whole matter from a selfish standpoint. There undoubtedly should be some of these schools and fewer technical forest schools than at present, but the course of study should be short. I do not believe that the ordinary man needs to put in, for the amount of salary that he can acquire upon completion, more than six months' work. I believe that he can get enough engineering, timber estimating and practice in planting, thinnings, etc., to do good work after such a course, provided he was a good man to start with. If he was not a good man, the two years' course would be of no value to him.

"I think there should be no requirements for admission other than health requirements. The course should extend over not more than six months. The school should be located in the forest and preferably in a forest under organized management. The training should be that of apprenticeship. Men start in with us as patrolmen at, say, $1.75 per day. The training which a man secures the first year makes him worth more the next year, and so on until he can finally be placed on an annual salary. I believe that there is need for a few ranger schools in the United States. One in New England would certainly be sufficient. The training should be local; that is, there would be no need of taking up with rangers here in New England the dendrology of the Rocky Mountain States, or the methods of lumbering on the Pacific Coast."

A. F. HAWES.

"The following is in reply to the list of questions submitted by you in relation to ranger schools:

1. "The course should include training in the fundamental subjects—mathematics, sciences, etc.—as well as in the technical phases of forestry. The scope is large and the general training should be thorough, in view of the fact that the ranger's work is of an exceedingly varied character and calls for the exercise of judgment in different aspects of practical forestry, as well as in many other matters such as the administration of his charge with reference to sales, free and special use, trespass, grazing, fire, in the construction of buildings, roads, trails, and telephones, in the classification of lands, agricultural and mineral, and in the care of himself and his horses while in the field. The ranger school should train men for the office of ranger and like positions, for positions as assistants to men engaged in technical work, research, etc., and for such places as do not require the initiative of an expert.

2. "The course of study in the ranger school should differ from that giving full technical training in that it must lay emphasis in each subject upon the general principles which younger minds can grasp and appreciate, with less attention to exceptions and details. Also relatively more attention should be given to those subjects such as surveying, mensuration, etc., with which the ranger is more likely to be concerned in his work, or the so-called practical subjects. The ranger's duties are largely administrative, and his training should qualify him for a satisfactory discharge of his duties.

3. "The requirements for admission should be a common school education, such as is generally required for admission to high schools. Less than this would

be an insufficient basis upon which to develop efficiency. More than this is unnecessary from the present standpoint of the ranger's duties.

4. "It would seem that at least a three years' course should be provided. Two years will not admit of adequate training in all of the essential subjects. The first year must be devoted largely to foundation work—mathematics, English, general biology—and the orientation of the student with reference to his future work. After this it remains to present the special subjects and to give some training in physics and chemistry, in geology and mineralogy as they bear upon the work directly or indirectly, all of which cannot be accomplished in one year, especially with the class of students with whom it is proposed to deal.

5. "Ranger schools should be located in connection with colleges or similar institutions wherever the surrounding country supplies adequate forest conditions. There are certain advantages accruing to students coming into contact with the right kind of educational standards and ideals under such conditions, and to them these may be of permanent value. Moreover, the larger equipment at hand and the greater range of opportunity should be stimulating factors. Besides the educational considerations involved, there is a ponderable factor in the matter of comfort and pleasure in which the city life has the best of argument through the school year.

6. "A faculty of foresters actually engaged in the management of forest property would not be wise unless a sufficient range of activities and conditions could be presented. Such a faculty would probably tend toward a narrower training than one conducted by men not occupied with the problems of a particular tract.

7. "There is doubtless a good field for ranger schools. They should be located in those parts of the country which they expect to serve. Eight such schools might at present be supported to advantage. One should be located in New England or New York to supply the Northeastern States; another in the South for the Southern Appalachian region; another in the Michigan or Minnesota; a fourth might be located in Missouri for the lower Mississippi Valley; the fifth at Missoula, Montana, which would meet the needs of the northern Rocky Mountain region (Montana, Idaho and Wyoming); the sixth in Colorado for the southern Rocky Mountain region; the seventh at Seattle for Oregon and Washington; and the eight in California for the Southwest. Each of these schools thus located would have a forest region of fairly uniform character as its own field, which it would be able to serve better than it would any other."

J. E. KIRKWOOD.

"I find it difficult to answer the set list of questions which you submit. I will do my best to outline work which I consider necessary in preparing men for the management of estates, for foremanship in logging operations, for timber land surveying and cruising, and for employment in State services. So doing, I realize fully that no limit is thereby set to the responsibility and competence to which such men may rise, and, on the other side, no bar is set to the encroachment on the field it is designed to cover by men without any set forestry training who in their field seem to me admirable foresters of this type.

"Mathematics up to plane geometry ought to be had in preparation at the school itself. No foreign language requirement. Good English training, including any science well taught that can be had. Bookkeeping very desirable. The course should not exceed two years in length. Practice work should go along with indoor training. A variety of operations and fields for practice ought to be at hand. As to teachers, personality and sympathy are the main things. I believe that quite a number of schools of this type could live in this country, if exactly the right men should open them.

"As to the subjects taught, I suggest the following:

(a). "Surveying and topographic mapping ought to be strong, not only for their direct use but for the training.

(b). "Botanical work may be on the empirical level.

(c). "Road and trail building ought to be taught, and familiarity gained with common lumbering operations, logging and mills. Instruction in these subjects should be practical and go along with observation and practice.

(d). "Silviculture is the central part of forestry and ought to be strongly developed, though mainly local and practical. On the other hand, management as it appears in literature can be dropped out.

(e). "Mensuration in practical form ought to be very strong.

(f). "Some training in agriculture is useful if it can be had, and the same is true of business training."

AUSTIN CARY.

"I appreciate the opportunity to offer my ideas on ranger schools.

1. "Ranger schools should train men in the field of elementary forestry which will be applicable in the near future. They should produce men capable of executing the methods of forest administration which are being practised now and will be practised in the immediate future.

2. "The instruction should be confined to local and practical problems. Mechanical drawing, surveying, mensuration, silviculture, fire protection, forest mapping and estimating, and lumbering should be the essentials. There should be enough discussion of general problems to give the men a broad outlook. The subjects forest management, forest regions, and forest law, as commonly taught in technical schools should be omitted. Subjects of secondary importance are the local forest laws, State and Federal, the practical matters of wood technology, and the propagation and care of fish and game. Geology, meteorology, botany, dendrology, diseases of trees, forest entomology are of indirect importance only in our present administrative problems, but can be treated in a practical way. The average technical forester is apt to overemphasize these subjects in ranger instruction.

"Seed collection, nursery wotk, and planting are important in many regions. Grazing is an important subject in western ranger schools. The National Forest Manual exemplifies forest administration well, and is decidedly worth study in any forest school. The character and amount of construction work—trail building, cabins, telephones, etc.—depend on the age and experience of the men admitted. Camp and personal hygiene, first aid, care and shoeing of horses, should be treated by authorities, if possible. Some aspects of these subjects must often be handled tactfully to avoid personal criticism.

"To summarize, it should be kept in mind that what we believe can be accomplished now in the woods is (1) better fire protection, and (2) closer utilization, and that gradually (3) conservative cutting and artificial regeneration are becoming possible.

"There should be a large proportion of field and laboratory practice. The books which serve well for class work in technical schools contain too much not pertinent for ranger school instruction. Care should be taken to eliminate the merely pedagogical from all subjects. There are few good text-books, and information should be given through dictated lectures or through carefully prepared printed or typewritten notes.

3. "In general, there are two kinds of schools possible—one for young, inexperienced men, and the other for men with some woods experience. My experience in both leads me to believe that under present conditions the latter are more

effective. In the eyes of the practical lumbermen, the young man who has spent two or three years in a ranger school is little less of a theorist than the graduate of a technical school. Little practical experience can be gained in less than two or three years. If a man can afford to spend two or three years in a school, Why not make it a little longer and go to college? The ranger school is for the benefit of the poorer men and should be as short and inexpensive as is consistent with proper standards. Drill in common woods work can be obtained under employment better than in a school and is an expense and a waste of time as part of the curriculum for men who ought to be able at graduation to do a higher class of work than that of the lumberjack.

"If woods experience is required for entrance, the incapable men will be weeded out, and the graduates will have a fund of experience infinitely more valuable to the lumberman or to the forest supervisor than they would if their only woods experience had been obtained in the ranger school. The older men will be able to undertake responsible work more quickly and their age does not lessen their ability to learn. In fact, if the courses are well prepared, they take much keener interest than the younger men.

"Educational requirements for admission are apt to exclude men who will succeed better in the woods than in the classroom, and are, in general, inadvisable. It is, of course, true that lack of common school education prevents the rise of many men later in life. Schools with no entrance requirement except an age limit of eighteen years are apt to be filled with men who finished high school, but did not get into college and do not want to work. I doubt if it is worth the time of any professional forester to conduct a school for such men. I feel very strongly that the ideal course would admit men not less than nineteen or twenty years old, and with at least a season's experience in a lumber camp, or in other practical work—for example, temporary employment for a season on a national forest.

4. "One year (forty weeks) is sufficiently long. If the course is longer, the men are apt to develop a distaste for the practical work for which they are needed. A longer course must consist either of advanced technical instruction, which is undesirable in a ranger school, or of drill in routine work, which the men can obtain better under employment. It must also be remembered that insofar as is consistent with standards, the purpose of ranger schools is quantity rather than quality. There should be plenty of drill in practical forestry, but I do not think that this should be of apprentice character. It is a great mistake to combine instruction with actual employment. The conditions are impractical for employment and good instruction alike, and dissatisfaction is very apt to occur. The business of the school is to teach and results disastrous to educational institutions have resulted from attempts to combine instruction with business undertaking.

"If there is to be apprentice work, compensation should be arranged. The apprenticeship idea is distasteful to a large proportion of our population. It is, of course, less applicable to older men.

5. "The schools may be conducted entirely in the woods, or it is quite practical to conduct the class work at colleges in cities, provided there is ample opportunity for field work.

6. "Men engaged in administrative work do not have the time justly due the students. I have found their lack of experience in handling classes, either indoors or in the field, often serious. Ranger schools, like other schools, should have their own instructors. The handling of administrative and instructional work by the same men is a growing evil in many American institutions. The ideal teacher in a ranger school is the technical forester with considerable practical experience both in forestry and lumbering also, if possible, and in teaching.

"National forest, State and fire protective association rangers, estimators,

woods foremen, and other employees of lumbermen, might be trained in such schools. Men of administrative ability should be selected and encouraged to feel that the practical work will ultimately open important administrative positions to them. Most institutions are not well prepared to train rangers and nursery foremen together. The latter should be trained at a large nursery. The problems of the nursery foreman are not those of the ranger.

"Unless there are positions open to graduates of ranger schools, the men are apt to feel a distaste for woods work of the lower grades, especially if their school course has been long. The future of the graduates should be given careful consideration before the school is opened.

7. "There should be many ranger schools in the United States—in fact, there should be at least one in each forest region. I believe in the future of men of administrative ability, but the courses should be simple and short enough to keep the men satisfied with the practical work for which they are needed.

8. "The training should be chiefly local."

PHILIP T. COOLIDGE.

"From my experience with the work here during the past four years and one year at Colorado College I have learned that what I originally considered, and what I should even now like to consider an ideal course, will not work out practically.

"I shall try to answer the various questions as presented in your inquiry, but find that I shall need to rearrange the order somewhat to make my contentions follow logically.

5. "Ranger schools should be located with the forest schools already established, or with the State universities or agricultural colleges, giving instruction in forestry. It would not be necessary that these schools be located in forests under management, and it would probably be preferable not to have them so located. A few years of the influence of the university atmosphere is an important feature in a young man's development. Furthermore, better apparatus for laboratory work will be available at the University than at a field school. If the work can be carried on at a regularly established forest school, it would undoubtedly prove most efficient.

8. "The training should be chiefly local in character. The ranger's field of operation is limited and his problems are, hence, such as would arise only within a comparatively restricted district, such as several adjoining States. The ranger, above all others, must be familiar with local conditions. His work will, probably, always be largely administrative. The local conditions of the particular region must be given special consideration in the preparation of a curriculum for a ranger school. It should be very largely based upon the character and the past training and experience of the men applying for instruction.

"The ranger school at the University of Washington was organized chiefly to help the young men already employed as rangers and guards to increase their efficiency, and to prepare men already more or less familiar with the forest, to take up the work. The men who applied for instruction were mostly men of mature age, with very little previous schooling, but with a great deal of woods experience. They also knew pretty definitely along what lines they were deficient. To sum up in a word, the men who came to us, brought with them very definite ideas concerning the subjects they needed, but they had a very meager scholastic foundation upon which to build.

"The conditions mentioned above are changing. Although the ranger is still required to do a great deal of administrative work, he is required each year to do more and more work that requires a knowledge of the technical subjects of forestry.

"The number of men coming to us who have appointments as rangers and guards is decreasing, and a larger proportion of younger men who have not had *extensive* woods experience, but who have had at least several years of high school training, are applying the course. This change, however, is in its infancy.

1, 2, 3 and 4. "With the foregoing in mind I think it should be evident that the nature and scope of the work will depend largely upon the local conditions. I do not believe that a standard course of instruction which would fit all schools, could be drawn up; nor would the best curriculum for the conditions of today necessarily be the best two or three years hence. In order to answer this question completely, I shall have to consider the following conditions: (*a*) The character and the past training and experience of the men who are applying for positions; (*b*) The problem of meeting new conditions. The equipment of the men applying for instruction demands that the instruction be wholly practical and under men who fully appreciate the needs of the students and their previous training. The work as now being carried out at the University of Washington, where the curriculum covers a period of three months each, during two years, seems satisfactory. I should say that the instructors should be men who are closely in touch with the field work.

"In regard to meeting new conditions, if I judge aright, from the present tendencies, the demand for ranger instruction by those already employed by the Forest Service, will fall off and in the near future there will probably be a demand for instruction from younger men who wish to take up ranger work in the Forest Service, with the various State forestry departments, and by the owners of private holdings. These men might probably be trained in the established secondary schools (high schools), or by means of a two-year technical course at the universities, following a high school training. Personally, I should favor the latter. Specialization in high school work to the extent that would be required to make an efficient ranger, must be considered a poor educational policy, because it would rob the young men of the training that they should have in order to gain a broad view of life. I believe it would be a tendency to result in, what in plain pedagogical terms, would be called 'arrested development.' So I should, above all else, start out with a broad foundation and add the technical work to this. In a two-year course I should advise also that a *large portion* of the work of the first year be given over to mathematics and scientific subjects related to forestry and that the work of the second year be chiefly technical and practical with, perhaps, one-half to two-thirds of the time devoted to class-room and laboratory work, and one-third to one-half to practical field work. The field work should follow the lecture work closely. Apprentice work should be taken up during the summers. There is always a demand for additional men during the summer months. Young men who intend to take up the work of the ranger school might begin doing guard work their first summer, *i. e.*, between the graduation from the high school and their entrance into the ranger school. During their first year at the ranger school they should be given some work that will enable them to do a higher class of work during their second summer vacation. It will be found that these students can be depended upon to do more satisfactory work as temporary employees than the class of persons otherwise available for the summer months only. The position that the ranger would fill would be largely one of carrying out the administrative work of a definite area of forest land under the direction of the forest supervisor, the State forester and his assistants, or under the direction of a superior officer of the large private owner. In addition he would assist the technical man in carrying out the various phases of technical work.

6. "I should not favor instruction entirely on the apprenticeship basis. I should, however, be very strongly in favor of having the teaching staff composed

of men who have received their training in established technical forest schools and who are keeping closely in touch with the forestry work that is being carried on in the field. Personally, I feel that even in surveying and the allied sciences, a forester could do more efficient work with the students than the engineer and the pure scientist, since these latter very often entirely overlook the forester's viewpoint."

HUGO WINKENWERDER.

[There was no discussion upon this report.]

THE RELATION OF FORESTS AND WATER

By the Sub-Committee on Forest Investigations.

Chairman, Raphael Zon, Washington, D. C.

F. B. Laney, Denver, Colo. C. G. Bates, Denver, Colo.
Walter Mulford, Ithaca, N. Y. Alec. G. McAdie, Cambridge, Mass.

Presented by Mr. Raphael Zon, Monday evening, November 17, 1913.

SYNOPSIS

The influence of the forest upon climate and the supply of water in streams and the regularity of their flow is one of the most important in human economy.

FORESTS AND CLIMATE

THE forest lowers the temperature of the air inside and above it. The vertical influence of forests upon temperature extends in some cases to a height of 5,000 feet.

The forest lowers the temperature of the soil in summer and increases the temperature of the soil in winter. This influence extends to a depth of at least 4 feet.

The relative humidity of the air during the summer is higher in the forest than in the open.

Forests increase both the abundance and frequency of local precipitation over the areas they occupy, the excess of precipitation as compared with that of adjoining unforested areas amounting in some cases to more than 25 per cent.*

The influence of mountains upon precipitation is increased by the presence of forests. The influence of forests upon local precipitation is more marked in the mountains than in the plains.

The reason for an increase in the total amount of precipitation over wooded areas as compared with that of barren and deforested ones is due to:

1. The tendency of moisture-bearing currents to precipitate their moisture more readily above or near the forests than over bare or cultivated fields at the same elevation because of the dampening and chilling effect of the forests upon the atmosphere, which induces a greater condensation of the water vapor.

2. The air from forests contains a much larger amount of moisture than that over bare or cultivated fields.

3. The mechanical action of the trees themselves. When a cloud in the mountains passes through a forest, the branches and the leaves of the trees retard its movement. It comes, therefore, into a state when it can no longer retain its moisture in suspension, just as a river carrying sediment deposits part of it as soon as the rapidity of its flow is diminished. The moisture from such clouds is

* Professor Walter Mulford, as a member of the Committee, does not agree with the conclusions of the majority of the committee with regard to the effect of forests upon precipitation.

intercepted by the forest in the form of mist or drops of dew or crystals of hoarfrost on the branches and foliage of the trees.

Forests in broad continental valleys enrich with moisture the prevailing air currents that pass over them, and thus enable larger quantities of moisture to penetrate into the interior of the continent. The destruction of such forests, especially if followed by weak, herbaceous vegetation or complete baring of the ground, affects the climate, not necessarily of the locality where the forests are destroyed, but of the drier regions into which the air currents flow.

Forests in the mountains, while they have a marked influence upon local precipitation, their influence upon the humidity of regions lying to the leeward on the whole is not very great.

FORESTS AND STREAMFLOW

THE effect of forests upon streamflow in *level countries* differs from that of forests in hilly or mountainous regions.

In a *level country* where there is no surface runoff, forests, in common with other vegetation, act as drainers of the soil. Hence the importance in draining the marshy lands and improving hygienic conditions. In such countries the effect upon streams is unimportant.

In the plains and in level country the forest:

(1) Constitutes an effective means of draining and drying up swampy lands, the breeding places of malaria, and swamp fevers. The reforestation of the Landes, Sologne, the Pontine marshes, and a hundred other examples prove this.

(2) Draws moisture from a greater depth than does any other plant organism, thus affecting the unutilized water of the lower horizontal strata by bringing it again into the general circulation of water in the atmosphere and making it available for vegetation.

(3) Lowers to some extent the subterranean water level, but it has no injurious effect upon springs, since these are practically lacking in the level countries with horizontal geological strata, where its lowering influence has been chiefly noted.

(4) Refreshes the air above it and increases the condensation of moisture carried by the winds, thus increasing the frequency of rains during the vegetative season.

In *hilly* and *mountainous country* forests are conservers of water for streamflow.

In the mountains, the forests break the violence of rain, retard the melting of snow, increase the absorptive capacity of the soil cover, prevent erosion, and check surface runoff in general, thus increasing the underground seepage and so tend to maintain a steady flow of water in streams.

Forests in hilly and mountainous country, even on the steeper slopes, create conditions with regard to surface runoff such as obtain in a level country. The steeper the slope the less permeable the soil, and the heavier the precipitation the greater is the effect of forests upon streamflow.

FORESTS AND EROSION

FORESTS are the most effective agency for protecting the soil from erosion because: (1) The resistance of the soil to erosive action is increased by the roots of the trees, which hold the soil firmly in place, and (2) at the same time the erosive force of the runoff is itself reduced because the rate of its flow is checked and its distribution over the surface equalized.

FORESTS AND FLOODS

THE total discharge of large rivers depends upon climate, precipitation, and evaporation. The observed fluctuation in the total amount of water carried by rivers during a long period of years depends upon climatic cycles of wet and dry years.

The regularity of flow of rivers and streams throughout the year depends upon the storage capacity of the watershed, which feeds the stored water to the streams during the summer through underground seepage and by springs. In winter the rivers are fed directly by precipitation, which reaches them chiefly as surface runoff.

Among the factors, such as climate and character of the soil, which affect the storage capacity of a watershed, and therefore the regularity of streamflow, the forest plays an important part, especially on impermeable soils. The mean low stages as well as the moderately high stages in the rivers depend upon the extent of forest cover on the watersheds. The forest tends to equalize the flow throughout the year by making the low stages higher and the high stages lower.

Floods which are produced by exceptional meteorological conditions can not be prevented by forests, but without their mitigating influence the floods are more severe and destructive.

CONCLUSIONS

THE extent of forest land necessary for the regulation of streamflow and the protection of the soil against erosion must be not less than from *one-fifth to one-third of the total area of the country.*

Forests must be protected, not so much in localities which already suffer from lack of moisture, as in regions which lie in the path of prevailing winds and are still abundantly supplied both with ground water and precipitation.

In the dry regions large bodies of forest may have an unfavorable effect upon the available water supply. There rows of trees or windbreaks surrounding fields and orchards, by preventing the drifting of the snow and increasing the activity of the wind, will act more as conservers of moisture in the soil than solid bodies of timber.

The care with which forests should be protected in the eastern half of the United States must increase from north to south and from west to east.

In the Atlantic plain and southern Appalachians, which are the gateway for the prevailing winds from the Gulf of Mexico and the Atlantic Ocean, forests must be especially conserved if the humidity of the Central States and the prairie region is to be maintained.

If the clearing of the forest in the Atlantic plain and southern Appalachians is a necessity, it should be done only under condition that the cleared land is to be devoted to intense cultivation, as, after forests, crops contribute most to the moisture of the air.

The highest organic production is in harmony with the safeguarding of the humidity in the regions which lie in the path of the prevailing winds. Cleared land which becomes waste or poor pasture or grows up to weak vegetation means so much evaporation lost to the passing air currents.

THE RELATION OF FORESTS AND WATER

INTRODUCTORY.

THE influence of the forest upon climate and the supply of water in streams and the regularity of their flow is one of the most important in human economy. Yet the great number of factors which make up this influence, the difficulty of observing them with precision, and the wide range of economic interests which it affects has caused considerable divergence of opinion on the subject. This report aims to bring together impartially, without attempting to pass, however, the final word on the subject, all the well-established scientific facts in regard to the relation of forest to climate and water supply.

I.

FORESTS AND CLIMATE

THREE main factors determine the climate of any locality: (1) Temperature of the air, (2) wind, (3) precipitation. These factors further determine the temperature of the soil, the relative humidity of the air, evaporation, and other secondary physical factors which form the climate of the region.

TEMPERATURE.

The forest lowers the temperature of the air inside and above it. The vertical influence of forests upon temperature extends in some cases to a height of 5,000 feet.

The physical and physiological processes which accompany any plant growth must necessarily reduce the temperature of the air, at least during the vegetative period. First, because, the leaves evaporate water. Second, because the heat of the sun is consumed in this evaporation, and the plant can not become heated to the same extent as, for instance, a rock or soil without any vegetative cover. Similarly the ground under plants can not become greatly heated on account of shading. Third, the surface from which heat radiates at night is much greater when vegetation is on the ground than when the ground is bare. The cooling effect on the air by crops has been experimentally proven. For every pound of dry substance produced it has been found that corn evaporates 233 pounds of water, and turnips 910 pounds.

Under good cultivation an acre may produce about 7 tons of dry substance. If the evaporation of water be only 500 times more than the amount of dry sub-

stance produced, then an acre will evaporate during the vegetative period about 3,500 tons of water. This example shows the extent to which ordinary crops can contribute to the moisture content of the air and the cooling which accompanies this evaporation. Forests, being the most highly developed form of vegetable life, exert this influence in the greatest degree.

The cooling effect of forests upon the temperature of the air has been proven by long series of observations continued for a long number of years in France, Germany, Austria, Switzerland, and now in the United States. All these observations, while they may differ as to the absolute figures, confirm each other. The yearly mean temperature at equal elevations and in the same locality has invariably been found to be less inside than outside the forest. In a level country this difference is about 0.9 degree F. It increases, however, with latitude, and at an elevation of about 3,000 feet is 1.8 degrees F.

The monthly mean temperature is less in the forest than in the open for each month of the year, but the difference is greatest during the summer months, when it may reach 3.6 degrees F., while in winter it does not often exceed 0.1 degree F.

The daily mean temperature shows the same condition, but to a greater degree. During the hottest days the air inside the forests was more than 5 degrees F., cooler than that outside, while for the coldest days of the year the difference was only 1.8 degrees F.

The temperature of the air within the forests is therefore not only lower, but also subject to less fluctuation, than in the open.

In tropical and subtropical regions the influence of the forest upon the temperature of the air is the greatest. The remarkably moderate temperature of the Amazon basin, whose geographical position near the Equator over 600 miles away from the Atlantic Ocean and isolated by high mountains from the Pacific Ocean, should have made it one of the hottest places in the globe, is attributed to the cooling effect of the enormous forest areas found there.

TEMPERATURE OF THE SOIL.

Forests influence the temperature of the soil in almost the same way as they do that of the air. The forest soil is warmer in winter by 1.8 degrees F. and cooler in summer by from 5.4 degrees to 9 degrees F. than soil without forest cover, and this holds true at a depth of at least 4 feet. In the spring, and especially in the summer, the forest soil is cooler than that of open land. In the fall and winter, however, it is warmer, but the degree of difference is always less than in summer.

RELATIVE HUMIDITY.

The relative humidity of the air is higher in the summer in the forest than in the open. This difference is usually between 4 and 10 per cent, but in some places may be as much as 12 per cent. In regions of heavy snow there is practically no difference in the relative humidity during the spring when the snow melts. The reason for the higher relative humidity of the air in the forest is because the

transpiration of water by the leaves appreciably increases the moisture content of the air within or near the forest and, second, because the temperature of the air in the forest is lower and therefore nearer its saturation point.

PRECIPITATION.

Forests increase both the abundance and frequency of local precipitation over the areas they occupy, the excess of precipitation as compared with that of adjoining unforested areas amounting in some cases to more than 25 per cent.

Observations upon the influence of forests on local precipitations began as early as the middle of the last century, but systematic observations did not start until the second half of the 60's (Bavaria, France, and Switzerland) and in many places are still being carried on. This excess of precipitation over forested areas varies from a fraction of one per cent to 25 per cent. Such wide variation is due partly to differences of geographic situation, altitude, character of the forest, etc. At the forest experiment station at Nancy 33 years' observations show an average excess of precipitation on forested areas of 23 per cent, while Ebermayer, in Germany; Bouvard, at Moumal, and Blandford, in India, compute it as being 12 per cent. Some meteorologists are inclined to ascribe the difference in the amount of precipitation over forests and open fields to the imperfection of the rain gauges. Hellman's experiments, for instance, showed that the ordinary rain gauge in a wind of medium velocity registers 19 per cent less of precipitation than actually falls. It is possible that rain gauges in the forest, being protected from wind, will catch more rain and therefore show a greater amount of precipitation than when placed in the open. That the greater amount of precipitation over forest areas as compared with open fields can not, however, be ascribed entirely to this has been clearly brought out by Müttrich, who, during four years of careful observation with Hellman's improved rain gauges, found that the difference of precipitation in the forest and outside the forest still amounted to 6 per cent.

French observers are practically unanimous in recording a larger amount of precipitation over forests than over fields. This conclusion is the result of experiments carried on at the forest school at Nancy, in the forests of Haye, by Fautrat in the forest of Halatte (Oise), and by de Pons in the forest of Troncais (Allier). Most of those carried on in Germany, Austria, Russia, and India have forced similar conclusions.

Regular observations taken at Nancy for 33 years since 1866 at stations inside, on the edge of, and outside the forest show that, without exception, more rain has fallen inside than outside the forest and that during 8 or 10 years more rain fell on the edge of the forest than outside. If the amount of the rainfall at the center of the forest be designated at 100, then the amount of rainfall at the edge of the forest would be represented by.93.9 and the rainfall outside the forest by 76.7.

The influence of mountains upon precipitation is increased by the presence of forests. The influence of forests upon local precipitation is more marked in the mountains than in the plains.

The difficulty of bringing out clearly the influence which forests have upon

precipitation results from the fact that the bulk of the forests are in the mountains. Altitude, as is well known, has a definite relation to the amount of precipitation, and unless this influence is eliminated that of the forest can not be clearly determined.

Precipitation increases with altitude, but it would be a mistake, however, to accept, as it has been commonly believed to be for many years, that the rainfall chart is practically identical with the contour chart. The influence of the forest upon precipitation increases with the increase in altitude. Therefore, while it is true that mountains affect precipitation, wooded mountains affect it to a still greater degree. This effect is especially marked during the summer months, and the effect is greater over coniferous than over broadleaf forests.

Practically all observations then tend to show that there is an increase in the total amount of precipitation over wooded areas as compared with that over barren or deforested ones. One reason for this is undoubtedly the tendency of moisture-bearing currents to precipitate their moisture more readily above or near the forests than over bare or cultivated fields at the same elevation, due to the dampening and chilling effect of the forest upon the atmosphere, which induces a greater condensation of the water vapor.

That the air over forests contains a much larger amount of moisture than that over bare or cultivated fields is today a proven fact, based both on actual conservations in the upper air strata and determinations of the quantities of water evaporated by the forest.

That the vertical influence of the forest extends to a height far greater than 100 or 200 feet has been proven by observations taken during balloon ascensions. Thus Renard, commander of engineers and subdirector of the Central Military Balloonist Institute of France, states that the effect of the forest upon the temperature of the upper strata of air has been repeatedly felt during ascensions at an elevation of nearly 5,000 feet over the forest of Orleans, which has an area of 75,000 acres. This influence is scarcely felt over field crops, and it is obvious that the difference can not be due to the greater height of the trees, which at best reach but a little over 100 feet on an average. It can be accounted for only by the greater amount of water given off by the forest and the lower temperature above it.

The condensation of vapor on the surface of leaves in the form of dew, hoarfrost, etc., in northern latitudes, according to C. E. Ney, is from 0.4 to 0.8 inches a year. It is much more in southern latitudes, especially in tropical forests. The condensing capacity of many tropical forests, because of the extreme dampness of the air within them, is so great that during every clear and still night drops of dew fall continuously from the leaves as in rain. (This is also the case in the redwood belt on the Pacific Coast.) Thus part of the moisture which is evaporated from the leaves during the day is condensed during the night, and the dews in the forest in all latitudes are so heavy that they dampen the soil under the leaves.

Another reason for greater precipitation over forests may be the mechanical action of the trees themselves. When a cloud in the mountains passes through a forest, the branches and the leaves of the trees retard its movement. It comes, therefore, into a state when it can no longer retain its moisture in suspension, just

as a river carrying sediment deposits part of it as soon as the rapidity of its flow is diminished. The moisture from such clouds is intercepted by the forest in the form of mist or drops of dew or crystals of hoarfrost on the branches and foliage of the trees.

The mechanical action of the forest is especially important in the case of snow. The influence of forests upon the amount of snow has been especially studied in Russia, where in some places more than 30 per cent of all the precipitation is in that form. During heavy storms the forests not only catch more snow than do large open fields, from which it is blown away, but they prevent it drifting. There is always more snow deposited within the forest than in nonforested areas, except in depressions and protected places where snow accumulates. In regions where the snowfall is heavy the amount of snow that accumulates in the forest, and especially in small openings within the forest, is often so great that gauges located even under the crowns of trees contain more snow than those located in large open places, in spite of the fact that snow is very readily retained by the branches, especially in coniferous forests, and that part of the snow thus retained by the trees gets into the rain gauges only at the time of thawing and, therefore, can not be accurately recorded. The results of many years of observations in Russia upon the accumulation of snow in the forest and outside of it have conclusively shown that young forests, deciduous forests, and small openings within the forest collect nearly twice as much snow as open fields.

After all, it really matters very little for the final result whether the increased precipitation over the forest is due to its influence upon the condensation of vapor in the air or to the mechanical action of its branches and leaves. The fact remains that forests receive more precipitation than open fields.

Forests in broad continental valleys enrich with moisture the prevailing air currents that pass over them and thus enable larger quantities of moisture to penetrate into the interior of the continent. The destruction of such forests, especially if followed by weak, herbaceous vegetation or complete baring of the ground, affects the climate, not necessarily of the locality where the forests are destroyed, but of the drier regions into which the air currents flow.

While definite observations to show the relation between the forest and the climate of continents are still lacking, there are many theoretical considerations which strongly point to a distinct influence of the forest, especially upon the climate of large continents of a level character.

The accompanying maps, on which the direction of the prevailing winds is indicated by arrows and the mean precipitation by lines, one typical of the summer period and the other of the winter, show a most intimate relation between the prevailing winds and precipitation in the eastern half of the United States. A high meteorological authority in this country states that the "precipitation in the eastern half of the United States is from the aqueous vapor that is raised up from the vast waters to the south and southeast of the continent" and that "the supply is inexhaustible."

If by this is meant that the precipitation over the eastern part of the United States is derived entirely from evaporation from the Gulf of Mexico and the At-

lantic Ocean, the statement is not entirely correct. It is true that the southern winds which prevail all over the eastern United States during the summer pass over the Atlantic Ocean and the Gulf of Mexico and reach the land loaded with moisture. As soon, however, as they reach the land part of the moisture is precipitated, and as they move farther inland they become drier and derive their moisture more and more from the evaporation from the land.

Of the 44,015,400 square miles of land surface of the earth, 79 per cent drains directly toward the ocean and 21 per cent forms an inclosed inland area without ocean drainage. The 79 per cent may be called the peripheral area of the earth's surface, and the importance of the evaporation from it is, on the whole, very great.

PREVAILING DIRECTIONS OF THE SURFACE WINDS AND THE MEAN PRECIPITATION IN THE UNITED STATES DURING JANUARY.

Prof. Ed. Brückner computes the "continental vapor" evaporated from this peripheral area to be about 21,000 cubic miles (20,871.3 cubic miles). It plays, therefore, even a more important part in supplying moisture to the air than does the vapor directly evaporated from the ocean. Brückner estimates that the peripheral regions of the continents are capable of supplying seven-ninths of their precipitation by evaporation from their own areas. If the evaporation from land plays such an important part in the precipitation over areas adjoining the ocean, it becomes still more important at some distance from the ocean. It may be assumed, therefore, that the moisture which is carried by the winds into the interior of vast continents, thousands of miles from the ocean, is almost exclusively due to continental vapor and not to evaporation from the ocean.

PREVAILING DIRECTIONS OF THE SURFACE WINDS AND THE MEAN PRECIPITATION IN THE UNITED STATES DURING JULY.

In the interior closed basins the precipitation and evaporation are, as a rule, equal.

The circulation of water on the earth's surface may be shown in the form of a balance sheet as follows:

BALANCE SHEET—*Circulation of water on the earth's surface.*

	Cubic miles	Depth in inches	Per cent
A. Entire earth surface (196,911,999.59 miles):			
Evaporation from water surfaces	92,121	29.5	80
Evaporation from land surfaces	23,270	7.5	20
Precipitation on entire earth surface	115,391	37.0	100
B. Oceans (141,312,600 square miles):			
Evaporation from oceans	92,121	41.3	100
Amount of ocean vapor carried to the land (net[1])	5,997	2.8	7
	86,124	38.5	93
C. Peripheral land area (44,015,400 square miles):			
Ocean vapor (net)	5,997	8.7	29
Continental vapor from the peripheral land surface	20,871	29.9	100
Precipitation over the peripheral land area	26,868	38.6	129
D. Closed interior basins with no drainage to the ocean (11,583,000 miles):			
Evaporation from closed basins	2,399	13.0	100
Precipitation over closed basins	2,399	13.0	100

An analysis of these figures discloses the fact that one-fifth of the entire vapor on the earth's surface comes from evaporation on land; that only 7 per cent, or 5,997.5 cubic miles, of all the water evaporated from the oceans enters into the precipitation over land, and that 78 per cent of all the precipitation that falls over the peripheral land area is furnished by this area itself.

Where is evaporation on land greatest? The evaporation from a moist, bare soil is, on the whole, greater than from a water surface, especially during the warm season of the year, when the surface of the soil is heated. Soil covered only with a dead vegetable cover evaporates moisture much more slowly than a bare soil or an open water surface. On the other hand, a soil with a living vegetal cover loses moisture, both through direct evaporation and absorption by its vegetation, much faster than bare, moist soil.

The more highly developed the vegetal cover the faster is moisture extracted from the soil and given off into the air. In this respect the forest is the greatest desiccator of ground moisture. The experiments of Otozky, which have been fully confirmed by many observers in other countries, have conclusively shown that the forest, on account of its excessive transpiration, consumes more moisture, all other conditions being equal, than a similar area bare of vegetation or covered with some herbaceous growth.

The amount of water consumed by the forest is nearly equal to the total annual precipitation—in cold and humid regions less and in warm and dry regions somewhat greater. This enormous amount of moisture, which is later given off into

[1] The difference between the amount of vapor that escapes from land to the ocean and from the ocean to land.

the air by the forest, may be compared to clouds of exhaust steam thrown into the atmosphere and must necessarily play an important part in the economy of nature. If the southern and southeastern winds, in their passage toward the north, northwest, and northeast in the spring and summer, did not encounter the vast forest areas bordering the shores of the Gulf of Mexico and the Atlantic coast and those of the Southern Appalachian, and therefore were not enriched with the enormous quantities of moisture given off by them, the precipitation in the Central States and the prairie region would probably be much smaller than it is now. For the central interior region of the United States is the battle ground of two titanic forces—one harmful, the other beneficial. The beneficial one takes the form of the mild and humid summer winds from the Gulf of Mexico and the Atlantic Ocean, which at their height extend into the continent as far north as North Dakota, as far west as the foothills of the Rocky Mountains, and as far east as New England, and during the prevalence of which the rainfall in the eastern United States is heaviest. The other and harmful force is made up of the warm chinook winds which blow out of the northern Rocky Mountains and the dry westerly winds of the upper Mississippi and the western lake region, both of which carry in their wake serious injury to orchards and fields. The Central States and the prairie region are geographically at the point where the battle between the two forces is fiercest, and the victory is now on one side, now on the other. When the humid southerly winds extend their influence far into the interior of the continent and overpower the dry continental winds, the Central States and prairie region, the granary of the United States, produce large crops. When the dry winds overpower the humid southerly winds, there are droughts and crop failures.

As soon as the moisture-laden winds from the Gulf reach the land and encounter irregularities they are cooled and begin to lose part of their moisture in the form of precipitation. As long as the air currents remain saturated with moisture the slightest cooling or iregularity of the land that causes them to rise will result in precipitation. But as they move inland and become drier the remaining moisture is given off with difficulty, and precipitation decreases. The sooner the humid air currents over land are drained of their moisture the shorter, of course, is the distance from the ocean over which abundant precipitation falls. If precipitation over land depended solely on the amount of water brought by the prevailing winds directly from the ocean, rainfall would, of course, be confined only to a narrow belt close to the sea. Not all the water that is precipitated, however, is lost from the air current. A large part of it is again evaporated from the land into the atmosphere. The moisture-laden air currents, therefore, soon lose the moisure which they obtain directly from the ocean, but in moving further into the interior absorb the evaporation from the land. Hence the further from the ocean the greater is the proportion which evaporation from the land forms of the air moisture. In fact, at certain distances inland practically all the moisture of the air, or at least as great a part as that formed originally by the water evaporated direct from the ocean, must consist of that obtained by evaporation from the land.

In the case of the central and plain States, then, what would be the effect

upon precipitation of complete or even partial destruction of forests in the Atlantic plains or in the Southern Appalachians? Since the mean temperature in the eastern portion of the United States drops rapidly from north to south, the moisture-laden air currents, upon reaching the land, would be cooled off and rapidly drained of their moisture within a comparatively short distance from the ocean. The sandy soil so characteristic of the southern pine belt of the Gulf and South Atlantic States would rapidly absorb the rain, without returning much of it into the atmosphere. The rain which fell upon the slopes of the mountains would rapidly run off into the streams. While the removal of the forest might increase the evaporation from the ground itself, yet the more rapid run-off and the absence of transpiration by the trees would reduce the total amount of water evaporated into the atmosphere. The land, even if taken up for agriculture, could never return such large quantities of rain into the atmosphere as the forests did. The result would be that less moisture would be carried by the prevailing winds into the interior of the country, and, therefore, less precipitation would occur there.

Regarding Sweden, an eminent meteorological authority, Dr. Hamberg,[1] says:

"The excess of evaporation which the forest vegetation of Sweden furnishes to the atmosphere above what the same area would furnish if it were covered only with herbaceous vegetation must, of course, be very considerable. If this aqueous vapor remained in the forest and returned to the land in the form of rain, it would be extremely beneficial. But winds carry it off and spread it in all directions with such rapidity that its beneficial influence for our country (Sweden) remains very doubtful."

The forests of Sweden have, however, an important influence upon the precipitation of the countries to the east, into which the prevailing winds blow, since in regions far removed from the ocean the feeding of the atmosphere by local evaporation has an important bearing upon the humidity and amount of precipitation. "On the continents in countries like central Siberia," says Hamberg, "forest vegetation must influence, of course, the humidity of the air. It returns to the atmosphere in the form of vapor the water collected and conserved in the forest which otherwise would run off. It lowers the temperature of the air. As a result of these two causes the relative humidity of the air must increase, and with it must also increase the inclination to precipitation in the form of rain or snow."

Whether mountain forests have the same effect as forests in level countries upon the precipitation of the regions into which the prevailing winds that pass over them blow is difficult to determine. The problem is complicated by the fact that high mountain chains themselves exert an influence upon precipitation and the direction of the winds, not only by presenting a mechanical obstruction to the free passage of the air, but also on account of the difference in temperature on the different slopes. A moist current of air in passing over a mountain chain under-

[1] Hamberg, H. E. De l'influence des forets sur le climat de la Suede. Stockholm, 1885-1897.

goes several changes. In ascending it becomes cooler, the temperature of air not fully saturated decreasing one degree F. for every 182 feet of ascension. At the same time the water-holding capacity of the air decreases until the saturation point is reached and fogs, clouds, and precipitation begin to form. Further cooling of the air in its upward course is counteracted to some extent by the heat that is separated in the process of condensing vapor and from then on proceeds only at the rate of about 0.5 degree F. for every 182 feet of ascension. After the air current has passed the crest of the mountain and lost an amount of moisture in ratio to the degree to which it has been cooled, it descends on the leeward side and becomes heated. In its descent it absorbs the fogs and clouds and in this process takes on some heat. Further heating goes on at the rate of 1 degree F. for every 182 feet of descent.

The more moisture the air loses in ascending a mountain the greater is the amount of heat it can absorb in descending. If, for instance, a current of saturated air, before ascending, had a temperature of 50 degrees F., and the crest over which it passed was 900 feet high, then, on the leeward side at the same altitude at which it began to ascend, it would have a temperature of 77 degrees F., and, provided no moisture is absorbed in the descent, a relative humidity of 21 per cent.[1] At other obstructions met by the same current of air the same changes would take place, though on the next chain of mountains new precipitation begins, as a rule, only at an altitude equal to that of the crest of the previous mountain chain over which the current of air has passed.

Prof. Mayr[2] has shown that wherever, as on the Pacific coast, in the Rocky Mountains, and in Caucasus and Turkestan, there are several parallel chains of mountains at right angles to the moist air current, each chain higher than the previous one, the forest on each consecutive mountain chain does not extend below an altitude equal to that of the preceding chain. Between the mountain chains are treeless, dry valleys.

As a rule the moist air currents passing over wooded slopes, being chilled, deposit most of their precipitation on the windward side. It is only in exceptional cases, such as when the air is not fully saturated, or when warm currents rise from below, that the air current, instead of depositing moisture, becomes enriched with moisture and carries it over the crest to the regions lying beyond. This may occur on southern slopes, which are likely to be warm. The influence of wooded windward slopes upon the humidity of the region to the leeward side of the mountains, therefore, varies. It is apparent, however, that while the forests in the mountains have a marked influence upon local precipitation, their influence upon the humidity of regions lying to the leeward can not, on the whole, be very great.

If the effect of mountainous forests upon the precipitation of regions lying in the lee of them is not entirely clear to us, the effect of forests in wide plains of continents, especially in the path of moist winds, can not be doubted. By increasing the evaporation from the land at the expense of surface run-off they

[1] Klossovsky, A. V. Osnovi meteorologii. Odessa, 1910, p. 48.
[2] Mayr, H. Waldungen von Nord Aerika, Munich, 1890.

enrich with moisture the passing air currents, and in this way help to carry it in larger quantities into the interior of continents. The destruction of such forests, especially if it leaves the ground bare or partly covered with only weak vegetation which does not transpire large quantities of water, must inevitably affect the climate, not so much the climate of the region in which the destruction took place but the drier regions into which the prevailing air currents flow.

FORESTS AND STREAMFLOW

THE effect of forests upon streamflow in level countries differs from that of forests in hilly or mountainous regions. In a level country where there is no surface run-off, forests in common with other vegetation act as drainers of the soil. Hence the importance in draining the marshy lands and improving hygienic conditions. In such countries their effect upon streams is unimportant.

In a level country any vegetable cover tends to reduce the amount of water available for streamflow. This has been clearly shown by numerous experiments in many countries. In a level country a soil cover with vegetation of some kind surrenders to the ground water a much smaller amount of water than bare soil with no vegetation at all and a forest, at least a spruce forest, less than field crops. The only vegetative cover which uses up more water than a spruce forest is an overflow meadow which can draw upon a supply of water in addition to the precipitation. In bare soil in a level country the only loss is from evaporation from the soil. This amount has been found to be on an average in temperate climates of about 50 per cent of the precipitation. In this country experiments with corn have demonstrated the lowering effect of plant growth upon the available ground water. Thus, during the growing season of 1899-1900, the mean height of ground water under corn was lower than that of fallow land and this lowering effect has been felt to a depth of over 7 feet below the surface. According to some European investigators, the desiccating influence of a spruce forest extends to 31.5 inches, and according to Russian investigators, even from 10 to 15 feet.

The forest, like any other vegetable cover, desiccates the layer of soil within which its roots are active, and since the roots of forest trees go to a much greater depth than the roots of cultivated crops, this has led to the conclusion that forest cover absorbs more moisture, and therefore desiccates the soil to a greater depth than any other vegetable cover.

The lowering effect on ground waters of the forest is well known from practical experience. The afforestation of the swamp lands of southern France, called the Landes, with maritime pine, brought about a lowering of the water table. In Italy the water table in swamps has been lowered by planting eucalypts, and in many swampy regions in Europe the drainage ditches, which before afforestation were always full of water, after planting became entirely dry.

As a net result of all these experiments in different parts of the world, the effect of forests in a level country because of its desiccating effect upon the soil, is different from that in mountainous country. In the plains and in level country the forest:

(1) Constitutes an effective means of draining and drying up swampy lands, the breeding places of malaria and swamp fevers. The reforesation of the Landes, Sologne, the Pontine marshes, and a hundred other examples prove this.

(2) Draws moisture from a greater depth than does any other plant organism, thus affecting the unutilized water of the lower horizontal strata by bringing it again into the general circulation of water in the atmosphere, and making it available for vegetation.

(3) Lowers to some extent the subterranean water level, but it has no injurious effect upon springs, since these are practically lacking in the level countries with horizontal geological strata where its lowering influence has been chiefly noted.

(4) Refreshes the air above it and increases the condensation of moisture carried by the winds, thus increasing the frequency of rains during the vegetative season.

In hilly and mountainous country forests are conservers of water for streamflow. Even on the steeper slopes they create conditions with regard to surface run-off such as obtain in a level country. Irrespective of species they save a greater amount of precipitation for streamflow than does any other vegetable cover similarly situated. They increase underground seepage of water to a larger extent than does any other vegetable cover. The steeper the slope the less permeable the soil, and the heavier the precipitation the greater its effect.

In the mountains, the forests break the violence of rain, retard the melting of snow, increase the absorptive capacity of the soil cover, prevent erosion, and check surface runoff in general, thus increasing the underground seepage and and so tend to maintain a steady flow of water in streams.

In the mountains the greatest source of loss of precipitation is through surface run-off, and the most important influence which a forest cover has is in reducing this. In general it may be stated that the amount of water which the forest cover saves to the soil by reducing the surface run-off and changing it to underground seepage is as follows: For forests at low altitudes where the rains are not heavy and the soil is less subject to freezing, 20 per cent; for forests of moderate altitudes, 35 per cent, and for mountain forests, 50 per cent of the precipitation. The saving of precipitation effected in this way by the forest is more than sufficient to offset whatever loss may be sustained through transpiration or interception by tree crowns. This is clearly brought out by the following facts: The entire loss of water from forested areas at moderate altitudes, even on the steepest slopes, is about equal to that from forest in level country. Ney places this at 19.4 inches, or 61.5 per cent of the precipitation (31.5 inches). Cultivated fields on similar slopes have been computed to lose, through interception by vegetable cover, evaporation from the soil, transpiration, and surface run-off, 24.9 inches, or 79 per cent of the precipitation, and bare surfaces 27.2 inches, or 86.4 per cent. The higher the altitude, the steeper the slope, the heavier the rainfall, and the greater the precipitation, the more marked will be the difference. This holds true, not only for such species of trees as beech or pine, the entire loss of water from which is less than that from cultivated fields, but also for spruce.

Although in a level country a spruce forest consumes more water than do cultivated fields, at high elevations, where the precipitation is from 43 to 47 inches, it consumes only 9.2 inches, or 21.5 per cent of the total precipitation, less than open fields, and nearly 15.7 inches or 34 per cent less than bare surfaces.

The ability of the forest to check surface run-off is greatest when the ground beneath is covered with an unbroken leaf litter. A forest without leaf litter, on slopes at moderate altitudes, has little effect in checking run-off. The entire loss of precipitation from such a forest was found to be 26.9 inches, while that from bare surface in the same situation was 27.2 inches. Hence, for a forest to exercise its most beneficial effect upon run-off, it must not be burned over, grazed, or otherwise interfered with in its normal function.

That a normal forest in the mountains saves more water for streamflow than any other vegetable cover or any bare surface is shown also by the abundance of springs in mountain forests.

Reduction of surface run-off means both an increase of underground seepage and prevention of erosion, two important factors in the regulation of streamflow. The action of mountain forests in protecting the soil against erosion and in increasing underground seepage at the expense of surface run-off is the result of their ability to lessen the severity of rainfall, to retard the melting of snow, to offer mechanical obstacles to surface run-off, to hold the soil together, to keep it in a permeable state, to increase its volume by constantly adding new soil, and to absorb large quantities of water by its leaf litter.

The forest modifies both the severity and the duration of the rainfall. By its foliage and branches it breaks the force of the rain, so that the water reaches the soil without violence and at the same time prolongs its duration. After a storm water continues to drip from the leaves and twigs for one or two hours. The water in the forest, therefore, falls more quietly and for a longer time and has thus a better chance to be absorbed by the soil.

The rapid melting of the snow in the spring, especially when the ground is frozen or saturated with water, favors surface run-off and lessens seepage.

The influence of forests in retarding the melting of snow has been demonstrated with especial precision in a ten years' series of observations carried on at the Imperial Agronomic Institute at Moscow. These show that the period of snow melting lasts within the forests from 26 (1904) to 57 (1902) days, while snow in the open disappears within 6 or 7 days. Thus, in 1908, the melting of snow, which began April 12, lasted in the forest until May 15 (34 days), but in the fields, pastures, and all other open places surrounding the institute, only until April 22 (11 days), while in the more exposed fields the snow had all disappeared as early as April 18, 7 days after it had begun to melt. The retention of snow in the forest until May 15 was in spite of the fact that after April 22 there were frequent warm rains.

In an ordinary forest region the water in the streams in the spring is derived from three sources: (1) The snow water that runs off from fields and clearings; (2) the surface run-off from forest soil, however slight; and (3) one, one and one-half, or two months later, after all the snow is melted, the under-

ground water. With the destruction of the forest the ground water is greatly decreased, there is no longer the retarded surface run-off from forest soil, and nearly all the snow water runs off at once as surface water from the fields and cleared land.

In cultivated fields and clearings in the north the ground is still frozen when the snow melts. This, together with the rapid melting of the snow in the open, causes the water soon to run off, even from gentle slopes, in great quantities, as though from the roof of a building. Freezing of the ground in fields and clearings is due chiefly to unimpeded radiation in the fall and to the blowing away of the protective cover of snow in the winter. Cultivated ground freezes especially deep during the winter if saturated with rain water at the time of the first fall frost. Surface run-off from the open fields is further increased when thaws during the winter coat the ground under the snow with an icy sheet, over which the snow waters run off in the spring without penetrating the ground.

In the forest, on the other hand, the soil is warmer than in the open. It is protected from radiation by trees. It is further protected by the leaf litter, a poor conductor of heat, which both prevents its cooling off and protects it from freezing in winter, and, in the processes of fermentation and decay, contributes the heat which these evolve. The relatively even cover of snow on the ground protects it still further. Under this triple protection the forest soil either does not freeze at all or freezes much later in the winter and to a much less depth than in open places. Moreover, it thaws out in the spring while still under its cover of snow. The slow melting of snow in the forest, together with the unfrozen, or only slightly frozen, condition of the ground beneath, permits a much greater percolation there than in the open. This water-holding capacity of the northern forest is more marked in coniferous stands, especially in spruce.

Closely connected with the relatively high temperature of the forest soil is another important fact which is often entirely overlooked. If the soil of watersheds remains soft and unfrozen, the ground water which feeds the streams continues to flow throughout the winter, thus keeping up the normal winter water stages in the streams under the ice. If, however, the flow of underground water ceases during the winter, the water accumulates in the ground, small streams freeze to the bottom, and the water stage of the river falls. In spring the ground water which has accumulated behind the icy dams thus formed at the bottoms of slopes bordering the streams enters the rivers in large quantities. For the regimen of rivers, therefore, the importance of forest cover on slopes bordering springs, creeks, and small streams, which are fed by underground waters, is especially great.

The forest floor, penetrated by a network of roots and covered by branches and stumps, offers many obstructions to the surface run-off and so permits the water to sink into the ground. Percolation is made still easier by the presence of deep channels in the soil, left by the decay of large roots.

The porosity or permeability of the soil has a great influence on the amount of surface run-off. The influence of the forest, therefore, will vary with the character of the soil on which it grows. On heavy clay or other impermeable

soils the crown of trees, which break the violence of the rainfall, together with a surface mulch of leaves and twigs, prevent the soil from becoming compact and allow it to retain its granular structure, thus making it more permeable to water. On a soil very permeable to water, such as sand, the influence of the forest in decreasing surface run-off may be very insignificant, consisting chiefly in preventing the soil from being washed away.

The depth of soil has a bearing upon the amount of water which it can retain. No matter what its character may be, a thin soil can not retain much water. The forest, however, tends to increase the volume of soil, and thus creates greater reservoirs for water. It does this in two ways: (1) From above, by the addition of leaves and twigs, which, when decayed, become a constituent part of the soil; and (2) from below, by inducing disintegration and decomposition of the underlying rock. The forest, by constantly increasing the depth of the soil, lessens the likelihood of it being washed away and enables it to remain where it was formed. The addition of organic matter to the soil increases its water-holding capacity. The tree roots at the same time enter the narrow fissures of the rock, which they widen, thus producing many new openings into which the water may sink.

During the vegetative season the demand of the forest upon the water stored in the ground is very great. In summer the forest, like other crops, consumes more water than it receives in the form of precipitation. At the end of the vegetative season, therefore, the level of the underground water is low. As a result, the forest soil can absorb large quantities of water during the period of vegetative rest, when there is an excess of water on the ground, either from heavy rains or from the melting of snow. The forest soil, therefore, forms a reservoir whose capacity is greatest when the excess of water on the ground and the danger of floods is greatest. The water stored in the time of rest is used by vegetation and for the flow of streams later on when there is usually a deficiency of precipitation.

FORESTS AND EROSION

THE forest is the most effective agency for protecting the soil from erosion because: (1) the resistance of the soil to erosive action is increased by the roots of the trees which hold the soil firmly in place, and (2) at the same time the erosive force of the run-off is itself reduced because the rate of its flow is checked and its distribution over the surface equalized.

Erosion has a bearing on the height of flood water in the rivers, since the sediment carried by the rivers and the coarser detritus brought down by mountain streams often increase streamflow to such an extent that the height of the water is raised far beyond the point it would reach if it came free from detritus and sediment. When the channel of a stream has become filled with waste material, even a slight rainfall will cause a flood; while if the channel were deep, it would have no perceptible effect upon the height of water in the stream. The filling of mountain streams with waste not only increases the frequency of floods but causes the streams to assume the character of torrents. A channel

filled entirely or partially with foreign material would hold large quantities of water while the denuded slopes deliver the storm water almost as fast as it falls.

Of all vegetable covers forests are most efficient in preventing the slopes from eroding and the beds of streams from filling with silt. Even on very permeable soils where their effect upon the underground seepage of water may be of secondary importance, they are necessary as protection against erosion.

FOREST AND FLOODS

THE observations upon the effect of the individual factors affecting streamflow are also confirmed by records and observations on the behavior of the streams themselves.

The available observations upon the behavior of streams in this country and abroad have established the following facts:

1. The total discharge of large rivers depends upon climate, precipitation, and evaporation. The observed fluctuation in the total amount of water carried by rivers during a long period of years depends upon climatic cycles of wet and dry years.

2. The regularity of flow of rivers and streams throughout the year depends upon the storage capacity of the watershed, which feeds the stored water to the streams during the summer through underground seepage and by springs. In winter the rivers are fed directly by precipitation, which reaches them chiefly as surface run-off.

3. Among the factors, such as climate and character of the soil, which affect the storage capacity of a watershed, and therefore the regularity of streamflow, the forest plays an important part, especially on impermeable soils. The mean low stages as well as the moderately high stages in the rivers depend upon the extent of forest cover on the watersheds. The forest tends to equalize the flow throughout the year by making the low stages higher and the high stages lower.

4. Floods which are produced by exceptional meteorological conditions can not be prevented by forests, but without their mitigating influence the floods are more severe and destructive.

CONCLUSIONS

THE facts brought out in this report clearly show that there is an intimate relation between the forests, the climate, and the regularity of the flow of water in the streams.

What should then be the practical deductions from this established relation? How large should be the forest area in a country so as to prevent any bad effects of the destruction of forests upon climate and the water supply in rivers?

There are no accurate means of determining the extent of forest land necessary for the regulation of streamflow and the protection of the soil against erosion. *From the study of conditions, however, existing in other countries it may be inferred that, in order not to disturb the natural balance, the proportion of forest land to other kinds of land must be not less than from one-fifth to one-third of the total area of the country.*

With the exception of those countries which have naturally a humid climate, like Great Britain or the Netherlands, the countries with a forest area of only 20 per cent or less show usually to a marked degree bad climatic conditions, with prolonged droughts, frosts, and alternating floods and low water, as a result of the reduced forest area. Portugal, with a forest area of only 3½ per cent of the total; Spain, with 16 per cent; Greece, with 13 per cent; Turkey, with less than 20 per cent, and Italy, with 14 per cent, are good examples.

The facts established with regard to the effect of forests in wide plains of continents, especially in the path of moist winds, allow the following practical deductions to be drawn:

1. Forests must be protected not so much in localities which already suffer from lack of moisture as in regions which lie in the path of prevailing winds and are still abundantly supplied both with ground water and precipitation. In the dry regions large bodies of forests may have the opposite effect upon the available water supply. There only forests growing along rivers may contribute to the humidity of the region. There rows of trees or windbreaks surrounding fields and orchards, by preventing the drifting of the snow and decreasing the activity of the wind, will act more as conservers of moisture in the soil than solid bodies of timber. Therefore, the care with which forests should be protected in the eastern half of the United States must increase from north to south and from west to east.

2. In the Atlantic plain and southern Appalachians, which are the gateway for the prevailing winds from the Gulf of Mexico and the Atlantic Ocean, forests must be especially maintained—

(a) On moist soils, provided the excess of water or the substances contained in it do not prevent their development, because the moister the soil on which forests grow the more moisture they evaporate. For this reason swamps, since they contribute less to the moisture contents of the air than crops or forests and lose considerable water by surface run-off, must be drained, as by doing this an increase of the evaporation at the expense of surface run-off may be secured.

(b) On sandy soils. Forests on sandy soils readily absorb water through the roots and evaporate it into the atmosphere. Denuded of forest cover, sandy soils readily absorb rainwater which percolates into the ground and often reaches the sea by underground channels without being returned to the atmosphere.

(c) On steep slopes and rocky places; the removal of forests on such places inevitably leads to an increase in the surface run-off and to a corresponding decrease in local evaporation.

3. If clearing of the forest is a necessity it should be done only under condition that the cleared land is to be devoted to intense cultivation, as, after forests, crops contribute most to the moisture of the air. The highest organic production, therefore, is in harmony with the safeguarding of the humidity in the regions which lie in the path of the prevailing winds. Cleared land that becomes waste or poor pastures or grows up to weak vegetation, means so much evaporation lost to the passing air currents.

DISCUSSION UPON THE REPORT OF THE SUB-COMMITTEE ON FOREST INVESTIGATION

The Chairman: We have heard a very interesting paper and presentation of a point of view which I believe a great many people in this country have not had before. Is there any discussion on this paper?

