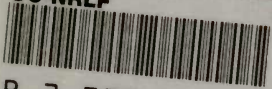
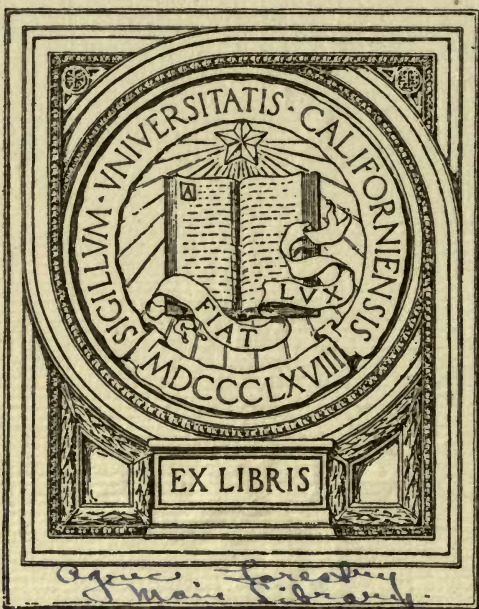


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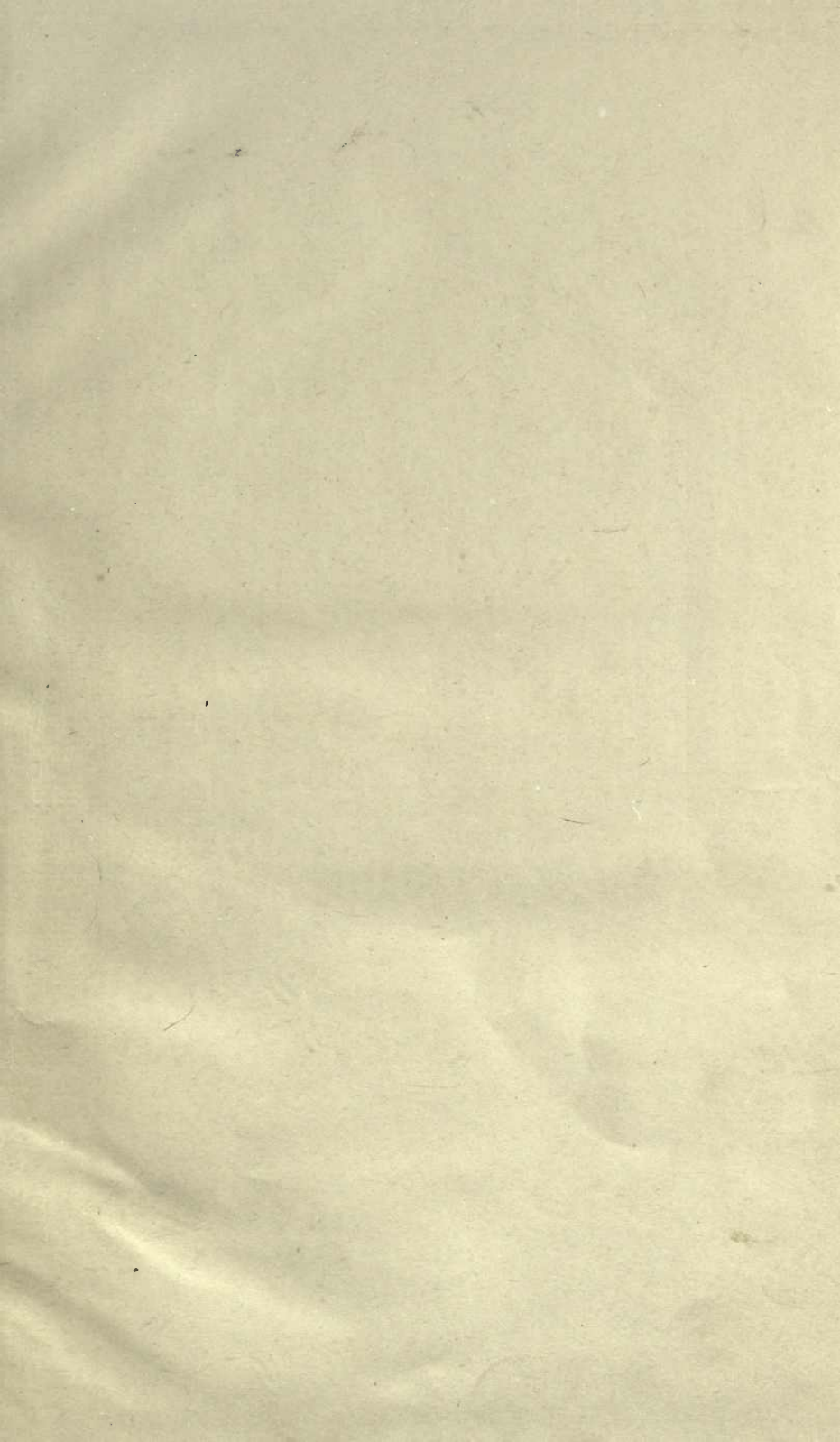
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TO
EDMOND S. MEANY,
the first to foster
and teach forestry in the
University of Washington,
the members of the Forest Club
respectfully and lovingly
dedicate this,
their nineteen hundred fifteen,
Annual.



DOWN THE QUINAULT RIVER

*High mountains, the stars, and wide ocean,
The forest, so silent, the stream,
Loud torrent from mountain lake tumbling
Through boulders for ever a-rumbling,—
How troubled my spirit's vague dream:
Fain' prayer in the midst of commotion!*

*I feel the lash
Of rapid's dash,
The thrill of lunge and glide;
Though rude the shock
Of hidden rock,
There stands my Indian guide!*

*Lo! Primitive man with full quiver
Launched forth in his mystic canoe.
All scornful of rock-scattered danger,
His soul to wild terror a stranger,
Bold magic of arrows' he knew
For demons who haunted the river.*

*One glimpse of past,
From secrets vast
Yon ancient spruces hide:
Old courage runs
From sire to sons,
To this, my Indian guide.*

*No star in the heavens may reckon
True course for this frail little bark;
Each lurch with the torrent's new veering
Responds to the paddle swift steering
Past Death lurking low in the dark.
Some eagle this Indian doth beckon!*

*O heart aglow,
Deep waters flow,
My fear doth mingle pride;
Behold the sea—
I'm safe with thee,
My Quinault Indian guide!*

—Edmond S. Meany.



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1914-1915

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APPRECIATION

The Annual Committee wish to take this opportunity to show their appreciation to those who have so willingly given their time and effort to make this Annual what it is. They especially appreciate the contribution of articles, material, and advertising.

In behalf of the Club the committee wish to thank the speakers of the year for the time and trouble they went to, making this year one long to be remembered by all.

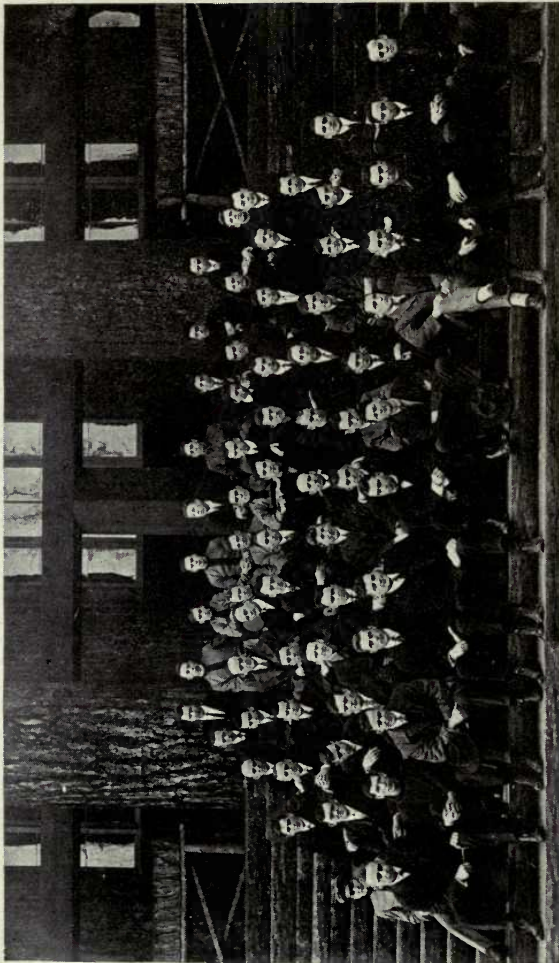
HAROLD A. BROWNING, *Chairman*

ARTHUR BEVAN

WILLIS CORBITT

DONALD CLARK

NOTE—As they left school at mid-year, H. A. Durfee, chairman, and Geo. O'Brien, resigned from the Annual Committee. The committee wish to thank them for their cooperation, and the work they did up to the time they left.



THE FOREST CLUB

EDITORIALS

PRESIDENT-ELECT, UNIVERSITY OF WASHINGTON



HENRY SUZZALLO

President-elect Henry Suzzallo, who will take office July first, is a westerner, having been born in San Jose, Cal., in 1875. He was educated in the public schools of California and was graduated from the state normal school in 1895, entering Leland Stanford university, the same year. He worked his way through college and was president of his class in his junior year, as well as being a varsity debater. In 1899 he received the degree of A. B. from Stanford.

Entering Columbia university in 1901, Professor Suzzallo took his M. A. the following year. He returned to his native state and held the position of deputy superintendent of schools for three years. During 1906 and 1907 he was an instructor and assistant professor at Stanford, going to Columbia in 1909, as professor of philosophy in the teachers' college.

The name of Professor Suzzallo appears in the 1915 edition of "Who's Who." He is a member of Phi Beta Kappa and Phi Delta Kappa, member of the national council of the National Education association, the American Sociological society, American Association for the Advancement of Science, National Society for the Scientific Study of Education and the Society of College Teachers of Education. He is editor of the Riverside Educational Monographs, published by Houghton, Mifflin & Co.

FOREST CLUB MEETINGS

1914-1915

Owing largely to the uncertainty of the conditions in the lumber industry this year a number of the speakers on the program could not appear on the scheduled date, and Messrs. T. E. Ripley, Alex Poulsen, J. P. Van Orsdale, and J. D. Young have thus far been unable to appear. All of these men have agreed, however, to be with us at another time, and we hope that we may still hear from some of them before the close of the year.

In addition to those regularly scheduled on the program, we had the pleasure of hearing from Mr. R. W. Douglas, a former president of the Short Course class and since then Executive Secretary of the Washington Conservation Association, and also of the State Conservation Commission, under appointment of Gov. Hay.

Following is the Program for 1914-15 and the men who spoke to the Club:

September 30, 1914—Problems Before the Forest Service.

Henry Solon Graves, Chief Forester of the United States.

October 6, 1914—Address of Welcome.

Hugo Winkenwerder, Dean of College of Forestry.

October 20, 1914—Forestry in Russia (Illustrated).

Trevor Kincaid, Professor of Zoology, University of Washington.

November 3, 1914—Seattle as a Great Lumber Shipping Center.
(Illustrated with moving pictures).

Fred W. Becker, Secretary Pacific Coast Shippers' Assn.

November 17, 1914—Sidelights on Lumbering.

George S. Long, Weyerhaeuser Timber Co., Tacoma, Washington.

November 17, 1914—Forest Products and Utilization.

W. B. Greeley, Chief of Dep't. of Silviculture, Washington, D. C.

January 5, 1915—Short Course Smoker.

R. W. Douglas.

January 19, 1915—Grazing on the National Forests.

G. F. Allen, Forest Supervisor, Rainier National Forest.

March 2, 1915—The Broader Uses of Wood.

George M. Cornwall, Editor "The Timberman," Portland, Oregon.

March 16, 1915—Activities in the Olympic National Forest.

R. L. Fromme, Forest Supervisor, Olympic National Forest, Olympia, Washington.

March 24, 1915—The Cause for the Depression in the Lumber Industry.

Austin E. Cary, U. S. Forest Service, Washington, D. C.

March 30, 1915—Election of Officers for Year 1915-16.

June 4, 1915—Forest Club Banquet at Hotel Savoy, Seattle, Washington.

This, the last meeting of the school year, ends the activities of the Club. The Seniors depart to enter the cold world and everyone bids goodbye for the summer months. An interesting feature is a review of the year's work.

Mr. J. J. Donovan of the Bloedel-Donovan Lumber Mills, Bellingham, is to be the guest of the evening and the principal speaker.

FORESTRY, THE LUMBER INDUSTRY, AND THE STATE

The forests of Washington and the industries dependent upon them have furnished the foundation for the present wealth and well-being of our State. Up to within comparatively recent times the people of the State were more dependent upon the products of the forests than on those of all other resources and industries combined. Even today they are more dependent upon the forests and lumber industry than upon any one other industry, unless all the varied agricultural pursuits be considered one. This is well illustrated in the accompanying tables:

TABLE I

Value of Lumber and Timber Products Compared to Agriculture*		
Lumber and Timber Products	\$89,155,000	
Woodlot Products	3,754,293	
Total Forest Products		\$92,909,293
Grain	\$78,927,053	
Domestic Animals	10,249,346	
Dairy Products	8,746,041	
Eggs	4,311,000	
Orchard Fruits	4,274,000	
Garden Truck	3,000,000	
Small Fruits	941,415	
Total All Agricultural Products		\$110,448,855

*All figures according to last census.

TABLE II

Forest Products Compared to Other Manufactured Products

All manufacturing Industries—Value	\$220,746,000
Lumber and timber products	89,155,000
Value of Forest Products in percentage of total	40.4%
Annual wealth added to the state through lumber manufacture in percentage of total added wealth due to manufacture	50.8%

The above tables show without further comment the tremendous value of our lumber industry to the State. The importance of this is emphasized even more when it is known that about 80 per cent of this total annual value of the lumber and timber products goes into general circulation among the people for wages and supplies and that 63.3 per cent of all the wage earners engaged in manufacturing in the State are employed in the lumber industry.

The Pacific Northwest in normal times furnishes a larger proportion of the lumber cut in the United States than any other region of similar size and Washington is the leading State. Since 1907, however, there were only two years during which the lumber industry has been operated on a profitable basis. The present state of affairs points to an economic situation the people of our State cannot afford to neglect. It rests upon two conditions. The first of these is the general economic value of the lumber industry and the other the large area of land within the State that will be almost wholly worthless unless it is made to produce timber crops. To be of the greatest value these two conditions are inseparable, because each is dependent upon the other. Without a sufficient lumber industry the wood crops that can be grown on the non-agricultural and non-grazing lands will have no value, and without the raw materials produced by means of continuous wood crops we can have no lumber industry of importance. Both of these conditions should be developed to their fullest capacity and the State owes it to itself and to the people to see that they are.

How can these conditions be fulfilled? A great deal, of course, will

depend upon the efforts of the lumber industry itself. It must develop a better market for Washington's forest products. Yet in order that the industry can undertake this work in a proper and efficient manner it is in need of more information concerning the qualities of our western woods. This information can be obtained only through scientific investigation in a thoroughly equipped Forest Products Laboratory. The State University now carries on some work along this line in co-operation with the United States Forest Service and the College of Forestry is furthermore carrying on a number of independent investigations in wood preservation. When we consider the importance of the industry in this State and the great mass of problems that ought to be investigated it would seem that a first class laboratory operated in conjunction with the College of Forestry at the University would be most expedient. The Forest Service has done much for our State in the investigations that it has carried on at the University and at the Forest Products Laboratory at Madison, Wisconsin, and has assumed a very liberal policy for the future; yet the field is so large and the problems to be solved so urgent that the installation of a sufficient laboratory at the University should be urged by all who are interested in the efficient maintenance of what should be one of our greatest resources.

Washington is the greatest timber state in the Union in point of annual production. We expend large sums annually for agriculture. Proportionately we have spent very little for the forest industries, yet the timber industry furnishes a livelihood for more than one-third of our people; it produces more than 50% of the annually created wealth of our state, and it turns 80% of the value of its products into general circulation each year for wages and supplies.

The Department of Forestry receives innumerable letters asking for information concerning our local forest products, to which the answer must be "The question has never been investigated." These questions cannot be investigated without a proper laboratory. The cost of establishment and maintenance of such a laboratory at the State University would soon be returned to the people of the state many times, and these returns would not be to only one class of people, but would be felt in every avenue of trade.

The other condition referred to above, namely, that of having our non-agricultural and non-grazing lands made to produce something, can only be met by the State adopting a forest policy such as has been adopted by our sister states. With nearly 400 billion of standing timber there is of course no immediate danger of a timber famine. In fact with much of the timber occupying agricultural soils and a great deal more of it overmature, and therefore unproductive, it would be good economics to hasten its cutting.

However, we are cutting in normal times about 4 billion feet a year, and it takes from 60 to 100 years to produce a new crop of merchantable timber. This would indicate that the time for starting the new crop is now. Again, it has been conservatively estimated that in Western Washington alone almost 50% of the land cannot be used to any better advantage than for growing trees. Our problem then becomes one of using the true forest soils for maintaining a continuous timber supply. A large part of this land will be practically valueless unless it is made productive

through forest management, and by making this land productive we shall be providing one of our greatest industries with its raw materials. In addition it will also give us adequate water-shed protection and such other advantages as are generally attributed to forest influences. That these latter are important there is no longer a question of doubt in the minds of thinking people.

Nearly every state now has a State Forester. They are not all technically trained men, though they should be. Fifteen states now have state forest reserves. Among those who stand in the lead, New York comes first with 1,600,000 acres, and Pennsylvania second with 1,000,000 acres; Wisconsin has 400,000; Michigan 230,000; South Dakota 75,000, and Minnesota 43,000. Minnesota also voted on an initiative measure at the last election concerning a material increase in her area of state forests.

All that our state is doing along these lines at present is providing for education in forestry at the State institutions and for a State Forester and a limited fire patrol system. Washington is the greatest timber state in the Union with the very best opportunities to remain so, and yet she is doing far less than the majority of other timber states to protect and perpetuate her interests in this matter.

It is hoped that at the next session of the Legislature we may have a fire law passed that will be at least as efficient as the best law now in operation anywhere and that a non-political State Board of Forestry to be composed of experts will be created to look after this great resource of ours.

INTERCOLLEGIATE ASSOCIATION OF FOREST CLUBS

Object of Association

In connection with the dedication exercises of the Forestry Building of Cornell University last spring, delegates of most of the forest schools of eastern United States met in a joint conference. At this meeting the "Intercollegiate Association of Forestry Clubs" was formed. The object of the Association shall be to "create interest in, and sentiment for scientific forestry in all its branches, and to encourage good fellowship among the students of the different forestry schools."

Present Membership of the Association

Cornell University	Ithaca, New York
Michigan Agricultural College	East Lansing, Mich.
University of Michigan	Ann Arbor, Mich.
Ohio State University	Columbus, Ohio
Pennsylvania State College	State College, Penn.
Mont Alto Academy	Mont Alto, Penn.
Yale Forest School	New Haven, Conn.
University of Washington	Seattle, Wash.

Clubs Represented in Office for Current Year

President	Cornell
Vice-President	One from each club
Secretary and Treasurer	University of Michigan
Representative of University of Washington Forest Club	A. C. Anderson

XI SIGMA PI.

Xi Sigma Pi, honorary fraternity in forestry, was founded at the University of Washington, November 19th, 1908. It is the purpose of the fraternity to maintain a high standard of scholarship in forest education and to encourage an active interest in the practice of forestry. Membership in this society is limited to upperclassmen who have shown marked scholastic ability and an active interest in forestry work. The society has now an alumni of over forty members engaged in forestry work either with the Forest Service or as Logging Engineers throughout the Pacific Northwest.

On March 27 the first convention of Xi Sigma Pi was held at the University. Of some forty alumni and active members there were twenty-five present, which signifies the great interest taken in the Fraternity. Of those not in attendance, it may be said that by far the greater majority were absent thru force of circumstances over which they had no control. Of the faculty Dean Winkenwerder and Prof. Clark were present.

The first session was called to order with Brother E. J. Hanzlik in the chair. After thoro discussion it was decided to perfect a permanent, and in time a National Forestry Honor Fraternity with ideals similar to those fostered by Xi Sigma Pi in the past. The honor of being the first executive fell to Prof. E. T. Clark. E. J. Hanzlik was elected associate Forester and Jos. G. Morgan was made Sec.-Fiscal Agent. A Constitution was drawn up and adopted.

The constitution provides for both Collegiate and Alumni chapters. It specifies that petitioning chapters must have at least six members, of whom two must be of the Forestry Faculty of the institution.

Eligibility to membership remains the same except that two and one-half years of college work is required. Faculty members are active while they are in college.

The Fraternity is governed by an Executive Council consisting of the officers of the Fraternity and an additional member elected by each chapter. Conventions are to be held annually at such time and place as specified by the Council.

The local chapter, known as the Washington Alpha Chapter, with the approval of the Convention, drew up certificates of membership which are to be furnished to members.

A remittance of fifty cents to cover cost of printing should be addressed to Brother Vincent Evans, care Lewis Hall, at the University, as soon as possible. These certificates are well drawn up and present a neat appearance.

Plans are now under way for bringing other Forest Schools into Xi Sigma Pi.

ACTIONS SPEAK LOUDER THAN WORDS

Our advertisers made it possible for us to publish this Annual in its present form. We wish to extend our sincere thanks to them, and hope they will derive as much benefit from the advertising as we do from their support.

Foresters can make this possible by patronizing them, as *actions speak louder than words* in such matters.

Mention the *Forest Club Annual* when buying.

RESEARCH CLUB

A new club, the Research Club, has recently been formed by men in the College of Forestry. Meetings are held every week, where problems under investigation are discussed and where new ideas are brought out. The object of the club is to foster and develop scientific interest and investigation in the many knotty problems confronting the timber industry today. No officers will be elected, each meeting being conducted by the speaker of the previous meeting, who will introduce his successor. Quite a number of men, including the faculty, have attended the meetings.

Don Clark is experimenting on "Wood Preservation"; Russell Watson, "Study of Seed Production in Western Hemlock"; Don Studley, "Theory of Penetration in Wood Preservation"; Henry Schmitz, "Compression and Expansion of Wood Under Hydraulic Pressure"; Arthur Bevan, "Donald Bruce Form Factor"; Vincent Evans, "Acidity of Soils as Affecting Tree Seed Germination," while H. A. Browning is studying methods of clearing logged-off lands.

The meetings of the club have acted as a stimulus to research work in the college with the result that a considerably larger number of men will take up subjects for special investigation next year.

CASEY JONES, THE LOGGER

(Author Unknown)

Come all you woodsmen if you want to hear
About a B. C. Logger who had no fear;
He knew his duties, but made one mistake—
He chopped down trees, and shoved 'em in the lake.
He was a modest Logger, all unknown to fame;
The price he got for logs was a downright shame;
But if heroes are rewarded as their deeds command,
He is logging off timber in the Promised Land.

When the whistle blew each morning at half-past four
Casey left his wife at the cook-house door,
Picked up his peavey, started down the track;
Never had a notion that he wouldn't come back.
The skidroads one day got greasy—cable wouldn't work;
Engine got to bucking and pulling with a jerk.
When logs began a-jamming, Casey he just said:
"We'll get them in the water or we'll all be dead."

The logs started down the skidroad hill—
Casey jerked the whistle with an awful thrill;
The engineer knew by the whistle's moans
That the man on the wire was Casey Jones.
The logs came 'round the first turn of the road—
And, coming down hill, made a mighty heavy load.
The haul-back broke with a whirr and a hum—
And Casey Jones departed for the Kingdom Come.

"I'm sorry," said Casey, just before he died,
"There's a few logging camps that I haven't tried."
The hook-tender said: "Casey, what haven't you seen?"
"Sure I never worked at Bellingham, nor down at Aberdeen."
Mrs. Casey, in the bunk-house, spoke with much regret
Of the troubles she had had since she and Casey met.
"Go to bed now, children, he was one gay deceiver,
The next dad you get's goin' to be a shingle weaver."

ENGINEERING OPEN HOUSE

FRED MADIGAN, '16

The College of Forestry was given the unanimous decision of the Judges as having the best exhibit at the Engineers' Open House, given on the campus on the evening of April 15th. The Judges were H. C. Gill, Mayor of Seattle, President Henry Landes, of the University of Washington, Kenneth C. Beaton, of the staff of the Seattle Post-Intelligencer, and Almon H. Fuller, Dean of the College of Engineering.

Mayor Gill based his decision on the difficulty of bringing the great outdoors within the compass of a small room, President Landes complimented the foresters on the amount of work accomplished in so short a time, Mr. Beaton gave the foresters his vote because their exhibit was the most original, while Dean Fuller thought that the utilization of the material at hand was very clever.

The underclassmen were busy for the major portion of two days decorating the exterior and interior of the Good Roads Building, where the main portion of the Forestry exhibit was housed. The very first display, and a very attractive one, was the model camp, as conceived by Vincent Evans. In front of his tent, which was pitched beneath the sheltering branches of a recently erected virgin forest, blazed a cheerful camp fire. Two of the boys were busy here preparing a camp meal. Evans threw the diamond hitch a few times on a rotund mare for the edification of the visitors during the course of the evening.

The next exhibit consisted of a display of forest fire signs and literature loaned for the occasion by E. T. Allen, and a collection of fire fighting tools under the supervision of Russel Watson.

The feature exhibit of the entire Open House was the third in order, a complete miniature Lidgerwood "Flying Machine" which yarded logs out of a tiny mountain valley, loaded them on a miniature railway, which in turn transported the logs to a small portable saw mill, where they were cut up into rough lumber, stenciled "U. of W. Forest School" and distributed among the visitors as souvenirs by R. Brindley. Harold Browning was donkey engineer on the overhead system, Arthur Bevan was "chaser," James Coyle was head loader and Fred Madigan acted as head rigger. Of the mill crew, Charles Brady was head sawyer, and Joshua Russel acted as carriage man. A marked feature of the logging scene was the electrically controlled steam whistle. This phase rendered the logging scene very realistic as it enabled the rigging crew to shoot the required signals to the donkey engineer. This type of whistle is just coming into general use in the woods, replacing the clumsy whistle wire of the "whistle punk" of recent years. J. P. McBride was on hand during the exhibit to explain the working principles of his product, which now forms a part of the standard equipment of the Lidgerwood and Willamette Logging Engines. The logging system and railroad were loaned for the occasion by the Lidgerwood Company and the saw mill by the Higgins Machinery Co.

Another attractive display was the model forest on a 60-year rotation under ideal conditions of forest management. This showed in addition to the various age classes of timber a selection forest on the top of the ridge, ranger cabin and the system of protection with telephone lines and lookout tower. Donald Clark was in charge here and rumor hath

it that his exhibit compared favorably with that at the Panama-Pacific Exposition.

B. L. Grondal, assisted by Erwin Rengsdorff and L. P. Young, put on a very interesting display of North and South American woods and a collection of cones. Tree diseases and the effect of insect and fungus attacks were also interesting features of this exhibit. The College Wood Preservation Plant was under the general direction of Donald Studley, who explained the open tank process of creosoting, and Noal Caywood operated the distillation plant. Philip Barret and Donald Broxon were in charge of the remainder of the forestry exhibit which was housed in the museum, and consisted of sections of woods and charts illustrating the methods of making growth studies.



EMBRYO TIMBERBEASTS

THE COST OF GROWING TIMBER IN THE PACIFIC NORTH- WEST, AS RELATED TO THE INTEREST RATES AVAILABLE TO VARIOUS FOREST OWNERS

BURT P. KIRKLAND, Associate Professor of Forestry

The cost per acre of growing timber anywhere depends on five main factors, viz. (1) The value of the land, (2) The cost of stocking it with young trees, (3) The administration of the operation and protection of the young timber, (4) The taxes, (5) The rate of interest. The cost per thousand feet depends in addition upon the productivity of the land involved. For the purpose of this discussion, however, the statement may best be put in another way, namely, that the costs per acre are as follows: (1) Interest on the value of the land, (2) The cost of stocking it with young trees, (3) Interest on this amount from time of stocking to maturity, (4) The annual expenses for administration and protection, (5) Interest on each annual expense from time of expenditure to time of maturity of the timber, (6) The annual taxes, (7) Interest on each annual tax from time of payment to maturity of the timber. The total of these costs per acre, divided by the average product per acre gives the cost of producing 1,000 board feet of timber.

The amounts for some of these items vary with natural conditions, and of others, with the ownership of the land. Thus state or federal ownership modifies the element of taxes and changes the rate of interest. Private ownership might facilitate administration in some ways, though it can hardly be expected to reduce the cost, owing to the smaller areas administered. The amounts of the various items under various conditions and forms of ownership are discussed below.

Interest on the Land Value

The cost of cutover lands of supposed agricultural value, or of a nature such that the seller can convince the inexperienced buyer that they have agricultural value would probably run from \$10.00 to \$50.00 per acre in Washington, where the values are not influenced by proximity to centers of population or other advantages of a similar nature. Hillsides, appearing even to the unpracticed eye too steep for agriculture, may be purchased for \$3.00 to \$5.00 per acre. The higher values first mentioned are undoubtedly beyond any present use value of the land for agriculture, but the optimism of the West can be depended upon to maintain them, because the buyer of land has sanguine ideas as to the income to be derived. If the land is to be used for forestry we must concede that current values must be met. Land which is held at over \$10.00 per acre should have agricultural value, and for the present at least, should be considered in that class and no attempt made to use it for forestry. The writer, therefore, believes that in Washington fair values for forest soil would be \$10.00 per acre for Quality I, \$5.00 for Quality II, and \$2.00 for Quality III, referring to three quality yield tables for Douglas fir prepared by the U. S. Forest Service.* These tables classify quality of soil for forest purposes according to its actual productivity. In growing timber it must be remembered that the soil is not used up by the growth of the timber. The

*These yield tables, prepared by E. J. Hanzlik of the U. S. Forest Service are as yet only in manuscript form. (See page 20.)

charge against the growing timber for one rotation, or single crop, is therefore not the soil value, but only the interest on that value for the term of years it takes the timber to grow. Since the timber is not an annual product, the interest cannot be secured annually, but must accumulate until the timber is cut. Hence compound interest is used. What this will amount to at rates applicable to forestry will be discussed later, and shown specifically in the tables forming part of this discussion.

Cost of Stocking Land With Trees

While space is not here available to take up in detail the cost of stocking the land, there is good evidence that \$5.00 per acre is a fair average figure. Although planting on a bare area will cost nearer \$10.00, few areas need be chosen which do not bear some young growth or contain some seed trees which will assist artificial regeneration. Areas that have not been cut over can seldom be stocked any cheaper by natural regeneration than by planting, since the value of the seed trees that must be left will usually bring the cost up to the average figure mentioned above unless there are an unusually large number of worthless trees of the desired species which may be used as seed trees. A skillful combination of planting with natural regeneration from stands not yet cut, and artificial regeneration by planting or seeding should bring the operation within this cost.

