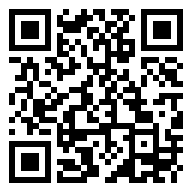


REPORT

OF THE

STATE FORESTER

OF WISCONSIN

For 1911 and 1912

MADISON
DEMOCRAT PRINTING CO., STATE PRINTER
1913

ERRATA.

Page 21. The west boundary line recommended for the permanent forest reserve should be as follows, from the northeast corner of section 13 in T. 44, R. 4 E.: "thence south on the east line of R. 4 E. to the northeast corner of T. 43, R. 4 E.; thence west to the northwest corner of T. 43, R. 4 E.; thence south to the northwest corner of T. 41, R. 4 E.; thence west to the northwest corner of T. 41, R. 2 E.; thence south to the southwest corner of T. 41, R. 2 E."

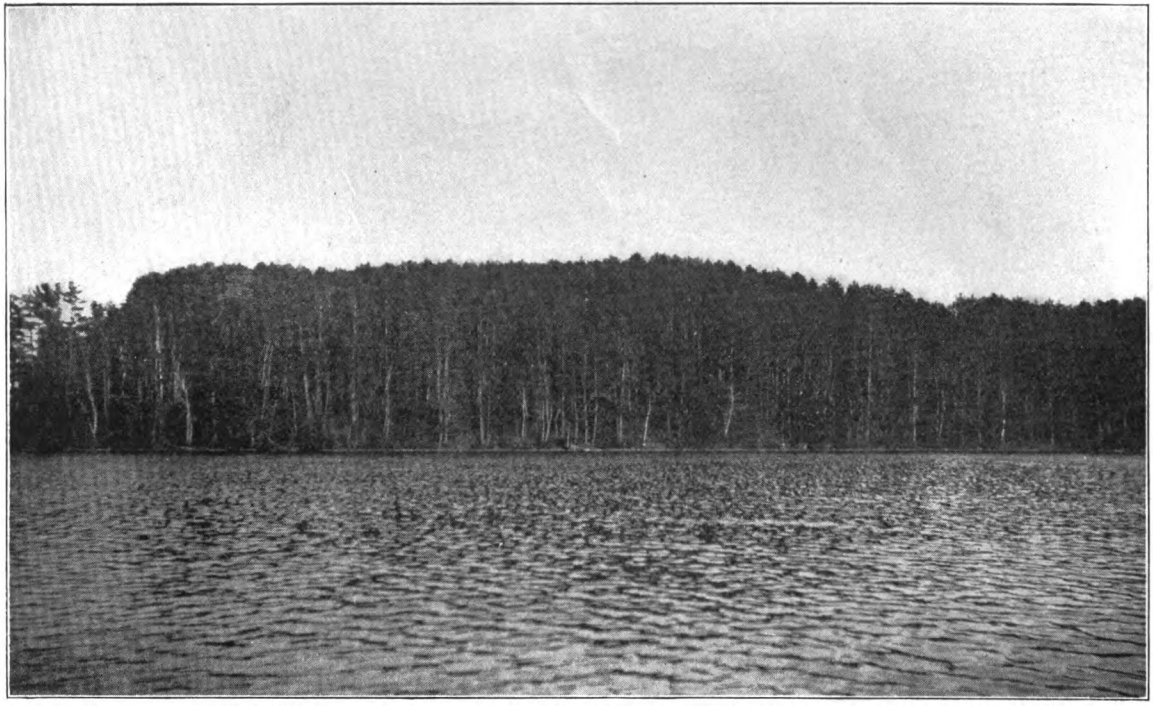
The townships excepted from the permanent forest reserve should include: T. 41, R. 10 E.

Page 76. The third paragraph should read: "As the Federal patrolmen received $4,431.25 in 1911, and $4,238.50 in 1912, the cost of protecting the 1,000,000 acres of privately owned lands has been less than ½ cent per acre per annum."

Page 100. Last paragraph, first line, should read: "The price received for all lands sold averages $3.35 per acre."

Page 102. Lines 6, 7 and 8 should read:

Total acres owned by the State, north of town 33	342,704.43
Total amount invested therein	$553,729.39
Average amount invested per acre	$1.61



CATHEDRAL POINT, TROUT LAKE, VILAS COUNTY. A PORTION OF THE FOREST RESERVE.

REPORT

OF THE

STATE FORESTER

OF WISCONSIN

For 1911 and 1912

MADISON
DEMOCRAT PRINTING CO., STATE PRINTER
1913

STATE BOARD OF FORESTRY.

MEMBERS OF THE BOARD.

CHARLES RICHARD VAN HISE, CHAIRMAN,
President University of Wisconsin.

H. L. RUSSELL,
Dean State Agricultural College.

EDWARD ASAHEL BIRGE,
Director State Geological Survey.

L. H. BANCROFT,
Attorney-General.

GEORGE BEYER,
Oconto.

EDWARD MERRIAM GRIFFITH,
State Forester.

FRANK B. MOODY,
Assistant State Forester.

M. A. CASTLE,
Clerk.

A. V. CRANE,
Stenographer.

PETER JACOBS,
Head Cruiser, Minocqua.

E. M. WEAVER,
Head Ranger, Woodruff.

JOS. LUCIUS,
Locomotive Inspector, Rhinelander.

H. A. JOHNSON,
Cruiser, Tomahawk.

W. D. BARNARD,
Forestry Assistant, Woodruff.

P. C. CHRISTENSEN,
Forest Ranger, Tomahawk Lake.

J. B. COOK,
Forest Ranger, Star Lake.

A. E. DOOLITTLE,
Forest Ranger, Woodruff.

HENRY FREUND,
Forest Ranger, Boulder Junction.

J. H. KRUMM,
Forest Ranger, North Crandon.

FRANK J. LONG,
Forest Ranger, Sayner.

J. J. McDONALD,
Forest Ranger, Minocqua.

P. A. McDONALD,
Forest Ranger, Boulder Junction.

F. G. WILSON,
Forest Ranger, Woodruff.

CONTENTS.

OFFICE OF THE STATE FORESTER,

MADISON, WIS., Dec. 31, 1912.

State Board of Forestry.

GENTLEMEN: I have the honor to submit herewith my report for 1911 and 1912.

Very respectfully,

E. M. GRIFFITH,

State Forester.

REPORT OF THE STATE FORESTER.

FORESTRY PROBLEMS ON STATE LANDS.

History of Forestry Legislation.

As early as 1867 a law was passed in Wisconsin providing for the appointment of three commissioners to investigate and report upon the injurious effects of clearing the land of forests, the duty of the state in regard to the matter, and the experiments that should be made toward the growth and proper management of forest trees. An exhaustive and very valuable report was completed and published the same year by the commissioners, I. A. Lapham, J. G. Knapp and H. Croker.

In 1897 another law was passed providing for the appointment of a forestry commission of three members by the governor, who were to draw up a plan for the protection and utilization of the forest resources of the state, and for the organization of a forestry department and the creation of a forest reserve. The members appointed were George B. Burrows, H. C. Putnam, and Ernest Bruncken and their report was made and published in 1898, and it included a draft of a bill recommended for passage. However, no legislation resulted until 1903.

The first forestry commission, which was in existence before the forests of the state had been enormously depleted by lumbering, suggested the regulation of timber cutting, in order to prevent public calamity, deplored the ruthless devastation of large tracts of land by nonresident lumbermen, and advocated experiments in tree culture and investigation of the value of various species. The second commission, appointed after thirty years more of heavy lumbering operations had taken place in the state, advocated the immediate establishment of a system of

state forests, "not only for the protection of the climate and waterflow of the state, but for the purpose of providing a sufficient supply of raw material to the various lumber and wood industries" and outlined a plan for the organization of a department to carry out this work.

The forestry law that was finally passed in 1903, chapter 450, was essentially the same as the bill recommended by the forestry commission of 1897. It created an unsalaried forest commission composed of the attorney-general, secretary of state and state treasurer, ex officio, and of two others to be appointed by the governor, and provided for a superintendent of forests who was also to be state fire warden and as such to appoint town fire wardens. This law was intended to stop the sale of state lands so that they should constitute the nucleus of a state forest reserve but there were conflicting sections and the law also provided for the sale of the lands and such sales were made after the passage of the law. The attorney-general could not construe the law, it was so loosely drawn, and the state officers who then were members of the forest commission were obliged to place such high valuations upon the lands that they would not readily sell, in order to save any considerable acreage for forest reserve purposes. The law provided for the establishment of one or more forest experiment stations and a detailed inquiry into the character and condition of each parcel of land contained in the forest reserve, but it made an appropriation of only $3,000 annually besides the salary of the superintendent of forests and none of the money received from the sale of lands or dead and down timber was to go into a forest reserve fund. Under this law in February, 1904, a technically trained forester was appointed superintendent of forests, who has directed the work down to the present time. The land commissioners set aside in 1904 as the nucleus of a permanent forest reserve, 40,000 acres of state land in Oneida and Vilas counties, and again in the same year 22,000 acres in Iron county. Thus was real forestry work begun.

In 1905, a much more effective forestry law was passed, chapter 264. A state board of forestry was created in place of the former forest commission, and as it was made up of the president of the state university, the director of the state geological survey, the dean of the state agricultural college, the attorney-

general and one member appointed by the governor, the membership of the board was much less liable to change and a uniform non-political forest policy could be counted upon. The state forester was given an assistant and a clerk as well as authority to employ the necessary assistance for the improvement and protection of the forest reserve. All state lands north of town 33 except school lands were set aside for forestry purposes and those that were not suitable for permanent forest reserve lands because of their isolation or greater value for agriculture, could be sold upon the recommendation of the state board of forestry, and the funds so acquired could be used to purchase other lands suitable for the permanent forest reserve. Moreover, all money received from the sale of forest reserve lands or products from them was to constitute a forest reserve fund and the annual appropriation was increased to $9,800. The system of town fire wardens remained practically the same. Railroads and individuals operating engines of various kinds were made to take precautions against the setting of fires in forest or marsh lands and were made more specifically liable for fires caused by them.

In 1907, a law known as chapter 491 was passed, which appropriated ten thousand dollars per annum for acquiring lands as additions to the forest reserve by purchase at tax sales or by purchase from counties that had acquired lands under tax deeds. This law was amended at the following session of the legislature so that other lands than tax title lands could be purchased by the public land commissioners for the same purpose. In 1907, chapter 592, also, was passed, exempting from taxation for a period of 30 years not to exceed 40 acres of land planted to forest trees. Although this law was given publicity, no landowner has ever taken advantage of it, probably on account of the mistaken feeling that the initial cost of planting would be high. Chapter 335 authorized the Wisconsin Valley Improvement Company to build dams and create storage reservoirs along a certain portion of the Wisconsin river, so as to produce a more uniform stream flow. The creation of reservoirs is under the supervision of the State Board of Forestry and the financial operations of the company are under the supervision of the railroad rate commission, that is, the regulation of toll rates and so forth.

There are some 47,000 acres of land within five Indian reservations in Wisconsin that are claimed by the state under the Swamp Land grant. A law looking to the settlement of the State's claim, chapter 96, was passed in 1907, authorizing the State Board of Forestry in their discretion to have these lands appraised and to convey the state's interest in and title to such lands to the United States upon the payment to the state of the amount of the appraisal. A bill is now pending in Congress providing for supplementary action by the government in regard to the state's claim. The land in the Lac du Flambeau and Lac Courte Oreille reservations is not suitable for agriculture and the same is true to a considerable extent of the land in the Menominee and La Pointe reservations. The state should make an effort to have the government establish permanent forest reserves on the nonagricultural lands in the La Pointe, Lac Courte Oreille and Menominee reservations and it is particularly to be desired that there be a forest reserve on the Lac du Flambeau reservation as it is surrounded by state forest reserve lands and there should be coöperative management of the state and federal forest reserves.

In 1909, three laws were passed, worthy of note. In chapter 374, the state reserved to itself in all future sales of state lands, all mineral and water power rights; town boards were authorized to acquire tracts of land to be used and maintained as town woodlots in chapter 77; and by chapter 119 the State Board of Forestry was authorized to inspect all locomotives operated in forest or grass land to see that they were properly equipped to prevent the escape of sparks, and was also authorized to direct railway corporations to patrol their tracks during a dangerously dry time.

In 1911, several forestry laws were enacted. Chapter 601 entirely changed the organization of the town fire wardens system. Instead of the appointment of one or more fire wardens as needed, for any town, by the State Forester, every town chairman is made, ex officio, town fire warden, and the superintendents of highways are made assistant town fire wardens. Many towns have no superintendents of highways, as they prefer to have their road work done under contract. Therefore, some towns have one warden and some have as many as 24 or 25. Moreover, the towns that have the larger number of road sup-

erintendents are those that are thickly settled and therefore have little or no timber. Thus we have large numbers of fire wardens in towns where they are little needed and very few in timbered, unsettled townships where fire protection is much needed. Moreover, local fire wardens may change with every annual town election and it is a difficult matter for the State Forester, who is also State Fire Warden, to keep an accurate record of a large number of ever changing fire wardens, and to prepare them for their duties by giving them necessary information and to supply them with warning notices, report blanks and pamphlets without great waste. The State Forester may appoint needed fire wardens temporarily on recommendation of a town chairman, in cases of emergency. He is also given authority to mass such fire warden force as may be available at any special point to suppress fires but the law makes no provision for meeting the expense incident to the exercise of such authority. The expense of preventing or extinguishing running fires by town or assistant town fire wardens or those called into service by them is to be borne by the road district or districts within which the expense was incurred, and paid from the town treasury. Payment for services performed by fire wardens appointed by the State Forester is made, one-half by the county where such services are performed and one-half by the state. The town boards are given the authority to forbid the setting of fires during a dangerously dry time. Although this law may be in many respects an improvement over preceding laws, it could be very greatly improved.

Chapter 245 makes every railroad corporation owning or operating a railroad in the state responsible for all damage to property by fire communicated directly or indirectly by locomotive engines or by fire set to clear their rights of way. A property owner who suffers damage has only to give notice of his loss and proof that the fire originated from the railway, to any officer, or station agent or ticket agent, and if the loss is not made good in 60 days, the corporation is liable for double the amount of damage in an action in court. If the corporation offers a fixed sum that is refused and a court fails to sustain the property owner's claim for larger damages, the owner recovers only his damages and the railroad recovers its costs.