Mr. Alfred Gaskill, of New Jersey: I confess I cannot find myself in entire agreement with Mr. Zon's position, but I want to say right here that there is a tremendous lot of food for thought in it. If Mr. Zon is right, of course the theory must fit a good many other conditions and that of the interior of this single continent. Perhaps Mr. Zon will be good enough to carry his studies and investigations a little further so that we may see how the application of the theory to other conditions works out. I can see, too, that some of our good friends who have found all sort of comfort in the fixed belief that the presence of forests causes continued rainfall, will be apt to quarrel with the argument. However, I am really not prepared to discuss this question on its merits. I do want, however, to invite the attention of some of the others to this one feature of the broad feature of the questions connected with the problem that we are trying to solve in this country of forests, that is, where forests must be maintained, where they should be maintained and where they may be maintained, because, after all, that is one of the things that we have got to consider. I firmly believe that most of us have turned to the side. This whole section around us has been converted from a primeval forest into something else, and the process is still going on. We are inclined to think that the Lake States are naturally pine forests, and there are lots of people up there who will tell you it is not so. However, I have no further suggestions to offer tonight."

Dr. J. T. Rothrock, of Pennsylvania, also discussed the report.

LUMBERING

By the Sub-Committee on Lumbering.

Chairman, R. C. Bryant, New Haven, Conn.

G. M. Cornwall, Portland, Ore.
J. B. White, Kansas City, Mo.
J. F. Clark, Vancouver, B. C.
C. B. Martin, Aberdeen, Wash.
Adam Trieschmann, Crossett, Ark.
W. R. Brown, Berlin, N. Y.
F. A. Silcox, Missoula, Mont.

Presented by Mr. R. C. Bryant, Tuesday morning, November 18, 1913.

THE OUTLINE

THE topics assigned to this committee by the Forestry Committee of the National Conservation Congress was as follows:

1. The basis of lumber costs and stumpage values.
2. The application of scientific management to lumbering operation.
3. Report on log and lumber measures, with recommendations for standard scales.
4. Forest engineering.

Since data should be collected from many sources before an attempt is made to offer suggestions to lumber operators, a satisfactory report can not be prepared in a single season and in the collection of data on the above subjects, and their preparation for public use it is absolutely imperative that the Committee have the cooperation and assistance of lumbermen. A further essential to success in this work is an appropriation sufficient to enable the Committee to employ a competent field man to personally obtain information from operators, since the results secured through correspondence are almost nil.

The lack of interest displayed by most lumbermen has precluded the preparation of a document of lasting value. Less than 5 per cent of those to whom communications were addressed by the chairman of the subcommittee on lumbering acknowledged their receipt. Mr. C. S. Martin, a member of the committee from the Pacific Coast, was fortunate in securing cooperation with certain operators in his region, and valuable material was collected. I wish especially to commend Mr. Martin's zeal, since most of his work was done under adverse circumstances and when pressed by other business affairs. I further wish to acknowledge the assistance given by Mr. W. R. Brown, whose suggestions, advice, and data have been a great help.

The report is chiefly suggestive and aims to point out the lines along which future work may be conducted to advantage.

Of the subjects allotted to the Committee the second one, namely, the application of scientific management to lumbering operations, appeared to offer the best opportunity in the limited time available, because the problem is vital to lumbermen and it was believed that they would gladly aid in the work of gathering and compiling the data. Since but little assistance was received, however, even this subject is treated only in a general way.

THE APPLICATION OF SCIENTIFIC MANAGEMENT TO LUMBERING OPERATIONS

LUMBERMEN in common with those engaged in the other large industries of the country have been interested, at least to some extent, in the discussions regarding scientific management which have occupied a prominent place in the public mind during the last few years.

The most successful application of the general principles as laid down by Taylor, Gannt, Emerson, and other exponents of this idea have been in industrial plants, such as railroad shops, steel mills, shoe factories, and like institutions, where the workmen are housed in buildings and therefore not exposed to the elements and where an individual is called upon to perform given routine work many times during the day. The work is usually specialized, sometimes to a high degree, and of such character that it lends itself more or less readily to systematic methods.

While some attempts have been made to inaugurate systems of so-called scientific management, based on time studies and similar lines of investigation in woods operations and in lumber manufacturing plants, there is no evidence that, as a whole, the systems patterned after those in vogue in railroad shops and like plants have proven successful. The reasons this is true are several, among which the following are worth mentioning: The studies and recommendations have come, to a large extent, from investigators unfamiliar with logging and lumber manufacture, who have not understood the fine points in regard to forest and mill labor which must be considered and who also have not been well informed on the details of logging and manufacturing work. Their recommendations therefore have been of an experimental nature and, so far as learned, have seldom proved as acceptable as the practice originally employed by the operator. There are cases where individual parts of the operation have been improved, but these have been chiefly concerned with the sales end of the business, or the systematizing of labor employment and similar features, which bear a fairly close relation to similar problems in many other industries. A further reason why the application of present methods does not seem feasible to woods work is the fact that every tree presents a new problem to the logger, because of the variation in size, the location of the tree with reference to topography, transportation, manufacturing plant, etc.

Since the labor is rather unstable and it is often necessary to shift men repeatedly from one operation to another, the lumber industry can not be compared to the average industrial plant, where the work is performed for long periods under similar conditions. The placing of felling, skidding, hauling, and railroading timber on a piecework basis or the establishment of a standard day's work is difficult because of the many and constantly varying factors which enter into each.

The most satisfactory results in increasing the efficiency of the various parts of lumber operations have come from suggestions made by men who are now actively engaged in logging and manufacturing work, and in most cases the improved methods have been applied to individual parts rather than to the entire operation.

It has not been possible to inquire into many of the present schemes for more effective management in force among lumbermen. The investigation, however, as far as conducted, has shown that there are many excellent ideas in use, about which the industry in general should be informed. It is hoped that in the near future some organization may undertake the work of compiling such data and formulating general principles for the benefit of the industry at large.

Since operators are engrossed in their own business cares and seldom find the opportunity and inclination to write at length concerning their methods, the investigation of the subject of efficiency can not be carried on by correspondence. Further, some are indifferent to a discussion of successful schemes devised by them and the dissemination of their schemes among the trade at large, since they feel that to a certain extent, at least, these are trade secrets, which they do not care to disclose to their competitors. On the other hand, a personal interview with operators would often lead to the development of a broader interest in the work and the proffer of valuable information which otherwise would not be disclosed.

The Sub-committee on Lumbering has been handicapped by the necessity of carrying on its investigation through correspondence, and the results secured have fully sustained the early conviction of the futility of such work.

In order to provide a foundation on which to prepare a report and also to secure uniformity in the subjects on which an attempt was being made to collect data, questions were prepared and sent to a selected list of operators. The inquiry covered a broad field, but it was not expected that any one operator would answer all of the inquiries. It was thought that each would select those subjects in which he was most interested and reply to them. The lists sent out differed somewhat in order to more nearly conform to the conditions in the different regions.

In the following brief report on methods used in the lumber industry the field open for investigation has scarcely been touched, and such meagre data as is here presented represents only facts furnished by a very limited number of operators and by certain members of the committee. The possibilities of acquiring a mass of very valuable data are great, provided time and money are available for the investigation and provided the cooperation of lumbermen can be secured.

There are now two agencies in this country which are doing much to bring about greater efficiency in lumber operations, namely, the Pacific Coast Logging Congress and the Southern Logging Association. The former organization during the four or more years of its existence has made great strides in improving the methods used in the Northwest and in educating loggers to a higher standard of work. A brier résumé of the conditions in the Northwest prepared by C. S. Martin, a member of this Committee, is appended to this report.

METHODS OF OPERATION

Planning the Operation.—One of the weak points in many lumber operations is the lack of proper data regarding the "logging chance," previous to the actual logging and manufacturing work, especially the former.

All operations of large size have been cruised in some manner previous to

logging, and usually some form of report is made and a map of some character submitted. In many instances these cruises were made at the time of purchase and have not been checked since then.

The reports prepared by the cruisers were usually conservative as to the stand of timber, and the maps were little more than sketches showing the approximate location of the main streams, dividing ridges, and other important topographic features. Boundary surveys may or may not have been made, according to the need for them. Crude data of the above character seems to have been sufficient for the loggers in many parts of the southern and eastern section of the United States. In the South the practice in preliminary examination has, in most instances, not advanced greatly during the last two decades. The practice still prevails of allowing certain woods employes to carry valuable information regarding the timberlands in their heads, instead of having it on paper in the office.

On the Pacific Coast, where the timber is large, the topography rugged, and the logging is often difficult, the logger has often been forced to more exact methods, and it is in this section that, as a rule, we find the work of planning the logging operation is best developed. Even here, however, as pointed out in Martin's report, there are still many who cling to rough methods.

There are several factors which would tend to increase efficiency in logging operations which come under the head of "Planning the Operation." The broad outlines of the work only are stated, since the details and methods would vary with every operation. The preparation of maps, preferably topographic, on which are shown the holdings of the company or individual; the distribution of the stands of timber, both by species and quantity; location of streams, ridges, roads, trails, tentative camp sites, and other similar works; location of main logging roads and dams, and the division of the area into logging units, etc., is essential.

The field work necessary to secure data to prepare the map and the degree of accuracy required will be governed by the character of the country and the purpose for which the map is to be used. Where the topographic map is to be used as a basis for road or railroad location and the estimation of costs of logging, the field work should be accurately done, especially in a rough region. In the flat pineries of the South, however, less accurate field work for topographic mapping is permissible.

Clark, a member of the committee, states that "in general there has been very little intelligent planning in advance of logging on the British Columbia coast. This has been due to the fact that most of the logging, up to the present, has been confined to areas immediately adjacent to tidewater, and 'rule-of-thumb' methods were practicable, and the need of more careful planning was not evident to the average logger. Within the last few years some larger operations, involving the building of railroad, have been opened, but in most cases the planning of the road location has been in the hands of a civil engineer, who had little knowledge of what the road was expected to perform."

Cruising Reports.—Accompanying the topographic map there should be a report containing an estimate and classification of the timber on the area, provided

this data is not already available. The estimate should be by species, preferably for small units—for instance, by "forties" or even some smaller division. In the Northwest the units are sometimes as small as ten acres. Embodied in this report should be data on soil, bottom, undergrowth, and general topography and, if water transport is to be used, a statement in regard to the driving possibilities of the various streams traversing the tract.

It is very desirable at some period prior to commencing operations that data should be collected and placed in the hands of the manager, covering the "logging chance" in various parts of the tract; the proposed division of the area into logging units; the character of the improvements required; the outlet for the timber, and the best method of logging to pursue. The latter is of great importance, especially in a new region. Foremen, to a large extent, are responsible for the details of the logging methods, although their knowledge is often limited to the practice in a restricted region. There is no single method that is best for all conditions in a given section. On single operations it may often be profitable to employ various methods, especially where a variety of conditions exist. While experience may be a good teacher, it is often cheaper to profit by the experience of others, especially in logging work. For this reason it is very desirable that the management have at hand complete data on the problems to be met in order that suitable provision may be made for solving them. The manager by the aid of the maps and the suggested data can gain a comprehensive idea of the problems surrounding the harvesting of timber, the mileage of sled, wagon, or railroad that must be built, and the area that must be cut over to secure a given annual output, etc. In other words, he has in writing and on maps what many lumbermen permit their woodmen to carry in their heads—data which is usually lost if the company is deprived of the services of such men.

The exact form in which these reports should be submitted is open to argument, since there are many different opinions on the subject. It is thought best to leave the details of method to be worked out by each company in accordance with the particular conditions it has to meet.

Records.—Loggers, as a rule, do not regard the preparation of records regarding their work of great value, except in the case of operating costs—a record of money spent. Records of this character are of value in comparing the costs incurred from year to year, but they are of comparatively little value in determining whether the actual costs are greater than they should be, except when greatly in excess of those incurred for similar work during some previous year.

One operator, who for years has been developing his method of keeping records, bases his system on three lines of thought, namely:

1. Planning the work.—The Budget.
2. Recording the results of work performed.—Accounting.
3. The compilation of the data and experience gained in carrying out the work. This provides a basis on which new methods and principles may be founded.

The object of the budget is to reduce loose plans and crude guesses to a scientific basis and to eliminate as nearly as possible the element of chance. Bud-

gets have been long in vogue with the foresters of Europe, and it is surprising that so few lumbermen in this country have adopted this means of promoting greater efficiency in their business.

The value of the budget lies in its anticipation of future demands for cash to carry on the business. In addition, it posts the operator on the period when these funds will be needed, and he is thus enabled to secure financial loans to better advantage, to buy supplies in the most favorable markets, and to secure labor when required because of the knowledge possessed some months in advance of the needs of the business.

The budget is in reality a statement of the work to be performed during a given period, preferably a logging season in the North or twelve months in the South, and the supplies, equipment, and funds necessary to carry out the projected program.

The budget is usually composed of various units prepared by the foremen and others in charge of woods work. These units are compiled in the main office for the information of the General Manager, the purchasing department, and any others directly concerned. The budget in detail should show when and where any work is to be performed, the number of men and animals required, the amount and character of supplies needed, and the estimated cost of each item.

A budget is a potent factor in reducing costs of operation, because a foreman in estimating on a given piece of work will be apt to place it as low as is consistent with good work, and once he has committed himself he will be diligent in attempting to maintain his reputation by not exceeding the estimate. In case the demands for equipment, supplies and labor, or other costs exceed those given in the budget the foreman can be called upon for an explanation of the discrepancy. A comparison between the budget estimate and the actual cost of performing work furnishes a basis for determining what figures in the cost sheet are in excess of those which would be incurred under efficient management, thereby eliminating a factor of uncertainty which many operations now possess.

The use of a budget not only brings economy in the purchase of supplies and equipment, but also leads to greater efficiency in the actual performance of logging work. It is regarded as an absolute essential where a forest is placed under proper management.

Accounting.—An essential feature of the records of every lumber operation is the collection and tabulation of data on costs and methods of work actually performed.

Cost figures are vital to the conduct of any lumber operation, no matter how limited the output; hence this branch of records is kept in some form or other. There is a wide discrepancy in the accounting methods, due both to the peculiarities of individual operations and often to a lack of understanding of the principles underlying proper accounting. Many of the larger operators have cost-keeping systems which are based on sound accounting principles, but these are in the minority.

There is such a wide divergence in the methods employed and in the items which enter into the cost-keeping sheets and in the handling of depreciation and

like charges that operators from the same region are frequently unable to discuss intelligently their cost of production, especially the details. It is believed that a profitable field of endeavor would be the investigation of the basic principles which underlie costs and cost-keeping and the preparation of a uniform cost sheet, which would be a model on which operators could base the main items of their cost sheet. A uniform system of this character is essential to any organization, such as the Federal Forest Service, which is continually called upon to appraise stumpage, and in time would be of added value to private parties in determining the value of stumpage which they may desire to sell or purchase. Equitable values can not be established if the costs of operation used in fixing values for each sale of timber are based on costs which are compiled in different ways.

In connection with the uniform cost sheet blank forms for report on the various phases of the work should be prepared. On these are recorded data which is combined ultimately in the cost sheet itself.

It is realized that a detailed set of forms would not be applicable to all operations because of individual differences in conducting the business, but it is desirable that the main points should be embodied in a set of forms for general conditions, leaving the addition of details to the individual operator. It is believed in this way that order can be brought out of chaos for many operators and lasting good would result. The adoption of proper accounting methods means greater efficiency and usually increased economy, since the operator knows the exact condition of his business.

The number of excellent ideas on cost-keeping in use by lumbermen, if compiled and systematized, would prove invaluable to the industry. The committee now has no definite recommendations to make in regard to a uniform cost-keeping method and the forms on which the data should be collected, but the necessity for the preparation of the same is well appreciated.

The Compilation and Comparison of the Experience and Data Gained in Carrying on the Work.—So far as can be learned there are few operators who keep careful written records of the achievements of past years, and study them to weed out weak points in their management and methods of operation. The most that is done is to ponder over the general experience of the past and in a rather unsystematic manner attempt to increase the efficiency of the work. The actual situation may thus be imperfectly understood owing to the absence of carefully prepared data. Striking examples of inefficiency may be detected and eliminated but it is certain that many minor items escape notice. It is often the sum total of the lesser evils that determine whether the operator's balance sheet shows a profit or a loss.

CAMPS

THE location and arrangement of camps and camp buildings have, as a rule, received careful attention, although there is a marked variation in the kind of buildings used. There are specific cases in every region where there is room for a marked improvement in the character of the living quarters of the men and in camp hygiene and sanitation.

The open-air life led by the men and the season of the year in which the logging work in the North is carried on, has, to a large extent, been responsible for the comparative freedom from camp epidemics in this region. In the South and West where operations are conducted throughout the year, the danger is much greater. The need for a strict enforcement of hygienic regulation and sanitary measures is not always appreciated or needed.

The best class of workmen can not be kept in an unclean camp, and further there is constant danger of a serious disturbance of the work through sickness. Some of the progressive loggers of the Pacific Northwest have been the leaders in the construction of model camps containing baths, steam heat, individual beds, private lockers for clothing, running water, and like accommodations. These comforts, while more costly than the old-style method of caring for workmen, are said to be well worth the money expended on them, since better workmen can be secured and they stay longer, and are more contented than under the old conditions. Efficiency can not be secured from dissatisfied men, neither can the best work be done where the personnel of the crew is constantly changing.

Sanitation in southern logging camps, especially in the yellow pine region, is usually bad, due to the climate and the character of the workmen. The camps are composed of portable houses which accommodate the loggers and their families, who are usually extremely ignorant of the most elementary principles of hygiene and sanitation, and who resent any attempts to enforce safe rules. Loggers come largely from rural communities in which the evil effects of their ignorance are not so apparent or destructive, but when several hundred are grouped in a logging camp the greatest care must be exercised to keep them from suffering from their own ignorance.

There should be fly-tight latrines provided for every two dwellings and these should be thoroughly cleaned weekly and the use of lime encouraged. An excellent practice followed by one southern logger is the placement of heavy garbage cans at frequent intervals throughout the camp and the requirement made that all kitchen refuse must be placed in them. Tin cans and like rubbish are placed in special receptacles. All camp waste is removed at least weekly, and, if necessary, semi-weekly.

The camp water supply should be hauled in, or deep-driven wells dug, since shallow wells are almost certain to be contaminated by camp sewage.

Clean and sanitary camps can not be maintained, however, without the cooperation of the people living in them. One southern operator has made good progress in this work by means of talks illustrated with lantern slides. These talks are on subjects of general interest, in order to hold the attention of the audience, and occasional slides are shown illustrating the more common principles of sanitation, and pointing out the evil effects resulting from unclean surroundings; the means by which flies contaminate food supplies; the preventive measures practicable, etc.

A serious drawback to the arrangement of some southern camps is the location of the stables with reference to the dwellings. A stable in the vicinity of a camp, especially during the summer season, is a prolific source of flies and

there is great danger of food contamination. It is also unpleasant when the wind blows from the stables toward the camp dwellings.

The practice of building board barns and establishing a permanent camp for several years does not appear as efficient as either moving at frequent intervals and thus keeping camp near the work, or moving the stables at frequent intervals to the vicinity of the logging work. The latter practice is possible if portable barns are used.

There are many advantages from the standpoint of efficiency in keeping the animals near the actual logging work. A minimum of time is consumed in traveling to and from the stable; the energy of the animal is not taxed in going and returning from work, and the stables and corral grounds do not become foul in wet weather as they often do where the barns and lots are more permanent.

Where car barns are used the barn men live in the vicinity of the stable, while the workmen are hauled back and forth from camp on a log train. At one camp, the blacksmith shop has been mounted on car tracks and forms a part of the general barn equipment.

The problem of housing employees on the coast does not always present the same kind of difficulties that are found in the South, since it is less common to find families residing in the logging camps. The water supply available from streams is usually more pure and there is a better chance to secure drainage from the camps without contaminating the water supply. Nevertheless, it is essential to enforce rigid sanitary rules in order to preserve the health of the men.

It is believed that in every section of the country loggers would profit by a study of the hygienic and sanitary features best adapted to logging camps, and that the adoption of up-to-date methods would increase the efficiency and well-being of the laborers.

Boarding Department.—In every section of the country loggers, as a rule, now provide excellent food for their workmen, since otherwise laborers can not be secured or retained.

When workmen provide their own board, as in many southern camps, there are numerous instances where the men are not properly nourished, due to an inadequate knowledge of food values and methods of preparing food. The food stuffs purchased are often of excellent quality, but are ruined in the preparation. Man, as well as beast, needs a balanced ration, and woods workers in a warm climate who are fed an excess of fats and half-baked biscuits, can never perform as much work as if they had well nourished bodies. One step forward in efficiency can be made by the introduction of cooking lessons in camps and the training of the female members of the community in the preparation of more nourishing and muscle-building food. This method has been tried in certain camps in the South with success.

In camps where board is provided by the operator there are certain economies which can be effected. While the same cook may be employed for a period of several years in one camp or under a given foreman, it is more com-

mon for cooks to move at occasional intervals, especially at the end of the season. Each cook brings some new ideas in regard to cooking and the kind of food supplies that are most suitable to serve. The culinary art as practised by most camp cooks is not an exact science. So far as known there has never been but one attempt on the part of a logger in this country to place his camp kitchen on a scientific basis. He is doing this by preparing a camp cook book. The idea is to find out what are the most nourishing, palatable and economical foods to feed woods workers; the best form into which they can be put for consumption, such as cakes, pies, bread, biscuits, cookies, meats, soups, tea, coffee, etc., and the exact quantities of each ingredient that should enter into the preparation of a given dish. This will eliminate the dozen and one methods of preparing certain food stuffs, do away with unnecessary waste and furnish an excellent basis for calculating the amount of supplies required for feeding a given number of men. The preparation of such a book should prove a profitable field of work for every logger who has to provide food for large numbers of men.

LOGGING

THE data which was secured from lumbermen on logging was so limited that only a few suggestions in regard to logging work will be made.

Improved Felling and Log-making Methods.—Men are employed for this work either by the day, the month or by contract. The prevailing opinion among those who expressed themselves has been in favor of day work, rather than contract. There are many factors, other than the amount of work actually performed in felling and log-making, which enter into the determination of the value of a given crews' work. For instance, crews working on a contract basis, will, naturally, have output as their main object, and, in their efforts at speed, will sometimes damage timber in felling which is several times the value of the remuneration received for the day's work. The damage consists in breakage in felling timber; in cutting logs too long or too short; in leaving merchantable timber in the bole, and in cutting the bole without proper regard to securing quality as well as quantity. Further, the contract system, in some cases, has led to collusion between the timber cutters and scalers. It is possible in combination with the day wage that some bonus system can be devised which will reduce the loss to the lowest possible limit.

Suggested improvements in the usual methods of cutting southern yellow pine are contained in Bulletin No. 2, Part II, Prolonging the Cut of Southern Pine, published by the Yale Forest School, 1913.

Improved Skidding and Yarding Methods.—The logging problems in the northeast, the south and the northwest differ markedly in character, and in each region the mehods have been specialized to meet local conditions.

Northeast.

In the Northeast "snow logging" predominates—that is, the logs are cut during the late summer, the fall and early winter, skidded to sled roads, hauled

on sleds during the winter to some stream or body of water, down which they are driven to market during the freshets of spring and early summer. The timber is comparatively small in size, the stand per acre is low and the logs customarily cut are of such size and weight that they can be brought from the stump to the stream by animal power. Logging railroads have not found much favor because of the light stands of timber, the rugged topography and the great network of driveable streams in the region.

Power logging which is usually associated with railroad operations has, therefore, found little favor in the region and has been confined to tracts which could not be logged profitably by horses.

The methods of animal logging do not differ radically from those in vogue during the last twenty years, the changes made consisting of improvements in existing equipment and methods rather than in the adoption of new ones. The most radical change in the method of hauling has been the introduction of steam log haulers, which in cases of hauls exceeding five miles have proved more advantageous than animal power, provided the amount of timber to be moved is four million feet or more. However, the use of steam log haulers is restricted even under the above conditions.

The only new tool reported in this region is a feller's axe which is a combination axe and hammer, designed to obviate the necessity of the felling crew carrying a sledge for driving wedges. The poll of the axe is drawn out in the shape of a hammer, the walls of the eye being made heavier than in the standard pattern.

An improved form of tug boat for towing logs on lakes and other large bodies of water is reported by the inventor, a large operator in New Hampshire.

South.

Timber in the southern pine region is chiefly brought to the mills or market by railroads, because the country is adapted to cheap railroad construction; the snowfall is insufficient to make snow logging possible; there is a scarcity of driveable streams on which to float timber, and the weight of the timber is so great that the loss in floating often ranges from 25 to 35 per cent.

Climatic conditions permit the conduct of operations throughout the year, except for short periods when work in the swamps and lowlands is interrupted by floods or wet bottoms. Animal and power logging are both used extensively in the region although the field to which each is adapted is fairly well marked.

As a rule, animal logging is more profitable in the stands running 8,000 board feet or less per acre; in rolling or rough country, and in small timber. Power logging is most successful in the flat longleaf pineries in the southern limits of the territory.

The general procedure in animal logging is to construct a main line logging railroad through the tract to be logged, securing the most favorable grades possible, in combination with tapping the greatest amount of timber. From this main line roughly constructed spurs tap the main body of the timber.

Horses, mules and oxen may be employed for draught purposes. Each has its advantages. For instance, horses are better in boggy ground than mules, since the feet of the latter are small and mire readily. Horses suffer with the heat more than a mule, and will not stand as much abuse. The latter is an important item when inefficient labor must be employed. On the whole, mules are the more satisfactory animal. Oxen are regarded as too slow for modern logging operations where the conditions are favorable for horses or mules. Loggers, however, often keep one or more yoke for handling heavy logs and for getting timber out of difficult places. They cost much less than horses or mules and save expensive horse flesh in difficult places.

The logs are brought to the spur or main line in several ways. For distances of 200 feet or less it is common to drag the logs with a team; for distances of from 200 to 500 feet the logs are loaded on low wheeled log carts, called bummers, or else dragged between a pair of high wheels, rigged as a logging cart; for distances greater than 500 feet the logs are either loaded on a four, six, or eight-wheeled wagon or on a high-wheeled cart. There are variations of distances and the methods of handling logs for the longer hauls, but the procedure given is fairly common and is regarded by many as good general practice. The logs that are dragged, or hauled on bummers and carts, are not decked up in piles along the railroad, but are placed in rows parallel to the track where they can be reached readily by the loading crew.

Logs hauled on wagons are often placed in piles two or three logs high since it economizes space and does not require any additional time for decking.

In certain parts of the southern pine belt, especially in Arkansas, it has been found practicable during the rainy season, when the bottom is very soft and the number of logs that can be handled by animals is small, to supplement animal by power logging, using for this purpose a steam log loader. While these machines are not adapted for the heavy work imposed upon them, they can deliver about thirty-five thousand board feet of logs, daily, along the track and often enable lumber manufacture to continue when it would be impossible for animals to skid sufficient logs.

The practice of logging both by company teams and by contract prevails, some operators furnishing the equipment and hiring laborers to perform the work, while others do all the work by contract. In some cases the equipment and animals are provided. Some operations are conducted exclusively on one or the other bases, while many companies operate under both methods, usually contracting the more difficult work.

It is usually regarded as desirable for the lumber company to own at least a limited amount of equipment and some animals, since it can then determine the actual costs of performing certain classes of work. This provides a basis for determining contract prices and further it prevents the lumber company from being held up by unscrupulous contractors in case a demand is made for exorbitant price.

A practice followed by some loggers who have sufficient railroad steel to permit them to keep spurs down for a period of from three to four months

is to place the spurs from 1,200 to 1,400 feet apart. The back end of the strip tributary to a given spur is logged during the winter when the bottom is solid and the timber for a distance of from 300 to 350 feet back of the track is left until the rainy season in the spring. It is then possible to secure this timber readily. If all of the timber tributary to the spur was removed during the wet season the ground along the track would become so boggy that it would be impossible to work animals.

The chief method of power logging used in this region and the one best adapted to the general conditions is a ground system, known as the snaking system. Four line machines are the more common. Overhead skidders are not adapted for handling yellow pine timber, because of their limited daily capacity in stands of from six to ten thousand board feet.

Where the snaking system is used a method followed to advantage is to log the section between the track and the back side of the strip in three units. The timber on the back third of the strip is felled and logged, then the middle third is felled and logged and finally the remaining one near the track. This insures a clean bottom between the machine and the strip being logged, and does away with the annoyance from brush and abandoned logs through which all timber would have to be pulled if the entire width of the strip were felled and logged at one time.

As a general rule, the practice in this region is to have from four to six weeks' supply of logs cut ahead of the skidding teams during the fall and winter months and to reduce this to a ten-day or two weeks supply during the summer season. The latter practice is necessary because the sap wood of pine logs which remain in the woods during the summer for a few weeks is attacked by insects.

Railroad location.—Except in the rough portions of the region, railroad location does not demand a high degree of skill. A common practice is to employ an engineer to locate the main line, while the spur location is chiefly done by the logging superintendent of the company. The transit is used for main line work, while a box compass is usually ample for the spurs.

The general principle of main line location is to follow the lower levels of the tract, especially in the rougher regions in order that there will be a down-grade haul for the mill-bound trains. Location on the lower levels also provides a down-grade haul for most of the timber on the tract. When animals are used to bring the logs from the stump to the railroad it is essential that the spurs shall also be located so that a down-hill pull will be afforded the animals.

Location is also influenced by the method used for loading logs on cars. When animal power is used for this purpose the road should be at the lowest level on which logs are to be decked, since there is too much power required to elevate logs from levels below the roadbed. Further it is not practicable to load logs from the bank of a small stream, on the side opposite the railroad. Provision must also be made for a clear space of at least forty feet on the side of the track opposite the skidway in order that the loading teamster may have a sufficient space in which to maneuver his team. This may require the location of the road in the stream bed or on the edge of the bank.

Where power logging is used the spurs may be located on the higher levels, since logs can be pulled up hill as readily as down; the cables foul less, because on down-hill pulls the logs are apt to run and catch against logs, stumps and other obstructions, and further a better bottom can also usually be secured for the railroad track.

In animal logging the spurs are located at distances of from 1,200 feet to one-half mile apart. The latter is regarded as the maximum for efficient work, except for small isolated tracts to which the logger is not warranted in constructing a railroad.

Spurs for logging with power should be located approximately parallel to each other, when topography permits, and the distance between them should not exceed 1,800 or 2,000 feet, since a distance of from 800 to 1,000 feet is the maximum efficient working radius.

Railroad construction.—The clearing of main-line logging railroad rights-of-way is usually done by contract on the acre basis, sometimes with an additional payment for merchantable timber which is felled and cut into logs. Rights-of-way for spurs are frequently cut by day labor although contract work is also common.

In some sections it is the practice to cut the right-of-way and build the grade some months or even a year in advance of logging in order to give the roadbed a chance to settle before the steel is laid. Other reasons also may influence the early construction of the grade.

Where the timber cut from the roadbed can not be brought to the mill, because of absence of transportation facilities, before the summer season commences the logs become badly infested with insects which render the sapwood of little value. This loss can be largely, if not entirely, eliminated by peeling the logs about March 1. The insects which do the most damage will not work in peeled timber. Peeling may be done with an ax and a bark peeling spud; a stiff-bladed shovel works well if the bark has loosened slightly. The estimated cost per thousand board feet for peeling does not exceed 75 cents, and the value of timber is increased several dollars per thousand over what it would be worth if left unpeeled. The logs if left throughout the summer may become somewhat checked on the exterior but the loss will be far less than where insects attack them.

The grades for main line logging railroads are usually constructed by contractors using drag scrapers and other simple equipment.

A log loader converted into a steam shovel is sometimes used in making heavy cuts. Equipment of this character is usually provided by the operator.

A lumberman in Mississippi uses dynamite for making shallow cuts in gumbo soil. The cost is said to be 50 per cent less than when the earth is handled with drag scrapers.

As a rule, the steel is laid by hand labor. Both contract and day labor prevail. Within recent years two forms of track laying machines have been devised which, however, have not been widely introduced.

One type adapted for conditions where there are a minimum of curves on

the spurs, consists of a hoisting engine mounted on trucks and equipped with a long boom. The machine is mounted on one of the flat cars composing the construction train. The rails and ties are handled in panels thirty feet long, which are elevated by the hoisting engine, placed on flat cars and relaid at some other point without removing spikes or ties. This system is not satisfactory where there are many curves, since the panel must be broken up before re-laying at such points.

The second system consists of a specially constructed car on which is placed an engine for operating cables, a conveyor for handling crossties, and two trolley systems, one on each side of the car handling rails, which are also stored on the car floor.

The track is broken up when moved and rails and ties handled separately. The track can be laid on curves to much better advantage with this machine than with the first one mentioned. Neither of the above methods have come into extensive use.

Improved tools and machinery.—So far as known there have not been any recent market changes and improvements made in tools and machinery.

Accounting for tools and equipment.—There are several methods in vogue for accounting for tools and equipment which are used by loggers. As a rule, the systems used are inadequate and there is an undue loss where the logger furnishes tools, especially for felling and log-making. Among the practices in vogue may be mentioned the following:

1. The distribution of tools without responsibility on the part of the workmen, the foreman of the crew being called upon to see that tools are not lost or damaged. This system is regarded as inefficient, since the loss of tools from breakage, theft and like causes is great.

2. The placement of responsibility for return of the tools on the workman to whom they are issued. He is charged with such tools as he needs and unless returned either entire or broken, the value is deducted from his wages. This system protects the logger from loss and renders the workmen more diligent in caring for their equipment. It relieves the foreman of work which would detract from his efficiency in other lines.

3. Where contract work is done, the contractor furnishing the tools as part of the price paid. This system relieves the company from any possibility of loss. The contract price is often somewhat higher to care for this risk on the part of the contractor. A drawback to this method might be the unsatisfactory character of the tools supplied by the contractor and an insufficient supply when extra crews are needed on short notice. These contingencies should be provided for in the contract.

Pacific Northwest

The general problems of this region are well treated in Martin's report, which is appended.

Labor

Methods of employment.—There is wide variation in the methods employed to secure laborers for lumbering work, especially logging.

Some rely upon general employment agencies to provide such men as are needed; others maintain an agency of their own for this purpose; while others hire men at the main office or at the logging camp. The methods used vary with the amount of labor required, the abundance of laborers, and the character of general organization maintained by the company.

One of the largest employers of woods and sawmill labor in the South some time ago established an employment agency on lines somewhat different than has been the usual practice in the lumber industry.

The demand for labor both in the woods and at the mill were constant, and it was necessary to be on the continual lookout for workmen. The plan in vogue for some time was for each foreman to employ such workmen as were required in his department, and when new workmen made application at the office for work they were referred to such foremen as were in need of additional men. The man was assigned to some task and if he did not prove adapted to it or in some way won the ill will of the boss, he was discharged and seldom could get work from foremen on other parts of the plant, even though there might be a scarcity of men. The company found it difficult to keep its force up to the proper strength by this method and devised a plan somewhat as follows:

A central employment bureau was established under the supervision of the main office, which, as necessity demanded, secured new workmen, making a careful study of the character of work for which each new workman was particularly adapted. A foreman needing workmen now applies to the bureau stating the number wanted, and the duties they are to perform. The bureau then turns over to the foreman the available men best fitted for the particular kind of work they are to perform. In case the men do not prove satisfactory or for any reason they are not needed, the foreman turns them back to the employment bureau with a statement of his reasons for so doing. In the light of the new knowledge gained, the bureau again assigns such men to some other line of work, each man being thoroughly tried out before he is discharged permanently. The old method often was the means of attempting to fit a square peg in a round hole, while the new method has the virtue of giving a man a thorough test before he is pronounced incompetent. This is especially essential where labor is scarce and the demand of the company is constant.

While it would manifestly be impossible to conduct such a department at a medium-sized plant, yet it is believed that the principle underlying the management of the bureau is in line with economy and should be attempted at every plant.

Special methods to secure cooperation among employers and employes.—There are numerous schemes in practice in the lumber industry looking toward the closer cooperation of employer and employe. They may take the form of the payment of a bonus or reward for good work; the provision of attractive homes and surroundings for the workmen and a general application of the

"Golden Rule;" or an opportunity to invest savings either in investment companies, building and loan associations, or some similar organizations.

The promotion of Social Welfare work, which has for its object the betterment of the social life of the community, is a comparatively new departure in the lumber industry, but one that is being received very favorably.

Since labor problems have such a strong bearing on efficiency in every form, a few of the methods used to increase it are here touched upon.

Piece-work Basis of Payment

A large cypress mill in Louisiana has had in operation during the last five or six years a system of the above character which has probably been developed to as great an extent as at any logging operation in the South, if not in the United States.

The following lines of work are those to which the piece-work method of payment applies.

Logging department—

1. Girdling trees.
2. Felling and log-making.
3. Skidding logs from stump to car.

Saw-mill—

4. Sawyers, edgermen, trimmermen.
5. Foremen.

Sundries—

6. Piling lumber.
7. Shipping lumber.

In explanation of the manner of conducting the work is the following:

1. All cypress trees are girdled several months in advance of the cutting. The usual price for this work is 8 cents per tree, although the price varies somewhat from time to time, depending on the labor market and the size of timber.

2. The average price paid for felling and log-making for logs averaging 16 feet in length is 40 cents per tree. This price varies with the size of timber and the labor conditions.

3. Overhead cableway skidders are used to bring logs from the stump to the logging railroad and to load them on cars. Each skidder uses a crew of seventeen men, each of whom is paid a certain number of cents (as per following schedule) for each full carload of logs received in good condition at the log pond from the machine that they are operating. If logs are lost off the cars enroute to the mill or for any reason the cars are only partially loaded on arrival at the log pond, the skidder men do not receive any pay for them.

	Rates paid to skidder for each full carload of logs delivered at mill pond.
Engineers	14.35
Levermen	9.37
Loaders	8.61
Riggers	11.96
Tong hookers	10.04
Firemen	7.17
Second riggers	7.17
Riggers' helper	7.17
Trailers	7.17
Slack pullers	7.17

4. One sawyer, one edgermen and two men at the trimmer constitute a crew and are paid on a piece-work basis, the lumber of that side of the mill being tallied and inspected separate from the remainder of the cut. The men are paid a certain number of cents per thousand feet (see following schedules) for all lumber which their side of the mill has manufactured during the day. A heavy premium is placed on the best grades in order to get quality as well as quantity.

RATES PAID PER THOUSAND BOARD FEET[1]

Grades	*Sawyers* cents	*Edgermen* cents	*Trimmermen* cents
Clear	25.29	13.90	7.90
B and better strips	22.96	12.62	7.17
Select	20.66	11.36	6.45
C strips	11.48	6.31	3.59
No. 1 shop	5.78	3.18	1.81
No. 1 common and D strips	3.47	1.91	1.09
Remanufactured strips	3.40	1.87	1.06
No. 2 shop	0.00	0.00	0.00
Rip and cut	2.29	1.25	0.71
Rail stuff	2.26	1.23	0.71
No. 2 common and strips	0.00	0.00	0.00
Thin	0.00	0.00	0.00
Peck and strips	0.00	0.00	0.00
Bay poplar	11.48	6.31	3.59

5. In order to check sawyers from cutting uppers from the outside of poor logs and sending the remainder to the shingle mill, the company has orders that every log must be sawed into lumber that is suitable for that purpose. In order to enforce this rule and to secure adequate supervision, the foreman of the mill is paid on the basis of the mill cut, without reference to grades. When the mill is shut down for an hour or more, or when closed for annual repairs, the foreman is paid on an hour basis, a reduction of about one-third over what he earns when the mill is running. He is diligent, therefore, in seeing that the plant is kept up to an efficient standard, and also that a minimum of time is spent in making such repairs as are necessary.

6. All lumber piled in the yard is paid for by the truck load and not by the

[1] No extra time is allowed for changing saws.

thousand board feet. The manner of regulating the amount of each truckload and the sum paid for piling work is not known.

7. Lumber loaded on cars for shipment is paid by the thousand board feet loaded. The practice at this plant is to tally the lumber as it is loaded. The inspector provides his own labor, but their time is kept by the company, and they are also paid by the company from the amount due the inspector. The difference between the agreed price for loading and the wage of the laborers constitutes the inspector's remuneration.

The results of the piecework system used by this company, after a trial of five or six years, have been an increase in the earning power of the men and a decrease in the operating costs.

The company has stated that it believes that men on piecework accomplish about 20 per cent more work than they did under a day-wage system, not so much because of added labor performed, but because of the greater intelligence used in devising easier and quicker methods of doing the work.

An example of the changed attitude the piecework system has brought about in the average laborer is well illustrated with the skidding crew. Loggers working on a day-wage basis often welcome breakdowns in machinery, which temporarily arrest work and give them an opportunity to remain idle for a time at the expense of the operator. Under the piecework system every minute of time lost means a decrease in the daily earnings of the workmen. It has been found that every workman on the skidding crew is on the alert to see that extra skiddings tongs, cable, and other supplies are close at hand, so that quick repairs can be made and lost time reduced to a minimum.

The scheme has led mill employes to a careful study of grading rules, with a resulting increase in the percentage of the better grades manufactured. Further, since the introduction of the piecework basis labor has been more contented, more efficient and stable, and labor troubles have been almost negligible.

This plan of operation may not prove feasible for many plants, especially where there are a variety of species manufactured and the number of grades are many. The idea, however, is worthy of careful consideration on the part of every logger and manufacturer. The plan may not prove feasible for many operators, but it is certain that for some lines of work it is a step forward in the solution of the problem of efficiency.

One operator has objected to the piecework system, especially for mill work, on the grounds that this basis tends to increase the general level of day wages paid to men not working on a piece basis; that the saving in cost effected by such a system does not always compensate the operator for the added cost of supervision; that the accuracy of determining the daily mill cut on which payment is made would be dependent on the honesty of the tallmen and graders, who consciously or unconsciously would tend to favor the employe at the expense of the employer.

He recommends in lieu of piecework a merit system in which a record is kept of the work of each man, and as opportunity affords promotion is based on the efficiency records.

Bonus Systems.

There are several "bonus systems" in use in the Northwest, two of which are mentioned in Mr. Martin's appended report. One is known as the "Brown's Bay Bonus System" and is applied only to those men working in yarding crews. The basis of the system is as follows: Fourteen men are designated as a yarding crew, each of whom receives a guaranteed daily wage, which he accepts as full payment for work done. When the crew have loaded an agreed number of thousand board feet, called the base, in less than a 26-day month, they are paid a bonus of 75 cents per thousand board feet for each thousand feet loaded over the base during a 26-day month. In case the crew works less than a 26-day month, 1-26 of the base is subtracted for each day not worked, and the bonus is then applied to the new base established in this manner.

The bonus is divided among the fourteen men in the crew so that each man receives, in addition to his guaranteed daily wage, the percentage which his guaranteed wage bears to the guaranteed wage of the entire crew.

Mr. Martin points out that one weak point in this system is that it is not applied to all members of the logging crew, although in practice the greater efficiency secured from the yarding crew and the efforts to maintain the increased output affect every man in the logging camp. Cooks have more lunches to put up, pump men have to put in extra hours and train crews are called on to handle a greater tonnage.

Another scheme now coming into use and which is regarded as somewhat more equitable, is also described by Mr. Martin. A new landing is carefully sized up by the foreman, superintendent, and hooktender, and an estimate made of the amount of timber which, under normal conditions, can be logged to it during the month. For each thousand board feet logged in excess of this amount a given bonus is paid to the men, over and above a given daily guaranteed wage. In case a workman is employed for a fractional part of a month only, he receives his proportional part of the bonus earned on the days he was actually employed. In case the amount yarded did not exceed the base or fell under it, the workman receives his daily guaranteed wage.

A bonus system, based on somewhat different lines, is in operation both in the West and South. This consists in dividing with certain workmen the saving effected in operating costs, below a certain base agreed upon.

One operator in the West reports that "All our men who are engaged in the regular course of production, including logging, saw-mill and yard are paid, in addition to their regular wages, a percentage amounting to 60 per cent of the gain which they may show over our average cost, as obtained from our records of similar work for two years prior to the commencement of the bonus system."

A similar method is in vogue, in at least one instance, in the South, including, however, only certain foremen and the shipping clerk in the manufacturing department. The plan is as follows: The foremen of the yards, dry kilns and the shipping clerk, in consultation with the manager of the plant agreed upon an equitable cost per thousand feet for performing such work as was in charge of each. The management then guaranteed to each foreman the same salary which

he had received previous to the inauguration of the bonus system, and, in addition, shared equally with the foremen any savings in operating costs in their departments below the base agreed upon. The inauguration of the system led to a readjustment of labor and in some cases a reduction in the force; closer cooperation among foremen; lower costs of operation; and greater personal interest on the part of the foremen in their work.

The results have been satisfactory to all concerned. It has a disadvantage in that the benefits accrue only to a few employes. With the exception of some workmen who received an increased wage for more work, common workmen do not have a share in the profits. It is believed that some scheme which gave an added incentive to the common laborer would be desirable and also profitable.

The firm using the above system has not, so far as known, applied the bonus system to logging work.

A bonus scheme used by one southern logger was discussed at the last session of the Southern Logging Congress. The plan provides a reward for good work and a penalty for inefficient work, in the latter respect differing from the other mentioned.

The scheme is about as follows: The average daily wage and cost of maintenance have been used to determine the cost per thousand feet for an assumed daily base of 400 logs. This daily output, however, is greater than the daily average of the crew. In case the output exceeds the base, a bonus is granted to each crew, while a reduction of the output below the base automatically reduces the compensation of the men below the daily wage received before the bonus scheme went into effect.

This method of handling a bonus system is unsound, since there are many factors beyond the control of the workmen which may reduce the daily output; the minimum daily wage each is to receive is uncertain, and therefore discontent is almost certain to result from the application of the scheme; the base is too high, since it is not an average day's work but a standard which the workmen seldom can attain. It is not believed that satisfactory results can come from a system by which workers are penalized by a reduction of their wage below a fixed minimum. A given wage must be assured to the laborer to make him content, and then an opportunity should be afforded him to increase his daily earnings by the exercise of more ingenuity and resourcefulness.

In hiring men, especially for logging work, it is suggested that they be required to sign a formal contract stating the conditions under which they accept employment, the fees that are to be charged for school and hospital support, doctor's fee, insurance, etc. A contract of this character would eliminate the trouble which sometimes arises on pay-day with new men who object to certain fees being retained by the company, claiming that they were ignorant of the fact that such charges were made.

The committee is not prepared to recommend or endorse any particular plan for rewarding laborers for efficiency, since there are many phases of the question to be studied before it can be determined what methods are, in general, applicable to the varied work of lumbering and to what extent any particular system may be applied.

Social welfare work.—An important feature affecting efficiency in any industry where manual labor plays an important part, as in the lumber industry, is the comfort and well-being of the employes. Not only are men more efficient when well housed and fed and when provided with harmless amusements, but further employers of labor in isolated communities, as are many logging camps and lumber manufacturing communities, owe a moral obligation to the workmen and their families.

In the early days of the lumber industry very little attention was given to workmen other than to see that they performed the maximum amount of work at the minimum expense. The last few years has witnessed a remarkable change in the attitude of employer toward employe. In the lumber industry this has been due to increased demands on the part of labor; to a desire on the part of employers to elevate the general moral tone of their employes; and to the efforts of organization, such as the Y. M. C. A., which have been vitally interested in such problems.

Although camp lodgings and board have been improved greatly in every region, some sections of the country have made a greater advance than others in providing further comforts for the men. This has been due largely to the character of labor, and the conditions under which the work is performed.

In the Northeast, Y. M. C. A's or similar organizations have been maintained at various junction points through which loggers pass on their way to and from the camps and mills. Logging and boarding accommodations are provided in some of these, and an effort made to furnish places of recreation for the men in order that they might not squander their earnings in saloons, gambling houses and dives. So far as can be learned these organizations have done an excellent work and those who have supported them have felt well repaid for the money spent in their maintenance.

The migratory character of the woods force, chiefly foreign, has, to a large extent, precluded the successful introduction of welfare work in the camps of the region, the isolation of which has, to a certain extent, eliminated some of the evils present in other regions. Individual operators have done much to protect their workmen from outside temptation by forbidding the sale of liquor in the vicinity of camps, and refusing to permit peddlers of clothing, cheap jewelry and other junk and solicitors for organizations, to visit the camps and impose on the credulity of men who have been removed from settlements for some time and who are therefore peculiarly susceptible to the piracy practiced by such men.

The plan of providing reading matter, entertainments and other recreation for the average northern lumberjack has been tried by various lumbermen with indifferent success. It is doubtful if operators in this region would be justified in constructing a small building or providing other quarters for special welfare work.

In the South the problem is different since many logging camps contain the loggers' families for whom church and school facilities should be provided and also some form of recreation, since the camp is the family home and loggers

do not get into the outside world except at occasional intervals. The saw mill towns in this section also are often composed solely of those dependent on the lumber company for employment, and often the inhabitants have little or no voice in the administration of community affairs.

The southern lumber industry, especially in the yellow pine belt, has made rapid strides in welfare work, due largely to the efforts of a few public spirited and far seeing men who realized the value of communities composed of clean, temperate citizens. The best results have been attained in the so-called "one-man" towns in which all property is owned by the lumber company. The manager often exercises entire authority over community affairs. The need for this autocratic administration is self-evident to one comparing a well conducted one-man town with many of the "open towns" in the same region. The first will be found to consist of quiet, law-abiding citizens, while in many cases the opposite is true in open towns.

In some cases one-man towns have been incorporated and the citizens given a share in the regulation of community affairs, with excellent results. While one-man towns have advantages from the lumberman's standpoint, there are also disadvantages. The company must invest large sums of money in buildings and other improvements, such as water and light; must enforce sanitary measures; and also be responsible either directly or indirectly for police protection. The construction of the town alone is a heavy drain on resources that might otherwise be invested in the business. It is believed, however, that, as a rule, the investment returns a fair interest.

School Systems.

The provisions made by lumber companies for the education of employes' children vary greatly. The more advanced companies, in one-man towns, have developed excellent school systems, in some cases being equal to the best offered by the more progressive independent towns. Elementary schools are maintained in the logging camps if families reside there. The higher grades are provided in connection with the town schools.

As a rule, the more progressive firms try to make their schools so attractive that children will want to attend of their own free will. Some rely upon this factor to secure the attendance of children of school age, while others have a requirement that all children of employes, between certain ages, must attend. The first system is the more desirable, although the latter is sometimes ncessary where parents are indifferent to the matter.

Every company operating a logging camp in which families live should maintain a school in charge of a capable teacher, and instruction should continue for a period of at least nine months, for it not only would be a great benefit to the children but also would keep those mischievously inclined from being a nuisance around the camp.

Schools can be made the means of enlightening the younger members of the community on questions of personal hygiene, on sanitation and like problems. The buildings afford a place where talks on popular subjects may be given and

interest in the outside world created. An excellent field is open for the general education of the workmen by inviting outsiders to give talks to the men on logging methods in both their own and other regions; on new and improved methods of doing the tasks which daily fall to their lot; and on the means by which they may increase their own efficiency. While this practice is not common, it is a field which holds out much promise both to the employer and the employe.

Encouragement of Thrift.

The average saw mill and woods laborer does not have a tendency towards thrift, nevertheless, it is a well known fact that the workman who has a savings account, or has funds invested is a more steady, satisfied and reliable employe than one who has no financial resources outside of his regular wage. Further, a man with money invested is less subject to influence by labor agitators and organizers.

The encouragement of men to save some portion of their earnings has led to most satisfactory results at many lumber plants. In some cases savings banks have been encouraged or established and at certain plants in the South, employes have, during the last few years, saved hundreds of thousands of dollars through this agency.

In connection with aiding the employes some lumbermen have organized investment companies which are open to the permanent force of workmen. Some form chartered companies and permit employes to purchase as much stock as their resources permit. The funds thus subscribed are invested in safe business enterprises paying a good rate of interest. In this way men of limited means have been enabled to secure an interest in valuable timber properties and in other business ventures which they would be unable to do when acting individually.

One company has organized a cooperative investment company with a stated capital stock for which the employes may subscribe at the rate of 2 per cent per month until their subscription is paid up. The lumber company loaned the investment company sufficient funds to inaugurate the work, taking notes of the investment company as security. These notes are retired from the monthly payments made by the stockholders. This lumber company also has a savings department which pays interest on deposits.

Financial aid of the character outlined above does not in any way savor of charity and in every case has been greatly appreciated by the workmen. Wherever a system similar to the above has been established it has proved a potent factor in creating and maintaining a spirit of helpful cooperation between employer and employe.

Marketing Lumber.

While it is not proposed to discuss in detail the manufacture or marketing of lumber there is one phase of marketing that should receive attention, since it has an impotrant bearing on greater efficiency in every department of logging and manufacture. This is the establishment of closer relations between the

manufacturing and sales departments. The most successful lumber manufacturer is he who caters to the market demands and manufactures his lumber accordingly. Too often manufacturers produce products and then call on their salesmen to dispose of them. Not infrequently these products are not the ones which are the most saleable, and consequently the price secured is not as great as it would be if more attention was devoted to a study of market requirements and an attempt then made to meet them.

A lack of harmony between supply and demand, and insufficient cooperation between the manufacturing and selling force, are factors that in the past have kept prices down and still continue to do so.

The sales manager should be a close student of markets and be able to "sense" the requirements of that class of trade which will yield his employer the greatest profit. He must also be on the alert for new uses and new outlets for his product. He should also have an important part in dictating the form of lumber into which the logs shall be manufactured, since he more than any one else is in a position to know what can be sold to best advantage. At some plants these conditions do exist, but there is a vast amount of lumber in every section which is not made and marketed in accordance with the best practice.

The establishment of new relations between the manufacturing and sales departments of many plants may be somewhat difficult of accomplishment, due to methods of organization, but it is one of the phases of work which must be given greater consideration if the lumber industry reaches a high degree of efficiency.

Log and Lumber Measures.

The sub-committee on lumbering, with the meager data at hand, does not feel warranted in discussing the merits and faults of existing measures, judged from the lumberman's viewpoint. It is a subject on which there is a wide range of ideas, all of which should be weighed before judgment is passed on them.

Forest Engineering.

This subject has not been investigated by the sub-committee on lumbering.

RECOMMENDATIONS FOR FUTURE INVESTIGATIONS

The Basis of Lumber Costs and Values.

THE sub-committee has not attempted to investigate this subject, chiefly because the limited time available did not permit an investigation which would yield sufficient data on which to base a satisfactory report. The importance of the subject is fully realized and the need for accurate data in regard to it is urgently felt. A satisfactory report can not be prepared, however, without the expenditure of a considerable sum of money for investigation purposes a comprehensive report would require several years for preparation.

Lumbering, although one of the first industries to be started in this country and today ranking as one of the most important, is still undergoing a process of development, and we are now in a period in which more important changes in

methods and utilization are taking place than at any period in its history. Further, we are now on the threshold of State and national legislation looking to the conservation of our forest resources, which, in the near future, may mean far reaching changes in the management of the forests and in the relation that timberland owners bear to the public welfare. The lumber industry, as a whole, will scarcely welcome such changes if they impose greater financial burdens on the operator, and especially if restrictions are placed upon the conduct of the business, such as will be necessary if effective measures are put into force. It would be unjust for the public to make laws for the regulation of the lumber industry without a careful study of the forest resources of the country; the development of the lumber industry and its relation to the people and their interests; the methods by which the industry now conducts its operations; markets and market conditions, etc.

There is not in existence today, except in fragmentary form, any clear, concise, and impartial treatise dealing with the industry, to which law makers may turn for reliable data on which to base legislation; which judges and court officials may turn to for information in cases of litigation; and from which such national bodies as the Interstate Commerce Commission may obtain impartial information regarding the transportation problems that affect the industry.

There is urgent need for such data, and it is recommended as one of the most valuable lines of investigation which might be taken up by a body such as the National Conservation Congress.

A comprehensive review of conditions, such as should be embodied in a document of this character would, of necessity, include many of the fundamental facts underlying the lumber tariff, forest protection, forest management, transportation problems, and lumber marketing. It would further provide authentic data on forest resources, stumpage and lumber values, accounting methods and other related subjects.

For the purposes of this study the United States should be divided into regions each of which comprises a unit, so far as markets and market problems, and logging and manufacturing methods, are concerned.

The general range of subjects which such a report should include are the following:

Part I. General—

1. The lumber industry of the region, past, present and future. Its influence on the prosperity and well being of the region.
2. The value of the forests to the people
   a. As a resource.
   b. For watershed protection and regulation of stream-flow.
   c. Climatic influences, etc.

Part II. The standing timber of the region—

1. Past and present supply.
2. Ownership, and its relation to the forest problems of the region.
3. Rate of cutting and future supply.
4. Forest management—relation to forests and welfare of region. What has been done and what may be done.

5. Forest protection—need of and methods of protection from fire, wind, insects, fungi, etc. Estimated damage and loss in the past.
6. Forest fire and tornado insurance—character and possibilities.
7. Forest taxation—character and effect on stumpage ownership (a thorough discussion of the problem as related to the region).
8. Values of standing timber and factors on which they depend. This to include a thorough discussion of the proper method of appraising timber.

Part III. Logging and manufacture—

1. Character of region and its influence on the methods of operation.
2. Character of timber and its influence on the kinds of products manufactured.
   a. Lumber.
   b. Pulp and paper.
   c. Minor products; staves, spools, hubs, etc.
   d. Products of distillation.
   e. Bi-products of paper manufacture
   f. Close utilization of inferior material both in the forest and plant for any of the above or other purposes.
3. Approved methods of logging and manufacture (standardization of methods).
4. Labor and labor conditions.
5. Supply market and influence on costs.
6. Costs of logging and manufacture, including systems of cost keeping.

Part IV. Log, lumber and other forest product measures—

1. History of log, lumber and other forest measures in the region.
2. Defects of present rules and methods.
3. Methods of measurement.
4. Recommendations.

Part V. Markets and marketing—

1. The chief log, lumber and other forest product markets of the region—their accessibility, requirements, etc.
2. Competitive species both foreign and domestic and their influence on the market for home products. (A thorough discussion of the lumber tariff.)
3. Transportation and transportation problems.
4. Methods of marketing forest products by
   a. The logger or manufacturer.
   b. The wholesaler.
   c. The retailer.
5. Factors governing sale values.
6. Lumber trade associations and their influence.
7. Cost of marketing lumber.

In undertaking such an investigation it would be advisable to first take some one region about which there is considerable data now available and to compile and utilize existing information so far as is possible. It is believed that the lumber industry would gladly welcome a document of the character suggested and would be eager to aid in its preparation, provided the plan of work was placed before them in a clear and forceful manner.

The plan as outlined would call for the employment of an expert on forest matters, to assume general charge of the work, and would personally prepare as much of the data as time permitted.

Much valuable data and assistance could be secured from the National and the various State forest departments, officers of lumber and forest protective associations, and other organizations interested in forest work.

The expert would require, at least from time to time, the assistance of technical men to secure data in the field and to prepare portions of the report. This is especially true where the services of experts on some particular subject were available. This would assure the most authoritative data on the subject. It is essential that a sufficient fund be available to meet these requirements. An estimate of the sum required has not been made.

The first line of work to be taken up would be the collection of all available data on the subjects under investigation. The historical data and the features called for under Part I, while requiring careful and expert work, could be compiled at a reasonable expenditure of time and money.

The committee well appreciates the labor, expense and time which would be required to make an original estimate of the standing timber in a given region and it is proposed that so far as possible all existing data on the subject shall be first collected and studied. In case the available data is insufficient, it is believed that an impartial body could secure valuable information from timberland owners in regard to their holdings, to better advantage than could the Federal or State forest departments. It might be necessary to supplement the material secured in this way by that obtained by a limited amount of field work, but it is believed that the purposes of the report could be met without an extensive cruise of the timberlands of the region.

Forest management and forest protection have been in force among some operators in certain sections for considerable periods, although the application of the methods used and the results attained have never been treated concisely and comprehensively for the region. Many operators are not familiar even with the practise of their own region and an impartial treatise on the subject would be of great interest and value to them.

Forest taxation, a much mooted question among timber owners in every forest region, is a subject on which much enlightenment is needed before a satisfactory adjustment of the problem can be made. It is believed that a careful review of past and present methods of taxation and the development of approved methods, based on regional conditions, would greatly hasten the satisfactory solution of this perplexing problem.

A factor of vital importance to every seller or buyer of timberland is the determination of the value of the standing timber. Valuations of stumpage have largely been approximations, the chief interest of the buyer being to satisfy himself that the purchase was "safe," rather than to find what was the true value of the timber. The high stumpage values of the future will demand greater care in the determination of the selling price, since if this is not done either the buyer or seller will suffer a heavy financial loss. The preparation of a standard

method of appraisal is regarded of importance, and is work to which much thought should be given, since there now exists a wide range of opinions on the proper method of appraising timber.

An intelligent understanding of the conditions surrounding the harvesting and manufacture of forest products is absolutely essential to a clear understanding of the forest problems of a region. Not only is it desirable that present methods should be discussed but also new or improved ones should be pointed out since the latter will have a vital bearing on the possibility of operating successfully and profitably under forest management.

There is now a wide variance in the methods used in a given region, at least so far as details of operation are concerned, and it is certain that the standardization of methods for given topography and stands would be of inestimable value to the lumbermen of the region. Many lumbermen, because their knowledge of logging is limited to those methods common to a restricted area, have used and still use methods which are not best adapted to their work, and in most cases such men would welcome light on the methods employed by competitors in other parts of their region.