Unlike the land cost, the expense of stocking the land with trees has to be repeated every time the timber is cut. This amount must, therefore, be charged against the product of each planting.

Interest on Cost of Stocking Land

The interest on the cost of stocking the land might have been included with the foregoing item, but it is here treated separately in order that all interest charges under various kinds of ownership may be segregated. As in the case of interest on the land value, compound interest must be used. The amount of this item at various rates will be shown specifically in tables forming part of this discussion.

The Annual Cost of Administration and Protection

Kellogg and Ziegler maintain that the annual cost of administration and protection can be handled for five cents per acre.* An analysis of the actual conditions will show that five cents is not sufficient for safety. It must be remembered that this includes office expense, supervision, fire patrol, patrol against trespass, and all other overhead expenses. Although forest fire insurance is not at present one of the expense charges included in this item, the practicability of insuring forests by an enlargement of the scope of the forest fire protective organizations is such that it is bound to come in the near future. Hence this figure should also be high enough to include forest fire insurance. In the case of the state or the federal government, the losses from fire must be charged to this item. Whatever amount accumulates between planting and cutting a single crop must be charged to that crop. The writer does not therefore, believe that the low figure generally assigned to the annual cost of administration and protection is sufficient, but will assign 20 cents per acre per annum as a reasonable, though entirely sufficient amount. The total first cost, or

*"Cost of Growing Timber," by R. S. Kellogg and E. A. Ziegler.
principal sum of this item per acre charged to a single crop of trees

will be the annual charge (20c) multiplied by the number of years the crop takes to grow.

Interest on Administration Costs

Compound interest at the chosen rate on each annual amount from the time it is expended until the timber is cut must be calculated. This may be done by compound interest formulae, or taken from such tables as those in Schenk's "Forest Finance."* The specific amounts under certain conditions will be considered later.

Annual Taxes

The annual taxes is a difficult item to foresee. At present taxes in Washington are all considered under the general property tax (a most unscientific system) averaging perhaps 1 per cent to 2 per cent on the actual value of the property. Since, owing to the urgent need of schools, roads, etc., in a pioneer community, and the absence of improved property, taxes may now be thought to be high. A rate of 1 per cent on the actual value of the property may perhaps be considered a fair figure when the future is to be taken into consideration.

Even if this figure is conceded fair, our difficulties have really just begun because of the changes in value that will take place with time, due to the growth of the stand and to changing land values and stumpage prices, to say nothing of continual changes in assessment methods. The following figures are, however, intended to represent a fair approximation of the values to be expected on Quality I Forest Soil, which, as already stated, is considered to be worth \$10.00 per acre.

(1) Up to the 20th year of the stand only the soil value of \$10.00 per acre would generally be considered by assessors. During this period the taxes at 1 per cent would be 10 cents per acre.

(2) From the 21st to the 30th years of the stand perhaps \$10.00 per acre might be added to the valuation because of the young stand, making taxes 20 cents per acre per annum.

(3) From the 31st to the 40th years of the stand, since it is not yet in the saw timber class, it can best be estimated in cubic feet. It will now contain (on Quality I Soil) 4,000 cubic feet per acre, or about 40 cords, which as pulpwood would be worth, say 50 cents per cord, bringing the total value of land and timber up to \$30.00 per acre and the tax to 30 cents per acre per annum during this period.

(4) From the 41st to the 50th years the volume will be about 20,000 ft. B. M. per acre, worth on the average (considering increased stumpage prices in the future) at least \$3.00 per M., or \$60.00 for the whole stand. Hence soil and timber would be worth \$70.00 per acre and the annual tax 70 cents.

(5) From the 51st to the 60th years the stand would contain an average of about 35,000 ft. B. M., with a stumpage value of say \$8.00 per M., hence the total value of stand and soil, \$290.00, and the annual tax \$2.90 per acre.

To recapitulate, the taxes on Quality I Forest Soil by the general property tax are estimated somewhat as follows:

1st to 20th years,	10 cents per acre per annum.
21st to 30th years,	20 cents per acre per annum.
31st to 40th years,	30 cents per acre per annum.
41st to 50th years,	70 cents per acre per annum.
51st to 60th years,	2.90 cents per acre per annum.

*"Forest Finance," by C. A. Schenk.

Considering the smaller volumes and poorer qualities with the Quality II soil the taxable values would be worth only about two-thirds as much, and with Quality III soil one-third as much; hence taxes may be assumed to be only two-thirds and one-third as much respectively, both as to first cost and interest accumulated. Taxation will be further discussed on the basis of the cost tables forming part of this discussion, after those tables are presented.

Interest on Taxes Under General Property Tax

Compound interest must be computed on the amounts paid in taxes from the time paid until the timber is mature. The specific amounts depend on the interest rates and the age to which timber is held, and will be considered hereafter.

Matters Which Influence the Above Elements of Cost

(a) *Ownership.* The chief classes of forest owners as affecting these elements are the federal government, the state, municipalities, large corporations, small corporations, and individuals. The chief items affected by ownership are:

(b) *Taxes.* The federal government pays 25 per cent of the gross yield directly to the states and expends another 10 per cent on roads, but as the roads are of equal value to the forests only the 25 per cent paid to the states will be considered as a gross yield tax. Lands owned by states and municipalities are also in a sense not subject to tax, but in another sense if we assume that the land would be worked under forest management either publicly or by private owners we may conclude that the state and municipality will lose tax revenue by reason of their land ownership, because of withdrawing lands from taxation, and must therefore make up from their forest revenue the deficit in their general fund as discussed hereafter.

If the federal government and the private owner pay 25 per cent of the gross yield of the forest for taxes, the state and municipality should set aside 25 per cent of the gross forest revenue from stumpage for their general fund. If the municipality is the owner it might be required to pay the state such a part of the 25 per cent set aside as the state's share of the taxes amounts to, and which will otherwise be lost by holding the land in public ownership. If the state were the owner it should pay the municipality, or local taxing body its proper share of the 25 per cent. Of course in practice this system of book-keeping might not be carried out in detail, but in effect it would be, if the practice of forestry proceeded profitably.

(c) *Interest.* This varies more widely with ownership than taxes. The fact that individuals, states, and the nation have to pay different rates is so well known as to need little comment except to name an average rate for each. The writer considers the following a fair average rate for each class of owner:

Federal Government	3	per cent.
State (Washington)	4	per cent.
Municipality	4½	per cent.
Large Corporation	4½ to 5	per cent.
Moderate Sized Corporation	6	per cent.
Small Corporation and Individual	7	per cent.

Naturally no owner will, from the standpoint of financial investment, care to engage in forestry unless he can make as high a per cent on this capital as he will have to pay for borrowed capital, or at which

he can lend his money. Hence the above rates will be used in calculations.

(d) *Length of Time Between Planting and Harvest.* This influences the amount to which the interest charges on the various items will accumulate. In previous calculations the writer has found the best available evidence seems to indicate about 60 years as giving the highest profits from the use of the soil for private forestry, while 80 to 100 years is more profitable for government forestry. In order to make a comparison as favorable as possible to private forestry, 60 years is chosen for the length of rotation. Specific costs are figured on this basis using the various interest rates already named.

Influence of Yield Per Acre on Costs Per Thousand Board Feet. Except for the interest on the soil value and the taxes with interest thereon, the foregoing elements of cost per acre will not vary widely on different qualities of soil. It is, of course, common knowledge that the yield on different soil qualities will vary greatly. This variation is even greater than generally supposed. The United States Forest Service has made a careful study of this subject in Western Washington and Oregon, the results of which have unfortunately only in part been published. In this study measurements were taken of stands on a wide variety of soils which were classified into three qualities on the basis of the yields found. Quality I or first quality 44 M. per acre, Quality II or medium quality 32 M. feet per acre and Quality III or poorest quality 16½ M. feet per acre for the same period. Obviously, then, if the cost per acre of growing the timber remains little changed for the different qualities the cost per 1,000 feet B. M. will be much less in the case of large yields, just as would be the case in an agricultural crop. These results are brought out in tables about to follow, in which the yields shown by the U. S. Forest Service study are used as authoritative.

Results of Foregoing Elements Presented in Tabular Form. The definite results of the foregoing elements have been worked out mathematically for each item and are presented in the following tables in order to show their relationships, and make comparisons of different interest rates and tax systems as simple as possible. The itemized and total costs to owners working under different interest rates are presented in a single table for each of the soil qualities already mentioned. Costs on Quality I soil are presented in Table I, on Quality II soil in Table III, and on Quality III soil in Table V. The intervening tables present summaries of those mentioned in which the first costs, the interest charges and the tax costs are segregated and their percentage relations to each other computed.

On Quality II forest soil the costs per acre are reduced slightly owing to lesser soil value, and hence to less taxes due to the lower soil value and the smaller volume of stand of timber. The land is considered worth \$5.00 and the taxes to be two-thirds of what they were on Quality I. The yield according to yield tables prepared by the U. S. Forest Service will be 32,000 ft. B. M. per acre at 60 years. The costs will be as shown for different owners in Table I.

Comparing Table III with Table I, it is seen that where interest rates are low, costs per acre are not reduced much below Quality I, but as yield is less the most cost per M. is raised, except in the case of 6 per cent and 7 per cent interest rates. Where interest is high, reduction in land

TABLE I.

Estimated average costs per acre and per M. feet B. M. of growing Douglas fir on Quality I, or best quality forest soil, under a 60 year rotation, computed for interest rates securable by various classes of owners.

ITEMS—	Federal Govt.	State	Municipality	Large corporation	Medium sized corporation	Small corporation and individual
Estimated interest rate for various classes of owners	3%	4%	4½%	5%	6%	7%
*Compound interest on \$10.00 soil value, 60 years	\$ 48.91	\$ 95.19	\$130.27	\$176.79	\$319.88	\$ 569.48
Cost of stocking land with young trees	5.00	5.00	5.00	5.00	5.00	5.00
Compound interest on cost of stocking	24.46	47.59	65.14	88.40	159.94	284.74
Sum of annual charges for administration and protection (20c per year for 60 years)	12.00	12.00	12.00	12.00	12.00	12.00
**Interest on all amounts spent on administration and protection from time incurred to time of cutting	20.61	35.60	45.90	58.71	94.62	150.71
Taxes under general property tax when owner subject to them . . . . .	.....	.....	.....	43.00	43.00	43.00
Interest on taxes from time planted to time of cutting timber . . . . .	.....	.....	.....	***52.04	77.40	114.42
Yield tax of 25% on final product	‡36.99	‡65.13	‡86.10	.....	.....	.....
Total per acre	\$147.97	\$260.51	\$344.41	\$435.94	\$711.84	\$1,179.35
Cost per M. when product is 44 M. per acre. The probable yield as shown by U. S. F. S. yield tables	\$ 3.37	\$ 5.92	\$ 7.83	\$ 9.91	\$ 16.17	\$ 26.80

*See interest table in Schenck's Forest Finance, Column IV.

**See interest table in Schenck's Forest Finance, Column V.

***There are at least two methods of computing compound interest on the taxes. The simplest method for purposes of this discussion is to analyze as follows, using the 5 per cent column in Table I. Consider that from the 1st to the 60th year, 10c per annum is paid for taxes. Referring to an interest table, we find that compounded for 60 years this accumulates to \$35.36, including principal and interest. Beginning with the 20th year, an additional 10c per acre is paid for the remainder of the rotation, or 40 years. This amounts to \$12.08 during the 40 years. Beginning with the 30th year, another 10c is added to taxes for the remainder of the rotation. This accumulates to \$6.64 in the remaining 30 years. Beginning with the 40th year, 40c is added to taxes for the remainder of the rotation. This accumulates to \$13.24 in the 20 years. Finally in the 50th year \$2.20 more is added to the taxes, which in the 10 years remaining accumulates to \$27.72. The total taxes and interest thereon for the rotation amount to \$35.36 plus \$12.08 plus \$6.64 plus \$13.24 plus \$27.72 equals \$95.04, the total accumulated taxes, both principal and interest. Take therefrom \$43.00, the principal sums paid, and there remains \$52.04, the accumulated interest on the taxes.

‡This figure represents the cost to the owner of a 25% yield tax when the various items of cost of production are as shown in the same columns. Since a 25 per cent yield tax takes 25 per cent of the product, it is evident that the cost of the tax to the owner would be one-fourth of the total cost of production, including taxes. All the costs aside from the yield tax would then amount to three-fourths of the total cost and the yield tax would be one-third of the other costs. It is thus that the cost of the yield tax is computed in these tables, that is to say, one-third of the costs aside from taxes is the cost of the 25 per cent yield tax in each case. In case stumpage sells at more than the cost of production all the profits on 25 per cent of the yield go to the state

TABLE II.

Summary of Table I.

Showing segregation of all first costs and all interest charges and per cents of total costs due each segregation.

ITEMS—	Federal Govt.		State		Municipality		Large corporation		Medium sized corporation		Small corporation and individual	
	% of total due to each item	3%	% of total due to each item	4%	% of total due to each item	4½%	% of total due to each item	5%	% of total due to each item	6%	% of total due to each item	7%
Estimated interest rates for different owners												
Total first cost per acre of planting and annual charges, except taxes, for 60 years	12	\$ 17.00	6.5	\$ 17.00	4.9	\$ 17.00	3.9	\$ 17.00	2.4	\$ 17.00	2.4	\$ 17.00
Accumulated compound interest on land value. Cost of planting and annual administrative charges per acre for 60 years	63	178.38	68.5	241.73	70.1	323.90	74.3	574.44	80.7	1,004.93	85.2	85.2
First cost of taxes under general property tax for certain owners							43.00	10	43.00	6	43.00	3.6
Accumulated compound interest on tax cost. General property tax												
Yield tax of 25% for public ownership	25	36.99	25	86.10	25	52.04	11.8	77.40	10.9	114.42	9.7	9.7
Total cost per acre	100	\$147.96	100	\$260.51	100	\$344.41	100	\$435.94	100	\$711.84	100	\$1,179.35

Cost per M. when product is 44 M. ft. B. M. per acre....\$ 3.37

\$ 5.92 \$ 7.85 \$ 9.91 \$ 16.17 \$ 26.80

and profits will be made by the owner only on the 75 per cent remaining to him. That is, the figures shown in these tables represent the cost of the tax, but its actual amount will depend on the stumpage values at the time of cutting.

value brings about a much lessened interest charge so that costs are reduced more than yield. This results in a slightly smaller cost per M. on this Quality of soil.

On Quality III forest soil the costs per acre are again reduced slightly, owing to reductions in soil value and in taxes due to a lower soil value and a smaller stand of timber. The land is considered worth \$2.00 and the taxes to be one-third of what they were on Quality I. The yield will be only 16,500 feet per acre at 60 years, according to Douglas fir yield tables by E. J. Hanzlik, of the United States Forest Service. The costs of artificial planting would be increased on Quality III because of the unfavorable soil conditions and also because trees should really be planted thicker. On account of the low yield per acre natural regeneration might be the most profitable.

The costs for different owners are shown in Table V.

TABLE III.

Estimated average costs per acre and per M. ft. B. M. of growing Douglas fir on Quality II or medium quality forest soil under a 60 year rotation, computed for interest rates securable by various classes of owners.

ITEMS—	Federal Govt.	State	Municipality	Large corporation	Medium sized corporation	Small corporation and individual
	3%	4%	4½%	5%	6%	7%
Estimated interest rate paid by owner.....	3%	4%	4½%	5%	6%	7%
Compound interest on estimated soil value (\$5.00), 60 years	\$ 24.46	\$ 47.60	\$ 65.14	\$ 88.40	\$159.94	\$284.74
Cost of stocking land with young trees	5.00	5.00	5.00	5.00	5.00	5.00
Compound interest for 60 years on cost of stocking land	24.46	47.60	65.14	88.40	159.94	284.74
Sum of annual charges for administration and protection for 60 years (20c per acre per annum)	12.00	12.00	12.00	12.00	12.00	12.00
Compound interest on all amounts, spent on administration and protection from the time incurred to time of cutting	20.61	35.60	45.90	58.71	94.62	150.71
Taxes under general property tax .....	.....	.....	.....	**28.66	**28.66	**28.66
Interest on Taxes .....	.....	.....	.....	**34.70	**51.60	**76.28
Yield tax 25% on final product	*28.84	*49.27	*64.39	.....	.....	.....
Total per acre	\$115.37	\$197.07	\$257.57	\$315.87	\$511.76	\$842.13
Total cost per M. on basis of 32 M. per acre yield in 60 years	\$ 3.61	\$ 6.16	\$ 8.05	\$ 9.87	\$ 16.00	\$ 26.31

*See foot-note under Table I.

**Since, as stated on page 20, the value of the yield on Quality II soil, though three-fourths as much in quantity, will on account of the smaller sized timber not be more than two-thirds as much in value as the yield on Quality I, the taxes have been assumed to be only two-thirds as great. These figures for both the taxes and the interest thereon have therefore been derived directly from corresponding values in Table I by computing two-thirds of each value there as the correct figure for this table.

TABLE IV.
Summary of Table III.

Showing segregation of all first costs and all interest charges and per cents of total costs due each segregation.

ITEMS—	Federal Govt.		State		Municipality		Large corporation		Medium sized corporation		Small corporation and individual	
	% of total due to each item	3%	% of total due to each item	4%	% of total due to each item	4½%	% of total due to each item	5%	% of total due to each item	6%	% of total due to each item	7%
Interest rate		3%		4%		4½%		5%		6%		7%
Total first cost of stocking and annual costs except taxes ...	15	\$ 17.00	8.6	\$ 17.00	6.4	\$ 17.00	5.4	\$ 17.00	3.3	\$ 17.00	3.3	\$ 17.00
Accumulated compound interest on all amounts invested except taxes	60	69.53	66.4	130.80	68.6	176.18	74.6	235.51	81	414.51	81	720.19
First cost taxes under general property tax							28.66	9	28.66	5.6	28.66	3.4
Accumulated compound interest on taxes. General property tax	25	28.84	25	49.27	25	64.39	11	34.70	10.1	51.60	10.1	76.28
Taxes under 25% yield tax	100	\$115.37	100	\$197.07	100	\$257.57	100	\$315.87	100	\$511.77	100	\$842.13
Total cost per acre		\$ 3.61		\$ 6.16		\$ 8.05		\$ 9.87		\$ 16.00		\$ 26.31

INFLUENCE OF THINNINGS

On Quality I Soil. Where thinnings are possible the costs may be reduced by utilizing thinnings about the 30th, 40th, and 50th years. Other studies by the writer, based on number, volume, size, etc., of trees per acre shown by Forest Service yield tables, would seem to indicate pretty clearly that on Quality I soil, timber of at least the values indicated in Table VII, may be removed in thinnings where they are utilizable. There is furthermore very little doubt that all thinnings from young stands originated now or hereafter may be utilized because even now demands for pulpwood, ties, and mine timbers are capable of using all of this type of timber within easy reach of transportation.

Tables VII, VIII, and IX show possible deductions from cost due to this source of income, but the data along this line are not as reliable as other cost data because of uncertainty as to the future price of wood.

TABLE V.

Estimated average costs per acre and per M. ft. B. M. of growing Douglas fir on Quality III, or poorest quality, forest soil under a 60 year rotation, computed for interest rates securable by various classes of owners.

ITEMS—	Federal Govt.	State	Municipality	Large corporation	Medium sized corporation	Small corporation and individual
Interest rate	3%	4%	4½%	5%	6%	7%
Compound interest on soil value (\$2.00) for 60 years	\$ 9.78	\$ 19.03	\$ 26.05	\$ 35.36	\$ 63.96	\$ 113.90
Cost of stocking with young trees	5.00	5.00	5.00	5.00	5.00	5.00
Compound interest on cost of stocking	24.46	47.60	65.14	88.40	159.94	284.74
Sum of annual charges for administration	12.00	12.00	12.00	12.00	12.00	12.00
Compound interest on all amounts spent for administration and protection from time incurred to time of cutting	20.61	35.60	45.90	58.71	94.62	150.71
Taxes under general property tax—when owner is subject to them				**14.33	**14.33	**14.33
Compound interest on taxes				**17.35	**25.80	**38.14
Taxes under 25% yield tax. Final product	<u>\$23.95</u>	<u>\$39.74</u>	<u>\$51.36</u>			
Total cost per acre ..	\$ 95.80	\$158.97	\$205.45	\$231.15	\$375.65	\$618.82
Total cost per M. on basis of yield, per acre, in 60 years, 16,500 ft. B. M.	\$ 5.80	\$ 9.64	\$ 12.45	\$ 14.01	\$ 22.77	\$ 37.50

*See footnote (**), Table I.

**As stated on page 23 the value of the yield on Quality III, or poorest quality forest soil, will not be more than one-third that on Quality I soil, hence the taxes under general property tax may be assumed to be only one-third as great. These figures for both taxes and interest thereon have, therefore, been derived directly from corresponding values in Table I by computing one-third of each value there given as the correct figure for this table.

TABLE VI.

Summary of Table V.

Showing segregations of all first costs and all interest charges and per cents of total costs due to each segregation, on Quality III. Forest Soil.

ITEMS—	Federal Govt.		State		Municipality		Large corporation		Medium sized corporation		Small and individual corporation	
	% of total due to each item	3%	% of total due to each item	4%	% of total due to each item	4½%	% of total due to each item	5%	% of total due to each item	6%	% of total due to each item	7%
Interest rate												
Total first cost of stocking, and annual charges except taxes, per acre	\$ 17.00	17.7	\$ 17.00	10.7	\$ 17.00	8.3	\$ 17.00	7.3	\$ 17.00	4.5	\$ 17.00	2.7
Accumulated compound interest on all amounts invested except taxes	54.85	57.3	102.23	64.3	137.09	66.7	182.47	79.0	318.52	84.5	549.35	88.9
First cost of taxes under general property tax for certain owners							14.33	6.2	14.33	3.1	14.33	2.3
Accumulated compound interest on tax cost; general property tax	23.95	25	39.74	25	51.36	25	17.35	7.5	25.80	7.9	38.14	6.1
Taxes under 25% yield tax												
Total cost per acre	\$ 95.80	100	\$ 158.97	100	\$ 205.45	100	\$ 231.15	100	\$ 375.65	100	\$ 618.82	100
Cost per M.	\$ 5.80		\$ 9.64		\$ 12.45		\$ 14.01		\$ 22.77		\$ 37.50	

On Quality II Soil. The volume of the thinnings to be obtained on Quality II soils may be expected to bear the same proportionate relation to the volume of thinnings on Quality I as their respective total stands, i. e., as 32,000 is to 44,000, or 8 to 11. The thinnings on Quality II soil, however, will be of smaller sizes, hence less valuable. It seems safe therefore, to assume that the total value will not be more than one-half as great. Hence these thinnings will be expected to make only one-half as much from the total costs as on Quality I soil.

The amount to be deducted from the total costs per acre on Quality II soils because of the thinnings may then be determined directly by taking half the values deduced for thinnings and interest on Quality I soils as shown in Table VII. Table VIII shows these amounts per acre and the resulting amounts per M. ft. B. M.

On Quality III Soil. The volume of the thinnings to be expected from the Quality III soils may be determined by proportion just as they were for the Quality II soils. In this case it would be as 16½ is to 44. As a matter of fact, however, the small sizes grown on Quality III soil would greatly lessen the value of the yield from thinnings so that it may be doubted whether this would exceed one-third of the value of Quality I. Assuming it has one-third the value of the Quality I thinnings, the values of thinnings per acre with interest thereon for Quality III may be taken directly as one-third of the corresponding values in Table VII.

TABLE VII.

Possible Deductions From Costs Due to Thinnings—Douglas Fir—Quality I Soil

ITEMS—	Federal Govt.		Municipality	Large corporation	Medium sized corporation	Small corporation and individual
	State					
Interest rate	3%	4%	4½%	5%	6%	7%
Value of 30th year, thinning—4 cords pulpwood at 50 cents per cord	\$ 2.00	\$ 2.00	\$ 2.00	\$ 2.00	\$ 2.00	\$ 2.00
Accumulated interest on this value, 30th year to 60th year	2.84	4.48	5.48	6.64	9.48	13.22
40th year thinning—5 cords pulpwood worth \$1 per cord stumpage	5.00	5.00	5.00	5.00	5.00	5.00
Accumulated interest for 20 years	4.05	5.95	7.05	8.25	11.03	14.35
50th year thinning—10 cords pulpwood worth \$1.00 per cord	10.00	10.00	10.00	10.00	10.00	10.00
Accumulated interest for 10 years	3.40	4.80	5.53	6.29	7.90	9.67
Total amount saved per acre when thinnings are utilized	\$ 27.29	\$ 32.23	\$ 35.06	\$ 38.18	\$ 45.41	\$ 54.24
Amount saved per M. ft. B. M. when final yield is 44 M. per acre	\$.62	\$.75	\$.79	\$.87	\$ 1.03	\$ 1.23

TABLE VIII.

Possible Savings in Cost Due to Thinnings on Quality II Soil

ITEMS—	Federal Govt.	State	Municipality	Large corporation	Medium sized corporation	Small corporation and individual
Interest rate	3%	4%	4½%	5%	6%	7%
Total amount saved per acre when thinnings are utilized	\$ 13.64	\$ 16.11	\$ 17.53	\$ 19.09	\$ 22.70	\$ 27.12
Amount saved per M. ft. B. M. when final yield is 32 M. per acre	\$.42	\$.50	\$.55	\$.59	\$.71	\$.85

TABLE IX.

Possible Savings on Cost Due to Thinnings on Quality III Forest Soil

ITEMS—	Federal Govt.	State	Municipality	Large corporation	Medium sized corporation	Small corporation and individual
Interest rate	3%	4%	4½%	5%	6%	7%
Total amount saved per acre when thinnings are utilized	\$ 9.09	\$ 10.74	\$ 11.68	\$ 12.73	\$ 15.14	\$ 18.08
Amount saved per M. ft. B. M. when final yield is 16½ M. per acre	\$.55	\$.65	\$.70	\$.77	\$.91	\$ 1.09

Certain Modifications of Costs

In General: It is believed that the costs given in the preceding tables represent as fair averages of the cost of growing timber by means of good forestry practice as can be given for the conditions on the west side of the Cascades in the Pacific Northwest. It is, however, obvious that average figures, no matter how correct, cannot be applied directly to all individual cases. In so far as the first costs in a specific case are known to be susceptible of modification, the final costs may be enormously modified. For example, it is entirely probable that much land which is already stocked with young growth could at the present time be bought at the rates specified in the tables, thus saving the cost of stocking entirely and perhaps several years' interest on other costs. This would greatly increase the possibilities of profit on the area in question, because in forestry every dollar saved at the beginning of the rotation may mean from \$5.00 to \$50.00 at the end, according to the interest rate. Likewise land already stocked with timber might be bought below the price specified, in which case, still more could be saved.

Certain owners might save all or portions of other costs, or find them properly chargeable to other lines of business which they conduct. Thus a coal mining company might find it necessary to hold a large area of coal lands, the surface of which is unsuited to agriculture, or other use except forestry. In this case it would be fair to charge all the land value to the coal, thus removing the heavy interest cost on land value from the forestry costs. On Quality I soil this would remove a charge of \$4.02 per M. from the cost of producing timber if the company worked with 5 per cent money. This would enable a company of this sort to produce timber as cheaply as the state.

In municipal forestry, a city finding it necessary to own land for watershed protection might practice forestry without charging interest on land value to it, and might also charge a large part of the actual administration cost to the water department because sanitary patrol is necessary anyway. This would reduce the cost of raising timber to a city below the average cost shown by the federal government, and make the industry one of great direct financial benefit.

When it is remembered that the logging and manufacture of this timber means that upwards of \$8.00 is paid out in wages for every thousand feet of timber manufactured, and that the city consumer may as a result of the local timber supply get the manufactured product cheaper, where the city already owns its watershed, no other argument for city forestry is necessary. To put the case in another way, it may be stated that since the average acre of forest soil will in this region produce about 500 feet of timber per annum, any city which practices forestry will for the average acre thus kept in forest produce raw material which will some time insure the payment of \$4.00 or more in wages for each year the land is kept producing forests. One hundred and fifty acres kept in forest will support at least the equivalent of one laborer and his family permanently, besides paying a handsome profit to the city. Municipal forests of this type are common in Europe, where profits as high as \$12.00 per acre per annum are now made. Of course, no such profit is possible at present in this country, but America is already well on the road to this condition.

Large Corporations

The large corporation can practice forestry because of its low interest rate and the economies in administration and protection due to the ownership of large areas. Where it has holdings in several localities its fire losses will not exceed the average losses of the community, so it will be cheaper for it to carry its own insurance than to pay premiums to a forest fire insurance company, even when the time comes that forest fire insurance is available. Even a heavy fire loss would not cause a correspondingly heavy immediate expenditure, as when a mill is destroyed, but would be made up gradually in growing a new crop. In spite of these facts the large corporation is not yet convinced that forest production would be profitable for it, although a study of the question gives convincing indications that it would be so, especially in the case of corporations which desired to make their life, and hence their investments, perpetual. However, the present political efforts looking toward the destruction of all large business enterprises may result in disintegrating these corporations so that their efficiency and command of capital will be so decreased as to

put them out of the class which might practice forestry successfully. Until these political questions are settled, therefore, it would probably be unwise for the large corporation to engage in an enterprise involving a continuous policy for so long a time as is required in forest production.

Railroad corporations not being so subject to this destructive action by government, because the problem of handling these natural monopolies is largely settled, do not labor under this latter disadvantage, though possessed of the other advantages of large corporations. They have also at least three additional advantages which would make it profitable to engage in forest production on lands already owned. The first is that they are large consumers, and the cheapest possible supply of timber is of enormous importance to their construction and maintenance departments. The second follows from this that since they are large consumers practically all selling costs would be saved to their forestry departments. The third reason lies in the fact that the railroad depends on adjacent territory for tonnage. Land adapted only to forestry will yield little tonnage any other way, but as already stated in the case of the municipality, in this region such land will under forest management yield at least 500 feet B. M. per annum on the average. This, then, means to the railroad that every acre kept under management will some time yield 500 feet of lumber, or from 1,500 to 2,000 lbs. of freight for each year that the forest crop is maintained. If this lumber should be shipped to the middle west it means a gross revenue to the railroad of perhaps \$5.00 or more per acre per annum, for transportation only.