Chapter 494 strengthened a law already in existence in regard to locomotives, by giving any inspector designated by the State Board of Forestry the power to order out of service immediately any locomotive or engine not properly equipped with fire protective devices until such locomotive or engine has been properly equipped. In case of disagreement between any inspector and any railroad as to the adequacy of fire protective equipment of engines or locomotives, an appeal can be made to the railroad rate commission for a decision and they are to determine the matter.

Chapter 638 reënacted the general forestry law with a few changes. The State Board of Forestry was given the power to exchange lands, so as to facilitate blocking up the permanent forest reserves and the annual appropriation was increased to $35,000 as the work in the field had developed to such an extent that a much larger force of assistants was necessary.

Until 1911 there had been no appropriation for the purchase of forest reserve lands (except the $10,000 appropriation for tax title and other lands), the fund for such purpose being derived almost entirely from the sale of the state lands north of town 33 that were not suitable for forestry purposes. Chapter 639 appropriated annually for five years $50,000 to constitute a forestry investment fund, authorized the State Forester to enter into contracts for the purchase of lands and provided for the condemnation of lands needed for forestry purposes. This law also provided for a forest reserve committee of the legislature consisting of two senators and three assemblymen to be appointed during each session and to investigate and report before the end of such session upon purchases of forest reserve lands made since the preceding legislative session, and also upon prospective purchases.

Chapter 640 authorized the Chippewa and Flambeau Improvement Company to construct and operate storage reservoirs upon certain portions of the Chippewa and Flambeau rivers for the purpose of producing a uniform stream flow.

What Has Been Accomplished In Forestry.

The first work undertaken by the Forestry department was the creation of a permanent forest reserve. An investigation that had been made before any state lands were set aside had

shown that that part of the state lying in Forest, Oneida and Vilas counties, and in the eastern portion of Iron and Price counties was unquestionably the region to select, as it contains a very large number of lakes which are the headwaters of our important rivers, and as the greater part of the land is too sandy, rocky or swampy to be suitable for agriculture. It is very doubtful if there is another region in the United States where there are so many lakes within an equal area and where so many important rivers have their source.

The three main objects of forestry in this state are; first, to maintain forests on the headwaters of our important rivers, so as to keep the stream flow uniform; second, to provide raw material for our wood-using industries; and third, to make an attractive resort region. As Wisconsin has not, so far as is known, any deposits of coal, it is very important that her large number of well-distributed water powers, which are her only source of manufacturing energy, be made the most of. To this end a uniform stream flow should be secured by the use of our numerous lakes as natural storage reservoirs, the creation of artificial storage reservoirs and the maintenance of forested watersheds. The wood-using industries of Wisconsin are exceedingly important but the time has come when they are purchasing fifty per cent of their raw material outside of the state. The state should make an effort to retain these industries by providing a supply of raw material. The state has a resort region of wonderful natural attractions, the numerous lakes and streams and the forests with their fish and game bringing tourists from long distances. The proper protection and development of this lake region will bring a large income to the local residents and to the state as well. The summer resort business in northern New York state amounts to approximately $10,000,000 a year, this amount being paid by the tourists in railroad fares, to hotels and boarding houses, and for guides, teams, boats, etc. New Hampshire does nearly as well and Maine receives nearly $20,000,000 a year from her summer business.

The first land set aside for a forest reserve was 40,000 acres in Oneida and Vilas counties, in 1904. A little later 22,000 acres were added, in Iron county. The next year the Forestry department secured the law granting to it all state lands north

of town 33, which increased the acreage to 233,364. Most of the lands in the last grant were scattered over the entire northern portion of Wisconsin and it was necessary to have them examined and appraised and put upon the market, a few counties at a time, so as to obtain funds to buy other lands to block up the permanent forest reserves. This has been a work of years but it has progressed steadily, ten or twelve land cruisers having been employed at various times. Many thousand acres of scattering and agricultural lands have been sold and yet the acreage of forest reserve lands has increased through the purchases made within the permanent forest reserve area. Mr. Frederick Weyerhaeuser of the Nebagamon Lumber Company gave to the state some 4,000 acres on the Brule river in Douglas county and a small permanent reserve has been established there. The Federal government as a result of efforts on the part of Senator La Follette and the Forestry department granted 20,000 acres of government lands to the state, and many purchases of land have been made from the forestry funds, so that the present acreage of forest reserve lands is approximately 400,000 acres and purchases now pending will increase this area to about 410,000 acres.

The forest reserves have not only been increased in area and blocked up more solidly, but many improvements have been made. The headquarters for the field force has been established at Big Trout lake and a large Headquarters Camp building has been erected there, also a stable, ice house and boathouse. Five ranger cabins have been built at various points on the reserve and at least seven more will be constructed. The main forest nursery has been established near the Headquarters Camp and it now contains about 2,500,000 seedlings. Twelve forest rangers have been employed by the state and, by a coöperative arrangement with the United States Forest Service, the latter has employed twelve patrolmen within the state. As the past two seasons were rainy and the danger from fire slight, these rangers and patrolmen have been able, with the help of laborers working under them, to clear about 160 miles of old railroad grades so as to make both good roads and excellent fire lines, to cut about 118 miles of fire lines through the forests, to construct over 56 miles of telephone lines and to destroy dangerous slashings on about 1200 acres. These fire lines and roads have been made

so as to connect lake with lake and thus divide the forest reserve into compartments.

Four steel lookout towers, fifty-five feet high, have been erected on high hills within the forest reserve region. These towers are connected by telephone with the Headquarters camp, ranger cabins and nearby towns, and are furnished with good maps of the region which can be seen from the tower. Men are stationed in these towers only during dangerously dry weather, and when signs of a fire are seen they locate it on the map and notify the nearest ranger by telephone.

Besides the work accomplished in connection with the forest reserves a considerable amount of educational work has been conducted by the State Forester. Courses of general lectures on forestry have been given at the University of Wisconsin and many single lectures have been given before farmers' institutes and various clubs and organizations over the state. The Chicago and Northwestern railroad brought together many of its employes on two occasions so that the subjects of forestry and forest fire protection might be presented to them.

In addition to the biennial reports of the department, the following publications have been issued: "The Wood-Using Industries of Wisconsin," "The Taxation of Forest Lands in Wisconsin" and "A Preliminary Report on Storage Reservoirs at the Headwaters of the Wisconsin River." The material for the first two was compiled in coöperation with the U. S. Forest Service. Many educational articles on forestry have been prepared for various periodicals.

The Department has given advice and help to individuals who wished to undertake planting operations, and has coöperated with one of the railroads in testing spark arresting devices.

In connection with the University of Wisconsin, a successful effort was made to have the U. S. Forest Products Laboratory located at Madison, Wisconsin, and this has resulted in great benefit to the state, as experiments in the utilization of various woods are made here, the results of which are of great value, and the experts in charge of various divisions of the work give free instruction to students at the University of Wisconsin. The state provides a building together with heat, light and power, for the Laboratory.

The creation of artificial storage reservoirs on the important rivers of the state accomplishes to some extent one of the main purposes that forestry aims to accomplish, the production of a uniform stream flow. The constitution of Wisconsin prohibits the state from engaging in any work of internal improvement and therefore the state cannot build or operate reservoirs. The Forestry department, however, is heartily in sympathy with the construction and operation of such reservoirs by private parties, under the supervision of the state, and it aided as far as possible in securing the passage of a law that is a remarkable and unique piece of legislation and that protects the interests of both individual manufacturers and the people of the whole state. In this law, chapter 335 of the laws of 1907, the Wisconsin Valley Improvement Company is authorized to construct, acquire and maintain a system of water reservoirs on the tributaries of the Wisconsin river north of township 33 for the purpose of producing a uniform flow of water in the Wisconsin river and its tributaries and thereby improving the navigation and other uses of the said streams and diminishing the injury to property both public and private.

The State Board of Forestry supervises the construction of each dam, its location, height, the amount of land to be overflowed and the time and manner of drawing off water. The state railroad commission, acting in its capacity of public utilities commission, passes upon a fair capitalization for the company, distribution of stock and amount of tolls to be charged, the net annual return on the actual cash capital being limited to six per cent. The right is reserved to the state to take over the ownership of all reservoirs and property of the company by paying the amount of the cash capital that has been paid in as the actual value of the physical properties, in case the constitution of the state should ever be changed to permit the exercise of such ownership. The passage of this law marks a long stride in progress in the development of one of the greatest resources of the state.

At the present time the Wisconsin Valley Improvement Company controls a drainage area of 580 square miles, upon which are about 84 square miles of water surface, or 14%. Of this 84 square miles of water surface about 58 square miles, or 10% of the drainage area, is made up of lakes used for storage reser-

voirs. The total storage capacity on these lakes is about 5,000 million cubic feet, giving an average fluctuation of lake level of about three feet. Experience from similarly located lakes would indicate that in a condition of nature, without dams at their outlets, there would be a fluctuation of about 1½ feet, or about one-half that obtained by regulation. This gives a storage capacity of about 2,500 million cubic feet in excess of natural storage, and from which actual benefit is obtained. Reports show that the average yearly storage draft at certain points on the Wisconsin river for 1908–9 has been 5,840 million cubic feet. The benefit from this storage has been an increase of stream flow over that with natural storage, at and below Tomahawk of about 160 cubic feet per second, distributed over seven months. This 160 cubic feet per second would produce for each foot of head utilized, 18 water H. P. or about 13½ actual H. P. A water power plant utilizing 20′ head would then have an increase in available power of about 360 water H. P. or 270 actual H. P. for seven months of the year.

In 1911 a similar law was passed giving like authority to the Chippewa and Flambeau Improvement Company.

It is the intention of the Forestry department to carry steadily forward the work of increasing and blocking up the forest reserve area; to continue cutting roads and fire lines, and building telephone lines, and to erect a number of ranger cabins and lookout towers, so as to furnish adequate protection from forest fires; branch nurseries will be established and replanting will be done on areas that are not restocking naturally; a patrol system will be maintained on the forest reserves and an effort will soon be made to have the U. S. Forest Service coöperate more extensively in protection from forest fires by furnishing a larger number of men to patrol portions of the state during the fire season.

This department has agreed to coöperate with the state university in conducting a school for the practical training of forest rangers, the students to be employed during a portion of their course on the state forest reserves.

The Department is coöperating to some extent with the College of Agriculture in making a soil survey of the forest reserve area, as it is intended that the practice of forestry in the state shall not interfere in any way with general agricultural develop-

ment. The Department has pointed out in its published reports that there are over 13 million acres of land in northern Wisconsin awaiting development and it has been recommended that the best agricultural lands be settled rather than the poorer lands of questionable agricultural possibilities, so that settlers may not be doomed to poverty and comparative isolation and be deprived of good schools and the many advantages of a growing community.

An effort is being made also to bring about coöperative management of a large acreage of forest lands in Forest county, owned by the Chicago and Northwestern railway, the state and several companies engaged in wood-using industries.

Mention has already been made of a bill now pending in Congress to reimburse the state for the swamp lands that were included within the boundaries of the several Indian reservations.

Through the efforts of Congressman E. A. Morse, who introduced the bill in the House of Representatives, and Senator La-Follette, who secured its passage through the Senate, Congress in 1912 granted to Wisconsin as an addition to the state forest reserves, all the remaining unsurveyed and unallotted islands in inland lakes north of town 33. The forest reserves will thus be increased by about 250 islands, many of them most beautiful, and they will be leased for summer camps and cottages.

Urgent Necessity For Completing Forest Reserve.

The state forest reserves now comprise over 400,000 acres of land most of which is on the headwaters of the Wisconsin and Chippewa rivers, but in many cases the state lands are so badly scattered that it will be necessary to acquire about 1,000,000 acres more in order to block up and consolidate the reserves, which must be done in order to make forestry management, and especially fire protection, feasible. A forest reserve of 1,500,000 acres will include practically all of the nonagricultural lands in Forest, Oneida, Vilas, Iron and Price counties; protect the headwaters of our most important rivers; insure a large part of the future supply of raw material that our wood-using industries must have if they are to remain in Wisconsin; protect one of the most beautiful lake regions in the world, and through the sale of forest products, leasing of resort property, etc., bring a large and increasing revenue to the state.

The privately owned lands, which are scattered all through the state's holdings, are a constant menace to the forest reserve, as they are not settled or cared for in any way, but are very largely in the hands of nonresident owners. The truest economy on the part of the state will be to acquire these lands as soon as possible, so that the valuable young timber on them may be protected. It is a most wasteful and expensive policy for the legislature to postpone purchasing these lands until some indefinite future date, as such unprotected lands are the source from which start many of the most destructive fires, and the young timber that is destroyed has a much greater value than the cost of the land and timber at the present time.

The urgent necessity of making an appropriation sufficient to acquire the necessary lands was strongly emphasized by the special legislative committee on Water Powers, Forestry and Drainage, that was appointed at the end of the 1909 session, and which visited the reserves and made its report to the legislature of 1911. The members of this committee were divided on the subject of water power and drainage legislation, but both factions pointed out the great need of completing the reserves and recommended that for this purpose a state tax of 2/10 of a mill be levied and collected annually for a period of twenty years.

The State Conservation Commission and the State Board of Forestry made the same recommendations to the legislature of 1911, but the final result was a totally inadequate appropriation of $50,000 a year for a period of five years. The Joint Finance committee of the legislature of 1911 was opposed to granting a mill tax as they preferred to purchase lands by direct appropriations. The senate favored an appropriation of $200,000 a year for a period of ten years, but as the assembly cut down the appropriation to $50,000 a year for five years, it has been possible to purchase only some of the largest and most desirable tracts. Although the senate studied this matter carefully, the assembly did not give this question the consideration that its great importance deserves.

At each session of the legislature the cry of economy is heard, and the statement is made that taxes will have to be increased if the appropriations asked for are granted, and yet in 1911 the state remitted $940,235 in taxes and in 1912, $2,000,000. No one can justify foolish and extravagant appropriations of

state funds, but the prompt completion of the forest reserves is an absolutely necessary investment, which will yield large future returns, and when the state can remit nearly $3,000,000 in taxes in two years, the legislature must realize that funds are available to complete this important work which the state began nine years ago.