Cost-keeping methods are so varied in character and so faulty in many ceses that it is very desirable that the fundamental principles underlying costs and cost-keeping methods should be carefully set forth. To do this will necessitate an extensive investigation of present methods of cost-keeping and the preparation of a standard form which may be modified to suit individual operations. Such work could be best done by an accountant familiar with costs and cost-keeping methods used in the industry.

The present basis on which forest products, especially logs, are measured are many, and there is a wide discrepancy in the measurement of logs by different log rules. A thoroughgoing investigation of the methods of measuring all forms of forest products and recommendations for a standard practice is very desirable and this work could well be performed in connection with the other investigations proposed.

There is great need of authoritative data on markets and marketing, because this phase of the lumber industry is concerned so largely with the lumber tariff, lumber prices, and other problems of national interest and importance. If impartial facts in regard to this branch of lumbering had been available to the public a few years ago there would not have been the charge of a "lumber trust" made against the lumber manufacturers of the country, which created a somewhat hostile feeling in the public mind.

An effort has been made only to sketch the possibilities of an investigation of this character and to point out some of the benefits which would result from it. It is believed that a report of the character outlined would prove of great value to the conservation movement, and to lumbermen, foresters and others. It is recommended that the future efforts of the sub-committee on lumbering be devoted to this line of work.

APPENDIX

A Preliminary Report on Efficiency in the Logging Industry in the Pacific Northwest

By C. S. Martin

IN presenting this report on methods tending to increase efficiency in the operations of the logging industry in the Pacific Northwest, we wish to make very clear the fact that this is merely a beginning in the collection of data which should ultimately prove of great value to the industry; to show that after all the primary meaning of conservation is simply to utilize to the best economic advantage our great national resources.

The first step in this utilization is the elimination of waste. To eliminate waste we must have efficiency. And to attain efficiency we must keep informed as to the methods employed by the various companies engaged in the cutting, manufacture, and marketing of timber.

Each company attacking its own individual problems will gradually work out improvements in methods and organization. How much sooner will these changes be brought about if each year we could summarize the results of the thought and effort of the thousands of men making a life problem of the successful handling of forest products.

It is not a new idea by any means. Witness the growing success and importance of the Pacific Logging Congress, where yearly the loggers and machinery men of the Northwest gather to discuss the problems and improvements of the preceding year and make mutual suggestions for the further advance of new, more or less untried, methods.

Naturally in taking up this subject for your consideration there will be very little ground to cover in the Pacific Northwest that has not been considered at one time or another during the last four meetings of the Logging Congress. In fact, a considerable amount of information was gained from the reports of the proceedings of that body, and we wish to give proper credit to the Logging Congress for this valuable and necessary information.

I. *Planning operation in advance.*

In comparatively few instances is there a definite budget for new work. Cruisers report with rough maps; topographic maps of varying accuracy; and the personal reports of logging superintendents or logging engineers, form the usual basis for opening up new bodies of timber.

The cruisers maps vary from very rough sketches showing little more than the streams, roads, trails, etc., to well-executed topographic maps showing possible railroad locations, giving aneroid readings along ridges and creek bottoms, and suggesting the logical outlet for the timber.

These maps are accompanied by reports. Some show merely the amount of timber on the ground, making little effort to classify it save as fir, cedar, hemlock, etc. The more detailed sheets require a careful classification of all timber

on each ten acres, as green standing, dead and down, for each species, including piling, poles, and tie timber. The percentage of defect, probable breakage, and of the various grades of logs on the tract; flooring, merchantable, and No. 2 and a description of soils, undergrowth, mineral indications, and general topography, are included in complete forest survey reports.

As the price of stumpage advances, the accuracy and detail of these cruising reports increases. Some of the larger companies have men run eight times through each 40-acre tract, estimating each tree separately and trusting nothing to averages.

Each year sees the contour map grow in popularity. Its accuracy depends on the uses to which it is to be put. Some engineers advocate running lines of levels along the boundaries of the forties, getting the intervening topography by chaining and the use of the hand-level or aneroid. Others argue that the use of the aneroid with due care in checking with a barograph or another aneroid, and careful pacing, will give a very satisfactory working map.

If the map is to be used as a relatively accurate field sketch from which the general lay of the country is to be judged, and the general direction and length of surveys for future railroads and logging roads is to be computed, supplemented with preliminary surveys and more detailed topography, the location of camp sites, etc., aneroid readings and pacing with suitable checks serve as sufficient basis for construction.

If it is to be used as a soundly established topographic map from which estimates of logging and railroad costs are to be made, then it should undoubtedly be more accurately drawn.

II. *Camps.*

The tendency of the better logging organizations is to construct their camps on wheels. This means quick moves, good fire insurance, camps located close to the work, and an opportunity to build permanent and convenient buildings.

On the other hand, some of the most ably managed companies prefer large camps, not constructed to be moved, in which from 150 to 300 men are accommodated, the men being taken to and from their work by train when working at a distance. The labor policy of the company usually has something to do with this. Where the policy is to encourage married men who want their families near them, these large and more permanent camps are most frequently found. Superintendents who do not permit families in or near camp most often favor the movable camps with a short haul to work.

The social welfare of the men is a question constantly receiving more careful consideration. Reading rooms, shower baths, private lockers, good lights, and some diversion for the crew, are but examples of the steps being taken by various companies to improve the condition of their men. Better food and more sanitary precautions are found almost universally, where a few years ago any sort of shelter and surroundings were considered good enough for a logger.

Where there are families in camp there is almost always a convenient school.

The camp location is cleared of all trees and stubs which might prove dangerous in a high wind. All slash and underbrush is burned to avoid unnecessary fire risk. Good drainage and plenty of pure water are essential to well-located camps.

III. *Organization.*

There are three principal methods of hiring the men aside from the few hired individually by the camp foremen.

The most common method, perhaps, is through the regular employment agencies. The camp has established relations with a number of responsible agencies and hires few men coming directly to the company for work, as men are ordered from the agents as vacancies occur, such orders guaranteeing at least a fair trial for the man sent out in response to the order. Were chance applicants taken on, it would entail a great deal of confusion.

Some of the larger companies employ their own agent. They figure that a man working for their interests alone will be able to get a better class of men for them, and that the men themselves will be better satisfied, not having to pay any employment fees. Where the company uses enough men to justify the expense of a private agent, and the right sort of a man can be secured to act in that capacity, it will usually prove the most satisfactory arrangement.

In some instances several companies go together and maintain an agent, a plan which has quite often proved unsatisfactory because of a feeling that may arise that one company may be favored more than another. In other cases the crews are kept up almost entirely from men who apply either at the camps or the city office for work.

So far, labor unions have not been a factor in the logging end of the industry —a condition of affairs which will undoubtedly be changed within the next few years, as more determined efforts for the organization of loggers' unions are being made each year. The natural independence of the lumberjack, coupled with his tendency to casual, rather than steady, employment has been the principal factor in keeping him free from union affiliations. Add to this the fact that work is almost always plentiful and good wages the rule, and you have the principal reasons for this state of affairs.

The men are almost universally paid once each month or on the termination of their work. Either bank checks or time checks are used. In most instances the time checks are taken for their full value by the merchants of the surrounding towns; the exception to this usually being in the town or city where the company has its office and where the men may exchange the time checks for bank checks or cash.

Most of the men are paid by the day and pay their own board. The monthly men, such as foremen, timekeepers, cooks, and engine crews, have their board included in their monthly wage. Pay days usually come between the 1st and 15th of the month.

One of the most important steps toward attaining efficiency and greater cooperation from the men, is the adoption of a system of bonuses by a number

of the most progressive companies. There are two principal systems in use at the present time. One, the "Brown's Bay System," is fully described and illustrated in the appended memorandum. Its principal drawback seems to be the fact that only a portion of the logging crew is included in the bonus given for greater efficiency. As a matter of fact, the working out of the bonus system has shown that the effort to keep up an increased output affects every man in the camp. Cooks have more lunches to put up, pump men extra hours to put in, train crew have more to do, etc.

Another system now coming into use seems a little more equitable. The foreman, superintendent, and hook-tender carefully size up a new landing before going on to it to log, and put an estimate as to the amount of timber which could be logged to the landing under normal conditions for the coming month; this figure representing what would ordinarily be regarded as "good logging." For each 1,000 ft. B. M. over this amount the men receive a set bonus. Should a man work only ten days, let us say, and the average output for those ten days exceed the required daily average for the month, then he would be entitled to his proportionate share of the bonus. Should the amount logged fall under this required average, he would only receive his guaranteed wage.

In almost every instance in camps where these systems are being used, they are pronounced a success. The output increases, the men take a more personal interest in their work, go out after supper in the summer to lay out the next day's work, and have a real pride in the organization of their crew and camp.

Another question which comes up in this connection is that of some suitable method of paying the fallers in proportion to their real value to the company. It is always the fallers who put down the most timber who are of the greatest value. A little carelessness may easily break enough timber to discount the wages paid the men many times. This has been the principal reason for getting away from the old system of paying the fallers according to the amount of timber they put down. It caused a great deal of unnecessary breakage. As a rule, the men are now paid by the day, in some instances the foreman or superintendents being allowed to increase the wages of particularly good men. This is more or less unsatisfactory, however, and the larger companies permit no leeway in this respect.

The cook camps are self-supporting, as a rule, board being from $5 to $5.50 per week. The quality and variety of the food is of a very high order. Fresh meats, vegetables in season, a good quality of canned fruit and vegetables, are to be found in practically all of the camps. It has been well demonstrated in the logging business that a well-fed man gives better service and is more easily satisfied with his job.

Cooks are paid from $50 to $150 per month, depending on the size of the crew. Camps of 60 men or more usually have an assistant cook, the kitchen help being figured on a basis of one man in the kitchen for each 30 men in the crew.

The supplies are ordered through the timekeeper and bought by the town office of the company. Fresh meat is delivered twice a week in the summer and once a week in the winter. General orders are sent out about once a week, as a rule.

Some managers prefer a man and wife for cooks. They are more apt to be steady, but others will not permit a woman about the camp. The cook and helpers live in the rear part of the cook-house, as a rule. A few companies provide separate quarters for the cooks when a married couple is employed.

Wherever possible, the men come in to all meals. A lunch is beneath the regal appetite of a lumberjack and occasions much grumbling. Where unavoidable, a man is usually sent out with hot coffee.

The larger camps operating logging railroads of any length have machine shops. These vary from small ones scarcely more than enlarged blacksmith shops to those fully equipped with the most modern machinery. Electric cranes, steam riveters, and high-power welding equipment, are found in the better shops. All repairs necessary to the operation can be made in the shop. In addition to the machinist, there is commonly a "donkey doctor," who goes out in the woods to make repairs on engines not seriously enough out of shape to warrant taking them into the shop. A few companies have a systematized tool system.

Each logging engine has a carefully standardized set of necessary tools; each camp a certain equipment of reserve supply in addition to the tools actually in use. At the headquarters camp the final reserve is kept in or near the machine shop. Some one man of the shop force has charge of these various tool supplies and is required to keep the reserve up to standard. If a tool or piece of rigging is lost or broken in the woods it must be reported or shown to the foreman, who either replaces it from the camp reserve or phones in to the headquarters camp for a new or mended article. Should the replaced tool come from the camp reserve it must be immediately made good from the final reserve at headquarters. Broken rigging or tools are immediately sent to the shop to be repaired, and even should they be beyond repair quite often parts of them are useful in mending other articles.

A common-sense tool system is needed in every camp that makes any pretension to efficiency.

A telephone system is found in practically all the larger camps. It is invaluable in case of breakdowns, accidents, and for general ordering.

The majority of the camps charge from 50 cents to $1 per month for hospital service. This is usually turned over to some doctor or hospital, which contracts, in turn, to give medical attention and care to the holders of these hospital tickets. The charge is compulsory and is deducted from the pay of all men who have worked three days or longer. In each camp an emergency equipment is kept, consisting of a stretcher, bandages, and disinfectants. Liability insurance is now cared for by the State, the companies being taxed according to their payrolls.

The larger companies operating railroad camps are coming to employ a logging engineer regularly. During the summer months he may have several crews under him and at other times must depend on such help as he can pick up in one of the camps.

The methods of work, of course, vary to a very great extent. Speaking generally, the main-line surveys are run very carefully with transit, and located

with due regard to the amount of timber that is tributary to them and the length of time required to get it out. The tendency is to increase the efficiency of these main lines so they can be used for long hauls and heavy loads with a fair rate of speed. The logging spurs are laid out in cooperation with the logging foremen so as to fit in with their scheme of operation. They should be as cheaply constructed as possible and may be operated over much steeper grades and much sharper curves. The custom is to have heavy direct connected locomotives for the main-line work, and lighter-geared engines for the switching work. Grades up to 12 per cent and curves of 36 degrees are not uncommon.

The construction is carried on both by day labor and by contract. Contracts are generally let by the station (of 100′) for light grading and clearing. The heavier work is done with scrapers, steam shovels, or by hand at classification rates. Where possible, the railroad is kept about one year ahead of the logging. This allows the grades to settle during the wet season and gives the opportunity for an immediate increase in output should the market demand it. The locomotive crane is proving a very useful piece of machinery in some of the larger camps. It may be used as a steamshovel, a pile driver, a scraper, to move heavy machinery, act as a wrecker, pick up logs from the right-of-way, handle lumber, load ballast, clean slides from the track, and do dredging at booms and log dumps. Is also a good machine to lay and take up track with.

Most of the track work is done by hand, however. The track must be well ballasted, if ballast is obtainable at anything like a reasonable figure. The high first cost of ballasting is usually overcome by the decreased cost of up-keep. The company which owns its own gravel pit is indeed fortunate.

The days of light steel are past in this section. The most common size is from 56 pounds to 60 pounds to the yard.

The importance of keeping the track in good line and surface can not be over-estimated. The ditches should be kept clean, and the track cannot be too well drained in this country. It is really cheaper to keep the track up in shape than to let it run down and then have extensive repairs to make.

The Baldwin direct connected type of logging engine is used quite extensively for main-line hauls. The Shay, the Climax, and the Heisler all have their advocates and have all given good service in this section. The use of oil for fuel is becoming more general and has proved as cheap in the long run as wood or coal. Besides this, when you eliminate the danger of setting fire from your locomotive you have gotten rid of about 50 per cent of the fire risk, as the other sources of fire can be more easily controlled.

In taking up the methods of accounting, we have reached the crux of the whole efficiency question. The superintendent must know the cost of each step in his operation in order to be able to tell where he may better his methods, or where the men are failing to do their part in keeping the expense of operation at the proper figure. The attached forms and descriptions are, perhaps, the best now in use for this type of logging and are self-explanatory.

Some companies charge no depreciation for equipment; others regulate their charges according to the length of their operation, figuring the value at the end

of logging to be a fair selling price for the equipment; the more permanently located companies usually make a flat depreciation of 10%.

The bucking and falling are, almost without exception, done by day wages now. In most of the large camps there is a timber inspector or head bucker, who looks after the buckers and fallers. His duties include the placing of the men, keeping the stumps down, watching for unnecessary breakage, and seeing that the logs are not only measured correctly, but that they are cut so as to get the best possible scale. This item of keeping a close supervision over the cutting and measuring of the timber is beginning to receive the consideration that it deserves, and careful operators are giving more attention to it than in years past.

In yarding and hauling the tendency is to use powerful, high-geared engines. An engine with 11" by 13" cylinders, using 1¼" main line, is as small as can be practically used in rough country and in the average run of fir timber. Short yarding is the rule where practicable, from 500' to 600' being the maximum haul under good conditions. In rough and more inaccessible country, however, the logs are yarded from 1,000' to 1,200' at times. Haul-back lines are usually ⅝" and are now supplemented by a light "ginney" line ¼" to ⅜" in size, which is used to take out the haul-back line, and for other light pulls where the heavier lines would prove much harder to handle. Where possible, the logs are yarded up hill, as there is much less tendency for the lines to foul or for the chockers to slip, especially in wet weather. In some places, however, this is impossible, and the logs must be yarded down hill. To meet the difficulties involved in this down-hill haul over steep slopes, several systems have been devised which left the ends of the logs off the ground, thus doing away with all chances of fouling. Perhaps the best known of these systems is the MacFarline Skyline, which is amply described in the enclosed article: The Lidgerwood system has been used with considerable success under certain conditions, and is constantly being modified to suit the varying requirements of this section. So far, it has been used with good results in comparatively level country where the timber was of moderate size. The use of these overhead systems will undoubtedly increase as the operators become more familiar with their use, and as the logging gets back into the rougher, more inaccessible country.

The number of machines to a "side" varies from one, in comparatively easy country, to as many as nine in exceptionally difficult situations. A "side" consists of the crew and machinery necessary to handle the logs from one "yarder." Where a number of engines are found to the "side," each "side" usually makes a camp. If only one or two machines be used to the "side," often as many as four "sides" are run from one camp.

Snubbing machines are used on pole or skid roads where the slope is so steep that the logs would run if not kept under control. The latest device in this line is described by the accompanying article. It has been successfully used by several companies.

The chute is a thing of the past in up-to-date logging operations. The loss of timber from breakage was so great that it has become economically impossible. The snubber has taken its place.

The various rigs for loading and landing the logs are so numerous to suit widely different conditions that it will be impossible to describe them here except in a very general way. The most common method is the use of a gin pole with either a separate loading engine or a loading drum on the yarder or road engine, as the case may be, that is operated nearest the landing. The gin poles vary in height from 40′ to 80′, and the logs are either rolled or lifted on with a critch line. Another method is to load without landings, as is done with the Lidgerwood system.

In camps of sufficient size to warrant it a separate crew is kept to build skidroads and landings. This crew is in charge of a head-skidder who is an expert in his line. By keeping the work laid out far enough ahead, all landings and roads will be in shape for immediate occupation by the time the logging crew is ready to move on to them.

The use of oil as fuel for logging engines is increasing rapidly. It eliminates fire risk, and makes it possible to keep up a better head of steam on long or steep hauls. Where oil is already installed on the locomotive, it is very little more trouble to use it on the logging engines, and many of the companies using oil can produce cost data to show that the expense of logging with oil may even fall below that of operation with wood for fuel. At present oil is used only where the donkeys are comparatively close to the track, as it takes high pressure and considerable time to pump the heavy fuel oil for any distance, especially in cold weather.

The use of electricity for power in a logging operation under suitable conditions has passed from the experimental to the development stage; the enclosed paper showing the actual results obtained from the use of electric logging engines will give an idea of the great possibilities of electricity as power for logging operations.

Gasoline engines have been successfully developed and in actual use for the past three years. While they have not developed the high power of the steam and electric engines, there seems to be no unsurmountable difficulty in the way of producing more power from the gasoline motor. The operation of the gasoline engine has proved quite economical, and the fact that it uses but little water is quite an argument in its favor.

One of the most important elements in the successful management of a modern logging organization is the intelligent cooperation between the woods and the office. These departments are interdependent in many particulars, and should work in perfect harmony and with a complete understanding of each other's methods and difficulties.

River driving is still practiced in some parts of the country, but only where the cost of railroad building would be prohibitive on account of the distance from suitable connections. The main arguments against driving the large timber of the Pacific Coast are: First, because of the large percentage of loss (5% to 10%). Second, on account of flooding the market with logs at certain seasons of the year, and many times not being able to take advantage of a good market because it was impossible to get the logs out. Third, the scarcity of good driving streams

for such large timber and the constant litigation involved in the eternal war of rancher and logger over riparian rights.

Camps cutting for their own mill make a rather close cut of the hemlock, but camps logging to sell in the open market can only take the highest grade, and then scarcely make the expense of getting it to market. Some of the more progressive interests on Puget Sound have discussed the feasibility of building a cooperative mill to cut nothing but hemlock, and some of the larger logging companies will soon come to the point of installing their own mills to use the hemlock and lower grades of logs. As a matter of fact, when properly treated the hemlock drys out about 40 per cent lighter than fir, which gives it a big advantage on rail shipments. When left in the cuttings it falls an easy victim to slash fires and high winds, as it is a species that demands the support of a dense stand of surrounding timber.

One fact stands out distinctly in this section of the country, and that is the number of strong logging companies selling their logs in the open market. With several very notable exceptions, the strongest organizations of the country are independent logging companies. By the size of their operations and the efficiency of their organizations they are able, in most instances, to sell their logs for a smaller price than the average mill can market their own logs.

IV. *Logging Engineering.*

In the past three or four years logging engineering has become a recognized profession in the Pacific Northwest.

This has been due primarily to the educational influence of the Pacific Logging Congress, and to the very real need for trained men to meet the increasing engineering demands of a modern logging operation. Another important factor in this development has been the excellent work done by the men, who, having the necessary basic training, saw the field opened to them and became the pioneers in a profession that is destined to play an important part in the development of the lumber industry of the West.

At the present writing the lumbermen of the section have taken steps to install a department of Logging Engineering in the University of Washington. British Columbia loggers have taken the same stand, and it will not be long before such courses will be included in the curriculum of every engineering school which draws students from territory where logging is the principal industry.

The problems presented to the logging engineer require not only a good knowledge of engineering methods, but demand a thorough training in practical logging, forestry, and in the use of high-power machinery. The logging engineer must be an efficiency engineer and a practical logger at the same time, a combination of abilities that rarely is to be found in one man.

Practically all the larger companies doing railroad logging west of the Cascades now employ an engineer more or less continuously, and most of them make him part of their organization.

V. *Log Rules.*

The use of the Spaulding rule is so nearly universal here that there is very little demand for a standard rule for the entire country.

It is very much of a question whether such a rule could be formulated to meet the requirements of the various sections of the country. Even were such a standard rule practicable it is not believed that the same rule would apply to all species of timber. A rule which would give accurate measure of the contents of the more cylindrical fir or hemlock log would not give satisfactory results for cedar or cypress, with their increased taper and large butts.

DISCUSSIONS UPON THE REPORTS OF THE SUB-COMMITTEE ON LUMBERING

The Chairman: The subject is now before you for discussion. Many questions about this very comprehensive report have been brought up.

Mr. W. R. Brown, of New Hampshire: Time is so short I do not think I will say much on the subject, except I think Mr. Bryant has done a very excellent work indeed in getting together data which will be of value to everyone in the country. It is data of this kind that will enable us to overcome a difficulty which lumbermen are almost always up against, and that is, very cheap cost of production in logging. I speak particularly, perhaps, on account of Canadian logging. The Canadian logger comes in with two or three men and two or three horses, with absolutely no scientific methods outside of his personal work, and to overcome that we should study and work out scientific methods which will enable us to compete with that.

I would like to ask Mr. Bryant if, in the many inquiries sent out to the lumbermen, he had any interest shown in those replies in the work of utilization and to what extent they were interested?

Prof. R. C. Bryant, of Connecticut: Mr. Chairman, utilization, of course, was somewhat outside of the line of investigation of the committee on lumbering, since that was handled by another committee. We do not get as much cooperation from lumbermen as we had hoped, for various reasons, the most important of which is, you cannot secure information through forest workers. To secure any data on lumbering methods and things of that sort, it is absolutely necessary that you see personally the men who are interested in these things, because it is something that you cannot get from men who, in the first place, have not the time, probably, to write opinions of those things, and in the second place, they do not always feel that they want to express an opinion. They are perfectly willing to talk with you and help you in every way they can, but the business demands the greater part of their attention, and work of that sort is out of their line.

Mr. Charles A. Scott, of Kansas: Mr. Chairman, the suggestion made by the last speaker is interesting along the line of cheapening logging opperations. Of course, one of the greatest variables in operation is logging; sometimes it is up to ridiculous prices, and then again we get it cheaply, due to many reasons. I would like to suggest one or two we have adopted in the last two years for the construction of our logging roads. We are letting that almost entirely by station work. We let it out for the dray road, for instance, so many stations, so many hundred feet—a station is a hundred feet. We let that out to some broad-shouldered Scandinavian or Norwegian, or whatever he may be called, and they do good work and make excellent roads, and where these fellows make three or four dollars a day, they do it for about half the price we could do it if we put our straw pushers on to do the work. We are doing that, and you can save a lot of money by letting your work out in that way.

The Chairman: I desire to call your attention to a problem which, I think, has not been emphasized, and that is the question of the planting of trees and protection of trees along our highways. We are doing now, in this country, an immense amount of road building, but we are not paying enough attention to the question of the shade trees and the roadside trees, which I am sure a good many of you know something of the work in Europe along this line, and that is one of the reasons why travel in Europe is so pleasant.

I want to call your attention to the work of the National Highway Protective Society of New York, which is handling this problem, and also working to a better protection of the trees, the prevention of defacement of trees by advertising, by chipping trees and in other ways. I hope those who have to do with State legislation, State foresters and others will not overlook this very important problem, and that you will bear in mind that there is already an organization in New York, with whom, perhaps, you would like to get in touch. That is the National Highways Protective Society, whose address is 1, West 34th Street.

I think we ought to have an opportunity for any further comments on the report of this Sub-Committee on Lumbering. I felt on hearing the report, having read part of it previously, that we ought to emphasize the necessity of continuing the work of this committee, especially. The committee had to undertake a problem on which it is almost impossible for them to get very far the first year, but they have succeeded in presenting the matter in a splendid way, and we are now in a position to go forward with it if the committees are continued next year and means are provided for doing the work.

Mr. S. B. Elliott, of Pennsylvania: Mr. Chairman, we have to meet this problem. The day of the large lumbering establishment is nigh closing. The next two or three decades will show it absolutely out of the proposition. We have to meet with the small manufacturer, the practical, portable mill man, because when our virgin forests are cut off, we will have no large areas to support a large industry. We have in our State a condition that probably the whole eastern portion of the continent will experience. We have very few virgin forests left, they will be cut off in ten years, and we have a large number of establishments of portable mills, parties owning five, and sometimes ten, portable mills cutting from 2,000 to 5,000 feet a day. They go around amongst the farmers and induce many of them to have the woodlot cut off. We have to face that proposition, and all the discussions we have had are applicable, in my judgment, to the large manufacturer who is using from three to five and ten million feet annually. I think we had better take up the proposition along that line in our study hereafter to see what we can do to utilize the timber that is left in the country, because they are wasting it, the slabs are wasted in the mills, the sides are wasted and everthing wasted except what they can get to market.

THE CLOSER UTILIZATION OF TIMBER

By the Sub-Committee on Forest Utilization.

Chairman, R. S. Kellogg, Wausau, Wis.

Bruce Odell, Cadillac, Mich. W. C. Miles, Globe, Wash.
E. A. Ziegler, Mont Alto, Pa.

Presented by R. S. Kellogg, Tuesday morning, November 18, 1913.

SYNOPSIS

POPULAR opinion holds the lumberman responsible for the wastage of 50 to 75 per cent of the timber which he handles, this waste consisting of high stumps, broken trees, logs and uncut timber left in the woods, and of sawdust, slabs, edgings and trimmings at the mills. The lumberman maintains that he saves as much material as he can at a profit, and that he should not be charged with wilful waste when he refuses to handle material which cannot be sold for at least the cost of production.

Conditions which make possible closer utilization in logging and manufacturing are:

1. Ready markets.
2. Cheap transportation.
3. Character of timber.
4. Efficient management.
5. Proper equipment.

Nothing can be saved unless there is a market for it. Mills located at points where there is a demand for all their products have practically no waste. Mills located far from consuming points often have heavy waste.

Transportation charges often determine whether material is utilized or thrown away.

Timber of one kind may be closely utilized, while timber of another kind, under the same conditions, may be so expensive to handle that only a small amount of it can be saved.

Efficient management, which is increasing, will help much in closeness of timber utilization.

The development of logging and manufacturing equipment has fully kept pace with the needs of the industry.

The present low price of stumpage makes it more profitable for the manufacturers of many small wooden articles to buy logs, and entire timber tracts, than for them to make their products from the waste of lumbering operations.

The labor costs in handling waste material are often prohibitive.

Many by-product plants require such large investments and long-time supply material that their erection is possible only in connection with very large lumbering operations. The conditions surrounding many small operations are such that close utilization is impossible.

Material is saved only as it is valuable. Closeness of timber utilization is in direct proportion to stumpage values. In some large and well located Eastern lumbering operations, practically all waste is utilized because of high timber values and good markets for a wide variety of products. In many Pacific Coast operations where standing timber of low value is abundant, and sawing capacity in excess of market demand, there is much waste at present unavoidable.

Overproduction of lumber and other products is a prolific cause of forest waste. Overproduction results from unlimited competition in the exploitation of forest resources.

Much can be accomplished in decreasing forest waste through the education of the consumer to the use of grades and sizes of material now rejected. The consumer has the final say in the disposition of the products of the manufacturer. This is not a condition peculiar to lumbering alone. It applies to the market for all manufactured and agricultural products. A market for forest products equal to that in Germany would result in as close timber utilization in the United States as exists in Germany.

The lumber industry needs more information than is yet available upon the merchantable products that can be obtained from trees of various kinds and sizes. Further investigation should be made of the costs of manufacturing many by-products, and of the conditions under which such operations are successful. The effect of unrestrained competition in timber exploitation upon our forest resources should receive serious study.

THE CLOSER UTILIZATION OF TIMBER

PUBLIC opinion has charged the lumberman with a long series of high crimes and misdemeanors. He has cut unnecessarily high stumps, broken many trees in the felling, left long tops, strewed the woods with skid poles, ties and defective logs, and left to burn up scattered patches of timber containing in the aggregate many million feet of lumber. He has driven logs down narrow, rocky streams where many have become stranded on the banks never to be gathered up. Many others have sunk in dead water to remain forever on the bottom. He has neglected to pick up logs dropped from railroad cars along the track or scattered when wrecks happen, as they sometimes do. When the remaining logs have reached the mill the lumberman is said to have used saws which make twice too much saw dust, to have cut heavy slabs where light ones might as easily be made, to have edged and trimmed the lumber to even inches and feet only, and to have thrown on the waste heap or run out to the burner, vast quantities of short lengths of all his products.

Still further, the lumberman has been accused of failing to follow the modern manufacturing practice of reaping a profit from a wide variety of by-products. It is even said that in the marketing of his standard grades and sizes he has shown little of the foresight and ability of the modern merchant. In short, the lumberman is charged with being wholly inefficient in the planning and operation of his business. A multitude of outsiders have freely offered him unlimited quantities of good advice, and when he has not accepted it, he has been called a wilful waster of one of the greatest natural resources.

In reply, the lumberman acknowledges that he has been guilty of many of the sins of omission and commission charged in the indictment, but he pleads that the extent of the sin depends upon the definition of the word "waste." Theoretical conservationists may say that 75 per cent of a timber stand is wasted because only 25 per cent of the wood fibre it contains reaches the ultimate user. The practical lumberman whose entire capital is invested in timber will reply that he logs, manufactures, and sells every foot that can be handled at a profit and that it is no fault of his if 75 per cent of the wood volume is lost enroute from forest to consumer; he is likely to add, further, that he has handled timber all his life, and that his experience absolutely contradicts the claims of the forester and the conservationist whose knowledge of the subject has been wholly gained from books or popular magazines.

Such being the contentions of those who see the opposite sides of the Conservation Shield, let us endeavor to make an impartial examination of the conditions which determine the closeness of timber utilization.

WORK PROPOSED

The outline submitted to our sub-committee for consideration proposed the following subjects:

1. Closer Utilization in Logging.
2. Closer Utilization in Manufacturing.
3. Closer Utilization in Marketing.
4. Preservative Treatment of Timber.

The suggestion was also made that the first topic, that of Closer Utilization in Logging, is at present the most important and should be given consideration this year, leaving the other topics for future development. The first exchange of opinion among the sub-committee members showed conclusively the impossibility of handling the topics in the fashion suggested, hence the fragmentary report now submitted is called by the general title of "THE CLOSER UTILIZATION OF TIMBER." While its incompleteness is fully realized, it is hoped that the facts presented may have value for the indication of future investigations of more conclusive character.

FACTORS WHICH AFFECT UTILIZATION

In a large way, a lumbering operation has three distinct parts which in their natural sequence are:

Logging.
Manufacturing.
Selling.

A study of conditions quickly shows that logging and manufacturing methods are governed almost entirely by market demands. The factors which in the order

of their importance make possible closer utilization in a given timber stand may be stated as follows, placing the most important first:

1. Ready Markets.
2. Cheap Transportation.
3. Character of Timber.
4. Efficient Management.
5. Proper Equipment.

The examples to be given later will be sufficient to prove that ready markets are by far the most important factors in timber utilization. Next, without question, comes the cost of transportation. If the cost of transporting the logs is not too great, a saw mill may be located in a thriving town or city where there is an immediate market for its waste products. In some cases logs are now taken two hundred miles by rail to the sawmill; the operation is profitable because of the low freight rate on the logs and an excellent market for the by-products. The raising of the log rate might at once compel the owner to transfer his manufacturing from the city to the woods so that he would lose practically all the market for by-products. This would cause a great waste of timber, but it might be an absolutely necessary outcome of a Railroad Commission decision. Instances of this kind have recently occurred.

The character of the timber has very much to do with the closeness of its utilization; a scattered stand of defective or inferior trees may cost more to log than the resulting lumber will sell for, while a dense stand of good timber may be utilized with profit down to the last stick.

Of course, many lumber plants are not efficiently managed, neither are many other business enterprises of similar magnitude. Possibly there has been less efficiency of management in lumber plants, according to modern standards of efficiency, because the lumberman is more a product of hard conditions in the School of Experience than he is of engineering colleges and accounting departments. However, competition is producing, through sheer necessity, a more efficient type of management, and many of the second generation of lumbermen, with greater advantages than their fathers, are bringing a scientific training to the solution of their problems.

The manufacturer of lumber is in a class by himself; he takes the trees supplied by Nature and puts them into merchantable form; he has nothing to do with the quality or the quantity; if there is a market for the whole tree he puts it into the forms demanded; if there is no market, he has to leave the tree in the woods; he cannot make lumber to suit the inclination of every customer, nor can he make lumber to suit his own inclination. A lumberman of many years' experience has said in a public address:

> "The manufacturer in most lines takes the raw material and, by various processes makes it into a finished commodity, that has very little, if any, resemblance to the raw material, and if his methods of manufacture are right, he makes a perfect article.
>
> "You can go to the dry goods merchant, buy a yard of muslin, a bolt of muslin or a thousand bolts of muslin, and should one prove defective, it can be returned to the manufacturer who can trace the defect to the careless operator, or to a defective machine, and eliminate the cause of the defect.

"Not so with the manufacturer of lumber; he takes the tree as Nature made it and cuts it into commercial shapes and sizes and his process of manufacture does not alter the characteristics of the raw material nor increase nor decrease its imperfections. This is why it requires a greater exertion of the seller's faculties to successfully market lumber than it does the products in almost any other line."

Much also depends upon proper logging and sawing equipment. However, the manufacturers of machinery have displayed so much energy and resourcefulness in its design and capacity, that good equipment is available to every up-to-date lumber manufacturer.

POSSIBLE SAVINGS

THE indictment against the lumberman says that if all the waste which occurs in the manufacture of yellow pine lumber were steam distilled, it would yield more turpentine than the annual production of gum turpentine. It also says that if all the waste occurring in the manufacture of spruce, hemlock and cottonwood lumber were converted into paper, it would furnish all the paper made from wood each year. Both of these statements are undoubtedly true; the question simply is, as to the practicability of making the indicated conversions of waste into marketable products. In operations of this sort, a casual observer starts with the assumption that waste material is cheap material, or, in other words, that where small logs, tops, slabs, edgings and trimmings are thrown away, the initial cost is practically nothing if they are taken as raw material for some other process of utilization. Many times this is a serious fallacy. To start with, such material has almost no value and the timber operator is glad to take a nominal price for it; however, the purchaser finds that to put it into usable form requires such an expenditure of labor that he can better afford to buy merchantable timber for his raw material. The real reason for this is, of course, the present cheapness of timber of nearly all species; every advance in timber prices means the opportunity for increased utilization, but until thorough experiments are made, it cannot be determined just how far the increase in utilization can go.

A lumberman whose college training in engineering lines has made him ambitious to apply all modern methods to his operations, recently said on this point:

"Our specifications for logging birch and maple are 8" surface clear for birch and 10" surface clear for maple. Since we adopted these specifications the value of birch and maple lumber has increased over $5.00 per M, and it occurred to us that this advance would enable us to cut our logs on a much harder specification, both as to size and character of the log.

"We made interesting experiments in this line. We reduced our specifications to 7" and up for birch and 8" and up for maple and included a fairly hard grade or No. 2 log. This difference in the specification increased the cost of logging from $1.00 to $2.00 per M. The smaller and rougher logs decreased our cut at the mill some twenty per cent with a consequent increase in cost of sawing of that amount. The larger percentage of low-grade lumber decreased the average value of the product of the log, so that by endeavoring to utilize the poorer logs in our forests, and thus to decrease

the waste of material in the woods, we virtually increased the cost of our lumber more than $5 per M, and if we had any means of determining the actual cost of manufacturing the poorer logs into lumber it would probably have amounted to four or five times the value of the product obtained, so that we have come to the conclusion that with our stand of timber 8" and 10" surface clear limits for logging birch and maple are the limits of economy. These specifications take not more than 30 to 35 per cent of the weight of the wood from the land, or 60 to 70 per cent of the weight of the material in our forest is left on the ground as having no economic value."

This same lumberman found that with his mill in the woods away from any large consuming point, he could make no profit selling his refuse for fuel; still further, he found that he was unable to induce any of the manufacturers of small wooden articles to use his waste for their raw material because with the present value of timber, they could better afford to buy logs than to take the mill waste at even a low price. Continuing his investigations, this lumberman finally formed a triple alliance with a chemical company and the owner of an iron furnace, which resulted in the erection of a complete hardwood distillation plant costing nearly $200,000, which requires a working capital of $25,000. It is expected that this plant will show a profit of from 6 to 8 per cent and make an average return of 25 cents per cord for the waste wood throughout the life of the lumber operation, the wood amounting to about one cord for every thousand feet of lumber manufactured. Operating in this manner, the only material left on the land consists of the tops, rotten trees, and saplings under 5 inches in diameter. This engineer-lumberman says that his distillation plant, with a capacity of 48 cords per day, is the smallest it is practical to operate, and that a plant two or three times as large would be more economical. In his opinion, the minimum requirements for such a plant are:

1st. A mill located near a hardwood timber supply to last twenty years at the rate of at least 10,000,000 feet of lumber a year.
2d. Plenty of running water.
3d. The proximity of a charcoal iron furnace.

Another manufacturerer who has kept accurate records of the costs in a well-managed hardwood distillation operation for several years, believes that, in addition to investment in plant, the working capital should be at least $100,000. This operator says:

"A plant requiring 48 cords per day for 300 days needs 14,400 cords of wood annually. It is necessary to carry about an 18 months' stock which would make a total of 21,600 cords at $3 per cord, or about $65,000. The amount required for labor and sundry expenses to carry on the operation until the manufactured goods are ready for market would require a sufficient additional amount to make a total woking capital of $100,000 necessary. Even this puts the investment in all facilities such as railroads with equipment and operation, camps, etc., on the lumber end of the business."

Such conditions as these make it at once evident that only in a large lumbering operation can this character of utilization be practised. The necessity for a charcoal iron furnace may not be apparent to those unfamiliar with the business;

it need only be said that one of the greatest obstacles in the utilization of waste through distillation is the disposition of the charcoal, which amounts to from 40 to 50 bushels per cord of wood. There is not a large market for charcoal, aside from the requirements of iron furnaces. More than once the lumberman who with great expectations started out to get a profit from waste through distillation has found it necessary to become a maker of pig iron in order to save his charcoal. Pig iron can be kept indefinitely with little loss and marketed when the best prices can be obtained, whereas charcoal must be almost immediately consumed. However, carrying charges become very heavy when a distillation plant has on hand a two or three years' output of pig iron.

Of course, the erection of a distillation plant is only one of many possibilities in the utilization of waste wood. Where practicable, however, such a plant affords the most complete utilization yet secured, but, as in lumber manufacturing, there is danger of frequent over-production.

Mills favorably located often find a good market for their soft-wood slabs and edgings for pulpwood. Again, the smallest forms of waste, which cannot be used otherwise, are run through a "hog," ground up fine, and sold by the ton for fuel for plants of other kinds. The manufacture of hardwood ties from timber which if sawed into lumber would probably produce little but low grades has been a profitable undertaking for some well-located mills. The saving of very short stock for box lumber and the cutting of the small hardwood dimension stock for chair factories have at times proved remunerative.

In accordance with the universal principle that material is saved only when it has a value, and that the closeness of timber utilization is in direct proportion to stumpage values, we find in some eastern lumbering operations (where the decreasing supply of merchantable timber has greatly increased its value) a utilization complete enough to satisfy the most extreme conservationist, while in the far West (where there is yet an abundance of standing timber of low value and a sawing capacity in excess of the market demand) there is a most regrettable amount of waste. While much of this waste of western timber is unavoidable under present conditions, it will gradually increase with the increase in population and diversity of consuming demands.

Although numerous unsuccessful attempts have been made to utilize Douglas fir waste on a commercial scale, the latest experiments of the University of Washington indicate that utilization of this character may reach a practical stage. The first attempt along this line was to use fir stumps for distillation, in the hope that the products obtained might partially pay for clearing the land. It was found that the cost of removing the stumps greatly exceeded the value of the resulting products. More recent experiments with sawmill waste have been encouraging, since it appears that the products are nearly as great from stumps, while the initial cost of the mill material is very much less than of stumps. While it probably would not pay to manufacture acetate of lime at present, there is a market in Washington for the light oil and part of the tar for shingle stains. There is a possibility that the rest of the tar may be used as a wood preservative, and there is promise that experiments now under way will result in a better charcoal market.

A still more encouraging undertaking is the recent erection of a plant at Marshfield, Oregon, which by means of the sulphate process will produce forty tons of paper pulp daily from sawmill waste.

Investigations and investments of private capital made in the South for many years have resulted in the development of processes and plants which have given promise of commercially successful utilization of yellow pine waste for the production of turpentine, alcohol, oils, charcoal and paper, but the decline in the price of gum turpentine and resin during the past two years has prevented the realization of anticipated profits.

A PENNSYLVANIA OPERATION

DURING the past summer a member of the Committee (Mr. Ziegler) had an opportunity to examine a lumbering operation in Pennsylvania, which affords one of the best examples of close timber utilization to be found in the country. It is worth while, therefore, to reproduce his notes, as follows (it is understood that they are subject to correction as to details):

"An examination of one of the few remaining large lumbering operations in Pennsylvania reveals an economy in wood utilization which would have been pronounced visionary and incredible if it had been prophesied 30 or 40 years ago. It is also truly prophetic of what will be possible in the future in the last stand of the original forest in the Pacific Northwest, and is worth study for that reason.

"The time for the examination was limited to one and one-half days—which was entirely inadequate for the size of the operation, and some of the notes show only approximate figures, but are good enough to indicate how economically the operation is carried on.

"The tract in question is located in the Northern Alleghanies and consists of little less than 30,000 acres of hemlock with a scattered stand of hardwood. The country is rugged and consists of ridges and narrow valleys which radiate largely from one drainage creek.

"This central drainage creek is 12 miles from the main line of railroad, and a logging road (standard gauge) was constructed over a ridge and down one of the tributary valleys or ravines to this central creek valley where the sawmill, stave mill and distillation plants are located, as well as the main timber town. The logging is done by rail with a track laid up each ravine. Horses are used only to pull the logs down the slopes to the skidways along the track where the slopes are not steep enough to shoot the logs down slides made of hewn logs.

"The mill town is a clean, well-ordered town with electric lights, water and baths in the houses and a sewage system. Not a saloon is allowed in the town. This has all been done with a knowledge that the town would live only ten years—the period of lumbering the tract.

"The stave mill is about one mile below the sawmill, and the chemical plant about a mile below the stave mill.

"The forest consists of mature hemlock averaging 18 M ft. to the acre, with about 4 M ft. of first-class logs and 12 to 20 cords inferior stock, of beech, yellow birch and maple (sugar and red or soft), with a little black cherry. The hemlock is heaviest along the ravines and flats, while the hardwoods are best on the slopes and ridges. Hemlock often runs up to 40 M ft. per acre, and the trees reach a maximum at about 3 feet in diameter at breast height and a height of 80 to 100 feet.

"The entire operation is carried over a series of contracts. The logging company contracts all the logging, and then sublets on different "chances" the felling, the cutting into logs, bark peeling, log skidding and bark loading. The railroad company contracts to haul the logs to the mill.

"The logging of the hemlock (18 M. ft. per acre), of course, must be done during the bark-peeling season. The yield of bark is rather low—only about ¼ cord of bark per M feet of logs. The bark is then removed somewhat before the logs are skidded. The hemlock logs are next taken out (loaded with steam loaders) and sent to the sawmill.

"The hardwood logs (4 M feet per acre) are next cut and taken to the stave mill, where they are all (beech, birch and maple) cut into staves and heading for sugar barrels. The cherry (about 250 M ft. annually) is shipped in the log for export.

"After the hardwood logs are taken out, all the cull hardwoods with limbs and tops to 2 inches are cut into chemical wood by contract (about 12 to 20 cords per acre).

"A considerable portion of the inferior hardwoods goes into chemical wood. All dead hemlock and hemlock tops to 2 to 3 inches are taken out for pulpwood.

"To summarize—hemlock bark first removed; then hemlock logs; then best hardwood logs; then balance of hardwood for chemical wood; then dead hemlock and hemlock tops for paper wood. This is clear cutting and clean cutting, for after the cutting is done bare land only remains with windrows of small branches as refuse. The land is in a beautiful shape for immediate replanting, if this brush were burned up. America does not show a closer woods utilization of a mixed forest anywhere.

"The hemlock logs only are sawed into lumber. The mill has a capacity of 200 to 300 M ft. per 24 hours. The equipment consists of the usual pond, two 14-gauge band-saws and one 14-gauge resaw, gang edgers and trimmers. Even lengths and widths only are cut, but lengths down to 6 feet are made. While the writer was in the mill a small hemlock log was cut on the band into one 2 x 4. A planing mill is also operated in connection with the sawmill, turning out shiplap and other forms of finished lumber. The lumber is graded into three grades, Nos. 1, 2 and 3.

"The boilers are heated with sawdust and planer refuse, entirely. Slabwood and edgings are too valuable to use for fuel. The best of the slabs are sawed into lath and the balance turned over to a kindling wood concern at a price for all refuse wood for each thousand feet cut. This concern first picks out the best slabs and edgings and loads them on cars, receiving $3 per 4 ft. cord for pulp wood. The remaining slabs and edgings (after the lath and pulp wood are taken out) are run through a series of kindling machines and cut into small blocks about 2¼ inches long. These are kiln dried and shipped to New York City, in oval packs (packed in forms by hand by women and girls).

"The basement of the mill is concreted, and the entire plant is kept clear of dust by going over it with a "blower" several times a week. No refuse of any kind is in sight. The engine house contains the engine for power, dynamo for electric light, and a special engine for the pump on the fire main connecting the fire hydrants.

"All the better hardwood logs are sold to the stave company, except the cherry. Birch, beech and maple are cut into sugar barrel heading and staves entirely. The mill uses about 60 M ft. per day. Each thousand of logs cuts about 3,300 30-inch staves. The logs are first sectioned into lengths, then quartered into stave bolts, steamed, cut (not sawed) into staves, then trimmed and grooved and air-dried in large sheds.

"The heading is cut and planed in small boards, which are laid together in squares from which the heads are cut.

"Close utilization is practised, the boilers being run with refuse for fuel. The balance is shipped to the distillation plant a mile below, where it is used for the manufacture of gunpowder charcoal. In this mill again nothing is wasted. Whether the fine large hardwood logs show a larger financial return in the form of staves than lumber was not ascertained.

"The last process for utilization of all remaining hardwood materials, wood waste in tops, defective logs and small trees, also the stave mill waste, is the destructive distillation plant. This plant uses 100 cords each 24 hours, and since there is no offal wood, the boilers are fired with soft coal. The products are charcoal, wood alcohol, and acetate of lime.

"The plant is especially organized to minimize the labor in handling wood and products. The wood is air-dried in the yard for 15 months and then loaded on iron cars and pulled into the charring ovens, car and all. The charring is completed in 24 hours, when doors on the opposite sides of the ovens are opened and the cars pulled out into air-tight cooling ovens, where they remain another 24 hours, and are then moved into second cooling ovens for the third 24 hours, when the coal is cool enough to be loaded into box cars direct for shipment to the iron furnace. The material is not taken off the car from the woodyard until the coal is loaded into box cars. As each oven is emptied at one end a new charge enters at the opposite end."

EDUCATIONAL FEATURES

TO promote a fuller utilization of timber, education along two lines is required: First, that of the public to the use of products now rejected; and, second, the lumbermen themselves, to more modern methods of production and sale.

Education of the Consumer

One of the means by which the public can increase the utilization of timber is through the acceptation of short and odd lengths of lumber where now only longer and even lengths are taken. Aside from the sills, joists and plates, much of the lumber actually used in buildings is of odd lengths or a mixture of odd and even lengths when put into final position. The outside dimensions are commonly in multiples of two feet, but, allowing for the walls and partitions, it is obvious that flooring cannot be laid in lengths which are multiples of two feet. As a matter of fact, the flooring is finally cut to a great variety of odd and short lengths. The same practice applies to ceiling, drop siding, and finishing lumber. If building lumber were as closely utilized as factory lumber, and if the contractor or builder ordered the material for a house in the lengths actually required, odd lengths and short lengths would find a ready market and much waste could be saved. Under such circumstances, both the logger and the mill man could handle defective logs that today have no market value, because short lumber does not bring a price equal to the cost of its production. This is for no other reason than that the consumer has been educated to think that if he wants four pieces of board 4 feet long he must buy a 16-foot board and cut it up into 4-foot lengths. The making of even lengths only for many classes of lumber in our sawmills is entirely unnecessary as has been proved in British Columbia, where lumber as it comes

from the mills is trimmed to odd or even lengths as is most economical. There the long and short lengths are bundled together and sold for the same price as the long lengths, and the odd lengths are sold for the same price as the even lengths because the consumers are educated to the use of these forms.

A member of the Committee (Mr. Odell) discusses as follows the relation of the consumer to forest conservation, as seen from the viewpoint of the manufacturer of forest products:

"In the serious study of not only Forest Conservation but of the conservation of all our natural resources, the consumer seems not to have received consideration in proportion to his importance or his ultimate influence on conservation. The consumer of the products of the forest, as of the products of all other natural resources, has the last say. His is the final and deciding influence.

"One of the first considerations in the production and marketing of an article is to meet the favor of the consumer. The consumer's favor may be influenced by whim, preference or necessity, but the consumer's favor must be had, whatever may influence or control it. Producers, manufacturers and merchants may spend millions of dollars, years of study and labor, in the production, manufacture and effort to market an article, but if this article does not meet the favor of the consumer, it is money, study and labor lost or wasted.

"Necessity may, and many times does, compel the consumer to accept and use or consume an article that does not meet his favor or choice, but you may be sure that he will not accept or consume an article that does not meet his fancy or favor one minute longer than necessity compels. Just so soon as the compelling force is removed, the consumer will revert to fancy or choice, in selection. Because of scarcity or high price, the consumer may be compelled to take an article of lower quality or a substitute of some kind, but only while the article of favor or choice remains so high in price or so limited in supply as to be beyond his reach.

"The general public, the utilmate consumer, has been extremely liberal in criticism of the wasteful methods, the lack of conservation, of those who have to do with our natural resources, with little, if any, consideration of the responsibilitiy of the general public, the ultimate consumer, in this so-called waste or lack of conservation. The general public, the ultimate consumer, may say in all sincerity, "What part have I in the matter, but to take just what is handed out to me?" In fact and reality this is far from what the consumer really does. He picks and chooses to the extent of his means and ability, rejecting, so far as his means and ability permit, the article that does not meet his fancy or favor, because of appearance or degree of quality. In this rejection lies the consumer's responsibility for waste or lack of conservation. If the consumer, the one whose decision is final, rejects an article, what is to be done with that article other than just what always has been done with it, and just what is being done with it now, let it go to waste.

"Unfortunately, this matter of selection and rejection has a greater influence on conservation or the lack of it, in the utilization of forest products than of nearly any other of our natural resources. The average consumer, in selecting lumber for a dwelling, a barn, a fence, or for whatever purpose he may want to use lumber, naturally wants lumber that is free from knots, splits, shake or decay; in fact, if his means permit he will select lumber that is free from all defects, a quality of lumber that many times is far beyond his actual requirements, making his building, or whatever purpose for which he may use the lumber, cost him, not only him, but others who select this

quality, more than it would if he had selected a quality to meet his requirements. He does not consider how much of this lumber that contains knots, splits, shake, some decay and other defects, might be used in the construction of his dwelling, barn or other purpose and not lower the quality and usefulness of the finished structure. The mechanic who does the constructing will very naturally recommend a quality that is free from defects because with the best only he can do his work quicker and easier.

"The consumer does not stop to consider that, of all lumber produced from our forests, probably not more than one board in five is of the quality he wants and will have, if his means permit. He chooses one and rejects four. What shall we do with the four boards that are rejected by the discriminating consumer who is able to make his selection—the eighty per cent of production? A part of it, because of his inability to make so critical a selection, may be accepted by some other consumer, but there is still a large proportion of the entire lumber production that is rejected.

"It costs the manufacturer of lumber just as much to produce the board of lower quality as it does to produce the one that is free from defects. Many times—in fact, practically always—the lumber manufacturer finds the good boards and the poor ones done up in the same package, so that he cannot take the good boards and leave the poor ones. To be more explicit, no forest contains all good trees and no poor ones, and, going further down the line, no log contains all good boards and no poor ones. In fact, among a lot of choice selected logs it is difficult to find one that does not contain more boards that would be rejected by the average consumer than boards of the quality that meets his choice or favor. The lumber manufacturer cannot separate the approved boards, the boards of high quality, from the rejected boards, the boards of lower quality, until after he has incurred the expense of purchasing the forest, constructing and equipping railroads to haul the logs out, constructing sawmills, planing mills, dry kilns, and various other expenses, amounting to hundreds of thousands of dollars and, in some very large operations, even millions of dollars. After all this expenditure and the further cost of cutting the logs, hauling them to the mill, sawing them into boards, piling the boards to dry, and holding them until they are ready to market, the manufacturer finds a large proportion of his boards of a quality that are rejected by the consumer whose means permit him to do so.

"These are facts, serious facts, that influence forest conservation, facts that in reality are of as much concern to the consumer as to the manufacturer. If the consumer rejects half or more of the product of the lumber manufacturer, what is to be done with this immense quantity of lumber, this large proportion of one of our greatest natural resources, the forest? The natural law of supply and demand furnishes a remedy in part, but in part only, because the consumer wants and favors only the best of the lumber, the grade that is free from defects. Naturally, the demand for that grade is in excess of the supply, and just as naturally the price for this grade advances. Then, because of scarcity and high price of the grade of lumber in favor with the consumer, necessity may compel him to consider a lower quality, but just so soon as the supply of the higher quality increases and the price is lowered, he will again reject the lower quality. From this you will readily reason that the higher the price of the better grades of lumber, the more of the lower grades will be consumed and less be wasted.

"The advance in the price of lumber during the past twenty years has compelled the use of more and more of the lower grades, thus tending to a greater degree of forest conservation now than formerly, but we have not yet reached the point where nearly all of useful valuable lumber of the lower grades will be accepted by the consumer. Nor will that point ever be reached

until the select lumber, the grade that meets the favor of the consumer, becomes so scarce in supply and so high in price that the consumer is compelled to accept all of the useful lower grades. The primary reason for the so-called waste of forest products, the lack of conservation, is the bountiful supply of, and the low price for, lumber. Just so long as an article is produced in excess of general requirements, there will be that tendency to select the better and reject the poorer.

"Were we able to produce all good lumber, it might be different, but, as heretofore explained, we must take the poor with the good. In all lumber manufacturing operations there are many trees left in the forest that contain a portion of select lumber, but these trees also contain a very large proportion of poorer lumber, so much of the grade that the consumer will reject that the cost of taking out these trees is much greater than the present value of the lumber they will produce. The lumberman has been censured for leaving these trees in the forest to be killed by fire and be wasted entirely. But who would do otherwise under present conditions? Make it profitable to do so, and the lumberman will take out all the trees.

"These trees that contain a comparatively small proportion of choice lumber and a very large proportion of lower grade lumber, constitute proportions of the whole forest, varying from 20 per cent to as much as 60 per cent, depending upon the kind and locality of the forest. In some localities a tree of a certain quality is considered worthless and is left in the forest, in another locality a part of a tree of this quality is taken, and in still another locality all of a tree of this quality is utilized, and each of the three lumbermen is practicing conservation to the extent of his ability to do so. One may be so located that the cost of getting the logs out to his mill, manufacturing to lumber, and freighting to market, would prohibit the utilization of a tree of this kind. Another may have a comparatively low logging and manufacturing cost and a comparatively high freight to market, enabling him to use a part of the tree. Still another may have a logging and manufacturing cost and a home market, enabling him to use all of the tree. All three apply the same test as to whether they shall use all of the tree, a part of it, or none of it. The action of each is determined by the question of profit, so that what in one locality is valuable is worthless in another locality.

"There probably is not more than one consumer in one hundred who considers the fact that of all the lumber produced in the United States, a very large proportion, in some localities more than half, is sold by the manufacturer at less than the actual cost to produce it. With this condition prevailing, is it any wonder that the small proportion of the entire product that meets with the favor of the discriminating consumer should be high in price?

"With most consumers it is a question of 'Pigs is pigs,' 'Lumber is high,' without any consideration of why or who is responsible for the condition. The consumer naturally blames the 'Lumber Barons,' without considering that the lumber may be used 2,000 miles from where it was produced, that the manufacturer, the wholesaler, and the retailer must have a profit, and that he must pay for not only his choice but to help to make up for the loss on the large proportion he has rejected.

"In the good old days of low-priced lumber, the days when stumpage was so low-priced as to hardly be a consideration in the cost of lumber, the days when the lumber manufacturer could fell the trees in his mill yard or could fell them on the banks of some stream and float them to the mill with but little cost, the days when the consumer drove to the mill with his own team and hauled the lumber away—these were the days when the consumer could pick and choose and reject to his heart's content, and how he did reject! Just how much he rejected is evidenced by the fact that in those good old days as much as two-thirds of the timber was left in the forest to burn

and otherwise die and go to waste. The remains of these forests are exhibited by some as the horrible example of the wilful waste of the lumberman. Was it the waste of the lumberman or the waste of the consumer? Just one more question: Was it waste? No doubt it would be waste now, but was it waste then?

"So much has been said and written by the thoughtless, the ignorant and the malicious about the awful, criminal waste of the lumberman, that by many he is looked upon as a kind of goblin or monster that goes about leaving waste and devastation in his wake. Devastation he may have made, but it was a tearing down in one place to build better in another. You cannot have your cake and eat it, too. You cannot improve the prairie countries without drawing from the forests to do so. You cannot have the agricultural lands where the forest grew without cutting down the forests. While many have been taught to think otherwise, you cannot help conceding that the lumberman is, after all, just human like the rest of us. He is just as honest, earnest, has the same hope for the hereafter, and abhors waste just the same as the man in any other business. Laying aside unfounded, unreasonable prejudice, can you think of any reason why a lumberman should knowingly and wilfully waste his resources? As a matter of fact, do you not know that he is inclined to practice conservation and economy the same as men of other enterprises? In the operation of his lumber manufacturing business he has always taken from the forest just so much of the timber as gave promise of a reasonable profit. You could not have expected more of him in the past, and you should not expect more of him in the future.

"This same element of waste, or lack of conservation, runs through nearly all lines of production or manufacture. Go into the fields of the farmers in the potato-producing States when they are harvesting the crop and note the hundreds and thousands of bushels of small potatoes they leave on the ground to rot and waste. Ask the farmer why he does not save them, and he will tell you because he cannot sell them, and this, to him, seems to be a perfectly good reason. Ask the dealer why he will not buy them, and he will give the same reason, because he cannot sell them. Ask the grocer the same question, and get the same answer. When you have traced it all the way back you will find that small potatoes do not meet the favor of the consumer. They are perfectly good potatoes, but the consumer prefers larger potatoes and rejects the small ones. If the consumer, the man who has the final say, rejects them, what is to be done but let them go to waste? This is not conservation, but who can change it except the consumer? The lumberman has his 'small potatoes' just the same as the farmer and makes just as earnest an effort to save them.

"After all is said and done, this matter of conservation is very largely up to the consumer. Not only the conservation of forest products, but of all our natural resources. Make it profitable, pay a price that will warrant doing so, and you will find the lumberman utilizing all of the trees of the forest instead of one-third, one-half, or two-thirds of them. Forest conservation of Germany is frequently compared with that of the United States. Pay a like price for the products of the forest here, and you will find the same degree of conservation. To have a greater degree of forest conservation, and build for the welfare of the future, less lumber must be produced, a greater proportion of it be utilized, and a higher price paid for it. Does the general public, the ultimate consumer, want forest conservation badly enough to use a lower grade of lumber at a higher price? If so, he can have conservation in just that degree that he is willing to pay for and can have it just as soon as he begins to pay.

"Don't lose sight of the fact that an over-supply of low-priced lumber is *the* cause of nearly all the so-called waste of forest products."

Education of the Manufacturer

Although a few lumbering operations, like some mentioned in this report, are models of efficiency, many logging and manufacturing operations still have much to gain through the introduction of better methods, together with more ingenuity in the creation of new markets. Much of this necessary education is being gradually disseminated through the efforts of the lumbermen themselves, by participation in logging congresses, manufacturing associations, and gatherings like this, whose purpose is the conservation of every resource. Efforts of this character are of a most worthy nature and deserve the utmost support.