The Small Owner—The writer believes that the forester can seldom advise the small owner, either corporate or individual, to practice forestry except in the case of the farm woodlot owner. The farmer consumes most of the product of his own forest, thus saving all selling costs, middleman's profits, and transportation to a distance. What he does not consume goes to his neighbor. To this strong economic position as to markets may be added several other advantages. Protection and administration costs nearly disappear because the farm woodlot is generally in sight of the residence and fields, and is surrounded by clearings, hence patrol is unnecessary and fires seldom will occur. Because of the small cutting areas necessary in the farm woodlot, reproduction will in nearly every case come naturally, without extra expense, providing grazing is properly restricted. Finally, though the farmer pays high interest rates when he borrows, he works principally on his own capital, on which he makes a very low rate as a rule. Hence in most cases his forest investment really comes in the low interest rate class.

These advantages place him in the best position of any private owner and the large product of farm woodlots in this country as compared with the National Forests indicate that their economic position is much stronger than the latter. Cuttings can be carried on annually in the farm woodlot in most cases, thus resulting in an annual income from it, and also in the most complete utilization, because windfalls and trees otherwise damaged can be utilized before they decay. Some of these advantages will not be realizable until the pioneer stage is passed, but this will undoubtedly pass with great rapidity in this state because of the many natural advantages it possesses for the settler.

In spite of the great possibilities of the farm woodlot, full produc-

tion is not likely to be realized unless some technical advice is available. Practically all governments have found it expedient to furnish this at government expense. This is now being done in the Eastern United States, and should be strongly recommended here. It may seem premature to take up such work at the present stage of farm development in Washington, but as a matter of fact, large farm areas are bound to suffer in the not distant future for want of timber because its obvious abundance led to the cutting of every tree for lumber. The down timber will disappear within a short time and leave no timber available on many farms, or at a convenient distance from them. Moreover, a farm woodlot may usually be established in a recently logged off area at no expense, while later, when all young growth has been destroyed, planting would be necessary.

It is, of course, obvious that if any owner can make forestry pay one per cent or more over the rate at which he can borrow money, he can on his own capital make two per cent or more above the interest rate at which he can borrow. For example, if a corporation can make capital invested in forestry yield six per cent and can borrow at five per cent, it can carry on an operation by borrowing 50 per cent of the capital required, at five per cent and carrying the other 50 per cent by funds received originally from sale of stock. Since all the capital yields 6 per cent, while only 5 per cent interest is paid on half of it, the other half will receive 7 per cent. If it borrows two-thirds of its capital at 5 per cent, the remaining one-third receives 8 per cent dividends. In the same way if a state can make capital it uses in this way yield 6 per cent, though borrowed on 4 per cent bonds, the portion of its capital coming from its general fund would yield 10 per cent, i. e., 6 per cent earned by the general fund proposition itself, and 2 per cent additional from each of the thirds coming from bonds. By using its general credit the state could borrow all the funds on 4 per cent bonds and make 2 per cent on all capital borrowed without advancing a cent from its general fund. Or it may prefer to let its citizens have the wood products at cost and neither make nor lose money.

*Taxes as an Element in Cost of Producing Timber**

It should be noted first of all that taxes do not, as sometimes stated, make up the chief cost of the production of timber. They are in fact

*Many foresters in computing cost of growing timber, have treated taxes under the general property tax as an average sum paid annually throughout the life of a single crop. This introduces gross inaccuracy into the calculation of the interest charge on the taxes, making the taxes and interest thereon appear to be far greater than is the case in practice. This may account for the widespread idea that taxes are the chief cost in growing timber. A specific example as to what the effect of this method would be in the present computation is as follows:

The total first cost of taxation on Quality I soil in 60 years, as shown in Table I, on the basis of the tax estimates on page 21, is \$43.00. By the method of averaging the general property tax over the entire time of growing a crop this would amount to an average of 72 cents per acre per annum. Referring to interest tables we find that with 6 per cent interest \$1.00 paid annually and placed at interest for 60 years amounts to \$533.14 by the end of the period. Seventy-two cents paid annually would, therefore, amount to $.72 \times \$533.14$ equals \$383.86, total accumulated sum, both principal and interest. Deduct \$43.00, the principal, and we have left \$340.86, the accumulated interest. Compare this with \$77.40, the accumulated interest at 6 per cent when it is computed on the general property tax sums more nearly according to their actual incidence and the difference is striking. It is so great in fact as to make taxes together with interest thereon, appear as one of the most important costs in forestry, when such is not the case.

rather a minor charge, though undoubtedly making up a larger proportion of the cost of production than in some other industries. Mr. J. W. Brislawn, of the State Tax Commission, stated before the tax conference at the University of Washington, May, 1912, that the farmer pays approximately 6.43 per cent of his gross earnings for taxes.** Referring to Tables II, IV, and VI, it may be seen that the first cost of taxes under the general property tax amounts to from 3 per cent to 10 per cent of the cost of producing timber, hence not differing widely from taxes in agriculture. However, so far as the owner is concerned, the actual cost to him is more than twice as great because of the interest charges which accumulate on the tax payments before the timber crop can be harvested.

If the taxes were deferred until the crop is harvested it would be of advantage to the owner without an entirely corresponding loss to the state which works under a lower interest rate. A yield tax at the time of cutting, greater in the aggregate than the present general property tax, in fact large enough to entirely reimburse the state for the deferred payment, would be advantageous to the producer of timber.

Should the producer of timber be subjected to a yield tax it would need to be placed at much less than 25 per cent of the gross yield or it would cost the owner far more than the present system, interest included. By referring to the 6 per cent column in Table I, it may be seen that the amount of the general property tax and interest thereon is \$120.40. If a 25 per cent yield tax were computed, as in the 3 per cent to 4½ per cent columns, it would cost the owner \$163.81, a much greater amount than the present system. The main advantage of the yield tax then, unless the percentage were reduced, would be that it could be met easier when the timber was cut. This would be no great advantage except to owners who managed forests under intermittent yield, a poor system, and one not apt to be maintained by any owner. A properly managed tract will give a yield annually from some part of the tract. Hence this system is not considered by the writer to be of much value, unless the percentage of the yield taken were reduced much below that now paid by the federal government. Therefore, the state cannot hope to secure anything like the tax revenue from private lands in forest as it now secures from the National Forests; or rather as it will secure when cutting is in full force in the National Forests.

In this connection it should be emphasized that, as a matter of fact, it is a fallacy to assume that even the state can practice forestry without paying a tax. The presence of the utilized forest means people. People mean taxes for schools, roads, and general expenses of government. Hence the state must spend money for the ordinary purposes for which taxes are expended. If it does not take this money from its forest revenue it must come from general revenue. Hence in effect if the state undertakes to own productive property it must pay taxes which the private owner would have paid had the resource remained in private ownership. Since the state is an aggregation of citizens mostly taxpayers in some form, payment of these expenses out of general funds by the state is the same as paying a tax by the citizens.

**See p. 40. Taxation in Washington, University of Washington Extension Series No. 12.

*Necessity for Securing Capital for Forest Production in the
State of Washington*

Production of timber, it appears from the foregoing, is mainly a question of the investment of capital either by the nation, state, individual, or some other owner. Those owners who must pay or can get high interest rates for the use of capital cannot wisely undertake the production of timber as an investment, even if they were content with such long term investments, which is seldom the case. High priced capital means high cost of growing timber even more strongly than it means high cost of production in other lines. Yet since the State of Washington has enormous areas fitted only for the growth of timber, or far better for such growth than for any other purpose, it seems exceedingly important that the capital be forthcoming. If capital is not secured, the state will be unable to utilize this area, unproductive for other purposes, and by so much fail to obtain the full productivity that its resources warrant. Failure of this raw material for industry means so much less industry, which is also a very important matter.

Sources of Capital for Forest Production

There are four sources of capital which may in a greater or less degree be relied upon for large scale forest production, viz., the nation, the state, the municipality, and the large corporation. As previously stated, the cost of capital to practically all others is so high that the well informed forester cannot conscientiously recommend forest production as a profitable or even a self supporting enterprise, except in the case of the farm woodlot. Of these four possible sources of capital the municipality may for the present be expected at the most to deal only with city watersheds, although it would be an excellent investment for many cities to secure adjacent tracts of rough lands for forest parks, which could serve, not only for park purposes, but also give revenue to the city. The large corporation cannot be relied upon to furnish the capital now nor at any time in the future until it is definitely decided whether it will have equal privileges with other owners.

It then devolves chiefly upon the state and nation to raise the necessary capital for this need, which a little careful consideration shows to be vital to the state. The State of Washington has done nothing in this line as yet and it will no doubt be difficult for it to devote large sums to this purpose. Instead, therefore, of there being any jealousy of the work of the federal government in forest production, it seems that intelligent cooperation should be the uniform rule. The writer expects to see the day when there will be a vigorous demand from the people through members of Congress for the expenditure of government funds for this purpose to the end that the resources of the state may be made as productive as possible. Certainly such productive expenditure is far more important to the state than federal expenditures on government buildings, which merely result in moving government offices out of private buildings, and by so much decrease the demand for space in the latter. The main advantage of these latter expenditures is the purely selfish one, that because of the supposed prodigality of the government, persons who have something to sell (either material or labor) may sell more of it at better prices for the construction of a government building than for a

private building to house the same offices. Forest production by the federal government means not only benefits from present expenditure of government funds in the state where they do not interfere with private enterprise, or even with investment by the state (because there is more to be done than both can do), but also that the productive results of these expenditures will mainly accrue to the state in the future because its citizens will receive wages for protecting, growing, and harvesting the timber, and when mature using it at reasonable cost primarily in wood industries, and ultimately in all the other industries of the state.

The federal government at present, however, has its hands fully occupied in the administration of the considerable areas already set aside for forest production. There is no probability that those areas will at present be extended by purchase of private lands, although a policy of acquisition of alienated lands inside the present boundaries of the National Forests would be very useful. Aside from the National Forests, irresistible logic leads to the conclusion that for the present nothing will be done to continue cutover lands and land unfit for agriculture, as producing areas, thus contributing to the industries and general welfare, unless it be done by the state.

Will a people, granted popular rule, make expenditures, the benefits of which will accrue in the more or less distant future, or will they only make expenditures of the hand-to-mouth sort? Will they use their natural resources with regard only for today, looting and destroying in any way to make today's profit the easiest at whatever expense to the future, or will these resources be conserved? This is undoubtedly the severest test of democracy, if not the supreme test, in the long run. If only today's needs are considered and resources destroyed without measures being taken for replacing the renewable ones, it needs no prophet to see that the power of a given area to support population must continually decrease. Place against this the fact that population normally increases and we cannot escape the conclusion that a continually lower standard of living must follow, together with a lower civilization as its inevitable result.

The United States, with its great resources and small population, has not felt the results of the enormous waste of its resources as yet. Certain eastern states are beginning to feel them in so far as it concerns their forest resources, and are taking steps, halting and inadequate so far, to provide for the future. It remains to be seen whether Washington will act in time or whether it, too, will wait until the damage done is so great as to render the cost of repair many times greater than it would be if immediate action were taken. It seems certain that a wider knowledge of the need and wonderful possibilities before the state will contribute to the desired end.

While it is not within the field of this discussion to make extended suggestions as to state policy, one point deserves mention. Referring to Table V, showing costs of production on the poorest quality soil, it may be noted that with private owners the cost of production runs from \$14.01 to \$37.50 per M. feet. As the material produced on this poor quality soil will be very small sized at 60 years of age and consequently of low value, it is unsafe for any private owner to expect to undertake production of timber in this soil quality unless in very exceptional cases. The state or federal government may do so with a reasonable expectation

of at least paying costs. Since this class of land is most certainly not agricultural in character, it would seem that this would be a wise point of attack in beginning a policy of purchase by the state for the purposes of forest production. Here at least is land which will produce nothing unless the state produces timber upon it. This it can do with benefit to its industries and without damage to any private interest. The extension of the purchase policy could be worked out as the needs of the future might suggest.

*Comparative Cost of Providing a Future Supply by Growing New Timber
and by Hoarding Old Timber*

This subject is introduced here because of the close relationship to the problem of growing timber. Most corporations, and to a large extent the federal government, proceed on the theory that the best way to insure a timber supply in the future is by hoarding mature timber. It is of interest, therefore, to apply the financial test to the cost of holding timber as compared with growing it. This can be done in several ways, one of which is by reducing to present value the stumpage price at which, in the foregoing tables, it has been shown that timber can be produced. In these reductions the same interest rate should be used as was used in computing the cost of growing timber.

Thus by reference to Table III, covering cost of growing timber on Quality II soil, we find that a corporation working under 5% interest can produce timber for \$9.87 per M. ft. B. M. on a 60 year rotation. It would then not be profitable to pay an amount for mature timber (not increasing its volume, but to be held 60 years) which would bring its cost to more than \$9.87 at the end of that time, except as the timber now mature would be of higher quality. The amount that could be paid per M. would be the present worth of \$9.87, less the present value of the cost of protection and taxes throughout the period. It is somewhat difficult to determine the latter costs, but a conservative figure may be ascertained. Since the researches of Prof. F. G. Miller show that timber is already taxed 1/2c per M. per annum on the average, and the fire risk and protection must also be counted, it seems that 3c per annum throughout the period would be a very low cost for this item. The solution then follows.

Referring to interest tables* we find that the present value of \$1.00 due 60 years hence will at 5% compound interest be \$.0535. The present value of \$9.87 will then be $9.87 \times \$.0535 = \$.53$. Referring to the same table, we find that the present value of \$1.00 due each year for 60 years is \$18.929. The present value of \$.03 due each year for 60 years would be $.03 \times 18.929 = \$.57$ —present value of the administrative costs, taxes and other expenses of holding the timber. Deducting the \$.57 (the cost of holding) from \$.53 (the present value of \$9.87, the cost of producing timber) we have —\$.04, that is, even if the timber were given to a corporation to be held 60 years it would be cheaper to grow it than to take the old timber.

To consider the holding of timber in private ownership for 60 years would be far fetched except perhaps in the case of the largest

*C. S. Schenck "Forest Finance," p. 39.

corporations, which could be placed on a basis of permanent investment. It would, however, easily be possible in many cases for corporations or companies wishing to insure a future timber supply to their mills to secure tracts bearing young growth at prices which would give the same advantage relative to the short length of time held that the above example gives for 60 years. For example, Douglas fir stands 10 to 50 years old can often be purchased at prices little greater than the land value. If the land value in such cases does not exceed \$10.00 per acre and the timber can be bought for \$10.00 per acre, the cost per M. of the stumpage at the end of 20 years would be as follows, where the interest rate is 6%. Interest on land value 20 years = $\$10.00 \times (1.06^{20} - 1) = 10.00 \times 2.21 = \22.10 . Cost of young timber is $10 \times \$3.21 = \32.10 . Cost of protection and administration for 20 years equals $\frac{20(1.06_{20} - 1)}{.06} = \7.36

Total cost per acre of the stand at end of 20 years equals $\$22.10 + \$32.10 + \$7.36 = \61.56 , total cost per acre. If the acre is well stocked and on Quality I forest soil it should yield 44,000 ft. B. M. per acre at the age of 60 years, thus the cost per M. ft. 20 years hence would be \$1.40. That is, it would have to sell for only \$1.40 per M. ft. to give the present purchaser on those terms 6% on his investment. Mature timber, no longer making growth, purchased now for even as low as \$1.00 per M. and held for 20 years on land worth \$10.00 per acre will cost as follows where the stand is 50,000 feet per acre and the annual expense of protection is 20c per acre. Cost of original stumpage payment per acre equals

$$\$50.00 \times 1.06^{20} = \$50.00 \times 3.21 = \$160.50$$

$$\text{Use of land} = \$10 \times (1.06^{20} - 1) = \$10 \times 2.21 = \$22.10$$

Annual cost of administration and protection

$$= \frac{20(1.06^{20} - 1)}{.06} = \$7.36$$

.06

$$\text{Taxes at 2c per M. per annum} = \frac{1.00(1.06^{20} - 1)}{.06} = \$36.78.$$

.06

Total cost per acre at end of 20 years

$$= \$160.50 + \$22.10 + \$7.36 + \$36.78 = \$226.74.$$

$$\text{Cost per M} = \frac{226.74}{50} = \$4.57.$$

50

Of course this old timber will be more valuable material but not sufficiently so to make this as good an investment as the young timber even at the low price of \$1.00 for the old. Where \$2.00 is paid now the stumpage price must be over \$9.00 per M. in 20 years to make the purchase a 6 per cent investment. Of course, every individual case of this sort must be dealt with on its merits.

The comparative cost of insuring a future timber supply by growing timber or by storing mature stands is a more important question on state and federal lands than on private lands, because it is a reasonable conclusion from the tables of cost of growing timber that upon the state and nation will devolve this task. The state is already pursuing an active policy of sale of mature timber, but many people question the federal policy, which is providing for very few sales. There are on the National Forests large areas of mature and over-mature timber which could be sold for \$1.00 per M. feet or more in any normal times. These stands are

over-mature and tend rather to decrease than increase in volume. They average 40,000 to 50,000 feet B. M. per acre. The cost of holding a stand of this nature of 40,000 feet volume on Quality I soil would be as follows, figuring 3 per cent interest, a present value of \$1.00 per M., \$10.00 per acre for soil value and 20c per acre for protection and administration.

$$\text{Soil rent} = 10.00 \times 1.03^{60} - 1 = \$10.00 \times 4.892 = \$48.92.$$

$$\text{Future value of timber at compound interest for 60 years} \\ = \$40.00 \times 1.03^{60} = 40 \times 5.892 = \$235.68.$$

$$\text{Protection and administration cost 20c per acre for 60 years} \\ = .20(1.08^{60} - 1) = \$32.61$$

.03

$$\text{Total cost of holding per M.} = \$317.21 \div 40 = \$7.93 \text{ per M.}$$

Comparing this cost with \$3.36, the cost of producing timber on the liberal estimates shown in Tabel IV it will be more than twice as expensive for the federal government to secure future timber supply by holding mature timber now worth \$1.00 or more per M. than it would be to cut off such timber and reforest so as to raise a new crop during the 60 years. It is, of course, freely admitted that the value of the old timber per M. feet would be greater than that of the young, but in no such proportion as indicated above. The cutting of old forests and the growth of the young on the ground thus vacated will also result in the area furnishing within the 60 years over twice as much volume of timber for use of the people. Seemingly this should be the chief consideration.

It is argued, of course, that the government does not intend to hold the old timber so long, and that by cutting in 20 to 30 years the government can make great profits by holding. This is too great a question to treat in detail here, but there seems to be no difficulty in demonstrating that this is poor financial policy. However, it is not necessary to resort to financial arguments to show that the policy of holding mature and over-mature timber is bad from the public standpoint, because in a great measure it defeats one of the principal objects of the National Forests, viz., to furnish a large volume of timber for use by consumers. This is defeated because the soil functions only for the storage of old timber, not for the growth of new. Proper forest management requires, however, that the old stand be removed gradually and replaced by new. Where the federal government does cut timber, effort is made to see that the ground is reforested.

With the state, the argument for immediate cutting of mature timber within reasonable limits is still stronger, because the interest rate is somewhat higher. The cost of holding mature timber, involving a large initial investment as compared with growing new timber is, therefore, still higher. The state's policy fails when it comes to growing the new timber, however. Nothing is as yet being done in this direction, so that land when cut over is not even functioning for storage of timber. The two policies may thus be contrasted, the state's being inadequate in the direction of growing timber after cutting, and the federal government in the direction of a reasonable amount of cutting so as to permit growth of new timber.

Summary of Principal Conclusions

1. The chief cost of producing timber is the interest on the capital involved.
2. It follows from (1) that the interest rate under which the forest owner works, to a large extent determines the cost of producing timber to the owner concerned.
3. Taxes, though important, are a minor cost as compared with interest charges.
4. The costs of production under high interest rates are so great as to bar forest production to those owners who cannot secure money at a rate not much, if any, higher than 5 per cent.
5. This makes forest production at a profit possible only to the federal government, the state, the municipality and the large corporation, and those owners exceptionally situated as to the ownership of land for other purposes, such as mining, in connection with farming, etc.
6. Since the federal government is already practicing forestry so far as its resources make practical at present, the large corporation is not likely to become interested under present conditions, and the municipality can engage only to a limited extent; there is little hope of introducing forest practice in adequate manner except through the state.



CHANGES IN THE COLLEGE OF FORESTRY DURING THE YEAR

HUGO WINKENWERDER, Dean College of Forestry



COLLEGE OF FORESTRY

the present highway laboratory for a branch library, a second story over the large lecture room for additional laboratory and classroom space, and, of course, a complete new overcoat to replace the present dilapidated exterior of our building.

The Faculty

There have been no changes in the teaching staff during the past year, but under a new system of University organization the faculty of each college consists, in addition to the instructors of the departments of the college, of one instructor above the rank of graduate assistant from each department in the University offering work in the college. This should help very materially to develop a broader all-university interest in the College of Forestry and to secure a more thorough correlation of the various subjects included in the forestry curriculum.

Enrollment

While the enrollment is increasing slowly, we are advancing quite steadily. Two years ago there was a regular enrollment of 74, last year 88, and this year 90, not including the Short Course. Because of the stringency in the financial situation the enrollment in the Short Course dropped from 30 to 20. Our students make up a very cosmopolitan lot. Men from twelve different states and Canada and from fifteen different universities, have registered in the College of Forestry this year. The new students, both freshmen and upperclassmen, come from the following states: Connecticut, Minnesota, Michigan, Idaho, Missouri, Colorado, Ohio, Kansas, Illinois, California, Wisconsin, New York, and Alberta, Canada. Old students now enrolled hail from New Jersey,



BURT P. KIRKLAND
FOREST MANAGEMENT



HUGO WINKENWERDER
DEAN



HENRY LANDES
ACTING PRESIDENT



C. E. NEWTON
CIVIL ENGINEERING



BROR L. GRONDAL
FOREST PRODUCTS



C. W. ZIMMERMAN
TIMBER PHYSICS



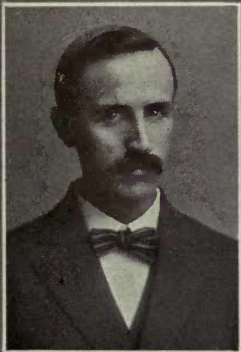
ELIAS T. CLARK
LUMBERING



HENRY K. BENSON
INDUSTRIAL CHEMISTRY



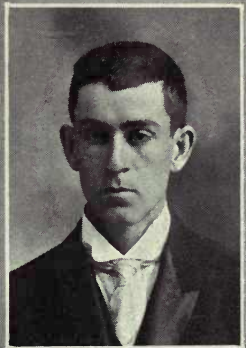
DAVID C. HALL
PHYSICAL TRAINING



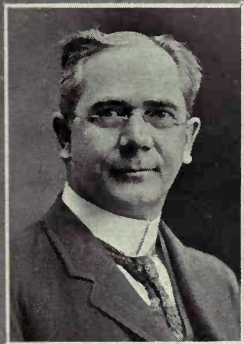
G. IRVING GAVETT
MATHEMATICS



HAROLD C. CULVER
GEOLOGY



TREVOR KINCAID
ZOOLOGY



JOHN W. HOTSON
BOTANY



RUDOLF RIEDER
GERMAN



FLOYD T. VORIS
PHYSICS

Montana, and British Columbia. Students who have attended the following institutions in the past, Pomona College, University of California, University of Southern California, University of Colorado, Colorado College, University of Wisconsin, Biltmore Forest School, Baker University (Kansas), Michigan Agricultural College, George Washington University, Ohio State College, University of Iowa, University of Alberta, and the University of Oregon are included.

A change all students will be interested in is that the University will have a matriculation fee of ten dollars and a tuition fee of ten dollars a semester, beginning with the opening of the work in September. The Short Course also carries a ten-dollar fee. As there will be a large number of free scholarships, it is believed that this will not work any serious hardship on the students, nor should it affect the enrollment materially.

The Curriculum

The policy adopted two years ago of allowing considerable leeway in the election of studies from other departments for the purpose of specialization along certain definite lines has thus far worked out very well indeed as is attested by the students who have taken advantage of the new scheme and are making good in the work of the world.

In the aim to keep the curriculum fully abreast of the times, a fourth group of elective studies has been added this year which will allow for specialization in the *Business of Lumbering*. As lumber no longer sells itself, but requires to be sold, there should be good openings developing in the lumber business for the office man and the salesman who has a thorough knowledge of certain branches of forestry, particularly forest products.

This course includes the following electives from the departments of Political Science and Journalism: Commercial Geography, Money and Banking, Accounting, Foreign and Domestic Markets, and the Principles of Advertising. While other subjects are open to election, those named are specifically recommended.

With this addition the College of Forestry now offers excellent opportunities for specialization in four distinct lines, (1) Forest Management, (2) Logging Engineering, (3) Forest Products, (4) The Business of Lumbering.

Other changes of lesser importance include a special full year course of Forest Mathematics and special sections for forestry students in English and German. It is hoped that another year may also develop special sections in Physics and Chemistry.

Graduate Work

Special stress should be laid on the efforts that are being made toward strengthening the graduate work. Considerable additional apparatus for work in Forest Products has been obtained and it is hoped that the wooded slopes along the east and north side of the campus, comprising about 70 acres, will be turned over to the College of Forestry in the near future as a permanent campus laboratory for Silviculture and Forest Management. The tract will be gradually put under wood lot management. Plans are also under way for securing a demonstration forest of considerable size in the Cascades. With the apparatus now at hand and the excellent op-

portunities offered by the region the work in forestry at the University of Washington should prove very attractive to graduate students. Up to the present time it has not seemed advisable to hold some of the advanced courses for graduate students only. It is believed, however, that such a change would also strengthen the graduate work, and this will come in time with increased enrollment of graduate students.



MEN'S BUILDING
Where the Club Meets

THE LOGGING SPUR

JOSEPH MORGAN, B. S. F. '13

Some one has said, "It is the little things that count," and in no place is the truth of the statement more evident than in the logging industry. It is the small item oft repeated that startles with its total when the cost figures come in at the end of the month, and if strict attention is not given to reducing the small costs, the business will eventually suffer. The logging railroad spur is the governor on the engine of railroad logging. Without careful watching the engine will show a loss in power, efficiency, and financial returns, and time spent in eliminating needless work in spur building will help greatly in keeping the engine running smoothly, besides showing a marked increase in the year's profits.

Logging spurs are in a class of construction by themselves, and first class spur construction is not to be confused with first class main line construction. The spur is built with a narrow roadbed; steep, short, broken grades; sharp curves, and a minimum of cuts and fills.

There must be a happy medium in the cost of a spur between expensive construction and that which barely stands up under the traffic. Spurs may have sharp curves, but they must be true curves and not run in by the eye. They may have steep grades, but they should be even grades, properly rounded at the breaks. The extra cost for these precautions is not as great as the reduction in the maintenance cost of the rolling stock, a fact which is not generally known, or which is generally overlooked.

Spurs, being temporary structures, should be as short as possible, but still should cover the ground thoroughly. The shorter the spur, the smaller the cost per thousand of logging the timber covered by the spur, and the less the amount of steel tied up. The amount of steel which is tied up in spurs is always surprisingly large, and unless a definite plan is carefully worked out in advance, the logger may find himself obliged to stop work at one landing in order to finish or to continue work at another.

Spurs are often built with the idea of using them for a continuation of the main line after the logging in that immediate vicinity is completed. Construction should be better in such cases, all grades and curves receiving the same careful consideration as those on the main line.

These points of possible economy are sound arguments for the method of making a detailed map and plan of operation before logging is started. This plan is of especial value in cases where a preliminary estimate of cost is to be made.

The main line, once constructed, is rarely changed, and the only yearly charge against it is maintenance. Spurs are continually being torn up, transported, and put down in the next area to be logged, so that maintenance costs for spurs are usually specific, and for many short spurs there is no maintenance cost.

Compared with the cost of the main line, the most of the logging spur represents a very small investment, but this investment often helps greatly

to break the logging company. The cost of the spur usually enters into the cost of logging a small amount of timber only, since logs from only a limited area pass over it. For this reason, if the cost of the spur is excessive in any particular, the cost of logging in that area will be high, and profits accordingly low. The main line costs are paid by the timber from a whole operation.

As near as the construction costs of the spur can be compared with those of the main-line, the ratio should be about one-half or three-fifths to one, per lineal unit. This is, of course, where similar country is traversed and labor costs are the same. Thus where a main-line cost is fifty dollars per station, the spur cost should be between twenty and thirty dollars per station; and where the main-line costs only thirty-five dollars, the spur should cost fifteen to twenty.

These main-line costs are of main-line constructed in the woods, the spurs branching out into country that is practically the same, and into similar stands of timber.

The following are some actual cases of construction costs based on equal labor costs, and yardage at the same price, namely twenty-five cents per yard for cut and fill:

Main-line \$ 35 per station.	Spur-line \$17 per station.
Main-line \$ 48 per station.	Spur-line \$23 per station.
Main-line \$ 65 per station.	Spur-line \$37 per station.
Main-line \$206 per station.	Spur-line \$73 per station.

The latter case was one in which the spur-line ran rapidly into hill side work, which reduced the cost. It often happens that spurs cost several times as much per station as the main-line, where they lead into difficult construction, or encounter rock-work which the main-line escapes. At other times they cost far less than one-half of the construction price of the main-line. However, the ratio of costs will usually be close to that mentioned above.

In many cases money is lost needlessly or spent unprofitably in spur location and building. This is due largely to the inefficiency of the engineer, or his lack of ability to distinguish between first class work on main-lines and first class work on a spur. Here lies the vital point of saving made by proper spur building in logging. The function of a spur must always be kept uppermost in the mind of an engineer while locating and building. He must remember that it is temporary; that steep grades and sharp curves are not objectionable within proper limits; and that the cost is charged to a small portion of timber.

By a little saving here and there in building spurs, a big saving will be made, and if men of ability give this part of logging proper thought and consideration, our logs will enter the market at a lower cost per thousand.