State Forest Reserve Policy.

The time has come when it is important for the legislature to clearly define the future policy of the state in regard to its forest reserves, so that all doubt on the part of settlers and land companies as to the boundaries of the permanent reserves may be set at rest. The State Board of Forestry has been criticised, because it has not announced a definite policy as to just where it was going to purchase lands for the forest reserve, but the mere statement of intention on the part of the Board is not sufficient, it should be backed up by legislative action.

In 1900 the legislature of New York, feeling that it was only fair and just that all citizens should be informed as to the location of the permanent forest reserves, passed the following act:

The Forest Preserve shall include the lands owned or hereafter acquired by the state within the county of Clinton, except the towns of Ottawa and Dannemora, and the counties of Delaware, Essex, Franklin, Fulton, Hamilton, Herkimer, Lewis, Oneida, Saratoga, St. Lawrence, Warren, Washington, Greene, Ulster and Sullivan, except:

1. Lands within the limits of any village or city, and
2. Lands not wild lands acquired by the state on foreclosure of mortgage made to loan commissioners.

New York has now acquired about 1,500,000 acres within the forest preserve, and will continue to purchase until they have secured all the forest lands that are unsuited for agriculture.

The Wisconsin state forest reserve now comprises some 400,000 acres, but it will be necessary to have a reserve of between 1,000,000 and 1,500,000 acres in order to block up and consolidate the present reserves; protect the headwaters of our most important rivers, and insure a future supply of timber for the important wood-using industries of the state.

This means that the state must purchase at least 800,000 acres of land in the permanent forest reserve area, and the lands to be purchased together with the lands already owned by the

state will probably make the acreage of the permanent forest reserve lands in the various counties approximately as follows:

	Acres
Vilas	506,000
Oneida	345,000
Forest	253,000
Iron	115,000
Price	70,000
Total	1,289,000

These lands would all be included within the boundaries of the permanent forest reserves, and it is recommended that a bill be passed by the legislature defining the boundaries of the reserve as follows: Commencing at the southwest corner of T. 38, R. 3 E., Price county, thence east along the south line of T. 38 to the eastern boundary line of Forest county, or the southeast corner of T. 38, R. 14 E.; thence north along the east line of R. 14 E., to the Wisconsin–Michigan boundary line, or the Menominee river; thence west along the Wisconsin–Michigan boundary line to the northeast corner of section 13 in T. 44, R. 4 E.; thence south on the east line of R. 4 E., to the northeast corner of T. 43, R. 4 E.; thence east to the northwest corner of T. 43, R. 4 E.; thence south to the northeast corner of T. 41, R. 4 E.; thence east to the northeast corner of T. 41, R. 2 E.; thence south to the southwest corner of T. 41, R. 2 E.; thence east to the northwest corner of T. 41, R. 3 E.; thence south to the southwest corner of T. 38, R. 3 E., or the point of beginning, excepting from the same the following:—

1. Lands within the limits of any village or city.
2. The following townships or portions of townships:
   (a) T. 39, R. 6, E.
   (b) The south half of T. 40, R. 6 E.
   (c) The east two-thirds of T. 38, R. 9 E.
   (d) The south two-thirds of T. 38, R. 10 E.
   (e) T. 38, R. 11 E.
   (f) T. 40, R. 10 E.
   (g) The north two-thirds of T. 41, R. 11 E.

The proposed act should clearly point out that it is the intention of the state to eventually acquire all the unoccupied and nonagricultural lands suitable for forestry within the boundaries of the forest reserve.

Necessary Legislation.

Completing the State Forest Reserves. The great need for the ultimate success of forestry work in this state is sufficient funds to consolidate and block up the present state forest reserves. Private holdings are scattered all through the state lands, and they are a constant menace to the forest reserves, as the state has no control over them and they are the source of most of the destructive forest fires. Adequate fire protection and systematic management will never be possible until the reserves are blocked up into a fairly solid body. The land that is needed can be acquired now at a much lower cost than later, and the initial investment will become immensely profitable to the state, as the forest reserves will in time bring in a large income from the sale of mature timber and the leasing of camp and cottage sites, besides the beneficial effect they will have on stream flow. Moreover, the state will profit greatly, though indirectly, from retaining the many wood-using industries within the state, and from the income that will go to railroads and resort owners from the summer tourist business.

This matter has been urged upon the legislature since 1907, and any further delay in providing the necessary funds will prove enormously costly to the state in the end. The Special Legislative committee on Water Powers, Forestry and Drainage, the State Conservation commission and other bodies have all recommended that an annual state tax of at least 1/10 of a mill should be levied and collected for a period of twenty years, the proceeds of the tax to be used for acquiring the necessary lands and for the improvement and protection of the forest reserve. The forestry department could then secure the lands at once, paying for them under land contracts as the funds became available. This is probably the most important and far reaching question of forestry policy that will ever come before the legislature of Wisconsin, and it is felt that they should give to it their earnest and careful attention.

Town Fire Wardens. Fire Wardens to act locally should be appointed directly by the State Board of Forestry and not be limited to short periods of service. Under the present law, which constitutes town chairmen and superintendents of highways local fire wardens, the fire wardens may change with every annual town election. It is exceedingly difficult for the State

Fire Warden to obtain accurate lists of the local fire wardens with their addresses. It is cumbersome and expensive to keep in touch with an *ever changing* force of men, to educate them in their duties and supply them with printed warning notices, report blanks and instructions.

The problem of forest fires is a serious one in the state. The enormous losses that occur periodically should be prevented. Experience has clearly demonstrated that such losses can be prevented only by *preventing* fires,—not by trying to extinguish them after they have started. The only effective system of preventing forest fires is by maintaining a patrol system during certain seasons of the year. Whether such a patrol system should be provided for by state funds or by a tax on the property protected, or by both, is a matter for the legislature to decide, but they should not neglect to provide for it in some way.

Dangerous Slashings. Another much needed measure should require owners of land on which there are dangerous slashings to clear a safe fire line between such slashings and adjoining timberland or other valuable property. Such a measure has been advocated by the lumbermen's association in this state but the legislature failed to pass it.

Taxation of timber lands. The present method of taxing forest lands is very unsatisfactory and is calculated to discourage the growing of timber. There are in the northern counties of the state large areas of essentially forest soil, land that will probably never be susceptible to any use other than the growing of timber. A law should be enacted that would encourage the owners of such land to hold it as a forest property and to apply practical forestry to the management. Such a law has been recommended by this department in detail, and should provide for the separate classification for taxation of land suitable for timber growing; that the land shall then be taxed separately from the timber, the assessed value per acre being limited to a certain amount; that whenever any timber or wood is taken from such land, the owner shall pay an amount equal to 10 per cent of its gross value on the stump; before any timber is removed from such land, the owner shall file with the state tax commission an accurate return under oath of the variety, amount and value of all material cut; that the assessment and collection of such tax on the timber be in the control of the state; that the determination of the suita-

bility of lands for timber growing rest with the State Board of Forestry and that in the event of an affirmative decision the Board submit to the owner a plan for the management of the timber and certify to the tax commission that the land has been separately classified for taxation; the management of such lands should be under the supervision of the State Board of Forestry; if an owner fails to comply with any provision of the law, his certificate classifying his land shall be canceled and he shall be required to pay an amount equal to the taxes under the general property tax for the period of time that the land was separately classified.

Soil Survey. The work on the soil survey of the state should be pushed as rapidly as possible so as to grade the soils and determine where the nonagricultural lands lie, as it is of great importance both to the forestry work and to landowners,—to say nothing of the incoming settlers—to have it finally determined just what lands are agricultural in character and what are not.

Storage Reservoirs. Mr. C. B. Stewart, the hydraulic engineer who has been retained by the State Board of Forestry to make necessary investigations in relation to proposed storage reservoirs, has reported that it is very important that the state should acquire information at an early date in regard to the storage problem on all of its main rivers. All natural basins at the headwaters of the Wisconsin river should be carefully investigated and if found more suitable for storage purposes and for benefit to the river as a whole, than local power development, the site could be reserved and developed accordingly. The U. S. Government engineers made preliminary surveys for reservoir sites at the headwaters of the Wisconsin, Chippewa and St. Croix rivers in 1880, and reported available storage capacities to the amounts of 19, 25 and 34 billion cubic feet, respectively. Conditions of development along the shores of the lakes and rivers since then, however, have probably progressed to such a point that it will be impossible to obtain one-half of what may then have been feasible.

Game Preserve. An appropriation of $20,000 is requested with which to enclose some 8,000 to 10,000 acres of forest reserve lands now owned by the state, with a game proof fence and to stock this preserve with elk, moose, deer, game birds and fur bearing animals. The federal government and sportsmen who are inter-

ested in game preservation will coöperate with the state in securing the elk, moose, pheasants, etc., and the deer and fur bearing animals can be secured within the forest region at little cost. As the game increases within the preserve, the surplus would be released and the moose and elk, at least, should be protected by law for a number of years.

The state expends annually a large amount in the propagation of fish, but so far the state has never done anything towards the propagation of game. The sportsmen of the state object to any of the funds derived from the sale of hunting or fishing licenses being turned into the general fund of the state, as they contend that all funds so derived should be used in the propagation and protection of fish and game. It is therefore suggested to the legislature that the appropriation of $20,000, which is asked for the game preserve, should be paid out of the hunting and fishing license fund.

State Lands For Sale.

As was fully explained in the report of the State Forester for 1909–10, the State Board of Forestry is authorized to sell the scattering and agricultural lands north of town 33, the proceeds of such sales to be used in blocking up and consolidating the permanent forest reserves, and in their protection and improvement.

The cruisers' reports are very complete and are on each forty separately, showing the amount of timber of each kind, and its stumpage value, the character of the land, whether rolling, hilly, or flat, and if stony; the soil is shown as loam, clay or sand, or more definitely described if necessary; if swampy, whether it can be drained; also character and amount of young growth.

During the summer of 1912 all the state lands in Oneida county, south of the north line of township 37 have been carefully examined and appraised. It was hoped that these lands could be offered for sale in the fall of 1912, but their examination and appraisal was not completed until about November first, and as all state lands must be advertised for at least six weeks before being sold, it would have resulted in obliging those interested in purchasing lands to look them over when covered with snow, and therefore it was deemed advisable not to sell the lands until the spring of 1913.

The state lands in the following counties are now on the market and can be purchased at any time, and in addition the State Board of Forestry intends to sell all the state lands in Marinette county and the lands south of the north line of township 37 in Forest county.

The following table shows approximately the amount of land on the market north of town 33, that remained unsold on January 1, 1913.

STATE LANDS ON THE MARKET.

	Acreage.		Acreage.
Ashland	4,166.20	Oneida	400.00
Bayfield	1,559.74	Polk	1,842.57
Burnett	6,217.83	Price	9,757.87
Douglas	1,276.02	Rusk	2,254.47
Florence	3,559.16	Sawyer	11,771.26
Iron	1,723.32	Washburn	3,985.09
Langlade	1,418.42		
Lincoln	1,558.10		51,490.05

The following table shows the approximate acreage of state land in eight counties that will probably be offered for sale in the spring or summer of 1913. The acreage in Forest, Marinette and Oneida includes all the land in those counties that it has been decided to eliminate from the permanent forest reserve.

STATE LANDS TO COME UPON THE MARKET.

	Approx. acreage.		Approx. Acreage.
Douglas	1,989.79	Price	3,040.00
Florence	80.00	Rusk	200.00
Forest	11,880.00	Sawyer	211.95
Marinette	4,494.21		
Oneida	19,680.00		41,575.95

Many of the above lands are suitable for agriculture, and in fixing the appraisal of each forty, the value of the land and of the timber was figured separately. Those who are desirous of purchasing lands in any of these counties can secure lists showing the appraised value of each forty of state land by applying either to the State Land Office, or State Board of Forestry.

TIMBER TRESPASS.

It is again recommended that the civil liability for timber trespass be increased from double to triple the value of the timber taken, plus all the costs of examination and survey. Nothing special can be added to the statement in regard to this matter contained in the report of this department for 1909–10, which follows.

The government and state practically encouraged timber trespass upon public lands for so many years by allowing trespassers to settle by simply paying the value of the timber taken, that it has been very difficult to stop the practice at once and to make such people understand that illegal cutting of timber is nothing more nor less than common stealing.

In 1905 the law was strengthened so that the civil liability for forest trespass is now double the amount of damages suffered and under criminal action the fine is not less than $25, nor more than $1,000, or imprisonment not less than fifteen days nor more than three years, or both fine and imprisonment. The result of this law has been to largely put a stop to all forms of trespass upon state lands, as it does not pay to cut timber illegally when one is obliged to pay double the value of the timber taken, plus all the costs of examination and survey.

Public opinion in northern Wisconsin, however, has not yet been educated to support a jail sentence for a trespasser, unless in the case of an old offender and when the trespass has been glaringly flagrant and willful. This is especially true in the case of a poor man with a family, as the jury seems to reason that if the man is sent to jail, his family will become a charge upon the county or town. After years of "rubber forties" and practical encouragement, the law cannot suddenly be made too drastic and still meet with public support.

However, the whole stumpage law has been in operation for over five years, and it is now recommended that it is time to still further strengthen this law. The law of New York state provides a penalty of $10 for every tree cut on state lands but so drastic a law in Wisconsin at the present time would probably defeat its own ends. It is recommended that the civil liability for timber trespass be increased from double to triple the value of the timber taken, plus all the costs of examination and survey. Both the state and private timberland owners have been put to considerable trouble and loss in past years by Christmas tree trespass. Large firms in Chicago, Milwaukee, St. Paul and other nearby cities make contracts with small jobbers or settlers to furnish a large number of Christmas trees. These contractors have been in the habit of going upon any land where there was a fine growth of young pine and cutting it all off in a few days' time. Many such trespassers are not resi-

dents of Wisconsin and they can cut, load and ship these small trees so rapidly that it is very difficult to detect them until the trees have been shipped and then the offenders are outside the jurisdiction of the state. However, timberland owners have dealt with such cases as severely as possible by imposing heavy fines, confiscating the trees cut and also bringing criminal action, so that this business is being largely discouraged and the dealers are compelled to buy the young trees from those who are willing to have them cut. The state has only suffered to a slight extent from such operators, as our lands are watched closely as Christmas approaches and we have been able to detect nearly all such cutting in time. The children and grown-ups need not fear that there will be any shortage of Christmas trees in the future or that foresters will discourage this old custom.