FUTURE WORK

IN making this somewhat rambling and fragmentary report, the Committee feels that all it can hope to accomplish at this time is to point out some of the conditions under which close timber utilization is practicable, and to indicate further investigations which may have a real constructive value.

The lumber industry needs much more exact, comparative information than it now has upon the merchantable products that can be obtained from trees of various kinds and sizes. It is difficult to say to a certainty at what point a tree ceases to be profitable for lumber, and whether it will yield a better return if used for ties, posts or poles, or other products. Moreover, there is a geat lack of knowledge of the relative amounts of the different grades of lumber cut from trees of various sizes. Still further, there is not sufficient information upon the labor costs in the making of many by-products, yet the cost of labor may easily be the chief determining factor as to success or failure. Most important of all, little study has been given to the relation between unrestrained competition in timber exploitation and the waste of forest resources.

The Committee recommends, therefore, that if its work be continued, the factors affecting forest utilization here suggested be fully presented to succeeding congresses through a series of reports which will have practical value for both lumbermen and laymen.

DISCUSSION ON THE REPORT OF THE SUB-COMMITTEE ON FOREST UTILIZATION

The Chairman: The subject is before you for discussion, and we would like to hear from different men.

Mr. J. F. Clark, of Vancouver, B. C.: Mr. Chairman, you might be interested to have a little word from the frontier, as it were, in the matter of utilization. In the mill that I managed four years ago in Vancouver we were manufacturing shingles, and you might be interested to know that ninety-five per cent were number one and five per cent number two, and that we tried to sell the number two for the cost of producing them, without allowing anything for the raw material, because otherwise the raw material would be simply thrown away, and we ended up the season's operation with a storeroom full of number two, which we could not market at all. With normal cutting of cedar shingles from the average product, there should be forty per cent number two, in British Columbia,

and thirty-five per cent, of course, went out to the burner with spots. In logging at the present time on the Coast we are taking material twelve inches and over at the small end, and we take out about fifty per cent of the stem. The rest is left in the slash or standing trees that we would not cut at all, or portions of trees that one or two logs were taken. We are, ourselves, logging to some extent, and we would like to log as foresters like to log, but we have to do it as the market will permit us. Of course, the fundamental difficulty is that stumpage is worth anywhere from fifty cents to a dollar a thousand, and you can buy it cheaper if you know how. Under those conditions the finest timber in the world, of course, is to be found on the Western Coast and Western Slope of the Cascades in Washington and Oregon. As long as stumpage values are normal, it is absolutely impossible to bring about utilization. The present situation is enough to make almost any forester sick, but what can be done? I do not see any solution for it until the price of lumber gets to a basis that will justify closer utilization. No doubt, in certain isolated cases closer utilization could be made where there is now bad management, but under the best of management there is a tremendous waste in every plant.

The Chairman: We would like to hear from others.

Mr. Bruce Odell, of Michigan: Mr. Chairman, I had not expected to talk on this subject here today, but it seems to me that it is broader than a good many of us think. We have a different condition confronting nearly every manufacturer. To my mind, one of the troubles with lumbermen today is the lack of cooperation. With approximately 25,000 sawmills of suitable size, they have nearly 25,000 different problems. The promoter will come along and tell you that with the hardwood men the solving of your problem of the whole thing is a certain distillation of wood, put in a chemical plant, they are making millions at it, and all this, that and the other.

I will tell you that the chemical business is full today; there is no room for any more chemical plants. If the chemical business is increased today you will be in the condition the Southern pine manufacturers are at this time. You have been shown here today what an increase of five per cent in over-production means, a decrease of twenty per cent in the price of your products. There are few other products that would stand a decrease of twenty per cent. I have been in the chemical business for fifteen years, and the firms I represent produce approximately ten per cent of the chemical products of the United States today—that is, wood alcohol and acetate of lime. We started out with wood alcohol at ninety cents a gallon, and today we are netting around thirty-three cents. Acetate of lime has gone along nearly in the same way and charcoal is going the same road. The promoters will tell you to put in an iron furnace in connection with your chemical plant to use your charcoal. There is not a manufacturer of charcoal pig iron today who can get his money back on charcoal at four cents a barrel, and there is not a man of you who wants to manufacture charcoal at four cents a barrel. When I tell you I know of iron plants that have twice their original capital tied up in pig iron today, with pig iron selling at $13 a ton at the factory, you will understand how this problem is situated.

Other promoters will come along and talk of the turpentine that is going to waste in the south. Look at the people who would like to utilize those things? There is one concern in the south with a capital of four and one-half million dollars with the two largest plants in the world, in the hands of a receiver. A year ago last February the stock was selling at a premium and today it is offered at four and one-half cents, without a taker. The receiver said it had not been run economically but they could go on and run it and make money for the stockholders. They shut down one plant and ran the other, the one that gave most promise of success, they ran it for four months at a $73,000 loss, or at the rate of $223,000 a year.

This is leading up to a point I have in mind, and I would like to have something done on this question today. There is not any one lumberman who can study all the possibilities of utilizing waste material. There has been a movement on foot from some sources to cripple the best sources of information we have, and that is the forest product laboratory. Gentlemen, there is something that the lumbermen need, something that the country needs. I would like to see this meeting go on record as favoring and fostering the United States Forest Product Laboratory. They can study and work out our problems better than we can do it, they are doing good work, and there are honest, capable men in that work. If they only find one thing in the world, it is worth all the expense of running it. They are finding more than one thing, however, a year, and they are doing things that the lumbermen cannot do. We have not the technical education nor the time, and lots of us have not the money. One mill out of those 25,000 cannot figure out problems for the whole lumber industry. The forest products laboratory is doing that.

There is one item of utilizing what is waste with some mills that may be broadened, and it is one of those few things that the more there is of it, the better it is and the better the price will be, and that is the utilization of small stuff, especially among the hardwood mills, stuff that is used in chairs and tables and largely by the furniture factories. I know that a great many mills have undertaken that, they have gone along a year or two and dropped it, because they could not make it up. There are two reasons why they cannot make it up. One is that they are not particular enough in manufacturing and caring for the stock and curing the stock. Another reason is that they are deficient in their selling organization. As much depends on the selling end as on the manufacturing end. They might manufacture well and still be unable to sell.

I speak from experience, because the mill with which I am connected has increased their cut of lumber from the same timber five per cent. We are cutting 20,000,000 feet a year and putting out more of it, and doing it at a profit. There is a chance for nearly every mill in the country to do that, and the more you widen that, the more you get the people to using it, and if they manufacture properly the better they will think of you. If you start out with the manufacturer and ask him to use this—he will want it for nothing, he may be getting the same material from lumber which costs him $50 a thousand, and yet if you ask him $25 a thousand for it he will think you are robbing him. When he gets to using it and finds that it is as good as the lumber that is costing him $50 a thousand, you will have some argument that will reach him. Do not make any mistake, however, of cutting any of it until you have it sold.

I do not think there is anything more I want to say, except I would like to see this meeting go on record as favoring and fostering the forest products laboratory. (Applause.)

Mr. J. E. Rhodes, of Illinois: Mr. Clark has given what I think to be the views of the lumbermen on this important question. That is a subject which is before the lumbermen of the country constantly and necessarily an important part of the business, the merchandising stock which they produce. They are subject at all times to market conditions and are able to sell only that stock for which there is a demand. That is axiomatic, of course, that they will utilize every portion of the raw material from which any profit whatever can be obtained. I want to amplify what Mr. Odell has said in regard to short lengths, and to call the attention of this committee to the cooperation which the public may give in the further closer utilization of lumber or of forest products. It is customary for the soft wood mills, whose product represents the greater portion of the lumber produced in the country, to sell even lengths and widths only, simply because the public has been educated to ask for eight, ten, twelve, fourteen or sixteen foot lengths or longer, disregarding the odd lengths and the odd widths, the lengths

of lumber being four, six, eight, ten, twelve inches and wider. The necessity of the mills, therefore, to cut even lengths and widths makes a very great loss of splendid material because the public will not use the odd lengths and widths.

Some years ago an effort was made by the sawmills on the Pacific Coast to introduce odd lengths; they tried to secure the cooperation of the retail lumber dealers in order to promote the use of odd lengths. The waste of material in the Pacific Coast mills is necessarily greater than it is in mills in the east, whose market is nearer by, and to which the transportation cost is much less. The average retail lumber dealer, and they market certainly, outside of the lumber consumed for boxes, 75 per cent of the lumber manufactured in the country, handles even lengths only, and he was very generally opposed to endeavoring to market odd lengths because it required more piling room in his yard and entailed a greater expense.

The lumbermen are now giving thought to what we are going to term very soon the new methods of merchandising lumber. With due regard to what the retail dealer has done for us in the past, the lumber manufacturer is growing rapidly to see that he has to reach the consumer through the dealer, if possible, if not directly. Possibly some of those present may have noticed the efforts being made to advertise lumber in various species, and it is for the purpose of reaching the consumer that this has been started. This is just in the beginning, and I apprehend within a year or two—or three, at least—the consumer will be very much more familiar with the possibilities of the lumber business—I mean the consumption of that available—than he is now.

Right now I would like to make an announcement, not for the purpose of advertising, but to exemplify what I am trying to explain. The lumber manufacturers of the country will hold a forest products investigation this spring, to be held in Chicago in the Coliseum and New York in the Grand Central Palace, the whole object of which is to place before the public the very great value that the forest is to mankind, and putting it before the public by such means that they can understand how the different forest material can be utilized. We shall endeavor to install flooring machines, as an illustration. I stand upon a section of hardwood oak floor, and I notice that pieces here are six inches long, some of them twelve inches and longer, and I venture to say that the contractor who built this building did not buy the flooring in that length. He bought it, probably, in ten, twelve, or sixteen foot lengths, and his carpenter cut it up into small lengths. If the truth is conceded it will be acknowledged that the average carpenter will buy it in ten and twelve foot lengths and cut it up into small lengths and put it in between the windows. At this exposition we hope to demonstrate what can be done in the saving of waste in veneerings and other directions as well. It is a question in which we are also soliciting the cooperation of the architects. We find architects have not gotten into connection with the producer of lumber. There is a cooperation between the contractor and the carpenter. The lumber manufacturer saws up his logs into boards, separates them into grades, one, two and three, and says to the contractor, or the architect, "You can take what you can use; you can apply these grades to your own needs." Needless to say, there is a wide gulf between the architect and the manufacturer, and we are soliciting the cooperation of the architects in order that they may show us how we can saw up our raw material to meet his particular requirements, and not put the lumber in a pile and tell him to take what he can use and leave the rest.

There are other agencies than the architects who can give us much information on this score. The public must come to see, and I think it is rapidly coming to see, that the lumberman is utilizing every portion of the raw material for which a profit can be obtained, and he always has.

Mr. F. S. Underhill, of Pennsylvania: Mr. Chairman, I have been very much interested in the discussion, particularly with the report of Mr. Clark, which

strikes me as being practical. It seems to me that the problem of utilization and of waste is looked at, to a large extent, from the particular position in which we may be located. Somebody in the East, where the timber has all been cut off, and where there are only small tracts, looks at it from the point of view of a tract of land where there is very little left, and somebody from the great Southwest, where there are tremendous tracts of lumber, looks at it from the standpoint of one interested in a large lumbering operation. The matter of waste in connection with a tract of timber has two aspects, to my mind. What seems to be waste in the lumber industry is not always economical—that is, absolutely positive economy. In other words, for a lumberman to undertake to place some products of the log on the market is, perhaps, economizing wood, but it is wasting labor, it is wasting the energy of man when he cannot put on the market, as Mr. Clark has emphasized at a price that will enable him to refund himself for his expenditure. The real estate men have an idea that is a very good one, and that is, buy real estate and sell location, and this matter of the utilization of waste, as has been brought out this afternoon is partly a matter of location. The utilization of waste in the lumber forests of Pennsylvania was solved some time ago and the producers of lumber in Pennsylvania found utilization for almost everything that the log produced. The men who are manufacturing long-leaf pine in the South would like to have that problem of distillation of turpentine solved, so that they could get it out of their slabs. I was interested in a lumbering operation which emphasizes the fact that it is a matter of viewpoint, to some extent, where we looked at that very problem. We were cutting from 20 to 25,000 feet of lumber a day, and we saw the slabs piling up around our mill, endangering the mill and the whole village in which the people dwelt and determined that they must either be burned up or they might burn down the town. We saw that there was beautiful wood in it, we saw that there was beautiful sap in it, we saw there were possibilities of turpentine, but when we began to investigate what it would cost to institute a plant and put on the market the products of those slabs, in the way of turpentine, we found we would be, at the end of our experience, in that region as lumbermen, thousands and thousands of dollars out of pocket because we would not get out of it what we attempted to put into it.

Mr. S. B. Elliott, of Pennsylvania: I rise for two purposes, one, to congratulate the audience upon the admirable address of Mr. Clark, which was the most clear, direct, accurate statement of the case and conditions that I have ever heard. I have been a practical lumberman all my life, and I know something of what he has been talking about. He presented a condition of things which is likely to exist in a greater or less degree until the price of lumber in the market should be equal to what it costs to grow it from the tree, and that is an event which is certain to occur in this country. The other point is that there are many and many people who are honest and sincere advocates of forestry, and the burden of their song is the condemnation of the lumbermen because the waste is still going on. I say to you, the lumbermen will not waste anything if he can get a market for it, nothing at all. You can lead a horse to water, but you cannot make him drink. You may cut out the stuff, as you think it should be cut; you can try to sell it in the market, and you will find they will not take it. A few years ago I was in Europe, and I saw the black forest where they were cutting everything clean, not leaving the bushes. The brush was tied up like bundles of wheat, and then they let the peasants go on the ground and dig out the stumps, and I understand they even sold them. Now, the American lumberman will do that thing: he will sell you the brush, the bark and the stump, and if you want it he will sell you the hole the stump came out of. (Laughter.)

Other gentlemen who participated in the discussion were:

Dr. Hugh P. Baker, of New York.

Prof. Nelson C. Brown, of New York.

Mr. W. L. Sykes, of New York.

FIRE PREVENTION BY STATES, BY THE FEDERAL GOVERNMENT AND BY PRIVATE INTERESTS

By the Sub-Committee on Forest Fires.

Chairman, C. S. Chapman, Portland, Ore.

D. P. Simmons, Seattle, Wash.
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J. S. Holmes, Chapel Hill, N. C.
Coert DuBois, San Francisco, Cal.

Presented by Mr. C. S. Chapman, Tuesday afternoon, November 18, 1913.

SYNOPSIS

NO phase of forest work has been so actively taken up or has made such marked progress as that of forest fire prevention, during the past ten years.

Though forest fires have occurred ever since there were forests, not until the national forests were created and stumpage on privately owned land became valuable, was there real effort to prevent destruction of timber by fire.

There are now ten patrolmen employed where there was one five years ago, and even yet an insufficient number of men are engaged in the work.

The expenditure for employment of men to patrol the forests of the United States is now counted in millions.

During the past five years there has been an increase of *over 3,000 per cent* in the area of privately owned forest land patrolled against fire; while, in addition to this, 92,000,000 acres of private land has been systematically looked after, and an area of some 187,000,000 acres of timber land patrolled by the Forest Service.

Forest fires in the United States, according to the most conservative estimates since any records were available, have caused an average annual loss of 70 human lives and the destruction of merchantable timber to the amount of $25,000,000.

Forest protection on privately owned lands is most intensively carried on in the Northwest, Lake States, New England, and those States adjacent to New England. In nearly all of these sections timber owners are doing as much or more than the State to preserve the forests. With few exceptions, the character of work performed is of a poorer character where the State alone is responsible for fire prevention than where timber owners and the State are working together to protect the forests.

The Federal Government, taking into account the character of its work throughout the United States, is performing the most effective service along fire protection lines. In the Northwest, however, privately financed associations are expending a greater amount per acre to protect their holdings than is the Federal Forest Service.

The Southern States, each of which have a large area of valuable forest land in private ownership, are still backward in protection work. In this section there is every possibility of successfully keeping out fires at small cost, provided

actual protection effort is accompanied by systematic publicity work, of a kind to change unfavorable to favorable sentiment towards fire prevention.

Every timber State has an unquestioned duty to protect the forests. In none of them are appropriations for this purpose adequate.

While nearly all States have at least some forest laws, many still provide for nothing but fighting fires after they become started, and some have no provision whatever for expenditure of funds to protect the forests.

Forest protection through voluntary warden service has in every instance proven a failure. The multiplication of duties of State officials, such as the provision that game wardens or fish wardens also act as fire wardens, has likewise been far from successful, though often tried out.

To secure the best results members of State Boards of Forestry as well as State Foresters and wardens must be free from political interference.

Publicity work in connection with patrol of timber lands is essential to the highest degree of success. Fire patrol associations have used this means of appealing to the public to a greater degree and more successfully than other agencies.

Experience of the past five years has proven that prevention of fires is far better and more successful than the mere fighting of them after once started. To successfully prevent small fires from becoming large ones, thousands of miles of telephone line and trails have been built, lookout points equipped, and instruments such as heliographs and range finders brought into use.

The plan of co-operative patrol in sections where the State or Federal Government does not take full responsibility for protection has been found far superior to individual effort. Any successful forest protective organization should consist of a detection or fire location force, a patrol force, and a force to apprehend and convict offenders against the law. Strict law enforcement will go far to prevent carelessness, which is the cause of a large percentage of all forest fires.

Railroads still continue to be the greatest single source of forest fires. The past six or seven years has, however, seen a change on their part from one of indifference to the keenest interest in assisting to prevent fires. The more general use of oil as fuel has likewise greatly reduced the number of railroad fires.

The so-called "light burning" theory advocated by certain timber owners in California and adjoining States is especially to be condemned. It is not only impractical from a financial standpoint, but causes destruction of young timber and makes for carelessness with fire on the part of the public.

With present protective machinery perfected, it is believed that fire damage during ordinary years can be practically eliminated, and that in extraordinary years it can be kept down to a small percentage of the board foot stand of a locality. With this reasonably well assured, it is felt that insurance on standing timber can be safely offered.

Thorough co-operation in protection work between the Federal Government, states, and private owners is believed essential to success, and to this end the continuance of the Week's Law appropriation is urged. This financial assistance

offered by the Federal Government to States actually engaged in forest protection, has had a beneficial influence far out of proportion to the amount of money expended.

Part 1.

INTRODUCTION

THE past ten years have seen no phase of forest work so actively taken up as forest fire prevention.

Logically this should be the case, for little would be gained by careful cutting, or the planting of forest crops, if, while this was going on, fires were allowed to burn and ravage our present supply of timber. Started but a few years back by States and private owners in a haphazard, incompetent manner, and by the Federal Government with an insufficient and often incompetent force, having little hope of successfully combating a supposedly unconquerable element, we have now arrived at a point where practical elimination of fire seems physically and economically possible. This statement can be truthfully made, even though existing methods of protection are incomplete and additional fire hazards are created as new forested sections are opened up.

In every State where competent patrols are maintained ten men are now employed where there was one five years ago, and yet in few places is the needed and economically feasible force available. Those important adjuncts to protection—trails and telephone lines—are seldom present in privately owned areas to the extent desirable, though each year brings us nearer to perfection.

Nor have we the required system of tool stations and supply depots, but here, too, progress towards an ideal, which each fire association or other protective agency has in mind, is being made. The various agencies have, in other words, gone far enough to know with reasonable certainty what is needed to give the maximum of protection, and to know that this being given the possibility of disastrous fires can be reduced to a very small percentage.

Although pioneered by the Federal Government, private owners in some sections are now spending considerable more money per acre to prevent fire than the Government. In the main, however, and taking into account the number of States in which work is being done, the Forest Service leads other agencies in fire protection.

The sub-committee on forest fires has collected considerable data regarding fire preventive measures in various States, but to procure complete and accurate information of this kind is a large task, requiring more time than the committeemen could spare during a busy season. However, we are presenting here such information as has been compiled, in the hope that more detailed data can be collected during the coming year. It will also be our aim to present in this report certain essentials to fire protection systems, in the hope that these may be of use to States which are backward in the movement, realizing while doing this that local conditions require local remedies and that no hard-and-fast rules for drafting legislation or perfecting organizations can be slavishly followed.

In commenting upon the work of the various agencies engaged in fire prevention the effect of the "Weeks Law" should not be overlooked. This law, providing as it does for Federal assistance to States in patrolling the headwaters of navigable streams, has had a widespread beneficial influence. The funds expended have stimulated the various States to greater activity, and much young timber heretofore ignored is being kept in such condition that it can develop into a valuable crop. To be effective, forest protection work and forest legislation must not be confined to present-day needs, but must, in some degree at least, look to the future benefits which will result from the efforts of the present generation.

This report will endeavor to deal most thoroughly with those States having much at stake in preventing fire, and it will be its aim, based upon the experience of those who have devoted the most time to study of protection methods, to point out impartially where weakness or strength lies, to the extent of the information available.

BRIEF HISTORY OF FOREST PROTECTION

FOREST Service Bulletin, No. 117, "Forest Fires," contains reference to cases which seem to prove that forest fires have occurred ever since there were forests.

That people residing in wooded districts have had to fight fires and take precautions against being destroyed by them during all past times is evident. But during the pioneer days in our own country the common means of preventing destruction of life and property by fire was to destroy the timber by burning, and, consequently, early efforts were all to prevent destruction of houses and crops at the expense of the timber, and not to protect the timber itself. Efforts looking to forest protection in this country, therefore, date but a few years back, and well within the memory of the present generation.

The first direct and general movement towards forest protection was that looking to the creation of national forests in 1891, and the subsequent action of Congress in 1897, providing for the administration of lands set aside by the President.

That forest destruction was a matter for serious consideration long before the dates above given is seen by the fact in the 10th U. S. Census Report. Prof. C. S. Sargent presented a compilation of statistics covering fire damage in the United States.

In 1891 the Division of Forestry, Department of Agriculture, collected statistics which, though incomplete, showed that during that year 12,000,000 acres of forest land had been burned over.

New York State as early as 1885 enacted a forest law, in which forest fires were given a prominent place, and other States, about this time or soon after, had enacted laws making it a misdemeanor to start forest fires.

In Wisconsin forest fires during October, 1871, are said to have resulted in 1,000 people losing their lives and 3,000 being left homeless.

It is difficult to secure data on early protection work by private owners. Undoubtedly, effort was made by many to prevent fire from destroying their

property at a date prior to that when laws regarding forest fires were enacted by States and work taken up by the Federal Government. Such assumption is unquestionably correct, for, without some more or less active interest in the matter, laws would never have been passed. Lacking organized and systematic action, however, along any line, reliable data is pretty sure to be missing.

In fire protection, as in other matters, action and interest have gone hand in hand with increased realization of the value of the material in question.

When the national forests were put under administration, one of the first matters taken up was a study of means for the elimination of fire damage. This work was not systematized and made effective until 1905, when the care of these lands was placed in the hands of the Department of Agriculture, which at once began and has since been continually demonstrating that fire loss can be largely done away with, if the forces are properly organized and sufficient men are employed.

Except for the past few years, it is difficult to trace the development of fire protection by private owners.

At first some owners began to fight fire when it seriously threatened their property. They then began having camp foremen or ranchers on the lookout for fires, and, if one started, these men were authorized to take necessary measures to put it out. After this came putting on a few patrolmen to watch campers and fishermen, perfection of spark arresters on logging engines, and matters of this kind, and then fairly intensive patrols maintained by private owners, each working individually. Soon it became apparent that fire was no respecter of property lines, and owners in the same watershed began, in many cases, to jointly hire patrolmen. After this came the general co-operative patrol idea, where owners of a whole State or county banded together and put on the necessary patrol. Since this has been done statistics of fire damage have been available.

But the co-operative patrol plan is not applicable in all sections. It works well wherever there is vast timber wealth in the hands of private owners. In some States this is not the condition, and the history and development of fire protection can only be traced through State legislation in the matter. In still other States the national forests contain nearly all of the timber, and private and State effort is little needed. The development of systems of protection has been so gradual that to trace it, giving dates and occurrences, is almost impossible, but its progress may be arranged as follows:

1. General realization that standing timber should be protected against destruction by fire.
2. More systematic agitation of forest protection by the Government, public spirited citizens and organizations.
3. Fighting of fires when particularly dangerous by private owners or States.
4. Creation of national forests and the institution of protective measures on these areas.
5. Unsystematic patrol to prevent fire by individual private owners.
6. Organized and carefully worked out patrols by the Government and by private owners, often with State assistance to the latter, and a careful campaign of public education through the press and other agencies.

So far as known, the first co-operative patrol association was formed in Idaho in 1906. This system worked so well for private owners and lent itself so readily to co-operation with the Federal Government and States that soon similar steps were taken in most of the heavily timbered sections. During all of this time the Federal Government had been perfecting its system of protection as fast as funds would permit.

Through educational work, a lively interest has been aroused during the past five years in securing good State forest laws. Many States have independently taken up the purchase of lands for use as State forests and a number of State institutions have established forest schools.

The development along forest protection lines has been remarkable in its rapidity.

The main problem now in most sections is not to convert people to the need for protection but to work out and perfect the best means of doing the work, and to equitably divide the responsibility for carrying it on as between the State, Federal Government and private owners. In some States this is adjusting itself well and with little friction. In others the reverse is the case.

But with broad-minded men representing each agency there should be no question as to the ultimate outcome since all are striving for the same end.

INFLUENCE OF STATE ASSISTANCE IN FOREST PROTECTION

THE national forests are being protected by the Federal Government under a definite well-outlined policy, while some of the States are assuming the entire responsibility of patrolling and otherwise protecting both private and State timber. While this is entirely proper, in many of the most heavily timbered States, such action will not come for many years, if at all, and consequently the private owner must furnish most of the funds for patrol and fire fighting, leaving to the State the large task of law enforcement and help along other lines, where possible. In many ways such an arrangement gives the best kind of results, provided there is proper harmony between the State and the private owners.

In other States the only effort at protection is being made by property owners. In the most heavily timbered States protection, aside from that carried on by the Federal Government, is a matter for joint action by State and private owners.

Where forest laws are adequate and the State maintains machinery for their enforcement, protection is far better than where it is left entirely to land owners. The reasons for this are obvious. Some owners are careless and, with no laws compelling them to be otherwise, they constitute a hindrance rather than a help to those who desire to protect their property. No small part of good fire protection depends upon rigid enforcement of the law, and, though often tried, it has been as often proven that little headway is made where volunteer forces are responsible for carrying out the provisions of the law.

Again, it is a proven fact that a small expenditure on the part of the State will stimulate activity by private owners. In one heavily timbered State, where

owners had gotten together for protection and formed associations covering part of the territory, great difficulty was experienced in extending the co-operative patrol movement, though where tried it had worked well, and been comparatively inexpensive.

The State Board of Forestry of this State, recognizing the benefits of co-operative organizations, finally offered to combine its efforts with those of owners in any county where a patrol organization was formed, adding their forces to those of the private owners, and thereby reducing expense and the possibility of friction. Within a short time practically all of the State was organized into co-operative patrols, and the plan has worked far better than anyone could have hoped for.

In Oregon a unique law was recently passed compelling every owner of timber to provide patrol for his property. This law in no way reduces the need for State appropriations to carry on protective work, but the effect has been most beneficial, and many sections where little interest was formerly taken are now well protected.

Certainly no one but the State, on lands outside federal jurisdiction, can properly enforce the law and enforcement can be brought about only by paid deputies. Such matters as slash burning, enforcement of laws governing clearing of rights-of-ways along railroads and wagon roads, regulation of railroads as regards setting of fires, enforcing spark-arrester laws and burning permit laws, have in the aggregate an enormous influence on proper fire protection. They can be carried out only with State support. A State's interest in forest protection is so vital that it can well afford to incur considerable expense in maintaining adequate forces to prevent fire, and when this is done private owners usually do their share.

Unquestionably the greatest influence is exerted by the States when they work in close harmony with other protective agencies, giving such agencies the full benefit of their experience and accepting that of others when it serves their needs.

DESTRUCTION OF TIMBER

THE most complete data on destruction of timber and loss of life through forest fires since any records have been available has been collected by the Forest Service, and is excellently presented in Bulletin 117, "Forest Fires." This compilation shows that forest fires in the United States have caused an average annual loss of 70 human lives and the destruction of standing merchantable timber to the amount of at least $25,000,000. This fails to take into account loss of immature timber, crops, dwellings, farm buildings and live stock. Were this information available, the annual losses would be surprisingly greater. The annual losses of timber have been so often commented upon that it is unnecessary to go into detail regarding this matter.

It is well to remember that direct destruction of propertly is not the only serious result of forest fires, but that such fires have a widespread indirect effect upon the community, State and Government where they occur. This fact

accentuates the necessity for Government, States, counties and municipalities taking a live interest in protection work, and the enforcement of laws intended to prevent disastrous loss.

When it is remembered that destruction of timber means a field for labor removed, adds to the possibility of high-priced lumber and fire wood in the near future, and causes an increase in taxes on other classes of property, it is evident that the public has a decided interest in not allowing destruction of forest resources, and can well afford as a public measure to, so far as possible, safeguard the crop. In many sections the farmer is directly interested because of the effect of forest cover on his supply of water for irrigation purposes; while in other cases cities or towns require that the watersheds of streams from which their water supply comes be kept in forest.

In a sense less important than the influences mentioned, but still a most important function of forests, is the protection and shelter they afford wild animals and fish, and the influence they have on the tourist traffic of a community.

It is an undisputed fact that since systematic prevention methods have been put in operation by the Federal Government, States, and private owners, loss through fire has been greatly reduced. Educational work has also played an enormous part in preventing the needless starting of forest fires.

A great fire to-day would be considered a calamity even though no lives were lost. The Miramichi, Chisholm and Hickley fires, while doing great damage to timber, caused necessarily the greatest concern because human lives were lost. The destructive fires of 1910 saw a fuller appreciation by the country at large of the enormous loss of standing timber, though loss of life was also appalling. With present preventive measures and means for quick detection of fires, the possibility of losses such as have been sustained in the past are greatly reduced, though not entirely eliminated.

It is a matter of interest to note that in sections where fires can be most easily eliminated here even the little effort required to prevent them is not generally taken. Where danger is great and the cost of protection correspondingly high, the best and most efficient work is carried on. The yellow pine regions of both the South and West have been the last to install fire patrols, and in most cases have not yet taken such action. Here protective measures have every chance of being successful at small cost.

In but few cases have States taken the lead in bringing about better regulations of the fire menace. When State assistance and support in the work has been forthcoming, it has been necessary, as a rule, for public-spirited citizens and timber owners to spur the State to action, and often the necessary steps have been taken with reluctance.

CO-OPERATIVE VS. INDIVIDUAL CONTROL.

THE replies received by the sub-committee from different sections of the country, in answer to the question, "What is your opinion as to the efficiency of co-operative versus individual patrol?" were almost unanimously in favor of co-operative patrol.

The first co-operative patrol, so far as our information goes, was organized

in the Pan-handle of Idaho in 1906. Since that date the movement has spread all over the Pacific Northwest and into the Lake States, New England, and Canada.

With the recognition of the principle that patrol to prevent fire was far better than fighting fires already under way, the employment of patrolmen by timber owners became not uncommon and, once started, these private patrols increased in number and effectiveness from year to year. Timber owners soon found, however, that they could often combine with each other and put on men to cover a given watershed or township, and that failure to do this resulted in several men going over the same ground, an unnecessary and expensive operation. Some few owners took advantage of the fact that other timbermen had to patrol their lands in looking after their own and, by failing to do their share, escaped expense. This often led to hard feeling and unpleasantness and hindered the general movement.

From individual and small joint patrols it was but a step to the larger, co-operative patrols covering a State, county, or district. In many cases owners adjacent to national forests found it advisable to co-operate with the Forest Service, and are still doing this. The co-operative patrols, when once started, proved to have many advantages over individual effort. The few owners who felt that they could get better results than an association because they were more directly interested, soon found that the advantages, financially and otherwise, of co-operative patrol made it to their advantage to affiliate with a forest fire association. Some owners still maintain their own patrols, but the number is each year becoming smaller.

Co-operative patrols, which are now running successfully, have not reached this point without some opposition and much annoyance. One of the hardest obstacles to overcome, particularly in the Northwest, was the opposition of local representatives of Eastern owners. Some of these representatives felt that part of their usefulness to their principals would be done away with if the patrol management was taken out of their hands. By misrepresenting the condition of affairs to the owners whose ear they had, much needed acreage was for a time kept from affiliating with fire patrol associations, often resulting in defeating the formation of a patrol organization in a section.

Early in fire protection work it was found that settlers, campers and pleasure-seekers in the timber often resented being told by employees of timber companies when they could or could not burn, or what should be done to prevent spread of fire. Forest fire associations, however, which are generally recognized as public good organizations and employees, have experienced little opposition of this nature. They invariably have the support of the press and of other public good organizations.

The fact which perhaps appeals most strongly to timber owners is that forest fires are no respecter of persons, and property lines do not stop them, and hence that concerted action in protection is the only safeguard. A patrol is as strong as its weakest point. It is not sufficient that part of a township or county be patrolled; it must all be looked after, or none of the property in it is safe.

Under an individual patrol system there will be many gaps where no protection is given. From the start, patrol associations have assumed the care of all of the land within their exterior boundaries, unless the individual owner of some property had on his own patrolmen. If owners refuse to pay their share, they get their lands looked after free, and at the expense of the other owners. Few people care to be put in this position and generally join the patrol or put on a man of their own. An owner may be willing to let some particular company look after his property and refuse to reimburse the company for its work. But when practically all of the owners in a county join together few individuals care to have it said and known by this large aggregation of holders that he accepts something for nothing.

The summarized advantages of co-operative patrol are:

1. It makes for better public sentiment, and as an organization, owners of property can request legislation and State assistance which could not be extended to individual owners.
2. It centralizes responsibility, and does away with delays in fire fighting resulting from differences of opinions as to responsibility.
3. It makes possible closer supervision of wardens, for with a considerable number in the field the services of an absolutely responsible high-grade head man can be retained.
4. It does away with duplication of effort and systematizes the work, thus cutting down expenses and at the same time increasing efficiency.
5. It makes co-operation with the Government and State easier and more effective, because of the fact that all owners who are members of a patrol association are a unit for co-operative purposes. It also makes it possible for the Government and States to extend help which could not be given to individuals because of the possibility that charges of favoritism or discrimination would be made.
6. In trail and telephone construction, purchase of tools, maintenance of tool caches and pack trains, boats and other equipment, and establishing and equipping of lookout points, the needs of the whole territory can be served cheaper and better than if each owner had to individually furnish all of these things for his own particular benefit.
7. By paying all costs for patrol, fire fighting and equipment from one general fund raised on acreage assessments, no individual is liable to heavy expense in any one year, even though a serious fire occurs on his land, and this acts, in a measure, as mutual insurance.
8. By systematically soliciting membership, both large and small owners can usually be induced to join a patrol association, and thereby strengthen the work of protection both morally and financially. Under a system of individual patrols, small owners in many cases fail to stand their just share of expense.

The following expressions of men eminently fitted to judge of the relative merits of patrol systems are of interest:

GEO. S. LONG, Tacoma, Washington,
President, Washington Forest Fire Association.

"A man may look after his little tract of one, two, or three hundred acres successfully up to a certain point. The trouble is that two miles, five miles, ten miles, or fifty miles away a fire may start and wipe him out.

Here is the necessity for protection of timber at all points, which can be accomplished with a greater degree of efficiency and more economically by co-operation. There is no such thing as ample protection unless every man is protected. You have to put out your neighbor's fires to protect your own timber. Community co-operation is essential to anything like universal fire protection."

A. W. LAIRD, Potlatch, Idaho.
President, Northern Idaho Forestry Association.

"In Idaho the private timber owners, the State administration, and the people at large believe in the protection of their forests from fire, and to-day there is probably no locality in the world—not even excepting Germany—where this branch of conservation is so efficiently handled as in the timbered section of northern Idaho, covered by our four local fire associations.

To state this a little differently, let me say that, at an operating cost of $47,000, we protected $45,000,000 worth of property from fire, with an outright loss of $300 worth of timber and damage in the fire-killed timber of $1,400. A large proportion of the latter will be saved by cutting within a year or two."

C. W. JUNGBERG, Helena, Montana.
State Forester of Montana.

"The above facts fully demonstrate that an effective fire patrol, such as was maintained by our association this season, will fully repay us, and is cheap insurance on timber. Speaking for the State of Montana, of State and school lands, I fully realize the good that has been accomplished by this association. Our assessment was only $343.61 on 67,721 acres of land, representing a value of $1,340,000. Rather cheap insurance, is it not? While this association is only in its infancy, yet it is bound to grow if proper interest is taken by those who have most at stake."

A. P. SPRAGUE, Portland, Oregon,
When President, Oregon Forest Fire Association.

"What we want here in Oregon is a thorough patrol of all the timber lands, but we do not need a federal, a State, and a private patrolman, or several private patrolmen, in the employ of different companies, going over the same territory. To do away with this condition, which exists in some sections, is one of our tasks before another fire season arrives. Probably the most simple solution of the matter is the formation of co-operative county or district patrol associations, these under the management of timber owners and co-operating with the State and Federal Government in such a manner as to prevent overlapping of territory and consequent duplication of effort. Such associations, where they have been tried in the State, have shown excellent results; have decreased the cost of patrol while increasing its efficiency; have made for better public sentiment and secured a greater measure of consideration from county and State officials. There are numerous practical reasons why live local organizations are best equipped for the work; first amongst them I should place the stimulation of greater public interest, and a more thorough detail knowledge of local conditions and the most plausible method of bringing the work to the notice of the greatest number."

F. A. ELLIOTT, Salem, Oregon.
State Forester of Oregon.

"The fire patrol associations have proven their worth beyond a doubt. A compilation of data concerning expenses connected with fire patrol and fire fighting during the past season shows that the cost per acre for this service on an area of 954,000 acres included within the boundaries of patrol associations did not exceed one and one-half cents per acre, while 32 timber owners not members of the associations and representing 874,000 acres, paid on an average of four cents per acre. That the service on the individually patrolled areas was less effective is clearly shown by the fact that the associations reported a loss of only 685,000 feet stumpage, while timber to the extent of 3,110,000 feet, board measure, was destroyed on the lands of the 32 owners not members of associations."

E. T. ALLEN, Portland, Oregon.
Forester, Western Forestry and Conservation Association.

"One of the first lessons learned from the establishment of private patrol in the west was that both efficiency and economy are obtained by co-operation between owners. Obviously, if one patrolman can cover the holdings of several, it is foolish for each to hire a man. If a fire threatens several tracts, it is better to share the expense of labor hired to put it out. The same is true of building trails, buying tool supplies, etc."

Co-operative patrol is also unqualifiedly endorsed by:

H. S. Graves, U. S. Forester, Washington, D. C.
Coert Du Bois, District Forester, San Francisco, Calif.
Capt. J. B. White, Kansas City, Mo.
Chas. Lathrop Pack, Lakewood, New Jersey.
A. L. Flewelling, Pres. Western Forestry and Conservation Association, Spokane, Wash.
H. R. McMillan, Chief Forester, British Columbia.
Henry Turrish, Duluth, Minn.
Henry Koster, San Francisco, Calif.
J. L. Washburn, Duluth, Minn.
A. W. Cooper, Western Pine Manufacturers' Association, Spokane, Wash.
J. E. Rhodes, National Lumber Manufacturers' Association, Chicago, Ill.
Thos. B. Wyman, Northern Forest Protective Association, Munsing, Mich.
Thornton A. Green, Ontanogan, Mich.
W. R. Brown, Berlin, N. H.
Geo. M. Cornwall, Editor, *The Timberman,* Portland, Oregon.
F. C. Knapp, P. O. Drawer 750, Portland, Ore.

Many others from all sections of the United States where timber lands are held in private ownership have expressed themselves as favoring the extension of co-operative patrols to their localities. Where once established, co-operative patrols have never been abandoned for individual effort.

PUBLICITY MEASURES IN FOREST PROTECTION

THERE are distinctly two branches of publicity or educational work in use by those engaged in forest protection, both of which are of immense importance.

1. The education of hunters, fishermen, campers, loggers and ranchers, through the medium of rangers or patrolmen who come in contact with these people.

2. Education of the general public, and of county and town officials, through circulation of printed matter, talks at public gatherings, motion picture films, newspaper items, advertisements in papers, booklets which reach the desired class of people, and by posting notices in conspicuous places.

No patrol or fire fighting organization can hope to get the maximum of results unless public sentiment is favorable to the work being performed. Opposition to forest protection, now practically eliminated, has been mainly from two sources:—

(*a*) People who thought their personal rights were being interfered with, through laws and regulations requiring them to be careful with fire and prohibiting burning when certain conditions existed.

(*b*) Those who thought efforts to prevent fire would be futile and that money expended to this end was thrown away.

While many minor matters in method of work brought opposition, the main adverse criticism can be largely traced to these two sources.

Echoes of discontent on the part of those who think their personal liberties are being abridged are occasionally heard at legislative times, and generally originate from ranchers who feel they should be allowed to burn their slashings whenever they see fit, without regard for the safety of other people's property. At this time, however, the rights of adjoining property owners are generally recognized.

The second criticism has been thoroughly answered by the government and the private patrols controlling fires, even though handicapped with forces far too small to adequately do the work.

A great deal of good can be done by field men employed by a fire protection agency, aside from their active work of discovering and putting out fires. It has been the policy of the Federal Government, many States, and most private organizations to have their rangers cultivate the acquaintance of the people in the territory they cover. By doing this they not only establish personal relations, but are able to explain what the fire laws are intended for, and what the patrol organizations are trying to accomplish. By helping ranchers with their burning when possible, and letting residents know that their object is not to hinder but help the development of the country, wardens can usually secure the confidence and support of the people, who in turn can be of great service in preventing fire.

The general policy with regard to treatment of campers, hunters, and fishermen is also to be courteous and helpful to them. By giving them accurate

information as to the best camping, fishing and hunting grounds their support is usually secured and many people taking their vacations in the mountains return with a high regard and respect for the work being performed by the fire patrolmen.

In case of emergency and as a strict business proposition a patrolman should know every resident in his territory, and while getting acquainted he can carry the gospel of fire prevention.

Publicity or educational work as carried on through circulation of literature has proven of wonderful benefit. In any section where forest fire associations, the Federal Government, or the States are maintaining patrols, every road and trail is thoroughly posted with fire-warning notices.

From using only notices quoting the laws, the custom has now grown up of using posters containing a short catch sentence regarding fire hazard, pictorial posters, popular appeals to campers and hunters, and in fact, any kind of notices which will catch the eye and be read. It has been generally found that to keep people reading fire-warning notices, at least, some new ones should be gotten out each year.

Pamphlets distributed among school children calling attention to the value of the forest crop are very valuable from an educational standpoint. If the younger generation can be brought up with the need for forestry and forest protection thoroughly implanted in their minds, protection in the future will be made infinitely easier than it is today. Similarly printed material made to appeal to the general public is now in many sections widely distributed just before the fire season. Such literature is found in hotels, farm houses, court houses, garages, etc.

Fire-warning notices in telephone books, railroad folders, county fair bulletins, commercial club literature and places of this kind have large circulation and probably more effect than most people realize.

One very effective means of calling attention to the need for care with fire is to have rangers distribute safety matches, on the boxes of which is a request that the recipient use every precaution to see that no fires start.

The press has always been most active in helping fire prevention by lending its pages to any matters which have news value. Some of the associations make it a point to send to all papers in their territory weekly or periodic bulletins on the fire situation, what is being done along protection lines, and matters of this nature.

Several years ago the Forest Service interested the clergy of Oregon and Washington in protection work, and many sermons were preached on the benefits from protecting a valuable resource against needless destruction. The effect of bringing attention to the matter through such a medium was very far reaching.

Numerous other ways of bringing the importance of protection before the public might be mentioned such as motion picture films of fire fighting, special magazine articles describing the work of State, Federal and private protection agencies, lectures before granges and educators, the use of stickers on envelopes. and stamps on pay checks. It is, however, sufficient to say that in carrying on

an educational campaign every available means of getting facts before the public in a striking manner which will appeal to them must be utilized. The work is not so different from commercial advertising. The main thing is to decide on a definite campaign and stick to it. Although its benefits are not measurable in dollars and cents, probably no single line of effort has done more to prevent fires than well-directed publicity. Long papers or bulletins on the subject are of little use for the average person who has to be reached. Popular catchy advertising is necessary.

The importance of having forest protection touched upon in the public schools of timber States, and of doing everything possible to properly educate the children in forest matters, is considered of paramount importance, for the effect such procedure will have on the future of the work.

FIRE FIGHTING TOOLS AND DEVICES

DIFFERENT sections of the country of necessity use different means for fighting fires which have become started. Certain standard tools are used in all sections, but particular devices are sometimes of great benefit and when they can be used save many times their purchase price in a few hours.

In considering tools for fire fighting purposes it must be remembered that forest fires are of two general classes; top fires and ground fires. A top fire which as the name indicates travels through the crowns of the trees and such fires are confined to coniferous forests. Ground fires run in the duff and logs which have accumulated on the ground. Top fires can seldom be successfully fought until they come down to the ground which generally happens at night or when the velocity of the wind slackens. Consequently fires are nearly always fought on the ground.

The ordinary means of fighting fires is by trenching, whipping out the fire with brush or wet sacks, back firing or a combination of all of these methods. In some cases water or chemicals can be used in fighting fires. Generally speaking, tools or devices for fire fighting are designed to work on a particular kind of ground as determined by the character of the forests, or when intended for actually extinguishing fires by application to the flames the apparatus is such that it can be transported into rough and inaccessible territory without too great difficulty. Where the country is level and well supplied with roads, tank wagons are used, and similar tanks to be transported on pack horses are useful where it is possible to get through the timber with horses even though no trails exist.

The most common tools and the ones which should always be on hand, are the shovel, axe, mattock, saw, and cant hook. In some places the soil is such that the hoe and rake are the most serviceable tools. A light grub hoe is often better than a mattock where there are few roots and rocks. A plentiful supply of buckets and water bags should be on hand wherever there is possibility of getting water.

In some sections wagons fully equipped with tools and cooking utensils are kept at stragetic points for instant use in case of fire. Some fire protective agencies maintain pack trains for transporting tools and supplies to a fire. Such

supplies are generally maintained for a limited number of men only, since in case of a large fire requiring 40 or 50 men to fight it, tools can be transported to the fire when the men are sent in. Large central supply depots must be maintained for this purpose.

In certain sections it has been found advisable to keep food supplies for use of fire fighters stored at different points in the territory. Another plan used by the Forest Service is that of having available at ranger headquarters a number of standard packs, containing food for a certain number of days. In case of fire a man can at once take such a pack and go to the fire. Should he be kept there for a long time further supplies are sent in.

In open country, fairly free from rock, the plow as a trenching tool is most valuable. A member of the Forest Service has invented a collapsible plow which can, if necessary, be packed on a horse. Dynamite for trenching in front of a fire has also been used to advantage.

Numerous other tools and devices such as shields for use of fire fighters when whipping out a fire, chemical engines, gasoline engines for pumping water from a stream, etc., might be mentioned. In each section devices to meet the peculiar needs of the section have been put into use and each year sees some new plan advanced for assisting in controlling fires. In order that advantage can be taken of all new ideas advanced there should be thorough exchange of ideas and information between fire protection agencies in all sections of the country. A plan for a national clearing house for such ideas should meet with the approval of all engaged in protection work.

TIMBER LAND PATROL

IN the report of the National Conservation Commission, February, 1909, the following statement appears in discussing protection of privately owned forest land:

"On probably not more than one per cent of the 450,000,000 acres of forest land in private ownership in the United States is there a system of fire protection, in which the object sought, and for the most part accomplished, is the prevention of fires rather than the mere control after the fires have actually begun."

Data are not now available on which to state definitely what proportion of the land in private ownership is patrolled with a view to preventing fires. Incomplete data, however, show that there is today such patrol covering some 92,000,000 acres, or over 30 per cent of the total timbered area in private ownership, if the large acreage of holdings in woodlots is not taken into account.

Woodlot areas for the most part need no patrol because the owner or his agent usually reside on the land. Patrol has been most largely taken up in the Pacific Northwest, New England and the Lake States. Were proper protection given in the Southern States, which have a large timbered area, the percentage of lands being patrolled, other than Government holdings, would be much greater than can now be reported. Present data, however, shows that in fire years there has been an increase of some 3,000 per cent in the area of timber land being protected against fire.

SPARK ARRESTERS

SUFFICIENT information to intelligently discuss the merits or demerits of the various spark arresters in use and to recommend any particular type is not available, and should be a matter for future reports.

In general it is safe to say that no arrester has yet been invented which absolutely precludes the escape of sparks. Cases are legion where fires have been started by engines equipped with the best arresters obtainable. Even oil burners have been responsible for the starting of fires.

Unquestionably the improved patent arresters are far better than the screens and other contrivances so largely used a few years back. An arrester is seldom equally good for donkey engines or locomotives. Master mechanics of various railroads have endeavored to construct devices which combine buffers and screens so as not to interfere with the draught and at the same time effectually prevent the escape of sparks. There are several devices, which, if properly kept up, would quite fully meet these ends. It is difficult, however, to keep the arresters on operating engines in the best working condition.

Since each year sees improvement in spark arresters it is possible that one may yet be devised which will be entirely satisfactory.

RAILROADS AND FIRE PROTECTION

RAILROADS continue to be the greatest single cause of forest fires. For many years, apparently, but little attempt was made by railroad officials to prevent the destruction of timber along their rights-of-way. Being absorbed with operating difficulties, any suggestion which interfered with cheap transportation did not meet with favorable consideration. However, as timber became more valuable damage suits to recover for fire losses were frequent and expensive, and the matter of preventing loss became necessary. Furthermore, lumber in many sections furnishes a large percentage of the freight hauled, and it is now realized that burning up timber means a direct loss to the railroads in freight receipts.

For these reasons, as well as the fact that railroad officials no more than any other class of people desire to cause unnecessary waste, conditions regarding railroad fires gradually began to improve. The more general use of oil-burning locomotives the past few years has been a great factor in reducing railroad fires. This use was not brought about primarily to prevent fires, but some roads have been influenced in substituting oil for coal because of the smaller likelihood of fires starting when such equipment is used.

Better spark arresters and more systematic inspection of them, greater care with ash-pans, instructions to section foremen to put out fires and to train crews to report them, are among the things which have been done to prevent the starting of fires. Such precautions have resulted in a marked reduction in fires along most lines.

Some lines are clearing all inflammable debris from along their rights-of-way and keeping these strips clear of such material from year to year. In other sections a fire line some distance back from the track on either side is made and

the intervening space carefully burned over. A number of States have passed stringent laws governing prevention of fire through the operation of railroads, even going so far as to require such roads to follow trains with a patrol when passing through wooded sections.

The steps taken by passenger lines and laws governing them apply equally to logging railroads.

It is sufficient to say that for the most part railroad companies are making a real effort to prevent fires and to co-operate with those agencies seeking to prevent destruction of timber through fire. It is seldom amiss, however, for States to provide, by law, that proper precautions be taken by common carriers to prevent starting of fires.

PROTECTION SYSTEMS

METHODS of protection have been referred to throughout this report. In general whether carried on by the Federal Government, States, or private owners, they can be classed under two heads:—(*a*) Protection through patrol, with a view to preventing fires from starting, combined with machinery for fighting fires which do start. (*b*) Machinery for fighting fires when they start, with little attempt at patrol to prevent fires.

The second of these is no longer recognized as in any sense adequate, and though better than no fire prevention effort, is only in vogue in States with antiquated forest laws and small realization of the need for safeguarding the forest crop.

Protection through patrol is generally recognized as the only means for insuring against serious loss of timber by fire.

An adequate protection system must comprise a fire detection or location force, a patrol force, and a force for apprehending and convicting violators of the forest laws.

The lookout or fire detection force must be supported by a strong patrol to make it effective, and the patrol force is in turn largely dependent upon the fire detection force to catch any fire immediately after it starts. In many cases the patrol force can enforce the law and secure necessary evidence to convict offenders. In special cases, however, men particularly fitted to carry on such work should be available.

LOOKOUTS

THE Forest Service throughout the National Forest area is as rapidly as possible installing a chain of completely equipped lookout stations. Sometimes these can be located on high bald points giving a view over a large scope of country. In other cases steel or wooden towers must be built to allow of seeing over the tree tops. Private associations and States are fast installing similar systems for detecting fires.

The equipment needed for such a station is (*a*) telephone communication with patrolmen and the headquarters of the protection unit; (*b*) a good map of the country and some device for getting an accurate bearing on the fire (numerous

means for doing this are in use); (*c*) field glasses; (*d*) living quarters for the watchman.

In some localities, where the building of telephone lines is difficult and atmospheric conditions are favorable, the heliograph has been successfully used for sending word of the location of a fire.

To give the best results, at least two lookouts should be able to see a fire. By each taking the proper bearings and reporting them, it is possible to locate the fire by the intersection of these bearings. In many instances fires have been very successfully located in this manner. The value of lookouts may be temporarily impaired by the country filling up with smoke and so limiting the range of vision.

PATROL

THE section of country to be patrolled is usually divided into districts, and a patrolman put in charge of each such area. The patrolman may be able to use a saddle horse, motorcycle, or buggy, in getting over his territory, or have to go on foot, depending upon whether or not roads and trails are numerous and kept in good repair. The character of country, probability of fires becoming started, density of population and means of convenience used in traveling, must determine the area a patrolman can cover adequately. During dangerous times a patrolman should cover his territory every day although this may not be necessary the entire season.

One or more head wardens, according to the area being looked after, should be in charge of the district patrolmen.

It is usually best to start the season with a skeleton force, increasing the number of men employed as conditions warrant. Patrolmen, in addition to keeping on the lookout for fires and putting out incipient ones, should become acquainted with all the residents of his district, keep track of all transients in his territory, and know exactly who can be called upon in case of fire. In some sections patrolmen have been able to successfully organize fire brigades among residents for emergency fire-fighting. Patrolmen usually have to be paid at a higher rate than day-laborers because their duties require tact and executive ability. The pay of such men varies from $60.00 to $100.00 per month. Head wardens are paid from $75.00 to $150.00 per month and expenses.

TRAILS

ONE of the most important adjuncts to fire protection is a complete system of trails. It has often happened that work on a fire is delayed for many hours because of the difficulty of getting in men and supplies. Recognizing this the Forest Service in the national forests has been working toward a complete trail system as rapidly as possible, and up to 1912 some 13,500 miles of trail had been constructed with national forests. Although carried on less systematically, thousands of miles of trail have been built by States and private timber owners.

It is, of course, impossible to have trails reaching each legal subdivision of property, but each protective agency should work out for its territory a system of trails which will make it possible for rangers to get over their districts, and for tools and supplies to be transported to within reasonable distance of places where fires are apt to occur.

TELEPHONE LINES

NEXT to trails, telephone lines have probably been of greatest assistance in patrol and fire-fighting work. Thousands of miles of line belonging to telephone companies, farmers and logging companies are used by protection agencies. The Federal Government has built and maintains over 12,000 miles of telephone line, while forest fire associations own several thousand miles of such line. A well organized patrol should have not only its lookouts, but all of its patrolmen accessible through telephone communication. Often ranchers and other residents of a ranger's district will notify him of fires if this can be done by telephone. For the most part telephone lines are built on trees, thus greatly reducing the cost of construction.

The possibility of using the wireless telegraph and telephone in connection with fire prevention, is being discussed. Unquestionably, if either could be suited to the needs of the work, it would be a big step forward.

INSURANCE ON STANDING TIMBER

THIS is a subject which has received little serious consideration, though its possibilities have been investigated to a limited extent. With the better protection being afforded each year, it is reasonable to suppose that insurance, in some form, may soon be offered owners of stumpage.

One drawback which has existed is lack of reliable data extending over a number of years, of the actual money loss through forest fires. Such data have been carefully compiled for a number of States covering the past five or more years, and would serve as a basis on which to figure risk.

Another thing that has probably retarded the offering of insurance on this class of property, is the fact that periodically we have had extremely bad years with corresponding heavy losses. Unless an insurance company's activities extended over a very wide field, it would be difficult for it to meet the losses of an unusually serious fire season. Still another drawback to insurance on standing timber is the constantly changing risk. Through establishment of logging works, extension of a railroad, or the opening up of other means of communication through a tract of timber, a good risk may, in one year, be converted into a questionable one. Then, again, the difficulty of determining the value of a piece of property, and the corresponding difficulty of checking up the degree of protection given it, all work to make people reluctant to offer insurance on standing timber.

With the perfection of patrol systems it is confidently believed that fire loss will be kept within reasonable figures even during bad years, and that in ordinary years it will be practically eliminated. Statements of fire losses in States main-

taining good protection systems now bear this out. Furthermore, by requiring an owner to have his land patrolled by a regularly organized patrol association, an insuring company would be relieved, to a large degree, of the necessity of keeping track of an owner's protective effort.

It has been suggested that insuring companies charge a rate which would enable them to maintain the necessary protective force. This is not considered feasible, and is not in line with what has been done with other classes of property. It has also been suggested that owners in a State or part of a State, band together and carry their own insurance by assessing property at a uniform rate to cover the losses of any individual owner when such a loss occurs. It is not believed that owners could be induced to take any such action because of the money liability involved.

It is not the purpose of this report to go at length into the question of insuring standing timber, but simply to mention it in the hope that it will result in thought being given the subject, and that at a later date its possibilities may be fully considered.

A compilation of fire losses in various States extending over as long a period as possible, and showing the average percentage of loss in various localities, would go far toward getting capital interested in this subject. Unquestionably, if insurance could be had on standing timber it would make it an even better and safer investment than it is, and greater encourage timber production as a crop.

FUTURE WORK FOR A COMMITTEE ON FOREST FIRES

THE Sub-committee on Forest Fires probably realizes more forcibly than any one else that its report falls far short of bringing to light all of the available information on the subject under discussion. The experience of different members of the committee in their endeavor to secure data, has likewise given them a clearer insight into what should be obtained and how to go about it, than those not intimately connected with the work of the committee.

It is the opinion of the committee that the work it has undertaken should be continued, the crop of the work enlarged, and that a more specific and complete report be submitted at some future time.

It is believed that more complete and detailed information on just what is being done by the different States should be collected and tabulated. This should include figures showing as near as possible the extent and value of each State's forest resources for various purposes, and the importance of the lumber industry to the State. The work of all agencies in each State should be carefully analyzed and in the case of each, definite and clean cut recommendations made for improvement where needed. Such a report would of necessity deal with forest fire laws, and so possibly encroach upon the field of another subcommittee, but it seems impossible to segregate the work of the different agencies in a State if all are properly working together.

A much more careful compilation of areas adequately and inadequately protected in each State would be of interest and of value to students of forest protection.

A careful analytical comparison of the administration of forest protection work in several of the States now being best handled would also be of interest and practical benefit to a large number of people.

A definite plan for exchange of information between different agencies, though perhaps not within the province of this committee and possibly already covered in some report, is a matter of utmost importance. Protective agencies have much to learn from each other.

Data regarding, and if possible drawings, of all tools or implements used in fighting fires should be gathered and carefully presented. No one person has intimate knowledge of all such devices and often an implement use in Pennsylvania might be well adapted to Washington or vice versa.

The most complete data available on both sides of the so-called "light burning" theory might also be a subject for future presentation.

Other matters not mentioned or treated in this report could with benefit be later considered, such as planning permanent improvements, the building and proper use of fire lines, and matters of this kind.

However, probably the greatest good could be done along protective lines by the conservation congress and with public service organization, if some practical scheme were devised for spurring to action the legislatures of those States which now take little or no interest in the subject. The object would be to secure better forest laws for these State. Possibly a more thorough presentation of present conditions in such States and the recommendation of definite remedies, would in a measure serve to stimulate the proper officials to action.

Another matter well worthy of careful study is insurance for standing timber. This subject has so far had scant consideration. The perfecting of patrol systems and through these the lessening of risk, makes timber insurance at this time a pertinent matter for discussion.

APPENDIX

FIRE PROTECTION WORK BY STATES

THE following incomplete information regarding what various States are doing to prevent forest fires is presented as an indication of the different methods or lack of methods employed in the work. In some cases recommendations as to what should be done are made, but this was not possible in all cases.

The South, a large district where little work has been undertaken, is treated as a region, followed by a brief statement of each State's activity. It is thought that this presentation may be of value to backward States in determining along what lines their forest work should be undertaken.

Conditions in California are presented at some length for the reason that it is the only one of the Pacific Coast States where little is being done by private owners to protect their property. California being one of our most important timber States should properly have adequate forest laws, but such is not the case. Nor have the private timber owners in that State, with few exceptions, taken the necessary steps to safeguard their own property.

ARIZONA

THE forest fire problem in Arizona is largely a Government one, the timbered area being for the most part within the boundaries of National Forests. To protect Government lands, as in other States, the Forest Service maintains a well organized force of rangers and has built many hundreds of miles of trails and telephone line, to assist in the work.

No action has been taken by the State or by the few large timber owners to keep fire out of their holdings. The Arizona Land Commission has, however, under consideration a co-operative agreement with the Forest Service covering the management of State land within the Coconino National Forest.

That forest fires are destructive in the State is evident from the fact that records of the past five years show an average of about 25,000 acres burned over yearly.

State laws are urgently needed which will make the public using the forested areas for pleasure or business purposes more careful, and require the few large land owners to either independently or through co-operation with the Forest Service protect their property.

CALIFORNIA

The Forest Fire Situation

OUTSIDE of the National Forests, on which the Government maintains a protective organization, the forest fire situation remains practically the same as it was in 1905. This has been pointed out year after year by the Federal and State forest authorities.