THE VALUE OF AMMONIUM POLYSULFIDE AS A WOOD PRESERVATIVE

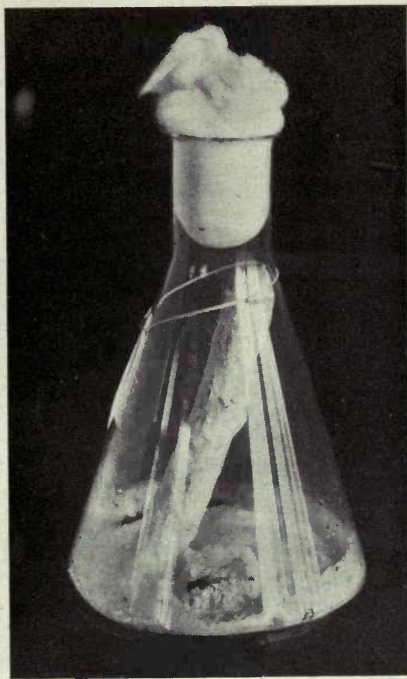
DONALD H. CLARK, '16

In the history of wood preservation, a large number of compounds have been tested as to their efficiency as agents to prevent decay. Of those that have been tried, a few have proven to be of commercial value, others more or less of a failure. A large proportion of the compounds so tried have been inorganic salts of various kinds. Most of these have proved to be of little or no value as preservatives, the chief reason for their failure being their solubility in water, and the consequent leaching of the salt from the timber after impregnation. Even though a compound has a high toxicity and is effective in preventing the germination and growth of fungi in the wood tissues, it is of little commercial value if it cannot be used for the preservation of timbers which are to be placed under outdoor conditions where leaching may occur. A good example of such a compound is copper sulfate, which has been proved to possess a high toxic value, but which leaches from the wood if the latter is placed in a moist situation.

Recently a method of preservation has been suggested whereby the wood cells are filled with a substance almost insoluble in water, namely, sulfur. Although the details of the process have not been worked out, owing to the fact that the commercial value of the method is not yet proven, the essentials of the method of impregnation may be briefly given. The wood products to be treated are placed in a retort somewhat similar to those used in impregnation with creosote. The retort is then filled with ammonium polysulfide and pressure applied. When the desired penetration has been secured the pressure is released, the excess of ammonium polysulfide is drawn off and the retort heated with steam coils. The effect of the heating is a regeneration of ammonia gas. This reaction is common to all the salts of ammonium when heated. In the case of ammonium polysulfide, ammonia gas and a small amount of hydrogen sulfide are given off, the residue being precipitated sulfur. When heat is applied to the retort containing the impregnated wood, the ammonium polysulfide passes through the chemical changes outlined above. The ammonia gas is collected for further use and the precipitated sulfur is left in the cells of the wood.

Before perfecting the mechanical details of the process or figuring the costs of operation and materials, it is necessary to prove the value of the sulfur as a preservative by testing its toxicity. The value of lime-sulfur as a fungicide is universally recognized. In this case, however, there is a reaction which is lacking in the case of the insoluble, precipitated sulfur. When slacked lime is boiled with sulfur in the preparation of lime-sulfur compound, a calcium salt of sulfur is formed which hydrolyzes in the presence of water, giving both sulfurous and sulfuric acids. Both of these are effective fungicides. In the case of ammonium polysulfide, however, the insolubility of the precipitated sulfur in the wood cells prevents the formation of such acids.

To determine the toxic value of the precipitated sulfur, the following series of experiments was performed. A common wood-destroying fungus, *Stereum hirsutum*, was used to test the toxicity of the preservative. This fungus is a facultative parasite, growing in either living or dead wood tissue, usually the latter. It grows remarkably well on artificial media as was demonstrated in the course of the experiment. The plan of the experiment was to find the medium upon which the fungus would grow most vigorously, then to make up a series of mixtures of this nutrient material with varying percentages of precipitated sulfur. Sterile slant tubes were made of these different mixtures, the fungus transferred to them, and the resulting growth of the mycelium taken as an index of the toxic value of the sulfur. For the purpose of comparison cultures of the fungus were made on the nutrient material alone and also on a mixture of this material with coal-tar creosote. These were treated in exactly the same manner as were the sulfur mixtures of the media. The medium upon which the *Stereum* grew most vigorously was determined by detailed experiment to be a mixture of agar-agar with a tea made by boiling in water the sapwood and cambium of *Alnus* and *Salix*. The fungus not only produced a vigorous vegetative growth on this substratum, but under the most favorable conditions produced sporophores, both on its surface and on sticks placed in the medium. A number of mixtures of the nutrient material with sulfur were made in test tubes, and in flasks of one half litre, litre, and two-litre capacities. The following



CULTURE OF STEREOUM HIRSUTUM, CONTAINING BLOCK OF WOOD IMPREGNATED WITH AMMONIUM POLYSULFIDE

percentages of sulfur were used: .10%, .25%, .50%, .75%, 1.0%, 2.0%, and 5.0%. Mycelium from a pure culture of *Stereum* was transferred to sterile tubes containing the nutrient-agar, nutrient-creosote-agar, and the nutrient-sulfur-agar. The results, in brief, showed that the fungus grew equally as well on the sulfur medium of the lower percentages as on the nutrient agar alone. A very slight reduction in the vigor of growth was evident in the tubes containing the highest percentage of sulfur. The fungus failed to grow on the creosote mixtures which contained .50% of creosote and grew rather feebly on those of lower percentages.

A number of two-litre flasks were partially filled with the *Alnus-Salix* tea agar, into which sticks of *Alnus* and *Salix* were placed in such a manner that portions of the sticks extended considerably above the surface of the agar. Into each of these flasks were placed small blocks of *Alnus oregona* and of *Pseudotsuga taxifolia* which had previously been impregnated with one-third pound of sulfur per cubic foot by precipitation from ammonium polysulfide. Mycelium from a pure culture of *Stereum* was then transferred to each flask. The fungus grew vigorously over the surface of the culture and on the blocks of impregnated wood. After a period of twelve weeks the impregnated blocks were removed from the flasks, sectioned on a microtome and treated with a differential stain for fungus and host tissues. The stain was one known as *Pianzeze IIIb*.^{*} The formula is as follows:

Malachite Green	0.50 grams.
Acid Fuchsin	0.10 grams.
"Martius Gelb"	0.01 grams.
Water, Distilled	150.00 c. c.
Alcohol, 95%	50.00 c. c.

The wood sections are washed in water or alcohol, stained for 15-45 minutes in the undiluted mixture and the excess stain removed in water. The sections are decolorized in 95% alcohol to which a few drops of hydrochloric acid have been added. The lignified cells of the host are stained green, and the unlignified cells of the fungus are stained a deep pink. An examination of the stained sections showed that the mycelium of the fungus had penetrated the tissues of the Alder in nearly every case to a distance of from four to twelve millimeters from the outer surface of the block. The presence of the mycelium in the tissues of the Douglas Fir block was doubtful, the results of the staining being less definite than in the Alder.

The results of the foregoing experiment would seem to indicate that sulfur precipitated in the tissues of Alder from ammonium polysulfide has not sufficient toxicity to inhibit the growth of the mycelia of *Stereum* through the wood cells. In order to get more complete results, experiments similar to those outlined herein are being conducted, using different species of fungi and different species of wood. It is known that marine borers are not destructive in water containing much sewage and experiments are under way to determine the effect of sulfur as a preventative against destruction of wood in salt water by marine borers. As sulfur is comparatively cheap, and as more favorable results may be obtained with heavier treatments, it is possible that sulfur may be used to some extent as a commercial wood preservative.

^{*}Vaughan, R. E. *Annals of Missouri Botanical Garden*. 1:241-42. May, 1914.

A PRELIMINARY GROWTH AND VOLUME STUDY

of

NOBLE FIR (*ABIES NOBILIS*)

EDWARD J. HANZLIK, B. S. F. '11, Forest Examiner, U. S. Forest Service.

The data presented in the following pages were obtained as a side study in the course of a silvical study of western hemlock by the United States Forest Service during the season of 1912. The information given here is all too meager concerning this little known, very much confused, and important species of the upper slope type; and this lack of pertinent data dealing with noble fir should stimulate interest toward securing further and more complete information throughout its commercial range.

Noble fir (*Abies nobilis*) is one of the main components of the forest in the upper slope type on the west slope of the Cascade Range in Oregon and Washington. It is rarely found in pure stands, usually occurring in mixture with Douglas fir, western hemlock, and amabilis fir in the lower part of its range; in the upper limits associating with western white pine, amabilis fir, mountain hemlock, and yellow cypress in Washington and Northern Oregon, and with white fir, white pine, sugar pine and western hemlock in Southern Oregon. It has also been reported as being found sparingly in the Coast Range in Oregon, but it has not been authentically reported in the Olympic Mountains in Washington.

The altitudinal limits of noble fir growth are between 2500 and 5000 feet, occurring at this higher point only in the southern part of its range. In Northern Washington its upper limit is between 4000 and 4500 feet. Below 3000 feet it occurs only as a rare scattered individual in mixture with Douglas fir and hemlock. It rarely forms any appreciable part of the stand at this low elevation.

Noble fir products in the past have been placed on the market under the name of "larch" without exception. Recently, however, more attention has been paid to its correct name, and advertising of its products is to be noticed under the name of "noble fir." There is really no good reason for the subterfuge of a fictitious name, since the wood of noble fir is of excellent quality. The wood is light brown in color, odorless, free from pitch and resin, splits readily, and is easily worked. Its strength qualities are not definitely known, although both Douglas fir and western hemlock rank above it in this respect. Noble fir is suitable for interior finish, sash and door stock, and is excellent for boxwood. Due to its freedom from pitch, this wood should have great value in the manufacture of pulp.

Object of This Study

The object of this study was to secure definite data concerning the growth, volume, and other characteristics of this little-known species which no doubt will play a very important part in the lumber industry in the near future.

Locality

The data were obtained at the logging operations of the Bridal Veil Lumbering Company near Palmer, Oregon, upon the west slope of Larch Mountain, in T. 1 N., R. 6 E. W. M. adjacent to the Oregon National Forest.

Physical Conditions

The area examined presented a west to southwest aspect with a gentle to moderate slope, at an elevation of from 3,000 to 3,500 feet above sea-level. The topography is very smooth and the drainage good, the area being cut into gentle contours by a number of small streams.

The soil consists of clayey to sandy-loam, 6 inches to 18 inches deep, with a moderate depth of humus and decaying vegetable matter on the ground. The subsoil is composed of rock and gravel, none of the former outcropping to the surface.

The climatic conditions are such as to be very favorable to tree growth. The temperature does not vary greatly during the different seasons; the summers are quite cool with an abundance of fog and mist, while the winters, although having an excessive snowfall, are not subject to exceedingly low temperatures. The precipitation in the form of rain, snow, fog, and mist runs from 80 inches to 90 inches per annum. For the best development of noble fir a comparatively humid climate and a fresh, deep, porous soil are required. This locality is a Quality III site of the lower slope type, although it is the best quality upon which noble fir grows.

Forest Conditions

The stand represents a mature forest composed of noble fir, Douglas fir, and western hemlock, with a scattering of amabilis fir. The last named species becomes more abundant with an increase in elevation, taking the place of the hemlock and Douglas fir, these latter species dropping out of the stand. Noble fir and Douglas fir form the dominant crown classes, hemlock occurring mainly as an understory. In point of numbers, hemlock forms about 60 per cent of the stand, noble fir and Douglas fir about 20 per cent each; according to volume, however, noble fir forms 46 per cent, Douglas fir 24 per cent, and hemlock 30 per cent. The crown density varies from .8 to .9 in point of density for the upper story, which coupled with the crowns of the suppressed hemlock, casts a rather dense shade upon the ground. This heavy shade accounts probably for the almost total lack of underbrush, exceptions being noted where the canopy has been opened up by windfall or by the death of the dominant trees.

The Tree

Noble fir in this locality forms a tall, straight, cylindrical bole, with a comparatively small and open crown. The trunk prunes itself readily of side branches, indicating the rather intolerant nature of the tree; the length of the crown being only about one-third to one-fourth of the total height. Trees were found up to 6 feet in diameter at breast height, attaining a maximum height of about 215 feet; the average tree, however, having a diameter of little over 4 feet, with a height of about 196 feet.

Noble fir is less tolerant than either western hemlock or amabilis fir, its light requirements being much similar to those of Douglas fir, perhaps being a trifle more tolerant than the latter species. Seedlings will germinate either upon bare mineral soil or duff, although the latter condition appears best. Reproduction takes place only in openings, such as are caused by fire or windfall, seedlings seldom being found in the shade of older stands. Rather moist soil conditions seem to be best for the reseeding of this species. The seed seems to be disseminated by the wind over quite a wide range.

Noble fir is adapted best, probably, to a type of forest where it is able to maintain a dominant position in the stand, such as when in mixture with Douglas fir and western hemlock, or amabilis fir and hemlock. Since it does not reproduce itself under shade, some system of clear cutting will no doubt be necessary to secure natural reproduction. Throughout the lower altitudinal limit of its range, its management should be akin to that of the associating Douglas fir, while at the higher elevations, where for protective reasons widespread clear cutting cannot be followed, some group system of cutting will have to be followed. Due to its superior qualities, noble fir should be favored more than any other species, with the exception of white pine, in the upper limits of the lower slope type and in the lower limits of the upper slope type.

Growth

It is probably in direct competition with the rather intolerant species, such as Douglas fir, that noble fir attains its best diameter and height growth.

Figure 1 illustrates graphically the comparative diameter growths of noble fir, Douglas fir, and western hemlock in a mature stand, the trees of all species averaging about 400 years of age. The results are for only the dominant trees upon the tract of all species.

Table 1 gives the average rate of diameter growth and height growth of noble fir grown in a mixed stand of Douglas fir and western hemlock at an elevation of from 3,000 to 3,500 feet on the west slope of Larch Mountain in Northern Oregon.

Table 2 gives the seedling height growth of noble fir grown under average conditions in the same locality as were the trees measured for Table 1.

Table 3 gives the average number of years required for noble fir seedlings to attain various heights.

Figure II illustrates graphically the seedling height growth of noble fir, Douglas fir, and western hemlock in Western Washington and Oregon. The growth of noble fir seedlings is slower than that of either Douglas fir or hemlock; to attain breast-height, 4.5 feet above ground, it takes noble fir an average of 11 years, open-grown western hemlock 7 years,* and Douglas fir 6 years.**

*Western Hemlock; Its Forest Characteristics, Properties, and Uses, by E. J. Hanzlik and H. B. Oakleaf.

**Growth and Management of Douglas Fir, by T. T. Munger.

TABLE 1

Average rate of diameter and height growth of noble fir in a mixed stand on the west slope of Larch Mountain, Oregon.

Age in Years	Average D. B. H. Inches	Average annual diameter growth in each decade Inches	Average total height Feet	Average annual height growth in each decade Feet
10	0.0	...	4.0	...
20	3.1	.31	12.0	.80
30	6.0	.29	23.5	1.15
40	8.7	.27	38.4	1.49
50	11.1	.24	53.0	1.46
60	13.3	.22	65.5	1.25
70	15.3	.20	76.2	1.07
80	17.1	.18	85.2	.90
90	18.8	.17	92.8	.76
100	20.5	.17	99.5	.67
110	22.1	.16	105.5	.60
120	23.6	.15	111.0	.55
130	25.0	.14	116.1	.51
140	26.3	.13	120.9	.48
150	27.6	.13	125.4	.45
160	28.8	.12	129.7	.43
170	30.0	.12	133.8	.41
180	31.1	.11	137.8	.40
190	32.2	.11	141.7	.39
200	33.2	.10	145.5	.38
210	34.2	.10	149.1	.36
220	35.2	.10	152.6	.35
230	36.1	.09	155.9	.33
240	37.0	.09	159.1	.32
250	37.9	.09	162.2	.31
260	38.8	.09	165.1	.29
270	39.7	.09	167.9	.28
280	40.5	.08	170.6	.27
290	41.3	.08	173.2	.26
300	42.1	.08	175.8	.26
310	42.9	.08	178.3	.25
320	43.7	.08	180.7	.24
330	44.5	.08	183.0	.23
340	45.2	.07	185.2	.22
350	45.9	.07	187.3	.21
360	46.6	.07	189.3	.20
370	47.3	.07	191.2	.19
380	48.0	.07	193.0	.18
390	48.7	.07	194.7	.17
400	49.4	.07	196.3	.16

TABLE 2

Noble fir seedling height growth—282 measurements.

Age—Years	Height—Feet	Current Annual Growth—Feet
1	....	...
2	....	...
3	.84	.28
4	1.16	.32
5	1.53	.37
6	1.94	.41
7	2.39	.45
8	2.90	.51
9	3.45	.55
10	4.04	.59
11	4.69	.65
12	5.38	.69
13	6.12	.74
14	6.88	.76
15	7.62	.74
16	8.32	.70

TABLE 3

Average number of years required for noble fir seedlings to attain various heights.

Height—Feet	Age—Years	Height—Feet	Age—Years
0.5	2	4.5	11
1.0	3	5.0	11
1.5	5	5.5	12
2.0	6	6.0	13
2.5	7	6.5	14
3.0	8	7.0	14
3.5	9	7.5	15
4.0	10	8.0	16

TABLE 4

Average number of trees, average diameter, and average volume, by tree classes and species.

Species.	Number of Dominant and Codominant Trees Per Acre.	Diam. of Average Dominant and Codominant Trees.	Total Volume of Dom. and Codom. Trees Per 'Acre.	No. of Suppressed Trees 12" and Over in Diam.	Vol. Per Acre of Suppressed Trees.	Total Number of Trees 12" and Over in D. B. H.	Total Volume Per Acre of All Trees.
Plot 1. Average for a 4 acre plot.							
Noble fir	8.50	45.6	51,887	1.00	1,125	9.50	53,012
W. Hemlock	4.25	42.1	16,892	20.25	13,922	24.50	30,814
Douglas fir	12.25	42.6	41,111	1.50	1,892	13.75	43,003
Red Cedar .....	.75	48.8	2,327	.75	384	1.50	2,711
All Species	25.75	43.7	112,217	23.50	17,323	49.25	129,540
Plot 2. Average for a 3 acre plot.							
Noble fir	8.33	55.0	79,667	1.33	536	9.66	80,203
W. Hemlock	3.33	44.1	14,821	30.66	39,594	34.00	54,415
Douglas fir	4.00	48.5	19,508	.66	1,127	4.66	20,635
Amabilis fir .....	.....	.....	.....	.33	267	.33	267
All Species	15.66	51.2	113,966	33.00	41,524	48.66	155,520

TABLE 5

Average yield per acre of mature noble fir, Douglas fir, and western hemlock on Larch Mountain. Averages for 17 $\frac{3}{4}$ acres.

Species.	Total trees per acre.	Basal area sq. ft.	Diameter of average tree.		Yield per acre. bd. ft.
			Inches.		
Noble fir	10	127	47.6		69,415
Douglas fir	7	66	42.0		22,268
West. Hemlock	40	146	25.9		49,427
All Species	57	339	30.4		141,110

Note.—Data are for trees 12 inches or more in diameter at breast height. Noble fir utilized to a top diameter of 15 inches inside bark. Doug. fir utilized to a top diameter of 10 inches inside bark. Hemlock utilized to a top diameter of 8 inches inside bark.

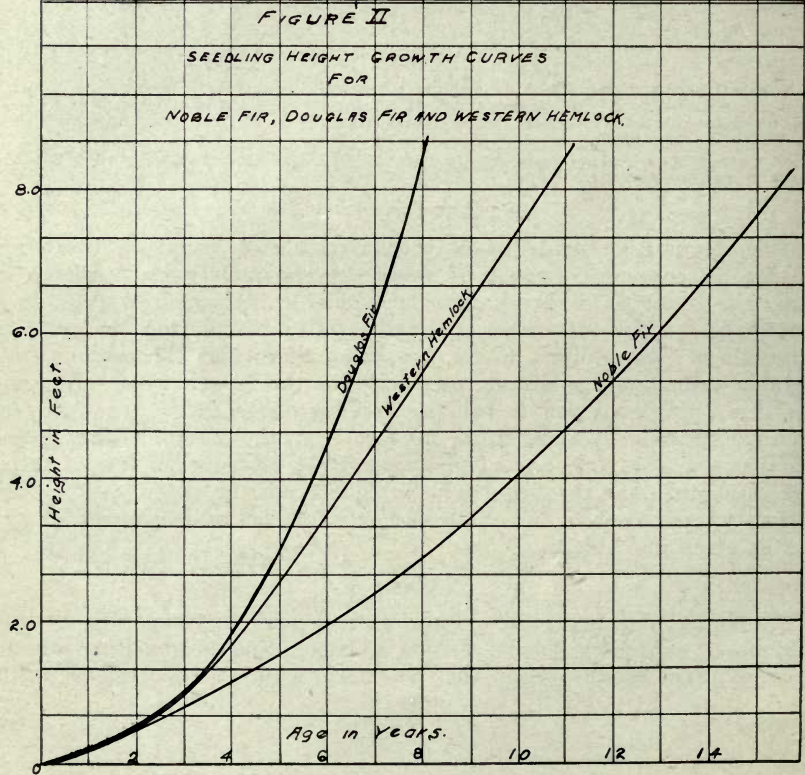
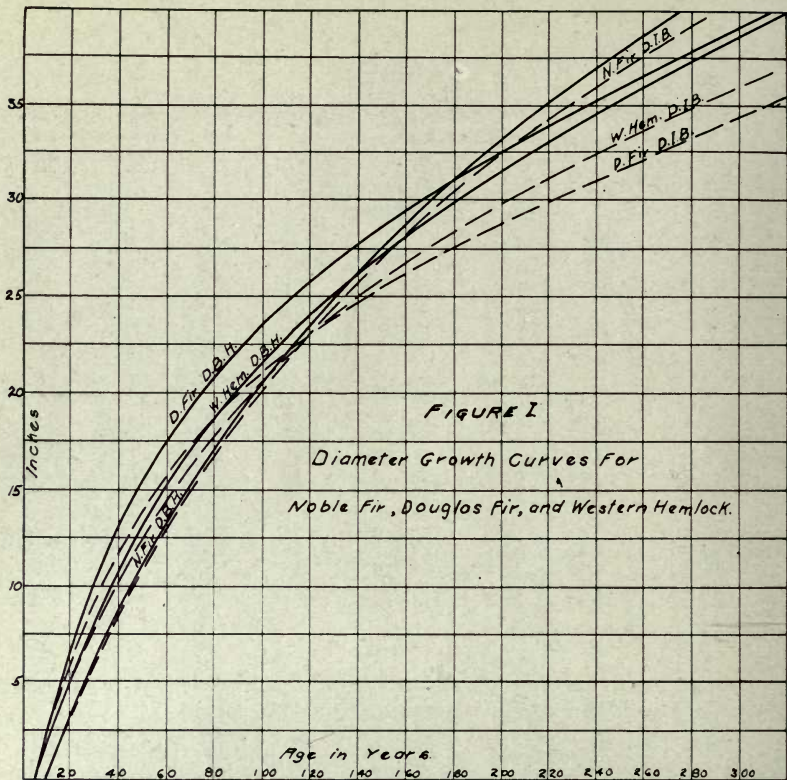
No data were obtained concerning the yield of second growth stands of noble fir in the course of this study.

Lumbering

The logging of noble fir of the extreme size found on this tract presents an enormous amount of waste, caused mainly by breakage in felling the trees. This breakage is unavoidable in many instances, as a great deal of care was exercised by the fellers in placing the trees in felling them. In addition to the breakage, there must be made a considerable deduction for defect, especially in the larger trees. In some instances it was necessary to cull the butt log of the larger trees, the rot in them extending up some 20 to 30 feet from the stump. Ring shakes were prevalent, scarcely any of the larger trees being found free of them. It is estimated that the deduction for defect and breakage will amount to from 20 per cent to 30 or 40 per cent of the total contents of the trees as given in Table 6.

Volume

Noble fir, due to a full cylindrical bole and its comparatively thin bark, bears a greater volume for its diameter and height than any of its associating species, with the possible exception of western white



pine. The bark rarely exceeds 2 inches in thickness, even at the butt of the tree, the average being about $1\frac{1}{2}$ inches for the larger trees. Douglas fir bark, on the other hand, for corresponding diameters varies from 4 inches to 8 inches in thickness. Table 6 gives the average contents in board feet of noble fir based on measurements of 77 trees on Larch Mountain.

TABLE 6

Total contents in board feet of old growth noble fir from measurements of 77 trees on Larch Mountain, near Palmer, Ore. Trees scaled by the Scribner Dec. C Rule in 16-foot log length or less to an average diameter of 15 inches inside the bark at the top. Stump height taken equal to the D. B. H. Average merchantable length, 156 feet, average total height 192 feet. Read from curves.

D. B. H. Inches	Merch. Vol. Bd. Ft.	Basis, No. of Trees
30	2,220	0
32	2,650	3
34	3,100	0
36	3,560	1
38	4,040	6
40	4,540	5
42	5,070	4
44	5,630	6
46	6,200	5
48	6,840	12
50	7,500	4
52	8,180	6
54	8,900	5
56	9,630	5
58	10,400	3
60	11,170	3
62	11,960	5
64	12,750	3
66	13,560	0
68	14,380	0
70	15,200	0
72	16,020	1



WOOD DISTILLATION PLANT

THE LOGGING ENGINEER

ELIAS T. CLARK, Assistant Professor of Forestry

The writer is frequently asked by men desiring to enter the lumber industry, by students in forest schools, and by men engaged in logging operations, "What is 'logging engineering' and how did the term arise? What is a logging engineer called upon to do? How should a man fit himself to become a logging engineer? What future prospects has a logging engineer?" It will be the aim of this article to answer these questions.

It is impossible to state at just what time, or by whom, the term "logging engineering" was coined. The first time that it was used to any extent was at the first session of the Pacific Logging Congress, held in Seattle in July, 1909, at the Alaska-Yukon-Pacific Exposition, hence the history of the term "logging engineering" and of the Logging Congress are closely joined. The idea of getting together all of the men interested in the logging industry on the Pacific Coast for an exchange of ideas, and the actual accomplishment of the idea is probably almost entirely the work of Mr. George M. Cornwall, Editor of the *Timberman*. For this the logging industry owes him its everlasting thanks. The idea of organizing the Logging Congress arose in Mr. Cornwall's mind some time in 1908 and with the aid of Mr. E. G. English, Mr. Frank H. Lamb, Mr. E. P. Blake, and several others, he made the idea a fact. Sessions have since been held every summer at different cities in the region and they have done much toward increasing efficiency in the industry.

The reasons for the organization of the Congress are several. At the time it was started the modern method of yarding by donkey engines and transporting logs from the woods by logging railroads had of course superseded the older method of yarding by bulls, or horses to a skid road, hauling the logs by skid road to a river, and driving the logs to a mill or booming grounds. The method, however, had not been organized nor developed to the state of efficiency which it has since reached. Skid roads were used in many places which would now be reached by logging spurs, smaller size donkey engines with light cables were used, and for the most part less efficient organization of the men was obtained. At this time only a few of the more progressive camps were supplying their men with springs and mattresses to sleep on, instead of the hard old filthy straw bunks. Practically none had thought of such things as shower baths, dry rooms, steam heat, electric lights, reading rooms, hot and cold water in the bunk houses, or any of the modern conveniences and comforts of some of the present "Model Camps." At this time too some operators in the Puget Sound, Gray's Harbor, and Columbia River Districts were beginning to get away from the level or rolling topography adjacent to the waterways and the conditions which they had to encounter were becoming harder and more costly to overcome. It was the usual custom at this time for the logging foreman to make all the plans for the work. This meant that he not only had to lead the men to work and keep them at it, but that he also had to get out into the uncut timber and survey the logging

spurs, "spot in the landings," decide upon the location of camps, and make all the plans for opening up the tract of timber. When crews were small and topography level this gave good results, but when conditions changed this led to one of two things, either the foreman spent most of his time in the woods and the crews were slighted, or vice versa. The former method resulted in the work slackening up, for it is only an exceptional crew that does not turn out more work when they know that the boss is pretty close at hand and the closer the foreman sticks to his men the better he can pick the little leaks due to poor organization or due to having poor workmen. If on the other hand the foreman spends most of his time with the crew and takes only an occasional day off to make plans for logging the next tracts of timber, many costly mistakes are made. In this case he has little time to get his spurs properly spaced and the result is long yarding distances to some spurs and too short distances to others; he has little time to set an accurate grade line and grades which limit the out-put of the operation result; he has little time to run out his curves and lines which give a great deal of trouble from wrecks and derailments result; he has little time to look up his route very far in advance of logging and the alternative of building a costly bridge across a canyon or constructing a new line through land already logged results.

These and many other conditions of the logging industry as carried on about ten years ago led to the organization of the Pacific Logging Congress and the birth of a hybrid profession called Logging Engineering. The first two sessions of the Congress were devoted to a discussion of new types of machinery, how to better conditions of labor in camps, and better methods of logging. The third session of the Congress devoted considerable time to better methods of planning operations by use of topographic maps and other means, while the fourth session devoted a great deal of time to the method of training men who would become logging engineers and would be able to take charge of the planning of operations.

The Work of a Logging Engineer

This naturally leads to the question as to what a logging engineer is called upon to do.

His work has to do primarily with the planning of operations in advance of the actual yarding and hence is concerned chiefly with the location of the logging railroads. As an aid to the location of the logging spurs many of the efficient companies are now having topographic maps made of their holdings. These maps, if properly made, repay their first cost many times in that they show the man locating the spurs what kind of conditions must be overcome. Much time is spent in looking up routes for the spurs and this time can just as well be used in a systematic way for getting data for a topographic map. This map will be of great value in showing possible routes for the lines, in determining proper spacing of the lines for the most efficient yarding distance, in deciding upon future extensions of lines, and for getting the line in a location in which it can be most cheaply constructed and at the same time give the best grades and curves. The preparation of these maps will of course fall to the lot of the logging engineer.

The actual surveying of the railroad lines will also be his work, and in this regard he can save the company a great deal of money each year

both in the first cost of the lines and in the costs of operation over them. By locating a line in one place it may be very expensive to construct because of the heavy cuts and fills and bridge work encountered, yet because of its location the logs can best be hauled to the railroad and most cheaply transported; or, on the other hand a line may be put in which is very cheaply constructed and yet does not handle the timber as cheaply as a line which might be more expensive to construct. That is, judgment must be used as to where an expensive line is justified and where it is not. It is a pity, however, when a line is put in which is expensive to construct and expensive to maintain and a route is entirely overlooked which would have been just as feasible and yet would have very much lessened these expenses. For example, one would-be logging engineer in locating a line which a company is now operating upon, put in a curve which has cost the company over \$700.00 to maintain. Thus the logging engineer must know the best method of surveying railroads. A person can soon acquire this knowledge, but more than this he must have rare judgment and ability in selecting routes. Otherwise the company had better save his salary and let the foreman put in the lines.