Upon lands that are protected from fire thousands of young pines will come up to the acre, and if left to themselves to follow out nature's law there will be a fierce struggle for existence, so that only a small percentage will survive. These will be the strongest and best developed but by far the greater number will gradually die and fall to the ground. Even the strongest young trees that survive are checked in their growth during the years of their fiercest struggle for existence and the forester can aid nature by cutting out the less promising trees and thereby allowing the stronger to shoot ahead free from the struggle.

Such cuttings are called "improvement thinnings" and are an important part of forestry work in all foreign countries where there is a ready market for the young trees that are thinned out.

In this country the forester as a rule has not been able to make improvement thinnings as there has been no market for such young trees, but the demand for Christmas trees promises to furnish the market to a considerable extent and therefore the forester hopes that more Christmas trees will be used and not less. However he wants such young trees cut out under a system that will hasten the rate of growth and improve the future forest and does not want to have every tree cut by a person who is politely called a trespasser while in fact he is nothing less than a common thief.

FORESTRY PROBLEMS IN GENERAL

The Town Fire Warden System.

In the report of the State Forester for 1909–1910, it was recommended as strongly as possible that the system of town fire wardens should be abolished and that in its place a well organized system of forest fire patrols should be provided. During 1908 the reports of the fire wardens showed that 1,200,000 acres were burned over, with a loss amounting to $9,000,000, and in 1910 some 892,000 acres were burned over with a loss of $5,000,000. During these same years the losses from forest fires in Minnesota and Michigan had also been enormous, and in order to work out a better system of fire prevention the Governor of Minnesota invited representatives from Michigan and Wisconsin to attend a Lake States Forest Fire conference, which was held at St. Paul on December 6th and 7th, 1910.

The conference was an unusually strong and representative one, headed by the Governors of Minnesota and Wisconsin, members of the legislative committees on forestry from the Lake states, and also lumbermen, foresters, and so forth.

The sense of the meeting was that the enormous annual forest fire losses in the Lake states were a public disgrace; that the old system of doing nothing until the fire occurred had always and everywhere proved to be little better than no system at all, and that the only sensible, practical plan was to concentrate the efforts of each state to building up the best possible system of fire prevention.

At the end of the two days' meeting the following resolutions were unanimously adopted:—

Resolved, That we recommend to the legislatures of our States:

First. That the forest fire protection of each State and such other branches of state work as may be deemed best to combine with it, be placed under the control of a non-partisan Commission empowered, as fully as possible under the Constitutions of the different States, to carry on the work, and under civil service rules. Such Commission should represent all the interests involved as far as possible, and we recommend that such Commission place the work in charge of a Chief Forester who should be a professional graduate Forester and that the Commission employ such trained Foresters and other assistants as may be necessary; define their duties and fix their salaries; said employes to

be engaged under such civil service regulations as the Commission may prescribe.

Second. Resolved, That it is the sense of this Conference that the present Forest Fire Warden Service of Michigan, Wisconsin and Minnesota, is totally inadequate to meet the existing fire hazard to both life and property, and that forest protection service, to become efficient, must be greatly extended. To this end we recommend an adequate Forest Patrol System, maintained by the State, organized and operated by the Commission referred to.

Third. We further recommend, that the Commission be authorized to coöperate with the National Government, the several adjoining States, and such associations and organizations as the Commission may find necessary to best protect the timber resources of the State.

Fourth. Resolved, That this Conference is opposed to a general slash burning law, as experience has proven it unsatisfactory, impractical and dangerous. We recommend, however, that the Commission should be given authority to order the disposal of dangerous slashings sufficient to establish a safe fire line around standing timber or other valuable property.

Fifth. Resolved, That this Conference advocates legislation providing strict regulation of the burning of brush and debris in clearing land during the dry season, such burning to be under the direction of the State fire patrolmen under such regulations as the Commission may prescribe.

Sixth. We further recommend, that the burning of all debris on the rights of way of the various railroads be under the control and direction of the State Forest Patrol. Further, that under special conditions as directed by the State Forest Patrol the railway companies maintain a patrol, properly equipped following their trains, also that all railroad and logging locomotives and traction engines must be equipped with the most practical spark arresting devices subject to inspection and approval of the Commission.

Seventh. Whereas, The building of fire lines around exposed property including settlements, villages and towns, has proven a most effective means for the control and extinguishment of fires, we recommend, that one of the principal duties of the patrolmen working under the direction of the Commission, should be to establish such fire lines where necessary for protection of property.

Eighth. We recommend, as the most effective measures for preventing and fighting serious fires, adequate means of transportation and communication, to include trails, telephone lines and lookout stations, and that the efforts of the Commission should be exerted toward the construction and establishment of the same as rapidly as consistent.

Ninth. The appalling sacrifice of life and the continued great loss of State and private property resulting from fires in our forested area, are a disgrace to our civilization and a most serious drain upon our natural resources, and we believe that the expenditure of such amount as may be necessary to prevent these losses is fully justified.

We therefore recommend, that the appropriation by the State Legislatures to maintain forest protection should be sufficient to provide for a Forest patrolman for each forty thousand acres requiring protection as well as for the expenses necessary to successfully carry out all of the measures suggested by these resolutions.

Tenth. We recommend, in addition to the Patrol System, an auxiliary County fire fighting force to be appointed by and under the direction of the Commission, to be paid by the State and charged back to the Counties. Such expense to be ultimately borne by the Counties or towns in which the fires occur.

Further Be It Resolved, That as it is shown by statistics that there are a large number of fires set each season through the carelessness of the general public, including campers, fishermen, hunters and others, we recommend, that a campaign of education be energetically carried on through every possible channel to the end that this hazard be reduced through a better understanding of forest conditions by all the people.

It will be noted in the second article of the above resolution the Conference stated that the town fire warden system was totally inadequate and recommended a forest patrol system maintained by the state.

A bill was introduced in the Wisconsin legislature of 1911 to provide for a state forest fire patrol, but the legislature refused to appropriate state funds for this purpose, and the legislative committee changed the bill so that all lands benefited by the patrol would pay a special tax of 2½ cents per acre, per annum. The timberland owners refused to agree to this amendment with

the result that the bill was killed. Wishing to accomplish something, the legislature passed a law providing that town chairmen should act as town fire wardens, and that road supervisors should be deputy town fire wardens. The idea of this law was to place the responsibility for and the cost of, fighting fires directly upon the local community where they occurred. It is only a makeshift, however, and is especially weak and inefficient for the following reasons:

1. Some of the best men in the towns are elected as town chairmen and road supervisors, but because they are good men it does not naturally follow that they have the strength and endurance or the knowledge of how to fight forest fires. The impression seems to prevail that anyone can fight forest fires. Almost any fairly able-bodied man can assist very materially, but the men in charge of the work must know the country thoroughly, and, more important still, must know just where and how to attack the fires. Experienced woodsmen should be in charge of the fire warden system in each town, and not simply some good man who happens to hold an office and upon whom it is easy to assign another duty by law.

2. The towns that have the most timber are always, for that very reason, either without any settlers at all, or else both settlers and roads are very few. Such towns, as a rule, have no road supervisors, and as a result, where the fire warden system should be the strongest it is in fact the weakest, and vice versa.

3. The town chairmen and road supervisors almost never take any action until the fire actually occurs. In other words, the present law makes the same old mistake of providing for fighting fires, but not preventing them. Prevention is the watchword of any successful fire warden system, and this has been proved in every state from the Atlantic to the Pacific. No city of any size would think of being without a fire department, and no town containing a large area of timberlands should be without a strong fire warden system which would devote its efforts in the first place to preventing fires.

Forest Fires in 1911 and 1912.

It is a great pleasure to be able to report that during the forest fire seasons of both 1911 and 1912 there was so much rain and the rain was so well distributed throughout the summer months

that only a few thousand acres in the entire state were burned over, and the losses were almost nothing as compared to recent years. Unfortunately, under the new law of 1911, which makes all town chairmen fire wardens, it has been found impossible to secure enough reports to compile any fairly accurate statistics for the last two years, but enough reports have been received to show that the losses have been very small.

This fine showing is due almost entirely to wet seasons, and compares as follows with the losses in the three years before:

	Acres burned	Loss
1908	1,200,000	$9,000,000
1909	166,751	104,012
1910	892,833	5,000,000

We are now apparently in a cycle of wet years and may have two or three more rainy seasons. But these cycles are not well defined, and therefore we must always be prepared for a dangerously dry season, and because we have been so fortunate in 1911 and 1912 there is the more danger in the next few years.

Some thirty small fires occurred on the state forest reserves in 1911 and 1912, but they were quickly detected and extinguished by the forest rangers and patrols before they did any considerable damage. These wet seasons were taken advantage of to the fullest by building up the permanent protective system of roads, fire lines, lookout towers and telephones on the state forest reserves, but unfortunately almost no protective work has been done on any of the privately owned timberlands of the state, and another dry season will again bring enormous forest losses unless a strong, well organized fire patrol system is built up at once.

Emergency Fund for Fire Fighting.

The state forest reserves after seven years of almost continuous selling of scattered and agricultural state lands, and purchasing non-agricultural lands in the permanent forest reserve area, are gradually being consolidated into fairly solid blocks, and it is a comparatively easy matter to prevent the spread of destructive forest fires in a solid body of timberlands.

The reserves have been divided into districts with a forest ranger in direct charge of the work in each district, and when a fire occurs in the reserves, it is quickly detected by means of the lookout towers, and help is promptly summoned by means of

the telephones, which connect the lookout towers with the Headquarters camp, ranger cabins and nearest towns. As the protective system of roads, fire lines, telephones, lookout towers, etc., is extended to cover all portions of the forest reserve, the danger of a destructive, wide-spread fire, which would get beyond control, becomes less and less, but nevertheless each season has its dangerously dry periods and therefore the Department must have available at all times sufficient funds to fight any forest fires that may occur.

The forest reserve fund into which is paid all the proceeds arising from the management of the forest reserve, is considered first of all as an emergency fire fighting fund, and after a safe reserve has been set aside the balance of the fund is used in purchasing land and for the improvement and protection of the forest reserve.

It is felt that the forest reserves are now fairly safe from destructive fires, and that they will be very well protected in a few years, and also that the forest reserve fund will be a sufficient emergency fund in most cases. Unfortunately, the situation in the northern timbered portion of the state, outside of the forest reserve, is quite different, as there is practically no protective system and the danger of forest fires is very great. The legislature of 1911 provided that all town chairmen should be town fire wardens, and superintendents of highways deputy town fire wardens, and that the expense of preventing or extinguishing forest fires should be borne by the road district within which the expense was incurred. In addition the law provided that in cases of emergency, or where a town has no highway superintendent, or is unusually large, the State Forester might appoint special fire wardens, and that the expense of preventing or extinguishing forest fires by these special fire wardens should be borne on the basis of one-half by the county in which the fire occurred, and one-half by the state. The law continues,

2. No payment shall be made to any claimant under this section until he shall have presented an itemized account, and made oath or affirmation that said account is just and correct, which account shall be approved by the county board, and audited by the county clerk. The county clerk shall thereupon issue to such claimant his warrant upon the county treasurer for the sum to which such claimant is entitled, and the county treasurer shall pay the same.

3. The county clerk shall transmit the original oath and copy of the warrant to the secretary of state, who shall audit such claim, and one-half thereof shall be paid out of the general fund of the state treasury by warrant issued by the secretary of state upon the state treasurer in favor of the county which paid such claimant, and such amount shall be forwarded to the county treasurer of such county. However, no county shall expend more than five thousand dollars under this act in any one year.

From the above it will be clearly seen that it was the intent of the legislature to create an emergency fire fighting fund of $10,000 for each county, but a very bad feature of the law is that the men who are called out to fight fire must wait for their pay until the county board can meet and approve the bills. Anyone who knows lumberjacks knows that they are a very shifting population, who are always hard up, and if they were obliged to wait several months for their pay for fighting fire, they would flee from the next summons as they would from the evil one. In order to be a practical workable law some way must be found to pay men promptly who are called out by the fire wardens to fight forest fires.

It is recommended that the bills should be promptly paid by the state treasurer when approved by the fire warden in charge of the fire and also by the State Forester, and that the state treasurer should collect from each county one-half the expense of fighting forest fires, but that in no case should any county be called upon to pay more than $5,000 in any one year.

Spark Arrester Inspection.

The passage of chapter 494, laws 1911, gave Wisconsin one of the strongest and most practical laws in the country for reducing the number of forest fires set by railway locomotives, donkey, traction and portable engines. The following provisions of the law are worthy of special note:

1. Between March 1st and December 1st all logging locomotives, donkey, traction or portable engines, which are operated in, through or near forest, brush or grass land, and which do not burn oil as fuel, must be equipped with screens or wire netting on top of the smokestack, and so constructed as to give the most practicable protection against the escape of sparks and cinders. "The term logging locomotive as used in this act shall be construed to mean any locomotive operated on a railroad, branch line or division, the chief or main business of which is the transportation of logs, lumber, or other forest products." The great value of this provision of the law will be at once apparent to any forester, as it compels every locomotive which is operated through the forests to be equipped with the oldest, simplest, and yet by far the most effective device for preventing the escape of sparks or cinders, namely, a screen or hood over the smokestack.

Locomotives that are operated on main through lines and that make long runs, could not be equipped in this way, for with the smokestack covered with a hood the front end of the engine would clog up with cinders, and then of course the engine could not steam or pull its load. Therefore the law provides that "all locomotives operated on any railroad other than a logging railroad shall be equipped with the most practicable spark arresters so constructed as to give the greatest possible protection against the escape of sparks and cinders from the smokestacks thereof, and each such engine shall be provided with the most practicable device to prevent the escape of the coals from ash pans, and fire boxes, and such devices between March 1st and December 1st shall at all times be maintained in good repair."