The National Forests in California, aggregating approximately 28,000,000 acres of public and private land and containing perhaps one-third of the merchantable forest area of the State, are under a highly organized fire protection system which costs the Government from $136,000 to $250,000 a year to maintain—depending on the severity of the season. This system is in a fair way to reduce fire loss to a reasonable minimum.

What Has Been Done

A few progressive citizens early recognized both the imperative need and the possibility of fire control by organized effort. In a memorial to Congress, dated 1889, three of San Francisco's leading citizens said:

> "If a tithe of the money and energy applied to the abatement of the lesser ill (prosecution of timber thieves) had been brought to bear on the suppression of the greater one, the evil (forest fires) of which we now complain would not have grown to such enormous and appalling proportions."

The citizens of Southern California, where the paramount industry—fruit growing—is absolutely dependent on a supply of water for irrigation *during the summer season,* have long recognized the vital connection between their material prosperity and the maintenance of the cover on their comparatively limited watersheds. Through propaganda issued by the U. S. Forest Service and the

State Forester's office, most ably seconded by the press of California, anti-fire sentiment crystallized and grew into a strong, intelligent, popular approval of the work these two agencies were trying to accomplish.

The intensity and unanimity of this public sentiment grew consistently and steadily from 1886 till the summer of 1910.

Then arose an insidious doctrine called "Light Burning." It was first advocated by one of the largest individual forest land owners in California. The method as advocated by him contemplated filling up burns in the butts of mature trees with rocks and dirt, and then after the first rains in the fall firing the land with the intention of burning up all inflammable debris on the ground. The method as practiced cost 50 cents per acre, and in the opinion of experts did not result in security against fire loss in subsequent dry seasons. This was eagerly taken up by a few other men—also large owners of California timber land. Backed by these men, an article by G. L. Hoxie appeared in the *Sunset Magazine* for August, 1910. Mr. Hoxie's article advocated a still further extension of the method of "light burning," and with much sarcastic comment denounced the method of patrol and immediate suppression practised by the U. S. Forest Service. The general impression left in the minds of readers not thoroughly acquainted with the business of fire protection was, "Fire in the woods is a good thing. Let 'em burn!" This article started a widespread controversy in which the "light burners" were ably supported by the San Francisco *Chronicle*.

Whatever the purpose of the men who started this attack on the only methods of protection for present and future forest crops that have been employed successfully by foresters in all civilized countries since the profession came into existence, the results of the attack were to cloud the issue, to divide the once solidified public opinion, and to increase carelessness with fire in the woods. The Forest Service records show that fires caused by strictly human agencies increased from 443 in 1910 to 515 in 1911 and 606 in 1912.

Owing largely to the publicity work of the Forest Service, the fallacy of the "light burning" theory was slowly but generally seen by the public, and at present California again presents not only a strong sentiment against the forest fire evil but *for* the Forest Service method of attacking it, which results have demonstrated to be the best.

Prior to 1885, public sentiment was strong enough to force some action by the State Legislature. On March 3, 1885, there was approved an Act "to create a State Board of Forestry." The organization consisted of three board members appointed by the Governor, a forester, and a botanist; and $2,500 a year was appropriated for its support. It did good work within the field of its limited authority.

On March 7, 1887, an Act was approved endowing the members of the Board of Forestry and its employees with the powers of peace officers with authority to make arrests for the violation of any law applying to forest or brush lands within the State. Under this law the Board employed agents in the field whose chief duty was to post fire warning notices. No successful prosecutions

were made "for lack of evidence or the insufficiency of the statutory enactments relating thereto." During the two fiscal years of 1889 and 1890 there were spent in salaries of field agents $5,658.60.

Through political influence the board was abolished in 1893.

Following legislative action in 1885 and 1887 and the abolishment of the Board of Forestry in 1893, the legislature lay dormant, so far as the forest fire situation was concerned, until 1903. Then, urged by the California Water and Forest Association, the Sierra Club, and certain public-spirited citizens, it passed an Act empowering the State Board of Examiners to enter into a cooperative contract with the U. S. Forest Service for the purpose of gathering the data on which to formulate a State forest policy.

Work was started under this contract by the Forest Service July 1, 1903, and the completed reports were turned over to the State in the spring of 1907.

Before this, however, the study of forest fires had been completed and a bill embodying the views of the Forest Service and backed by the organizations named, was introduced into the legislature. This bill provided, among other things, for a paid State protective organization. It was opposed by certain interests and as a result a compromise measure—the Act of March 18, 1905,—was passed. This, with a few minor amendments, is California's basic forest law today.

This Act provides for:

An ex-officio State Board of Forestry;
A technically trained State Forester appointed by the Governor, and for his assistants;
Authority for technical advice to land owners;
Publication of forest laws and fire warnings;
Appointment of volunteer fire wardens who receive no pay;
Conferring of powers of peace officers on volunteer firewardens;
The maintenance of preventive fire patrol *when the counties or private landowners will pay for it;*
Vigorous prosecution of offenders by District Attorneys; and
Fines for destroying fire warnings.

Other previous Acts, or Acts passed about the same time, provided for; enforced clearing of slash when a menace to adjacent property; fines for leaving camp fires burning, or allowing fire to escape, using coal or wood burning engines without sparks arresters, or refusing to fight fire when called upon by a warden.

These are the tools that the executive branch of the State Administration has had to work with.

As has been said, the bill, as originally drawn after three years careful study by the Forest Service, provided for the nucleus, at least, of a State protective organization. Before passage, the scope of the measure was changed entirely from affording a working organization for forest protection to establishing an agitation in Sacramento to spur local and individual effort.

The Board of Forestry was organized and a State Forester appointed late in 1905. From then until the present time consistent efforts have been made to secure an organized protection field force through the county organization section

of the Act of March 18, 1905. So far as results, in decrease of area burned annually, are concerned, these efforts have met with consistent failure.

By constant hammering, by attending meetings of the county boards of supervisors and by urging upon them the necessity of fire protection, the State Forester's office had by the fall of 1908 induced 13 counties to employ a total of 128 paid wardens. By 1910 the number of counties spending money for this purpose had decreased to seven. In 1911 ten counties were employing 11 men. During the calendar year 1912 twenty-two counties spent $10,975 for extinguishing fires. The number of paid patrolmen employed is not stated in the State Forester's report.

Meanwhile a new administration had come into power in California. In accordance with its campaign promises, the legislative program included the creation of a Conservation Commission to gather data concerning forestry, irrigation, water-power, minerals, and lands, for the purpose of revising the laws on these subjects. The Act creating the Commission was approved April 8, 1911.

In the course of its work on the fire problem the Commission consulted freely with the U. S. Forest Service, and freely used its advice. In its report submitted to the Governor, January 1, 1913, it said:

> "The Commission's proposed fire bill, if enacted into law, will, the Commission believes, greatly aid in the *prevention* and suppression of forest fires. The State should have a *well organized fire patrol* under the guidance of a practical fire-warden, which is the most effective known manner of *preventing* and suppressing fires. . . .
>
> "States suffering from the results of large and disastrous fires, costing millions of dollars and, in some cases, many lives, are realizing that the prevention of fires is more effective and economical than fighting fires after they are started."

With this report the Commission submitted a bill which had the endorsement of a lumbermen's Forest Protective Association representing perhaps 80% of the privately owned stumpage in the State; of Mr. Gifford Pinchot; of Forester Henry S. Graves, Chief of the U. S. Forest Service; and of various conservation associations in California.

This bill passed and went to Governor Johnson in May, 1913, but the statutory period was allowed to elapse without his signing it—receiving thereby what is known as the "pocket veto." No explanation has been given the California public for the failure of this bill.

In December, 1911, an invitation was issued by the District Forester of the U. S. Forest Service to practically all of the lumbermen in California to meet with the National Forest Supervisors in San Francisco. Over 70 attended, and the question of organization was fully discussed. As a result, both of this meeting and of the public hearings on the proposed fire bill held by the Conservation Commission, the California Forest Protective Association was formed and incorporated March 28, 1912. In July, 1913, its membership included 117 individuals and firms, representing 1,822,193 acres of timber land.

As stated in its articles of incorporation, the purpose of the Association is "the protection of the forest of California, and providing facilities for co-

operation to that end by forest owners, the State of California, and the Government of the United States." Little was done tending directly toward this purpose during the season of 1912, the main efforts of the Association being directed toward securing increased membership.

Later the Association distributed among its members copies of the regular cooperative fire protection agreement offered forest owners by the Forest Service, and urged upon them its advantages. During the last legislative session, the secretary of the Association did signal service toward securing the passage of the conservation commission's forest fire bill.

The Association has not, however, made any decisive effort toward fostering cooperative preventive patrol on the lands of its members, possibly because there is dissension in its ranks as to the proper method—some influential members still holding to the "light burning" theory.

One result of the lumbermen's meeting in San Francisco, in 1909, was the formation of the Redwood Fire and Protective Association, composed of four operating redwood companies in Mendocino County. This Association, while covering a relatively small area, is actively engaged in organized preventive work, maintains a field force, and in addition to patrol has made good progress on a carefully planned fire-line system.

Next to the lumbermen, the citrus fruit growers in Southern California have evinced more substantial interest in fire prevention than all other industries in the State. Their interest has taken form of organized cooperative effort, which, through the Forest Service protection systems on the Angeles, Cleveland, and Santa Barbara Forests, has produced cash results. As an instance, the San Antonio Fruit Exchange after the picking season assesses its members one cent a box on oranges, and as a result holds subject to expenditure under the direction of the Forest Supervisor a sum of $4,000 for employing patrolmen, building fire lines or trails on the watersheds in which its members are interested.

The most delinquent industry in the State is the railroads. One of these has also the largest interests at stake; being the owner of enormous acreage of timber land. Its land department has, apparently, no fire protection policy. In one part of the State its local land agents cooperate quite effectively with the National Forest officers, while in another they do little or nothing. All of the railroads, however, have been more than willing to help in publicity campaigns for educating the public in the necessity for care with fire in the woods.

As a result of the lesson of the recent Tamalpais fire, there has been in process of formation (August 20, 1913) the Mount Tamalpais Protective Association, which proposes to employ a forester and install a protective system throughout southern Marin County.

The Federal Government, through the Forest Service, maintains a protective system on approximately 28,000,000 acres—or one-third of the forest and brush area of California. The system comprises about 850 men in the field during the dry season; 90 lookout stations manned and equipped with fire detecting devices; over 3,000 miles of government-owned 'phone lines and connections with an equal mileage of private lines; patrol stations; tool and supply caches; motor-

cycle and railroad speeders, and mounts for upwards of 750 men. It provides for the organization in advance of the fire season of all available volunteer help —some 10,000 men—and for their quick equipment, transportation, and immediate payment for services. It is highly organized and under strong centralized control. Its cost for maintenance and fire fighting varies from $150,000 to $250,000 per year.

WHAT IS TO BE DONE

OF course a thousand refinements of organization or improvements of method are necessary to perfect the best protection system we have. But these do not need discussion for a State which not only has no protection system but no law authorizing one.

The paid patrolmen of the Forest Service do not actually put out any of the larger fires which occur on the National Forests. They are put out by volunteer help—settlers, mill crews, stock men. The Forest Officers summon them, equip them, organize them into crews, and direct their work in extinguishing fires. The National Forest protective system furnishes the apparatus which turns anti-fire public sentiment into a fire-suppressing machine. In case of fire, each National Forest Guard is a rallying point for the citizens within his patrol division.

But this machine for changing unorganized enthusiasm into extinguished fires exists only over a scant one-third of the forest area of the State. The necessity for it exists to a far greater degree over the other two-thirds. The county firewarden organization has failed, and no forester ever expected the volunteer fire warden system to become an organization.

A striking example of the lack of a rallying point was seen at the Mount Tamalpais fire of July 6-12, 1913.

After the Tamalpais fire the citizens in the affected district immediately began to inquire how they could insure against a recurrence of the disaster. After a study of the laws they were forced to the conclusion that the State of California was impotent to help them, and accordingly they have organized and financed the Tamalpais Fire Association, employed their own forester, and are proceeding to install their own fire prevention and suppression system.

The State needs a system—however small at the start—that will serve to prevent many fires from starting and will suppress many others in their incipiency; that will serve as the framework on which to organize volunteer help to extinguish fires, just as the National Forest protection system does within its field or just as the regular army and the State militia do within theirs.

Such a State system would tie in to the National Forest system on the one hand and offer facilities for organized cooperation with timber land owners on the other. Such a system, backed by the splendid public sentiment which is almost universal throughout California, is essential to further real progress in fire protection in the State. Until a bill similar to the measure recommended to the last legislature by the Conservation Commission is signed by the Governor, discussion of other phases of the fire protection situation is not warranted. The State of California is responsible for the most serious obstacle in the way of reasonable security from fires within her borders.

COLORADO

HAVING a large percentage of its timbered area in National Forests, which are each year better protected against fire loss, the problem of securing State or private assistance in the work does not take on the same importance which must be given this matter in some other States of large private ownership.

Forest fires have, however, caused enormous losses in Colorado, and the subject of forestry and forest protection is an important issue in the State.

A State Conservation Commission was appointed by the Governor in 1908, and largely through the efforts of this commission Colorado's present forest law was enacted, which takes the place of the earlier enactment of 1885 and 1897.

Aside from the excellent work being done by the Forest Service, the State's limited activities along protection lines constitute practically all that is being done to prevent loss of timber through fire.

PRESENT EFFORT IN THE STATE.

The area within the exterior boundaries of the National Forests is 14,761,900 acres. This part of the State receives the best possible protection which limited funds will allow of.

During the past year the State Forester has sought to add the strength of his office to preventing forest fire damage. To this end assistants have been appointed and the active cooperation of county boards of commissioners solicited. In addition to this work a number of special forest fire wardens have been appointed.

To cement the work of the various agencies a definite agreement was entered into during 1912 between the Forest Service and the Colorado State Board of Forestry, with a view to thorough cooperation in forest protection.

Although hampered with a small appropriation, Colorado is making progress in forest protection. Due to the fact that there are no large ownerships of timber land in the State, as well as to the fact that watershed protection is of great importance, it would appear that little financial aid can be asked from owners of property. The State must take upon itself such protection as is needed outside National Forest areas. Mining interests also require protection for their supplies of timber and buildings, and these two great interests—mining, and water for irrigation and domestic use—fully warrant State activity in forest protection.

CONNECTICUT

CONNECTICUT has 1,500,000 acres of timberland, largely in the form of farmer's woodlots. Most of the timber is, at present, of cordwood size and the quantity is conservatively estimated to be about 30,000,000 cords, with an approximate value on the stump of $20,000,000.

Under the provisions of the law passed in 1905, a fire protective system was established and the State Forester became ex-officio State Forest Fire Warden. The selectmen of towns were also authorized to appoint town fire wardens with

the approval of the State fire warden. Each town fire warden is required to divide his town into a sufficient number of districts to secure adequate protection, and to appoint a resident of each district as district fire warden.

Each year, since its establishment, the organization has been improved by appointment of more wardens.

In 1911, the kindling of fires during the dry season without a permit from the fire warden was forbidden by law. At the same time railroad companies were made liable to property holders for damage by fires caused by their locomotives, and in addition were made liable for all expenses incurred in extinguishing such fires.

There has been a limited amount of patrol work performed by the State and towns, and through cooperation with the United States Forest Service, under the provisions of the Weeks law.

Two lookout stations were maintained during 1912, and the results obtained demonstrated the value of this form of protection. Others will be established when funds are available.

IDAHO

IDAHO has a timbered area of 20,000,000 acres, of which approximately 18,000,000 acres are within the exterior boundaries of National Forests, and consequently as well protected against fire as available funds will allow of. The remaining 2,000,000 acres are in private or State ownership, the latter being a large timber owner. Except in parts of southern Idaho, privately owned lands are extremely well protected against fire. No State can boast of better organized or more effective protection than that carried on by the four Idaho Protective Associations.

Idaho, so far as known, was the first State to inaugurate a system of cooperative patrol among timber owners. During 1905, which was an extremely dry year, several bad fires occurred in the Pan-handle district, causing heavy expense to owners of timber. After the fire season the companies who had taken charge of these fires endeavored to adjust the cost of fighting them and naturally the question of future cooperation was discussed. In 1906, Mr. F. A. Blackwell, at the request of F. J. Davies, of Edward Rutledge Timber Company, called a meeting of timber owners at Couer d'Alene to discuss cooperation in protection matters.

As a result of this meeting the Coeur d'Alene Timber Protective Association was organized. The State, being a heavy owner of timber, was asked to join this organization, and though hampered by legal provisions arranged to pay its share of the expense, which it has continued doing since that time.

In 1907 a bill was introduced in the Idaho legislation by Jos. P. Fallon, which became Idaho's first forest law. This law, while providing penalties for setting fires, burning without permit, etc., also by later amendment authorized the State to cooperate with timber owners and pay its proper proportions of patrol and fire fighting expenses on State owned lands. No appropriation was made by the State, the wardens who were given authority under the law to enforce it being paid by timber owners.

Since the formation of the Coeur d'Alene Timber Protective Association three other similar organizations have been formed in northern Idaho, and effectively patrol all of the privately owned and State timber. Through definite cooperative agreements these organizations and the Forest Service work together wherever there are mutual interests. The cost of patrol is usually from 2½c to 4c per acre annually, during bad years sometimes greatly exceeding this amount. Although northern Idaho is probably as well protected as any section of the United States, the burden of all that is done on private lands rests upon the timber owners.

MAINE

MAINE has 14,291,918 acres of wild land with an estimated stand of 50,000,000,000 feet of merchantable timber, valued at approximately $100,000,000.00.

For a century lumbering has been one of the chief industries of the State, and during this time numerous destructive fires have occurred. Not until the last decade has a system of protection in any degree adequate been established.

To the lumbermen of Maine belong the credit of originatitng the mountain lookout station with telephone connection as a means of promptly detecting forest fires. About 1900, several such stations were built by land owners cooperating for this purpose.

In 1901, these stations were taken over by the State Forest Commissioner and an appropriation of $10,000 authorized for fire protection. This amount was increased to $20,000 later, but it was not until 1909 that the present excellent system became effective.

The law of that year, endorsed both by the forest commissioner and timberland owners, established the Maine Forestry District. This is composed of all of the townships and plantations taxed wholly as wild land, and includes about 9,500,000 acres located in eight counties.

A tax of one and one-half mills on the dollar was established as a fixed rate on all lands within this district, and the proceeds, about $70,000, are to be used exclusively for fire protection.

The forest commissioner is empowered to divide this district into subforestry districts as units of management, and to appoint a district warden to be in charge of each. This district warden has under his direction the required number of patrolmen.

In many places the patrol routes have been equipped with telephone lines in order that patrolmen may promptly secure help when needed.

Beginning with the few lookout stations built by the timberland owners prior to the formation of the forestry district, the State department has each year added to the number until, at present, forty-three are in operation. They are equipped with camps and towers where necessary, and with maps, alidades, field glasses and telephone connection. Since 1909, Maine has spent $33,335.66 in the construction of lookout stations and telephone lines and in the employment of watchmen.

In 1911, Maine secured an allotment of $10,000 from the Weeks law co-operative fund, and since that time has every year received a similar amount.

The timberland of the organized towns of the State does not come under the jurisdiction of the Forest Commissioner, consequently little progress toward satisfactory fire protection has been made. To improve this condition, it has been recommended that the protection of these towns be placed in the hands of the Forest Commissioner, and that he be given the power to appoint the local wardens. These suggestions have not so far been carried out.

During dry and dangerous seasons the Forest Commissioner is authorized by the law of 1911 to maintain a patrol along railroad rights-of-way wherever necessary and to collect all expense so incurred from the railroads. Between May 1st and November 10th the railroads are required to screen the windows of all smoking cars.

In the spring of 1912, the Kennebec Valley Protective Association was organized with twenty-seven members, representing, 1,189,391 acres owned by them in the Kennebec watersheds. An assessment of one and one-half mills was collected in 1912. The association is aiding in securing wise protective legislation for the State, and in cooperation with the State Department aims to provide their territory with adequate means of protection.

The fire losses since the establishment of the Maine Forestry District are given below:

	Acres burned over.	Damage.
1909 inc. towns	11,945	$32,965.00
1909 uninc. "	27,083	63,734.00
1910 inc. "	581	1,906.00
1910 uninc. "	267	935.00
1911 inc. "	11,423	48,303.00
1911 uninc. "	99,654	289,052.00
1912 inc. "	4,042	14,096.00
1912 uninc. "	16,198	57,152.00

MICHIGAN

THE Northern Forest Protective Association, an organization of timber owners having a membership representing 2¼ million acres, is one of the greatest factors in forest fire prevention in the State.

Following the plan of the timber owners of the Northwest, this organization has a paid secretary who manages the affairs of the Association, does propaganda work, and is also endeavoring to promote forest management on private lands.

Patrolmen are put in the field by the Association and from $15,000 to $20,000 is expended annually for this purpose. This organization has done more to prove that fires can be successfully handled in Michigan than any other agency.

It is said that forest fires have destroyed $20,000,000 worth of timber in Michigan. In spite of this, the State is backward in doing its share towards protection of timber. As is usual the association has to patrol a large acreage on which no assessments are received. It has therefore gone on record as favoring State control and financing of forest protection work.

In Michigan the State Game and Fish Warden has charge of the prevention and suppression of forest fires. Michigan's forest law provides for a commission known as the Public Domain Commission. This commission has control of public lands, State forest reserves, and all interests of the State in connection with stream protection and control.

The State Forest Fire Warden, who is also Game and Fish Warden, is answerable to the commission. Supervisors of townships are constituted fire wardens of their respective towns. Counties may be divided into suitable districts by the State Warden and a deputy warden appointed for each district. Deputy wardens or township fire wardens in case of fire may employ men to extinguish it. The total amount which the State Warden may expend during dry and dangerous seasons for fire prevention or suppression is placed at $10,000. Fire wardens receive $2 per day for actual services rendered, two-thirds of this being paid by the municipality where the service is performed. It is also specified that no fire warden shall be paid in one year for more than 15 days for services of any character.

The Public Domain Commission, up to the close of 1910, had established State forests aggregating 277,000 acres and were then preparing to establish further areas of this kind. These forests are established from lands coming to the State through non-payment of taxes.

Though the State of Michigan is doubtless doing more at present than ever before to prevent destruction of timber through fire, it is evident that she is far behind the nearby State of Minnesota in the character and effectiveness of her forest laws.

No warden system made up largely of town or other officials can be expected to give the maximum of efficiency in fire protection. Nor can the best results be secured by having the fish and game warden, no doubt largely occupied with his principal duties, also responsible for forest protection work. Particularly is this true in a State where so many fires occur.

Michigan can well afford to revise her forest laws, and in so doing follow the good example set by Minnesota.

MINNESOTA

MINNESOTA has forested area of 28,000,000 acres, the largest of any State east of the Rocky Mountains.

These forests extend for more than 300 miles along the northern boundary of the State and for 364 miles north and south. Being composed of a high per cent of valuable species, Minnesota's 70 billion feet of merchantable timber is conservatively estimated to be worth $280,000,000.

As has been the case in most other States, it required a series of disastrous fires to arouse popular opinion to the need of organized protection of the timber. In 1895, the year following the Hinckley fire, a chief fire warden was appointed and under his leadership steady progress was made in securing legislation for forest protection. It was not, however, until after the great Baudette fire of 1910, that an effective State department was established.

The Minnesota law of 1911, creating a forestry department, and the fire service, is undoubtedly the most complete legislative act of its kind operating in any State. It provides an adequate organization and an appropriation of $75,000 to put the organization in operation. Though, without doubt, an increased appropriation will be necessary to ensure the highest efficiency in protection work, the start is unusually good.

Under the Minnesota law a State forester and assistant was appointed as the central authority in the fire service. The timberland of the State was then divided into fourteen districts, each district in charge of a ranger who superintends all prevention work and directs the fighting of fires which may occur.

Under the direction of these district rangers is a force of patrolmen, who, during the less dangerous times, are kept busy constructing camps, lookout towers and trails, and extending telephone lines. During 1912, 50 State, 25 Federal and 50 township patrolmen were employed. In addition to this force 250 patrolmen were maintained by the railroads of the State. Independent patrol work is done by the mining and lumber companies of the State, their total expenditures in 1912 being about $50,000.

Minnesota has within the limits of its forest area 2,700 miles of railroad upon which 475 engines are regularly operated. To minimize the risk from this source the State department employs an inspector whose duty it is to investigate the condition of the spark arresters and report such as are found defective. This system of State inspection in connection with the speeder patrolmen maintained by the railroads, has gone far toward lessening the number of fires started by locomotives.

Slash, left after lumbering, has been a difficult problem to deal with, and a determined effort safely to dispose of it has been made in Minnesota. The law of 1909 required that all slash resulting from cutting operations should be piled and burned. This, because too inflexible, was not satisfactory and required the same treatment for a variety of conditions.

In 1911, this law was modified by an amendment, which left to the judgment of the State forester the form of disposal to be used in each case. The methods of slash disposal most often required of the operators are among the following: Piling and burning, lopping of tops, clearing of fire lines around the slash. The principal winter work of the State rangers is to examine each logging operation in his district, to decide which form of slash disposal is best suited to the conditions, and to enforce his directions as to its disposition. The expense to the lumber companies for this work at present is about $300,000 annually; but this cost will be materially reduced as the men in charge gain experience.

Minnesota was apportioned $10,000 annually from the Weeks law fund for the protection of the watersheds of navigable streams.

The annual loss from fires in Minnesota for the last ten years is estimated at $100,000. The losses figured by the State department for the year 1912 is as follows:

Number of fires	345
Number of acres burned	18,927
Damage	$22,754

MONTANA

WESTERN MONTANA has a forested area of some 18,500,000 acres, of which about 11,500,000 acres are within the exterior boundaries of National Forests, leaving 7,000,000 acres outside of these forests to be protected.

There have been numerous attempts to secure some systematic protection effort on the part of private owners and the State, none of which have been entirely successful. The Northern Montana Forestry Association has, however, been formed and represents some 300,000 acres, while private owners co-operating directly with the Forest Service represent about 1,800,000 acres. On the balance of the area no special protective measures are taken.

During the past season some 325 patrolmen were engaged in protection work. Of this number the Forest Service employed 285 men, 20 were employed by the State and through the Weeks' Law fund, the balance working in the interest of private owners.

Although compared with other Northwestern States (except California) the showing in Montana is poor, practically all that has been done is the result of the effort of the past two years.

The State suffers from lack of good forest laws, although itself a large land owner. The legislature should be even more vigorously urged to enact suitable legislation, and timber owners who now seldom expend to exceed ½c per acre for protection should make a more determined effort to get together. Wherever private and Government interest can work together to the advantage of both, such procedure will furnish the cheapest and best patrol. This is recognized at present and private owners are cooperating with the Forest Service under regular agreement.

NEW HAMPSHIRE

THERE is approximately 4,000,000 acres of timber land in New Hampshire of which about one-half is included in woodlots. The majority of these smaller tracts are in the southern part of the State.

The conditions found in the northern part of the State are in sharp contrast to those found further south. The country is sparsely settled and the timberland is in large tracts owned by a few companies or individuals who are keenly alive to the value of giving their property the best protection possible.

In 1903 an appropriation was made for an examination and report on the forest conditions of the State, in co-operation with the United States Forest Service. The report which was submitted in 1905, contained a strong recommendation that a forestry department be created and a fire protective organization be established. In 1908, a forestry department was organized and the State Forester was made State Forest Fire Warden.

In 1910, a few of the timberland owners of the northern part of the State subscribed $4,000.00 to be used for the erection of mountain lookout stations. With this sum the State Forester, as their agent, built and maintained ten lookout stations.

The act of 1911, provided for the purchase and maintenance of the stations already built and for the construction of others where necessary; eight more stations have since been built, four for permanent use and four to be manned only in critical times.

The law of 1911, provided for the subdivision of towns under deputy fire wardens, for the division of the State into districts and the appointment of district chiefs to have charge of them, also for a series of conferences of the town fire wardens for the purpose of instructing them in their duties. The appropriation for fire protection was increased to $10,000.00 at this time.

In 1913, important changes in the railroad fire law were made. The use of a suitable spark arrester on all locomotives was required; section foremen of the railroad companies were made deputy fire wardens, and any person cutting timber adjacent to a railroad right-of-way must dispose of the slash for a distance of twenty-five feet from the right-of-way.

1901, the Society for the Protection of New Hampshire forests was formed and has since unceasingly carried on a campaign of education for improved forest conditions in the State.

New Hampshire was the first State to make a co-operative agreement with the Federal Government under the Weeks law, and on June 4, 1911, was awarded $7,200.00 for that year. This amount was used entirely for the payment of the wages of patrolmen, twenty-five being permanently employed during the rest of that season.

In the fall of 1910, the New Hampshire Timberland Owners Association was formed for the purpose of co-operative fire protection. It has now thirty-eight members representing timber holdings of 1,025,000 acres. The annual assessment is one cent per acre.

The plan of the Association's patrol system is to have a small permanent force. This season fourteen men have been regularly employed and are stationed in the most remote and dangerous sections. During dry periods about fifty additional men are employed. When the danger of fire is small these men are used for making permanent improvements.

NEW JERSEY

NEW JERSEY has a timbered area of approximately 2,000,000 acres, the stumpage on which is valued at about $8,500,000. Only a small amount of this forest crop being suitable for saw-logs, the lumber industry is of comparatively little importance. The State owns 13,720 acres of wild land while single tracts 20,000 acres in extent are owned by individuals and municipalities as part estates and city water supplies. For the most part, however, the land is in the hands of the small owner.

New Jersey has a dense population, and probably the greatest proportion of railroad mileage of any State in the Union. This is reported to be one mile of railroad to every three square miles of territory. These facts make the fire risk unusually great and the difficulties of protection proportionately so.

Up to 1905, legislation aiming to prevent forest fires was vainly sought. In that year, owing to the active interest of Governor Edward C. Stokes, a Forest Commission was appointed, and the following year a revised law was enacted and a State forest fire warden appointed.

From time to time the laws have been changed as experience dictated and the organization improved. At present the State force consists of

1 State Fire Warden.
4 Division Fire Wardens.
110 Township Fire Wardens.
151 District Fire Wardens.

The division fire wardens are salaried and are appointed and paid by the State. The township and district fire wardens receive a small fixed sum annually in addition to the amount paid them while engaged in fighting fire.

The present appropriation of $15,000 in the opinion of the State Forester, is as much as the State should be asked to contribute. Further expenditures should be borne by the towns and landowners.

Three lookout stations equipped with towers and telephones are now maintained, two by the State alone, and one in co-operation with the United States Government through the Weeks law appropriation.

A feature of protective work in New Jersey is the determined effort of the State rigidly to enforce the law. In 1912, 252 cases were prosecuted, a majority of the offenders penalized by fines, and in a few instances by jail sentences.

The chief cause of fires in New Jersey is the railroads, and the attitude of the State is to put the burden of prevention and control on the companies.

NEW MEXICO

THE State has a timbered area of some 12,000,000 acres, and a gross National Forest area of a little over 10,000,000 acres.

On National Forest lands a well organized protective force is maintained with telephone lines, lookout points, caches of fire fighting tools, etc.

On privately owned and State owned land practically nothing has been undertaken. Though like Arizona the fire problem is largely in the hands of the National Forests, there are a few companies and the State owning considerable tracts of timber land.

Statistics for the past five years show that an average of over 26,000 acres are burned over annually in New Mexico.

Forest fires in the State owing to the character of the timber, are comparatively easy to control. With proper co-operation between all agencies, and public opinion strongly against burning they can be largely eliminated.

Owning timber land as it does, the State could well afford to have a State Forester and State Board of Forestry as well as adequate laws pertaining to setting of fires. Such a body if given sufficient funds could by working in conjunction with the Forest Service greatly stimulate protection, properly look after State holdings, and perform real service along lines of sentiment making.

NEW YORK

NEW YORK State has approximately 7,500,000 acres of wild land in addition to 4,300,000 acres included in farm wood-lots. Of this amount 1,651,553 acres are included in the State-owned forest preserve.

It is estimated that there is some 41,710,000,000 feet of merchantable timber within the State, valued at $125,000,000.00.

The history of forest fire legislation began in 1778, when the first law for forest protection was enacted, but it was not until the passage of the forest fire law of 1885, that an effective fire protective organization was made possible.

Since the establishment of the Forest Commission in 1885, numerous reorganizations have taken place, each adding in some degree to the power of the fire protective system. The law of that year provided for a superintendent the department, but it was not until 1909 that important changes were made in of forests to be the operating chief of the department, divided the State forest preserve into five districts, each in charge of a district ranger, and provided for a force of rangers. At present the State employs 70 rangers.

The old system of town fire wardens in the forest preserve counties was superseded by this State organization. In the other towns of the State the town supervisor still remains ex-officio fire warden, but the present law renders him personally liable for damages in all cases when he fails to perform his duties properly. He may employ patrolmen when necessary when authorized to do so by the town board.

The revised law made provision for the construction of mountain lookout stations and telephone lines. Such work has been carried on each season since its authorization and New York is now best equipped with lookout stations of any State.

The act of 1909, required as a forest protection measure that all limbs be lopped from the tops of coniferous trees left after logging carried on within the forest preserve. This was the first legislation in the East compelling operators to dispose of their slash.

New York State secures assistance from the Federal Government under the Weeks law.

Unless otherwise directed by the Commission, railroads operated within the forest preserve are required to maintain a patrol of their rights-of-way from April first to November first. Outside of the forest preserve a patrol system must be established as the Commission may direct.

Inspectors are employed by the State to enforce the regulations effecting the use of spark arresters and other equipment used by railroads to prevent the setting of fires. Frequent inspections are made to see that these devices are properly installed and kept in repair and in case of defective equipment inspectors have authority to order the withdrawal from service of any locomotive. On those lines using oil-burning locomotives, no fires whatever have been reported.

The State appropriation for fire protection the past year was $100,000.00.

OREGON

FOREST protection efforts in Oregon started as far back as 1903. From that date until 1909 the Federal Government and certain private owners endeavored to protect the timber against loss through fire, being feebly assisted by the State through a voluntary warden system.

In 1909 the Western Forestry & Conservation Association, now the greatest single factor in conservation work of the northwest, was formed by a few timber owners in Idaho, Washington, Montana and Oregon, and this organization established headquarters in Portland, Oregon. There being no concerted effort on the part of timber owners looking to fire protection, an effort was made by this Association to bring about such action. This resulted in the formation during 1910 of the Oregon Forest Fire Association and the districting of the State into six (6) patrol areas. These six sections were each to put in effect such protection measures as seemed advisable and the representatives of the patrol districts were to form the State organization.

The plan though sound failed because of lack of interest and inability of individual owners to get together, and the serious season of 1910 found Oregon in poor shape to combat fires occurring outside the National Forests.

The natural result was that this one year saw a loss of over 1¾ billion bd. feet of timber valued at 2½ million dollars. Over 1 billion feet of this timber was on private lands, the Forest Service with its better protection keeping their losses below those of the private owners. Prior to this bad year three counties, Coos, Klamath and Lake had former co-operative patrol organizations and their losses were comparatively small.

The serious losses of 1910 caused owners to act with a view to preventing a recurrence of such serious consequences. The Oregon Forest Fire Association was reorganized and at once started a campaign to secure greater activity in the protection of private lands. The Western Forestry & Conservation Association, together with the Oregon Forest Fire Association, Oregon Conservation Association and Oregon Conservation Commission assisted so far as possible by the Forest Service prepared a most excellent State forest law, and carried on a vigorous campaign looking to its passage by the Legislative Session of 1911. The bill was passed as presented and gave the State the first law providing for actual State aid.

The law of 1911 carried an appropriation of $60,000.00 for the two year period, provided for a State Forester, a non-political State Board of Forestry, and gave this board authority to expend the funds appropriated in such a way as to secure the best results.

As indicated, though many owners of timber land in Oregon had for several years protected their lands against fire, there was no concerted effort to this end and many sections of the State received no attention whatever. Due to the efforts made by the various organizations in the State, public spirited timber owners and the beneficial effect of an excellent forest law, 1911 saw great activity in protection matters. This was the start of efficient work in the State as a whole, and since that time such progress has been made that probably in no other State is better protection afforded.

PRESENT PROTECTIVE EFFORT

The areas protected in Oregon by different agencies are approximately as follows:

Forest Service acres	16,148,900
Forest Fire Associations with State aid	7,810,430
Timber owners co-operating through agreements or informally	2,221,900
Individual Patrol	382,360
Lands requiring little attention	757,820
Total Timbered Area	27,321,410

The three agencies working along protection lines in Oregon are the Forest Service, State, and private timber owners.

The Forest Service has direct charge of protecting about half of the timbered area of the State. In this work some 345 men are regularly employed during the fire season. Largely for protection purposes some 2,129 miles of trail and 1,802 miles of telephone line has been built. The fire protection work of the Forest Service is efficiently and systematically handled. Lookout stations have been established, equipped with telephones and range finders so that all the National Forest land is under the eye of rangers during the entire fire season. In addition to this the country is patrolled by men on foot or horseback who daily travel over the trails, keeping track of hunters, fishermen and campers, visiting logging works, and in general being on the lookout for fires. Tool caches are maintained at strategic points, trails and roads posted with sign boards and fire warning notices, and where necessary pack trains are maintained quickly to transport tools and supplies to a fire. With limited funds for the work the Forest Service has performed signal service along protection lines.

In the State of Oregon the Forest Service expends for protection in the ordinary year about $100,000, aside from funds devoted to trail and telephone building for which another $50,000 is expended.

The State of Oregon has an appropriation of $37,500.00 yearly and through the Weeks law $10,000.00 additional to expend in forest protection work.

This fund keeps in the field a force of some 90 men during the fire season. Through co-operation with timber owner's associations there is no duplication of effect. The State expends practically no money for trail building or telephone construction but requires its wardens to help on such projects in connection with their other work where possible. It is the general policy of the State to do no patrol work in sections where ownerships are in large holdings, but to confine its protection to foot-hill and burned over areas, and sections where owners live on or near their land or each person has but small acreage.

Timber owners in the State patrol their holdings through forest fire associations, informally through agreements with each other, or independently. There are sixteen patrol associations in the State operating in twenty counties. The county is the unit of organization.

The associations are financed through acreage assessments, such assessments ranging from 1 cent to 3 cents per acre according to the difficulty of protection.

The officers of the patrol associations consist of a president, vice president, secretary and treasurer and a board of usually five directors. The office of Secretary and Treasurer is generally filled by one person who undertakes the work because of interest in it and receives a salary of $200.00 to $300.00 annually. Other officers receive no renumeration.

Such an association takes charge of all protection work in a county or counties, pays all wardens, builds necessary trails and telephone lines and fights all fires. The owner of 160 acres pays on the same basis in accordance with his acreage as the one with 10,000 acres, and has the same voice in the affairs of the organization.

By co-operating with the State it is often possible jointly to employ a head warden and some patrolmen, in this way eliminating expense to both agencies and increasing the efficiency of both.

Where private and Forest Service patrols are both interested in protecting a zone of timber, this is done under co-operative agreement, one or the other agency taking charge of the patrol of the area, the other agency paying its proper share of the expense of the work.

Private owners keep in the field a force of about 250 paid wardens and expend during the normal year approximately $125,000.00 for patrol and improvements.

It will be seen from the foregoing figures that in the State of Oregon the combined fire protection forces employ the following number of paid wardens and expend the following amounts in protection work.

	Wardens Employed	Funds Expended
Forest Service	345	$100,000.00*
State and Week's Law	90	47,500.00†
Private Owners	250	125,000.00‡
Total	685	$272,500.00

In addition to the local patrol associations, a State association, the Oregon Forest Fire Association is maintained by timber owners. This association serves as a clearing house for all matters relating to protection by private owners in the State. It also suggests from time to time needed legislation, and keeps its members informed of activities of other States and other sections of its own State in forest matters. The organization is represented on the State Board of Forestry, and does necessary publicity work looking to better realization of need for protection.

CONCLUSIONS

In view of the few years which have elapsed since systematic protection has been taken up in the State progress has been extremely rapid. The patrol force is for the most part adequate and except during an unusually bad year it would now be impossible for large losses of timber to occur.

* Does not include cost of building trails, telephone lines, cabins, etc.
† Includes cost of maintaining the State Forester's office.
‡ Includes patrol, fire fighting and improvement work.

Investors in Oregon timber can feel that their property is well insured, for the past three years have been no fire losses worthy of serious consideration. This is not through chance but the result of well organized patrols.

Certain details of protection need to be worked out but these are rapidly being set right.

Oregon also has a forest law which is excelled by none in the United States insofar as it affects forest protection. It is, however, weak in that no provision is made for the purchase of cut-over and burned-over land to be held as State forests. There are some 4,000,000 acres of burned-over lands in Oregon. This land is for the most part rough and unsuited to agricultural use. It could be purchased at a nominal figure and through protection be made to yield a second crop of timber which would result in handsome returns to the State. Much cut-over land of the same character could also be secured. Oregon now has about 1/5 of the Nation's timber supply. Its lumber industry is the backbone of the State. It can be made to so continue by seeing that all land not suited to other purposes is kept stocked with forest trees. The National Forests will be a great factor in a future timber supply, but the States must also do their share to insure the permanency of the lumber industry. Because of taxes and other carrying charges private enterprise cannot be depended upon to provide timber for the future.

PENNSYLVANIA

PENNSYLVANIA has an estimated timbered area of seven and one-half million acres, of which 983,529 acres, or about 1/8, is owned by the State as a forest reserve.

At present the wild lands of the State have a stand estimated at 4½ billion board feet of lumber, and 26,000,000 cords of wood. Farm woodlots are estimated to contain 3 billion feet of lumber and 38½ million cords of wood. The total estimated value of timber in the State is $139,000,000.00.

In 1880, Pennsylvania produced about 10% of all the lumber manufactured in the United States. To secure this output a very large area was cut over annually. This cutting was followed by fire and the wholesale burning brought about a change in stream and climatic conditions, which aroused public sentiment against this rapid destruction of the forests. Taking advantage of this condition of public mind a campaign for better forest fire protection was carried on under the leadership of Dr. J. T. Rothrock, the State Board of Agriculture and the Pennsylvania Forestry Association. This resulted, in 1895, in the establishment of a Forestry Commission, and, in 1899, in the appointment of town fire wardens. From this beginning continuous progress has been made and at present Pennsylvania has a good organization with excellent laws for forest protection.

The timberland owned by the State is located in 26 counties, and is divided into reserves in charge of foresters graduated from the State Forest Academy at Mont Alto. At present 56 foresters and 92 rangers are employed on the reserves. This force of rangers furnish a thorough patrol system on the State forests. In times of emergency about 200 additional men are employed. The

patrol system is reinforced by mountain lookout stations and trails and telephone lines are being built for the use of patrolmen. Lack of necessary appropriation prohibits the extention of this excellent patrol system throughout the State. It is at present confined to State-owned lands.

In 1913, the Central Pennsylvania Fire Protective Association was organized to protect 300,000 acres of timberland owned by its members, and an assessment of one-half cent per acre was levied for this purpose. The activities of the Association are along the lines of education, patrol work, protective work in the way of burning railroad rights-of-way, the erection of lookout stations, opening up of roads and establishing cooperation with people having telephone service.

The Pocono Protective Association in the Pocono Mountains in northeastern Pennsylvania has also performed considerable work for a number of years along similar lines.

To encourage cooperative protective work among timber owners, an act was passed by the Pennsylvania Legislature in 1913, authorizing the Department of Forestry to expend from its forest fire appropriation a sum equal to that spent by each local association for patrol work.

The total State appropriation for forest fire protection is at present $25,000.00, and about $5,000.00 is spent by local associations. The total expenditure at present represents a little more than one-third cent per acre for the forested area of the State.

No measures are taken to prevent fires from railroad locomotives except those that are put into effect voluntarily by the railroad companies. Action of this kind should be taken.

VERMONT

THE severe loss caused by the fires of 1903, brought about the first steps toward the control of forest fires in Vermont. The following year a law was enacted making the first selectman of each town ex-officio fire warden, and giving him authority to take such measures and summon whatever assistance needed to extinguish fires in his town.

The first test of this new organization came during the dry season of 1908, and the showing made was far from good, since losses in the State that year are estimated at $50,000.00.

In 1908 a State Forester was appointed, whose duty as State Fire Warden required enforcement of the laws of the State regarding forest fires. It was not, however, until 1912 that there was much progress made in revising the fire laws. At this time the board of selectmen of each town were authorized to appoint a town fire warden subject to the approval of the State Forester. This made it possible to continue in office a warden who had shown energy and ability instead of having a constantly changing force.

Any fire warden may establish, with the permission of the State Forester, a patrol in his town during dangerous times, the expense to be borne by the town. Where conditions make it advisable, the State Forester may divide a town into a number of districts and appoint a warden for each district.

The present law provides that the State shall furnish a watchman for any mountain lookout station built and equipped by land-owners.

Since most of the railroad lines run through agricultural land they cause few fires. Some of the companies, however, have cooperated with the State to the extent of furnishing passes for patrolmen and paying part of their wages.

From the appropriation made by Congress in the Weeks Law, Vermont received $2,000.00 in 1911, and the same amount in 1912. The territory to be protected was divided into three ranges and each put in charge of a ranger paid from this fund.

In 1909 the State Forestry Department made an examination and survey of the old burns throughout the State. The published report covering this field work gives all details obtainable regarding each fire such as its origin, duration, extent, damage, method and cost of fighting it. The report covers a period of about twenty years, and as a record of past experience should be a reminder of the seriousness of the forest fire problem, and a valuable aid in the prevention of disastrous fires in the future.

This report shows an area of 27,250 acres burned over resulting in a loss of $122,354.00. Since the report was published the annual loss has been as follows:

	Area burned	Damage
1909	570 acres	$ 985.00
1910	341 "	1,035.00
1911	2,150 "	6,000.00
1912 to July 1st	3,330 "	6,300.00

WASHINGTON

THE State of Washington has 22,000,000 acres of timber land that requires protection. Of this area, 11,684,680 acres are within the exterior boundaries of the National Forests. Of the balance, 8 million acres are protected by the Washington Forest Fire Association and, approximately 3 million acres, mostly in Eastern Washington, receives no systematic protection aside from that of the State, together with Federal assistance under the Weeks Law. Of this 11,000,000 acres outside of the National Forests approximately 800,000 acres are owned by the State of Washington, being acquired through grants from the Federal Government.

Forest Protection

The first systematic effort toward forest protection outside the National Forests resulted from the passage of a law in 1905 creating a State Board of Forestry and providing for the office of a State Fire Warden and a Deputy Warden in each county. The first appropriation made by the State was $12,500.00 for a biennial period. The passage of this law was a direct result of the forest fires of 1902, which destroyed over 2,000,000,000 feet of timber, besides resulting in great loss of life and property.

The appropriation for State work was exhausted the first year, and in order to continue it the timber owners were called upon for financial assistance, which

request was promptly complied with. The Washington Forest Fire Association was organized in 1905 by a few timber owners. This organization, due to the competent management of its officers, soon had a membership which enabled it, with the assistance of the State and by cooperating with the Federal Government, to adequately protect all the timbered area of the State lying west of the Cascade range.

This association is still the chief factor in forest protection outside of the National Forest.

Present Protective Effort

About one-half of the timbered area of Washington is protected by the Forest Service. In this work about 210 men are employed and as an adjunct to protection 758 miles of telephone line and 1,270 miles of trails have been constructed and are maintained by the Forest Service. The cost of protection within the boundaries of the National Forests, in the ordinary year, is about $80,000.

The State has an appropriation of $37,500.00 yearly with which to maintain the office of State Forester and put Wardens in the field. In addition to this fund, the State received the past year, $10,000.00 from the Federal Government as its share of the Weeks Law fund. The State has in the field one, and in some cases, two fire wardens in each county. These wardens receive $4.00 per day and necessary subsistence expenses when away from headquarters. Their duties are to enforce the law and, by so doing, prevent destruction by fire.

The Washington Forest Fire Association has a membership representing approximately two and three-quarter million acres. This Association patrols all of the territory west of the Cascade Mountains outside of the National Forest, or about 8,000,000. Its patrol and fire fighting force consists of a chief fire warden, 12 inspectors, and from 75 to 100 patrolmen. For purposes of protection the State is districted, first into inspector districts and then into patrol districts. Each patrol district is in charge of a ranger, who, in addition to being responsible for the suppression of any fires that may start, is charged with the duty of law enforcement, issuing burning permits and seeing that the law requiring the burning of dangerous slashings is enforced.

An inspection district is made up of several ranger districts and, as the name implies, is in charge of an inspector. These men are responsible for the work of the rangers in their districts and are selected for their wide knowledge and experience in fire suppression. All rangers and inspectors are responsible to the chief fire warden, who in turn is responsible to the trustees of the Association. Inspectors receive from $90.00 to $125.00 per month and expenses and are employed for about five months of each year. Rangers receive from $75.00 to $100.00, no expenses being allowed.

The Association expends for patrol alone about $40,000.00 a year, and during bad fire years has expended as high as $100,000.00.

Cooperation

To insure the greatest success, thorough cooperation between the three agencies engaged in fire prevention is necessary. Such cooperation exists. The

Forest Service, the State and the Association cooperate under an informal agreement in looking after the areas along the National Forest boundaries.

Needed Changes

The Washington law is good in most respects and protection work in the State is of a high character. However, there is need of radical reform along lines which will free the State Board of Forestry, the State Forester, and the warden force from political influence. At the present time a portion of the State funds are held in readiness to meet emergency fire fighting expenses. The result is that during the ordinary year a balance accumulates which is turned back to the State Treasury because of non-use. Obviously the State appropriation being far too small, the maximum of benefit would be derived if all of the funds were expended in putting on a larger patrol force, leaving to some other agency the raising of funds with which to fight fire.

At the present time the State Board of Forestry has little voice in the management of State-owned timber land, although approximately 800,000 acres of such land exists. Legislation should be enacted giving control of the management of such lands to the State Board of Forestry and providing for the retention of such of these lands as are not suited to agricultural use as State Forests. Provision should also be made for adding to the area of these State-owned forests by purchase of cut-over and burned-over areas which are now restocking with a new stand of timber.

It also seems logical that besides its appropriation for fire protection in general, which is no more than is done by Oregon and other States without large grant areas of their own, Washington should also contribute additionally on an acreage basis for the specific care of its timber holdings, as does Idaho under the Fallon law.

WISCONSIN

IN 1900 Wisconsin ranked first among the lumber-producing States. Since that time its production has rapidly decreased. The present stand of merchantable timber in the State is estimated at 29 billion feet, with an average value of $4.00 per thousand.

The State, at present, owns 400,000 acres held as a forest reserve, and appropriations providing for annual additions to the area held for this purpose have been made by the legislature.

In 1867 a law was passed providing for a commission to investigate forest conditions in the State. Later (1887) another commission presented plans for the organization of a forestry department. This action was not taken, however, until 1903.

At this time the law created a State fire warden and gave him power to appoint such town fire wardens as were necessary. In 1905, a revision of the law changed the existing commission to the present State Board of Forestry, set aside for forestry purposes all State lands in the northern part of the State, and made railroad companies liable for damage resulting from fires originating on their rights-of-way.

In 1911, the State inspector was given the power to withdraw from service any locomotive without satisfactory fire protective equipment. In the same year a change was made in the town fire warden system, depriving the State fire warden of the appointive power formerly held, and making the town chairman ex-officio fire warden and the superintendent of highways assistant town fire wardens. This new system has not yet been tried out in a bad fire year, but it appears to be unwise legislation which substitutes a continually changing set of local officials for an organization where officers can be removed if inefficient or retained year after year if their services are satisfactory.

Aside from the appointment of town wardens and regulation of railroads, little legislation has been enacted in Wisconsin toward the prevention and control of forest fires.

On the State-owned forest, a complete fire protective organization exists. Telephone lines, lookout towers, camps, roads, fire lines and trails are being constructed.

Wisconsin receives assistance through the Weeks law appropriation for the protection of the watersheds of navigable streams.

Last season twelve State rangers, twelve Federal patrolmen and six patrolmen, maintained by private interests, were in the field and this force patrolled an area of 1,260,000 acres of State and private land.

During the past two years 160 miles of old logging railroad grades were converted into highways and serve as excellent fire lines. One hundred and eighteen miles of other fire lines were cleared through the forests; most of these follow old railroad grades, and, where possible, connect rivers, lakes or highways. Four 55-foot steel towers were built for lookout stations and 56 miles of telephone line constructed for protection purposes.

WYOMING

ABOUT sixteen per cent of the land area of the State, or 10,000,000 acres, is forested. Of this amount over 8½ million acres are within the exterior boundaries of National Forests where fire protection is systematically carried on. The Yellowstone National Park, with a gross area of 2,142,720 acres, and a timbered area of about one-half this amount is also well protected by Federal troops and in cooperation with the Forest Service.

So far as known there is little or no effort on the part of private owners to systematically protect their property, fire protection being considered for the most part the function of the Government whose holdings form such a large proportion of the timbered area.

Wyoming's forest laws are insufficient, but owing to the comparatively small acreage in private ownership, there has been no great incentive to enact forest legislation. The State being a large owner of timber land, however, there is apparent need for a well-defined policy in the handling of these lands, and this is evidently the opinion of the land commissioner.

Cooperation with the Forest Service in forest protection and management and adequate laws governing the handling of State forest lands, are needed in Wyoming.

FOREST FIRE CONDITIONS IN THE SOUTHEASTERN STATES

THE REGION

THE region covered by this report includes the States of Delaware, Maryland, West Virginia, Kentucky, Missouri, Arkansas, the eastern half of Texas, and all of the States to the south and east of these. This region was originally almost entirely covered with forest, and, though much of the land has now been cleared for agriculture, even yet 54 per cent of the total area is occupied by forest growth.

Forest: Two general types of forest occupy the region: the southern pine forests extending along the Atlantic and Gulf coast, and the central hardwood forest occupying the northern and western parts of the region. The two main types are about evenly divided, there being approximately 130,000,000 acres of each. According to the report of the National Conservation Commission, supplemented by some local data, 46 per cent of this forest land is owned by lumbermen and other large owners. The rest is held in small tracts by farmers and other residents.

In the States under consideration there is an estimated stand of a little more than 700,000,000 M feet of timber, something over half of which is pine. Placing the value of stumpage at $5 a thousand, the present value of this stand is about $3,600,000,000.

Fire Damage: Throughout this entire region, comprising 16 States, only one, Maryland, has any complete data in regard to forest fires. Two other States, North Carolina and Louisiana, have some incomplete records, which are here used for what they are worth. The only complete figures for the remaining States were those collected in connection with the 10th census. It seems probable that while the area annually burned over is no less than given there, the damage done by fires is much greater because the value of stumpage has so largely increased since that time. It appears, therefore, that there is an annual loss from forest fires throughout this region of $23,700,000. In this estimate only the loss in standing timber and other personal property is included. The loss through impoverishment of the soil, injury to stream flow, and change in the composition of the future forest would add enormously to this damage. There are no records of any loss of life in any of the Southern States except North Carolina, but in all probability each fire season exacts its toll.

PRESENT ATTITUDE

THE attitude of the general public towards forest fires is at present one of indifference. In a few States, however, the sentiment is against burning the woods, and throughout the region this sentiment is growing; in some States very rapidly. In Maryland "very few believe in burning"; in Virginia "the majority are interested in keeping out fires"; while in North Carolina landowners are anxious to prevent fires, especially in the hardwood region; in Louisiana "the people generally recognize the evil and do not favor burning the woods"; in the remaining States there seems to be little definite sentiment against the practice. Professor Alfred Akerman well summarizes the general attitude

of forest owners and users thus: "That in pine woods burning improves pasturage, protects turpentine orchards, and does little or no harm; and in hardwood forests it improves pasturage and does little harm."

Lumbermen: As a rule, lumbermen try to keep fires out until the timber is cut, after that no further effort is made, especially if they own only the stumpage. Taking the hardwood region as a whole, however, land-owners would prevent fires if this could be done without any expense for patrol work.

Throughout the pine region lumbermen rather favor fire because it keeps the woods open and so makes logging easier. As one lumberman expresses it, they "are only interested in longleaf pine, and that is resistent to fire." In the loblolly pine woods, where the injury done to the young growth by fire is so much more evident, some lumbermen favor fire prevention. As a class, however, the southern pine lumbermen are indifferent to the fire problem. It is argued in support of this indifference that "annual grass fires are safer than accumulated forest—floor debris, which invites heavier conflagration.

A Florida lumberman, F. E. Waymer, President of the Union Lumber Company at Jacksonville, states the general attitude of forest owners thus: "Some think burning necessary in all timber and all agree that it is necessary in boxed timber." It is a common practice in turpentine orchards to burn over the area each winter as a protective measure in order to prevent devastating fires when the ground is dry and the turpentine is running. Very few, however, of the turpentine operators own the land, so they may be classed with the non-land owning lumbermen and with the small farmers and tenants owning little or no land. In short, the attitude depends more upon whether the person owns land or not than upon any other one circumstance. This is true both in the pine and in the hardwood region, though the feeling against fires, as before stated, is decidedly less in the pine region.

Stockmen: The small farmers and renters favor burning the woods where stock is allowed to run at large, and these conditions extend over nearly the whole of the southern pine region and the western part of the hardwood region. Stock owners burn the woods in order to make early grass more available to the cattle and also to kill out the under-growth so that it will be easier to keep track of loose stock. As long as there is free and unrestricted range there will be general trouble from fire, and possibly no measures would do more to prevent fires than the passage of general State-wide stock law bills.

Railroads: In speaking of the general attitude, that of the railroads should be mentioned. Though it would seem to be to their interest to assist in preventing fires, they are not only indifferent, but in some cases use all their influence to prevent the enactment of fire preventive laws. Their excuse for this attitude is that though they are spending a large amount of money every year in damages for fires set by them, still they do not know what the cost of preventive measures would be and they are unwilling to undertake any unknown expense.

REASONS FOR PRESENT ATTITUDE

THE principal reasons for the present attitude of indifference towards fires and its consequent ruinous effect on the present and future value of the forests, may be summed up as follows:

(1) The Large Amount of Forest Land in the South: At the present time over half the total area of the region is in woods.

(2) The Comparative Immunity of Mature Timber from Destruction by Fires: Only in turpentine orchards is there very serious danger of widespread destruction of large timber, and here operators contend that controlled burning is the surest method of protecting it. Under present conditions they are no doubt right.

(3) The Comparative Low Value of Second Growth Timber: Up to within very recent years, second growth pine throughout most of this region has been looked upon as worthless material and as something to be destroyed or prevented from occupying the ground. This condition is rapidly changing, for even now in many parts of the region second growth timber is the principal supply for the sawmills.

(4) The Free Ranging of Stock: As a general thing the stock that roams the open range does not belong to the owners of the land. In most of the open range region the stock owners outnumber the land-owners very considerably, so that the prospect for any rapid change in this direction is remote. There seems, therefore, little prospect of effective fire prevention until stock can be confined to the land of its owner.

(5) The Dread of Increased Taxation: This feeling against taxation is as strong or stronger in the South than elsewhere, and, as fire protection costs money, the need for such expenditures must be very real and very pressing before it is undertaken. Mr. George K. Smith, Secretary Yellow Pine Manufacturers' Association, connects taxation with the problem in this way:

> "The tax laws and interest rates make it unprofitable for any one to undertake to reforest a given area in the South, and while some efforts may be made to keep fires out of young timber, I do not believe there has been any organized effort along that line so far in the South."

The three following adverse influences would, it seems, help to account for lack of interest on the part of many lumbermen:

(6) The tenure of timber without the land. Non-landowning lumbermen have no interest in preventing fires except to protect merchantable rimber, or other property connected with their operations. As soon as the timber is cut they have no further interest in the property.

(7) The low prices paid for stumpage, or for land including stumpage, no doubt largely, though perhaps unconsciously, influences the lumberman. The present value of the stumpage alone is, in most cases, much more than was paid for the land and timber together. When the timber is removed it is felt that the remaining land and young growth, having cost less than nothing, is not valuable enough to spend money on for protection.

(8) In many cases the owner plans to sell off his cut-over land to settlers as rapidly as possible, and his only efforts are to secure purchasers for this land at remunerative prices. However, a large part of the cut-over pine lands will not be needed for agricultural purposes and cannot be sold for many years to come.

It seems a business proposition to encourage second growth so that a second crop of timber might be secured while a market for the land is developing. The opinion is too prevalent among timber-land owners that reforestation means planting, and that it is an entirely separate and subsequent operation to lumbering. This is possibly the attitude of Mr. George K. Smith, who courteously answered the inquiry sent to him. He says:

> "In my judgment, the indifference shown by timberland owners and lumbermen in the South to the prevention of fire in the forest is on account of the fact that no systematic or definite effort has been made for reforestation. Until the time arrives when an attempt is made to reforest the cut-over lands, no one is particularly interested in the question of fire. As long as fires do not damage the standing timber of merchantable growth it will be very difficult to arouse general interest in fire prevention."

Perhaps the most important, as well as one of the most difficult, problems before the advocates of fire protection in the South today is that of enlisting the active support of the lumbermen. In the Northwest, where associations of lumbermen are cooperating with the State and Federal authorities in fire prevention, the safety of the mature timber is at stake. In the South, on the other hand, the mature timber is comparatively resistant, but the young forest, the supply of the future, is menaced. Over nearly the whole of this region natural regeneration is practically assured if hogs are excluded, seed trees provided for (either before or after cutting) and fires are prevented. How can the landowners, farmers as well as lumbermen, be convinced that fire will pay *them?*

PRESENT STATUS

EFFORTS have been and are being made along the lines of education and legislation in most of the States, though in most cases they have been lamentably feeble and ineffective. The number of professional foresters employed by the Southern States is not over five or six.