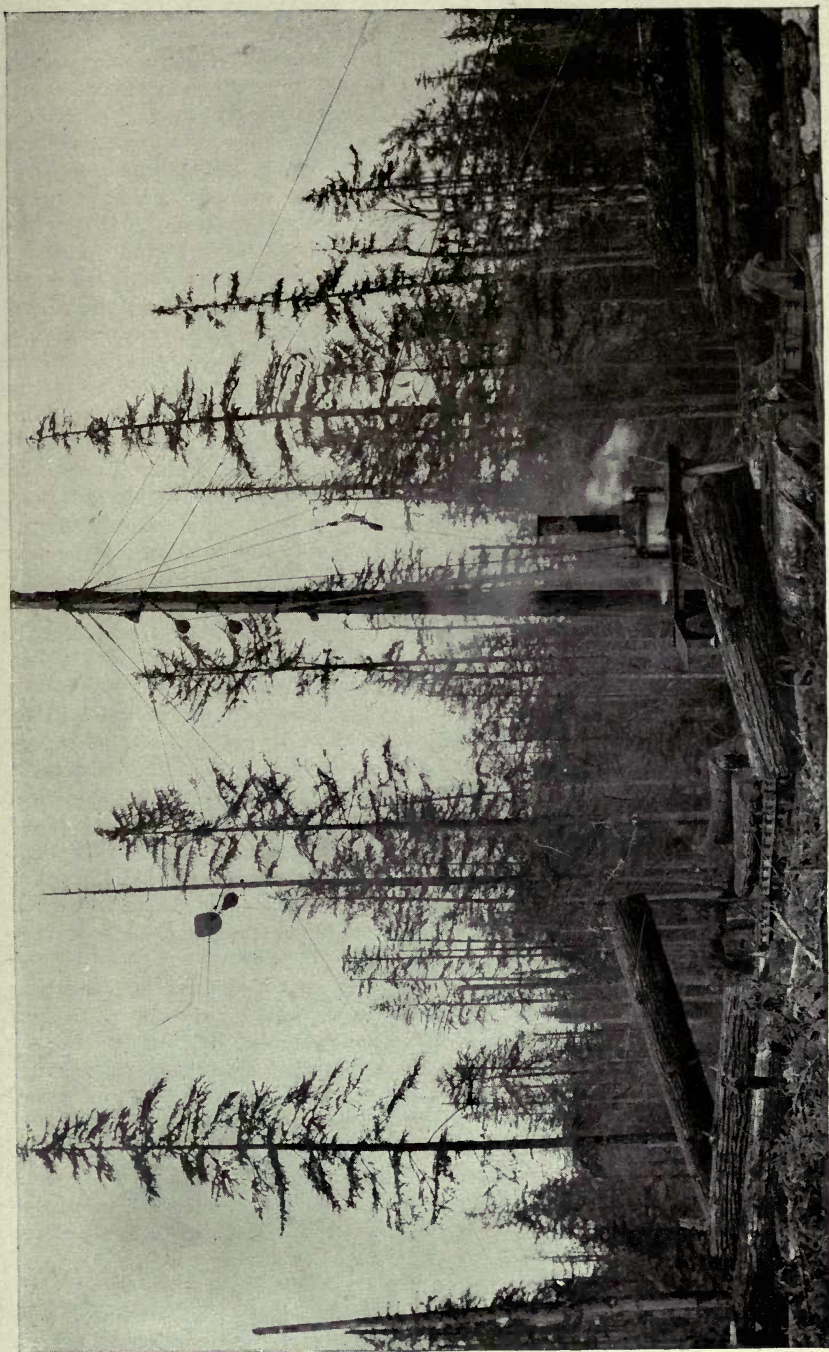
The location of the logging railroads, along with which often goes the location of landings on the spurs, is usually the main work of the logging engineer. As he is a technically trained man, however, he will usually be called upon for many other kinds of work, among which might be quoted specific examples. A new gravity water system is to be put in and the superintendent asks the engineer how large a feed pipe will be required to supply the camp, two locomotives, and six donkeys; an oil tank is to be constructed and the size of the timbers required is asked for; an incline is to be put in and the superintendent wishes to know whether a certain sized engine will raise two carloads of logs and whether a certain size of cable will be strong enough; the foreman wants to know how many gallons of oil there are in the circular tank at the back of the donkey when the oil is at a certain level; the manager wishes to buy an adjacent tract of timber and asks for a cruise of the stand of timber; the scaler is sick and requests the engineer to take his place for a day or two; one of the foundations of a bridge has been washed out and he is asked how best to replace it; a new forest policy for the state is suggested and the logging engineer, as he has attended a forest school, is asked for some technical advice on the question by the president of the company. Of course all of these questions may never be asked one man, but he will, in the course of his work, encounter many of these or similar ones.

As he works into the organization of the company and gains the confidence of the superintendent and foremen, he will be called upon more and more for advice, and hence he should be constantly fitting himself to meet the occasion.

The Training of a Logging Engineer

The next question which arises in the mind of a young man intending to become a logging engineer is, how may he best fit himself for this work?

There are two routes open. One way is by gaining the necessary knowledge and experience in actual work and the other is by technical training. Neither way alone will give the best results. Many successful men in the industry at the present time have acquired their knowledge entirely by hard knocks in the world, but if their ability had been backed



THE OVERHEAD SYSTEM—A PROBLEM SOLVED BY LOGGING ENGINEERS

by technical training they might have reached higher goals. On the other hand technical training with no experience is a great deal worse than the experience with no technical training, for it means a mass of ideas with no practical knowledge of how to apply them. For this reason there are but few managers who would not rather trust their business to the man with experience; for they know that the experienced man will accomplish the task even though it may not be done in the most efficient manner possible. The beginner should then strive for both training and experience. He should get his training while he is young and can easily and quickly learn and while his character is being moulded. After obtaining the required prerequisites he should attend some school teaching logging engineering. The broadening subjects in english, mathematics and the allied science subjects, should be pursued for a time which will be the foundation of later work. These courses will give him ability to express himself in public and among his fellows and at the same time will give his mind the capacity to assimilate larger subjects. While taking these courses he may argue that they have no bearing on his case, but his opinion will usually be changed after getting out into actual work, unless it may be that he did not take enough of them to give him breadth of vision sufficient to see their need. This lack will soon show as he progresses in his profession. If he has not the stamina to conquer a good stiff course he has not the tenacity to stick to a forty of timber until the best route for opening it up is found.

Of course a good deal of training in surveying is necessary so that it becomes a tool which he can use as easily as a compass or an axe.

A knowledge of the timber side of the business, by studying how a tree grows and can be made to grow, its diseases and protection will be part of the engineer's study. He will learn how to get amounts of standing timber by cruising, or amounts of cut timber by scaling. He must deal with trees all his life and should start his training from this viewpoint. If he works for logging companies he will probably never have to plant trees, yet he is a forester as much as is the man who replaces stands, except that he is working at the utilization end of the profession while the other man is working at the reproduction and protective end. As time goes on these two phases of the work are being brought closer and closer together and sooner or later they will be carried on side by side.

One thing the logging engineer should guard against is scattering his training too much. Of course many camps have electric systems and in time a great many will have electric hauling systems, but because of this there is no use in going far into the subject of electrical engineering. A course in physics and perhaps a short popular course in electricity should give foundation enough to study up any problems he may have to meet. Similarly there would be little use in going into bridge designing, for few companies ever have to build anything but small pile or bent bridges. Even though the logging engineer has taken a course in bridge designing he will probably have no use for it in a logging operation for many years.

It would be a far better policy from the standpoint of a company for them to get a consulting engineer, who does that kind of work constantly and is up to date in it, to take the contract for their truss bridges. The logging engineer will be of more value if he is proficient in a few things than if he is an encyclopedia of knowledge on a great many things,

for if he has sufficient breadth of training he can study up any side issues should the need ever actually arise.

At the same time he is gaining his technical training he should be gaining practical experience. Every vacation should be spent in the woods. If he has never had much woods experience it would be well for him to spend his first summer in the National Forest Service. Here he will learn the ways of the woods, how to take care of himself in the forest, how to work in the woods, and at the same time not have to stand the long hours of a logging camp, nor be thrown in with the rough characters sometimes found there.

The next summer, however, he should break into a logging operation in whatever capacity he is physically capable. He might get on the surveying crew as axe man or chainman, or he might get in as a whistle man, a swamper, or a grader.

The following year if he is sufficiently mature he might well get a job on the rigging or around the donkey. If he is still at the growing age and is not strong and hardy he should not attempt this as it is a "man's size" job. Some time in his career he should get experience in handling the rigging and machinery of a logging operation for it will prove valuable should he ever rise to an executive position.

Upon leaving college the embryo engineer should try to get work upon some engineering party in a logging company and gain more experience in this sort of work, or if he is unable to get such a position further experience gained along the operating side of the work will not be valueless.

In work after leaving college a notebook should constantly be kept for jotting down information about the industry, the cost of a certain spur, the cost of a certain bridge, output of yarders, etc. No one can tell when such information may be valuable.

In line with fitting himself for his work he should keep up to date on the improvements in the industry. This can be done to a certain extent by taking the two lumber trade journals published on the coast, *The Timberman*, and the *West Coast Lumberman*. If possible the sessions of the Pacific Logging Congress should be attended. From time to time different up to date operations should be visited, as many new points can be learned in this way. It is broadening to travel about and see the many different ways in which things may be done.

The Life and Future of the Logging Engineer

After all of this training what sort of a life does the logging engineer lead and what may he expect of the future? In other words, what are the advantages and disadvantages of being engaged in such a profession?

In the first place, the logging engineer leads a life which will certainly not appeal to every person. The greater part of his time is spent out of doors in the open and many times he must work out in all kinds of weather. He will be expected, the same as everyone else in the operation, to put in ten hours of work six days in the week, and at the same time will have to use his head as well as his muscle. He will have to live in a camp which may be comfortable, yet lacks some of the things which he has been accustomed to believe the necessities of life. He will have to eat at the common table, and while the food may be wholesome and good, it will be cooked in huge masses and will not have the appetizing flavors that a good housewife can put into it. He will have to mix with

men of all ages, nationalities, and characters, be at home with them and yet not be pulled down by them. In a word he will encounter a set of conditions which may not be of the type which he likes.

Hence, if he has not a great liking for the work and is not adapted to it he had better go to making suits, repairing watches, selling groceries or automobiles, or preaching sermons, for he will never succeed where his interest does not lie.

Life for nearly every person who does not inherit a fortune or a "pull" means work; work often repeated becomes drudgery, and the conditions surrounding the work irksome, unless viewed in the proper light.

The life of the logging engineer has many compensations. It is one of the most healthy lives that can be led. A man tramping over the hills day after day breathing the kind of air which can never be found in a large city will have few of the ailments common to most people. The appeal of the life among the trees and flowers, birds and scenery, is strong to all but the most callous. The work itself is of absorbing interest. New problems which keep coming up every day, each of which must be solved in a different way, constantly keep a man's mind bright and the realization that one is a part of a large business, and a rather responsible and important part, gives him a feeling of self-satisfaction.

The statement is often made that the profession of logging engineering does not permit of home life. This is not true, for many of the engineers are married and live in cottages at the camps or in the small towns nearby, and they can usually spend more time with their families than is often the case with persons engaged in other professions.

The future of the logging engineer depends a great deal upon himself and on the conditions that he encounters. At the present time with many kinds of business blaming the war in Europe, the removal of the protective tariff, the regulation and restriction of freedom of large organizations by the government, the contraction of credit, and so on, for the hard times, a man holding any kind of position had better keep it and a man out of employment had better take whatever he can. Prosperous times are sure to return and with prosperity will come new life in the lumber industry. Many companies who should have an engineer but who, in hard times, try to get along without one, will demand them with the return of better conditions.

Promotion of the logging engineer will depend quite a little upon his executive ability and also upon his ability to mix with the men with whom he has to associate. He should be friendly with the foremen and cooperate with them, for no superintendent will promote a man who can not get along with other men. He should constantly have the best interests of the company at heart. He is an employee of the company, but if he joins with some of the employees in killing as much time as possible and not preventing the many leaks in the treasury as far as he is able he will never get very far.

His first line of promotion will probably be from location of the spurs to general charge of the construction of these spurs. If he makes good at this he may in time be given charge of the landing construction and later perhaps laying of the steel. Then perhaps some morning he wakes up with an offer to become head of a whole operation. As time goes on his salary increases and perhaps he is given a small interest and becomes part of the company.

Such changes come slowly of course, and to some they never come. The industry certainly needs young men who will put themselves into it whole-heartedly; men who are temperate, honest and industrious, and who have the ability will sooner or later be rewarded in good measure.

THE LAY OF THE LAST BULL PUNCHER
(DAN McNEIL)

The sun shone clear on the dying year,
As I strolled down the old skid-road;
The maple leaves, in fantastic weaves
Of riotous color glowed.
A pine-squirrel swore at a scolding jay,
In a fir's deep branches hid,
When I came on the form of an aged man
Who sat on the end of a skid.

His head was bowed in his toil-worn hands;
His shoulders were stooped and round;
A battered old hat near where he sat
Lay on the sodden ground.
The light breeze whirls the snow-white curls
Of his tangled crown of hair;
While the sobs that shook his aged frame
Told a story of deep despair.

"Oh, why do you moan in the woods alone,
My good old man? said I;
"What sorrow or fear hath brought the tear
to bedim your once keen eye?"
"Oh, I mourn for the time when in life's full prime
I was a bull-puncher bold;
And many a load, down this same skid-road
I hauled in the days of old."

"Then I was king of the whole woods-crew,
And I ruled with an iron grip;
And never a slob on the whole d—d job
Dared give me any lip;
But now, alas! those days have passed—
There's no job for me here;
My bulls are all killed; and my place is filled
By a donkey-engineer."

"Instead of my stately team of bulls
All stepping along so fine,
A greasy old engine toots and coughs
And hauls in the turn with a line.
So that's why I'm sad; but for you, my lad,
I'll sing of those days again—
Your heart seems true, so I'll tell to you
How we used to do it then."

His weary old form stood erect and tall,
His eye flashed as of yore;
As with tottering steps and croaking voice
He drove his bulls once more.
"Back, Buck! G-e-e, Spot! Whoa, Mose! Haw, Star!
Steady there, Red! Back, Bright!
Now! Wiggle your tails, you long-horned snails
Or we won't get in tonight."

"Get into your yokes, you lazy blokes,
Old Bill's on deck once more;
And every bull must scratch and pull
As he never pulled before."
So with many strange oaths and hoarse commands,
He staggered along in his dream—
Till, loud and clear, from somewhere near,
Came a donkey-engine's scream.

Bill stopped; at the sight of his agonized face,
My heart with pity bled;
And e'er I could reach his side, he fell
Across the skid-road—dead.
We buried him there on the scene of his past,
His headstone an old fir stump,
With this epitaph scrawled: "Old Bill has hauled
His last turn down to the dump."

—Courtesy Gibson's Limited.

LETTERS FROM THE FELLOWS

New Orleans, Louisiana.

My Dear Fellow Foresters:

Given one healthy body, an average mind and the best undergraduate forest school education in the country, to determine one's future in the world of business. In the first place each graduate must work out the individual components which will determine the extent of his success for himself, and in each case they will be different. Now the "jump" you get towards a future success in business will depend largely upon the effort which is applied to one's work while in college and you can have no very definite idea as to just how much the individual bits of knowledge and information acquired at school will aid you when you get out of school.

"And then you can't always sometimes tell" just the line of work you will follow and the location thereof, when the college ties are broken. If a person had told me four years ago that upon graduation I would locate in the Southland I would have immediately replied that such a person had had a pipe dream; three years ago I would have said such a person was badly mistaken; two years ago the answer would have been the "possibility is slight"; but a year ago when opportunity presented, it was immediately considered.

Time after time during the course of my forest school training I heard uttered by fellow students, and said myself on numerous occasions: "Well this course or this assignment does not amount to much and so I'll just slide through it." And just as many times since taking this position I have wished that I had paid a certain point a little more attention or had saved a certain reference, or had tried to secure a copy of a certain article at the time.

Little did I think when taking Wood Technology that I would ever be called on to make an application of the distinction between white oak and red oak, or to identify many of the different kinds of hardwood and in like connection with numerous other points I have found such information exceedingly useful. The point I am trying to bring out is that if a course of study is worth pursuing, it is worth all the effort which such a course requires for a proper pursuance of same.

Another practice which I think every forestry student should follow up is a careful study of the lumber and forestry journals and publications. They are real text books when intelligently studied. Read them systematically and subscribe to two or three of the more prominent ones. Save every copy for future reference. I have found this practice on my part of inestimable value and have gone back to them to inform myself on some point, long after I supposed that I had gotten all I had need for, from that issue.

Study trade conditions, and learn who the big men are in lumbering and forestry. I believe that an innovation which could be carried out with much success and profit to all foresters would be a questionnaire, supervised by the Forest School Faculty. This would consist in any one

asking anyone else who such a person of prominence in the lumbering or forestry industry is, what a certain movement is, what is the purpose and name of various organizations, etc. Such a class or meeting carried on in a parliamentary manner would be worth many times the effort and time thus spent. Study the business methods of leaders in these lines and find out why they hold the positions they do. If some new idea is presented, do not take somebody's word for it, but analyze for yourself the advantages and disadvantages which present themselves to the scheme.

One of the most helpful things to me at present is a carefully kept loose-leaf pocket note-book. This I started early in my college course and have endeavored to keep up to date all the time. In this I have kept cost-data of all kinds, concise bits of information dealing with any points which I thought might be profitable, and a directory of persons and concerns who are affiliated with the lumbering industry.

Try to lay out a plan of study and observation and follow up same conscientiously. One can accomplish twice the amount of work in the same time if you go about it with a definite plan.

Now, this sounds a great deal like "preaching," but I thought it might be of interest to those now pursuing forestry and lumbering courses if they could see what points had proven of advantage to a person who has completed the course, and also note the points which might have been followed more intensively with greater advantage, and I trust this little article may be of help to some one now taking a forestry course.

Now, as to the work I am engaged in here in the South. No doubt some of you will be interested in just what my duties are here, since I believe my work is slightly different from that most of the Washington forestry graduates enter.

I am engaged by the Panama Canal as an inspector for all classes of lumbering products going ahead for use at the Canal. We have a force of six men and a Chief Inspector (who, by the way, is Mr. H. P. Wyckoff, a Seattle boy). The greater volume of our inspections covers pine lumber of all kinds, sizes and dimensions, cypress, oak, lesser quantities of other hardwoods and creosoted material. I have also been detailed and "educated" to the inspection of oils, greases, kerosene and other miscellaneous products which go forward in lesser quantities. The actual inspection part of the game, while most important, is the easiest part of it, and diplomacy is the virtue which must be exercised at all times to prevent the ever impending friction incident to the work.

There are pleasantries in the work, too, incident to the travel to different Coast and Gulf cities and the coming in contact with many big men in the world of industry, which is always interesting and helpful.

New Orleans is a quaint and historic city, with a pleasing air of hospitality, but the Northwest country appeals to me most and I hope to return there in the not too distant future.

I extend my best wishes to the Washington "Foresters," and stand ready at all times to help out any progressive movements of the school.

Sincerely,
J. S. Williams.

616 Whitney-Central Building,
New Orleans, Louisiana.

Tete Jaune, B. C., March 24, 1915.

Dear Forest Club Bunch:

This answer to your committee's letter dated March 6th has been delayed till now on account of my absence in the field.

First, let me extend to all you "timber beasts" of Washington my sincere best wishes that you find satisfaction in your chosen profession. After all, fellows, we who work for wages get little else out of our work other than solid satisfaction and occasional moments of real happiness when we accomplish some difficult task successfully.

But I am wandering from the real business of this letter as per the instructions of the committee which were, I believe, to furnish a statement of activities entered into during the past year. For the past two months I've been located here in the Tete Jaune District, which embraces some eight thousand square miles of good British territory lying in the northern interior of British Columbia. The Germans haven't invaded us yet and we'll be ready for 'em when they try.

The greater portion of this District may be classed as absolute forest land, there being only a very limited amount of agricultural land in the narrow valleys of the Fraser, Canoe, and Thompson Rivers. There are something over one thousand timber limits within the area mentioned, held by private parties, which are roughly estimated to carry a stand of about ten billion feet. These limits represent, of course, only a small portion of the merchantable forests.

As yet comparatively little logging has taken place here on account of lack of transportation, but now as soon as the present financial stringency incident to the European War lessens up rapid development of the lumber industry is to be expected. The Grand Trunk Pacific and the Canadian Northern Pacific Railways are practically completed through the District and with these ample means of transportation the industry should prosper.

Prior to being assigned to this District, I was acting as assistant to the District Forester at Fort George, which lies two hundred miles west of this point.

The B. C. Forest Service is a young institution, but during the three years of its existence a great improvement has been made in the protection, administration, and management of the Provincial forests. The Chief Forester, Mr. MacMillan, is a man of resource and action and is supported by an able set of assistants.

Well, fellows, I guess I have peddled enough to partially satisfy the committee; with greetings and best of luck till we meet, I am,

Yours sincerely,

P. S. Bonney, '13, District Forester.

Olympia, Wash., March 13, 1915.

Members of the Forest Club:

The following is what I think of the work in the U. S. Forest Service:

"Since 1911 I have been continually with the Forest Service upon work that has been quite varied as well as greatly instructive. For two years I was assigned to the District Office at Portland, the greater

amount of my time being put upon silvical studies, mainly securing yield, growth and volume data on the principal species of Washington and Oregon. In addition, planting experiments were started under my supervision on the Siuslaw and Snoqualmie National Forests which are now examined at stated intervals by the investigative force of the District. For the past two years I have been engaged in intensive reconnaissance work mainly, in 1913 on the Cascade National Forest, and since then on the Olympic National Forest.

Work in the Forest Service to me has been both agreeable and instructive. It offers a great variety of conditions and it enables one, if so inclined, opportunities for further study and advancement along forestry subjects. Regarding the financial aspects of Forest Service work, I feel that the opportunities are no more limited than in private work.

Sincerely yours,

Edward J. Hanzlik, Forest Examiner.

State College of Washington, Pullman, Wash., March 24, 1915.

Members:

It is a real disappointment in not being able to finish the paper on "Teaching," which I had begun for our annual. (I may call it ours, may I not? For I am still one of you.) Due to several reasons it is impossible for me at the present time to complete it, and I feel that the publication of the "Annual" has already been delayed past all endurance of any ordinary person.

Perhaps in a few lines I may be able to tell of the first seven months of teaching. The University of Washington's catalogue does not, I believe, give a group in its listing of the Forestry College, of teaching. Yet the regular four years scientific course contained enough botany so that I had enough understanding of it to be able to teach botany. Often you will hear men in the class say, "What good will this botany do me?" or "What good will this subject do me?" There is nothing that is learnt that is not at some time just what we want. The broader our education, the broader the understanding of life. To enjoy life we must understand it and in the understanding there must be known the Laws of Nature and its Forces.

Looking back upon the five years lived at the University there is always a tinge of disappointment due to not seizing the opportunities that were all around me. No doubt these last few words you know by heart, having heard them often said. But it's true. Right among you are opportunities, advantages, and men that are well worth your while. Get them now, for they go and when gone the realization is too keen.

Besides the teaching, I am taking advance work under Dr. F. L. Pickett, and Dr. F. D. Heald. Both men know their subject, and in saying "know," I mean it. One of the best lessons I have had, has been in seeing Dr. Pickett use his mind. Perhaps you wonder at this, but it's true. For when he makes a statement he has proof, that's quite a thing, do you know it? Let the person who "guesses" at things say something, then beware, for if the "guesser" has not the facts it would have been better not to have "guessed." Dr. Pickett's examinations are not those that can be answered by mere memory work. No. The subject must be turned over in the mind. Do you know what that means? Yesterday in speaking

to a class before giving a "quiz," he told them that if they began in a rambling manner they indicated to him that they did not have it at all. But then I have heard many a time, your Dean and mine say the same thing. There again is where you men at Washington are fortunate in having such a man at the head of your College of Forestry. He is not only a teacher but also a friend. If you have not known him before, now is the time to begin. Do you realize what it means to have a friend?

It is from him that I received the ideas in teaching that have been of greatest advantage to me this year. Each person is a unit, each person is different, and to get the best from them, each must be understood differently. This not only applies to those teaching, but to any line or branch you may enter, whether it be logging, government, private or salesmanship. A full understanding of character is needed for obtaining the best results. At times this may be doubted, especially when one is looking from a twenty-story window down upon the people in the street or reading of the loss in a battle. But then, go and be among that crowd or in that battle and conditions are reversed. Why? I am leaving that to you.

The period is now up, you are all anxious to be out and at something else. In parting I wish you a most successful year. The Seniors in their field trip, who may be dreading it, but when you return you will be happy in the experience. There you will learn to know your classmates, you may think you do now, just wait, the heart is what counts. Don't worry about the things to be missed that are to take place on the campus and about it, for they are trivial to the *real* things, the *big* things of life. You are perhaps asking what constitutes the last two? Only you can find out. I might tell you, but you would only laugh and say "Oh pshaw!"

To you Freshmen whose eyes have been partially opened to the things that are around you in this nice, big, interesting world. Myriads of things, never dreamed of or realized before, exist. Keep on, let nothing interfere with your college work. Build for the future for the revelation of the middle years are to be yours only so far as you now build.

You are asking "Where has he been through out this letter, nothing about teaching." Think it over.

G. Hamilton Martin, Jr.,
University of Washington, '13.

ALUMNI AND EX-STUDENTS

The following list of alumni and ex-students is not complete. Additions and corrections will be appreciated as we desire to keep a complete, accurate list of former students. The information following each name is: (1) Degree, (2) home address, (3) present address, (4) occupation.

CLASS '09

Jackson, A. G., M. S. F. (A. B., Syracuse), Margaretville, N. Y.; 6561 16th Ave. N. E., Seattle; Forest Examiner, Snoqualmie National Forest.

CLASS '10

Johnson, H. M., M. S. F. (A. B., Univ. Cal.), Los Angeles, Cal.; Hebo, Ore.; Forest Examiner, Siu-slaw National Forest.
Pope, C. R., M. S. F., (B. S., Bellevue, Col.); Xi Sigma Pi; Hoxsie, Kan.; Mt. Vernon, Wash.; Logging Engineer, English Logging Co.

CLASS '11

Chloupek, E. H., B. S. F., Manitowoc, Wis.; Eagle Gorge, Wash; Grader, Page Lumber Company.
Hanzlik, E. J., B. S. F.; Xi Sigma Pi; 214 W. 20th St., Olympia, Wash.; Forest Examiner, Olympic National Forest.
Keith, C. B., B. S. F.; Xi Sigma Pi; Seattle, Wash.,; Tacoma, Wash.; Timber Brokerage.
Leve, W. H., B. S. F.; Seattle, Wash.; Detroit, Ore.; Forest Examiner, Santiam National Forest.
Treen, Lewis A., B. S. F.; Xi Sigma Pi; Seattle, Wash.; Deputy Supervisor, Snoqualmie National Forest.

EX-'11

Brinkley, J. A., Xi Sigma Pi; Seattle, Wash.; Assistant Forest Ranger.

CLASS '12

Anderson, Clarence, B. S. F.; Xi Sigma Pi; Hoquiam, Wash.; Seattle, Wash.; Forest Ranger, Snoqualmie National Forest.
Douglas, R. W., M. S. F. (A. B., Univ. of Mich.); Prineville, Ore.; Forest Clerk Ochoco National Forest.
Elich, Walter H., B. S. F.; Chicago, Ill.
Gronald, Bror L., M. S. F. (A. B., Bethany College); Xi Sigma Pi, Sigma Xi; Lindsborg, Kan.; 5418 5th Ave. N. E., City; Instructor in the University of Washington, College of Forestry.
Ottestad, J. W., B. S. F.; Xi Sigma Pi; Blaine, Wash.; Seattle, Wash.; Consulting Forest Engineer with the firm of Root & Ottestad, at present with the U. S. Indian Service.
Stamm, S. A., M. S. F. (B. S., Ohio Northern); Xi Sigma Pi; Hamilton, Wash.; Logging Engineer, Hamilton Logging Co.

EX. '12

Ballard, D. D., Xi Sigma Pi; 201 20th St. N., Seattle, Wash.; Insurance, Arcade Building.
Brown, A. H., 2208 Marion St., Seattle, Wash.
Gustafson, R. R., 2003 Franklin Ave., Seattle, Wash.; With Ravenna Lumber Co.
Harmelling, H., Xi Sigma Pi; Bakersfield, California.
Hedlund, D. A., B. S. Civil Engineering; 815 S. Lincoln St., Spokane, Wash.; With the Hedlund Shingle and Box Co.
Odell, W. T. (A. B., Princeton); Engineer, Tomkins Cove, New York.
Pendleton, R. L., Everett, Wash.; Stillwater, Wash.; Cherry Valley Logging Co.
Schoenfeld, Wm., 2657 West 87th St., Seattle, Wash.; P. O. Clerk, Station B.
Ward, E. V., Bend, Oregon; Commission Business.
White, R. F., Xi Sigma Pi; Seattle, Wash.; With Schwabacher-Nettleton Lumber Co.
Whitney, Wendell, Xi Sigma Pi; LaConner, Wash.

CLASS '13

Bonney, P. S., B. S. F., Xi Sigma Pi; Victoria, B. C.; Tete Jean Cache, B. C.; District Forester.
Ericson, Oliver, M. S. F. (A. B. Bethany College); Xi Sigma Pi; Chelan, Wash.; Forest Ass't, Chelan National Forest.
Graham, Paul, B. S. F., Alamosa, Colo.; Yard Manager, Graham Lumber Co.
Hutton, G. W., M. S. F. (Yale), Xi Sigma Pi; 755 Pettygrove St., Portland, Oregon; Olympia, Wash.; Forest Ass't, Olympic National Forest.

Langdell, Louis, B. S. F. (A. B., Dartmouth); Portland, Ore.; With S. P. R. R. **Martin, G. H., B. S. F.**, Xi Sigma Pi; 1629 Cincinnati St., Spokane, Wash.; Instructor in Forest Pathology, Washington State College, Pullman, Wash.

Morgan, Joseph, B. S. F., Xi Sigma Pi; 428 Belmont Ave., Seattle, Wash.; Consulting Logging Engineer.

Murnen, E. J., B. S. F., Xi Sigma Pi; 2910 N. Union Ave., Tacoma, Wash.; With Weyerhaeuser Timber Co. at Shelton, Wash.

Schoeller, J. Diehl, B. S. F., Xi Sigma Pi; 2632 Kenwood Ave., Los Angeles, Cal.; Assistant State Forester of California.