2. The law provides that the superintendent of motive power or equivalent officer on each railroad shall designate an employe of such railroad at each division point and roundhouse, who shall examine each locomotive each time it leaves the division point or roundhouse between March 1st and December 1st, and such employe shall be held responsible for the proper carrying out of the provisions of this section, but without relieving the company from its responsibility hereunder. This provision of the law has proved very effective in keeping the locomotives in proper condition, and also in bringing about real coöperation between the state and the railroads.

3. It will be noted that the law provides that screens or hoods on the smokestacks must give the "most practicable protection" and that spark arresters must be constructed so as to give the "greatest possible protection." The question naturally arises as to who shall decide as to the most practicable device and as will be noted, this is provided for in the following section which is the strongest part of the entire law:

3. Any locomotive inspector designated by the state board of forestry shall have the power to reject from service immediately any locomotive, donkey, traction, or portable engine which, in the opinion of the said inspector, is deficient in adequate design, construction, or maintenance of the fire protective devices designated in sections 1 and 2 of this section, and any such locomotive, donkey, traction, or portable engine so rejected from service shall not be returned to service until such defects have been remedied to the satisfaction of the state board of forestry. In case of disagreement between said inspector and the owner of the locomotive, donkey, traction, or portable engine so rejected from service as to the efficiency or proper maintenance of said protective devices, then the owner of said locomotive, donkey, traction, or portable engine may appeal to the railroad commission of Wisconsin for a decision of said matter, but pending such decision the said locomotive, donkey, traction, or portable engine shall not be returned to service.

Particular attention is called to the fact that any defective engine can be ordered out of service and that it cannot be re-

turned to service until the defects have been fully remedied. This provision of the law is extremely important and is far more effective than the usual fines, for any railroad company that was inclined to disregard the law would be quickly brought to its senses by having its locomotives ordered out of service.

4. Minor though important provisions of the law are:

a. Railroads must provide patrols for duty along their tracks in dangerously dry weather, and if any railroad company fails to provide such patrols after due notice, the State Board of Forestry may employ patrols and the cost shall be charged to the railroad company.

b. Every railroad must at least once every year cut and burn, or remove from its right of way all grass, weeds, brush, logs and refuse material.

c. No railroad company shall permit its employes to deposit fire, live coals or ashes upon their tracks outside of the yard limits, except they be immediately extinguished.

d. Engineers, conductors or trainmen who discover fires along the right of way, or on lands adjacent to the railroad, shall report the same to the agent at the nearest telegraph station. The railroads of Wisconsin have come to realize within the last few years that they are more directly interested in preventing forest fires than any other great industry in the state, and as a result of this realization they are anxious to do their full share in putting a stop to forest fires that are caused by the railroads.

The main causes of railroad fires are sparks, which escape from the smokestacks, and live coals, which are dropped by the ash pans. The Chicago & Northwestern railway has been coöperating with the state for the last three years in an endeavor to perfect a spark arrester which would prove entirely satisfactory in preventing the escape of sparks, and though great progress has been made, complete success has not been secured as yet. It is a comparatively simple matter to get an arrester that will stop a locomotive from throwing sparks, but very difficult to find one that will also allow the engine to steam freely and pull its load.

The State Board of Forestry has a locomotive inspector, who devotes his entire time from March 1st to December 1st to inspecting locomotives in the forest regions of the state, and he is constantly working with the railroad officials to perfect improved devices. Following is a brief summary of his report for 1912:

Spark Arresters.

The Chicago & Northwestern railway now uses the Slater box front end on nearly all of their engines operating in the forest reserve regions. This front end is a big improvement over the old style known as the Master Mechanic front end. Fifteen night runs were made on engines equipped with the box front end, and several on engines equipped with the old style front end. Less sparks are thown from the stack when the box front end is used, and it is estimated that less than five per cent of the sparks are alive when they strike the ground. They are nearly all self cleaners while the old style are not, but the engine crews state that they are harder to steam with than the old style and that they use considerably more fuel.

The Great Northern railway has experimented during 1912 with a new spark arrester which is known as the Cannon or Conical front end. Four night runs were made on engines equipped with this arrester and one night was also spent in the tower at Saunders, Wis., watching 25 engines which passed. Very few sparks are thrown from the stack, and only occasionally would one reach the ground alive. The engine crews do not appear to have any fault to find with this arrester.

A number of other spark arresters are being tested and the necessity for finding the best possible device is so great that the investigations will be continued along all possible lines.

Hoods and Screens.

The Chicago, Milwaukee and St. Paul railway during 1912 has used a very satisfactory hood on all its engines, operated through forest lands. The hood is fastened to the top of the smokestack with a hinge at the back, and at first engineers and firemen were inclined to tip the hood back when they thought there was not much danger from forest fires, but close supervision and the fact that one or two men were laid off by the railroad for doing this, has largely put a stop to this dangerous practice. This is considered to be the best hood in use, the only objection to it being that the cinders are apt to fly back into the engine cab, but in August a device was perfected that overcomes this trouble to a certain extent.

The Chicago & Northwestern railway, early in the summer of 1912 used a hood that did not prove a success as the engines do not steam well after they have been run 8 to 10 miles. Later in

the season another hood was tried which apparently promises to give very good satisfaction.

Some of the smaller railroads and a number of lumber companies used the old diamond stack, with a large top and cone well down in the stack. This type of stack has been found very expensive to keep in good repair, and the front ends sometimes choke up as they collect a lot of cinders. It would appear that an entirely satisfactory hood has not been worked out as yet, but the type of hood that is used by the Chicago, Milwaukee & St. Paul railway is fairly satisfactory.

Ash Pans.

Hopper bottoms. There are many of this type now in use, but frequently a hopper ash pan that is supposed to be in perfect condition is found upon close examination to still allow room for some live coals to fall through. It seems absolutely impossible to make a sliding or tilting door that will not warp or crack and that will always come up tight.

The Chicago, Milwaukee & St. Paul engines are equipped with one of the very best types of hopper ash pans now in use. They are an improved Chicago, Burlington & Quincy railway ash pan and are considered to be a great improvement over the original. The doors open at the ends and are equipped with an automatic latch which is easily opened and which cannot be jarred open. About forty of these ash pans were inspected during the season and only one defective door was found.

The hopper ash pans which were in use by the Omaha railway early in the season of 1912 were found to be a very inadequate type and in bad condition. The many forest fires that occurred along its lines in 1908 and 1910 were undoubtedly very largely caused by these ash pans. In the latter part of July, 1912, this road began to equip its engines with a new ash pan which is known as the swipe pan, and which has a sprinkler blow-out. This type of ash pan gives promise of proving very satisfactory. The following tables show the condition of the engines that were examined during 1912.

LOCOMOTIVE INSPECTION 1912.

Examination.		Condition.					
Date.	Place.	Total no. engines.	Good.	Fair.	Bad.	In shop for repairs.	Ordered out of service till repaired.
	Chicago, Milwaukee & St. Paul Railway Company.						
May 23	Green Bay, Wis.	14	8	2	2	2	.....
24	Green Bay, Wis.	24	10	7	4	3	.....
28	Iron Mountain, Mich.	1	1	.....	.....	.....	.....
June 18	Wausau, Wis.	6	3	3	.....	.....	.....
19	Tomahawk, Wis.	11	8	2	.....	1	.....
Aug. 14	Green Bay, Wis.	8	7	.....	1	.....	.....
Sep. 11	Tomahawk, Wis.	10	8	2	.....	.....	.....
20	Portage, Wis.	8	5	1	2	.....	.....
21	Madison, Wis.	7	.....	1	6	.....	.....
23	Watertown Jct., Wis.	4	2	1	1	.....	.....
25	Milwaukee, Wis.	6	2	3	1	.....	.....
Oct. 1	Janesville, Wis.	7	4	2	1	.....	.....
		106	58	24	18	6	.....
	Wisconsin & Michigan Railway Company.						
May 21	Peshtigo, Wis.	5	1	1	1	2	.....
21	Peshtigo, Wis. John Marsh. Eng.	5	1	1	.....	3	.....
Aug. 17	Peshtigo, Wis.	1	1		.....	.....	.....
		11	3	2	1	5	.....
	Bayfield Transfer Railway Company.						
Apr. 22	Bayfield, Wis.	2	.....	1	1	.....	.....
		2	.....	1	1	.....	.....
	Wisconsin Northern Railway Company.						
May 18	Crandon, Wis.	1	1	.....	.....	.....	.....
29	Shawano, Wis.	2	1	.....	.....	.....	1
		3	2	.....	.....	.....	1
	Marinette, Tomahawk & Western Railway Company.						
May 1	Tomahawk, Wis.	2	2	.....	.....	.....	.....
June 19	Tomahawk, Wis.	2	1	1	.....	.....	.....
		4	3	1	.....	.....	.....
	Lake Superior Terminal & Transfer Railway Company.						
June 29	Superior, Wis.	14	.....	1	10	2	1

Examination.		Condition.					
Date.	Place.	Total no. engines.	Good.	Fair.	Bad.	In shop for repairs.	Ordered out of service till repaired.
	Illinois Central Railway Company.						
Sept. 21	Madison, Wis.	1	.....	1	.....	.....	.....
		1	.....	1	.....	.....	.....
	Chicago, Burlington & Quincy Railway Company.						
Oct. 3	La Crosse, Wis.	7	6	1	.....	.....	.....
		7	6	1	.....	.....	.....
	Northern Pacific Railway Company.						
June 22	Ashland, Wis.	2	.....	1	1	.....	.....
		2	.....	1	1	.....	.....
	Duluth, South Shore & Atlantic Railway Company.						
June 29	Superior, Wis.	1	.....	1	.....	.....	.....
July 5 & 6	Thomaston, Mich.	3	3	.....	.....	.....	.....
		4	3	1	.....	.....	.....
	Green Bay & Western Railway Company.						
May 24	Green Bay, Wis.	16	.....	9	5	2	.....
Aug. 15	Green Bay Wis.	11	3	.....	4	4	.....
26	Grand Rapids, Wis.	3	.....	1	1	.....	1
		30	3	10	10	6	1
	Yawkey Bissell Lumber Company.						
May 10	Arbor Vitae, Wis.	1	.....	1	.....	.....	.....
June 5	Tomahawk, Wis.	1	.....	1	.....	.....	.....
July 12	Arbor Vitae, Wis.	3	2	.....	1	.....	.....
Aug. 2	Arbor Vitae, Wis.	3	1	2	.....	.....	.....
		8	3	4	1	.....	.....
	Omaha Railway Company.						
Apr. 19	Ashland, Wis.	2	.....	1	1	.....	.....
June 22	Ashland, Wis.	5	5	.....	.....	.....	.....
Apr. 19	Spooner, Wis.	12	7	4	1	.....	.....
Apr. 20	Itasca, Wis.	10	3	6	1	.....	.....
July 18	Itasca, Wis.	5	3	2	.....	.....	.....
Apr. 22	Washburn, Wis.	1	1	.....	.....	.....	.....
July 26	St. Paul, Minn. W. End Shop.	4	3	1	.....	.....	.....
	St. Paul, Minn. E. End Shop.	7	4	1	2	.....	.....

Examination.		Condition.					
Date.	Place.	Total No. engines.	Good.	Fair.	Bad.	In shop for repairs.	Ordered out of service till repaired.
	Omaha Railway Company—Continued.						
July 27	Altoona	17	9	3	2	1	2
Aug. 27	Marshfield, Wis	1	.....	.....	1	.....	.....
Oct. 4	Wyeville, Wis	2	1	.....	1	.....	.....
		66	36	18	9	1	2
	M. St. P. & Sault Ste. Marie Railway Company.						
June 3	Rhinelander, Wis	3	1	.....	2	.....	.....
21	Ashland, Wis	13	4	2	2	5	.....
27	Superior, Wis	15	6	4	4	.....	1
July 16	Superior, Wis	11	9	.....	2	.....	.....
13	Weyerhaeuser, Wis	6	3	1	2	.....	.....
27	Chippewa Falls, Wis	7	7	.....	.....	.....	.....
27	Shoreham, Minn	35	25	8	2	.....	.....
Aug. 23	North Fond du Lac, Wis	18	16	2	.....	.....	.....
27	Stevens Point, Wis	13	11	2	.....	.....	.....
		121	82	19	14	5	1
	Chicago & Northwestern Railway Company.						
May 18	Antigo, Wis	8	5	2	.....	1	.....
21	Marinette, Wis	2	2	.....	.....	.....	.....
25	Green Bay, Wis	40	18	12	7	2	1
28	Iron Mountain, Mich	1	1	.....	.....	.....	.....
28	Strambaugh, Mich	5	2	3	.....	.....	.....
29	Wabeno, Wis	1	.....	.....	1	.....	.....
June 10	Watersmeet, Mich	5	.....	.....	5	.....	.....
21	Ashland, Wis	10	8	1	1	.....	.....
Aug. 6	Antigo, Wis	14	10	3	1	.....	.....
7	Eland Jct., Wis	6	4	.....	2	.....	.....
16	Green Bay, Wis	17	9	2	1	5	.....
20	Marinette, Wis	1	1	.....	.....	.....	.....
21	Kaukauna, Wis	7	5	.....	.....	2	.....
24	North Fond du Lac, Wis	14	10	2	2	.....	.....
27	Marshfield, Wis	5	4	.....	1	.....	.....
Sept. 21	Madison, Wis	5	3	2	.....	.....	.....
23	Baraboo, Wis	6	4	1	1	.....	.....
23	Watertown Jct., Wis	2	2	.....	.....	.....	.....
26	New Butler, Wis	10	3	2	5	.....	.....
Oct. 1	Janesville, Wis	13	8	3	1	.....	1
2	Galena, Ill	3	1	2	.....	.....	.....
4	Wyeville, Wis	7	5	1	1	.....	.....
5	Wausau, Wis	3	2	.....	1	.....	.....
		185	107	36	30	10	2
	Great Northern Railway Company.						
July 2	Allouez, Wis	5	.....	5	2	.....	.....
3	Superior, Wis	17	6	3	6	.....	2
17	Allouez, Wis	9	2	3	4	.....	.....
18	"	10	1	4	5	.....	.....
18	Superior, Wis	22	5	8	3	6	.....
		63	14	21	20	6	2

Logging Railways.