Education: Some elementary forestry courses are given in a few of the State institutions of learning, but they are incidental to other courses and are in a very few cases adequate to the needs, only Maryland, Georgia and, possibly, Missouri, having such courses in charge of technically trained men. Several of the States have issued one or more publications on forestry subjects, in most cases based on work done in cooperation with the Federal Forest Service. The Federal Government has also done much to bring the question of forestry before the people of the various States through lectures and exhibits, and by making examinations of woodland properties for the owners. The results accomplished by this and other educational and propaganda work of the Government would be hard to overestimate.

Only two States, Maryland and Kentucky, employ as State Foresters technically trained men, though North Carolina employs a Forester in the State Geological and Economic Survey.

Legislation: Forestry legislation is quite as inadequate as forestry education. Maryland has had an excellent law for several years, so she is really outside of this class. Louisiana and Kentucky have recently enacted laws carrying adequate appropriations and are now organizing work on an efficient scale. Tennessee, Alabama and Delaware have enacted fairly good laws, but, through lack of interest in the subject, have failed to carry appropriations to make the laws effective. They are therefore practically dead letters. West Virginia would have passed an up-to-date law at the last session of its legislature but for lack of time. It will undoubtedly enact one at the next general session. Efforts have been made to pass important forest laws in several other of the Southern States, but so far there has not been sufficient definite public opinion behind them to overcome the opposition of certain interests, chiefly the railroads and the non-landowning stock men.

Private Effort: No efforts have been made among landowners to organize for fire protection, though individual owners have in several States organized and carried out protective measures on their own lands. Two railroads operating in the northeastern part of the region, the Pennsylvania and the Baltimore & Ohio, are said to be attempting some measures of fire prevention along their lines. The former has constructed a few miles of fire line along their road in Maryland and Delaware, and have issued notices to their employers to take precautions to prevent fires. The latter road also instructs its section hands to extinguish fires. Engines on all the roads are said to be equipped with spark arresters, but there are no State or, as far as can be learned, railroad regulations, except in Maryland and West Virginia, to insure that these are kept in proper condition. As a matter of fact, railroads set a large percentage of forest fires.

Federal: With the exception then of Maryland, the Federal Government is the only active organization preventing fires in this region. The National Forests in Florida and Arkansas have been patrolled for several years, and organized protection has been started on the land recently acquired in Virginia, North Carolina, South Carolina, Georgia, West Virginia, and Tennessee, for the Southern Appalachian Forests. The total area now being protected by the Federal Government in this way is about 2,125,000 acres. This, together with the private property in the various States said to be patrolled by the owners, amounts to something like 3,250,000 acres, or about 1¼ per cent of the total forest area of the region. Through the operation of the Weeks Law, the Federal Government offers to cooperate with the States in organizing State fire protection, but so far only two States, Maryland and Kentucky, have availed themselves of this offer.

Stock Law: With the exception of Delaware, and possibly of South Carolina, all the States in the region are handicapped by having some at least of their territory not subject to the stock law. On such open-range territory live stock is allowed to roam at will over all unfenced lands. Maryland has only one free-range county, and Virginia only a comparatively small amount. In North Caro-

lina only some of the far eastern and western counties, 12 to 15 per cent of the State, now has free range. A larger percentage of most of the other States are still without the benefits of the stock law. This law is usually a local option measure and spreads slowly by townships or counties.

What Is to be Done

The important measures necessary to bring about general fire protection throughout the South come under the heads of (1) Education; (2) Legislation; (3) Cooperation. Education will bring about the legislation, and education and legislation should aim to bring about the cooperation.

1. *Education*: Publicity and propaganda work must be conducted throughout the South for many years to come, reaching not only the landowners and other adults, but also, and perhaps chiefly, the children of the public schools.

Federal: The Federal Government has already in operation an excellent organization for carrying on propaganda work. Lectures, exhibits and demonstrations are now being carried on. The Government should be allowed and urged to extend this work in every way possible. Miniature exhibits, if only of photographs, might be made at State and even county fairs; lectures might be given in connection with these exhibits, as has been done at some of the larger exhibits made. Lecture courses, illustrated when possible, now given at many summer schools, should be extended; they might even be made to include the teacher's institutes at which the public school teachers meet and study before dispersing to their various schools. The demonstration work now carried on in the National Forests should be extended to as many States and as many parts of States as is possible under the Weeks Law. The publications of the U. S. Department of Agriculture are many of them unexcelled for propaganda work.

State: The various States should employ technically trained foresters, at first chiefly with the object of interesting people in this subject. A subsequent duty, and sometimes one long postponed, will be to organize and carry out actual protective work. The public schools are of course under direct control of the States, and it is the State's duty, in one way or another, to bring this matter to the attention of the children. The general observance of Arbor Day should be insisted on, and some elementary instruction, either in connection with botany or some other course, or as a special course, should be given in all schools. Lectures and addresses at schools and colleges, at public meetings, farmers' institutes, etc., should be given as often as opportunity offers. Demonstration forests should be purchased and administered by the State. As many State educational institutions as possible should teach forestry, not as a professional course but as an auxiliary, aiming to train for their life work prospective landowners and lumbermen.

Association: The organization of live Forestry Associations, or the formation of Forestry Divisions in already existing organizations, will be of great assistance. The appointment in our half-dozen large lumbermen's associations of Forestry Committees and the organization of Forest Protective Departments, such as some of the northern associations have, should be advocated and worked

for. The Farmers' Union and other similar organizations should be enlisted in this work. The farmers, as a class, are more concerned both personally and financially than anyone else, and they should be the easiest class to reach. The women's clubs have, in some States, Kentucky for example, taken up this question earnestly and done heroic work; their active cooperation should be enlisted all over the country. They can, perhaps, do more to bring this question to the attention of the public school authorities than any other one force.

2. *Legislation*: It is recognized that legislation is of little value unless public opinion is behind it. This is shown by the present condition of legislation in several of the States. However, the efforts to secure legislation, though they may be feeble and ineffective, do tend to educate public opinion and call the attention not only of legislators but also of the people in general to the question of fire prevention. All efforts at securing legislation must have some good effect. It is a general maxim in seeking legislation to "ask for what you want, but take all that you can get." This, however, may be modified in some cases by refraining from asking for one necessary measure of fire protection if certain interests—for instance, the railroads—will be antagonized. It might in certain cases be a better policy to try for what it seems possible to get, and, by arousing no organized opposition, succeed in securing it. Later laws can remedy early defects.

Four general classes of legislation are needed throughout the South: (a) Laws to control the individual; (b) Laws to regulate railroads and other corporations; (c) Laws to secure the enforcement of the law; (d) Appropriations to make them effective.

(a) In North Carolina, which is, perhaps, fairly representative of the region, 45 per cent of forest fires are caused by carelessness or indifference of the individual, largely from farmers burning brush, rubbish, etc., and from hunters. It does not seem possible as yet to make and enforce any stringent laws requiring licenses for burning brush, though Maryland has such a law which works well. Laws against carelessness, and forbidding the leaving of any fire unextinguished, whether camp fire, brush, stumps, or what not, seem necessary and advisable all through the South.

Under this heading the Stock Law must again be referred to. Throughout the South this is a most important forest protective measure, not only because hogs are preventing the regeneration of most of our long-leaf pine forests, but because so many fires are set in order to "improve the range." As long as forest lands are looked upon by the resident and non-landowning population as so much free pasture, the sentiment in favor of burning the woods will not greatly diminish. Everyone interested in forest protection should preach State-wide Stock Law.

(b) Railroads, sawmills, and other engines cause, approximately, one-third of the forest fires; the necessity, therefore, for laws to control the operators of such engines is obvious. Railroad corporations throughout the South, as in other parts of the country, are very powerful, so that unless public interest is aroused it will be difficult to secure the passage of laws which are obnoxious to them. On the other hand, it does not seem fair to

the railroads to insist on their taking expensive precautions to prevent fires until the people are sufficiently alive to their own interests to do their share.

(c) It is the experience throughout the South that general laws against fires cannot be enforced. The usual county and township officials are not interested in forest protection and do not receive sufficient compensation to secure the enforcement of these laws. In two or three States an attempt has been made to have the forest laws enforced through the State game warden system. This has also failed. A State system of fire wardens such as is in force in Maryland and many of the Northern and Western States seems the best method for the South. There is no need, for the present at least, to appoint wardens in all townships, but where the percentage of forest land is over 60 per cent there is need for organized fire protection.

(d) No system of fire protection can be effective without an adequate appropriation. It is the general opinion that this should be made by the State, but it might well be added to by counties, townships and associations of landowners. The proffered assistance of the Federal Government under the Weeks Law would not only be of great assistance but should also be a great incentive towards securing an appropriation. The operations of this Federal law should be continued and extended as much as possible.

3. *Cooperation*: It is the general opinion that to make forest fire protection most effective the cooperation of all available forces is necessary. Nearly all correspondents advocate State protection assisted by either the Federal Government or by associations; where possible, all three of these forces should be utilized, and, in addition, the counties and townships themselves might be brought into the cooperative scheme. Such an arrangement is being worked out in the Northern and Western States, and will subsequently have to be worked out in the South. State protection should come first; Federal cooperation will thus be automatically secured in most of the States; then, under favorable State laws, the cooperation of associations should be secured. It will not be until all these forces work together and are supported by public opinion that real forest protection will be secured.

Area of Forested Land, Stand of Timber, Amount Protected, and Annual Money Loss Through Fires in Southern States.

	Area of forest land acres	Timber Million board feet	Value Dollars	Area patroled by private owners Acres	Area in National Forest under protection Acres	Area burnt over annually Acres	Value of property destroyed annually Dollars
Alabama	20,000,000	56,300	281,500,000	40,000		569,160	1,616,414
Arkansas	24,200,000	78,700	393,500,000		1,184,012	858,115	2,437,047
Delaware	350,000	300	1,500,000			4,687	7,500
Florida	20,000,000	73,900	369,500,000		318,960	105,320	299,109
Georgia	22;300,000	46,000	230,000,000		64,889	705,351	2,003,197
Kentucky	9,416,000	24,000	48,000,000	100,000		556,647	1,580,877
Louisiana	22,000,000	100,000	500,000,000	60,000		2,000,000	5,000,000
Maryland	2,000,000	3,500	14,000,000	10,000		40,000	120,000
Mississippi	17,500,000	95,300	476,500,000			222,800	632,752
Missouri	18,300,000	9,900	49,500,000			783,646	2,225,555
N. Carolina	19,600,000	55,000	165,000,000	250,000	95,459	440,000	660,000
S. Carolina	13,741,000	30,700	153,500,000		21,376	431,730	1,226,113
Tennessee	15,000,000	26,000	52,000,000	150,000	173,101	985,430	2,798,621
Texas (E. ½)	30,000,000	66,000	330,000,000			599,359	1,702,180
Virginia	15,000,000	30,000	150,000,000	50,000	212,796	234,375	375,000
West Virginia	9,500,000	30,000	150,000,000	500,000	54,598	629,526	1,018,144
Totals	258,907,000	725,600	$3,364,500,000	1,160,000	2,125,191	9,166,146	$23,702,509

DISCUSSION UPON THE REPORT OF THE SUB-COMMITTEE ON FOREST FIRES

Mr. W. L. Sykes, of New York: "I would like to ask if, when you were looking into this matter of fires, you learned about what proportion of fires were started by railroads as compared with those started by campers, fishermen and hunters.

Mr. C. S. Chapman, of Oregon: I cannot remember the exact percentage, but it is considerably higher percentage that is started by the railroad.

Mr. W. L. Sykes: There is now?

Mr. C. S. Chapman: Yes; is now.

Mr. W. L. Sykes: Last week at the annual meeting of the Empire State Forestry Products Association in New York, Superintendent Pettis of the Forests of New York State showed us some charts in which one piece, running up farther than the rest, indicated that most of the fires started in New York State forests were started by fishermen and hunters, and the fires started by the railroads were very much less in proportion to the others, and I was surprised, but I am not so much surprised since I know that the railroads are taking more care.

I want to say in this connection, for the information of you people, that oil burning in the Adirondacks has a good deal to do with it, but it is working another evil that is coming back on the general public very soon. I was talking with some New York Central officials a few days ago, and they said the price of oil has increased over 100 per cent within the last year and they are carrying all their passengers at a loss. It is costing $80 to run a passenger train now to Utica, where it ought to cost only $30. The Standard Oil Company has notified them that they cannot furnish oil next year at all. Now, this is a conservation proposition. I do not own the New York Central Railroad, or any stock in it, but we could not lean so far back of the perpendicular to fall over any of these propositions. I want to say that the time has come when pleasure seekers and hunters who do not have a dollar invested in those great forests should account for their actions whenever they go into the forest. I have a home in one of the most beautiful cities in this country. Most of the lawns in our cities are protected by

fences, but who of us would permit the people to walk over the sidewalks and destroy our flower beds? Would that be good policy? But how about the fisherman or the hunter who goes from the city, by thousands, and goes into our forests with packed baskets, and they will take a tree as big as they can find, climb that and skin the bark off and make a shanty and let the tree stand there and die, and in two years it is brush ready to be set afire. Every man who is a hunter or a fisherman generally smokes or drinks, and I tell you, gentlemen and ladies, that we must get after the pleasure seeker and the camper, and, as the gentleman said who read the report, we ought to make it so that if they go into the woods for a good time they will have to be careful of fire.

Up in the Adirondacks, where we have just been building a railroad for twenty-five miles, eleven men got off the train and got into our camps, and I said to the boys, "Where are you going?" They replied: "Somewhere." I did not tell them I owned half of the woods, but I said: "I would like to know where you are going." They went ten miles, they got off the train and shot their deer and killed a couple of big bucks, and they wanted to go to Utica, put their game on the train, ride the train back, and suggested that we send a special train to take them up to Utica. Our bookkeeper asked them for $5 for special permit, and they said they were poor men.

The lands we represent in the Adirondacks would make a right of way for a railroad sufficiently long to reach from New York City to California and back again and from Canada to the Gulf. The lands we own in Vermont would make another track from Vermont to the Gulf and back, and the lands we own in Pennsylvania would make another one from there to California and back. I merely give you those figures, and you can guess there is some land and I would like to ask you how the owner can patrol that during the dry hunting season when these hunters are turned loose in them? Gentlemen, we must do something to prevent those fires, and we cannot put the tax on men who are trying to carry a $2,000,000 tax on it to preserve it for future generations. I believe in insurance, but every time you add another insurance price, you add the price that my brother, naturally, and everyone else who sells to the consumer, would add on the sale to the consumer.

Mr. J. G. Peters, of Washington, D. C.: May I ask Mr. Chapman for a brief statement as to the advantages of the Weeks Law, in cooperation and fire protection in the Pacific Northwest?

Mr. C. S. Chapman: I might, on the Pacific Coast generally and in Oregon particularly, say that we have found the Weeks Law assistance of a good deal of benefit. The State forester, under the Weeks Law, has a great deal to say about the disposition of these men.

A hard country to have patrolled in our State is the foot-hill country and the sections where the timber is so scattered or in such small ownerships that no individual will look after it, and the Weeks Law men are covering a great deal of territory of this kind in high points around the headwaters of streams and places of that nature. Last summer, for a short time, I think there was something over fifty Weeks Law men in the forests there, and every one of them did excellent work. I might say, too, that the extension of that cooperation on the part of the Federal Government has been a very great stimulation to the private owners themselves in doing more work along the line of forest protection.

Mr. Elwood Wilson, of Canada: Mr. Chairman, we have in Eastern Canada one of the largest cooperative fire protective associations on this continent. For this cooperative association we are largely indebted to an American, Mr. W. R. Brown. We have brought out in the work of this association one novel point which has not been touched upon by this report, and that is, we have gone a step farther than simply charging the men who are cooperating in this work a pro rata share for the expense. The association, as we are now conducting it.

pays all the expenses of extinguishing fires and charges this back to the members according to their acreage, pro rata, which is valuable from this standpoint. When we formed this association there were a lot of men who had small areas of timber, and they were very loathe to come into the association, for fear it would cost them too much money. A man who owns a few square miles of timber, if he has to pay the expense of putting out a fire which occurs in it, the expense may be so large that it is a very heavy burden on him, so we decided to pro rate the cost of fire fighting according to the acreage, and we find this a very valuable help to us in getting people to come into the association. We also find this principle of cooperation is the most effective way of fighting fires that we have ever heard of or have ever tried.

Mr. F. S. Underhill, of Pennsylvania: Mr. Chairman, our work here today is educational, and it is educational to those who are present. There are three classes of people, I comprehend, who are interested in this discussion, the practical forester who is interested in fire protection under the Federal Government, the lumberman who is interested in this question of cooperative fire protection, and those who are interested because of their interest in general public welfare.

It has occurred to me that this suggestion might properly come up at this time: What can those who are not here, those who are not lumbermen and not practical foresters, do in this matter. I have listened with a good bit of interest to what Mr. Sykes said, as well as to what the others have said, and it occurs to me that one of the great principles that is before the civic associations is to emphasize the fact that a large percentage of the forest fires, as well as other fires, are due to carelessness and indifference.

Not long ago I attended the meeting of the National Fire Association of Philadelphia, and they had up for discussion fires in cities and towns, and that point was brought out. Mr. Sykes brought up the fact that a great many fires are brought up by men who go into the forests and throw away a match or leave a cigar or cigarette burning. It is true, also, that there is, to a certain extent, carelessness on the part of employes on the railroads. I was concerned in the investigation of a case that led to a disastrous fire, and the ultimate conclusion that we reached was that that fire was caused by sparks from a locomotive and the locomotive that passed at that particular time had the spark arrester, but somebody, an employe of the railroad who was indifferent or careless to the result of what he did, in order to create a better draft for the fire in his furnace, went to the smokestack and, with an iron implement, burst a hole in the spark arrester in order to get a better draft. It is true, a part of this proceeding will appear in the Washington newspapers, but we do have access to local newspapers, and we can secure sufficient data from the American Forestry Association and the National Conservation Association in regard to forest fires and the dangers that result from indifference and maliciousness and place it before our editors as well as our clubs and associations and ask them, in the interest of the welfare of the public and the welfare of the land, to emphasize the existence of carelessness. I believe that our civic associations can do a great deal to prevent forest fires.

The Chairman: May I recognize myself a moment in order to suggest an answer to your question as it appears to me? I do not see how we are going to accomplish anything, or, at least, not very much in this direction, except through organization and direct effort. There has to be some machinery, some person to keep at this thing to really accomplish very much, and that leads you straight back to the legislature. There must be some kind of an organization, a State agency which will direct these matters within the State, and there must be back of that, not moral authority to do things, but there must be plenty of money, and if you have got plenty of money back of an adequate and efficient State organization which can call upon the different educational agencies from the universities and all the different sources of clubs and civic associations and women's clubs,

clear down to the schools, then we are going to accomplish something, but every time it comes right straight back to the legislature and appropriation. (Applause.)

Mr. Lovett: In connection with the discussion of the railroad fire situation, I think it is pretty generally conceded that the railways are responsible where oil fuel is not in use, for half or more than half of the fires, on the average. In connection with the statement made by the speaker, last, before the Chairman, with regard to the action of engineers in breaking a hole through the netting or screen in order to get a better draft, I have heard that statement made and seen it in print many times, but I think that with the class of locomotives that are in use at the present time, that is an impossible thing to do. With the old-styled locomotive, where the screen was placed over the top of the stack, it was possible to break a hole in it, but at the present time, with the engines that are in use, it is absolutely impossible to do that. The only way to get at the screen is to open the door in the front end, and it cannot be done through the stack.

There are defects in the fire-protective appliances on locomotives, the screens wear out and openings are formed around them if they are not kept in proper repair, but I think that Mr. Allen and Mr. Chapman both will bear out my statement that it is not possible for a man, by taking a crowbar and jamming it down through the stack, to make a hole in a netting or screen.

With regard to fire protection along the railway lines, I would like to ask, would it not be possible to take some action in many States similar, somewhat, to the action that has been taken in Canada? In Canada the assumption is there that the railways must protect the public against the fires caused by the railways, and the burden of proof is placed upon the railways to extinguish every fire which occurs within 300 feet of the railway track unless the railway can show that it is not responsible for starting that fire. Under the regulations of the Dominion Railway Commission, the railway companies are required to establish special patrols in sections where fire hazard is great, and they are required to instruct all their employes with regard to reporting and extinguishing fires. The requirements are very strict with regard to clearing of right-of-way, so that the burden of cost upon the public is very greatly reduced and, in this way, the railway companies handle their own operation at their own expense, and that relieves, to a certain extent, the timber owners and the government for the purpose of supplementing that fire protection instead of covering it alone. The main burden they have to assume is to put on a sufficient inspection force to make sure that the railway companies do the work they are supposed to do. That is the way the situation is working out in Canada at the present time, and it is working out admirably, and it has occurred to me in some States where fire hazard is great along railway lines that something of that kind might be done.

The Chairman: We have had rather a long session this afternoon, and we are going to have a brief session this evening to discuss the question of any resolution which may be presented from this body, and the matter which came up at the end of yesterday afternoon, the matter of continuance of committees, so far as this body had power to make recommendations.

There is on the program one other subject, that of Federal Forest Policy, which I am taking the liberty of leaving out of the discussion. There is going to be brought up a number of discussions touching the policy of Federal administration of public lands in the general congress tomorrow and the following day, and the report of the sub-committee on Federal Forest Policy is contained in one of the pamphlets. I think, inasmuch as we have had such a long session, it will be wise for us to omit that.

FEDERAL FOREST POLICY

By the Sub-Committee on Federal Forest Policy.

Chairman, Jos. N. Teal, Portland, Ore.

Hon. A. F. Lever, Lexington, S. C.
Hon. Robt. P. Bass, Peterboro, N. H.
E. G. Griggs, Tacoma, Wash.
F. E. Olmsted, Boston, Mass.

SYNOPSIS

THE Sub-committee on Federal Forest Policy considers in the first section the Needed Legislation in National Forestry. It is pointed out that Congress has already recognized the essential principles in the administration of public forest lands. The present needs are for an extension of these principles and the necessary executive authority to put them into practice. One of the urgent needs is more liberal appropriations for preventing the destruction of the national forests by fire, by the construction of roads, trails, telephone lines and other improvements.

Another measure which has materially reduced the fire damage is Federal appropriations for cooperation with the States, and the continuation of such appropriations is urged.

Outside of the national forests are considerable areas suitable only for timber production, and legislation which would put these lands under competent administration is advocated.

Authority under which the Forest Service may grant term permits for the occupancy of land for special uses, legislation permitting cooperation with cities and towns in the sanitary protection of municipal watersheds within national forests, and the extension of the fire protective service on the national forests to include national parks are additional legislative measures advocated.

Section 2, on National vs. State control of public forests, outlines the advantages of Federal control of public forests, and points out the fallacy of the arguments for State administration. That the forest laws are constitutional and that the authority exercised by the Department of Agriculture is legal, are proved by references to decisions of the Supreme Court. The criticisms made are usually not of the law but of its administration and the prejudices existing are not substantiated by the facts.

The ability of the States to act as administrators of public forest lands is open to serious doubt on the record of past performances. As yet there have appeared absolutely no concrete suggestions of a proposed State policy.

Enormous areas of land have been granted to all the public land States and it is an indisputable truth that not one of these States has appreciated the heritage bestowed or shown ability to protect it. The chief purpose has seemed to get rid of the public land at any price, with the result that Sate control has rapidly been substituted for private ownership and exploitation, at inadequate return to the State.

The actual record of several States in the matter of public land administration is given in detail, and furnishes proof that the States have neither the organization, the policy, nor the funds to properly control public forest lands. Moreover, it would be impossible to develop uniform policies under separate control.

The expense of administration alone, and the one item of fighting forest fires, would prove an insurmountable obstacle to effective State management of the national forests. The argument that the loss in taxes to the State by reason of Federal control is a sound argument for State control is shown to be a fallacy. The taxation value of most of the national forest timber is low, and the perpetual income the State will receive from the sale of stumpage must far exceed any amount that could be received from taxes, since under Federal administration the States receive 35% of the gross proceeds of the national forests. The assertion that Federal control of the national forests is a hindrance to settlement, mining, and waterpower development is not substantiated by the facts. The truth is that the agricultural lands within the forests are being restored for settlement as fast as they can be classified; while homesteading within the national forests is possible under the present laws. The same is true of mining and waterpower, and any honest development is encouraged. The classification of lands within the national forests, which is now proceeding steadily, will obviate many of the difficulties and criticisms of the past.

Confirmation is given to the statement that once public ownership is surrendered the three great resources of the forest,—timber, water and forage—are rapidly monopolized for private advantage. After the results of private ownership become apparent, the people appeal to the National Government for help. They do not then appeal to their own State to recreate the forests, but the appeal is made to the Federal Government to appropriate the money to restore that which should never have been destroyed.

The settlement of these important questions will come from a full understanding of this difficult problem and by a fair compelling meeting with the Federal Government of constructive minds that are based neither by dividends nor elections.

Section 3, on Economics of Timber Supply in Relation to Production and Consumption, was prepared by Mr. E. T. Allen, at the request of the subcommittee. The subject involves questions of policy somewhat embarrassing for joint discussion by the interests represented on the committees; hence it was believed best to assign the subject to Mr. Allen, as a disinterested authority.

The management of the standing timber on the national forests will inevitably affect profoundly the management of existing private and State holdings. It is obvious that no disposal policy which may be adopted by the Government can give universal satisfaction. The governmental perplexities in the crystallization of a forest policy will be greatly lessened when, as in older countries, a forest policy can be developed which involves the welfare of the whole people and protects with equal impartiality private as well as public interests.

It follows that the maximum cut from the national forests should be insured not during the existing period of stored and excessive virgin supply, or during that permanent future which will begin when adequate forest crops have had time to mature, but during the closing years of an intervening transition period.

Of immediate concern in the sale of timber from the national forests are the questions as to whether there is too much or too little of the mature timber being sold, and whether the prices charged too high or too low? Furthermore, there is the execution of the policies which are adopted, and whatever the criticisms, it is certain that few governmental branches have so general a reputation for sincerity and absolute integrity.

The consensus of opinion regarding the execution of the present system seems to be about as follows:

1. The administration of the national forest timber business is marked by sincerity and complete absence of graft or favoritism.

2. Purchasers testify that when the necessity arises they obtain a hearing, and differences are usually adjusted to mutual satisfaction.

3. There is sometimes too much delay and controversy over the preliminary negotiations, due both to the magnifying of inessential details and to the submission of such details to too many authorities.

4. The attempt to adjust prices to the profits of purchasers involves considerable investigation of a most difficult nature, subject at best to some theory and uncertainty.

5. This work is necessarily done sometimes by men lacking in practical lumbering experience, because government salaries do not attract experienced lumbermen and the service is not old enough to have developed the combined lumberman and forester in sufficient numbers. Higher salaries for such men would get and hold better ones.

6. Unreasonable public suspicion and danger of criticism for alleged collusion prevents the Forest Service from making full use of assistance, it might otherwise receive with practical problems, from unbiased sources within the lumber industry itself. Such cooperation might be as useful in this as it has proved to be in fire prevention.

7. The system of continued government control of operations under detailed contract places upon the subordinate officials directly in charge, a responsibility for requiring exact fulfilment to the letter when contingencies justify some deviation. This difficulty, also most of those in preliminary negotiations, would be reduced by increasing the authority of field men. There is a tendency to constant centralization of authority in Washington and perhaps in the district offices, whereas it should be constantly diffused all the way down the line as fast as local officers can be developed by so doing to take it increasingly.

8. On the whole, execution is improving with the age and development of the Service.

THE REMEDY

We have seen that the main objects of the Federal timber policy should be to:

1. Insure the consumer a maximum supply of timber at the critical time

toward the end of the duration of the country's virgin forests, and before new crops take their place.

2. To exert a steadying influence on forest industry which will, on the one hand prevent monopoly and extortion, and on the other prevent over-production, demoralization of the industry, wasteful utilization, and wrecking of the small operator, all of which in the long run injure both the consumer and the States in which national forests are situated.

3. To make its terms for government timber attractive enough to permit use by those who really need it, but not to subsidize the transfer of lumbering generally to the national forests, leaving private timber uncut to control the situation when government timber is gone.

4. To secure as fair a revenue as is consistent with the above objects, but not to sacrifice them or future revenue unduly merely for a little more present gain.

5. To be as simple and understandable as possible to public, purchasers and congress.

To attain all these objects requires:

1. A non-partisan, unprejudiced, statesman-like treatment of the whole subject by all concerned, based upon knowledge of the conditions governing forest industry. These include the factors which govern prices, logging and manufacturing methods, the growth of forests and like influences which are too little comprehended by many who now seek to interfere.

2. A study of stands and conditions not only on the national forests but also on other forest lands, from which to judge future competitive relations.

3. Intelligent State action in encouraging conservative handling of private forests by wise tax and protective laws and in reforestation, and wise handling of their own lands by the States themselves.

4. The closest cooperation between government, States and private owners in all forest matters, bringing about friendly constructive effort in harmony, rather than conflict. The whole problem is an interlocking one, unsolvable by either agency alone.

5. A policy, based upon the above preparation, which considers all forest production and forest use as little or no different from the production and use of any other crop, to be encouraged and stabilized on the best permanent business basis for all concerned. The government should use its control of forest land profitably for its constituents for which it serves as steward, but without taking advantage of its position to accord either producer or consumer any unfair advantage. In the long run all have most to gain from making all true forest land, regardless of ownership, capable of earning such an income from forest production as will insure its best management and consequent fullest service to community and nation.

Under such a policy stumpage prices will continue to advance, because timber is becoming more valuable and because it costs money to carry it, will they reach the cost of growing timber, which is the true criterion of the value of any product, *but they will not pass it*, as they will if recklessness at this time results in bad

use of so much forest area that the remainder acquires a monopolistic position. Under such a policy the terms of sale will be more clearly defined, with less left uncertain for future adjustment. It is probable that the problem of fixing fair prices in long term transactions will be largely met by improved transportation facilities, placing the timber open to competition by more purchasers and shortening the time necessary for them to open and use it, and where this does not result otherwise the government itself may provide such facilities. The competence of officials will naturally increase continually, through experience, unless Congress fails to provide adequate pay to hold them. States, Congress, and people will be equally satisfied with the national forests as a profitable public project.

SECTION I

NEEDED LEGISLATION IN NATIONAL FORESTRY

THE legislation which is needed in national forestry is primarily to extend the principles already recognized by Congress and to enable the executive authority better to put these principles into practice. In handling the public property the executive departments are handicapped because the present laws do not give sufficient authority in certain specific matters, and because sufficient means are not yet provided to meet fully the practical requirements of the most effective administration. Attention is called to the need of legislation in the following matters:

1. We would urge more liberal appropriations to render the national forests secure from destruction by fire. Especially would we urge much larger appropriations for the construction of roads, trails, telephone lines, lookout stations, and other improvements which must be built before it is practicable to give the forests proper protection. Although a great deal of this work has already been done, the progress is necessarily slow compared with the enormous amount of work which must be done. Every dollar spent in this work is insurance against direct loss. It is significant that private patrol associations of Pacific coast timber owners spend much more per acre for protective work than does the Government on contiguous National Forest lands.

2. Since Congressional appropriation for co-operation with States in protecting watersheds outside National Forests has proved of immense value in stimulating State action, we urge its annual continuance as a part of a regular Federal forest policy.

3. There are areas outside the National Forests which are valuable only for timber production, and which at the present time are not under any adequate administration. The committee urges that this land be classified as rapidly as possible, and those areas which are found to be chiefly valuable for timber production should be included in the National Forests. They stand today exposed to destruction by fire and trespass, and in many instances they constitute a menace to the forests which are under protection.

4. The committee urges legislation which will authorize the Forest Service to grant term permits for the occupancy of land, for construction of hotels, summer cottages, and other special uses. At the present time there is authority for the granting only of a revocable permit, except in a case of development of mineral springs. The executive authority should be able to grant leases for at least twenty years for the use of National Forest land for hotels and similar purposes.

5. There are over 1,200 cities and towns which derive their domestic water supply from streams rising within the National Forests. The protection of the sources of these streams, both from the standpoint of the regularity of flow and of purity, is of enormous importance. At the present time the Forest Service may co-operate with cities and towns in the protection of their watershed so far as the protection of the vegetative cover and exclusion of stock are concerned. There exists no authority, however, to prevent contamination of the water through the use of the land by campers, prospectors, and others. We would urge legislation which would authorize the Secretary of Agriculture to take such action to co-operate with cities and towns as is necessary to protect municipal watersheds lying within National Forests; such authority to extend to regulating the use of the surface of the ground in mineral locations, or prevention of camping where this action is necessary.

6. Most of the National Parks are more or less heavily timbered and present the same problem of protection from fire as the National Forests, and they present also a very important phase of forest development, though the purpose of their management is primarily for scenic beauty rather than the production of timber. There is, in the judgment of the committee, great need of legislation looking to the establishment of a Bureau of Parks, either in the Department of the Interior or the Department of Agriculture. There is need also that the entire organization of the National Parks should be under Civil Service protection, just as is the case of the Forest Service.

7. No reference is made in this report to needed legislation regarding the use of water power sites, as that is handled by another committee.

Section II.

NATIONAL VS. STATE CONTROL OF PUBLIC FORESTS

IT is the purpose of this Committee to discuss this question from the standpoint of public policy and to present it in such form that the public which owns the forests may see more clearly the issues involved, and on which side of a very sharply defined line its interests lie. At the outset the very title assigned us, although it is the popular statement of the problem, is misleading because it implies that all parties to the controversy believe in public forests and that their *control* is the issue. In reality, knowledge of the facts and consideration of the arguments used to substitute State and National control show that the underlying motive of the propaganda for State control has for its object the *elimination* of public forests, State or National. This fact should be known, and the issue accepted and fought out in the open instead of from ambuscade.

HISTORY OF NATIONAL FORESTS

As early as 1799 the demands of our navy led to purchase of timber lands by the general Government, but while acts were passed from time to time setting apart forest lands for specific purposes, it was not until 1871 that an attempt was made to secure comprehensive administration of the national forests. The attempt failed. The following statement taken from *The National Forest Manual* dated August 12, 1912, gives in concise form the genesis and development of our forest legislation:

"In 1876, $2,000 was appropriated to employ a competent man to investigate timber conditions in the United States, and on June 30, 1886, an act was approved creating a Division of Forestry in the Department of Agriculture. On July 1, 1901, this Division became the Bureau of Forestry, which, in turn, under the act of February 1, 1905, became the Forest Service.

"With the increasing realization that the Nation's forest resources must be protected, and with the immense growth of irrigation interests in the West, the necessity for retaining permanent Federal control over selected forest areas was recognized by a brief section inserted in the act of March 3, 1891 (26 Stat. 1095), which authorized the President to establish forest reserves, now called National Forests. The first exercises of this authority was in the creation of the Yellowstone Park Timber Land Reserve, proclaimed by President Harrison March 30, 1891. The mere creation and setting apart of forest reserves, however, without provision for their use, was both ineffectual and annoying to local interests, dependent upon their resources. Consequently the Secretary of the Interior, in 1896, requested the National Academy of Sciences to recommend a national forest policy. This resulted in the passage of the act of June 4, 1897 (30 Stat. 11), under which, with subsequent enactments, National Forests are now administered."

ADMINISTRATIVE POLICY

The general policy laid down for the Forest Service is well expressed in a letter of the Secretary of Agriculture to the Forester, dated February 1, 1905, from which the following excerpt is taken:

"In the administration of the forest reserves it must be clearly borne in mind that all land is to be devoted to its most productive use for the permanent good of the whole people, and not for the temporary benefit of individuals or companies. All the resources of forest reserves are for use, and this use must be brought about in a thoroughly prompt and business-like manner, under such restrictions only as will insure the permanence of these resources. The vital importance of forest reserves to the great industries of the Western States will be largely increased in the near future by the continued steady advance in settlement and development. The permanence of the resources of the reserves is therefore indispensable to continued prosperity, and the policy of this department for their protection and use will invariably be guided by this fact, always bearing in mind that the conservative use of these resources in no way conflicts with their permanent value."

FOREST LAWS CONSTITUTIONAL

From time to time attacks have been made on the powers granted the Department of Agriculture by Congress, on the validity of rules established by the Department, and on the constitutionality of acts of Congress withdrawing lands from settlement without the consent of the State wherein they are located. The Supreme Court of the United States has passed upon these questions, *sustaining the acts of Congress and rules and regulations made and promulgated thereunder*. United States v. Grimaud, 220 U. S. 506, and Light v. United States, 220 U. S. 523, are illustrative.

It can therefore be assumed without further discussion that the chief question now open for consideration is one of public policy. Is it better for the public that this vast resource, unquestionably belonging to all, be turned over to the

respective States for disposition as they may severally see fit, or that it be kept in the nation's control and disposed of under a comprehensive policy looking to its greatest and wisest use and conservation in the interest of all the people?

PURPOSE OF CONGRESS IN LAW OF 1897

National forests are created for the purposes, as declared by law, to improve and protect the forest, to secure favorable conditions of water flow, and to furnish a continuous supply of timber for the use and necessities of the citizens of the United States. It is expressly declared *not* to be the purpose or intent of Congress *to include lands more valuable for mining or agricultural purposes* than for forest purposes within such reserves. It is provided that nothing shall prohibit the egress and ingress of actual settlers residing within the boundaries of the national forests. Any person may enter for all lawful purposes, including that of prospecting, locating and developing mining resources. The waters in the forests may be used for domestic, mining, milling or irrigation purposes, the water laws of the respective States governing their use and appropriation, and the laws of the United States controlling the mining. The mature timber is being sold in fast increasing quantities. Grazing is permitted under regulations so fair that those directly concerned are its strongest supporters. Permits for developing water power sites are granted on easy terms and conditions. The one dominant idea running through the law and its operation is the rightful use and protection of the public interest. In other words, the paramount purpose of Congress was to provide for the appropriation, and preserve for future use, a great national resource, a necessity of life, and in so doing also to conserve another great resource and necessity, water, with its varied uses.

On the other hand it is also true Congress did not desire or intend to retard development, prevent settlement of agricultural lands, or handicap mining, stock raising, or any other industry, in any locality in which a reservation might be made. It would seem that from every standpoint the object sought to be attained is so manifestly in the public interest, indeed is so vital to the public welfare that it is somewhat difficult to understand why any should oppose it.

CRITICISM NOT OF LAW BUT OF ADMINISTRATION

Few openly attack the object of the law, but many insist that the State, not the nation, should be the guardian or trustee of the people's interest. Criticism of administration is the general line of attack, but it is not apparent that anyone has, as yet, made charges of graft, of neglect, or failure to appreciate responsibility. Attacks are almost wholly upon alleged excess of zeal, lack of knowledge of conditions, and impracticalness of officials in charge.

It is significant that no charge of dishonesty or graft has been made against this department and, although perhaps unconsciously, those thus attacking the officials are in reality paying them a high compliment. The men in charge may be "ignorant," "incapable" or "incompetent;" their attempts may be "inane," "academic," "unjust," but there is yet to be made the charge of dishonesty. This

is true of the most fiery resolutions against the Forest Service. A record of such has emanated from a State, to which, by the way, the Government has granted over 12,500,000 acres of lands, in which language was exhausted in describing the utter incompetency and general foolishness of the Forest Service, but even this production did not charge dishonesty.

REASONS OF CRITICISM

While no doubt causes for complaint have and do exist, it is also true the Forest Service has endeavored to carry out the policy of the law. It has been handicapped in its efforts by lack of means to care properly for the vast trust in its charge and to do all that is desirable within a short time. Given the money, classification of the lands could be greatly expedited and this in itself would remove a chief cause of complaint. With experience gained from year to year, with a better knowledge of local conditions, with a clearer understanding of the situation, with the application of good judgment and common sense to every-day problems, the service is fast removing existing prejudices and the public is learning more and more to appreciate its value and the importance of the preservation of the forest to State and Nation. Assuming, therefore, that there will be no substantial dissent as to the general policy of public control, we shall consider whether the State or the Nation is the better agency to carry it out.

THE STATE AS AN ADMINISTRATOR

We have all read, doubtless, many resolutions and addresses issued by congresses, legislatures and publicists advocating turning over the public forests to the respective States. As yet *there have appeared absolutely no concrete suggestions of a proposed State policy.* Much less has there been discussion of what the States have done with their public lands in the past. There runs through all the arguments, appeals not only to prejudice but also to that sentiment of selfishness and personal gain implanted in us all. Conceded as it must be that the national forests are now legally the property of the nation, it would seem that those seeking to change the present status for alleged public welfare would have the burden of showing, first, that they have some plan under which they propose to control and dispose of them; second, that such plan will produce better results than we are now securing; and third, that actual experience shows the States to have developed their superior competence to execute such a plan in the interest of the public. None of these fundamental requisites is ever discussed by the State control advocates. We can therefore turn only to past performances to ascertain, if possible, what the test of experience shows the results of State control to be.

DISPOSITION OF GRANTS TO STATES

Enormous areas of lands have been granted all the public land States, so every opportunity has been afforded them to show not only their willingness but their ability to handle these public assets in the public interest. The following list, taken at random, will give some idea of the amount of these grants: Cali-

fornia has received 8,370,701 acres; Colorado, 5,431,222; Idaho, 4,631,779; Minnesota, 8,341,718; New Mexico, 12,556,027; Oregon, 5,350,382; Utah, 8,414,276; Washington, 4,044,471; Wisconsin, 5,095,351; Michigan, 7,512,877. Included within these grants were some of the choicest bodies of timber lands known.

It is within the bounds of truth to say that not one of these States either appreciated the priceless heritage bestowed on it or realized the importance of protecting it. Nor even at this late time has a single State a well-defined policy expressed in law and adequately supported, looking to the properly co-ordinated care, disposition, and conservation of its natural resources. There is hardly a public land State in which there have not been charges of graft and fraud in connection with the disposition of public lands. Scandals of great and small proportions have been so numerous as to be commonplace.

Generally, the chief purpose has seemed to be to get rid of the public lands at any price, with the consequences that enormous areas have passed, without regard to value, into the hands of speculators pure and simple, of non-residents of those who had absolutely no interest except to strip the land at whatever cost or waste without regard to the future. When earnest, sincere men sought to remedy abuses, they were sneered at as dreamers and reformers, and where policies were sought to be established by the State they were as vacillating as the swinging pendulum.

Vast areas were donated by the States for roads that were never built, water fronts were given away without any consideration, tide and swamp lands were granted on promises that never materialized, and vast areas of the choicest timber lands sold for a song. These statements are not exaggerations. On the contrary, they are mild when compared to what the facts justify. The same story runs through them all, whether in Wisconsin or Oregon, Michigan or California.

Indeed we are forced to the conclusion that there is some impelling cause acting in the premises, too powerful to resist. There is, and that cause is precisely the one now appealed to—selfishness and the opportunity for immediate personal gain. The future seems to weigh as nothing against the temptation of securing some possible immediate profit when dealing with public property. Some one proposes to undertake some popular public improvement, perhaps local in its nature, and to take in exchange a tract of forest or other State lands. By skilful appeals a sentiment is soon created which the legislature cannot withstand, and with a stroke of a pen public property is gone forever. Then only does the public awaken to the fact that once again an inheritance has been exchanged for a mess of pottage. Experience in this respect counts for nothing. All that is needed is a new scheme, a clever operator, and the trick is done. Who of us is there who has been reared in public land States but will admit that the picture is not overdrawn? But we need not confine ourselves to generalizations.

WISCONSIN

THE public reports of every State bear mute but eloquent witness to the facts. We take the following from Vincent Phelan's "The Financial History of Wisconsin," issued in 1908.

"The management of Wisconsin's public domain has been marked by inefficiency, carelessness and fraud. The State has sustained great losses

through the premature bringing of land into market, through trespassing, through under-appraisement and through the sale on credit of timber lands which were forfeited to the State after they had been stripped of their wealth; the State, the people of the State, and prospective settlers have suffered great loss and great injustice because of the sale of immense tracts to speculators."

"In his message of 1849 Governor Dewey complained that the practice of disposing of the public domain in unlimited quantities was becoming a crying evil. In many parts of the State, settlement was being greatly retarded because immense tracts of the best lands were being held by speculators. Settlers were obliged to pay advanced prices for their homes, and then by their labor they enhanced the value of neighboring land held by non-residents. In one county a single individual, who was not even a resident of the United States, held upwards of 20,000 acres. It was reported in 1854 that in the northern counties most of the school lands were entered by persons in the East, and in many cases in 30,000 and 40,000 acre tracts. Advertisements of large tracts of school lands were common. In 1858 James P. Falkner advertised for sale 50,000 acres of choice school lands in eastern and western parts of the State. In 1855 Mann, Hammond & Co. offered for sale over 100,000 acres of choice school lands in northern and northwestern counties. Such advertisements show that a great deal of State land was bought for speculative purposes. The joint investigating committee of 1855 showed that in 1854 over 200,000 acres had been sold without any payment down and on thirty years' credit. To nine persons were sold 129,520 acres. The smallest sale among these nine sales was one of 5,065 acres. There were among these nine sales one of 34,701 acres and one of 28,124 acres. . ."

"The wasteful and often shamelessly corrupt management of Wisconsin's public lands illustrates two very important principles of public financial administration; first, it is folly to economize unduly in the management of great public interests, and second, laws will not execute themselves. . . The legislature enacted many land laws that were excellent in themselves, but which failed to accomplish their ends or did so only in a minor degree, because good and efficient administrative machinery for their enforcement was lacking. The problem was by no means an easy one, but the way in which its public lands and its trust funds have been managed should be a source of regret and of shame to the great State of Wisconsin."

MICHIGAN AND CALIFORNIA

MICHIGAN has no better record. It sold lands as low as one cent an acre and received on an average but one dollar per acre as consideration. California sold its timber lands at the uniform price of $1.25 per acre and sold them to the first applicant. But it may be said, "This is all past history, the States did as well as the general government, and legislatures were no more profligate or short-sighted in handling the public lands than was Congress. The States have the experience of others to guide them, and they will act more wisely."

WASHINGTON AND OREGON

BUT will they? Are they so acting? Let us see: The State of Washington has always been more or less the storm center of opposition to Federal control and has some of the most energetic advocates of State control. It is comparatively a new State and had a very large area of forest land. It had

the experience of others to guide it and the opportunity to demonstrate its ability and desire to profit thereby. It has even yet hundreds of thousands of acres of forest land; some inside the national forests, some without. It has a State forestry school as good as any in the country, and so should have plenty of foresters. It has many lumbermen with practical experience. Indeed, as in Oregon, lumbering is its greatest industry. It even has a law providing for all necessary study on which to base a policy.

Yet thus far it has done nothing in forestry work. Unless within a short period, it has never employed a trained forester, except possibly temporarily in a subordinate fire-fighting capacity. It has made no studies, collected no information, made no maps. It sells timber through the land board without any forestry consideration. It does nothing to encourage restocking. Charges of improper conduct in connection with sales became so insistent that they were made a subject of legislative inquiry. An excellent committee on forest legislation was appointed to report on these matters. It worked hard and conscientiously and recommended an excellent set of laws that would have put Washington in the front rank. Its report, prepared by qualified, earnest men, was of great value, not only to the State of Washington but to every one interested in the proper conservation and use of forests and logged-off lands. This report for some reason was not only not presented to the legislature but was not even printed. The net result was the passage of a fire-fighting measure.

All the State has really done is to appropriate $37,500 a year for fire prevention (its private owners spend twice this and the Federal Government eight times this within its borders). In no case has a fire law or appropriation originated as an administrative measure, but has been forced by the insistence of citizens. Nothing herein, however, is intended to reflect upon the head of the State Forest Department, whose task is so great and whose facilities are so meagre.

The State of Washington is not the only delinquent. The State of Oregon disposed of practically all its timber lands at $1.25 per acre and is now doing its best to trade the fragmentary remains of its lands, scattered throughout the national forests, for a solid body of 50,000 acres of forest land which will in terms be inalienable. Out of its hundreds of thousands, perhaps millions of acres of timber lands, the State of Oregon, within whose borders stands the greatest amount of timber of any State in the Union, is now seeking 50,000 acres for a State forest.

IDAHO

IDAHO sold what is probably the best body of white pine in the State at a very low figure. Originally, the sale included the timber only, but we are advised that the State finally parted with the title to the land. This State has no definite timber policy and never has made an attempt to outline one. Similar history could be given of Minnesota, Colorado, Wyoming, and the rest.

This unscientific, haphazard, reckless method of handling public lands is not confined to any one or two States. The cause is deep seated. The fault does not lie with the public, but with the politician. It is not that progress is not

being made, for it is. It is not that people are not awakening to the true value of the timber land and their interest in it, for they are. But at this time there is absolutely no justification from any standpoint for abandoning an efficient, well-organized and intelligently directed control of this public asset and turning it over to the States with any idea or hope of any result other than the wiping out of the public forests and their passing into the hands of a few great land owners. In the interest of the States themselves this should be prevented, and their wisest friends are those who stand firmly and unflinchingly against such a policy. But there are other reasons as cogent if not more convincing that State control would be a fatal mistake.

DANGERS OF SEPARATE POLICIES

ASSUMING as we must, that the vast majority of the people favor retaining public ownership of the forests and assuming that the respective States desire to do their full duty by them, we are at once confronted with difficulties that are almost insuperable under *separate* control. For, generally speaking, there is no local policy, let alone a uniform one in the treatment of the problem. Bearing in mind that many of the problems to be met are interstate in character, we may have as many conflicting plans and policies as there are States. There is scarcely another industry that demands such uniformity of policy in matters which affect its permanent foundation as does the lumber industry.

The potential value of public forests as a reserve supply, as a balance wheel in controlling prices, cannot be overestimated. Their value as conservators of water supply and water run-off is incalculable. As furnishing grazing grounds for live stock, thus directly affecting the supply and price of meat they are important. Indeed their preservation enters into the daily life of all the people and is confined to no single State. Starting, therefore, with the fact that the problems are national, that the forests are national and their maintenance affects all the people, it is startling, if not appalling, to consider the situation that would follow the splitting up of this national asset into independent units with conflicting local policies, each operated without sense of responsibility to the other.

The efforts of one State which might adopt a sound, far-sighted policy with regard to the forest industry, seeking to perpetuate the general business prosperity dependent thereon in a heavily forested State, would have its policy jeopardized and possibly negatived by a sister State whose policy or lack of policy might be entirely different. The effect of forest destruction in one State might affect the source of water supply used in another State so as to absolutely destroy the value of its property. These possibilities are not imaginary. Many of the arguments advanced for State control, in so far as they suggest any policy, would lead to just such results.

In discussion presenting the theory of State control, every fault of present administration is exaggerated and benefits are rarely referred to. Seldom, if ever, is there any reference to the expense the State must incur if it is to own and control the forests. Nothing is said of the work, or cost thereof, in the

study of woods and their uses and of the maintenance of supply. That this great resource for its proper care needs a clear-cut, uniform policy, based on accurate knowledge and scientific study, seems to have been lost sight of. That in its development and care the collaboration of other scientific services of the country is essential is overlooked. The word "practical" is made to do yeoman service, and it is almost a matter of reproach that one should really know something more of forests than that lumber can be made of them.

EXPENSE OF ADMINISTRATION

TAKE, for example, one item of cost alone,—preventing and fighting fire. It must be presumed that every one will concede that this protection must be furnished, in the interest not only of property but of human life. In this instance we have irrefutable proof of what the States will do and how difficult it is to secure the limited aid now furnished. It is a fact that in any Western forested State if it were not for the means furnished by the general government, literally millions of dollars of property would be destroyed every year. In Oregon alone there is expended by the general government in patrol and prevention about $480,000 a year, an amount nearly one sixth as great as the State's total expenditures for all governmental purposes. This figure does not include sums expended in actual fire fighting, which in destructive seasons amounts to thousands of dollars more. Fires and accompanying losses and disasters are not confined to State lines. This dread destroyer knows neither geographical nor governmental divisions.

ENCOURAGEMENT OF SETTLEMENT

WHILE the Forest Service is often charged with retarding and discouraging settlement and development, the reverse is the truth. Its telephone lines, trails and roads are often the forerunners of settlement and the only means of communication in remote sections. If the Forest Service is given the opportunity with the next few years, through the efforts of the forest road builder the remote sections of our Western States will be brought into communication with the other portions thereof. Instead of retarding development, the Forest Service will be a powerful factor in opening up to settlement and use lands on which as yet the foot of man has scarcely trod. With the work there is to do, in every portion of the Western States, it would seem that ordinary business judgment would welcome the aid of the National Government in the care of the forests and suggest only the closest co-operation by the respective State authorities with the Forest Service.

TAX ARGUMENT FALLACY

THE loss of taxes to the State by reason of the national forests being non-taxable is another favorite argument of those who contend for State control. The use of this argument is sufficient if this in itself is the object to be sought. Those who advance this argument cannot believe in a public forest, State or national, for it would be non-taxable in either event. The argu-

ment itself is largely fallacious. The taxable value of much timber in remote and inaccessible regions is, to say the least, very problematical; and the perpetual income the State will eventually receive from sales of the stumpage when accessible must far exceed any amount that could be received from taxes. At the present time 25% of the gross proceeds from national forests is paid to the State for road and school purposes in the counties whence derived. Ten per cent more must be spent locally by the Government for road work. While this total, 35%, is not now a large sum in all States, it is considerable, and timber sales are now increasing so rapidly both in number and amount that the revenue received by the States will soon amount to large sums. This is a permanent revenue.

CHARACTER OF FOREST LANDS

MUCH is made of the area of the national forests and withdrawal thereby of lands from settlement and use. Analysis and examination is necessary if a right conclusion is to be reached. We may wonder why, when this statement is made, three other facts are not stated: first, the situation of the lands; second, the reason for non-classification; third, the purpose of the withdrawal. It would seem that the public, to whom such appeals are made and arguments presented, should have all the facts and not merely a part of them. In connection with this particular topic Oregon is perhaps a fairly illustrative State, as the amount of lands in the national forests in this State are very great. Its topographic features are much like other forest States. The net acreage in the national forests in Oregon, for example, is about 13,658,679, certainly a vast area. Much of it, however, is situated in the highest and most inaccessible regions of the State, far removed from transportation facilities, a fact to which no consideration is ever given when criticisms are being made of the failure to sell ripe timber by the Forest Service. Much of the area is so broken and the slopes so steep as to make cultivation out of the question. Approximately 43 per cent of this area is at an altitude of more than 5,000 feet above sea level. About 17½ per cent 4,000 to 5,000 feet above sea level, and about 9 per cent 3,000 to 4,000 feet above sea level. On these mountains the forests stand as guardians of our water sheds, affecting not only this State but other States as well, a matter of direct concern to the well being of every citizen now living or hereafter to live in the vast domain protected by them.

REAL HINDRANCES TO SETTLEMENT

IT is true there are lands within the forests that are agricultural and should be restored for settlement. No one disputes this fact. While restorations have not been made as rapidly as many of us would like and feel they should be, to what extent this is the fault of the Forest Service and to what extent the fault of Congress, in not providing funds for classification to be made as required by law, is seldom understood. The entire fault is generally cast upon the Forest Service. Both causes have operated, but it is not to be doubted that Congressional economy has been potent. Moreover, large areas are constantly being restored, the law requires it and those responsible for the conduct of the department have

neither the desire nor wish to offend either again—at the letter of the law or its spirit. There is no question that within a few years this cause of trouble will be a thing of the past.

But why delude ourselves? These withdrawals have but to a limited degree affected either settlement or development of the Western States. They certainly have not affected the production of lumber or price to the consumer. Millions and millions of acres of land are in the hands of manufacturers who, if they could find a market, would be only too glad to increase their facilities for turning it into lumber and other products. The fact is, as those who are advised know, that the production of lumber in the West is in reality far in advance of the consumptive ability of the markets. Causes, both economic and statutory, entirely outside the Forest Service or of its control have largely caused the market conditions of which we complain. The "back-to-the-land" movement has been encouraged in every way, but as yet has not shown very great results. It is not peculiar to this section but is applicable to all parts of the country. Vast areas of land in every Western State are open to settlement or purchase, but they are being settled but slowly and purchased in limited quantities. On any of the Government irrigation projects it is only with extreme difficulty that lands are now being disposed of. Statistics of railroads as to immigrant movement to a number of Western States for the past few years show that the majority of those carried were not farmers or farm-seekers. The vast majority were bound for the cities, looking for work therein or hoping to profit by speculative increase in town lots or other activities of city life. Our homestead laws and regulations thereunder have rendered it well-nigh impossible in the forest section for the homeseeker to secure land under the law, while right across the border Canada and its railroads were offering every inducement for settlers. Our private lands are often held prohibitively high.

With none of these things has the Forest Service aught to do. Because we are discouraged by failure to grow as fast as we think we should, shall we, instead of seeking the true remedy and trying to correct our failure, let the Forest Service be made to bear all the sins of omission and commission not only of its department but of all other departments? As a remedy for this condition, we are urged to do away with the national forests. Greater folly cannot be conceived. Illustrations are not lacking to prove how a false hue and cry may be raised and people misled to their own injury.

OLYMPIC NATIONAL FOREST

IT would be of tremendous service if the history of the throwing open to settlement of a large portion of the Olympic National Forest could be in the hands of every citizen of the State of Washington. In 1901, under an enthusiastic demand to throw a portion open to settlement, and which demand was said to be in behalf of bona fide settlers and homesteaders, 705,600 acres of lands were released. It was urged at that time that business was suffering; that the entire section in which this forest is situated was at a standstill; that development was retarded; that actual settlers were desirous of taking up lands and mak-

ing homes thereon, and that if something were not done chaos would result. What has been the result? In ten years 625,520 acres of this land are in the hands of private owners who are holding it for its timber. A list of these owners, if we had space to publish them would be interesting and would tell its own story. Over 178,000 acres were included in five holdings, and one man owned 81,630 acres. Of the area originally timbered it is said on authority only about 600 acres are now in cultivation. With this experience it is not a matter of surprise that many very good citizens are somewhat skeptical as to the purpose of those so strongly urging State control.

FORESTS ARE NATIONAL ASSETS

THE value of this national asset is more than $2,000,000,000. In fact, it is so great it cannot be measured, great actually and great potentially. It now belongs to all the people and serves all the people. The public forests fill other functions than merely to furnish lumber, functions and uses which extend far beyond State lines and involve the well being of many communities. They cover and protect the headwaters of streams used for navigation, irrigation and power. They prevent or minimize constantly recurring disastrous floods, which know not State lines. They retard soil erosion and in many ways have a direct effect upon natural conditions of the greatest consequence. The timber supply of the future is nation-wide in its importance and the continuity of its production a national problem. Natural conditions for maintaining the timber growth and supply not being equally favorable, those States not able to supply their own wants must depend on the sections peculiarly adapted therefor to supply the same.

If this vast property belonging to the nation is to be given to the respective States within whose borders it chances to lie, then it is a national duty before such transfer is made to see to it that the great trust imposed by virtue of such ownership will be properly administered so that those for whom it is maintained will be better, or even as well, protected as they are now in their rights in and to it. With the lamp of experience to guide us, is there any reasonable probability that this would be the case?

Notwithstanding the experience of the Eastern States, or perhaps by reason of their experience, it was not an easy task to have the forests created, for it was opposed not only by those who had profited by the acquisition of timber lands in such States, but by all of those who had profited by, or hoped to profit by, the use or acquisition of other natural resources on a large scale. It is unnecessary to go into detail in the discussion of this phase of the question, for the history of the exploitation of our national resources is an open book, and he who runs may read. That the contest for opportunity to secure monopolistic control of the few remaining resources will be maintained under various guises is to be expected. But when the public awakens to a realizing sense of what this all means there will be but one answer.

PROPER CONTROL ALL IMPORTANT

WE have not entered into a discussion of administrative features for, after all, no matter how important this may be, it sinks into insignificance as compared with the greater question, that is: whether the public interest in these great resources is to be preserved. If one-half the time were devoted to constructive criticism and efforts to correct mistakes that is devoted to abuse and destructive criticism of matters of administration, correction and advance could be speedily made.

"Once a public ownership is surrendered, the three great resources of the forest,—timber, water and forage,—are rapidly monopolized for private advantage." This statement can be confirmed over and over again by facts which cannot be disputed. Let the public forest once be abandoned, and the mistake is remediless. The attempt now being made at the request of more than a dozen States to restore the denuded areas of the Appalachian range is an excellent illustration of what will certainly follow. First, under the guise of development, the forests will pass into private hands with all the results of private ownership. After this, the people have an object lesson of what it means. *They do not then appeal to their own State to recreate the forests, but the appeal is made to the Federal Congress to appropriate the money to restore that which should never have been destroyed.*

The sole question in this whole controversy is what agency will best secure results? The forests are as national as the rivers they help to maintain and as broad in their influence as the plains for which they store the life-giving water. The Nation is paying the cost of their protection. The States get the greatest benefit at no expense. It would seem that every one except those directly interested in profiting thereby has all to lose and nothing to gain by a transfer from Nation to State.

The injecting of the claim of the two sovereignties, State and Nation, into the discussion of questions of a public nature is not a new one. It is sometimes done for the purpose of creating confusion, of finding a twilight zone in which there is no apparent authority. The purpose often is not the protection of the public interests, but rather escaping from any public control or obligation. Mr. Bryan, in a speech at Kansas City, stated the matter aptly when he said:

> "My observation is that you very seldom have a conflict between the State and Nation unless some private interest is attempting to ignore the rights of both State and Nation. Back of this controversy which we hear suggested between the State and Nation you will find the interest of the predatory corporation that is as much an enemy to the people of the State as to the people of the Nation."