Wright, Newell L., B. S. F., Xi Sigma Pi; Bellingham, Wash.; Assistant Logging Engineer, Bloedel-Donovan Lumber Co; At Present With the U. S. Indian Forest Service.

EX. '13

Cahill, W. S., Xi Sigma Pi; 4817 N. Pauline St., Chicago, Ill; Seattle, Wash.; Timber Inspector, Port of Seattle.

Gibson, E. J., Xi Sigma Pi; East Sound, Washington.

Greider, C. E., Xi Sigma Pi; Seattle; Forest Service, Portland, Oregon.

Redman, Kenneth, Xi Sigma Pi; Creosote, Wash.; Experimental Engineer, Pacific Creosoting Co.

Williams, W. H. G., Port Blakeley, Wash.; Lumber Inspector, Port Blakeley Mills.

CLASS '14

Billingslea, J. H., B. S. F., Xi Sigma Pi; Westminster, Md.; Ass't, Forest Ranger; At Present in Scotland.

Escher, W. E., B. S. F., Xi Sigma Pi; Seattle; Instructor in Manual Training, Seattle Public Schools.

Garvey, C. E., M. S. F., Xi Sigma Pi; 644 29th St., Milwaukee, Wis.; Pittsburg, California, with Redwood Mfg. Co.

Gilbert, Geo. W., B. S. F., Xi Sigma Pi; Seattle, Wash.; With U. S. Indian Service.

Klobucher, F. L., B. S. F., Xi Sigma Pi; Ranger, Snoqualmie National Forest.

Macauley, N. G., B. S. F., Deming, Wash.; Forest Ranger, U. S. Forest Service.

Mercer, B. F., B. S. F., R. F. D. No. 3, Box 165, Seattle, Wash.

Monks, H. L., B. S. F., Xi Sigma Pi; Bonners Ferry, Idaho; With Bonners Ferry Lumber Co.

Mueller, M. L., B. S. F., Xi Sigma Pi; 1616 E. 65th St., Seattle; Logging Engineer, With Portland Lumber Co., Portland, Oregon.

Stinson, H. C., B. S. F., Xi Sigma Pi; Seattle; Forest Ranger, Snoqualmie National Forest.

Welch, A. E., B. S. F., Xi Sigma Pi; Hobart, N. Y.; Shingle Inspector, Puget Sound Mills and Timber Co., Port Angeles, Wash.

Williams, J. S., B. S. F., Xi Sigma Pi; Jeffersonville, Ohio; Timber Inspector, U. S. Panama Canal Commission, New Orleans, La.

EX. '14

Durland, C. A., 903 Norfolk Ave., Norfolk, Nebraska; Assistant Supt. Norfolk Bldg. and Loan Association.

Harpham, E. E., Olympia, Wash.; Forest Service, Olympia, Wash.

Dorman, H. S., 3019 Broadway, Everett; Draughtsman, Sumner Iron Works.

EX. '15

Cooper, J. G., Hoquiam, Wash.; With Raymond Lumber Co., Raymond, Wash.

Gorham, Geo. C., Seattle; Forest Service, Experimental Station, Quincy, Cal.

McGillcuddy, C. O., 907 N. L Street, Aberdeen, Wash.; Inspector, Greenwood Timber Co.

Schmaelzle, K. L., Xi Sigma Pi; Timber Inspector, Panama Canal Commission, New Orleans, La.

EX. '16

Negley, C. L., Hagerstown, Md.; Guard, U. S. Forest Service, Bend, Oregon.

EX. '17

Hobi, F. D., Aberdeen, Washington; Logging.

SPECIALS

Gibbons, W. H., Seattle, Wash.; Timber Appraiser, U. S. Forest Service, Portland, Oregon.

Johnson, Ham, Seattle, Wash.; U. S. Indian Forest Service, Tacoma, Wash.

Kistner, B. H. G., Humptulips, Wash.; Logging Engineer.

McKibbin, V. M., Xi Sigma Pi; Seattle, R. F. D. No. 1.

Smith, Kau., Sumpter, Oregon; Forest Examiner, U. S. Forest Service, Ketchikan, Alaska.

ROSTER OF STUDENTS

GRADUATES

Beard, Frank W., B. S. F., University of Minnesota, '11; Minneapolis, Minn.; Xi Sigma Pi; Dominion Forest Service, '11, '12; British Columbia Forest Service, '12, '13.

Caywood, Noel F., B. S. F., University of Washington, 1913; Everett, Wash.; Xi Sigma Pi; Entered from the University of Puget Sound, Tacoma, '10; Cross-

country, '10, '11, '12; Snoqualmie National Forest, '11, '12, '14; Sultan Logging & Timber Co., Everett, '13; Brooks, Scanlon, O'Brien Co., Vancouver, B. C.

Jilson, W. R., B. S., New York State College of Forestry, '12; Syracuse N. Y.; Transferred to Geology at beginning of second semester; Graduate Assistant in the Geology Department, U. of W.

Ottestad, J. W., B. S. F., University of Washington, '12; Blaine, Wash.; Consulting Forest Engineer; Temporarily with Indian Forest Service, Quinault Indian Reservation; Xi Sigma Pi.

Schneider, Isaac, B. S. F., University of Washington, '14; 5011 Brooklyn Avenue, Seattle; Entered from Ohio State University, '12; Guard in Forest Service, '12, '13; U. S. Reclamation Service, '14.

CLASS '15

Burris, Michael M.; Seattle; Xi Sigma Pi; Entered from Michigan Agricultural College, '13; Guard, Olympic National Forest, '14.

Cook, Arthur F., 1604 E. Harrison St., Seattle; Xi Sigma Pi; Forest Club Literature Committee, '13, '14; U. S. Geological Survey, '10, '11, '12; Reconnaissance, Snoqualmie Forest, '13, '14.

Evans, W. Vincent, Livingston, Mont.; Entered from George Washington University; Xi Sigma Pi; Forest Guard, '12, '13; Asst. Forest Ranger, Absaroka Forest, '14.

Foran, Harold G., 9317 57th Ave. S., Seattle; Tyes Tyon; Class Treasurer, '12; Class Football, '11, '12; Class Track, '11, '12; Forest Club Athletic Committee, '14; President Forest Club, '15; Class Athletic Manager, '15; Senior Council, '15; City of Seattle, Cedar Falls, '12; C. W. Harris, Spirit Lake, Idaho, '13; U. S. Indian Service, Union City, Wash., '14; Vice-President-elect, A. S. U. W., '15-'16.

Regstorff, Erwin, Enumclaw, Wash.; Entered from College of Engineering, University of Washington, '13; Sub-Contractor, Wright Contract Co., Rossmusson's Shingle Co., '13; Scaler and Clerk, Brown's Bay Logging Co., '14.

Schmitz, Henry, 4300 Alki Ave., Seattle; Xi Sigma Pi; Sigma Xi; Vice-President, Forest Club, Program Committee, '15; U. S. Forest Service, '14; Student Assistant in Botany, '15.

Sternberg, Henry B., Colorado Springs, Colo.; Xi Sigma Pi; Entered from Colorado School of Forestry, 1913; Colorado College, '12, '13; Class Football, '13, '14; Clearwater Forest, Idaho, '13; Olympic Forest, '14.

Watson, Russell, White Bear, Minnesota; Xi Sigma Pi; Entered from University of Minnesota, 1910; Silvical study of yellow pine in Oregon, '10; yield table study of Douglas fir in Wash. and Oregon, '11; silvical study of western hemlock, '12; intensive and extensive reconnaissance, Wind River Experiment Station, Washington, '13; extensive reconnaissance in Alaska and intensive reconnaissance in Oregon, '14; irrigation surveying in Texas, '15.

Young, L. Pierce, Seattle; Entered from Colorado School of Forestry, '13; Class football, '13, '14; Wrestling squad, '15; Monument forestry nursery, Monument, Colo., '11-'12.

CLASS '16

Barrett, Phillip E., Tacoma, Wash.; Xi Sigma Pi; Class Vice-President, '13; Class Treasurer, '14; Cross country, '12, '13, Captain, '14; Secretary Tacoma Club, '13; Vice-President, '15; Forest Club Program Committee, '15; Guard, Rainier Forest, '12; Carlson Logging Co., Hoquiam, Wash., '14.

Brown, Edward, Wilkes-Barre, Pa.; Entered from Forestry Dept., Penn. State College; Wrestling coach, University of Washington, '15.

Broxon, Donald R., Boise, Idaho; Xi Sigma Pi; Entered from University of California, '14; Survey work, Boise, Idaho, '09, '10; Los Angeles, Cal., '12.

Burnham, Roland P., Boulder, Colo.; Entered from the University of Colorado, '14; Rifle Club, '15; U. S. Geological Survey and city work, Boulder, Colo., '14.

Clark, Donald H., Three Pines, Oregon; Xi Sigma Pi; Forest Club Program Com., '14; Executive and Annual Committees, '15; Scabbard and Blade; U. S. Kelp Survey, Alaska, '13; Siskiyou Forest, '15.

DeCamp, Lee R., Lansing, Mich.; Xi Sigma Pi; Left at end of first semester to work as ranger on Sequoia Forest, California.

Durfee, Harold A., Hollywood, Cal.; Xi Sigma Pi; Class track, '13, '14; Executive Comm. Forest Club, '14; Chairman, '15; Annual Committee, '14; Chairman, '15; Mineral Lake Lumber Co., '12; Field Asst., Snoqualmie Forest, '13; Field Asst., Olympic Forest, '14.

Faulkner, Ralph B., Aberdeen, Wash.; Forest Club Social Committee, '15; Glee Club, '13, '14; Logging Camp, B. C., '13; U. S. Indian Forest Service, '14.

Hutton, James F., Portland, Oregon; Xi Sigma Pi; class football, '13, '14; Class crew, '14; Literature Committee, Forest Club, '15; Varsity Boat Club; Oregon Club; Forest Guard, '13; Asst. Forest Ranger, Olympic Forest, '14.

Madigan, Fred H., Seattle; Class Track, '13; Sub-Varsity Football, '13, '14; Class basketball, '13; class baseball, '14; Forest Club Athletic Committee, '12 (chairman), '13; Chairman Executive Committee, '15; Editor, Forest School Edition, U. of W. Daily, '14; Associate Editor U. of W. page, Seattle Times, '15; Varsity Rifle Team, '15; Junior Day Committee, '15; Forest Club Publicity, '15; Chokerman, Puget Sound Mills & Timber Co. and Clear Lake Lumber Co., '12, '13; Rigging slinger and handy man, Willapa Logging & Timber Co., '14.

Muncaster, Roy, 4503 17th Ave. N. E., Seattle; Entered from Colorado School of Forestry, '14; Class Boxing Team, '15.

- Studley, J. Donald**, Seattle; Junior Day Committee, '15; Guard, Snoqualmie Forest, '13, '14.
- Waterhouse, Frank G.**, Warrenton, Ore.; Varsity Boat Club, Freshman Crew, '12-'13; Treasurer Oregon Club, '13-'14; Literature Committee, Forest Club, '13-'14; Secretary-Treasurer, Forest Club, '14-'15; Boxing Club, '15.
- Westerberg, J. Frederick**, Mill Valley, Cal.; Badger Debating Club; Scandinavian Club; Cosmopolitan Club, Treasurer; Prohibition Club; Smith-Powers Logging Co., Marshfield, Ore., '13; Reconnaissance, Plumas Forest, '14.
- Young, J. Arthur**, Seattle; Varsity Rifle Team, '15; Guard, Snoqualmie Forest, '13; Alumni Committee, Forest Club, '12.

CLASS '17

- Alexander, J., Beverly**, Sedro-Woolley, Wash.; Varsity Boat Club, Scabbard and Blade.
- Anderson, Albert C.**, "The Badgers," Colton, Oregon; Class football, '13, '14-Vice-pres. and Corresponding Secretary of Intercollegiate Ass'n of Forest Clubs, '15; U. S. Forest Service, Snoqualmie Forest, '14.
- Anderson, Lee N.**, 4522 18th Ave. N. E., Seattle; Entered from the University of Nebraska, '14; Capt. Varsity Rifle Team, '15; Stimson Mill Company, '14; withdrew in April to enter Landscape Gardening business in Lincoln, Neb.
- Ault, Byrd M.**, Enterprise, Oregon.
- Bevan, Arthur**, Forest Branch, Victoria, B. C.; Cross country, '13, '14; Forest Club Executive Committee, '14; Annual Committee, '14; British Columbia Forest Service, '12, '13, '14.
- Blunt, Joseph R.**, Tacoma, Washington.
- Brindley, Ralph**, Boscobel, Wis.; Entered from the University of Wisconsin, '14.
- Brooks, Fred E.**, Seattle, Washington.
- Browning, Harold A.**, Los Angeles, Cal.; Cross country, '13, '14; Chairman, Annual Committee, Forest Club, '15; Fire Warden, Angeles Forest, '08-'10; Asst. Ranger, Plumas Forest, '11-'13; Telephone Construction, Olympic Forest, '14.
- Cochran, Lamont M.**, 209 13th Ave. N., Seattle; Rifle Team, '15; Michigan Pacific Lumber Co., Victoria, B. C., '13.
- Erickson, Harry**, Hoquiam, Washington.
- Fish, Harold W.**, 4706 14th Ave. N. E., Seattle; University Orchestra; Logging Camp, '13; U. S. Reconnaissance, '14.
- Gardner, William K.**, North Bend, Washington.
- Gillespie, James T.**, Albany, Mo.; Class football, '15; Guard, Snoqualmie Forest, '14.
- Hanson, Harley I.**, Grand Forks, N. D.; Cedar Lake Logging Co., '13; Left school at end of first semester.
- Jaegar, Waldemar**, Seattle, Washington.
- Knapp, F. Roy**, 923 24th Ave. S., Seattle; Literature Committee, Forest Club, '15.
- MacCullough, Robert S.**, Seattle, Wash.; Left during first semester.
- McAdams, Richard**, 4705 18th Ave. N. E., Seattle; Wrestling squad, '13; Lake Reilly Mill Company, '13.
- McClure, Procter M.**, Sedalia, Mo.; Left during first semester.
- McDougall, Edmund H.**, Edmonton, Canada; Entered from the University of Alberta, Canada, '14; University Band, '15.
- McHenry, Lloyd A.**, Baldwin City, Kansas; Entered from Baker University, '14.
- O'Brien, George W.**, Vancouver, B. C.; Annual Committee, '15; class football, '14; Gulf Lumber Co., '10; B. C. Land Survey, '11-'13; U. S. Geological Survey, Bratton & Lawbaugh; U. S. Pacific Lumber Co., '12; Continental Logging & Timber Co., '14; Withdrew in February to take up work with lumber company.
- Reavis, David B.**, Enterprise, Oregon.
- Rostedt, Roy V.**, 8408 South G Street, Tacoma, Wash.; Withdrew in February; Secretary, Fern Hill Lumber Co.
- Stephens, James T.**, Spokane, Wash.; Cross country, '12; class football, '12; wrestling squad, '12, '15; guard, Crater Forest, '13, '14; Ranger, '15.
- Thompson, George W.**, Special, Marion, Ohio; Xi Sigma Pi; Entered from Biltmore Forest School.
- Torkelson, Timon J.**, Astoria, Oregon; Entered from Willamette University; Printing, '12, '13, '14.
- Wright, Clifford**, Portland, Oregon.

CLASS '18

- Balmer, Jesmond D.**, Cle Elum, Wash.; Class basketball, '15.
- Boyle, Kenneth R.**, Tacoma, Washington.
- Brady, Charles C.**, Long Beach, Cal.; Guard, Cleveland Forest, '12; Star Lumber & Mill Co., Long Beach, '13; Land Classification, Rainier Forest, '14.
- Bristol, Maurice A.**, E. 118 Indiana Ave., Spokane, Washington.
- Corbitt, Willis G.**, 1009 N. 42nd St., Seattle; Annual Committee, '15.
- Coyle, William J.**, 3412 E. Howell St., Seattle; Pacific States Lumber Co., '14.
- Davis, A. J.**, Seattle; Left at end of first semester.
- Elzy, Arthur S.**, 3315 Rockefeller Ave., Everett, Wash.; Athletic Committee, Forest Club, '15; Snohomish County Surveying Crew, '12; U. S. Forest and Indian Reservation Survey, '13; Weyerhaeuser Timber Co., '14.
- Fogelquist, Carl**, Selah, Washington.
- Garrett, Clarence B.**, 5704 16th Ave. N. E., Seattle; Sourdough Club.
- Hicks, Donald E.**, Seattle.
- Jacobsen, William H.**, 969 21st Ave., Seattle.
- Jillson, Frederick F.**, Syracuse, N. Y.; Entered from N. Y. State College of Forestry, '14.
- Keller, William K.**, Redmond, Washington; Stevens Debating Club.

MacKechnie, A. Ross, Port Angeles, Wash.; Varsity Football team, '14; Surveying with C., M. & St. P. R. R., '13-'14.
Morrison, C. V., 756 Broadway N., Seattle.
Gass, Alf., 2117 N. 63rd St., Seattle.
Parker, William A., 4743 19th Ave. N. E., Seattle.
Powers, Victor S., Lincoln, Nebraska.
Rafiuski, Clement J., Thomaston, Conn.; Forest Club Pin Committee, '15.
Roberts, Wesley K., 10520 Longwood Drive, Chicago, Ill.; Forest Club Pin Committee, '15; C. A. Goodyear Lumber Co., Tornoh and Boulder Junction, Wis., '12, '13, '14.
Russell, Josh P., Hamilton, Wash.; Asst. Logging Engineer, Hamilton Logging Co., '13, '14; Special.
Saylor, O. Dean, Spokane, Washington.
Sill, Marion A., Seattle.
Smith, Edward T., Seattle.
So Relle, Wiley A., Seattle.
Stanton, Louis G., 1610 Pacific Ave., Everett, Washington.
Sundholm, Frederick O., Bellingham, Washington; Washington Forest, '12, '13.
Talbert, Harry W., White Salmon, Washington.
Thomas, James, 973 22nd Ave., Seattle; O.-W. R. R. & N. Survey, '13; Hewitt-Lea Lumber Co., '14.
VanWickle, James M., 4847 Alki Ave., Seattle; Varsity Boat Club; Cox, Freshman Crew, '15.
Wirt, William H., North Yakima, Washington.

SHORT COURSE, 1914-15

Chartrand, Lee F., Meadow Creek, Wash.; Michigan State College, ex-'14; Forest Service, Wenatchee, Forest, '12, '13; Simpsons Logging Co., '13, '14; Asst. Ranger, Olympic Forest, '14.
English, Clifford M., 1161 21st Ave. N., Seattle; Entered from the University of Wisconsin.
Hage, Sigmund, 316 32d Ave., Seattle.
Hartsuck, David G., Tumwater, Wash.; Washington State College and University of Oregon; Asst. Ranger, Olympic Forest, '14.
Heilman, Harry P., Decatur, Ill.; Payette Timber & Mill Co., '00; Orchard Land & Timber Co., '11; Columbia Valley Lumber Co., '12; North Coast Timber Co., '13, '14; Secretary-Treasurer, "Short Horns," '15.
Hennig, Harry K., 334 E. 9th St., Portland, Oregon.
Huff, Roland, Halfway, Oregon; Forest Guard, '12; Ranger in charge of grazing on Minam Forest, '13.
Jeffrey, J. H., Newcastle Lumber Mills, Noncose Bay, B. C.; Northwestern University, ex-'02.
Malcolm, Gordon R., 585 Toronto St., James Bay, Victoria, B. C.; Forest Service.
McGillieuddy, Blaine H., Aberdeen, Wash.; President "Short Horns," '15; Sagi-naw Timber Co., Elma, Wash., '10, '11, '12, '13, '14; Polson Logging Co., Hoquiam, Wash., '12; S. E. Slade Lumber Co., Aberdeen, Wash., '14; Jefferson Oil Co., Hoh, Wash., Humptulips Logging Co., Aberdeen, Wash., '14.
McKay, J. W., 210 W. Garfield St., Seattle, Wash.
Parker, Donald C., 9 Shelburne St., Greenfield, Mass.
Powell, Harry A., Forest Branch, Kamloops, B. C.; Short Course, U. of W., '14; Forest Guard, Clearwater, B. C., '14; Field Asst., Forest Branch, Tete Juane Cache, B. C., '14.
Sangar, Owen J., Forest Branch, Victoria, B. C.; B. C. Land Survey, '11, '12, '13; Forest Asst. B. C. Forest Branch, '14; Short Course, U. of W., '14.
Smith, B. F., Tugh Valley, Oregon; Short Course, U. of W., '14; Forest Guard, Deschutes National Forest, Oregon, '14.
Smith, D. H., Box 397, Kamloops, B. C.; Forest Branch, Patrol, '13, '14.
Taylor, Thomas B., care Blakely R. R., New Kamilche, Wash.; Niagara University, ex-'05; Southfork Lumber Co., Tacoma, Wash.; Blakely R. R., Port Blakely Mill Co., New Kamilche, Wash.
Thompson, Jackson, Forest Branch, Victoria, B. C.; Timber and Land Survey, '12, '13, '14.
Wever, W. T., Molson, Wash.
Woodruff, R. E., White Salmon, Wash.; B. S., Whitman College, '11; Mt. Adams Lumber Co., White Salmon, Wash.

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Weyerhaeuser Timber Company
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Puget Mill Company
THOS. BORDEAUX, *President*
Mason County Logging Company
T. JEROME, *Secretary*
Merrill & Ring Lumber Company
B. W. BAWDEN, *Manager*
James D. Lacey & Company



Offices : 1126-7 Henry Building
Seattle, Washington

Report of the President

To the Members of the Washington Forest Fire Association.

Gentlemen:

The annual reports of the Chief Fire Warden of our Association, and of the Secretary and Treasurer of our Association, all as contained herein, set forth quite fully the record for the year 1914.

During no year of the Association's existence has there been so much dry, dangerous weather for forest fires as existed during the months of July, August and September of the year 1914. About the only condition that did not happen, that would be considered unfavorable, was that we did not have very much high prevailing wind. During the months named there was scarcely a drop of rain, and brush fires and ground fires and fires in the slashings of loggers, were more numerous than at any time in the history of our Association, and yet with the close attention that was given to all these fires by the patrolmen of our Association, and by the forest rangers and wardens in the state, and of the Government rangers, as well as the interest taken by the public at large, we escaped almost miraculously from any wide-spread disaster.

The figures show that the total aggregate of all timber fire killed was approximately 30,000,000 feet and nearly all of this can, by prompt attention, be saved from very much depreciation. This loss expressed in figures gives the rather infinitesimal quantity of two-tenths of one per cent of all the green standing timber in the State of Washington.

The season as a whole was one bringing anxiety and grave responsibility to all of the active forces at work in the suppression and control of forest fires, and the exceedingly light loss sustained, pays tribute to an excellent organization, well handled and to a co-operation on the part of our Association with the State Forester and his forces and with the Federal Department, showing a joint and harmonious action that has brought about such beneficial results.

From the very nature of forest fires, it is absolutely necessary to suppress them wherever they are found, and in this way quite a little of the energies of our Association are often directed in suppressing fires in the timber belonging to individuals who contribute nothing for this protection. Our Secretary's report calls attention to this fact, his figures indicating that probably there is a million acres in Western Washington that does not contribute directly to the expense connected with forest fire patrol and protection.

For any owner of timber to accept this kind of service without contributing to the expense certainly indicates a lack of patriotic appreciation of a worthy cause, for our Association, as well as the State, is not only protecting the timber that belongs to its own members, but also protecting every acre of timber that lies in and amongst that of our members and every timber land owner, regardless of whether his holding is large or small, should contribute his just proportion of the expenses incurred in forest fire protection. If he is not willing to do this voluntarily there should be legislation enacted which would compel him to do so.

The thanks of the Association are extended to the State Forest Fire Commission and to the State Fire Warden and all of his deputies as well as to the Forest Service of the United States Government, and to the public at large and especially to the press for the loyal support which has been given our Association in carrying on its work during the season of 1914.

Yours very truly,

GEO. S. LONG, *President,*
Washington Forest Fire Association.

Financial Statements for Year 1914

BALANCE SHEET	ASSETS	DECEMBER 31, 1914
Cash in Metropolitan Bank of Seattle.....	\$	424.22
Assessments Collectible		1,309.04
Equipment, Tools and Supplies		1,362.00
Office Furniture and Fixtures		300.00
Printing and Office Supplies		100.00
		\$ 3,495.26
Surplus:	LIABILITIES	
Balance at January 1, 1914.....	\$	8,825.66
Deduct—Excess of Expenses over Income for Year 1914, as per statement annexed		5,330.40
		\$ 3,495.26
INCOME AND EXPENDITURE ACCOUNT FOR YEAR 1914		
INCOME		
Assessments Levied—2 cents per acre:		
Amount Collected	\$52,073.64	
Amount Outstanding	1,309.04	
		\$53,382.68
Interest received on bank deposits.....		85.00
		\$53,467.68
EXPENDITURES		
Patrol Salaries, Wages and Miscellaneous Ex- penses	\$40,124.83	
Patrol Expenses	4,808.05	
Fire Expense and Extra Labor.....	8,852.08	
Office Rent, Salaries and Expenses.....	2,794.03	
Stationery, Printing and Postage.....	1,048.57	
Depreciation and Maintenance of Equipment, Tools, Furniture and Fixtures, etc.....	1,131.12	
Delinquent Members' Accounts written off.....	39.40	
		\$58,798.08
Balance—Being Excess of Expenses over In- come for the Season 1914, carried to Bal- ance Sheet		\$ 5,330.40

To the Trustees of the Washington Forest Fire Association:

We have examined the books of the Washington Forest Fire Association for the year 1914 and hereby certify that the foregoing Balance Sheet and accompanying Income and Expenditure Account set forth the financial condition of the Association at December 31, 1914, and the result of the operations for the year ending that date.

PRICE, WATERHOUSE & CO.,

Seattle, Wash., January 16, 1915.

Certified Public Accountants.

Secretary's Report, Covering Operations for 1914

The past year has been an active period in the history of the Association. Unusual weather conditions prevailed during the dry season, demanding constant vigilance on the part of everyone connected with the work and also called for larger expenditures for patrol and fire fighting than for any of the past seasons, excepting 1910. Notwithstanding the unfavorable conditions confronted, the Board of Trustees were able to hold down the assessments to 2 cents per acre, which with the balance on hand at the beginning of the year, provided sufficient funds to meet all expenses incurred, and inasmuch as the loss to green standing timber can be set down as nominal, the result of the year's work may be said to speak for itself.

For the season of 1914 there were listed with the Association 2,669,134 acres of timber land, and the membership December 31st consisted of 203 corporations or individuals.

The next cost of operation for the year aggregated \$58,758.68, or 2.20 cents per acre counting membership holdings.

During the year, seven regular meetings were held by the Board of Trustees for the transaction of the business of the Association.

Members have generally made prompt response to call for assessments and it is expected that the amount carried over as unpaid will be collected.

The books and accounts have been submitted to Price, Waterhouse & Company, certified public accountants, for audit and the statements on the foregoing page, prepared by the said firm, contain the income and expense accounts for the year and also show the present financial condition of the Association.

Last year's campaign for new members resulted in the acquisition of twenty-one names to the membership roll, listing 15,908 acres, a rather indifferent result when it is considered that outside of two or three compact holdings, with individual patrol, there are fully one million acres of timber lands held by non-members scattered in and amongst the lands patrolled by the Association, sharing equally in the benefits derived from the work carried on for the protection of the forests, without helping to defray any of the expenses. Oregon has a law upon the statute books which practically makes individual or co-operative patrol of timber compulsory during the dangerous season of the year, and the necessity for a similar legislation in this State is indicated by the continued indifference displayed by many timber owners who, although they realize and admit that patrol of the forest during the dry season is indispensable, are too willing to let others do it.

O. BYSTROM, *Secretary.*

Table Showing Burned Area and Losses During Season of 1914

COUNTY	AREA BURNED OVER—ACRES										Merchantable Timber Burned		Location of Burned Timber
	Cut Over Land		Merchantable Green Timber		Young Growth Not Yet Merchantable Acres	Total Acres All Fires	Killed M. E. M.	Destroyed M. B. M.	Merchantable Timber Burned				
	Accidental Fires Acres	Purposeful Burning Acres	Killed or Destroyed Acres	In Fire Zone, no Damage Acres					Killed M. E. M.	Destroyed M. B. M.			
Chehalis	2,948	6,996	3	87	70	10,104	.....	.....	160	T. 18 N., R. 5 W., & 15 N., R. 5 W.	
Clallam	6,746	777	2,000	.....	180	9,703	19,000	.....	100	Ts. 29 & 30 N., Rs. 11 & 12 W.	
Clarke	4,000	3,517	.....	.....	.....	7,517	.....	.....	.....	.....
Cowlitz	9,857	5,539	.....	10	.....	15,406	.....	.....	50	T. 10 N., R. 1 W.
Island	320	417	.....	20	.....	757	.....	.....	5	.....		
Jefferson	3,630	588	10	140	100	4,468	.....	.....	1,450	Ts. 27 & 28 N., R. 1 W.	
King	12,915	12,969	5	350	95	26,334	.....	.....	180	.....		
Kitsap	6,000	760	.....	.....	.....	6,760	.....	.....	.....	.....
Lewis	5,966	13,504	20	480	235	20,205	.....	.....	930	T. 14 N., R. 3 W.	
Mason	4,107	1,476	30	1,000	200	6,813	.....	.....	600	T. 20 N., Rs. 3 & 4 W.	
Pacific	355	3,089	1	20	.....	3,465	.....	.....	50	.....		
Pierce	24,216	4,200	5	325	500	29,246	.....	.....	275	.....		
Skagit	12,300	6,452	15	185	150	19,102	.....	.....	599	.....		
Snohomish	24,845	17,111	50	.....	.....	42,006	.....	.....	2,500	T. 27 N., R. 4 E.
Thurston	23,843	4,819	20	415	500	29,597	.....	.....	380	.....		
Wahkiakum	3,645	426	80	.....	.....	4,151	2,200	.....	.....	Ts. 8 & 9 N., Rs. 4 & 5 W.
Whatcom	4,993	11,652	.....	10	.....	16,665	.....	.....	100	.....		
	150,686	94,292	2,239	3,042	2,030	252,289	25,000	.....	5,085	.....		

Loss in cut logs reported by loggers, 13,048,000 feet.

Report of the Chief Fire Warden for 1914

To the Trustees of the Washington Forest Fire Association.