Examination.		Condition.					
Date.	Place.	Total No. engines.	Good.	Fair.	Bad.	In shop for Repairs.	Ordered out of service till repaired.
1912.							
Apr. 30	Buswell Lbr. Co., Buswell, Wis.	1	.....	.....	1	.....	.....
May 11	Vilas County Lbr. Co., Fosterville, Wis.	1	.....	.....	1	.....	.....
13	Brown Bros. Lbr. Co., Rhinelander, Wis.	1	.....	1	.....	.....	.....
17	Hackley-Phelps-Bonnell Lbr. Co., Hackley, Wis.	2	.....	.....	2	.....	.....
17	Keith & Hiles Lbr. Co., Crandon, Wis.	1	1	.....	.....	.....	.....
17	Forster-Mueller Co., Hiles, Wis.	1	.....	.....	1	.....	.....
28	Menomonee Bay Shore Lbr. Co., Wabeno, Wis.	1	1	.....	.....	.....	.....
June 19	Roddis Lumber Co., Park Falls, Wis.	2	1	1	.....	.....	.....
19	Mellen Lumber Co., Glidden, Wis.	1	1	.....	.....	.....	.....
20	Atwood Lumber Co., Park Falls, Wis.	7	.....	1	6	.....	.....
20	Foster-Latimer Lumber Co., Mellen, Wis.	2	1	1	.....	.....	.....
Aug. 29	Rib Lake Lumber Co.	4	2	.....	.....	.....	2
		24	7	4	11	.....	2

SUMMARY OF LOCOMOTIVE INSPECTION.

No.	locomotives examined	651	100%
"	in good condition	327	50%
"	in fair condition	145	22%
"	in bad condition	126	19%
"	in shop for repair	41	7%
"	ordered out of service	12	2%

County and Town Forests.

Chapter 77, laws of 1909, authorizes any town board to acquire by purchase or otherwise, a sufficient tract of land to use and maintain as a woodlot, and to preserve and reforest the same under regulations approved by the State Board of Forestry. It is estimated that in northern Wisconsin there are from twelve to thirteen million acres of wild and uncultivated land. Of this amount it is estimated that fully ten million acres are suitable for agriculture and will eventually be cultivated. This leaves, then, about three million acres of land in the twenty-two most northern counties of the state that are unfit for agriculture, and that must be depended upon to produce a large part of the future forest products of the state. It will probably be impossible for the state to ever acquire all of this land and place it under forestry management, and even if it could do so it would not be well for the state to attempt to own and manage many of the smaller and more isolated tracts of forest land. The state will have all it can do for many years to come to manage the large forest reserves upon the headwaters of the Wisconsin and

Chippewa rivers, and the counties and towns should acquire the smaller tracts.

This is a comparatively new idea in America, but in Germany, France, Norway, Sweden, Switzerland, and other European countries there are many communal forests and even city forests. These have almost universally proved most successful and in many instances the revenue from the communal forests has been sufficient to pay all taxes and to build splendid roads.

If the towns and counties in northern Wisconsin will gradually acquire the non-agricultural lands, at reasonable prices, and then place them under forestry management, they will find that they will secure an increasing revenue, provide work for many of their settlers during the winter months, and not only retain but add to the number of their small wood-using industries.

Closer Utilization of Forest Products.

The Forest Products Laboratory, located at Madison, Wisconsin, which is a branch of the United States Forest Service, is especially organized and equipped to study all the various problems connected with the closer utilization of forest products. The following summary of the report of Mr. H. S. Betts of the Laboratory force, illustrates only some of the chief results accomplished by the Laboratory along lines that are of especial interest to the wood users of Wisconsin.

WOOD PRESERVATION.

Conditions in Industry.

Number of railroad ties used for new track in 1910..	22,255,000
Number of railroad ties used for replacements in old tracks	125,976,000
Value of railroad ties used for replacements in old tracks	$64,200,000
Proportion of ties treated in 1910	20%
Annual saving possible by treating ties, poles, posts, piling, mine timbers, shingles, and lumber exposed to weather	
Material	6,000,000,000 bd. ft.
Value	$71,700,000

Problems of Industry.

(1) To bring the advantages of wood preservation to the attention of wood users.

(2) To determine the best methods of treating various woods.

(3) To determine the merits of various preservatives.

(4) To determine the best methods of operating various types of plants.

(5) To determine a method of rendering wood fireproof.

Work Done by Products.

(1) Tests to determine the life of both treated and untreated material are being carried on in coöperation with railway companies, cities (paving blocks), telephone companies, and mine companies. It has been shown that the life of wood used in exposed situations or in contact with the soil or water can be increased at least three times by treatment with preservatives. Forty-two sets of test material in various parts of the country are inspected at regular intervals by Products and the results published from time to time. Information of this sort shows definitely the saving in both material and money due to preservative treatment. In one instance the installation of a small treating plant by a coal company reduced their annual consumption of timber to one-half of the amount previously required, though only part of the timber used was treated.

(2) The Service has designed some twelve wood preserving plants for wood-using companies and assisted in the design and preliminary operation of many others. The industry is now well established. A large amount of information on the best methods of treating certain woods, of operating various types of plants, and of handling certain preservatives is being constantly supplied in reply to inquiries. In 1904 there were 30 plants in operation, while in 1910 there were 84. From 1909 to 1910 there was a gain of over 45 per cent in the quantity of material treated annually.

(3) Tests have shown that many woods of comparatively little value, such as loblolly pine of the Southeast, jack pine of the Northeast, and lodgepole pine of the Rocky Mountain states, can be easily treated with preservative and are suitable for ties. The use of these pines for tie purposes has doubled in the last five years.

(4) Tests have been made on 23 preservatives, including creosotes and salt solutions, to determine their properties, such as effectiveness in checking the growth of fungus, ability to penetrate into wood, effect on the strength of wood and permanency. As from 50 to 75 per cent of the cost of treating is for the preservative, accurate data to guide a selection are important. Such tests have shown the necessity of careful analysis and grading of the creosotes used as wood preservatives, and laboratories have been established by the largest water-gas tar company in the United States and by one of the largest creosote companies for the better handling of their wood preservatives.

(5) As a result of tests to show the possibilities of treated loblolly pine for pole construction a plant has been constructed in the South and is operating on this species.

(6) Tests to show the advantages of treating silo timber have resulted in silo companies furnishing treated material.

(7) The results of investigations of the treatment of paving blocks have been utilized by the city of Chicago in drawing up specifications for city pavements.

(8) The specifications for wood preservatives adopted by the American Railway Engineering and Maintenance of Way Association and by the National Electric Light Association are based on work done by Products in analyzing and grading preservatives.

(9) The methods of treating poles by the brush and open-tank process adopted by the National Electric Light Association are based on the recommendations of Products.

MECHANICAL TESTS OF WOOD.

Conditions in Building Trades.

Amount of wood used in 1910	20,000,000,000 bd. ft.
Value of wood used in 1910	$300,000,000

Problems of Industry.

(1) To determine the strength of woods commonly used for structural purposes and the effect of defects, such as knots, checks, and shakes, on the strength.

(2) To determine for comparative purpose the mechanical properties (strength, stiffness, hardness, toughness, shrinkage, swelling, etc.) of woods grown in the United States in the form of small, clear pieces.

(3) To show the relative strength of standard woods and proposed substitutes in the form in which they are used, such as boxes, spokes, axles, poles, mine timber, etc.

Work Done by Products.

(1) The grading rules for structural timber formulated by the American Railway Engineering and Maintenance of Way Association, and also the rules formulated by the American Society for Testing Materials, are based largely on the results of tests made by Products.

(2) The National Association of Hickory Manufacturers incorporated the results of a series of tests on red and white hick-

ory wagon spokes in their grading rules, allowing red hickory to appear in higher grades than before, thus making better use of material that was formerly considered inferior.

(3) The portion of the new building laws for New York City that relates to wooden construction is based largely on the results of Products tests.

(4) Tests made by Products on telephone poles of various species have shown that woods heretofore considered unsuitable have the requisite strength for pole purposes. The tests have resulted in the increased use of lodgepole pine and Engelmann spruce in the West as substitutes for the less plentiful and higher priced cedar.

(5) Formerly timbers cut from trees tapped for turpentine were thought to be weaker than timbers from untapped trees, and only unboxed timber was accepted. This discrimination has caused a waste of about thirty-seven billion board feet of longleaf pine timber, valued at $111,000,000. Tests made by the Forest Service have shown that tapping trees for turpentine has no effect on the strength, and the use of boxed timber is becoming general.

(6) Tests on packing boxes of various types, including boxes with and without battens, dove-tailed boxes, and wire-bound boxes, have shown wire-bound boxes to be the most economical form of construction. These results effect the use of some 4,000,000,000 bd. ft. of material. The tests have resulted in the revision of the specifications of the Interstate Commerce Commission for boxes used in shipping explosives.

(7) Tests on shortleaf pine and white cedar cross-arms in standard sizes have shown these species to possess ample strength for this purpose, as well as the commonly used species, Douglas fir and long leaf pine.

(8) Tests on California tanbark oak have shown it to be entirely suitable for many purposes for which eastern oak is used. Approximately 400,000,000 bd. ft. of tanbark oak have been left in the woods to decay after the bark was removed for tanning purposes. Tanbark oak flooring was used in one of the large hotels recently rebuilt in San Francisco.

(9) The practice of steaming timber before preservative treatment has been practically abandoned as a result of tests that showed the strong possibility of weakening the timber and also that air seasoning was preferable to steaming as a means of rendering timber more easily treated.

WOOD PULP.

Conditions of Industry.

Number of paper mills in the United States in 1909..	787
Value of products	$267,869,000
Wood used for pulp	4,000,000 cords
Annual sawmill waste suitable for pulp (Slabs and edgings)	5,000,000 cords

Year.	Proportion of spruce used.	Proportion of spruce imported.	Cost of spruce per cord.		Imports of pulp.	Exports of pulp.
			Domestic.	Imported.		
	per cent	per cent			Tons.	Tons
1900..	76	23	$4 80	$6 50	82,000	14.000
1909..	60	32	9 30	11 30	307,000	10,000

Problems of Industry.

(1) To find satisfactory substitutes for spruce.

(2) To determine the paper-making possibilities of species not now used.

(3) To find methods adapted to making paper from the waste of sawmills and other wood-using industries.

(4) To find methods of raising the yield and quality of pulp obtained in average practice.

Work Done by Products.

(1) Tests have shown that pulps of commercial value suitable for use in the manufacture of news and wrapping paper can be made by the sulphite process from eight species of native woods, several of which grow in large quantities on the National Forests. Some of these woods are now used to a limited extent, others not at all. Mills have started to use red fir, white fir, and lodgepole pine. Other species are under investigation.

(2) Tests have shown that three native species, jack pine, tamarack, and hemlock, of which large quantities are available in the Lake States, can be satisfactorily substituted for spruce in the ground-wood process in making the cheaper grades of paper such as news and wrapping. Several mills have begun grinding these woods. A number of western woods are now being tested.

(3) Tests have shown that pulps suitable for book or wrapping paper can be made from 12 new species of native woods by

the soda process; several other native species show commercial possibilities as soda pulpwoods. One mill that will operate on western yellow pine is in course of construction in the Southwest.

(4) Tests have shown that the highest grades of "Kraft" paper can be made from longleaf pine by the soda and sulphate processes. Three paper mills in the Southeast are now using longleaf pine, a fourth is under construction, and plans are under way for a fifth.

(5) A number of methods of increasing the yield of pulp from the raw material without decreasing the quality of the product have been found.

(6) Tests by the sulphate process, now little used in the United States, have shown especial possibilities as a means of making paper from mill waste. A number of mills are now operating on waste.

DRYING LUMBER.

Conditions of Industry.

Amount of lumber dried or seasoned before use 1911	30,000,000,000 bd. ft.
Proportion of waste in drying conifers	3%
Proportion of waste in drying hard woods	10%
Value of material wasted in drying	$21,375,000

Problems of Industry.

(1) To find methods of drying or seasoning lumber that will reduce the present waste.

Work Done by Products.

A kiln has been designed which has shown greater efficiency than is the case in average practice. A carload of water oak wagon felloes furnished by a large vehicle manufacturing company, and claimed by them to be of little value because they could not be seasoned without checking and warping, were dried with a loss of only 2 per cent of the material. A kiln of the new type has been constructed in coöperation with a California lumber manufacturing company, and another one is being built in coöperation with a hickory manufacturing company in Illinois.

WOOD DISTILLATION.

Conditions in Industry.

Wood used in 1910	1,452,000 cords
Value of raw materials	$4,728,000
Value of products	$9,600,000
Number of distillation plants	147

Wood for distillation is used in the form of cordwood, small pieces, and to some extent as sawdust. The products are acetate of lime, wood alcohol, turpentine, pine oils, and charcoal.

Problems of Industry..

(1) To investigate the possibilities of wood not used at present.

(2) To find methods of raising the yields and quality of the products.

(3) To find methods of using the waste from wood-using industries in distillation plants.

(4) To secure information that will make possible more uniform standards in grading wood distillation products.

Work Done by Products.

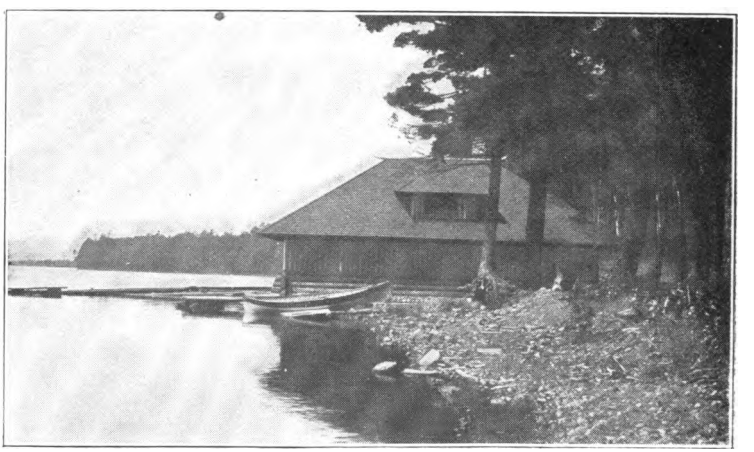
(1) In hardwood distillation over 90 per cent of the material used is beech, birch, and maple, and practically no attempt has been made to utilize other species. Tests made by Products have shown that commercial yields of acetate of lime and wood alcohol can be obtained from hickory, oak, tupelo, and red gum. Mill waste consisting of oak and red gum is now being used by at least one plant.