But the predatory motives are by no means the only ones which can utilize this movement. The politician who seeks through misrepresentation to foster among Western voters a belief in fictitious State benefits, and unwarranted resentment of presumed federal injury, and this for his own political advantage, should merit no public or private sanction.

The settlement of this important question will come from a full understanding of this difficult problem and by a fair compelling meeting with the Federal Government of constructive minds that are biased neither by dividends nor elections.

Section III

ECONOMICS OF TIMBER SUPPLY IN RELATION TO PRODUCTION AND CONSUMPTION

(Prepared at the Request of the Sub-committee by E. T. Allen, Member of the General Committee on Forestry.)*

INTRODUCTION

THE standing timber of the national forests, while probably less than a fifth of the total under all forms of ownership in the United States, is sufficient to be of tremendous importance not only as a source of supply but also in the long run as a factor in the market. Since it is the greatest supply under a single control, with that control vested in the public, its management will inevitably affect profoundly the management of existing private and State holdings, especially as the aggregate supply is reduced and as the present keen competition among private owners becomes lessened. At the same time the relation of its management to reforestation and future supply makes consideration of existing conditions exceedingly complicated.

It is obvious that no disposal policy which may be adopted by the government can give universal satisfaction. Private lumbermen who have no timber of their own and can buy and operate national forest material more advantageously than they can other timber, or who think such a policy will cheapen other timber they desire, may advocate an extensive selling policy. So may heavy owners of private timber who desire to operate but prefer to hold their own until it is worth more. A contrary view is naturally held by those who have most to fear from immediate lowering of stumpage or lumber prices. These include those who are responsible for revenue from other public forest lands, like State and Indian lands, as well as private owners. From a less direct viewpoint there are those who, mistakenly believing that a policy of large and cheap sales will lower the retail price of lumber today, regard only the immediate consumer and are without sympathy for either the lumber industry or the future consumer, and just as many who believe with better knowledge of present competitive conditions that the future consumer is in greatest danger and should be protected by a holding policy that will insure a supply for his relief at the time when prices are really burdensome and more in peril of monopolistic control. As a principle of administrative stewardship, there are those who urge extensive sales, at prices which will assure them, in order to balance administrative ex-

* Since this subject is not only highly technical in some of its aspects, but also involves policy questions somewhat embarrassing for joint discussion by all interests represented on both committees, it was believed best to assign its preliminary treatment to Mr. Allen as a disinteresed authority.

penditure and make the national forests self-supporting. There are as many who insist that good faith to the whole people requires holding as an investment for higher prices to come. Finally, there are innumerable technical problems which may or may not suggest early cutting and reproduction from a strictly silvicultural standpoint.

In many older countries these governmental perplexities have been greatly lessened by the crystallization of a forest policy, which, because it involves the welfare of the people as a whole, governs the conduct of all agencies, private as well as public, and attempts to protect each with equal impartiality. It is recognized that the consumer does not care who supplies the lumber, so long as it is available at a price which warrants its use, and that to insure such availability requires encouraging uniformly the wisest permanent use of all land chiefly valuable for forest production. To accomplish this, they seek to extend protection and stable good management to private as well as public forests. While insisting upon certain standards of private conduct, they are equally scrupulous to maintain corresponding public reciprocity in order that such conduct may be mutually profitable. As a rule, public forests abroad are expected to pay financially and lessen taxation.

Under such a policy circumstances could hardly arise wherein the government would be seriously asked to consider an absolutely independent course with its own forests, especially if this course were without regard to the welfare of forest industry as a whole. Certainly it would not be expected to act without such knowledge of forest conditions outside governmental administration as would enable fairly accurate forecast of the aggregate result of such a course.

Here, however neither nation nor State has any clear-cut, dependable policy which takes into consideration both public and private forests and their influence on permanent industrial development. No department or bureau directly responsible for disposal of federal forest resources can announce such a policy permanently, much less execute it, so long as there is every extreme of variance in the views not only of the States, whose attitude toward their own forests and forest industries has a profound influence, but also in Congress itself where any executive policy, to be dependable, must find sanction and support.

This situation is due chiefly to conflicts of interest that are apparent, not real, and would largely disappear were forest problems approached with a broader understanding of forest economics. As a matter of fact, interest should be mutual in the *one solution that can be permanently satisfactory to all—stable conditions for the fullest use and perpetuation of all our forest resources.*

It is absurd to suppose that these conditions can be determined without carefully considering the quantity, character and location of *all* these resources, their relation to each other, and the economic factors that govern the protection, harvesting, manufacture, transportation and use of all. It is also unreasonable to suppose that, had we such information, we are not intelligent enough to solve the fundamental problems of forest policy. That we are now bewildered on so many points proves only the crying need for wider and more sincere study of the factors involved, and particularly as they affect interests other than our

own in order to find where we have common ground. None can pretend to have covered the field; indeed the chief need is for more systematic effort and wider publicity by those most competent to do so. But we may properly outline what we believe to be the chief problems to be solved in the disposal of national forest timber, and in so doing perhaps suggest considerations relating to other disputed questions of forest economics.

The questions suggested first are these:

Is the Government selling less timber than it should from a strictly financial or revenue viewpoint, considering only its responsibility as agent of the owners—the people?

Is it selling less than it should to protect consumers from private monopoly?

Is it selling less than it should to reimburse the western States, through their statutory 35 per cent share of gross receipts, for their loss of tax revenue through withholding of the timber from private ownership?

Is it selling less than it should to afford opportunity to lumbermen without timber of their own? This question incidentally covers also responsibility for up-building a lumber industry to afford local communities a market for labor and supplies.

Is it selling less than it should to accomplish the best technical management of the forest—the utilization of existing material and its replacement by new material?

Is it selling *more* that it should to accomplish best any of the above objects or to insure a needed supply later on?

Is it charging too much for its timber, or too little, considering all these things, to accomplish the most desirable measure of disposal, to obtain the best revenue, or to influence desirably the price of other timber?

Does it base its policy in all these things upon complete and sound premises?

Aside from its basic policy, is execution business-like, practical and competent?

If it is remiss in any of these things, is the remedy determinable, or does it require the acquisition of further knowledge?

It will not be possible to discuss all these questions categorically without reference to each other, for they are closely related. Nevertheless the order in which they have been stated may be followed as far as necessary to introduce the facts involved.

REALIZING THE VALUE OF THE TIMBER

CONSIDERING the return to the Treasury of the United States, consequently to the population as a whole, present and future, obviously it does not pay to sell any timber today that will increase in sale value faster than its carrying cost accumulates. Excepting dead timber, there is probably none in public ownership and free from taxes that will not so increase. That most of it will, even when taxed, is the basis of private timber speculation. While it is true that over-mature timber may be advantageously replaced by young timber if the selling period is far enough in the future, for some time

to come the advance on stock on hand will exceed any profit obtainable by use of the land for growing a new crop. Acting solely as an agent in charge of a property, expected to make the most out of it financially, the Government would do best for its constituents to take its timber out of the market and hold it for speculation. The price obtainable today is not what it is intrinsically worth today, for the vast supply on the market of timber secured at small cost makes the price less than that of production, which is the true price criterion of any commodity. In other words, timber sold today by anyone not too heavily burdened by carrying charges is sold at a sacrifice.

It may be said that two crops are worth more than one, consequently that if the low price obtainable today is realized and placed at interest until it can be added to the price received in the future from the second crop to follow, the sum of both will be greater than that obtainable by holding for speculation. But the basis of this argument would apply also to holding for a time, adding the higher price thus received to that of the deferred second crop. The period involved would be longer, that is all. Moreover, from a financial viewpoint, as well as from that of conservation, there is clearly an important element of loss in cutting while utilization cannot be as clean as it will be later. As time goes on, more and poorer material becomes marketable, hence holding not only insures a higher price for a given quantity but for a time will also increase the salable quantity nearly or quite as fast as would the growth of young timber.

For the same reason much diseased and very old timber should be regarded as financially immature rather than mature. While it yields but a small proportion of grades which are merchantable today, it contains grades which will be merchantable some day. Cases can be cited to prove that in given forests the diseased or dying trees have for this reason had the greatest relative increase of value and paid best to hold—contrary to a popular belief that they should always be cut and thus "saved." Again, other things being equal, government timber is less mature than private timber because it costs less to carry. As long as stumpage value increases faster than the interest paid by the private owner on his investment and carrying costs, his timber is financially immature. Since private interest rates are high, stumpage values must double in short cycles to reimburse him. Government rates are low, hence afford a profit in waiting much longer. Does it not follow that, considered solely as an investment for the people, government timber *cannot* be financially mature until long after profit in similar private timber has disappeared?

BREAKING PRIVATE MONOPOLY

IT has been charged that a speculative attitude on the part of the Government savors of collusion with private speculators to the disadvantage of the consumer. At present this is more theoretical than real, for two reasons; (a) The one-fifth proportion of national forest timber, mostly inaccessible for logging and also subject to long expensive rail haul in competition with the lake States and southern supply which together with the middle west demand determines the market, follows rather than leads this market; (b) For similar

reasons, were its stumpage price sharply lowered, the difference would go to profit the dealer and transporter, since they would still be able to demand of the consumer the price of lumber determined by other factors. This would be equally true of any effect in lowering private stumpage or mill prices of lumber. The disadvantage to the lumberman would not mean corresponding advantage to consumers, except perhaps local purchasers at the mill, for it would be absorbed in the same way. The western lumberman no more fixes prices for his product than does the farmer who takes a load of vegetables to town. Either must sell at market quotations, in the determination of which he has nothing to say. In short, so far from there being any trust regulation of stumpage or manufacturers prices, the keenest possible competition exists. Large and small owners of timber and mills are alike confronted by the necessity of revenue with which to carry on aggregate investment which is far greater than can be realized upon with the present demand. They are selling all they possibly can, at any price, in order to carry the rest, and obviously those at the greatest distance from the main markets must accept a price which when added to very high freights makes no more than their nearer competitors can get added to immensely cheaper freights. This exceedingly important point should be borne in mind throughout.

On the other hand, this condition will not always continue. The diminution of private supply, particularly that nearest the seat of demand in the central, southern and eastern States, will tend to raise prices to a point where the transportation factor is less governing and a government reserve can be made most useful as a curb on extortionate speculation.

As a matter of fact, the profits in timber speculation to date have been much exaggerated. While it is true that stumpage once secured for a song is now valuable, this value is largely an expectation value, seldom realizable at greater profit today than is expected in any commercial use of money. Timber sufficient for the present lumber demand can be had for less than it is really worth, as has been previously said, and its price usually represents a succession of transfers at small profits above accumulated carrying charges. It is highly important to bear in mind here also that the extensive marketing of government timber now will have its chief immediate effect not in cheapening lumber, but in cheapening stumpage, or, in other words, delaying the early profits of present private holders but increasing their opportunity for further acquirement and also affording opportunity for a new crop of speculators. It will not increase the amount of lumber used, but transfer the drain to the public forests and leave a correspondingly greater private supply untouched for speculation. Such speculation will be furthered by removal of the government reserve which would otherwise be available to break monopoly.

Another exceedingly important point commonly overlooked is that, so far from being in a strong strategic position to increase prices by the holding process, the private speculator is in a very weak position to do so at present. Diminution of supply will tend eventually to give him such an advantage but because of reasons previously mentioned, doubtless assisted by the increasing use of sub-

stitutes, mill prices of lumber are neither advancing nor capable of being advanced by any action of his to an extent making manufacture profitable if stumpage prices are materially increased. Meanwhile increasing and compounding carrying charges are much higher than popularly supposed, often amounting to ten per cent compound interest on the realizable value of the timber. The consequence is a financial pressure which tends to force marketing the timber, especially upon the weaker holders, which needs no augmenting by government action. The tendency already is to cutting at a price which barely covers the investment.

On the other hand, suppose that government timber is placed on the market at a price which is not only successfully competitive with that acceptable by over-pressed private owners but also sufficiently lower than this to cover the greater logging cost due to its remoteness. The result must be largely the further consolidation of such private holdings, which instead of being cut at a loss will be sold to stronger speculators, and their retention until the still further accumulated and compounded carrying charges *can be taken out of the consumer.* In other words, *there must be a lack of public economy in using first the timber which does not bear heavy carrying burden, and eventually coming back to that which does after the burden has become even greater.* And it is the consumer who must pay for such lack of economy.

It follows that while the standing timber seeker or the manufacturer may find any present tendency to monopoly relieved by liberal government sale, the consumer of lumber will receive most protection by a holding policy on the part of the government for some time to come.

EFFECT ON STATE REVENUE

THE States in which national forests are situated receive 35 per cent of the gross receipts from the forests. In other words, they have over a one-third dividend, less all charge of administration and protection. In effect, they are third owners, without financial or other responsibility. It is clear that in the long run 35 per cent not only of all stored resources now existent but also of successive proceeds from regrown forests, forage, etc., kept up in perpetuity by good management, will return the States immensely more than they could hope to obtain by taxing the same resources were these in private ownership. On the other hand there is much dissatisfaction because the present population realizes comparatively little owing to the slowness of exploitation. This complaint is not without grounds. The cost of conservation is borne largely by the population which has the hardest task to meet public expenses and the minimum compensating advantage of employment and market from national forest exploitation, while the population which will enjoy this advantage of earning capacity will also be the one to have a maximum tax reduction through the incident 35 per cent reimbursement.

The remedy would seem to lie in some method of discounting this revenue which will prevent it from being disproportionately great when least needed, but hardly so crude and destructive a one as selling timber in defiance of all other

considerations and consequently at a sacrifice to the State itself. Nor is the situation as acute on the one hand, or as easily remedied by such a course on the other, as is sometimes alleged. No amount of effort to sell timber today for actual manufacture, even if carried to disastrous lengths, would force the market to take more than it needs. The only way to get great immediate revenue would be to sell for speculative holding or to export large quantities to foreign countries. But it is also reasonable to suppose that the natural course of events will bring it into the market at an accelerating rate from now on, soon satisfying the States with its promise of approaching complete reimbursement. It is absurd to make calculations for a long term of years based upon the past rate. To sum up, it is believed that any readjustment of the 35 per cent lieu receipts should be of a general fiscal nature, and so far as timber sales are concerned best served by having the latter under the wisest permanent policy from all viewpoints.

FOSTERING A LUMBER BUSINESS

IT is natural that many operators who have cut out previous supplies, or are newly engaging in the business, should turn to the national forests for material. The system of purchase is attractive, for payments may be small in advance of corresponding cuts and thus permit frequent turning of a small capital. Compared with purchase of private timber, there are the advantages of less requirement of capital or credit; freedom from interest, tax and protection charges; and absence of fire risk upon the timber, which remains with the government. These advantages compensate any additional expense of cutting under forestry requirements, leaving transportation and stumpage costs the chief consideration, consequently the price asked by the government may, from one point of view, be said to regulate the demand. Nevertheless, since contract terms and cutting requirements have financial weight, greater or less liberality in these have the same effect as lower or higher stumpage prices.

There are at present nearly 6,000 timber sales, big and little, on national forests annually. Their cut is approximately half a billion feet a year. The volume of sale business has greatly increased of late owing to greater effort by the Forest Service to stimulate purchase, especially by granting a longer period for removing the timber, and it will constantly increase without effort because of the improvement of transportation facilities and the cutting off of private holdings. The question is whether, aside from other considerations treated in this report, the government should hasten the process, for the specific purpose of establishing new operations, by reducing price or restrictions so as to make its timber more attractive than the private timber that now competes.

There are few more difficult problems than this in connection with the entire subject at issue. In its consideration, theory is everywhere confronted by indeterminate conditions of market, personal efficiency, and effect upon forest industry and forest conservation as a whole. Theoretically it is well to afford opportunity to all, also to remove restrictions from competition. On the other hand it is sound theoretically, as well as practically, to stop short of stimulating

any industry by subsidy to a point which induces bad management and instability. The point of safety is particularly impossible to determine in this case because forest industry in the United States is not yet on any permanent footing, based upon cost of producing a commodity, but is in a transition period from the stage when it was like the working of a mine without regard to growth.

It has been shown that a cheapening of lumber at the western mill results in little, if any, reduction of retail prices in the main centers of consumption. Consequently a lowering of price or contract standards by the government to an extent having any decided effect upon sale volume would bring as its most perceptible other result a price cutting among all western mills which would injure these while benefiting jobbers and retailers. The opponents of such a policy assert that the undesirable effect of this would be five-fold, as follows:

1. A majority of manufacturers of private timber have not made speculative profits, but base their business upon a narrow margin of manufacturing profit after purchasing timber at market prices and paying carrying charges. Ups and downs of the market under present conditions affect them and their competitors equally. A paternalistic cheapening of government timber to competitors without their investment would wipe them out.

2. Ordinarily, any business eliminates the most unfit. While the most able presumably succeed best, it is average industry, thrift and integrity that fix its conditions, stability, and relations with the community. It is unfair to those who have exercised these virtues to submit them to the subsidized competition of rivals who may not possess them and might not become rivals if obliged to conform to the same standards without subsidy. No industry is benefited in the long run, even from the consumer's standpoint, by disturbances due to the temporary advent of incompetent or financially weak operators. The would-be national forest operator who is competent and trustworthy from the government's standpoint in seeking a purchaser, as well as from that of his industrial comrades and his own customers, needs no particular subsidy. One who does is likely to fail if he has one, leaving his contract with the government unfulfilled, profiting little or none himself, and injure all others concerned except the jobbers who take advantage of his failure.

3. While the purchasers under a subsidizing policy would include some of the class just described and others of a deserving class it is admittedly desirable to help, there would also be a rush of operators who already have ample supply but, besides naturally preferring to hold it for speculation as long as they could get government timber for present operating purposes, would be forced to do so in self-defense. These would often be in the best position to bid on the material. Therefore, since consumption would not be increased, the result would be largely to shift operations, but not operators, from private to government timber.

4. There is a growing and not unwarranted demand by the public for conservation by private lumbermen. Prevention of waste and better provision for reforestation are admittedly desirable. But that they are not more widely and successfully practiced is due to inability to do so on the present margin of profit.

Absolute retrogression will follow if this margin is reduced or destroyed. Operation must continue, to pay investment costs, but under lower standards, at ultimate public sacrifice. This tendency is conceded by all foresters. A lowering of lumber prices, or at least of log prices, always results in a larger cut to get high-grade material and the leaving in the woods of a larger proportion of low-grade material that cannot be taken out at a profit.

5. Finally, the lumber industry now suffers keenly from over-production forced by over-capitalization and necessity of meeting bonding and other charges. To further glut an unwilling market by creating both more lumber and more plants to keep up is to risk a reaction, injuring instead of helping the public. All but the strongest will go out of business, leaving it harder to sell government timber than ever, leaving local industries stranded, wiping out the small man whom it is sought to help, and leaving the few strong survivors in a strategic position to exert monopolistic control. While the process could be repeated in time, so this control would not be permanent, it is better to exercise a steady hand throughout than to alternate extremes.

Every one of these five arguments is sound in a measure, yet subject to exceptions. That they would prove true to a considerable degree is more than prŏbable, but the exact degree would depend upon many future conditions impossible to forecast. It would probably fluctuate. One thing at least is certain, that since the bulk of the national forest timber is comparatively remote, its early exploitation at any price must be by large operators able to finance railroad building on a considerable scale. The day of the small man has not arrived except in comparatively few localities. It is in the future when transportation has pushed back further. While numerically most of the 6,000 yearly sales are to small men now, the amount of timber involved is comparatively insignificant. On the other hand, there is no logical objection to large operations, merely as such, if they are otherwise desirable. If timber can be sold without ill effect, the larger the sale the more profitable to the government, and the greater the purchaser's responsibility the surer his contract is to be fulfilled.

To sum up, it is not believed advisable to force the industry into risks of instability by any radical departure to increase it. On the other hand, any normal steady demand might be taken advantage of more effectively by a somewhat more adaptable and responsive system than now exists. In its attempt to protect the government, the present system of fixing price and contract terms is complicated and different from ordinary business procedure. Increasing transportation facilities will continually lessen the necessity of this and a more easily understood and less one-sided system will give sufficient safety and be more attractive to inexperienced purchasers.

THE PRODUCTION OF MATERIAL

MAXIMUM forest production is secured by replacing mature and slow-growing trees with young stock. There is also waste in deterioration by death and decay. Were production and consumption fairly balanced, forestry would indicate utilization at that stage of maturity which produces the maximum combination of quality and quantity for the period involved.

On the other hand, there exist concerning the national forests the following conditions which govern the degree to which such utilization can or should be secured:

1. Lack of present market for most of the mature timber.
2. Inaccessibility of much of it.
3. Effect of low lumber values in preventing extra logging expense required to insure reforestation or to utilize low grade material.
4. Effect of further reduction of values, due to forcing the market by too extensive cutting, in creating more wasteful utilization of private timber.
5. Lack of definite knowledge as to growth of national forest timber to meet most acute future shortage; in other words, as to whether such shortage can best be met by holding old timber or growing new.
6. Lack of definite knowledge as to private and State production or holding as they relate to the same problem of meeting future shortage.

The first four of these conditions have been discussed already. The third and fourth certainly have a bearing on production. To the extent that selling on a low market results in present waste of material that would otherwise be used later, it is robbing Peter to pay Paul from a conservation standpoint. They are, however, far more easily gauged from time to time than the fifth and sixth conditions, which are even more important because evil consequences can hardly be remedied.

At some time in the future our virgin timber will be exhausted. Without a new crop, lumber will be unavailable. Considerably before this time, the virgin timber in sufficiently good condition to hold will attain a speculative value determined wholly by the quantity and quality of the new crop coming on to compete with it. If sufficient old timber is held, and if the new crop is also sufficient, timber will gradually increase in value until it reaches the cost of production, but it will go no higher. If there is a failure in either direction, there will be a period of excessive value until the situation is relieved by the growing of timber that such period will stimulate.

Such a situation will be affected by what happens on private land and on national forests almost equally, for it is the total supply that will govern, except insofar as a failure of Government supply at the critical period would permit the speculative monopoly of any existing private supply that would not endanger the consumer were the conditions reversed. And the majority of the supply of mature timber is now in private, not Government, hands, consequently *equally rapid cutting, like give-away in checkers, will leave the controlling remnant wholly private.*

It follows that the maximum cut from the national forests should be assured, *not during the existing period of stored and excessive virgin supply, or during that permanent future which will begin when adequate forest crops have had time to mature, but during the closing years of an intervening transition period.*

The exact date cannot be predicted, but since the duration of any considerable stored supply is usually estimated at somewhere near fifty years and it will certainly take as long to bring adequate new forests to merchantable size, the critical

period would seem likely to begin in about thirty years and continue for two or three decades. To overcut now the timber which can be held for this approaching need, for the purpose of increasing production on the same area to be utilized at a more distant time, is justified only under two conditions—if there is a large second crop now growing that will ripen in time, or if there is a very marked deficiency in the area that is being restocked today for the distant utilization referred to. Do either of these conditions exist? Is there enough information upon these points to determine a wise policy?

Concerning the last—the rotation of crop being started today—there is little question. At no previous or following period in American forest history for a long time to come is it at all probable that there will be an equal amount of denuded forest land beginning to restock. The tremendous amount which has been denuded in the past by cutting or fire contains a proportion which, by lucky accident, bears different ages of reproduction. No single age class of second growth, however, is as well represented as the area which, by reason of recurring fires, has been kept denuded until the present time and is just now beginning or ready to restock if protected from future fire. The recent rapid progress in fire prevention is just beginning to give it this chance. For this reason the area beginning to reforest in the present decade is greater than that of any past decade and probably greater than that of any future decade because early future cutting or burning is hardly likely to equal the accumulation we now have. Consequently further addition to this accumulation by further immediate cutting is not *urgently necessary,* although were it not at the sacrifice of the needed standing reserve it would be desirable because future crops will always be valuable largely in proportion to their age and there is no point in deferring them.

As to the existence of partially matured second crops, to be available to eke out the mature reserve at the time of crisis, there is far less certainty. One of the greatest needs is for a census to determine the quantities and age-classes of such existing second growth, both Government and private, and it is the absence of this that renders impossible any absolutely logical forest policy. From information available, however, it does not appear that there is sufficient insurance of such a crop to warrant ignoring the paramount importance of protecting the mature reserve or, as we have called it, the controlling remnant.

To sum up, then, the extension of sales for the sole purpose of starting new growth, while theoretically sound from a productive viewpoint, should be attempted but guardedly because maximum permanent production is not, after all, the most important immediate problem.

IS TOO MUCH BEING SOLD?

WHILE much has been said in preceding pages against the danger of hasty and sacrificial sale extension in response to ill-advised clamor, this danger still lies in the future. The timber sale business on the national forests can be extended moderately without harm from any viewpoint and there are many reasons why it is desirable, particularly where there is a

wholesome demand under present conditions, or where there are technical problems demanding experiment and the training of officials. This does not require forcing by any sacrifice of good principles, however. Without such sacrifice it will probably soon satisfy States and Congress as to revenue.

ARE PRICES TOO HIGH OR TOO LOW?

THIS question has necessarily been touched on in most of its bearings already, with the intimation that no general reduction of price is warranted for the purpose of unduly stimulating business or influencing the price of private or State-owned timber. On the other hand, there are occasionally reported over-valuations in individual cases, especially in comparing quality, species, accessibility and like value-factors, which tend to prevent or delay sales, or cause actual loss to over-sanguine customers, with doubtful benefit to anyone. There is an attempt to systematize the system of pricing upon a basis of probable profit to the purchaser, rather than upon comparative prices and carrying charges of competing private timber, which upon analysis seems to verge closely upon being more in the nature of contracting the cutting of Government timber than that of a straight sale. Its success is largely dependent upon local demand for the privilege of using the Government supply, and can hardly be said to be demonstrated if the sale of large quantities everywhere is an object. So far it has certainly been conservative, not encouraging disposal to any dangerous extent yet meeting, as a rule, all urgent requirements for national forest timber. In detail it is a policy of considerable complication and indefiniteness, in actual effect it tends to a middle-of-the-road safety not undesirable, perhaps, while a clearer policy is being arrived at.

There is one point, however, that should be clearly emphasized for the benefit of those who assert that by appraising its stumpage closely in pace with ruling private prices the Government is upholding the speculator. Carrying costs make such a comparison wholly illogical. In an extended private operation, the costs of investment, taxes, etc., bear an interest which compounds to prevent any profit on the stumpage itself, aside from any manufacturing profit, unless there is a doubling every year in what the purchaser can realize upon it. A national forest purchase covering a like period carries no such costs, not even for investment, for payment is in instalments upon actual scale of the timber as it is cut and turned, therefore at the same price would net the purchaser all the increase of value required to make his private competitor come out even. The term would not have to be very long to permit him to pay double the highest private price. This situation is met by a sliding increase on the instalments and, whatever the opinion on the basis of this increase as practiced, it clearly governs. In all long-term sales it might be adapted to an appraisal much higher than speculative private prices and leave such appraisal without any undesirable influence. Finally, the law itself requires competitive bids and specifically forbids sale at less than appraised actual value.

IS THE POLICY WELL-GROUNDED?

PROBABLY the Forest Service itself would admit that its methods of determining the amount of timber to be sold, the prices to be fixed, and the terms of contract, are to a certain extent makeshifts with which it attempts to do the best it can in the face of bewilderingly different demands.

Instead of being free to install a firm far-seeing policy, based upon study of all the considerations outlined in the preceding pages and adapted to them for the best welfare of all concerned for all time, it has to meet the exigencies of political strife in which conservation is made a pawn, of popular sentiment changing swiftly with time and locality, and of the demands of Congress and States for current revenue regardless of the future.

Consequently it proclaims all mature timber for sale, but while meeting the requirements of small purchasers for immediate use with fair simplicity, hedges large and long-term sales with reserved rights to readjust them which safeguard the Government but make such transactions only moderately attractive to purchasers, and by this conservative course sells enough timber to meet one class of critics fairly satisfactorily and not enough to get in serious trouble on the other side. The practical results would be as good, and the position far easier to sustain, were it possible to announce a sounder basis for the Government's exact attitude toward the whole subject.

National forest timber is sold only for use, not for speculation by the purchaser, hence it must be removed within a specified period. Until recently five years was the maximum limit. Since it became apparent that this prevented large sales, especially where inaccessibility required railroad building by the purchaser, the limit was extended recently to 20 years or more. This introduced a new perplexity—the fixing of sliding scale prices which protect the Government in case of material rise in stumpage value, but are not prohibitive to the purchaser in the beginning. In the absence of better means of determination, or of certainty as to the Government's future attitude, the Forest Service now safeguards such long-term sales by contracts permitting periodical increase of prices. The original minimum price set before bidders is not based upon that of competing stumpage, but upon the current average price of lumber and the estimated cost of logging and manufacturing, being intended to allow the purchaser a reasonable profit. At intervals a proportion of any considerable increase in average prices of lumber is added. It is clear that such a transaction is different from a private timber transaction in which, the price once settled, the purchaser has no limit to his profit except his original judgment, his skill of operation, and the fortunes of the future. It more closely resembles a contract for cutting on shares, with the contractor's share definitely limited, but the Government without responsibility for his receiving it.

This system affords an opportunity to obtain timber at a fair price and with comparatively small capital which is attractive in many ways. On the other hand, its element of uncertainty may easily be greater than that presented by private timber if the latter can be obtained at much the same price, carrying costs considered, without obligation to cut in any given time or manner and with all stump-

age or lumber profits accruing to the purchaser. The transactions are hardly comparable on the same basis. And since the system is rather an innovation, involving not only different basic calculations, but also the element of continued Government control under possible changes of men and policies, it is natural that many lumbermen prefer to deal in a manner with which they have experience. Nor has the Government itself the experience, for the system is frankly one of meeting future conditions as they develop.

The result, so far at least, is not the sale of a carefully regulated amount, systematically distributed by regions, but a more or less accidental disposal, determined chiefly by the competition of private timber which is more in a comparison of the local bearing of terms and method than in a comparison of prices. The policy can hardly be said to be based upon complete and sound premises, for the accomplishment of any specific end; unless such a flexible and indeterminate disposal, pending crystallization of the country's undertaking of forest economics, is in itself considered ideal under present conditions.

It is obvious that radical changes might be made, especially if supported by legislation (there has been practically no change in the timber sale statutes since 1897). Retaining a time limit for removal to insure use instead of speculation, timber might be sold outright upon careful estimate instead of upon scale as cut. Price might be based upon competing stumpage values instead of upon lumber prices. Instalment payments could be continued but advance in rate fixed positively beforehand upon a comparison with carrying costs as they compound upon private timber. In all such calculations close attention would needs be given relative transportation costs and accessibility, for it is these factors and the changing margin due to compounding of carrying costs, rather than temporary fluctuations in the lumber market, which chiefly fix stumpage values in regions of large stored stumpage supply where much must inevitably go long uncut.

In short, with the present value soundly based in each instance, the advance of such stumpage is largely a matter of economic laws, and periodical increases could be based thereon, or a single original price be made, so as to adjust any difference of carrying and operating national forest timber with perhaps as fair accuracy and satisfaction as under the present system. It has been argued with some force that such a method is preferable under present conditions, while the present system would be the most logical later when improved transportation facilities have obviated the necessity of making long-term sales at all and lumber prices will actually govern for the short periods which will be involved.

Whether or not there should by any such exchange of systems, wholly or in part, today is a matter of opinion. Probably there should not without more study of the new considerations that would be involved by those who would be responsible for execution. But it seems beyond dispute that such study, at least, should be given. The one-fifth proportion of Government timber can hardly be sold intelligently solely upon a study of operating and lumber market conditions, without the fullest possible insight into all the factors which govern the holding and disposal of the four-fifths proportion of private timber with which it must compete.

EXECUTION

WHILE critics of the system are prone to condemn its execution also, and its supporters are loyal in refuting all criticism, it is almost self-evident that neither view is correct. It is unlikely that a new and underpaid service will consist wholly of practical experienced men competent to deal unerringly with all details of a complicated timber business, especially one which, as has been seen, is itself experimental by nature. On the other hand, few governmental branches have so general a reputation for sincerity and absolute integrity. These are compatible only with earnest effort toward competent execution. Certainly no occasional local dereliction warrants general criticism by its observer and certainly there is in existence no competent and unbiased agency with complete facilities for observation. Perhaps this committee is the nearest approach to such and it cannot claim full acquaintance with personal conduct of business throughout the field. The consensus of opinion, however, seems to be about as follows:

1. The administration of the national forest timber business is marked by sincerity and complete absence of graft or favoritism.

2. Purchasers testify that when the necessity arises they obtain hearing and differences are usually adjusted to mutual satisfaction.

3. There is sometimes too much delay and controversy over the preliminary negotiations, due both to the magnifying of inessential details and to the submission of such details to too many authorities.

4. The attempt to adjust prices to the profits of purchasers involves considerable investigation of a most difficult nature, subject at best to some theory and uncertainty.

5. This work is necessarily done sometimes by men lacking in practical lumbering experience, because government salaries do not attract experienced lumbermen and the service is not old enough to have developed the combined lumberman and forester in sufficient numbers. Higher salaries for such men would get and hold better ones.

6. Unreasonable public suspicion and danger of criticism for alleged collusion prevents the Forest Service from making full use of assistance it might otherwise receive with practical problems from unbiased sources within the lumber industry itself. Such co-operation might be as useful in this as it has proved to be in fire prevention.

7. The system of continued Government control of operations under detailed contract places upon the subordinate officials directly in charge a responsibility for requiring exact fulfilment to the letter when contingencies justify some deviation. This difficulty, also most of those in preliminary negotiations, would be reduced by increasing the authority of field men. There is a tendency to constant centralization of authority in Washington and perhaps in the district offices, whereas it should be constantly diffused all the way down the line as fast as local officers can be developed by so doing to take it increasingly.

8. On the whole, execution is improving with the age and development of the service.

THE REMEDY

WE have seen that the main objects of the Federal timber policy should be to—

1. Insure the consumer a maximum supply of timber at the critical time toward the end of the duration of the country's virgin forests and before new crops take their place.

2. To exert a steadying influence on forest industry which will on the one hand prevent monopoly and extortion and on the other prevent over-production, demoralization of the industry, wasteful utilization, and wrecking of the small operator, all of which in the long run injure both the consumer and the States in which the national forests are situated.

3. To make its terms for Government timber attractive enough to permit use by those who really need it, but not to subsidize the transfer of lumbering generally to the national forests, leaving private timber uncut to control the situation when Government timber is gone.

4. To secure as fair a revenue as is consistent with the above objects, but not to sacrifice them or future revenue unduly merely for a little more present gain.

5. To be as simple and understandable as possible to public, purchasers and Congress.

To attain all these objects requires—

1. A non-partisan, unprejudiced, statesmanlike treatment of the whole subject by all concerned, based upon knowledge of the conditions governing forest industry. These include the factors which govern prices, logging and manufacturing methods, the growth of forests and like influences which are too little comprehended by many who now seek to interfere.

2. A study of stands and conditions not only on the national forests, but also on other forest lands, from which to judge future competitive relations.

3. Intelligent State action in encouraging conservative handling of private forests by wise tax and protective laws and in reforestation and wise handling of their own lands by the States themselves.

4. The closest co-operation between Government, States and private owners in all forest matters, bringing about friendly constructive effort in harmony, rather than conflict. The whole problem is an interlocking one, unsolvable by either agency alone.

5. A policy, based upon the above preparation, which considers all forest production and forest use as little or no different from the production and use of any other crop, to be encouraged and stabilized on the best permanent business basis for all concerned. The Government should use its control of forest land profitably for its constituents for which it serves as steward, but without taking advantage of its position to accord either producer or consumer any unfair disadvantage. In the long run all have most to gain from making all true forest land, regardless of ownership, capable of earning such an income from forest production as will insure its best management and consequent fullest service to community and nation.

Under such a policy stumpage prices will continue to advance, because timber is becoming more valuable and because it costs money to carry it, until they reach the cost of growing timber, which is the true criterion of the value of any product, *but they will not pass it,* as they will if recklessness at this time results in bad use of so much forest area that the remainder acquires a monopolistic position. Under such a policy the terms of sale will be more clearly defined, with less left uncertain for future adjustment. It is probable that the problem of fixing fair prices in long-term transactions will be largely met by improved transportation facilities, placing the timber open to competition by more purchasers and shortening the time necessary for them to open and use it, and where this does not result otherwise the Government itself may provide such facilities. The competence of officials will naturally increase continually, through experience, unless Congress fails to provide adequate pay to hold them. States, Congress, and people will be equally satisfied with the national forests as a profitable public project.

THE CONCLUDING SESSION, NOV. 18, 1913, 8 P. M.

The Chairman: We have one or two matters of business to complete tonight before the special section of forestry is entirely adjourned. Yesterday afternoon the conference requested that I appoint a special committee to make a recommendation in regard to the continuance of the work which has been undertaken by the forestry committee. I had appointed a special committee, the chairman being Professor Toumey, and I will ask him to make a report.

Professor Toumey: Mr. Chairman, the special committee appointed to draft the resolutions, presents the following:

"That it is the sense of this meeting that the admirable work initiated by the Forestry Committee should be continued; that provision be made for meetings in the future for discussion of forestry problems; and that the present committee, in conjunction with the American Forestry Association, confer with the new officers of the Conservation Congress looking to accomplishment of these results."

Mr. F. L. Underhill: I move its adoption.

Professor Gunther: I second the motion.

The Chairman: It is moved and seconded that the resolution be adopted. All those in favor say "Aye", opposed "No".

(The motion carried.)

Lack of space prevents the giving of a full report of the remainder of the evening session. It consisted largely in the presentation and discussion of resolutions to go to the main resolution committee of the Congress. These resolutions as finally adopted in the main Congress are given under a separate head on another page.

The Chairman called attention to a telegram from Major Ahern who has charge of the forest service in the Philippines asking for assistance in opposing the plan to change the jurisdiction of the Philippine forests and unite it with the Bureau of Forestry of the Land Department which now is, or is soon going to be, under native jurisdiction.

The resolutions committee was, after some discussion requested to present to the Congress a suitable resolution on this matter.

There followed remarks by Professor Gunther, Henry S. Drinker, Mr. Hall, Mr. A. F. Hawes, Mr. J. Randall Williams, Mr. Leonard Bronson, Mr. S. B. Elliott, Mr. W. R. Brown, Mr. F W. Underhill, and Prof. R. C. Bryant, on the need of saw mill men in the rural districts, of education which will teach them economy in their operations and how to properly manufacture their product. The value

of the American Forestry Association for this kind of work was mentioned by several of the speakers.

Mr. J. Randall Williams said in telling how he had been interested in several tracts of timber in North Carolina which the natives were cutting at their small saw mills:

"I think the proper thing for me to have had done at that time, had I realized that they were wasting lumber, would have been to have come to the forestry association, gotten literature and taken it to them and showed them. The same way now, I think the lumbermen, if they only realized that they could teach these men a great many things, they could show the individual saw mills they would do so, because you will find, in many cases, those saw mills are supported by the lumbermen, who advance the money to carry them along. Therefore, it is the lumber men who teach them and if you will take the trouble, it might relieve the situation somewhat.

The point is, how are you going to interest the lumbermen? I think the best way to do that is to get them interested in forestry work. I would like to ask a question. Do we not owe a great deal to the American Forestry Association for these reports.

The Chairman: You owe everything to the American Forestry Association for these reports. The American Forestry Association secured the funds for the printing and for the expenses that were incurred in the preparation of the reports by the sub-committees and handled all the routine and business of printing them and we are greatly indebted to the American Forestry Association and its officers for getting them out in time and in their very fine shape.

Mr. Williams: That is what I understood, and I think we owe a vote of thanks to the Association for these excellent reports. What came to my mind was this: As a member of the Philadelphia Wholesale Association, I would furnish you with a list of the members and ask you, as long as the reports hold out, to send each member of our Association a copy of them, and personally write to them, as a member of the forestry association of our association, calling their attention to the fact that these reports are going to be sent to them and the valuable information they can get from them. In that way you can get more people interested in the American Forestry Association which, to all, is the cause of the stimulation of the interest which has brought about so much work. I hope when we go away from here we will try to get more members for the American Forestry Association and more people interested in the work that they are doing? (Applause.)

The meeting adjourned at 9:30 p. m. Tuesday, November 18, 1913.

RESOLUTIONS ON FORESTRY

The resolutions referring to forestry and adopted by the Fifth National Conservation Congress are as follows:

Deploring the lack of uniform State activity in forest work, we emphatically urge the crystallization of effort in the lagging States toward securing the creation of forest departments with definite and ample appropriations to enable the organization of forest fire work, publicity propaganda, surveys of forest resources, land classification and general investigations upon which to base the earliest possible development of perfected and liberally financed forest policies.

We recommend in all States more liberal appropriations for forest fire prevention, especially for patrol to obviate expenditure for fighting neglected fires, and the expenditure of such effort in the closest possible cooperation with Federal and private protective agencies; and also such special legislation and appropriation as may be necessary to stamp out insect and fungus attacks which threaten to spread to other States.

Since Federal cooperation under the Weeks' act is stimulating better forest protection by the States, we urge annual appropriation by Congress for its continuance.

We recommend simplifying and shortening the process of purchasing land under the Weeks' act.

We recommend that the Federal troops be made systematically available for controlling forest fires.

We recommend the work of the Federal Forest Service in protecting and improving the forest resources under its control, also in developing better methods of forest utilization, and urge our constituent bodies and all citizens to insist upon adequate appropriations for such work and to combat any attempt to break down its efficiency.

Holding that conservative forest management and reforestation by private owners are very generally discouraged or prevented by our methods of forest taxation, we recommend State legislation to secure the most moderate taxation of forest land consistent with justice and the taxation of the forest crop upon such land only when the crop is harvested and returns revenue wherewith to pay the tax. We call attention to the recent adoption of such system by several States.

We appreciate the increasing support by lumbermen of forestry reforms and suggest particularly to forest owners the study and emulation of the many cooperative patrol associations which are doing extensive and efficient forest fire work and are securing closer relations between private, State and Federal forest agencies. Believing that lumbermen and the public have a common object in perpetuating the use of forests, we endorse every means of bringing them together in mutual aid and confidence to this end.

Recognizing the practical constructive work which has been done by the Phillipines Bureau of Forestry, we urge that no change be made in jurisdiction or policy which would result in any setback to forestry in the Phillipines.

We recommend the holding of expositions in various parts of the country which demonstrate the vital importance of maintaining our forest resources and which will more fully educate the public to the manifold uses of forest products.

FORESTRY ADDRESSES

At the Fifth National Conservation Congress.

Thursday, November 20, 1913.

President Pack: The Congress will please come to order. We take up the program today, as ordered under our rules by the Executive Committee.

We have with us this morning the President of the American Forestry Association and it gives great happiness to the officers and directors of the Conservation Congress, as I know it will to you, to have him preside over this splendid forestry session of the National Conservation Congress this morning. I have great pleasure in introducing Doctor Henry S. Drinker. (Applause.)

Chairman Drinker: Ladies and gentlemen of the National Conservation Congress, I think you understand that the American Forestry Association went into consultation through its officers, during the past year, with the Executive Committee of this Congress, relative to joint action at this Congress, to make the Congress a success, so far as the foresters could contribute their share to it, and they have been holding sectional meetings up to this time. The meeting yesterday afternoon, as you know, was intended to be devoted particularly to forestry ,as was this meeting this morning. Owing, as the President has intimated, to the occurrences of yesterday, our meeting today is going to be rather crowded with very much good material. It will be wise for the speakers to condense their talks as far as possible and to hurry them as far as possible, so we may get all we can out of the two sessions into one. Under the ruling of yesterday, I am advised that we are to go on with so much of yesterday's program as we can take up at this time, which we will now proceed to do.

I therefore call upon Mr. Henry S. Graves, United States Forester, for his address upon "Federal Forestry Work." Ladies and gentlemen, Mr. Graves! (Applause.)

FEDERAL FORESTRY

By Henry S. Graves, *Forester in charge of the Federal Forest Service.*

THE part played by the Nation in forestry must always be large. Here, as in all other countries, the real development of forestry began when the government took up its practice. Even today some persons would leave the forests entirely to private owners; others insist that the public phases of forestry are altogether a State function and Federal activities in this field uncalled for. Those who hold this view are usually either lukewarm concerning the need for forest conservation or opposed to restricting private activities.

National responsibility in forestry is perfectly clearcut. There need be no confusion with an equally clear-cut responsibility of the States. And as to private forestry little of value has so far been done that has not been an outcome of public action through State or Federal agencies, or both. It was the work of the Federal Government in placing its own forests under administration, its

demonstration of fire protection and of conservative lumbering, its experimental and educational work, and its stimulus to our educational institutions to train and turn out a large body of foresters, which created the present wide interest in forestry and brought the efforts of other agencies into successful play. I do not mean in any way to overlook the splendid work of certain individual States like Pennsylvania and New York, which dates back many years. But that was localized in a few States. It required the Nation itself to set in motion a national movement. The national work will always be the backbone of American forestry, not trenching on or interfering with State work or individual efforts but serving as a demonstration of forest management on its own lands, a center of leadership, cooperation and assistance to State and private work, a means to handle interstate problems and coordinate the work of neighboring States, a guarantee that national needs which individual States can not meet will be provided for on a national scale.

Underlying the forestry problem are two fundamental considerations which should be emphasized and reiterated until thoroughly driven home. One is the public character of forestry. The public has a peculiar interest in the benefits of forestry. Both in the matter of a continued supply of forest products and in that of the conservation of water resources the public welfare is at stake. In each case purposes vital to the prosperity of the country can be accomplished only with the direct participation of the public. Private owners will secure results only on a limited scale in the long run on their own initiative. It takes too long, 50 to 200 years, to grow a crop of timber trees. Most private owners in face of fire risk, bad tax laws, and uncertain future markets will not make the necessary investments. Most lumbermen have bought their lands either to log or to speculate in the standing timber, not to grow trees for later generations. Nor will private owners make investments for general public benefits, as in watershed protection. If the public is to secure the benefits of forestry it must take the measures necessary to guarantee these results, and it must bear the cost of what it receives.

Closely related to the fact that forestry is in many aspects a public problem is the second of the fundamental considerations I wish to emphasize. Forestry requires stability of administrative policy and such permanence of ownership as well ensure it. Herein lies the difficulty of private forestry on a large scale. Timberland owners are interested in the protection of their standing timber merely as insurance. Most of them are not interested in forest production, or in protecting cut-over lands if that involves substantial annual charges and is not necessary in order to protect their remaining standing timber. As yet the problem of cut-over private lands is unsolved. It is now devolving on the State to aid in their protection from fire in the interest of its own citizens. It will require the utmost resources of State and Federal Government together to handle this problem of getting reasonable protection of private forests and permanent production of timber on cut-over lands. Stability of policy and permanence of ownership are essential to any successful attack on this great conservation problem.

This principle of stability of policy of administration is a large factor in successful handling of public property and has been consistently considered in the national forest work. I am frequently asked as I travel about the country whether I am going to make important changes in the forestry policy. I was asked that very often in 1910, when I first took office. I am asked it often this year. My answer is that what we are seeking is not changes but the development of a permanent public enterprise with consistent and stable policies. The national forests were set aside in the recognition that the bulk of these lands should be handled permanently under public protection and control. Provision was made for the acquisition of agricultural lands that might best be developed under private ownership, and such areas are now being classified and segregated from the forests very rapidly. The successful handling of the national forests requires annual expenditures in administration and protection and in development of roads, trails, telephones, buildings, and other improvements necessary for proper administration. We seek, therefore, as fast as possible to develop through classification the permanent boundaries of the forest land, and the management of it according to definite far-sighted plans that will make for the best results of all expenditures in the long run. The result sought is an efficient business administration, a proper and adequate forestry practice, and development of the public property in the interests of the people who own it. These simple principles have been kept in mind since the first organization of the work by Mr. Pinchot, who was more than any other one man responsible for what has been accomplished in forestry in this country.

The national forests have now been under administration fifteen years, and under the Forest Service for eight years. The aim of the present administration is not to overturn, but to take every possible step to increase efficiency of the organization, to adjust difficulties, and advance as fast as possible the purposes for which the national forests were established. Secretary Houston recently said to me regarding the national forests:

"Establish permanent boundaries. Classify your lands; segregate the agricultural land and fix right limits for what is needed as protective and productive forests. Develop permanent policies based on full recognition of lasting public interests, and settled forestry practice fitted to the individual needs of each forest and locality. Study efficiency; make any changes necessary for this purpose, but make no changes that are not clearly called for in the public interest. Carry out your plans for the development and increasing use of the forests; but above all, make each forest work for community upbuilding and local as well as general welfare. We must always have in mind the men and women who are building up a new country and laying the foundations for prosperous, thriving commonwealths. We must try to study their needs and see where and how the forests can help them. But we must not cease to guard effectively against the evils of private privilege and monopolistic control of resources now the property of the public."

The first important result of national Forestry is a demonstration that the forests can be protected from fire. It was only a few years ago that many as-

serted this to be impossible. In the northwest the smoke season was as inevitable as the rainy season of winter, and this was not merely the result of clearing land but from forest fires. It is only recently that our own forest officers have regarded lookout stations as feasible in certain places; for lookout stations are useless if smoke hides the view. This year has been the worst in many respects of all years in California because of the frequency of lightning fires. Yet the lookout stations on only two forests, and then only for a short time, were out of commission because of smoke; and the smoke came from fires on private lands. This year in California there were over 1,100 fires on the timbered areas. These were kept down to an average of a little over 20 acres per fire. This was done by an effective fire organization and through the means of the trails, telephones, and lookout system. In one storm lightning set over 20 fires on one forest. It takes swift and efficient work to handle such a situation. The results so far attained show that fires can be mastered. But it is necessary first to put the forest in a condition to enable the force to prevent fires, to detect those which start promptly, and to reach them quickly. The Forest Service is developing a system of lookout stations, fire lines, trails, and telephone lines that ultimately will make the forests secure. Already the force is able to save every year property valued at many million dollars through the improvements so far built, although as yet only a beginning has been made. This work is carried on according to a definite plan, already projected in detail. Each year's work adds 2,500 miles of trails, 3,500 miles of telephones, and many lookouts and other improvements, progressing toward the final scheme. Until that is completed the forests can not be made entirely secure. With that development, the forest fires can be handled even in that exceptionally dry year that occasionally comes to every region.

This protection not only saves the trees from destruction or injury, but already the effect is shown in the restocking of many areas where the old fires had prevented reproduction. Personally, I had hardly expected that there would be so quick a response. But the results are now apparent to even a casual observer. More specifically, while previously the forests were going backward because of fires, there is now an annual gain through growth. This increase translated into dollars and cents is much greater than the total cost of protection and all other expenses of the forests.

The necessity to take immediate steps to prevent the public forests from being destroyed by fire has placed a large emphasis on the protective feature of the administration. The wise use of the forest resources in the development of industries and in building up the country is essentially the real aim of maintaining the forests. Protection from destruction is a first essential; otherwise there would be no resources to use. But the purpose of the administration is not merely protective, but constructive. It is a favorite theme of the opponents of the national forest system to represent the forests as a separate Federal domain, held for the use of future generations or for persons other than those now living in the regions in which the forests are situated. Such statements are not only contrary to the spirit of the administration of the forests, but are disproved by the results already being secured. The aim is to make the forests count in the highest

possible measure in the industrial upbuilding of the local communities, at the same time that they serve their broader public functions. In classifying the agricultural lands the aim is to get people to make permanent homes in the forests. Every consideration in the development of the States and in the upbuilding of the forests themselves makes for the encouragement of a greater local population. When there are people to create a demand for the timber and other resources, the real development of the forest becomes possible, and the forest begins to render its greatest service.

To encourage this development the Forest Service is promoting the sale of its ripe timber to build up local lumber industries of a permanent character; it is opening to entry land chiefly adapted to agriculture; it is further helping the settler by providing free such timber as he needs and protecting him in the use of the range needed for his stock; and in every way it undertakes to make the forests of public service and the country in the long run a better place for men and women to live in.

That a long step has already been taken toward this end is indicated by the very extraordinary change in sentiment in the West in the last few years. I have this year been able to analyze in detail the sentiment on the individual forests and now know just where opposition in each case exists and the extent to which the work of the Federal Government is valued. I have been astonished at the overwhelming preponderance of sentiment among the local communities in favor of the forest system. Frequently there are objections to certain regulations, or difficulty and friction in specific transactions. But every year these local troubles are being adjusted on the ground. There is still definite opposition to the forest system and the principles of our administration from certain groups, and certain interests. There are still certain water power interests which are carrying on a fight against the Forest Service. Many speculative interests oppose the forest system because the resources are not open to private acquisition under the general land laws. Certain men are opposed to the national forests because they can not secure privileges that would be possible if the forests were unprotected. For example, in the Southwest I find a well-defined opposition among those who desire to run herds of goats on the forests without restriction. The desire to secure valuable timber for speculation is now, and always will be, a source of opposition to the public control of our forests.

One proof of the present favorable sentiment is the fact that there are now relatively few breaches of the regulations. For example, in the Fourth Administrative District, which includes Utah, Nevada, northern Arizona, southern Idaho and southwestern Wyoming, over 11,000 permits were issued last year, each involving some regulation. There were only 35 cases of trespass, about half of which were innocent and the majority of the remainder not very important. Such a record would be absolutely impossible if the people themselves were not right behind the regulations. In other words, it was public sentiment that made it possible to carry out the procedure with such success.

In the national forest districts it is now seen that the aim is to make the national forests serviceable at present as well as in the future, and people are

cooperating more and more with the Government to make the local administration successful.

In the East the work of the Federal Government is today far more effective than ever before. The establishment of national forests under the provisions of the Weeks Law is accomplishing many results not anticipated even by its most earnest advocates. The purchase of lands on important watersheds in the White Mountains and southern Appalachians is steadily progressing. Already contracts for over 700,000 acres have been approved by the National Forest Reservation Commission. These lands are located on the most important watersheds and have been secured at prices representing their actual value, the average being $5.07 per acre. It has already been demonstrated that the building up of national forests by purchase and at reasonable prices is practicable.

The first effect of these purchases has been an educational one. The wide interest in the work has resulted in an awakened appreciation of forest protection and forestry wherever the Government has been examining land for purchase. Cooperation in forestry between the Government and the States has received a great stimulus. The actual annual saving from loss on areas protected from fire directly as a result of the Weeks Law, on private as well as public property, would amount to a very large aggregate sum. In short, the Weeks Law is now yielding results which fully justify the new policy which it established.

The nation's interest in the success of the forestry movement is very great; the contribution of the nation through Federal agencies should be correspondingly liberal. Let the Federal Government assume its full responsibilities of leadership, assistance, and cooperation, and our forest problem will be on the way to certain solution.

ECONOMIC FACTORS IN PRIVATE FORESTRY WORK

By E. A. Sterling, *Forest and Timber Engineer.*

PRIVATE forestry in its full commercial application is essentially the production of successive forest crops from the same land, through the employment of private capital. If private capital seriously engages in forestry it will apply the scientific and business principles most effective in affording safety and profit, the same as in any other industrial enterprise.

Forest crops, with no exceptions, require longer to mature than any other living, growing product of the soil. They are, however, as much a crop as wheat or corn, and in older countries are grown in systematic rotation like other crops. Failure to realize this fundamental fact is no doubt responsible for much of the misconception as to what scientific forest management involves. Moreover, the existence of so much mature forest growth has established a conception of forests as a mine rather than as a crop. Even when the principles of forest economics are fully comprehended and the necessary procedure and ultimate profits carefully figured out, a sober, long-time investment in growing timber crops proves less attractive to American capital than the more speculative exploitation of existing forests. A story illustrative of this point was told in the forest schools ten years ago of two German capitalists who came to this country to invest in timber. The American lumbermen who acted as hosts showed them various properties and operations where profits of 15 or 20% a year were assured, but the visitors refused them all, on the ground that they wanted a safe timber investment paying not over 5%. This was before the day of timber bonds, and the Americans had no investments of this kind to offer, so the Germans, since they wouldn't take the high speculative profits, went home with their money. Neither understands the other's point of view to this day.

The conditions described will probably hold until most of the old virgin forests, which have been our sole source of supply, are cut-over. When this time comes and original forest growth is no longer obtainable at less than the cost of production, which has always been the case with even the highest priced stumpage, systematic production of forests as such will be accepted as a business proposition. Fortunately, there is an intermediate period when the old forests will still constitute the main source of supply, but new fields will not be available, thus creating a tendency to perpetuate the supply on large holdings by producing new growth on the cut-over areas. This necessitates large operations and ample capital, and emphasizes Dr. Schenk's truism that: "Forest conservation has never been practiced by the small holder of timberland. We must have either public or private corporations—lumber barons—engaged in it."

FORESTRY AS A BUSINESS.

Forestry as a recreation or experiment is quite different from forestry as a straight business enterprise, which must earn fair profits. The former has con-

stituted most of the activities up to the present time, and is extremely helpful in developing methods and arousing public interest; while the latter, although it does not exist as a fully developed business policy, is developing through protection and other measures absolutely essential to private forestry. It has been said that "forest conservation is more expensive than forest waste, in the immediate future." This statement will bear modification according to regional or local conditions. It would certainly be true in the heavy forests of the Pacific Northwest, where the elimination of waste is impossible with present market and transportation facilities, but even so, fire protection, which is an initial and indispensable factor in conservation, is intensively and successfully applied. Fire protection is also practiced successfully in the Northeast, and here close utilization is far more feasible. As an example, today the small hardwood mills in Southeastern New York are paying as high as $12 per M. for logs 6 inches at the small end, and many of them are so knotty and crooked they won't lay still on a skidway. On the Pacific Coast the finest No. 1 logs, running practically all clear, 30 inches and up, are going begging at less than $10 per M. The answer is enormous reserve supply and over-production in one case and scarcity and a ready market in the other. A surfeited market and excess supply will mean excessive waste until conditions change.

FOREST CONSERVATION NECESSARY.

Whatever the present status of private forestry, and the conditions which retard or encourage its development, there will come in the near future, and there is even apparent today, a national need for the maintenance of an adequate timber supply from public and private forests. All that is necessary to interest private interests in forest crop production is a sustained demand for lumber and for minor products at a price which will make their production profitable. Broad public interests demand forest conservation for special purposes, as watershed protection, and these, together with an indeterminate amount of general lumber production, will be provided by Federal, State and municipal agencies.

After our present stored-up natural heritage of timber is exhausted, future supplies will have to come from trees which have grown on land maintained in forest and not suited for agriculture. These future wood supplies will come from three principal sources. First, the national forests and the State forest reserves, on which timber has been systematically protected and grown as a crop; second from forest growth which has sprung up voluntarily on cut-over lands, and has escaped fire and reached maturity without being systematically planned for or protected; and, third, from individual or corporate owned forest lands which have been devoted to forest crop production as a private business enterprise under scientific long-time management.

WHAT OF THE FUTURE.

The development of private forestry operations will be a potent factor in determining whether forest crops adequate for the nation will be available in the future, when the inaccessibility or exhaustion of the stored supply forces depend-

ence on new crops. The fact that private timberland holdings outnumber Government and State lands about five to one, in the matter of timber volume, makes the ultimate use of these private lands of predominating importance. We have 82 per cent of our forests under private ownership; Germany 46½, and these under State control.

Another important factor is that private timberlands, as a rule, are more accessible and usually capable of more profitable forest management than Government or State forests. In fact, even with the most extensive and complete development of transportation which can be anticipated, much of the national forest land will always be difficult of access, and, to this extent at least, incapable of the most rapid and economic forest production. Furthermore, a considerable percentage of the public forest lands will be maintained primarily for watershed protection; and while timber will be produced from such areas, the output will be limited to the amount which can be spared without materially reducing the water-conserving power of the forested area.

Considered from a broad, national standpoint, very extensive areas of privately managed forest land will be necessary in the future, unless there is an extensive transfer of timberland from private to public ownership, or an increase in use of substitutes which will reduce the demand for wood to a consumption which the national forests and State reserves can supply. It is not likely that either of these developments, or a combination of the two, will occur. At any rate, it is certain they will not come in time to destroy present public interests in measure for forest production on privately owned lands.

It is against the traditions and principles of our Government to purchase and operate private industries; and whatever the measure of control ultimately exercised, public ownership of enough non-agricultural land to supply the country's needs for timber is not a reasonable expectation.

In the matter of consumption, we may look in the comparatively near future for reduction in the amount of wood used per capita; and the opinion is even now expressed that our gross consumption has passed or is near its peak. Even if the increasing use of substitutes decreases the per capita consumption, we must reckon with a rapidly increasing population, and also consider that the rural communities, where the greater proportion of our population still lives, will continue the almost universal use of wood, even though our cities become of steel, stone and concrete. Moreover, historical data from other countries show that whatever the use of substitutes in most fields, the railroads and the pulp and paper plants require a constantly increasing amount of wood.

NO DECLINE IN DEMAND.

In other words, the curve of timber consumption is not likely to decline rapidly enough to make our reserve timber supply, even in conjunction with voluntary new growth, adequate for our needs without a supply from intensively managed private forests. It is more probable that a greatly reduced per capita consumption will not come until the virgin supplies are nearly exhausted, and we find ourselves, some thirty or forty years hence, with the old growth nearly gone,

and the new not large enough, and lumber prices at a point which will force economy in the use of wood and make private forestry profitable.

FOR FUTURE USE.

Just as a forecast of the part private forest lands will play in future production, let us assume the improbable possibility that fifty years hence our wood consumption will be as low as that of Germany today, or 18.8 cu. ft., or 225 board feet of saw timber per capita. Assume, also, that during the same period our population has increased to 175,000,000. On this basis, with a per capita consumption of 18.8 cu. ft. of solid wood, our gross consumption in board feet would be about 39,000,000,000 ft., or practically what it is today.