Gentlemen:

I herewith submit the seventh annual report of the Chief Fire Warden of the Washington Forest Fire Association, covering the season of 1914.

General Review

That the forest fire season of 1914 was the driest ever recorded is the report of Mr. Geo. N. Salisbury, Section Director of the U. S. Weather Bureau Office located at this point. In a summary of weather conditions he has this to say for the different months of the season: "May, as a whole, was a remarkably warm and dry month. As an indirect effect of long continued dry weather, forest fires broke out during the third week in some of the Western counties. This was remarkably early for such an occurrence, as usually there is little fire hazard in the forests until after the middle of June or later.

"June was, in general, below the average in temperature and above the average in the amount of precipitation, but it could hardly be characterized as either a cool or a wet month, as the deficiency in temperature was comparatively slight, and the excess of precipitation was mostly due to heavy showers on one or two days, while the total number of days with rain was only about the average.

"July. Everywhere west of the Cascades the month was unusually dry. At seven stations in this division no rain fell. The number of clear days was unusually large. Numerous forest fires caused the atmosphere to become smoky towards the close of the month.

"August. The month was not greatly different from the average August in temperature, but was the driest August on record for the State of Washington since the establishment of the climatological service in 1890. Out of 122 stations, fairly well distributed over the state, 68 reported the absence of appreciable rainfall, while at 40 stations no rain whatever occurred. The drought continued throughout the most of the state, since the 26th of June, and there is no authentic record of so prolonged and severe a dry spell in Washington during the last 30 years. The soil was, in consequence, dried out to a greater extent than it has been in any season for 18 years or more. Roads became excessively dusty, pastures and meadows dried up, and gardens suffered from lack of moisture. On many days the air was filled with smoke from incipient forest fires, but constant watchfulness and fire-fighting by the forces employed prevented any disastrous conflagration."

This dry spell of weather continued until September 6th, a period of 72 days, in which only .02 inches of rain fell. The only fire of any consequence and which burned any appreciable amount of timber occurred in the month of May, on the 20th, 21st and 22nd days. These three days were unusually warm and windy (the wind blowing from the Northeast), a combination of weather conditions which is productive of and conducive to forest fires.

Organization

Owing to these unusual weather conditions, so early in the year, we were obliged to put some rangers on duty by the 20th of May. On June 1st, our entire force of 68 rangers and 12 inspectors were in the field. These men were able to take care of the work until about the middle of July, at which time it became necessary to employ extra help to cope with the situation, which had become dangerous as a result of the continued dry weather. Beginning with the 17th of July we increased our force of patrolmen to 140 men, and these were kept busy until September 6th.

This was a very trying summer for the inspectors and rangers and only those who have had experience in such work can realize what so dry a season means to the men in the field. Some of our men were engaged in fighting fire from the opening of the season in May until its close in September. I wish to say at this point in my report that, with scarcely an exception, our employees did their utmost to control the fire situation, were faithful in the performance of their duties and loyal to the interests of the Association. While there were a great many fires, which burned over a large amount of ground, yet, if a lot of hard work had not been done to check some of these and to prevent others from being started, the results from so dry a season would be far different than what they are.

Season's Work

The work performed by the Association was much the same as in former years. In April a letter was sent to loggers warning against the practice of felling trees into standing timber on adjoining property, such work creating a bad fire hazard and being a violation of the Forest Fire Laws. The early dry weather facilitated the burning of slashings and was taken advantage of by a good many loggers to clean up the debris from their winter's operations. In some localities no slash burning was attempted, owing to unfavorable weather conditions. Our rangers were prevented from taking a very active part in this work, owing to so many fires springing up at this time, which demanded attention to keep them out of the timber. The results and experiences of this season's work prove conclusively that early slash

burning is of great assistance in keeping down the fire hazard. A good percentage of our trouble this year came through loggers' slashings which had been left over from last season. Almost without exception, when one of these slashings was burned it was at a time when weather conditions were the very worst. In two or three instances, which are exceptional, early burning of slashings caused considerable trouble, but these occurrences should not be taken as an evidence against such work. During the greater part of June our men were kept busy patrolling their respective districts, posting notices, visiting logging camps to see that the Forest Fire Laws were being complied with in respect to fire preventive measures as stipulated, putting out smoldering fires, assisting in the construction of telephone lines and in looking after road contractors who were inclined to slight their work of clearing up right-of-ways properly, thus creating bad fire hazards. Eight thousand warning notices and sequence signs were put up along roads, trails and camping places frequented by hunters, fishermen and pleasure seekers. Several thousand pictures of a campfire scene, especially designed to inculcate in children the importance of being careful with fire, were sent to most of the public schools and distributed to the pupils, a larger size picture being included to be hung upon the schoolroom walls. Four hundred picture slides depicting forest scenes and calculated to impress upon the minds of the public the need of forest fire protection, and what the loss is when timber burns, not alone to the timber owner, but to everyone in the state, were sent to moving picture theatres and were shown during the more dangerous part of the fire season. This is the best form of advertising for our work yet devised. The credit for this innovation in publicity work belongs to Mr. E. T. Allen of the Western Forestry and Conservation Association of Portland, Oregon.

Our rangers and the county wardens granted 12,000 permits to burn 94,292 acres of land which is being cleared for agricultural purposes. In very few instances did any of these fires cause serious trouble. Wherever any timber was endangered by the burning of these slashings, the patrolmen were present to assist with the burning.

Beginning June 26th, an unprecedented spell of hot, dry weather set in, and from that time until the close of the season the men had a most strenuous time in looking after the numerous fires which soon began to spring up and which increased in number as the summer advanced. Owing to this we were unable to do any work in the construction of fire breaks, as was done last year, our whole attention being given over to keeping fires out of the woods. The number of forest fires occurring in Western Washington during the season of 1914 was 345, of which 190 were started from unknown causes, 36 by farmers in clearing land, 31 by logging and railroad locomotives, 22 by sparks from donkey engines, 20 from smoldering fires, 19 from log-

ging camps, 14 from campfires, 10 from smoking out bees, 2 from clearing rights-of-way, 2 from lightning, 2 from burning mills, 1 from a slashing, 1 caused by friction in pulling one log over another, 1 from a burning house and 1 set by firecrackers.

Losses

On another page of this report will be found a table showing the amount of ground burned over and timber killed and destroyed. Our reports indicate this amount to be about .02 of 1% of the estimated stand of timber in Western Washington.

Co-Operation

As in former years, we co-operated with the state and federal patrol organizations. In May a meeting was held at Olympia, at which State Forester Ferris, the county wardens, Assistant District Forester C. H. Flory of the Forest Service, together with the forest supervisors and myself and our inspectors, were present. This meeting was held for the purpose of talking over the different problems which come before us in the work and map out a unity of action whereby this work might be carried on harmoniously and at the least possible expense. Beginning in June a series of local meetings were held at different points in the state, at which the rangers of the three patrol organizations came together. These meetings were productive of a much better understanding between the field forces as to the country patrolled and duties performed by each one. District lines were made to conform to the exigencies of each locality and into our whole system was injected that spirit of co-operation which is so essential to the success of our endeavors.

Loggers in general were careful and took every precaution against fires being started in their works. They also rendered assistance on fires outside their operations and co-operated with us in patrol work. Railroad companies were especially active in putting out fires which started along their lines and were quick to respond with help whenever called upon by any of our men for assistance.

Through the efforts of Mr. E. T. Allen we arranged with District Weather Forecaster Beals of Portland to notify us of approaching easterly winds, which, heretofore, have been coincident with most of the devastating fires occurring in the past twelve years. This was tried out as an experiment only. The results demonstrate beyond doubt that a system of forecasting dangerous fire weather could be inaugurated whereby those interested in forest fire protection would be advised of impending danger and thereby take such precautions as are deemed necessary for the protection of their interests.

Five times during the season Mr. Beals advised us that these hot winds would occur, and in only one instance did his predictions fail. In securing reports on weather conditions over a large area and studying the effects of climatological changes locally and in disseminating the knowledge gained thereby, the Weather Bureau Service can be of great assistance to timber owners in the matter of fire prevention.

Recommendations

Our experience of this year and of 1912 is sufficient to justify a demand that the "closed season," in which burning can be done only under permit and requiring logging concerns and others to adopt fire preventive means, should begin not later than the 10th of May.

An opinion rendered by the attorney general, at the request of the state forester, on Section 11 of the Fire Laws is, in effect, that anyone responsible for the starting of a fire cannot be made to extinguish the same or be compelled to reimburse others for so doing. This interpretation of the law has been accepted as correct, but its effect upon our work is mischievous in that people starting fires refuse to take care of them, not being conscious of the danger in allowing them to spread. This places the burden of caring for such fires upon our patrolmen and the county wardens. The law should be so amended as to make the suppression of a fire obligatory upon the ones responsible for it. This should be done upon demand of any fire warden.

The state forester, through his deputies, should be given more specific authority in regard to the enforcement of Section 12 of the law, providing for the disposal of any forest material likely to further spread the fire.

Respectfully submitted,

G. C. JOY, *Chief Fire Warden.*

Standing Committees

EXECUTIVE COMMITTEE

NAME	ADDRESS
E. G. AMES.....	Port Gamble, Washington
E. G. GRIGGS.....	Tacoma, Washington
M. R. HUNT.....	Seattle, Washington
GEO. S. LONG.....	Tacoma, Washington
T. JEROME.....	Seattle, Washington
B. W. BAWDEN.....	Seattle, Washington
D. P. SIMONS.....	Seattle, Washington
THOS. BORDEAUX.....	Seattle, Washington
L. G. HORTON.....	Seattle, Washington
W. B. MACK.....	Aberdeen, Washington
E. S. COLLINS.....	Ostrander, Washington
J. W. DEMPSEY.....	Tacoma, Washington
J. J. DONOVAN.....	Bellingham, Washington
J. L. BRIDGE.....	Seattle, Washington
A. G. HANSON.....	Enumclaw, Washington

FINANCE COMMITTEE

B. W. BAWDEN.....	Seattle, Washington
E. G. AMES.....	Port Gamble, Washington

FIRE PROTECTION

D. P. SIMONS.....	Seattle, Washington
V. H. MAY.....	Seattle, Washington
M. R. HUNT.....	Seattle, Washington
E. G. AMES.....	Port Gamble, Washington
J. L. BRIDGE.....	Seattle, Washington
RALPH D. BROWN.....	Seattle, Washington
E. G. ENGLISH.....	Mt. Vernon, Washington
G. C. JOY.....	Seattle, Washington

LEGISLATION COMMITTEE

E. A. SIMS.....	Pt. Townsend, Washington
E. S. COLLINS.....	Ostrander, Washington
W. I. EWART.....	Seattle, Washington
V. H. MAY.....	Seattle, Washington
T. JEROME.....	Seattle, Washington
H. C. HENRY.....	Seattle, Washington
C. H. COBB.....	Seattle, Washington
DAVID SCOTT.....	Tacoma, Washington
GEO. S. LONG.....	Tacoma, Washington
E. G. AMES.....	Port Gamble, Washington

NAME	ADDRESS
ED. GAUDETTE.....	South Bend, Washington
W. C. ALBEE.....	Tacoma, Washington
E. MILTON STEPHENS.....	Monroe, Washington
JOSEPH IRVING.....	Everett, Washington
J. J. DONOVAN.....	Bellingham, Washington
J. C. NEVILLE.....	Walville, Washington
M. R. HUNT.....	Seattle, Washington
MARK REID.....	Shelton, Washington
C. F. WHITE.....	Seattle, Washington
W. B. MACK.....	Aberdeen, Washington
J. G. McFEE.....	Seattle, Washington
J. H. BLOEDEL.....	Seattle, Washington
J. A. BYERLY.....	Castle Rock, Washington
PAT McCOY.....	Seattle, Washington

PUBLICITY COMMITTEE

V. H. MAY.....	Seattle, Washington
O. D. FISHER.....	Seattle, Washington
W. I. EWART.....	Seattle, Washington
F. H. BROWNELL.....	Seattle, Washington
FRANK B. COLE.....	Tacoma, Washington
THOS. BORDEAUX.....	Seattle, Washington
M. R. HUNT.....	Seattle, Washington
W. W. SEYMOUR.....	Tacoma, Washington
D. P. SIMONS.....	Seattle, Washington
R. H. BURNSIDE.....	Raymond, Wash.

Members of the Washington Forest Fire Association

December 31, 1914.

NAME	ADDRESS
ALDWELL, THOS. T.....	Port Angeles, Washington
ALEXANDER BROS.....	Chehalis, Washington
ALGER LOGGING Co.....	Portland, Oregon
ANDERSON, A. F.....	Seattle, Washington
ANDREWS, H. D.....	Centralia, Washington
ARMSTRONG, V. G., ESTATE.....	Seattle, Washington
ATLAS LUMBER Co., THE.....	Seattle, Washington
AVERY, W. A.....	Detroit, Michigan
BAILEY, J. G.....	Cathlamet, Washington
BAILEY TIMBER Co.....	Everett, Washington
BARKER CREEK TIMBER Co.....	Seattle, Washington
BENN, SAMUEL.....	Aberdeen, Washington
BLOEDEL-DONOVAN LUMBER MILLS.....	Bellingham, Washington
BOLCOM-BARTLETT MILL Co.....	Seattle, Washington
BONER, W. H.....	Everett, Washington
BRADLEY, EDWARD.....	Tomahawk, Wisconsin
BRADLEY, JAS. W.....	Milwaukee, Wisconsin
BRADLEY, L.....	Clallam, Washington
BRADLEY LOGGING Co.....	Portland, Oregon
BRADLEY, N. B. & SONS.....	Portland, Oregon
BREWER, F. A.....	Duluth, Minnesota
BROCKWAY, MRS. MYRA A.....	Chehalis, Washington
BROWN BROS. LUMBER Co.....	Seattle, Washington
BROWN, S. A.....	Portland, Oregon
BURROWS & RUST.....	Saginaw, Michigan
CAMP, HOEL H., ESTATE.....	Milwaukee, Wisconsin
CAMP REAL ESTATE Co.....	Milwaukee, Wisconsin
CANAL TIMBER Co.....	Everett, Washington
CARSTENS & EARLES, INC.....	Seattle, Washington
CARRIER, M. L.....	Centralia, Washington
CASCADE TIMBER Co.....	Tacoma, Washington
CHEHALIS LAND & TIMBER Co.....	Chehalis, Washington
CHERRY VALLEY TIMBER Co.....	Everett, Washington
CHURCHILL, JAMES.....	Centralia, Washington
CLARK COUNTY TIMBER Co.....	Portland, Oregon
CLARK, JAMES F.....	Quillayute, Washington
CLEAR LAKE LUMBER Co.....	Clear Lake, Washington
COBB & HEALY.....	Seattle, Washington
COFFMAN-DOBSON & Co.....	Chehalis, Washington
COLE, F. B.....	Tacoma, Washington
COLLINS, E. S.....	Ostrander, Washington

NAME	ADDRESS
CONEWANGO LUMBER Co.....	Warren, Pennsylvania
CORY, A. S.....	Chehalis, Washington
COWLITZ COUNTY LOGGING Co.....	Portland, Oregon
COWLITZ LUMBER Co.....	Williamsport, Pennsylvania
CRABILL, F. W.....	Chehalis, Washington
GROGSTER TIMBER Co.....	Portland, Oregon
CROSSETT TIMBER Co.....	Portland, Oregon
CRUMLY, J. H.....	Chehalis, Washington
CURRAN TIMBER Co.....	Portland, Oregon
DAY LUMBER Co.....	Seattle, Washington
DAVIS, C. H.....	Saginaw, W. S., Michigan
DEEP RIVER LOGGING Co.....	Portland, Oregon
DEMPSEY LUMBER Co.....	Tacoma, Washington
DENNY-RENTON CLAY & COAL Co.....	Seattle, Washington
DOSEWALLIPS TIMBER Co.....	Pt. Townsend, Washington
DURNEY, ROBT.....	Hoquiam, Washington
EAGLE SHINGLE Co.....	Hamilton, Washington
EBEY LOGGING Co.....	Seattle, Washington
ENGLISH LUMBER Co.....	Seattle, Washington
ENTERPRISE LUMBER Co.....	Seattle, Washington
EVERETT PULP & PAPER Co.....	Everett, Washington
EVERETT TIMBER & INVESTMENT Co.....	Seattle, Washington
FLEISCHMAN, FRANK.....	Hoh, Washington
FAIRSERVICE, A.....	Clallam Bay, Washington
GARDNER, N. B.....	Toutle, Washington
GERBER & KEMPF.....	Fremont, Michigan
GOLD BAR LUMBER Co.....	Gold Bar, Washington
GRANDIN COAST LUMBER Co.....	Seattle, Washington
GRAYS HARBOR COMMERCIAL Co.....	Cosmopolis, Washington
GREAT NORTHERN RAILWAY Co.....	Seattle, Washington
GRIFFIN TRANSFER Co.....	Tacoma, Washington
HAMILTON COAL & DEVELOPMENT Co.....	Hamilton, Washington
HAMMOND LUMBER Co.....	Astoria, Oregon
HAWKEYE TIMBER Co.....	Raymond, Washington
HAZELTON, E.....	Monroe, Washington
HENRY & LARSON LUMBER Co.....	Seattle, Washington
HERSHEY LUMBER Co.....	Stillwater, Minnesota
HIGHLAND TIMBER Co.....	Lyman, Washington
HUMBIRD, J. A., ESTATE OF.....	Spokane, Washington
HYLAND, IVAN L.....	Seattle, Washington
ILLINOIS TIMBER Co.....	Chicago, Illinois
INDEX-GALENA LUMBER Co.....	Index, Washington
INMAN-PAULSON LOGGING Co.....	Kelso, Washington
IRVINE, THOS. LUMBER Co.....	Everett, Washington
JEROME, T.....	Seattle, Washington

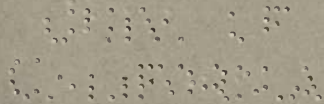
NAME	ADDRESS
JOHNSON-DEAN LUMBER Co.....	Robe, Washington
KENAGA, D. H.....	Seattle, Washington
KLABER INVESTMENT Co.....	Tacoma, Washington
KUEHNER, L.....	Chehalis, Washington
LACEY, JAS. D. & Co.....	Seattle, Washington
LAMSON, R. H.....	Fortson, Washington
LEE, O. H.....	Maltby, Washington
LEHN, HENRY.....	Clallam Bay, Washington
LEVERETT LUMBER Co.....	Seattle, Washington
LEWIS, B. R.....	Seattle, Washington
LINDBERG, GUSTAF.....	Tacoma, Washington
LONG, T. J.....	Chehalis, Washington
LUCE, MRS. CHARLOTTE C.....	Grand Rapids, Michigan
LYMAN TIMBER Co.....	Everett, Washington
McCAUGHEY MILL Co.....	Fortson, Washington
McCoy, PAT.....	Seattle, Washington
McCoy, LOGGIE TIMBER Co.....	Seattle, Washington
McCUTCHEON, JAS. D.....	Chehalis, Washington
MALONEY, JOHN.....	Skykomish, Washington
MANNING, F. A.....	Chehalis, Washington
MASON COUNTY LOGGING Co.....	Seattle, Washington
MERRILL & RING LUMBER Co.....	Seattle, Washington
MERRILL-RING-BLISS Co.....	Seattle, Washington
MERRILL & RING LOGGING Co.....	Seattle, Washington
MERRILL, T. D.....	Seattle, Washington
MERRILL, R. D.....	Seattle, Washington
METCHAN, PHIL.....	Portland, Oregon
MILBURN, CHAS. C.....	Washington, D. C.
MILWAUKEE LAND Co.....	Spokane, Washington
MONROE INVESTMENT Co.....	Monroe, Washington
MT. BAKER TIMBER Co.....	Seattle, Washington
NIELSEN, FRANK A.....	Oshkosh, Wisconsin
NOBLE, H. E.....	Portland, Oregon
NORTH BEND LUMBER Co.....	North Bend, Washington
NORTH WEST LUMBER Co.....	Seattle, Washington
OAK POINT PILING & LUMBER Co.....	Oak Point, Washington
O'CONNELL LUMBER Co.....	Winlock, Washington
O'NEAL TIMBER Co.....	Everett, Washington
OLMSTED, CLINT.....	Cathlamet, Washington
OREGA LAND Co.....	Portland, Oregon
OREGON IRON & STEEL Co.....	Portland, Oregon
ORIENTAL LAND & IMPROVEMENT Co.....	Chicago, Illinois
PACIFIC NATIONAL LUMBER Co.....	Tacoma, Washington
PACIFIC STATES LUMBER Co.....	Tacoma, Washington
PENDLETON, F. R.....	Everett, Washington

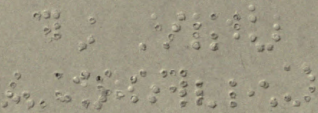
NAME	ADDRESS
PORTLAND LUMBER Co.....	Portland, Oregon
POWELL, DR. J. L.....	Tacoma, Washington
PRESTON MILL Co.....	Seattle, Washington
PRESTON, T. B.....	Ionia, Michigan
PUGET MILL Co.....	Seattle, Washington
RAINIER INVESTMENT Co.....	Seattle, Washington
RHINELANDER-PORTLAND TIMBER Co.....	Rhineland, Wisconsin
RIVERSIDE TIMBER Co., THE.....	Seattle, Washington
RIXON, THEO. F.....	Clallam Bay, Washington
ROBBINS, HARRY M. (Trustee).....	Hopkins, Minnesota
ROSS, FLOYD.....	Beaver, Washington
RUDISILE, J. F.....	Clallam Bay, Washington
SACHS, ADAM.....	Elbe, Washington
SAGINAW TIMBER Co.....	Aberdeen, Washington
SALLING, E. N., ESTATE OF.....	Grand Rapids, Michigan
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SALZER, DAN.....	Centralia, Washington
SCHOFIELD TIMBER Co.....	Seattle, Washington
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SEATTLE LUMBER Co.....	Seattle, Washington
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SILVER LAKE RAILWAY & LUMBER Co.....	Castle Rock, Washington
SIMONS, D. P.....	Seattle, Washington
SIMPSON LOGGING Co.....	Shelton, Washington
SKAGIT COAL & COKE Co.....	Seattle, Washington
SKYKOMISH LUMBER Co.....	Skykomish, Washington
SLADE, G. A.....	Snoqualmie, Washington
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SMITH & BURR.....	Manistee, Michigan
SMITH, M. F.....	Berlin, Washington
SOUTH BEND MILLS & TIMBER Co.....	South Bend, Washington
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STROM, SAM.....	Darrington, Washington
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ST. PAUL & TACOMA LUMBER Co.....	Tacoma, Washington
SULTAN LUMBER Co.....	Sultan, Washington
SULTAN RAILWAY & TIMBER Co.....	Everett, Washington
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NAME	ADDRESS
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VANBIBBER, JIM.....	Riffe, Washington
WAGNER & WILSON.....	Monroe, Washington
WAITE MILL & TIMBER Co.....	Seattle, Washington
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WALTERS, C. H.....	Chehalis, Washington
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WEEKS & Co.....	North Bend, Washington
WELDRICK, GEO.....	Clallam Bay, Washington
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WEYERHAEUSER TIMBER Co.....	Tacoma, Washington
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WISCONSIN LOGGING & TIMBER Co.....	Portland, Oregon
WIGHT, WM.....	Mayfield, Washington
WOOD & IVERSON.....	Hobart, Washington
WORTHINGTON BROS.....	Quilcene, Washington

CONTRIBUTORS

NORTHERN PACIFIC RAILWAY Co.....	Tacoma, Washington
NORTHWESTERN IMPROVEMENT Co.....	Tacoma, Washington
SOUTHWELL, H. E.....	Chicago, Illinois





Press of the
Lumbermen's Printing Co
Seattle



Eighth Annual Report of the
Washington Forest Fire
Association
1915



Officers:

GEO. S. LONG, *President*
THOS. BORDEAUX, *Vice President*
B. W. BAWDEN, *Treasurer*
G. C. JOY, *Chief Fire Warden*
O. BYSTROM, *Secretary*



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T. JEROME, *Secretary*
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Milwaukee Land Company
L. G. HORTON, *Secretary-Treasurer*
Northwest Lumber Company



Offices: 1126-7 Henry Building
Seattle, Washington

Report of the President

To the Members of the Washington Forest Fire Association.

Gentlemen:

The annual report of the Chief Fire Warden of our Association and the reports of the Secretary and Treasurer, all as contained herein, set forth quite fully the record for the year 1915.

The dry season of the year 1915 was upon the whole a very advantageous one for forest fire protection. While the annual rainfall was below normal, yet the general weather conditions were almost ideal for fire protection, and this, coupled with the very efficient organizations that were occupying the field, i. e., that of the federal and state authorities, as well as our own organization, all had to do in bringing about a record which represents almost the minimum amount of loss that has ever been sustained during any season since our Association has been organized.

The Secretary, in his report, calls attention to the number of acres of timber land in Western Washington that need and require fire protection, and likewise calls attention to the number of acres that are reflected in membership in the Washington Forest Fire Association, showing that over a million acres of timber lands in Western Washington are not contributing to the expense and responsibility of protecting the forests from fire. This lack of co-operation on the part of many timber land owners is the only unfavorable situation in the forest fire protection work.

These lands which do not contribute to the expense of protection are so intermingled with the timber belonging to the state and to the members of our Association that they really get the benefit of all of the protection which is put forth on the part of the state and on the part of our Association, for we are protecting not only the timber that belongs to our membership, but also all adjacent timber regardless of whether the holdings are large or small. For any owner of timber to accept this kind of service without joining in the expense involved, indicates a lack of patriotic appreciation of a worthy cause.

In the State of Oregon the law is such that if a timber land owner will not contribute to a local forest fire protection association, then he has to pay a special sum per acre into the state funds and the state disburses the money in forest fire protection. A similar law in

the State of Washington should be enacted, if the non-contributing owners refuse to give their support.

The sincere thanks of the Association are extended to the State Forest Fire Commission, to the State Fire Warden and all of his deputies, as well as to the Forest Service of the United States Government and to the public at large and especially to the press for the loyal support which has been given our Association and its work during the season of 1915.

GEO. S. LONG, *President.*

Financial Statements for Year 1915

BALANCE SHEET	ASSETS	DECEMBER 31, 1915
Cash in Metropolitan Bank of Seattle.....	\$	547.34
Assessments Collectible	5,464.03	
Equipment, Tools and Supplies	1,555.75	
Office Furniture and Fixtures	270.00	
Printing and Office Supplies	90.00	
Surplus:	LIABILITIES	\$ 7,927.12
Balance at January 1, 1915.....	\$3,495.26	
Add—Excess of Income over Expenses for year 1915, as per statement annexed.....	4,431.86	
	—————	\$ 7,927.12

INCOME AND EXPENDITURE ACCOUNT FOR YEAR 1915

INCOME		
Assessments Levied—2 cents per acre:		
Amount Collected	\$46,264.15	
Amount Outstanding	5,464.03	
	—————	\$51,728.18
EXPENDITURES		
Patrol Salaries, Wages and Miscellaneous Ex- penses	\$34,432.60	
Patrol Expenses	3,986.53	
Fire Expense and Extra Labor.....	4,022.45	
Office Rent, Salaries and Expenses.....	2,346.79	
Stationery, Printing and Postage	799.51	
Depreciation and Maintenance of Equipment, Tools, Furniture and Fixtures, etc.....	434.13	
Total Expenses	\$46,022.01	
Add—Delinquent Members' Accounts written off	1,274.31	
	—————	47,296.32
Balance—Being Excess of Income over Ex- penses for the Season 1915, carried to Bal- ance Sheet		\$ 4,431.86

To the Trustees of the Washington Forest Fire Association:

We have examined the books of the Washington Forest Fire Association for the year 1915 and hereby certify that the foregoing Balance Sheet and accompanying Income and Expenditure Account set forth the financial condition of the Association at December 31, 1915, and the result of the operations for the year ending that date.

PRICE, WATERHOUSE & CO.,

Seattle, Wash., January 17, 1916.

Certified Public Accountants.

Secretary's Report, Covering Operations for the Year 1915

That the eighth year in the history of the Washington Forest Fire Association proved successful is evident from the report of the Chief Fire Warden, contained herein, which shows the losses from forest fires to have been less than any year, excepting 1913, since the Association was organized. The end of the year also shows the finances of the Association to be in good shape, the surplus having been increased from \$3,495.26 at the end of the year 1914, to \$7,927.12 December 31, 1915.

The membership in the Association now consists of two hundred individual timber owners or corporations and the contributing area of timber lands as listed for 1915, aggregates 2,586,409 acres.

All vouchers, books and records of the Association have been submitted to Price, Waterhouse & Company, certified accountants, for inspection and audit and the report of the said firm published on the foregoing page contains a full income and expenditure account for the year and also gives the present financial condition of the Association. The net cost of operating as shown in said report amounts to \$46,022.01, which is equal to 1.78 cents per contributing acre.

During the year seven regular meetings were held by the Board of Trustees. Assessments levied by the Trustees aggregated two cents per acre.

As in former years, at the beginning of the season, letters were addressed to timber owners having holdings in the territory embraced within the Association's activities, soliciting their membership, with the result that fifteen new members were added to the membership roll. The Association lost eighteen members during the year. It is gratifying to be able to report that in spite of the financial depression experienced during last year, which hit the lumber industry harder than any other business in the Pacific Northwest, members have generally been prompt in responding to calls for assessments and but few members have been stricken from the rolls for non-payment of assessments, the amounts carried over to next year all being considered collectible.

Large Area Non-Contributing:

On the tax rolls of the various counties in Western Washington 3,756,554 acres of land were assessed for 1915 under the classification

of timber lands and as this is supposed to include all lands carrying a certain amount of timber averaging a minimum of 1,000,000 feet to the quarter section, in some counties this minimum is less—in others somewhat larger—it may safely be taken as an indication of the actual area of timber in this territory now in private hands, a small portion of which is located within the boundaries of the National Forest.

The Washington Forest Fire Association is supported by a membership contributing on 2,586,409 acres, leaving practically 1,170,000 acres of timber lands, the owners of which are reaping the benefit of the Association's work without cost to themselves. Individual patrol is maintained by a few timber owners whose holdings are in such compact shape that separate patrol is practicable, but most of the non-contributing area is scattered in and amongst the holdings of the Association and so widely separated that individual patrol of the timber is impracticable. Not exactly from choice, but rather for self-protection, these tracts must therefore be taken care of by the Association and included within the Association's patrol. Laws have been passed in other states which compel timber owners to either individually or by co-operation maintain an effective patrol system during the dangerous season of the year. It has been hoped that timber owners in Washington would voluntarily either contribute to existing protective organizations or, if preferred, where practicable maintain their own patrol system and thus avoid the necessity of compulsion and for this reason it was deemed inadvisable to push a bill introduced in the last Legislature which provided for compulsory patrol along the lines adopted in the State of Oregon.