(2) Commercial methods used in hardwood distillation are generally crude and only part of the possible products are obtained. Tests have shown that it is possible to increase the yield of acetate of lime 50 per cent over present practice. This means a possible annual increase in the amount of acetate of lime produced from the same amount of raw material of over 38,000 tons.

(3) Steam distillation as an industry is still in an experimental stage. Methods of operation vary widely. The Service has made tests to show the effect of varying conditions in the steam distillation process on the yield and cost of operation. This information has been of service to operators in standardizing methods and raising the efficiency of their processes.

(4) The American Chemical Society, the American Society for Testing Materials, the Navy Department, and the Isthmian Canal Commission have used the results of tests made by Products in formulating specifications for wood turpentine.

HEADQUARTERS CAMP, STATE BOARD OF FORESTRY.
Headquarters of Field Instruction for Forest Ranger Students.



BOATHOUSE AT HEADQUARTERS CAMP.

STATE FOREST RESERVES.

Headquarters Camp and Ranger Cabins.

During the summer of 1911 a large Headquarters camp was built on Big Trout lake in Vilas county, and this is the headquarters of all the forestry work on the reserve, and also the location of the main forest nursery, which now contains some 2,500,000 young trees.

The main building is a large double house, made from peeled Norway pine logs cut near the site of the nursery. Norway pine logs were also used in the construction of the barn, boathouse, and the wood and ice house at the Camp. Views of all these buildings are shown in this report, and as will be noticed they are handsome, substantial buildings, which are very appropriate to their surroundings, and as the main forestry buildings on the reserve.

Four ranger cabins with barns, wood and ice houses and small bunk houses for laborers have been built at the following points:

Little Carr lake	in T. 38, R. 7 E.
Rest lake	in T. 42, R. 5 E.
Boulder Dam lake	in T. 42, R. 6 E.
Plum lake	in T. 41, R. 8 E.

During the winter of 1912–13 a ranger cabin is being built at Star lake in T. 41, R. 8 E., and one will probably be started at Carroll lake in T. 39, R. 7 E., and one will also be either built or purchased at Arbor Vitae in T. 40, R. 7 E.

It is planned to gradually furnish comfortable cabins for all the rangers, and small cabins must be built for the Federal patrolmen to occupy during dangerously dry seasons.

Mapping.

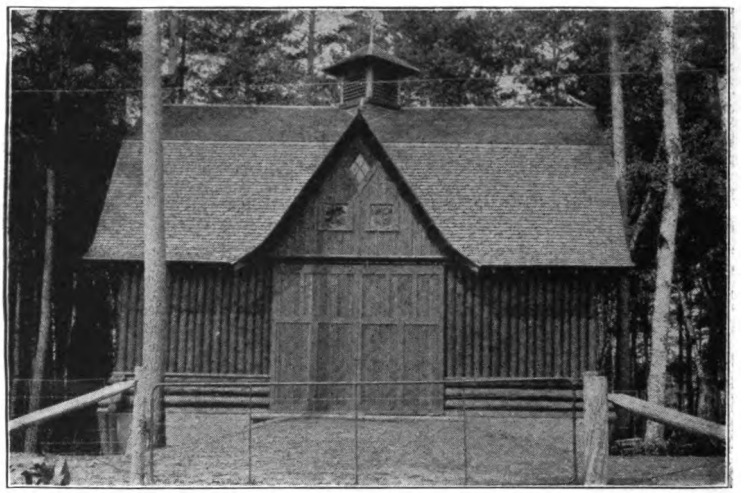
In the state forestry work and especially fire protection, the need of an approximately accurate map of the forest reserve

region was early felt and therefore during the field seasons of 1911 and 1912 the state forest rangers and cruisers, and also the Federal patrolmen, have been noting errors on the old map and also sending in to the Headquarters camp township plats upon which they have noted the location of all roads, fire lines, and telephone lines built within their districts. One of the forest rangers has used this mass of material in making a new map of the forest reserve area, and although it is not absolutely accurate in many of the minor details, still it is a great improvement over all previous maps and will be invaluable, especially to the lookout men in accurately locating forest fires. This map will be constantly corrected and added to, so that in the course of a few years we hope to have a map of the forest reserve area that will be a great aid in forestry management.

Soil Survey.

During the summer of 1910 at the request of the State Board of Forestry, the College of Agriculture of the University of Wisconsin made a careful soil survey of seven townships within the forest reserve area in Oneida and Vilas counties. The area covered included all of townships 38, 39 and 40, range 7 E., and portions of township 43, ranges 5, 6, 7 and 8 E., as it was thought that these townships were fairly typical and representative of the forest reserve area in these counties. This survey disclosed the fact that 78% of the total area examined was true forest land, more valuable for forestry than for agriculture, and that 22% was a loamy sand, which was classed as possible agricultural land. However, this 22% of possible agricultural land is not in a solid block, but is scattered through the seven townships of true forest land, and the Forestry board has felt that it would be a grave mistake to encourage settlers to locate on small tracts of doubtful agricultural value, where they would be surrounded for many miles on all sides by lands that were only suited to the growth of timber. If this were done they would be doomed to comparative isolation, and would be deprived of good schools and the many advantages of a growing community.

During the summer of 1912 the College of Agriculture continued the soil survey of the forest reserve, the following eight



BARN AT HEADQUARTERS CAMP.

townships being covered; township 41, ranges 6, 7, and 8 E., and township 42, ranges 4, 5, 6, 7 and 8 E. Following is the report of Mr. F. L. Musback, who had charge of the work under the direction of Professor A. R. Whitson, of the College of Agriculture.

Mr. E. M. GRIFFITH,
State Forester.

Dear Sir:—

I am sending you with this a brief preliminary report by Mr. F. L. Musback on the soils of a portion of Oneida and Iron counties. You understand that it is our purpose to ultimately complete the mapping of the soils of that whole region. Mr. Musback has this year finished the survey of his area of the northwestern part of the state and we are hoping, therefore, to be able to push the work in the north central section somewhat more rapidly during the next few years. In the meantime we hope this brief report on the areas in which you are now working will be of assistance to you in distinguishing between the agricultural and nonagricultural lands of that region.

While, as you know, I am in hearty sympathy with the efforts being made to develop a state forest reserve, it must be borne in mind that the mapping of the soils of this small area which have so far been covered does not form a basis for estimating the relative amounts of the different classes of soils with reference to their agricultural or nonagricultural value which will be found in other sections of that region.

Very truly yours,

A. R. WHITSON.

PRELIMINARY REPORT OF SOILS OF EIGHT TOWNSHIPS IN VILAS AND IRON COUNTIES.

These eight townships are located in Vilas and Iron counties (all but 42–4 are in Vilas county) and include a considerable portion of land within the so-called Forest Reserve. The work was begun in May, 1912, by the writer assisted by Mr. J. McDonald of the forestry department. At this time eight days were spent with horse and conveyance going over all the roads and trails that were passable. Long walking trips were taken where the trails were widely separated, or impassable. Some of these walking trips were along old railroad grades, fire lines, or trails that admitted only of travel on foot. Later in the fall another week, making a total of fifteen days actual work, was spent in the area. At this time more roads were opened so that considerable more area was accessible than earlier in the year. During the fifteen days approximately three hundred miles were covered including travel by horse, walking, and by means of launch and row boats, and an area of two hundred and seventy six (276) square miles was examined.

From the large tract covered in the short time the report is necessarily more of a general one and less specific in the matter of detail than would otherwise have been the case had more

time been spent. But with the many miles of good roads throughout the reserve and the assistance of a cruiser who was thoroughly familiar with the country, a very good general knowledge of the soil, surface features, and adaptability to agriculture of the eight townships above mentioned was obtained. It does not, however, furnish detailed information as to any particular 40 acre tract area, in this respect it differs from the work done by Mr. Bergh in 1910 who at that time spent nearly two months on an area of about equal size.

The Soil.

The soils in this section of the state are glacial in origin. This fact in itself is ground for wide variation often within short distances. In a general way the soils in the area under discussion fall under four groups which have quite marked differences both as to textural qualities and to topographic features. These four groups are as follows:

1—Sandy to sandy loam (pine land and mixed hardwood)
2—Jack pine sandy soil (Jack pine and Norway pine)
3—Sandy loam to loam (Mixed hardwood mainly)
4—Peat (Mainly open swamp land)

Sand to Sandy Loam.

This type embraces more than 50% of the area examined. The tract is practically all cut over pinery with isolated patches of hardwood, yellow birch, poplar, maple, scattered here and there throughout the area. The Norway pine, however, was the predominant species developed on this soil type.

The soil to a depth of eight (8) inches is a sandy to a sandy loam, of a brown to golden color and carrying a small amount of organic matter in surface one inch. Small fragments of stone and gravelly material are associated with this surface soil. Below eight inches the soil assumes more of a sandy texture, the color becomes lighter and more rock fragments and coarse gravel are mixed with it. These rock fragments are usually small and angular. Over surface good size boulders are frequently strewn. Occasionally boulders 10-12 feet in diameter are encountered. The surface features of this type are undulating and represent a typical morainic development. The hills for the most part are not over 40–50 feet in height,

though some are seventy-five (75) to one hundred (100) feet above the surrounding country, and extend in a succession of undulations of varying slope and shape. Lakes are common throughout the area. Along streams marsh tracts are frequently developed.

The agricultural possibilities of this soil are limited, chiefly on account of the rough topography. Tracts of one hundred (100) acres or more in extent are frequently found which are gently rolling or nearly level, and may be considered agricultural land, yet eighty-five (85) to ninety (90) per cent of this soil type cannot be considered of agricultural value.

Jack Pine Sandy Soil.

This soil is developed extensively throughout this area and embraces nearly 1/5 of the block examined. The land has a rather uniformly level topography and is often spoken of as Jack Pine Barrens or plains elsewhere. While the greater portion is generally level, more or less rolling tracts are also included in this general classification. This sandy soil area was timbered principally with Jack pine and Norway pine. In the finer textured soil poplar, white birch and some white pine developed. At present the larger portion is cut-over land, though some good stands of Norway and Jack Pines yet remain. Several areas of considerable extent were observed upon which a very sparse growth of timber developed. Sweet fern and brake are common.

In general the soil is made up principally of sand grains of varying size to a depth of 40″ and more. However, two rather distinct types may be described:—one is a fine sand carrying a small amount of gravelly material, and the other a coarser sand with which more gravel and rock fragments are associated. The fine sand has a pronounced dark brown color becoming lighter in color at lower depth. At surface a layer of gray sand one to two (1–2) inches deep is often developed. The vegetation is better developed on this soil type, for besides carrying larger proportion of fine earth, it also contains more organic material. About ⅓ of the area mapped as Jack Pine Sandy Soils is of this quality.

The coarse sand carries considerable amount of gravelly material below 12–14 inches. The surface eight to ten (8–10)

inches is also brown, with subsoil of grayish cast. Both types are generally free from stone though the finer sandy is found to be stony in small local areas.

The value of this soil type, agriculturally, depends on its proper management as well as to its physical condition and depth to ground water. Under ordinary management, much of this type, especially the coarse phase, cannot be made profitably productive. This is especially true when the depth to ground water is any considerable distance. The soil under proper management, however, produces good yields of potatoes, rye, oats, buckwheat, clover, truck crops, corn and beans.

Sandy Loam to Loam.

This type embraces about 15 per cent of the total area and is situated mainly in towns 41 and 42, R. 6 East. The type is also cut-over land. The soil to depth of eight (8) inches varies from sandy loam to loam followed by a subsoil which grades more into sandy material with some gravel. The color is grayish to a brown, becoming light colored at lower depths. Stoniness throughout soil mass is of frequent occurrence. The topographic features are rolling to slightly hilly. More nearly level tracts occur frequently.

The timber, nearly all cut now, consisted of mixed hardwoods and pines. Seventy-five to eighty per cent can be utilized for agricultural purposes. It is well suited for various grains and root crops, clover and alfalfa.

Peat.

The areas of peat in this section are either small isolated tracts that occur along stream bottoms, or tracts in one continuous body covering several thousand acres or more. The largest continuous tract is found in Townships 42, R. 4 and 5 East. These large tracts are usually open swamps with islands of wooded uplands scattered throughout. These islands are usually from a few rods to a mile or more in diameter. The smaller isolated tracts are covered with growths of spruce, tamarack and cedar.

The soil is largely composed of decomposed vegetable matter spoken of as "peat." It is of a dark brown color fairly well decomposed and underlain by a sandy subsoil at a depth ranging from 18–24 inches below the surface.

The value of this type of soil from an agricultural point of view is largely dependent upon the drainage possibilities. This phase of the problem was not studied except in a very general way. The Manitowish waters drain the greater portion of the open marshes above referred to, and include the Manitowish river, Bear creek, and their tributaries. Nearly all these have good fall, with the stream beds in many instances of sufficient depth to afford good outlets for drainage systems.

F. L. MUSBACK.

From the above report it will be noted that the land within the eight townships can be approximately classified as follows:

1. Sandy to sandy loam (forest land)	50%
2. Jack pine sandy soil (forest land)	20%
3. Sandy loam to loam (possible agricultural land)	15%
4. Peat (reservoir lands)	15%

The peat lands are in the low marshes and will be either largely overflowed by the reservoirs that are being built at the headwaters of the Wisconsin and Chippewa rivers, or used as natural reservoirs. The Federal government has reserved the right to overflow these lands and any prospective settler should look into this matter very carefully.