The national forests are estimated to have a potential output for all time of 6 billion feet per year, while the State forests might eventually produce a billion feet annually, or a total, from public forests, of 7 billion feet. This leaves 32 billion feet to come from private forests if our needs, on the economical present German basis, are to be supplied. German private forests yield per acre about 200 bd. ft. of saw timber per year, so our private forests would have to comprise 160 million acres under intensive management to produce the needed 32 billion feet. Our present area of private or unreserved forests is about 440 million acres, so on at least 36 per cent of this area private forestry needs to be practiced if we are to have enough wood. In the above, cord wood, which constitutes about half of the gross wood consumption in most countries, is ignored, since it is low-grade material which will probably be available on farm woodlots and from tops and waste for all time.

PRIVATE FORESTRY DEVELOPMENT.

The development of private forestry in the United States, from a historical standpoint, will have to be recorded by the next generation because, up to the present time, intensive private forestry on a scale which establishes its commercial feasibility has not been undertaken. Sporadic attempts have been made all over the country to practice forestry, and some are fairly good examples of what should be or what should not be.

Most of these operations, however, go only part way and are usually dependent, at least in part, on some other factor than that of timber production for profit. Corporations and institutions are sometimes owners of timbered land which they must hold in any event, and in such cases timber production helps to pay the carrying charges, or even may take care of expenses and show a net profit.

One of the earlier activities of the old Bureau of Forestry was the preparation of complete forest working plans in cooperation with private owners. These were usually based on a very careful forest survey, from which a working plan was prepared which indicated to the owner the methods of cutting which would make his operation continuous. It is significant that in practically no case were these plans carried out, to the extent of full application of methods which would assure continuous forest crop production from the same land.

No blame for the failure of these working plans can be attached to any one, and in several respects they have proved of lasting value through indicating the possibilities of close utilization and of protection. The Federal Forestry Bureau first of all lacked experienced men who could outline plans and methods which would be considered practical by the hard-headed lumbermen. Timberland owners, on the other hand, have to meet very strict commercial conditions, and if advanced methods of operation could not be made to pay, they obviously could not be followed. Moreover, they had to be made to pay then and continuously to fully the extent possible under the usual methods, and not in the distant future, even though the ultimate profits would have been greater than by their usual methods. Stockholders, even in lumber companies, want dividends now, not fifty years hence. In other words, we seem to be rather slow to appraise and appreciate the commercial conditions under which private forestry is possible, and to work out and apply the unvarying principles of forest economics upon which private forestry in America must be based.

PUBLIC DEMAND HELPFUL.

The public demand for forest conservation has been helpful in calling attention to the national importance of the question and to the direct personal interest which it has for every citizen. On the other hand, the somewhat unreasonable clamor of enthusiasts who have no personal interests at stake, has retarded progress, because it has put the lumbermen on the defensive, by accusing them of deliberately wasteful and reckless methods.

For some ten years there has been a ceaseless propaganda for better management and wiser use of timberland and a constant controversy as to what should be done, most of it being the well-intentiond agitation of those who could do little more than talk; while the lumbermen, who really control the destinies of our private forest lands, sat back and said nothing. While this has been going on, industrial conditions as they affect the forests have materially changed, so that with the awakened public interest as it now exists, there is greater hope of definite accomplishment.

Present tendencies indicate a more helpful and logical development than at any time since forest conservation became an issue. Instead of attempting to put immediately into effect the complete policies and intensive methods of management which are scientifically correct, at least in older countries, things are now being done which are logical steps in the development which may ultimately lead to intensive forest management on private forest lands. Instead of asking the private owner to cut by a system which will curtail his output and reduce present profits for the sake of perpetuating new growth, by merely stating in an indefinite way that fire protection, for example, is essential in applying these methods, the private owner is now being shown that protection from fire is possible by systematic methods and thorough organization, and that it pays. He is also learning by what means and in what ways he can utilize material which was formerly wasted, and at the same time maintain a more effective organization. While these are not the things which theoretically constitute complete forest management,

they are unquestionably initial steps which must be worked out before anything more intensive can be attempted.

What is more logical than that the successful fire-prevention methods in the Northwestern States and elsewhere, as applied by private owners through cooperative fire patrol associations, should soon lead to a realization that a fine stand of voluntary young growth has come up on cut-over areas? Later, when it becomes apparent that this young growth is worth having because of its potential value, it will be a natural step to modify logging methods so that more and better young growth will follow the logging operations. If these things work out and the owner sees a profit in holding his land because of this young growth, he will begin to think about planting up areas which have been burned or which have failed to reseed naturally. Each one of these steps leads closer to the kind of private forestry which will provide a timber supply for the future and earn a reasonable profit for the owner.

From an academic standpoint, this should all perhaps be definitely planned for in advance and an intensive system of management worked out on paper for application in the woods. The fact is, that under present conditions the average private owner will not consider applying such a plan, but he will be guided by the current developments which indicate, from time to time, a change in methods which will be profitable. With better fire protection and closer utilization, wherever the market justifies it, must be expected to come reform in forest taxation and in State forest laws, which will permit capital to remain invested in forest lands with reasonable assurance of a fair return. Even at best, the average timberland owner is not going to make a large profit from practicing forestry, although under ideal conditions it would be a gilt-edged investment. In some regions and under certain conditions, the State is justified in proffering assistance through cooperation and in planting and fire protection, and everywhere tax laws should be passed which do not impose a heavy burden on the crop while growing and earning nothing, and therefore not in a position to pay.

Of all the large timberland operations in the United States, not a single case may be cited as an example of intensive forest management of the kind taught in schools and seen by every forest student who visits Germany. It may also be safely said that no large lumber company could apply ideal methods without going broke, and this condition will hold true until commercial conditions affecting the lumber market materially change. Another consideration is that our irregular virgin forests are not adapted in their present state to the refined principles of forest management. In most cases they must be cut and started all over again in order to practice real forestry, and it will not be until the end of the first rotation, or at the time the new growth is ready for cutting, that anything widely approaching normal forest conditions can be obtained. These conditions, however, have got to be faced, and should not be a bar to the application of improved methods as fast as conditions permit.

A number of examples of private management, which include at least some of the things which are feasible today, are found throughout the United States. On the ground that fire protection is the first essential, much encouragement is found

in the willingness of a large number of private owners to cooperate fully, and contribute freely towards cooperative fire association work. While in some cases nothing will be done beyond fire protection, every owner, whether East or West, who takes an interest in fire protection work, is taking the first step towards the practice of private forestry.

PRIVATE FORESTRY IN THE NORTHEAST.

In the Northeast the most notable advance towards private forestry in addition to fire protection, has been taken by the large pulp and paper companies. Here again German forestry methods are not practiced, because they would not pay; but definite provision is being made for producing successive crops of timber to supply the large permanent pulp mills, and the tendency is strongly towards the consolidation and long time management of holdings, advantageously located from the standpoint of transportation and forest conditions, for the permanent production of pulpwood. In the same general region many small owners have already reaped a good profit from growing and utilizing second growth timber, particularly white pine; and while most of these operations are on too small a scale to materially contribute to the needs of the country, the aggregate of such operations is too large to be ignored. If it would pay to cut within the last ten years second growth timber which was forty or fifty years old, it will certainly pay much better to start new growth now for cutting fifty years hence.

In the Southern pine region, natural forest conditions are in many places favorable for private forestry, although up to the present very little has been done even in the way of fire protection. Conditions are favorable to the extent that young growth comes up very readily where fire is kept out, transportation facilities are good, and logging costs are comparatively low. The principal drawback is the slow rate of growth of the longleaf pine, but in many regions this species can be replaced with trees which come into maturity much faster.

In the yellow pine region of Texas a lumber company, with very large holdings, has been quietly operating for some years with a view of producing successive crops from the same land, and apparently finds that it pays. In South Carolina another concern investigated thoroughly the possibilities along this line and found that 100,000 acres of land on which loblolly pine predominated would produce, under a regular system of cutting, the normal mill output of 20 million feet annually for all time. The methods which would produce this result were followed for a short time and promised to work out successfully; but owing to some difficulty in applying systematic fire preventive measures, the whole plan was abandoned. It nevertheless illustrates the possibilities, and it is probably safe to say that systematic fire protection would have paid even if long-time management had not been contemplated.

In the Pacific Northwest organized fire preventive measures have been carried farther than anywhere else, and the point has been reached where the fire hazard no longer constitutes a bar to forest production. In the same region scientific management is being applied in connection with saw-mill and logging operations, and a higher degree of efficiency in the manufacturing end will ultimately

prevail in many companies. These and the many similar activities are the most tangible indications we have of the crude beginning of private forestry on a commercial scale.

FAR FROM AN IDEAL SYSTEM.

The ideal in private forestry work need be given little space, because it will be attained only by evolution and will not be seen by anyone who is interested in forestry problems today. Merely to show how far we are from an ideal system, it may be interesting to outline briefly what we would find in such a forest. It would be necessary, first, to assume that the State in which the forest was located had provided wise forest legislation under full enforcement, and a system of forest taxation which encouraged rather than hindered forest production. We would also have to assume ample transportation facilities and a ready market for practically all forest products.

With these conditions existing, we would find that the woods operations were based on a complete topographic and type map, supplemented by volume tables indicating the amount and size of the timber by species. The mill output would be adjusted to the amount which the forest could safely produce each year, without reducing its productive capacity, and the cutting area would be confined quite strictly to the definite limits decided upon. In the woods every tree felled would be carefully worked up so as to produce the maximum number of logs in the lengths which would bring the highest value when sawed. After the logs were taken out, the tops would be converted into cordwood and the refuse remaining carefully piled for burning. Under a system previously decided upon, provision would be made for new growth either by leaving seed trees, cutting in strips, or by some one of the various regeneration systems best adapted for the local conditions.

The sawmill would be equipped with machinery to eliminate hand labor as much as possible, and the logs would be sawn by the finest and thinnest bands to prevent waste. There would be no burner in connection with the mill, and slabs and odd pieces not available for lumber would be worked up into various minor wood products for final disposal. The waste which could not be worked up into marketable form would either be used as fuel or, if coniferous wood, turpentine would be extracted; or, if hardwood, converted into by-products through destructive distillation. In other words, both in the woods and in the mill, close utilization would be practiced, and definite plans followed for growing successive timber crops, not merely a second crop.

Fire protection would be an essential and continuous part of the system, the forest would be patrolled and fire watch kept from lookout stations, and all the refined methods practiced which assure a minimum number of fires starting and the prompt suppression of those which occur.

ACTUAL CONDITIONS TODAY.

Turning from our ideal privately managed forest to a consideration of conditions which actually confront lumber manufacturers today, we find a state of affairs not altogether encouraging to private operations. Private timberland own-

ers, who must naturally operate so as to give the highest returns on the capital invested and who also desire to be good citizens and do what they can towards conserving the forest resources of the country, are confronted by at least two distinct sets of conditions. The first is the one involving the broad economic conditions of market, transportation, competition, taxation and finance; the other, the inside details of logging, milling, labor and fire protection. While it is true that men engaged in other industries are confronted with these same problems, the lumber business in many ways is on a less stable basis than other manufacturing industries and capable of less refinement.

Among the broad economic considerations, transportation plays an important part. The distance and freight rates from the point of production to the market are determining factors; while in addition the lumber manufacturer must provide his own transportation facilities from where the timber stands to the mill, and not infrequently from the mill to the railroad line. He caters also to a fickle market and one which may demand all or only part of his products. Moreover, the manufacturer is unable to dictate the sizes and grades he produces, but must meet to a large extent the arbitrary requirements of the consumer. With many manufactured articles this is comparatively easy; but since trees grow as Nature provided, and not always as man desires, the lumberman must take his trees as he finds them and do the best he can towards making them meet the requirements of a market which does not consider these fundamental facts.

Competition is to be expected, and between the larger concerns it is no more serious than in other industries. The small lumber producer, however, with his vest-pocket sawmill, often creates a form of competition which it is difficult to meet. The small mill is often a family affair, and in any event represents mainly the labor involved, against which the large operator must figure his heavy overhead charges and expensive equipment. Financing lumber operations offers no unusual difficulties except that the capital invested in private timberlands must usually be tied up for a long period, and until within comparatively recent years there was no systematic basis for issuing timber bonds.

THE TAXATION QUESTION.

The taxation of timberland deserves a separate article and it is only necessary to say that it has actually been true in some cases that the imposition of the general property tax on timber has forced rapid cutting even under conditions which made a large output profitable; while some of the new tax theories advocated, by giving no consideration to forests, might prove even worse than present systems.

Most of the broad economic problems which confront the lumbermen are not more serious or more difficult of solution than in other industries, if the lumbermen merely lumber without regard to conservation. It is true, however, that the present economic influences are not favorable to intensive forest crop production. The margin between manufacturing costs and selling price of ordinary grades of lumber is too narrow to permit of any radical change of methods, nor will it permit keeping heavy investments of capital too long tied up in one operation. The carrying charges as represented by interest and taxation are not fully offset

by increased stumpage values, nor is it always possible to increase the output in order to take care of these charges, because the market will not absorb a greatly increased production.

STUMPAGE VALUES AND LUMBER PRICES.

It is generally recogized that stumpage values never go down, whereas lumber prices frequently do. At the present time, for example, the average prices for coniferous lumber in ordinary grades are no higher—and in some cases they are lower—than they were 25 years ago. At the same time stumpage values of many woods are two or three times higher. This simply means that if an operating lumber concern buys stumpage today, there may not be enough margin between the cost of production and the selling price to justify operating; although many plants are kept running under these conditions because of the necessity of keeping the organization together and of securing ready money with which to meet current obligations. There can be no conservation under these conditions. High stumpage and low lumber values mean quick liquidation where possible, and all the attendant evils of over-productions, waste, and abandonment of the cut-over areas to fire destruction and tax sale.

In the Pacific Northwest, where there are large reserve supplies of timber, it is freely said today that the millmen cannot afford to buy stumpage at present prices, nor even to buy logs in the open market for manufacture into lumber. It is also frequently said, and often without exaggeration, that most of the money made in the lumber business is in selling stumpage which was bought at the lower price of a few years ago. If these statements are true, it is very apparent that long-time management, which must necessarily involve manufacturing, would not be a profitable enterprise.

In addition to the general conditions which influence private forestry, there are many operating details which affect any variations from the usual practice. The danger from fire is still a fundamental handicap in many regions, and fire will always threaten the destruction of new growth, if not mature timber, in the greater portion of the country. Even assuming that the fire hazard will be reduced to a safe minimum, the operator in many regions still has no clear way to practice the close utilization which is an essential of private forestry. It is simply folly to bring material from the woods to the mill which cannot be sold at a fair profit after being manufactured. It is practically certain that many mills today are losing money on much of their low-grade material, merely because they have not figured carefully enough on the relation between the cost of producing low grades and the price received.

LUMBERMEN NEED INSTRUCTION.

If the evidence was all in, it would make convincing testimony as to why the private timberland owners, as a class, cannot practice close utilization or indulge to the full in intensive forestry methods. On the other hand, it is equally certain that there are many cases where these same private owners do not do as much as they could or should in applying the measures which will ultimately make private

forestry possible. In fact, the lumbermen, taking the country over, come in for a lot of just criticism. They have not studied the broader phases of their own business as they should, and not infrequently the administrative heads have allowed themselves to be hopelessly dominated by subordinates who were in a rut or had only the one personal ambition or desire of maintaining a reputation for a certain log output or cost basis, regardless of waste, fire, or anything else. Also, in the matter of waste, possibilities have been overlooked through failure to determine just what could be utilized with profit. Another neglected factor is that of records, cost data, and general administrative details. If the lumbermen shake off the spell of custom and apply advanced methods adapted to their business they will find that much can be done at a profit which they have thought could not be done at all. When they do get out on the firing line with advanced business and technical methods, private forestry will receive an impetus which will develop it to the full extent of its commercial limitations.

In nearly everything which attracts public notice there is invariably some one, usually a rank outsider, who propounds a complete remedy for the problem under consideration. The question of private forestry is an exception, and we rarely hear any plans or theories advanced which would make possible the practice of private forestry. It is quite generally recognized by those who have given the most thought to the subject that neither radical nor rapid developments are to be expected; that gradually, as conditions justify it, more and more private land will be devoted to systematic forest crop production. There are many, however, who argue that private forestry will never be commercially feasible, or, at any rate, not in time to contribute materially to our wood supply at the time that we will most need it. The suggestion most freely and frequently offered is not to try to practice private forestry at all, but to turn the whole job over to the States and the Federal Government.

On the ground that over-production is one of the greatest retarding influences on forest conservation, the suggestion has been made that the Federal Government control the lumber output. Since the lumber manufacturers seem unable to get together on this point voluntarily, this suggestion would perhaps solve the immediate difficulty, which will never be solved in any other way. When, however, an attempt is made to work out the details of such control, unsurmountable difficulties seem to arise. Among the first questions to arise is, what constitutes over-production? And another of equal importance concerns the effect upon the consumer if the output is limited. The lumber manufacturer would naturally expect a curtailment of production to maintain and probably increase the selling price of lumber, and to this extent he would be entirely satisfied if the increase was sufficient to give him the same net returns as with the smaller output and the lower price. In this case, however, the consumer would have to pay the bill, and such a policy would not receive public approval. Such a policy might also act as a boomerang to the lumberman because the higher prices of lumber would result in the increased use of substitutes and the consequent permanent reduction of demand.

Another difficulty in the way of Government control of output is to reconcile

the needs for various classes of material. A flat reduction in all grades and species would not be practical because some woods, on account of their scarcity, are always in demand at a high price, while others, such as the yellow pine and red fir, because of their abundance, are usually available in excess of demand. The yellow-pine producers would be very glad to have the red-fir output curtailed, but would strenuously object to a reduction in their own mills, and vice versa.

Present tendencies are somewhat toward Government regulation and control of all corporate interests, and if this was ever applied to private timberland operations, it might be expected to lead to regulations which would force measures for forest conservation and to scientific forestry on private holdings. Since it is quite evident that intensive forestry cannot be practiced profitably under present conditions, the only way the private owner could keep in business under such an arrangement would be to materially increase the price of the lumber produced. This in turn would again put the burden on the consumer and evidently so reduce the consumption that private forests would not be greatly needed as a source of wood supply. Whatever the constitutional or legal phases of the question of State or Federal control, it can hardly be conceived that anything in the way of limitations approaching confiscation of private forests, even for the public good, will be tolerated without proper compensation.

Private forestry is needed to provide future wood supplies for the nation. It is not practiced today on a commercial scale because of economic conditions which make straight lumbering a more attractive investment. Some of the things essential to private forestry, particularly fire protection, are being applied extensively and successfully.

Private forestry must come as an evolutionary development, not because the public demands it but because private timberland owners find it profitable to practice it.

Public comprehension of the principles of forest economics, and the realization that forestry is successive wood-crop production, must precede the full application of the art and science of private foresry.

PUBLIC KNOWLEDGE OF FOREST ECONOMICS

By E. T. Allen, *Forester for Western Forestry and Conservation Association.*

DID you ever go into any project requiring your money and effort, together with considerable responsibility, without really understanding it? I suppose every one of us has. Most of us have invested hard-earned money in some enterprise because we couldn't find a single flaw in the argument of the promoter and consequently didn't have strength of mind to resist. We didn't really want to invest, even if it were a good thing. We hadn't the money to spare or, even if we had, we knew some other business better and would feel safer in it. We succumbed to persuasion and logic just because we were off our own ground and couldn't escape decently, but our hearts weren't in it. And however good that project was, it didn't succeed as well as it would have if we had understood it, known it good because we did understand, followed every development with intelligent interest, and put our money and enthusiasm behind it every minute accordingly.

Maybe we never actually distrusted the promoter, but we watched affairs mighty ready to criticise or sell out. We could even fail like martyrs if necessary, but we didn't help as though our honor and judgment were at stake.

Now that's just what is wrong with forestry in America. We have propagandists with a perfectly irrefutable assertion that forest preservation is a good investment. The public either says "too busy today," and while not denying does nothing, or it says "here's your law (or appropriation or whatever is asked for); now make good and save the forests." But it dosen't know the business factors that govern the enterprise and cannot criticise or help intelligently. Sometimes the propagandist doesn't know either and forest preservation, unfortunately, cannot be conducted wholly by a business manager or board of directors. It is mutual co-operative enterprise, requiring daily participation and ratification by all concerned. There must be an American forest policy which exists, not because a few of us say it should, but because a majority of citizens understand what is needed and why and proceed to put it into effect.

True we are making rapid progress toward such a situation. Twenty years ago we had practically nothing. Now we have a great and efficient national forestry administration. Most States have some forest lws, some have good ones, a few are fairly liberal with funds. We have forestry associations and congresses. Lumbermen, once regarded as the opposition, are now showing the most rapid advance of all, for in less than ten years their systematic protection of private timber has grown from practically nothing to cover about 100,000,000 acres, with an increase of 3,000 per cent in five years.

But why does the Forest Service still have to fight for existence in every Congress, and at best be supplied with funds much less than private owners spend to protect adjoining lands? Why do many States have no forest legis-

lation and few legislation that is adequate? Why are there sections where lumbermen and public are so mutually suspicious that neither supports any real solution of a mutual problem? Why do we have to have forestry associations and conventions?

Evidently because the average citizen does not know much about the problem himself, in spite of all we have said and done, and result dependent upon human action depends partly upon the extent of desire for this result but more upon the extent of knoweldge how to achieve it. We are trying to do as a minority what in its very nature must be an expression of the majority. We tell the average citizen it is his problem, that we have solved it for him, and that he should support the project. We are wrong. *We* cannot solve it or reduce it to a mere supportable project. We can give him the facts, but he must solve it by studying the relation of his conduct and the community's to his own welfare and then acting accordingly. Then, and only then, will Congress, legislatures, lumbermen, foresters and public be able to work together as they must work together, knowing that their policies are sound and commended, that success will be rewarded, and that failure will be punished.

We talk and write a great deal about methods, as though all that is necessary is to make foresters proficient and lumbermen interested. This is all right enough, but what is most needed is permission to apply what we already know. Knowledge and interest are far ahead of opportunity. Success depends chiefly upon having conditions under which they are encouraged. With such conditions you couldn't stop it if you tried.

Let us return to our average citizen who with his fellows constitute the majority of our population. Suppose that in his home town, where community relations are so closely under his eye that they are familiar and clear to him, a single industry employs a large proportion of the population, produces the chief share of all manufactured products, and pays an essential part of the taxes. Let us say it is fruit-growing, or dairying, or furniture making. This citizen would not think twice before conceding its necessity. Anything threatening its discontinuance would be a menace to be fought vigorously; anything promising to increase it would be encouraged. Town officials, chamber of commerce, citizens—all would work and spend in earnest for its continuance and development just as you have seen them do often when occasion offered to promote enterprises of community advantages. No one in public life would dare do otherwise.

Moreover, they would know how. If it were a dairy community its average citizen would know pretty well what production costs, what prices are necessary, what improvements are feasible, what the State can and should do to aid and regulate, what public demands are reasonable and what are unreasonable.

The relation of forest industry to the State or nation is exactly that of our illustrative industry to our suppositious town and so is its relation to every citizen. Lumbering is one of the three or four greatest American industries—it is our greatest manufacturing industry—and forest products are used in almost every other besides being practically life essentials. Certainly it is second in

usefulness to none except agriculture, and this would fare ill without its aid in many ways. The only reason the average citizen does not realize this and give it the same active and intelligent interest that he gives home town problems is that he cannot see it so clearly. The very immensity and importance of the industry causes its several processes of growing, manufacturing and distributing to be conducted separately and thus confuses the public mind. Different communities see different parts of the process and get no thorough grasp of forest economics.

In many a little German village the whole community sees the forest grown, cut, manufactured and used. Those who do not actually participate, serve or supply those who do. All use the crop or profit by what is sold elsewhere. There forestry needs no propaganda. The people could not understand the need of it, any more than of propoganda for raising wheat and making bread. Yet their situation is really no different—it is only more concentrated. Here, too, forest industry is an entirety. Man needs wood in various forms. To make the earth supply it, employing such labor as is required to make it suitable and available for his use, is a business. Its performances and service to the community; supplying the consumer, employing labor, using supplies, and paying taxes, requires, like other business, perpetuation of the resource dealt with, economy in every process, and just payment by the consumer for service rendered.

Here is where we, who should be the teachers, are at fault. We talk too much about forests, as though they were an end in themselves. We might just as well talk only of land when trying to improve agricultural conditions, or water when urging the protection and propagation of food fishes. How can the average citizen understand forests? It is the business of producing and making them useful to him that he must understand—its place in the society under which he exists, the economic laws under which it exists. He must be brought to consider all forest production and all forest use as little or no different from the production and use of any other necessary crop, obviously to be encouraged and stabilized on a permanent basis profitable to all concerned. Whether he is a private citizen or a law maker serving private citizens, he must be fairly familiar with the factors which govern lumber prices, logging and manufacturing methods, the cost of growing and protecting the raw material. As long as he thinks an uncut forest is forestry, and that such forestry is good and all lumbering bad, there will be no real progress. Nor will he have lumber to use sometime when he needs it.

We are moving in the right direction slowly. Once propagandists made forestry an abstract problem of public or private conscience. They dwelt on the needs of posterity and urged present sacrifice as a duty. They practically said, "You are partly responsible for lack of forest protection. Forest destruction is bad for somebody's grandchildren. Badness is wicked. Therefore you are wicked. You need a sermon and we'll preach it." Nowadays we realize that abstract ethics do not influence human action as quickly as does fear of immediate personal injury. It does not offend our reforming instinct to add to our preachments of duty more vigorous and skilful appeals to human selfish-

ness. We say "Do you want to make more money? They stop the other fellow from destroying dollars you would otherwise share. Forest preservation is a bargain-price insurance policy you can't afford to be without. It's cheap for a short time only. Look over our prospectus and invest."

Now forest preservation *is* prosperity insurance and insurance is good business. But it is a commodity that must be paid for in money and careful conduct. The new way is better than the old, but our prospectus is still so general it only gets a certain confiding class of customers. It needs to give more information about the business; information that will both convince the critical and make every customer another salesman.

Seek local arguments. If for the Atlantic coast, look up the pay-roll total for all lumbering and woodworking industries in your State and the total selling receipts from their manufactured products. The size of the revenue thus kept at home, but which will leave you if these industries have to move nearer some other sources of raw material, will probably amaze you as much as it will the public. Learn how much your consumers pay annually for all forest products and figure how much they would save if there were no import freight bills. Then learn the rate of growth of your own species and refute the popular belief that it is too slow to enable saving these sums to those now living. Do you know that Massachusetts is today manufacturing its fourth crop of white pine?

Learn your area of waste land, and with the same definite growth figures to give your statements news value and convincing business accuracy, show what it might be earning the community by producing forest commodities. Calculate the tax revenues your existing forests bring, and that which forests on now waste land would pay, and show the consequent reduction of taxation on other property. On definite promises of area, growth rate, and conservative crop values show the revenue obtainable by the State from forest reserves of its own, balance this against the cost of such a project, and prove that you could lower all taxation just as they do in Europe. Study the effect of deforestation on stream flow, use specific familiar examples, and convert the injury into dollars and cents. When you get figures in all these calculations, turn them into popular comparisons that are easily grasped.

If you live on the Pacific Coast, forget that white pine grows rapidly in Massachusetts and appeal to local pride by saying that here, undoubtedly is the nation's woodlot, where climate and rapid-growing species give an advantage over the East which it is a business crime to leave ungrasped. Show that the area denuded by fire and use will produce an equally valuable crop in, say, sixty years, and that leaving this land idle is costing our five coast forest States about thirty million dollars a year. Add to this the loss by fire and show many millions altogether are being thrown away that might be distributed through every channel of industry. The lumber industry now brings about $140,000,000 a year into the four northwest Pacific States. Show that this is more than they get from wheat, wool, fruit, dairying and fisheries combined. The Pacific Coast had more than half the nation's timber. Show how many billion dollars this will bring in if saved for manufacture. Show the wreck of industries that would

follow its sudden destruction and point out that partial destruction means the same thing in proportion.

When a score of American citizens are endangered by an uprising in China or Mexico, no price is too great to pay for their protection. When a few hundred sailors went down in the "Maine" we were aroused to the supremity of national effort—war. Are the lives of hundreds of men and women who meet fearful death in forest fires through American carelessness any less precious? Their sufferings any less cause for national horror? The neglect of our people to observe the same care with fire in the woods that they exercise at home, the refusal of Congress and legislatures to appropriate adequately for fire prevention, and the leniency of our courts with fire law violators, all must be due to failure by those of us who are responsible for American education in these matters to impress a true comparison of values on the public mind.

As a nation we are engaged in forestry. Our national forests comprise nearly 200 million acres. Here is a stupendous task, involving the protection of existing supply, reforesting denuded areas, and disposing of the product so as best to serve the people and to influence conservative management of private forests. To withhold funds necessary to do the work is letting an immensely profitable manufacturing plant lie almost idle, as well as in danger of destruction, to save the cost of fuel and watchmen. To mismanage it would be as bad or worse, for the one-fifth of our timber supply thus under public control cannot but influence profoundly the permanent wise management of the four-fifths under private control upon which we are still more dependent. Clearly all of us—lumberman and consumer alike—have most to gain from stable conditions for the fullest use and perpetuation of all our forest resources, regardless of ownership; from making all true forest land capable of earning such an income from forest production as, without being excessive, will insure its best management and consequent fullest service to community and nation.

And yet who can deny that we are without any accepted clear-cut, dependable, national policy which supports and finances this immense project with competent consideration of both public and private forests and their influence on permanent industrial development? The Forest Service can neither announce nor execute such a policy so long as there is every extreme of variance in the views not only of the States, whose attitude toward their own forests and forest industries has a profound influence, but also in Congress where any executive policy, to be dependable, must find sanction and support. Every Congressional session sees the whole subject debated from a dozen viewpoints, chiefly political, with a marked lack of statesman-like treatment based on any real knowledge of forest economics. Besides unwillingness to provide adequate protection for the people's property we even hear advocated the turning it over to a dozen State legislatures that are doing still less with their own forest responsibilities. Ignorance or a desire for political effect has even urged immediate sacrificial cutting to break a mythical "lumber trust" when it should be self-evident that private competition is now at its keenest and that the Government supply should be husbanded against the time when it may have some real effect on prices to the consumer.

Now all this is by no means chiefly the fault of Senators or Congressmen. There is nothing in it for them, except so far as it can be made to strike a responsive chord in their constituents. With the public half as well informed on the production of the lumber it needs as it is on the getting of its parcels by mail or the price of sugar, there would be an expression on an American forest policy that would leave no statesman uncertain. We cannot blame him if there is no such expression nor can we blame his constituents for not seeing that he gets it. It is because they have not been told the facts in convincing business language.

Come now to our States. Many have done nothing. Few have comprehensive farseeing policies, covering their own opportunity on State-owned lands and adequate encouragement of good private management through efficient fire protection and just taxation. It is not enough for the reformer to present good laws and recognize bad ones. Why is there little trouble in passing laws for protection and advance of agriculture, horticulture and dairying? Not because these industries are more useful and deserving, but because people understand their governing conditions and see the point of such laws readily. The chief reason they do not so understand forest conditions is that the reformer himself makes forestry a creed and not a business.

In my opinion forestry will never succeed in the United States until it is so closely allied with lumbering that neither forester, lumberman nor public makes any distinction. This is the case in Europe and everywhere in America that there has been successful progress. So long as the lumberman suspects forestry of being antagonistic, he will not help. So long as he does not help, the forester cannot talk intelligently to the public. After all, the private owner controls most of our forest area. His use of it, our use of it, and the effect of our relations upon our joint use of it, largely determine our forest destinies.

Were foresters in proper touch with the business and of producing forest products they would have the support of all lumbermen and jointly they would have an irresistible argument. Were forest economics understood and forest industry given its proper rating compared with other industries, suspicious lumberman and suspicious public would alike see a common object and make mutual cause to further it. A State with a hundred times more revenue to be expected from lumbering than from wool growing would not appropriate $500 for forest protection and $20,000 for coyote scalps. A community that applauds its chamber of commerce for getting a shoe factory and gives it a free building site would not carelessly burn up a forest capable of employing a thousand times as many men and then tax the owner so he cannot afford to hold and protect the land for a new crop. A State that is glad to see its farmers get a good price for wheat, even if it does use some flour, would not rejoice when its sawmills are forced to accept a low price for lumber. A lumberman who prefers to let his trees stand until Americans need them, rather than cut them at a loss for foreign export, would not be accused of conspiracy to bleed the consumer any more than would a farmer who decides not to raise potatoes when they don't pay for raising. A country that applauds fruit growers for systematizing to assure reliable grades and intelligent marketing, sends publicly paid experts to help improve their orch-

ards, and exempts them specifically from the Sherman law, would not condemn and seek to prosecute forest growers for attempting similar co-operative improvement of a business still more necessary to the community.

In short, the public would prefer to see all forest industry, public and private, on a sound business footing calculated to preserve it and its benefits to the community, and would expect to pay the cost of producing lumber from the tree to the yard plus the same fair profit that the public itself requires from its individual enterprises. And if this is true, the great need today is for teaching the principles of the business from start to finish. Every process, its cost, and its relation to other processes and to the final price of the product, should be common knowledge.

Nothing can be more inconsistent, so long as most of our forests are privately owned, and even the public forests must be manufactured for us privately, than to antagonize the lumberman whose help we must have by continuing such ignorance of his problems that we even treat him as an enemy. On the whole, forest industry probably surpasses any other in smallness of profit. Unusual opportunity has built some large fortunes, but for every one of these are many cases where the public has profited by failure. Nor is stumpage speculation any exception. Times are changed. Taxes, protection and interest are now compounding more rapidly than prices advance. The tendency is toward competitive overproduction rather than toward monopolistic holding back of material. Few if any things are sold at so much less than their value as the trees of which lumber are made.

Whatever may have been in the past, when new supplies were easily available, the lumber producer now sees his industry dpendent on forest preservation and his interest in this is as keen as ours. If he does not practice forestry it is, as Forester Graves says, for one or more of three reasons: First, the risk of fire; second, burdensome taxation; third, low price of lumber. This situation will not be relieved by threats of compulsion but only by learning what it costs to furnish forest crops and establishing a business-like policy accordingly.

When forest economics are as well understood as the economics of fruit or wheat growing, the suspicion which always confronts mystery will no longer manifest itself in prejudice which works to the consumers' disadvantage. The private as well as public lumber producer, as a class, because he is honest and useful as a class, will be accorded the same respect and helpful sympathy as is accorded the farmer or engineer who develops the possibilities of utilizing our country and supplying its people. And he will be quick to respond.

So we always get back to education, the line in which forestry effort is the weakest. The ingenuity of theatrical, railroad, political and advertising agencies is proverbial. Activities of this kind are now regarded as business necessity. They are needed and legtimate nowhere more than in forest propaganda, which has nothing to conceal but everything to teach. Education is a matter of publicity and publicity is a trade. It cannot be practiced intuitively. Foresters and lumbermen must learn this trade.

CONSERVATION OF LIFE IN THE LUMBER CAMPS

By Miss Mabel T. Boardman.

THE Red Cross Societies in all countries, though primarily organized to take charge of volunteer aid to the sick and wounded in time of war, have broadened the scope of their work to include the mitigating of suffering after great disasters. To fulfill their duties successfully and efficiently under both of these conditions necessitates the maintenance of a permanent, if skeleton, organization with a trained, skilled, and experienced personnel. This means not only an expenditure of considerable funds, but also the creation of departments for special work. Organized and maintained, these departments have proved not only of untold value during war or disaster relief, but have become capable of rendering a constant, patriotic, and humane service to the country in its every-day life.

The St. Johns and the St. Andrews Ambulance Associations of the British Red Cross, the Sanitary Columns of the German Red Cross, the First Aid Departments of the Italian and other societies have all entered into a broad and helpful crusade in the field of accidents, especially in the industrial world. Dr. Von Esmarck once said, "The fate of a wounded man depends into whose hands he first falls," and in this he voiced the belief of the men who really know, the men of the medical profession. Watch a doctor handle only a slight cut. How carefully his hands are washed and every instrument to be used sterilized. How skillfully he applies an antiseptic gauze or pad without touching the wound. Is this for nothing or because he knows that in all this caution may lie the difference between complete recovery and the pathetic existence of a crippled life or even the loss of life itself.

Following the example of its sister societies, the American Red Cross has established under a sub-committee of the War Relief Board a First Aid Department, in charge of an Army Surgeon, Major Robert U. Patterson, detailed for this duty by the Secretary of War.

In our mines 2,450 miners are killed annually, and 6,772 injured. Our railroads slay 3,000 victims yearly and injure 60,000 more. Facts like these present to the view of the Red Cross a national calamity that calls to it for aid. To that cry of a Welch miner I once heard, "Come quickly, there's a man hurted," it seeks to respond.

Some twelve or fifteen years ago Dr. M. J. Shields, of Scranton, Pennsylvania, started this work of first aid among miners in that district. Without aid or recognition from the companies, he labored for five years. Then came the sudden realization of the value of his work, and he was engaged by one of the companies to devote himself to the instruction of first-aid teams among their men. In a few years more the fame of the work had grown, and the services of Dr. Shields were loaned to various companies, anxious to undertake this work. About

this time the American Red Cross, having decided to organize a new department devoted to first-aid instruction, was fortunate enough to obtain Dr. Shield's services, the company which employed him sacrificing their own interests for the benefit of the entire mining industry. Since then two other physicians have been added to the Red Cross corps for this work. The Pullman Company has generously donated and rearranged two cars specially fitted up as traveling schools of instructions. Two of the doctors live on these cars, for which the railroads give free transportation. The organization of first-aid classes among miners, trainmen, and other industrial employees taught by mining, railroad or local physicians has been carried on by means of these cars and by the third physician, who devotes his time mainly to work among miners. Major Charles Lynch, formerly at the head of the First Aid Department, has prepared a number of textbooks on first aid, in which not a small amount of space is devoted to instruction for the prevention of accidents in different industries. These books have been translated into Polac, Slovac, Italian, and Lithuanian for the benefit of our foreign-born miners.

The Red Cross, the Bureau of Mines, and the mining companies in co-operation hold from time to time first-aid competitions, each company competing having held a preliminary competition among its local teams to select one to represent it at these meetings. Special medals and diplomas are awarded by the Red Cross, and frequently companies or individuals provide cups or other prizes for the winning team. This greatly stimulates the interest of the men.

Furthermore, the Red Cross gives annual prizes in money to miners and trainmen for the best first aid rendered in case of actual accidents. Two years ago forty teams were present at a great meeting at Pittsburgh, attended by the President of the United States, also president of the American Red Cross; the Secretary of the Interior, Dr. Holmes for the Bureau of Mines, and many thousand others. The teams represented nearly every mining State in the country. Some came from as far west as Oregon, the companies paying all the expense—a testimony as to their estimate of the value of the work. In Pennsylvania since the organization of these first-aid instructions in the mines, accident and death benefits have been cut fifty per cent. Does not this prove, therefore, a labor for the conservation of human life that is worth while?

Now let me turn to the condition in our lumber industries, particularly in the logging camps. It would be presuming upon my part to speak on such matters to those who know so much of what I know so little, had not the Red Cross a service to offer them.

Unfortunately, the vital statistics of our country are as yet far from perfect, and no data concerning accidents in the lumber industries could be obtained from the Census Bureau. For this reason we are forced to base our statistics on those obtained from the State of Washington, where 47,400 men are employed in this industry. In twenty-three months' time we find 251 fatal accidents occurred, 990 persons permanently partially disabled, and 8,420 suffered from temporary total disability. To bring this down to monthly averages gives us more than

ten killed, forty-three permanently partially disabled, and three hundred and sixty-six temporarily totally disabled in one month.

I note in his address last year Major E. T. Griggs said that 800,000 are employed in the lumber industry, one-sixteeth of that number being employed in the State of Washington. We have no reason that I know of to assume that lumbering is a more hazardous occupation in that State than in any other. Therefore, I think we are justified in multiplying the above figures by sixteen for one month, then multiplying this by twelve to obtain a rough estimate for accident statistics in the entire lumber industry. This will give us 1,920 killed, 8,256 permanently partially disabled, and 70,272 temporarily totally disabled. annually; or about 5 killed, 22 permanently partially disabled, and 182 temporarily totally disabled a day. This is, of course, an estimate based on the Washington statistics, and may not be accurate as to the rest of the country.

Major Griggs in his address said:

"With an industry affecting throughout the United States over 45,000 sawmills and 800,000 employees, regardless of families dependent on them, you will agree with me that we are all vitally interested in workmen's compensation."

If we are vitally interested in compensation laws, should we not be still more vitally interested in the prevention of the need of such compensation; that is, in the instructions for the prevention of accidents and in the practical application of first aid to the injured for the lessening of fatal, serious or prolonged results of accidents when they do occur, interested not only for the sake of 800,000 men employed but for the families dependent on them?

There is almost no labor utilized in the lumber industries that has not some danger involved in it. The sharp edge of the axe or the jagged teeth of the saw in a moment may cause an injury where unchecked hemorrhage will result in death in a brief space of time. Physicians have signed many a death certificate of men who bled to death from slight injuries and whose lives might easily have been saved by some knowledge of first aid. The application of cobwebs or some other traditional remedy to an open wound or the use of soiled rags in binding it up often produce an infection with crippling or fatal results.

There is danger to the sawyer from the falling tree, especially when a rotten heart or high wind makes the direction of the fall uncertain; or on steep slopes if the tree shoots suddenly downward, or if a badly strained tree breaks with great force. The handling of the logs at the skidway and the loading onto the trains require skill and agility on the part of the loaders to avoid being caught and crushed by these great pieces of lumber.

The temporary nature of most of the railroads provide their share of accidents, and danger lurks even in their construction, in the blasting of stumps and rocks, and the thawing out of dynamite in the colder camps. Nitroglycerine may be absorbed through the hands, causing severe headaches to the men who use it.

Those who have never seen a lumber camp have yet had vividly impressed upon them by graphic stories the hardships to which the log drivers are exposed, the great personal danger to the river drivers in the excitement of freeing jammed

logs, when a single slip may mean the crushing out of life between the heavy logs or drowning in the water below them. Nor does the danger end with the logging, for the saw mills, with their powerful and sharp-edged machinery, add their quota to the number of yearly accidents.

Recognizing, as we must, the hazards, dangers, and accidents in the lumber industry, our desire is naturally aroused to do something in the way of prevention and in extending to the lumbermen the knowledge of first aid.

I note in the Washington law for workmen's compensation, which is a sort of State insurance, the employers of labor paying the premium, that if statistics show an udue number of accidents among the employees of any given company, because of poor or careless management, the rate charged that company is increased. It seems to me this law should also be made to work the other way, so that any company making a good showing in the way of fewer accidents than may be taken for the normal number should have its rates correspondingly reduced. Even if this is not done, the less that has to be paid out in compensation by the State will have a tendency to reduce the general rates paid by the companies.

The Red Cross will gladly co-operate with the Bureau of Forestry and the lumber companies in arranging for first-aid instructions. Conditions in lumber camps differ greatly from those in mines, railroads, and other industrial plants. There can rarely be physicians resident in such close proximity to lumber camps that their services for instruction can be easily made available. For this reason, it would be advisable to secure the entire time of a certain number of doctors for this purpose. To make an experiment—and we learn best by experience—the Red Cross makes this proposal: towards a fund of $3,000 it will contribute $500, if a number of lumber companies in a given locality will club together to raise the additional $2,500, each contributing according to the number of their respective camps and employees. This fund will provide for the salary and expenses of a physician specially trained by the Red Cross for instruction to men engaged in the lumber industry both for the prevention of accidents and first aid to the injured. In connection with logging camps, there should be added certain simple but important instructions in camp sanitation for the benefit of the general health of all the men.

Such a doctor devoting his entire time to this work would travel from camp to camp. In cases of remote camps, he would stay long enough to give the men daily instruction for a short time. In cases where a number of camps could be reached more easily from one place, he would arrange to give one or two lessons a week at each camp. The classes are formed from volunteers who are given practical training. The men soon realize the importance of such knowledge and are anxious to learn. Even those who gather about as spectators pick up not a little useful information. Each camp should be supplied with first aid outfits suitable to the needs of logging accidents, and these the men taught how to use. This is aturally but a tentative plan, with many details to be worked out; but may I commend it to the consideration of those interested in the lumber industry

and suggest that they appoint a committee or representative to confer with the first aid department of theRed Cross upon this matter.

Again I am tempted to quote from Major Griggs' able address. He said:

"Logging is a hazardous life at the very best and calls for strong, dare-devil men and men who are willing to take chances. Danger is always present and men become so used to it that they get careless. This, however, is no excuse for needless loss of life and limb."

He commends: "The benefit of co-operative effort in conserving human life and in protecting the bread-winners, upon whom depend the life and happiness of so large a population."

The American Red Cross offers to do its share in this co-operation for the conservation of the life of the lumber-jacks in the logging camps throughout our country.

THE LUMBERMAN'S POINT OF VIEW.

By J. E. Rhodes, Secretary of the National Lumber Manufacturers' Association.

I HAVE been intensely interested in the splendid address delivered by Miss Mabel Boardman, of the American National Red Cross, because of the reference which she has made to the lumber industry and the necessity for cooperation between the Red Cross and the lumbermen in giving first aid instructions to woodsmen.

I am very happy, indeed, to say to her that the proposition which she has presented to the lumbermen will be taken up immediately by the national organization which I represent. The cooperation which she proposes will be placed before the members of the National Lumber Manufacturers' Association and through other agencies to the lumbermen of the country. I wish to refer briefly to one of her conclusions to the effect that the fatalities and accidents in the State of Washington might be taken as an indication of the number of accidents, fatal and otherwise, in the other lumber producing sections of the country. Without definite knowledge on the subject, it is my judgment that the number of accidents in logging operations in Washington is higher than the average in other sections, because woods work on the Pacific Coast is more hazardous on account of the size of the timber, the mountainous character of the country, and the fact that most of the logging is done by machinery.

In following Mr. William Irvine so closely, upon a subject precisely like that assigned to him, I think you are entitled to a brief explanation.

The Forestry Committee, which arranged this portion of the program of the Conservation Congress, invited Mr. George S. Long, of Tacoma, Washington, to present "The Lumberman's View of the Forestry Question." Mr. Long is identified with timber-holding interests of the Pacific Coast, and has given as much sincere thought to this subject as any other lumberman of the country. He was detained at home, and I was asked to substitute for him by the committee who did not know at the time that Mr. Irvine had been assigned the subject of the "Attitude of the Lumberman Toward Forestry" by the officers of the Congress. I asked to be relieved from representing Mr. Long under the circumstances, but the committee has been insistent, and if I shall duplicate some of Mr. Irvine's statements, I will ask both you and Mr. Irvine to pardon me.

I have not the slighest idea what Mr. Long would have presented to you, but I know that he has very mature views on the problem before us, and I trust that he may be prevailed upon to express them in writing, so that they may be made a part of the records of this congress.

I can give you only what I believe to be the views of the average lumberman toward forestry. There is, of course, considerable difference of opinion among them on this subject, as upon all others, and what I say may not represent the views of certain individuals, but of the lumbermen as a class.

The lumbermen are engaged in their business for the purpose of making a living, and as much of a fortune besides as possible. To this extent they are not unlike any other class of business men. Their business from the first has proceeded along the easiest possible lines. Ours has been a wood-using nation. Lumbermen have engaged in the business for supplying the demand, and to realize therefrom the largest net returns to themselves.

The values of standing timber in this country are almost universally fixed by the prices from lumber, for, obviously, standing timber is worth no more than can be realized from its manufacture. Timber must constantly increase in value, or it cannot be held for investment. The carrying charges, which include interest on the original investment, annual taxes and cost of protection, are constantly increasing, so that the average tract of timber must double in value at least every seven years, or it will represent a loss. The public should know that timber prices do not set the price of lumber. It is fixed by the demand that exists for it, the quantity of any certain species and grade available, as well as the general commercial and business conditions which affect the prices of all other staple commodities. Few articles of general utility fluctuate in value as widely as does lumber. There is no trust or combination which fixes the wholesale price of lumber. The manufacturing end of the business is represented by many thousands of mills, and all of the different producing sections of the country are in keen competition with each other. The impossibility of bringing about any thing like a concerted action among the number of individuals engaged in business to the extent of fixing a uniform wholesale price is apparent to anyone.

The value of standing timber does not fluctuate as do the values of lumber, simply because timber is not bought and sold in small quantities, and the general tendency of the price of lumber, over a period of years, is upward. A manufacturer is obliged to buy a quantity of timber sufficient to stock his mill for a number of years. He would not be justified in putting the amount of money into the necessary equipment without doing so.

Because trees are a slow growing crop, and are being cut in America faster than they are reproducing themselves, it is of course inevitable that timber prices will continue to advance. While lumber will fluctuate, its general tendency will be upward, and timber values will follow. Higher prices mean closer utilization of the raw material. Operators in the Northern Lake States originally cut the white pine only, as there was no demand for anything else. As values advanced they were able to sell the lumber from Norway pine, and today many species of timber formerly considered worthless are cut. Lumbermen use every portion of the raw material from which a profit can be obtained. They generally have all of their own money invested in their operations, and all the money they can safely borrow, and conduct their operations with as much regard to economy as any class of manufacturers. They resent the criticism that they have wasted and looted the Nation's timber resources. Men are not in the habit of destroying material which can be sold even for the cost of handling. If there has been any waste of forest material in America, the public must share its full responsibility, for lumbermen have sold everything the public would buy.

We find that the utilization of raw materials depends largely on the location of the saw mill with reference to markets. For instance, in New England, where the saw mills are located more closely to large consuming centers than those of any other section of the country, they are able to transport their products to the consumer with the least expense. White pine timber is so closely utilized that 30,000 board measure feet per acre is obtained. This simply means that there is a market for practically every portion of the tree. The same timber in the Lake States, farther removed from the market, will produce not to exceed eight to ten thousand feet per acre of marketable material. On the Pacific Coast millions of feet of good material are wasted either in the woods, or at the saw mills, because the cost of handling and shipping it to the markets where it could be used would be more than the price obtainable. As the consumption of lumber increases in closer promixity to the mills, it is possible to sell a greater portion of the trees.

Lumbermen are studying their markets as closely as the producers of any other material. They are not particularly alarmed about the inroads of substitutes, for they are willing to concede their markets to those substitutes which perform a greater service. Many present will remember when the sidewalks of the smaller towns and cities were made of wood, and while this represented an enormous consumption of lumber, the lumbermen have made no complaints about the loss of this market, simply because they have recognized that the cement walk, now universally used, is a superior article. They further know that lumber possesses qualities not inherent in any other material.

They are engaging in the advertising of their products for the purpose of educating the public how it can cooperate in using forest materials for which no market now exists. The manufacturers can influence custom to only a slight degree. There are several customs now generally in vogue, which could be changed with a swing of material, and without any detriment to the consumer. There is now a large amount of raw material wasted at the saw mills because the public will purchase only even lengths and widths in standard building sizes. It is only in those sections of the country where lumber prices have reached the highest point that this is not true. Throughout more than two-thirds of the United States it is impossible for the lumbermen to sell anything but boards and dimension lumber in even lengths, the odd foot being cut off and wasted at the mill, and the same is true of widths in inches in all but the highest grades. The lumber manufacturers are anxious to educate the public to the fact that by cooperation with the carpenters, contractors, architects, retail dealers and lumber jobbers, much material now wasted at the mills can be utilized.

The question is asked why lumbermen do not practice forestry. They do not feel that economic conditions have reached a point where the application of so-called scientific forestry methods can be undertaken without financial loss.

Lumbermen are practicing the first step of forestry in the measures which they are taking to prevent fires. The conditions on the Pacific Coast are most favorable for the easy reproduction of the forest because of the climatic conditions, and the species of timber. Where fire has been successfully eliminated the young forest is growing rapidly. This work, which has been so successfully

done by the Pacific Coast lumbermen, has been undertaken by the timber owners of the Lake States and other sections. The fire problem has been practically settled. Except in years of extreme dryness, and when the conditions get beyond human control, there will be no great loss from forest fires.

As the prices of timber and forest products advance, lumbermen will conduct their logging operations with more and more regard for future crops of timber. Lumbermen are too intelligent a class of business men not to undertake those methods which will perpetuate their supplies of raw material, and thus prolong their business. The public must realize, however, that until forestry can be undertaken with practical results, it cannot be considered at all, as individuals cannot engage in a work of this kind at a loss to themselves, no matter how much they may be prompted by sentiment or regard for future generations.

The professional forester fully agrees with this view. Indeed it is he who is doing more than the lumbermen to educate the public that no material progress in forestry can be made in this country as long as the wholesale prices of timber products remain where they are. Representing the lumberman, I am pleased to acknowledge the great value of the reports which have been submitted to the Forestry Section of this congress. They constitute what I am sure is the most intelligent, exhaustive and practical review of forest economics that this country has ever had, and throughout all of them the obstacles with which the lumberman is faced when considering any other than existing methods in handling his business are fully recognized and explained.

The public must realize that the price of lumber must reach a point where it will pay to grow trees, or forestry cannot be thought of. The lumbermen will be glad to do whatever they can to afford the virgin timber a chance to reproduce itself, and that is what they are already doing to a greater extent than even they, themselves, realize in their efforts to eliminate fire. The planting of a new crop of trees, however, must be done by the State or the Federal government, for, in no sense, is it a private enterprise. It takes too long to mature a crop of timber from the seed to interest capital. The great risk, and the cost of carrying such an investment make it impossible. Individuals are obliged to pay taxes in some form or other, while the State is not. The State should be interested in taking all measures necessary to safeguard the future, while individuals cannot be expected to do more generally than take care of their own interests.

In the holding of young timber for further growth, lumbermen feel the constantly increasing burden of taxation. The present method of taxing timber annually is a handicap, which makes the consideration of any forestry methods in connection with private logging operations absolutely impossible. Many lumber companies would be glad to hold large areas of cut-over timber land, and to pay the cost of keeping out the fire were they given some relief from the annual tax. No other civilized nation treats the owners of private forest land as does America in this regard. Lumbermen realize that there is much land from which they have taken the timber, which is more suitable for agricultural crops than for trees, and these they are holding and paying the taxes on for the purpose of eventually selling them for agricultural development. Land suited for farm

crops should not, of course, be held for trees, because the income from a few annual farm crops is as much as would be realized from the sale of timber after many years' growth. Many timber owners are very much discouraged over the attitude of the public toward the taxation problem. They do not believe that the American people will ever be willing to concede changes in present methods of taxation until the present timber supply is so nearly exhausted as to make prices of forest products very high.

They are looking to the forester to educate the public to the correct view of this important matter. Their motives have so often been questioned when urging some relief from taxation, that as a class, the lumbermen generally are unwilling to agitate the matter. It is a very hopeful sign that the States of Pennsylvania and Massachusetts have recognized the necessity of encouraging timber owners to hold trees for future growth by changing the methods of taxing could afford to carry these immense areas of timber land, and that they would be compelled to dispose of large parts of them. Lumbermen much prefer, however, to see the timber of the National Forests managed as it is at present, because they are absolutely certain that it will result in the utmost advantage to the greatest number of people in the long run.

I hope it will be seen from what I have said that the lumbermen are absolutely dependent upon the foresters and upon organizations like the National Conservation Congress to show the public that they cannot adopt those methods which will make it possible to perpetuate growing timber until there are radical changes in existing economic conditions.

Because of the confidence which I have in the intelligence and patriotism of the American people, of which those citizens engaged in the production and handling of forest products constitute a very large and important element, I am entirely certain that conditions which will make possible the practice of forestry in its best sense, will be conceded, and will be developed, and that the supremacy of the United States among the nations of the earth will not be threatened because of a famine of her timber supply.

LUMBERMEN AND FORESTRY

By William Irvine.

A GREAT many of the lumbermen of the United States are interested in the science of forestry believing that thereby intelligent information is being supplied as to the best methods of conserving the forests of the country while furnishing their products in response to the country's commercial needs. Scientific lumbering was not favorably received for quite a period by a great many practical lumbermen, but gradually they have been awakened to the fact that forestry is a science that should be cultivated to the utmost extent. The public prints, voicing public sentiment, condemn the lumbermen in no uncertain terms for the destruction of the forests, ignoring the fact that the lumber consuming public should be held equally accountable, for the reason that it has furnished the demand for the forest products, without which they would not have been produced. The view-point has changed materially within a comparatively brief period, and the conditions obtaining a few years ago are not the conditions of today. The earlier lumberman was in a constant struggle with the wolf and had no time for questions of reproduction, care of smaller growth and kindred subjects. The great question in the forests was that of getting to market the merchantable product in such manner as to permit the operator to pay his labor and supply bills with the hope of a reasonable return upon his investment. The products of the forests were used in the building of railroads, cities and towns, and to supply the manifold requirements of the people in general; and to the observer of the period the best interests of all classes were advanced by the methods then in effect. Millions of acres originally covered with trees that have been felled to supply the people's needs are now fertile fields supplying homes and employment for thousands of husbandmen, who in turn are furnishing food and raiment for countless citizens of the republic. No great fortunes were accumulated by the makers of lumber of a few years ago, and as a matter of fact the increase in the value of stumpage which has followed the diminishing supply, has furnished the major part of the lumbermen's profits during later years. Lumbermen who have bought trees for their commercial value have very naturally cut the trees into saw logs, and will undoubtedly continue to do so in response to the demand for the product. The cutting of today, however, is done on more economical lines than in the past and each succeeding year will see improvement in this regard. Gifford Pinchot and his successor, Mr. Graves, of the Federal Forest Service have labored hard, and with a great measure of success, in the effort to induce more economical cutting, and the sparing of the smaller growth. A good many operators are making an effort along the lines suggested, but in many instances the owners are not convinced that they can afford to leave any portion of their merchantable standing timber, the tax gatherer offering a very substantial bar to such a course in the majority of instances. Conservation and

forest restoration would be advanced by the adoption of tax laws in line with the suggestion of the Federal forest service, relieving from taxation areas devoted to the growing of trees and providing for taxation at the market value when the crop shall be harvested. The best inducement that can be offered for the production of any crop is the reasonable assurance that it will pay, and the planter and cultivator of trees must have the same prospect of eventual profit as that which stimulates to action the planter and cultivator of cotton or corn. Individual effort in the line of forest preservation will aid, but will not accomplish the desired result, by far the most important factor being the policy of the government, both Federal and State, as to the treatment of the public timbered lands. The action of many States in establishing forest reserves is commendable and it is eminently proper that the Federal reserves should include all vacant lands on which there is any species of standing timber, and that the eventual cutting of the trees should be done under supervision of men trained to the work of forestry, to the end that the ripe trees only shall be cut, and the smaller growth conserved and permitted to grow to reasonable maturity. Travel through the forests discloses the fact that nature is everywhere endeavoring to reproduce, and her efforts in that direction would show greater results were it not for the ravages of fire—the arch enemy of the forest. In the earlier logging a large percentage of the timber was left in the woods, for the reason that the cost of delivering low grade logs to the mill exceeded by far the value of the product. The operators were legion and without organization or cummunity of interest and in the absence of Federal or State supervision, destructive fires were of frequent occurence. The burning of old cuttings also destroyed in most instances the smaller trees that had been left standing, and the new growth of all varieties of timber. The system of fire patrols now in vogue in most timbered localities is giving good results in the line of protection, and it is to be hoped that there will not be a recurrence of the destructive forest fires of the past. Finally the forests have no better friends than the lumbermen, and while the lumbermen will continue to cut the trees, thereby supplying the material necessary to the country's needs, they will constantly strive toward increased economy in cutting and decreased waste and will support the practice of rational forestry, to the end that the full wealth of the forests may be conserved and utilized in supplying the constantly increasing demands of the constantly increasing population.

WHAT THE CONSERVATION CONGRESS ACCOMPLISHED

By Charles Lathrop Pack

President of the National Conservation Congress

AMONG the fourteen hundred delegates present in Washington at the Fifth National Conservation Congress were more foresters than had ever heretofore attended any similar meeting in this country. The forestry work accomplished, as evidenced by the twelve printed reports in pamphlet form prepared under the direction of the Forestry Committee, is considered by forestry experts and lumbermen to be the best work that up to this time has been done for American forestry and lumbering. These results alone would justify all the effort that has been made and the presence in Washington of such a representative body of men.

The adoption by the Conservation Congress of the recommendations unanimously presented by its Committee on Water Power was a long step forward in the development of a definite governmental policy, recognizing clearly the principle of Federal control; and also recognizing clearly the necessity of offering to the investor opportunity to invest his time and money in the development of water power under conditions which safeguard both the public interest and his investment.

The Committee on Water Power comprised ten men, exceptionally qualified by knowledge of this subject in all its aspects. Under the able chairmanship of Dr. George F. Swain, President of the American Society of Civil Engineers, it worked out and presented not a mere declaration of principles, but concrete and specific recommendations which should be of great value to the Government in framing the legislation that is needed to convert the present comparative inactivity in water power development into a period of active Conservation by use.

The fact that a committee comprised, not only of professional experts of the highest distinction, some of whom are actively associated with the water power interests, but also such men as ex-Secretary Stimson, Mr. Gifford Pinchot and Mr. Lewis B. Stillwell were able to agree upon a definite and constructive program, and that this program received the emphatic endorsement of the Conservation Congress, is a demonstration of the public spirit of the Committee and the ability of the Congress to accomplish effective and constructive work. All true Conservationists will hope that our National Government will promptly enact the legislation that is so greatly needed.