That the co-operative organizations for forest protection against fire, as now maintained by timber owners in most every timbered state in the Union, have proved great factors in helping to minimize the danger from forest fires is conceded, and it is evident that these organizations have come to stay. Considering the small cost of keeping such organizations going, particularly in Western Washington where the assessments have in no one year exceeded two cents per acre, which can by no means be considered a burden to anyone, there appears to be no reason why everyone interested should not do his bit without being compelled by law to do so.

Although the number of patrolmen employed by the various protective agencies, state and private, have been increased in late years, it is obvious that a still greater force ought to be employed

during the danger season of the year in order that a closer patrol be maintained than heretofore. Members of the Association do not feel, however, that they should assess themselves a larger sum than two cents per acre in an average year for this purpose. The non-contributing acreage if listed in the Association, would provide funds enabling the Association to double its patrol force during the most dangerous part of the dry season of the year, without any increase in assessments.

Lack of co-operation on the part of the owners of nearly one-third of the timber lands in our territory, is the present unfavorable situation in forest protection. Many timber owners are indifferent, not realizing the danger; others profess to believe that their holdings are immune and still others, although well aware of the risk, are too willing to accept the service now rendered without cost to themselves. Every season telephone calls and telegrams calling for help to fight fires are received from people who only seem to recognize the Association when their own individual timber is threatened, and in such cases assistance is always rendered whenever possible, regardless of whether the holdings in the Association are directly endangered.

The tendency is to hold timber owners responsible for the protection of their property and if they will not do so voluntarily, laws are sure to be enacted compelling them to take adequate measures, but laws of this nature are not apt to be popular and should be resorted to only as a last recourse.

Members Can Aid:

How can timber owners be made to realize these facts? A few lines written or a word spoken by old members to those who either do not think that danger exists or are indifferent and also to the last class mentioned above, may have more effect than a number of letters from this office, and old members can serve both their own interest and that of the public by aiding in getting non-members to become members of the Association and thus help to protect the forests from the danger of forest fires and also eliminate the necessity of a compulsory patrol law, such as was contemplated in the last Legislature.

O. BYSTROM, *Secretary.*

Report of the Chief Fire Warden for 1915

To the Trustees of the Washington Forest Fire Association.

Gentlemen:

I submit herewith the eighth annual report of the Chief Fire Warden of the Washington Forest Fire Association, covering the season of 1915, which season I am pleased to state proved very successful, the losses from forest fires being less than in any year previous, excepting 1913, since the organization of the Association.

Weather:

A comparison of the weather records as compiled by the U. S. Weather Bureau during the past eight years gives the following interesting data concerning the rainfall for May, June, July and August of these years. These records are made up from reports sent in from different stations throughout the Western part of the state and are therefore a fair index of general weather conditions.

1908, 7.76 inches; 1909, 5.72 inches; 1910, 5.23 inches; 1911, 7.36 inches; 1912, 11.86 inches; 1913, 9.53 inches; 1914, 5.04 inches; 1915, 7.31 inches. During the past summer, rains were seasonable in the southern portion of the state, but in the northern part, especially the territory adjacent to Puget Sound, the situation was different, as very little rain fell in this locality after the middle of July, and this dry spell continued until the first of September, when light rains fell throughout the western part of the state. In Island, Clallam and Jefferson Counties little rain fell before the middle of October. One very threatening fire occurred in Clallam County the last of September and some work had to be done on another in eastern Jefferson as late as the 20th of October. One very bad fire occurred in a logging camp in western Snohomish County on October 1st.

The season was unusually warm. At times heavy winds prevailed, which caused a great deal of trouble and are responsible for most of the damage done. September was an ideal month for the burning of slashings and was taken advantage of by loggers and others in disposing of some bad hazards.

Organization and Work:

We added another inspector and four rangers to our force of patrolmen, bringing the total up to eighty-five regular men. Thirty

extra men were employed beginning the fore part of August and these were kept on duty until the close of the season.

The inspectors began work May first and the rangers between June first and fifteenth. Most of the men were let go between September first and fifteenth.

The rangers were employed in patrolling, putting out fires, visiting logging camps, assisting in burning slashings, clearing out trails and rehabilitating telephone lines. A total of 12,525 permits to burn were granted by them and the County Wardens, covering 117,778 acres which were burned over. There is a marked improvement noticeable amongst ranchers and others in preparing for the burning of slashings, and as a consequence there were few fires originating from this source which caused us any trouble.

There is also some improvement in the manner in which road contractors and road supervisors clear right-of-ways. No road contract is now let without it contains a clause, stipulating that all inflammable material on the right-of-way shall be cut, piled and burned thereon, and a portion of the contract price is held back until the road is properly cleaned up. The State Highway Commissioner and several Boards of County Commissioners are to be commended for the stand taken by them in reference to this matter.

Warning notices and sequence signs were posted along roads, trails and places frequented by campers and hunters. Picture slides, illustrating the importance of forest protection and teaching the danger and consequences following the results of forest fires, were sent to moving picture houses and shown, and this had a most wholesome effect on fire prevention.

Through the Western Forestry and Conservation Association, a forest story, dealing with forest fire protection, was sent to the pupils of the public schools residing in timbered counties.

In preventing and putting out fires, good results depend largely upon the work of the men in the field, and I wish to thank the inspectors and rangers for the efforts put forth by them in preventing the loss from being any greater than it was.

Losses:

According to the reports of our rangers and the County Wardens some 500 accidental fires occurred during the season. On another

page of this report is a table showing the amount of ground burned over and timber killed and destroyed. The loss to standing timber is somewhat less than last season, a very small percentage of which is owned by members of the Association.

The most destructive fire occurred in Whatcom County on August 19-20-21. About fifteen million feet of timber was killed and destroyed by this fire. It was started in green timber, presumably by some hunter or fisherman, and before being discovered burned over quite a territory. Several thousand dollars was expended in checking it and there was little timber destroyed after it was discovered.

Whatcom County suffered most from fires of any county in the state and this was due to the excessively dry weather and strong winds which prevailed there during the greater part of July and August. A large amount of ranch land was also burned over in this county, doing considerable damage to farm property in the destruction of buildings, fences and crops. This was the driest zone in the state, and the dense smoke which hung over Western Washington for so long during the summer, came from this locality and from British Columbia.

Railroads suffered little damage and there was a considerable decrease in the loss to loggers in logs, camp equipment, etc., as compared with last year. The chief causes of fires were logging engines and locomotives, railroad engines and campers. There were eighty-five fires of unknown origin.

Co-Operation:

We co-operated with and assisted the State and Federal Patrol organizations. The territory patrolled was divided into districts, each district being placed in care of one of our men or one employed by the state.

More patrolmen were employed by the State Forester this season than heretofore and as we had several additional rangers, the districts were divided into smaller units which allowed of a more thorough patrol.

I think the policy adopted by State Forester Ferris in increasing his force of patrolmen is an advance step on the part of the state towards giving a more adequate patrol and I hope to see this policy continued.

An inspector was appointed by the Federal District Forester's office to supervise the work of patrolmen employed under the Weeks Act. Mr. H. W. Jackson of the Forest Service was selected for this position and much credit is due Mr. Jackson, as his work has had a tendency to bring about a better co-operation of effort between ourselves, the state and federal organizations.

The Weather Bureau, under direction of Mr. E. A. Beals, furnished us with fire wind forecasts and these were of great assistance in giving time for preparations for any unfavorable weather conditions.

Railroad companies did all that was asked of them and logging concerns did their part in taking care of their own fires and in furnishing men whenever one of our rangers called upon them for assistance.

I wish to thank the State Forester's office for the support and co-operation extended to us and I must not forget to mention our friends of the Forest Service who have worked so harmoniously with us.

There is a steadily growing sentiment in favor of forest fire protection and a consequently decreasing opposition to the fire laws. This state of the public mind can be maintained by a harmonious co-operation between the forces engaged in this work in a judicious enforcement of the fire laws.

G. C. JOY, *Chief Fire Warden.*

Table Showing Burned Areas and Losses During Season of 1915

COUNTY	AREA BURNED OVER—ACRES										Merchantable Timber Burned		Location of Burned Timber
	Cut Over Land		Merchantable Green Timber		Young Growth Not Yet Merchantable Acres	Total Acres All Fires	Killed M. B. M.		Destroyed M. B. M.				
	Accidental Fires Acres	Purposeful Burning Acres	Killed or Destroyed Acres	In Fire Zone, no Damage Acres			Killed M. B. M.	Destroyed M. B. M.					
Chehalis	972	1,000	2,472
Clallam	3,180	1,200	.....	40	.....	4,420	.....	.....	.....	.....	.....	.....
Clarke	.....	2,500	.....	.....	.....	2,500	.....	.....	.....	.....	.....	.....
Cowlitz	500	750	.....	.....	.....	1,250	.....	.....	.....	.....	.....	.....
Island	6,000	.....	.....	.....	250	6,300	.....	250	100	.....	.....	{ Sec. 18, T. 32, R. 3 E., and Sec. 25, T. 32, R. 2 E.
Jefferson	4,500	450	.....	.....	100	5,050	.....	.....	.....	.....	.....	{ Sec. 3, T. 26, R. 6 E.
King	11,575	1,350	.....	40	75	13,080	.....	1,300	200	.....	.....	.....
Kitsap	3,250	1,000	.....	.....	.....	4,250	.....	.....	.....	.....	.....	.....
Lewis	2,000	600	.....	160	.....	3,770	.....	80	20	.....	.....	Sec. 33, T. 14, R. 5 W.
Mason	1,600	1,200	.....	.....	.....	2,800	.....	.....	.....	.....	.....	.....
Pacific	100	700	.....	.....	.....	800	.....	.....	.....	.....	.....	.....
Pierce	3,000	200	.....	.....	.....	3,200	.....	.....	.....	.....	.....	.....
Skagit	9,000	1,400	.....	80	.....	10,640	.....	200	200	.....	.....	Sec. 14, T. 35, R. 4 E.
Snohomish	12,000	600	.....	20	.....	12,720	.....	100	100	.....	.....	Sec. 10, T. 31, R. 4 E.
Thurston	1,500	300	.....	.....	.....	1,800	.....	.....	.....	.....	.....	.....
Wahkiakum	300	.....	.....	.....	.....	300	.....	.....	.....	.....	.....	.....
Whatcom	20,000	160	.....	1,800	.....	22,000	.....	11,000	4,000	.....	.....	{ Secs. 11, 12, 13, 14, 15, 23, 24, T. 39, R. 5 E.
Totals	79,472	13,430	2,080	620	.....	97,352	12,930	4,620	.....	.....	.....	.....

Standing Committees

EXECUTIVE COMMITTEE

NAME	ADDRESS
E. G. AMES.....	Port Gamble, Washington
E. G. GRIGGS.....	Tacoma, Washington
M. R. HUNT.....	Seattle, Washington
GEO. S. LONG.....	Tacoma, Washington
T. JEROME.....	Seattle, Washington
B. W. BAWDEN.....	Seattle, Washington
D. P. SIMONS.....	Seattle, Washington
THOS. BORDEAUX.....	Seattle, Washington
L. G. HORTON.....	Seattle, Washington
W. B. MACK.....	Aberdeen, Washington
E. S. COLLINS.....	Ostrander, Washington
J. W. DEMPSEY.....	Tacoma, Washington
J. J. DONOVAN.....	Bellingham, Washington
J. L. BRIDGE.....	Seattle, Washington
A. G. HANSON.....	Enumclaw, Washington

FINANCE COMMITTEE

B. W. BAWDEN.....	Seattle, Washington
E. G. AMES.....	Port Gamble, Washington

FIRE PROTECTION

D. P. SIMONS.....	Seattle, Washington
V. H. MAY.....	Seattle, Washington
M. R. HUNT.....	Seattle, Washington
E. G. AMES.....	Port Gamble, Washington
J. L. BRIDGE.....	Seattle, Washington
RALPH D. BROWN.....	Seattle, Washington
E. G. ENGLISH.....	Mt. Vernon, Washington
G. C. JOY.....	Seattle, Washington

LEGISLATION COMMITTEE

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E. S. COLLINS.....	Ostrander, Washington
W. I. EWART.....	Seattle, Washington
V. H. MAY.....	Seattle, Washington
T. JEROME.....	Seattle, Washington
H. C. HENRY.....	Seattle, Washington
C. H. COBB.....	Seattle, Washington
DAVID SCOTT.....	Tacoma, Washington
GEO. S. LONG.....	Tacoma, Washington
E. G. AMES.....	Port Gamble, Washington

NAME	ADDRESS
ED. GAUDETTE	South Bend, Washington
W. C. ALBEE.....	Tacoma, Washington
E. MILTON STEPHENS.....	Monroe, Washington
JOSEPH IRVING	Everett, Washington
J. J. DONOVAN.....	Bellingham, Washington
J. C. NEVILLE.....	Walville, Washington
M. R. HUNT.....	Seattle, Washington
MARK REID.....	Shelton, Washington
C. F. WHITE.....	Seattle, Washington
W. B. MACK.....	Aberdeen, Washington
J. G. McFEE.....	Seattle, Washington
J. H. BLOEDEL.....	Seattle, Washington
J. A. BYERLY.....	Castle Rock, Washington
PAT McCOY.....	Seattle, Washington

PUBLICITY COMMITTEE

V. H. MAY.....	Seattle, Washington
O. D. FISHER.....	Seattle, Washington
W. I. EWART.....	Seattle, Washington
F. H. BROWNELL.....	Seattle, Washington
FRANK B. COLE.....	Tacoma, Washington
THOS. BORDEAUX.....	Seattle, Washington
M. R. HUNT.....	Seattle, Washington
W. W. SEYMOUR.....	Tacoma, Washington
D. P. SIMONS.....	Seattle, Washington
R. H. BURNSIDE.....	Raymond, Washington

Members of the Washington Forest Fire Association

December 31, 1915

NAME	ADDRESS
ALDWELL, THOS. T.....	Port Angeles, Washington
ALEXANDER BROS.....	Chehalis, Washington
ALEXANDER, J. B.....	Seattle, Washington
ALGER LOGGING Co.....	Portland, Oregon
ANDERSON, A. F.....	Seattle, Washington
ANDREWS, H. D.....	Centralia, Washington
ASHE BROS.....	Granite Falls, Washington
AVERY, W. A.....	Detroit, Michigan
BAILEY, J. G. ESTATE.....	Cathlamet, Washington
BAIRD, E.....	Union, Washington
BARKER CREEK TIMBER Co.....	Seattle, Washington
BENN, SAMUEL.....	Aberdeen, Washington
BLOEDEL DONOVAN LUMBER MILLS.....	Bellingham, Washington
BONER, W. H.....	Everett, Washington
BRADLEY, EDWARD.....	Tomahawk, Wisconsin
BRADLEY, JAS. W.....	Milwaukee, Wisconsin
BRADLEY LOGGING COMPANY.....	Portland, Oregon
BRADLEY, N. B. & SONS.....	Portland, Oregon
BREWER, F. A.....	Duluth, Minnesota
BROCKWAY, MRS. MYRA A.....	Chehalis, Washington
BROWN BROS. LUMBER Co.	Seattle, Washington
BROWN, S. A.....	Portland, Oregon
BURROWS & RUST.....	Saginaw, Michigan
CAMP, HOEL H. ESTATE	Milwaukee, Wisconsin
CAMP REAL ESTATE Co.	Milwaukee, Wisconsin
CANAL TIMBER COMPANY	Everett, Washington
CARRIER, M. L.....	Centralia, Washington
CASCADE TIMBER Co.....	Tacoma, Washington
CHEHALIS LAND & TIMBER Co.....	Chehalis, Washington
CHERRY VALLEY TIMBER Co.....	Everett, Washington
CHURCHILL, JAMES.....	Centralia, Washington
CLARK COUNTY TIMBER Co.....	Portland, Oregon
CLARK, JAMES F.....	Quillayute, Washington
CLEAR LAKE LUMBER Co.....	Clear Lake, Washington
COBB & HEALY.....	Seattle, Washington
COFFMAN-DOBSON & Co.....	Chehalis, Washington
COLE, F. B.....	Tacoma, Washington
COLLINS, E. S.....	Ostrander, Washington
CONEWANGO LUMBER Co.....	Warren, Pennsylvania
CORY, A. S.....	Chehalis, Washington

NAME	ADDRESS
COWLITZ LUMBER Co.....	Williamsport, Pennsylvania
CROGSTER TIMBER Co.....	Portland, Oregon
CROSSETT TIMBER Co.....	Knappa, Oregon
CROWN-WILLAMETTE PAPER Co.	Portland, Oregon
CRUMLY, J. H.....	Chehalis, Washington
CURRAN TIMBER Co.....	Portland, Oregon
DAY LUMBER Co.....	Seattle, Washington
DAVIS, C. H.....	Saginaw, W. S., Michigan
DEEP RIVER LOGGING Co.	Portland, Oregon
DEMPSEY LUMBER Co.....	Tacoma, Washington
DENNY-RENTON CLAY & COAL Co.....	Seattle, Washington
DOSEWALLIPS TIMBER Co.....	Port Townsend, Washington
EAGLE SHINGLE Co.....	Hamilton, Washington
EBEY LOGGING Co.....	Seattle, Washington
ELBE LUMBER & SHINGLE Co.....	Elbe, Washington
ENGLISH LUMBER Co.....	Seattle, Washington
ENTERPRISE LUMBER Co.....	Seattle, Washington
EVERETT PULP & PAPER Co.....	Everett, Washington
EVERETT TIMBER & INVESTMENT Co.....	Seattle, Washington
FLEISCHMAN, FRANK	Hoh, Washington
GARDNER, N. B.....	Toutle, Washington
GERBER & KEMPF.....	Fremont, Michigan
GOLD BAR LUMBER Co.....	Gold Bar, Washington
GRANDIN COAST LUMBER Co.....	Seattle, Washington
GRAYS HARBOR COMMERCIAL Co.....	Cosmopolis, Washington
GREAT NORTHERN RAILWAY Co.....	Seattle, Washington
GRIFFIN TRANSFER Co.....	Tacoma, Washington
HALLBERG, P. A.....	Seattle, Washington
HAMILTON COAL & DEVELOPMENT Co.....	Hamilton, Washington
HAMMOND LUMBER COMPANY.....	Astoria, Oregon
HANSELMAN, MRS. BERTHA C.....	Portland, Oregon
HAWKEYE TIMBER Co.....	Raymond, Washington
HENRY & LARSON LUMBER Co.....	Seattle, Washington
HERSHEY LUMBER Co.....	Stillwater, Minnesota
HIGHLAND TIMBER Co.....	Lyman, Washington
HUMBIRD, J. A., ESTATE OF.....	Spokane, Washington
HYLAND, IVAN L.....	Seattle, Washington
ILLINOIS TIMBER Co.....	Chicago, Illinois
INDEX-GALENA LUMBER Co.....	Index, Washington
INMAN-PAULSON LOGGING Co.....	Mount Solo, Washington
IRVINE, THOS. LUMBER Co.....	Everett, Washington
JEROME, T.	Seattle, Washington
JOHNSON-DEAN LUMBER Co.....	Robe, Washington
KENAGA, D. H.....	Seattle, Washington

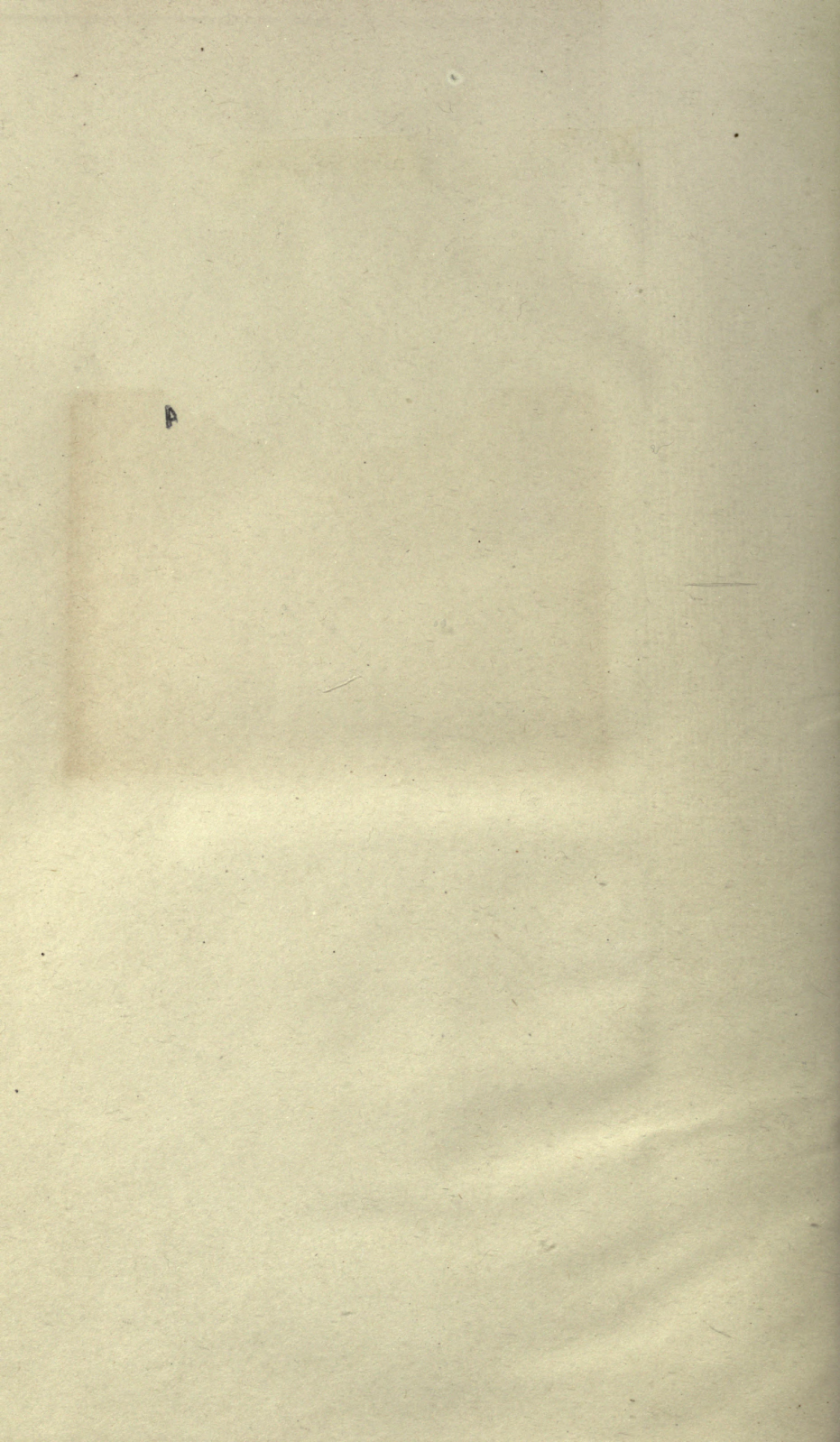
NAME	ADDRESS
KLABER INVESTMENT Co.....	Tacoma, Washington
KUEHNER, L.	Chehalis, Washington
LACEY, JAS. D. & Co.....	Seattle, Washington
LAMSON, R. H.....	Fortson, Washington
LEE, O. H.....	Maltby, Washington
LEHN, HENRY	Clallam Bay, Washington
LEVERETT LUMBER Co.....	Seattle, Washington
LEWIS, B. R.....	Seattle, Washington
LINDBERG, GUSTAF	Tacoma, Washington
LOCHSLOY TIMBER Co.....	Everett, Washington
LONG, T. J.....	Chehalis, Washington
LUCE, MRS. CHARLOTTE C.....	Grand Rapids, Michigan
LYMAN TIMBER Co.....	Everett, Washington
McCAUGHEY MILL Co.....	Fortson, Washington
McCOY, PAT	Seattle, Washington
McCOY-LOGGIE TIMBER Co.	Seattle, Washington
McCUTCHEON, JAS. D.....	Chehalis, Washington
McGUIRE, CHAS.	Seattle, Washington
McNEIL, MRS. A.	Seattle, Washington
MALONEY, JOHN	Skykomish, Washington
MANNING, F. A.....	Chehalis, Washington
MASON COUNTY LOGGING Co.....	Seattle, Washington
MERRILL & RING LOGGING Co.....	Seattle, Washington
MERRILL-RING-BLISS Co.	Seattle, Washington
MERRILL & RING LUMBER Co.....	Seattle, Washington
MERRILL, T. D.....	Seattle, Washington
MERRILL, R. D.....	Seattle, Washington
METCHAN, PHIL.	Portland, Oregon
MILBURN, CHAS. C.	Washington, D. C.
MILWAUKEE LAND Co.....	Spokane, Washington
MORAN, H.	Seattle, Washington
MONROE INVESTMENT Co.....	Monroe, Washington
MT. BAKER TIMBER Co.....	Seattle, Washington
MURPHY & DIGGINS.....	Cadillac, Michigan
NIELSEN, FRANK A.....	Oshkosh, Wisconsin
NOBLE, H. E.....	Portland, Oregon
NORTH BEND LUMBER Co.....	North Bend, Washington
NORTH WEST LUMBER Co.....	Seattle, Washington
O'NEAL TIMBER Co.....	Everett, Washington
OLMSTED, CLINT	Cathlamet, Washington
OREGON IRON & STEEL Co.....	Portland, Oregon
ORIENTAL LAND & IMPROVEMENT Co.....	Chicago, Illinois
PACIFIC NATIONAL LUMBER Co.....	Tacoma, Washington
PACIFIC STATES LUMBER Co.....	Tacoma, Washington

NAME	ADDRESS
PENDLETON, F. R.....	Everett, Washington
POWELL, DR. J. L.....	Tacoma, Washington
PRESTON MILL Co.....	Seattle, Washington
PUGET MILL Co.....	Seattle, Washington
RAINIER INVESTMENT Co.....	Seattle, Washington
RHINELANDER-PORTLAND TIMBER Co.....	Rhineland, Wisconsin
RIVERSIDE TIMBER Co., THE.....	Seattle, Washington
RIXON, THEO. F.....	Clallam Bay, Washington
ROBBINS, HARRY M. (TRUSTEE).....	Hopkins, Minnesota
ROSS, FLOYD	Beaver, Washington
RUDISILE, J. F.....	Clallam Bay, Washington
SACHS, ADAM	Elbe, Washington
SAGINAW TIMBER Co.....	Aberdeen, Washington
SALLING, E. N., ESTATE OF.....	Grand Rapids, Michigan
SALLING-HANSON Co.	Grayling, Michigan
SALZER, DAN	Centralia, Washington
SCHOFIELD TIMBER Co.....	Seattle, Washington
SCOTT & HOWE.....	Tacoma, Washington
SEATTLE LUMBER Co.....	Seattle, Washington
SHELDON, N. W.....	Seattle, Washington
SILVER LAKE RAILWAY & LUMBER Co.....	Castle Rock, Washington
SIMONS, D. P.....	Seattle, Washington
SIMPSON LOGGING Co.....	Shelton, Washington
SKAGIT COAL & COKE Co.....	Seattle, Washington
SKYKOMISH LUMBER Co.....	Skykomish, Washington
SLADE, G. A.....	Snoqualmie, Washington
SLADE, S. E. LUMBER Co.....	Aberdeen, Washington
SMITH & BURR.....	Manistee, Michigan
SMITH, M. F.....	Berlin, Washington
SNOQUALMIE FALLS LUMBER Co.....	Seattle, Washington
SOUTH BEND MILLS & TIMBER Co.....	South Bend, Washington
SOUND TIMBER Co., THE.....	Seattle, Washington
SQUIER & GERBER.....	Fremont, Michigan
STEPHENS-BIRD LUMBER & LOGGING Co.....	Monroe, Washington
STEWART & ALEXANDER.....	Wausau, Wisconsin
STEWART, F. L.....	Kelso, Washington
STIMSON MILL Co.....	Seattle, Washington
STROM, SAM	Darrington, Washington
ST. PAUL & TACOMA LUMBER Co.....	Tacoma, Washington
SULTAN LUMBER Co.....	Sultan, Washington
SULTAN RAILWAY & TIMBER Co.....	Everett, Washington
THREE LAKES LUMBER Co.....	Three Lakes, Washington
TOZER, DAVID Co.....	Stillwater, Minnesota
TYEE LOGGING Co.....	Seattle, Washington

NAME	ADDRESS
UNION LUMBER Co.....	Seattle, Washington
UNITED TANNERS TIMBER Co.....	Fremont, Michigan
UPPER, HERBERT S.....	Seattle, Washington
URQUHART, W. M.....	Chehalis, Washington
VANBIBBER, JIM	Riffe, Washington
WAGNER & WILSON.....	Monroe, Washington
WAITE MILL & TIMBER Co.....	Seattle, Washington
WALLACE LUMBER & MANUFACTURING Co.....	Startup, Washington
WALTERS, C. H.....	Chehalis, Washington
WALVILLE LUMBER Co.....	Walville, Washington
WEEKS & Co.....	North Bend, Washington
WELTY, J. R.....	Portland, Oregon
WESTERN TIMBER Co.....	Portland, Oregon
WETMORE LUMBER COMPANY.....	Warren, Pennsylvania
WEYERHAEUSER TIMBER Co.....	Tacoma, Washington
WHATCOM FALLS MILL Co.....	Bellingham, Washington
WHEELER-OSGOOD Co., THE.....	Tacoma, Washington
WHITE RIVER LUMBER Co.....	Enumclaw, Washington
WILLAPA LUMBER Co.....	Raymond, Washington
WILLIAMS, FRANK G.....	Ferndale, California
WILLIS, DR. PARK W.....	Seattle, Washington
WISCONSIN LOGGING & TIMBER Co.....	Portland, Oregon
WOOD & IVERSON.....	Hobart, Washington
WORTHINGTON BROS.	Quilcene, Washington

CONTRIBUTORS

NORTHERN PACIFIC RAILWAY Co.....	Tacoma, Washington
NORTHWESTERN IMPROVEMENT Co.....	Tacoma, Washington
SOUTHWELL, H. E.....	Chicago, Illinois
WIEST, J. B.....	Skamokawa, Washington



Washington.

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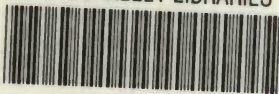
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