As will be noted from the above table the forest and reservoir lands cover about 85% of the entire area examined, and the 15% of possible agricultural lands are rather badly scattered, though not so widely as in the seven townships surveyed in 1910. Fifteen townships, or approximately 345,000 acres have been examined in 1910 and 1912 and from 78 to 85% can be classed as true forest land, which is not good agricultural soil and upon which settlers should not be encouraged to locate. Town and county officials and land companies are naturally loath to admit that any of their land is non-agricultural, and they are prone to charge foresters with discouraging settlement. But the tenets of forestry are that no land should be kept for forestry that is more valuable for agriculture, and certainly the Forestry board would be inclined to welcome settlers in the forest reserve as they would usually prove good workmen whose interests would be identical with those of the state.

But the Forestry board would be doing a great wrong to encourage any man to locate on an isolated tract of rather doubtful agricultural land in the heart of the forest reserve, for though the man might be willing, it would doom his wife and

children to a hard, lonely existence without the benefits of good schools or a growing community.

It is estimated that there are at least 13,000,000 acres of land in northern Wisconsin awaiting development, and much of it is the highest grade agricultural soil. Wisconsin is so rich in this natural resource, and the state has so much at stake in the prosperity and happiness of her settlers, that the state should direct such settlement into the proper channels. The amount of land within the state forest reserves that can possibly be classed as agricultural is a small percentage and in most cases is so badly scattered as to preclude settlement. The forest rangers will use a considerable portion of the areas that are possible agricultural land, but the state should not encourage any settlers to locate in this region.

It is an admitted fact that when the state buys large tracts for forest reserve purposes and thereby withdraws such lands from taxation, it should pay its fair share of the costs of schools and local government within the forest reserve area. But because the state should do this is no reason for condemning the Forestry board for purchasing lands to block up and consolidate the state forest reserves.

Surveying Lake Lots.

In order that the lake shores within the forest reserves should be platted to the best possible advantage for leasing as camp and cottage sites, it has been necessary to survey them, and one of the forest rangers has devoted most of his time to this work. All lots are of good size, usually with a lake frontage of from 300 to 500 feet, and containing from one acre up to five acres. The lake frontage owned by the state has been surveyed and platted on the following lakes: Tomahawk, Big Trout, Plum, Star and Palmer, and work is progressing on Rest, Clear and Carroll lakes.

Leasing Camp and Cottage Sites.

There are nearly 1200 lakes within the state forest reserve area and the fact that this wonderful lake region is being built up as a great forest reserve means not only that the beauty and attractiveness of these lakes will always be preserved, but also

that the forests will be protected and greatly improved, that hundreds of miles of roads, fire lines, trails and telephone lines will be built, and that this region will be made safe from forest fires. Already the main part of this work has been done, and the work will be continued from year to year until the reserves are placed in the best possible condition.

Hunting and fishing in this region will also constantly improve for many years to come, and for these several reasons the forest reserves are going to be very attractive for summer camps and cottages.

The reserves are of course intended for the fullest use and enjoyment of all the people, and therefore the State Board of Forestry has adopted the policy of leasing camp and cottage sites on the lakes and rivers. The following circular prepared by the Department explains the general terms under which leases are granted.

DEAR SIR:

In response to many inquiries in regard to the leasing of camp and cottage sites on lakes within the state forest reserve, the following general information is given.

The forest reserve area, especially in Vilas county and the northern portion of Oneida county, includes hundreds of beautiful lakes and the state owns many of the most desirable lots on those lakes. The state board of forestry is prepared to lease five acres or more to any individual or club for a period of from one to twenty years, with privilege of renewal, as sites for summer camps or cottages, at an annual rental of from $10 to $50, depending upon the location, area and value, upon which suitable buildings are to be erected by the lessee.

Sites can be had either near a railroad or distant from one, and applicants should state which they prefer; and whether they desire a site suitably located for a family outing or whether they simply require good hunting and fishing. These lands are wild and forest lands and not suited for agriculture. Application should be made to the State Forester, giving full and definite information as to the requirements of the applicant.

The provisions of the lease are very simple and not at all restrictive, the main points being that no green timber shall be cut for building or other purposes without the consent of the State Forester, that all reasonable care shall be taken to prevent starting forest fires and that no intoxicating liquors will be sold.

Individuals or families who would like to spend the summer in the forest reserves can secure a site for the erection of tents or temporary structures upon the payment of a yearly fee of $2.00 for an individual and $5.00 for a family. Detailed information as to any particular lake, also camp, cottage or tenting sites, will be furnished upon application.

The state forest rangers, in connection with their work, will try to protect camps and cottages on state land from being molested.

A map showing the most desirable lake lots can usually be loaned to applicants, and it should be returned as promptly as possible.

Very respectfully,

E. M. GRIFFITH,
State Forester.

Congress has now granted to Wisconsin for forestry purposes some 250 islands in the inland lakes, most of these being within the forest reserve area, and these islands will be leased exactly the same as the lake shore property.

Grant of Islands from the Government.

Due to the untiring efforts of Congressman E. A. Morse, in the House of Representatives, and Senator La Follette in the Senate, the U. S. Congress on August 22nd, 1912, granted to Wisconsin all the unsurveyed and unallotted islands in inland lakes, north of town 33. The islands are granted to Wisconsin as an addition to the state forest reserves, and the act provides that they must always be managed as part of the reserves, or will revert to the United States.

Before this grant a large number of islands had been acquired by private parties, and in many cases they had cut off all the timber leaving the islands eyesores, instead of the beauty spots that nature intended them to be.

The government did not have an accurate record of the number of islands in the inland lakes, but the reports of the state forest rangers show that that there are about 250 islands, and that they contain all the way from ¾ of an acre up to 40 acres each. During the winter of 1912–13 it is planned to have all these islands carefully surveyed and described, and they will then be leased for summer camps and cottages in exactly the same way that lake shore property within the forest reserves is leased by the state.

Wisconsin is extremely fortunate in securing such a large number of beautiful islands and they will greatly enhance the beauty and value of the forest reserves.

Proposed Game Preserve.

It is proposed to fence in some 8,000 to 10,000 acres of land in 41–7 E., within the heart of the state forest reserves, as a game preserve, and to inclose within this preserve elk, moose, deer, pheasants, grouse and such fur bearing animals as beaver, mink, otter, and so forth.

The state already owns the land that it is proposed to enclose, and the government is prepared to give the state elk from the big herd that winters in Jackson's Hole, Montana, and in which many of the animals die each year on account of the lack of feed.

Some game enthusiasts have also offered to assist the state in securing some moose and a gentleman will give a large number

of Mongolian pheasants. Native deer can readily be driven into the game preserve, and the fur bearing animals can be secured within the state.

It is also proposed to use the game preserve, and possibly large marshes within the forest reserve, as a wild fowl refuge, where migratory birds will have a chance to breed without being slaughtered.

Mr. Edward A. McIlhenny, of New Orleans has established some splendid wild fowl refuges on the coast near New Orleans, and largely through his efforts, Mrs. Russell Sage of New York has recently purchased Marsh Island, near New Orleans, and has presented it to the government to be held for all time as a wild fowl refuge.

Mr. McIlhenny is a true sportsman who is working to preserve the wild bird life of America, and he is meeting with great success in his efforts to have all the states along the Mississippi river set aside wild fowl refuges so that the birds in their flights may find protective areas from New Orleans to the Canadian line.

The main idea of the proposed game preserve near Big Trout lake, in 41–7 E., is to protect the elk and moose until they increase to sufficient numbers so that some of them can be set free within the forest reserves in Vilas county and to then ask the legislature to prohibit the killing of any elk or moose for a number of years. In this way it will prove possible in a few years to again have these splendid game animals in Wisconsin, and the deer within the preserve should increase so rapidly that a number of them could be liberated each year.

The game birds will of course fly from the fenced area to other parts of the forest reserve, but they will very quickly learn where they are not shot, and will return to the preserve during the breeding season or when shot at frequently.

The fur bearing animals should gradually be distributed through all the lakes and streams of the forest reserve, and their taking carefully regulated so that they will not again be nearly totally destroyed.

Such a game preserve is the only feasible way of stocking the forest reserve with the game which it should contain, and now that the state owns the land, the chief cost will be the fencing and that can be purchased for about $100 per mile.

Forestry Work for Convalescent Consumptives.

The state forest reserves, comprising some 400,000 acres, and lying within the wonderful lake region of northern Wisconsin, should be used and enjoyed to the fullest extent by all the people of the state, and one of the best possible uses to which a portion of the reserves can be put is as a big outdoor sanatorium for convalescent consumptives and those who are threatened with the disease. The State Board of Forestry now has one large forest nursery containing some 2,500,000 tree seedlings, and within a year or two other nurseries will be built, so that probably the annual production of the nurseries will be about 2,000,000 seedlings, which will be nearly sufficient to reforest 2,000 acres a year.

Work both in a forest nursery, and in planting the seedlings, is light work which can be arranged so that it would be especially suited to the weakened condition of a convalescent consumptive patient. It is proposed to ask the legislature for an appropriation of $5,000 per year which would cover the cost of building and keeping in repair the wooden shacks in which the patients would live, and also the salaries of a doctor and nurse. The State Board of Forestry would set aside the land required for the sanatorium, forest nurseries and tracts to be reforested, and would pay the patients for the time in which they were actually employed in working for the state.

At first a patient might not be able to work more than four hours a day, but at 15c per hour, he would have earned 60c, or more than his board for one day would cost, and all that he earned over and above the cost of his board, would be credited to him, so that when cured he could leave the sanatorium with at least a small amount of money to start life anew.

This is not an absolutely untried plan, for as early as 1902, J. T. Rothrock, who for many years was commissioner of forestry in Pennsylvania, started a camp for consumptives at Mont Alto, in the forest reserve. Mr. Rothrock writes as follows in regard to the results that were accomplished in this camp:

"It was simply a camp—rough board shacks, costing from $40 to $60 apiece. The inmates provided their bedding, furniture, and prepared their own food. It continued so for nearly four years, receiving from the State $23,000, and from friends about $3,000. Meanwhile we had built some better cabins at a cost of $250 apiece, and erected an assembly hall.

"For the last few months we were able to begin feeding the patients from the state appropriation. June 1, 1907, the camp, at the request of the Forestry

Department, was transferred to the newly created State Health Department. Liberal appropriations were made for its support, and there is now on that ground a tuberculosis sanatorium, having at present 850 patients. Before we had time to work out the plan of forest planting, etc., thoroughly, the change was made, though we had tried the plan of small individual gardens for the patients, with great success. It was natural that I should try to find some avenue along which I could lead these people into light out-door work in forestry.

"You ask what obstacles were encountered during our five years of work on the camp idea. I reply none, inherent in the plan. I am anxious to impress one thing,—*It is cheaper, wiser, more humane, to prevent disease than it is to cure it,* and I think we begin our work at the wrong end. There are in Wisconsin, as in Pennsylvania, thousands of overworked, underpaid, underfed people, who are wearing out their lives in unsanitary surroundings, living to propagate a weaker generation, and then themselves die charges upon the tax or bounty of the community. Would it not be better from every point of view to get those people out camping, when just a little ailing, before they become sick? We are commencing to think so here in Pennsylvania, and are working to revive the camp idea to keep weak ones from becoming sick ones. I hope you progressive people in Wisconsin will keep everlastingly at this camp business in one form or another, or if need be, in several forms."

Mr. Rothrock does not take the credit that is due him for the really remarkable success of this camp, for in the nearly five years of its operation, over 75 per cent of those who came to the camp afflicted with tuberculosis, were discharged either cured or with the disease arrested.

As will be seen, Wisconsin is not blazing an entirely new trail, and yet the proposed plan in Wisconsin is fundamentally different from the Pennsylvania camp in the following important respects:

1. The plan in Wisconsin is to accept in the camp only convalescent patients, or those who are threatened with the disease.

2. The state will build and furnish the necessary shacks and will also feed all the patients.

3. Work will be provided for all the patients either in the forest nurseries, planting or some other form of light forestry work.

Wisconsin has a splendidly equipped sanatorium for consumptives at Wales, but Dr. Coon, the Superintendent, as well as other doctors of the state, finds that the hardest problem is to find light out-door work for the convalescent patient. Many of these are men and women from the larger cities, who on account of their very slender means are obliged to return at once to their work in the factory or store, and the long hours, combined with lack of fresh air, frequently result in a serious relapse, and sometimes death. For these reasons the doctors have welcomed enthusiastically the plan of giving these convalescents a few months at least of steady out-door life on the forest reserves, combined with light and pleasant work.

Some patients will undoubtedly find that in order to avoid a relapse they must continue to live in the cool dry climate of northern Wisconsin, and in such cases the State Board of For-

estry could lease to them at very reasonable rates, small tracts of arable land near the public resorts, hotels and private camps, and the patients would find that they would have a ready sale at good prices for all their vegetables, milk, chickens, etc. There are also thousands of men and women workers in Wisconsin, who though not consumptives, are so run down and worn out that they are an easy prey to the disease. It is a good sound policy for the state to aid such people in regaining their health, and thus avoid their becoming public charges, and the state could well afford to allow them to build camps on many portions of the forest reserves, and also to give them work in reforestation to a very considerable extent.

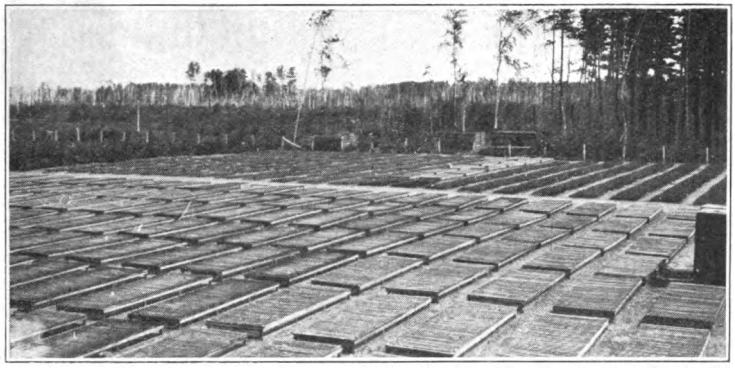
As a few months' out-door life in the bracing climate of northern Wisconsin will often make certain the complete cure of the convalescent consumptive, and also ward off possible consumption from the weak and debilitated worker, and as the state must reforest its denuded lands which are unfit for agriculture, it would seem both a sane and humane policy to give the patient a chance to do the work for which he is so suited, bringing to him health, and to the state wealth, through the forests that will be grown.

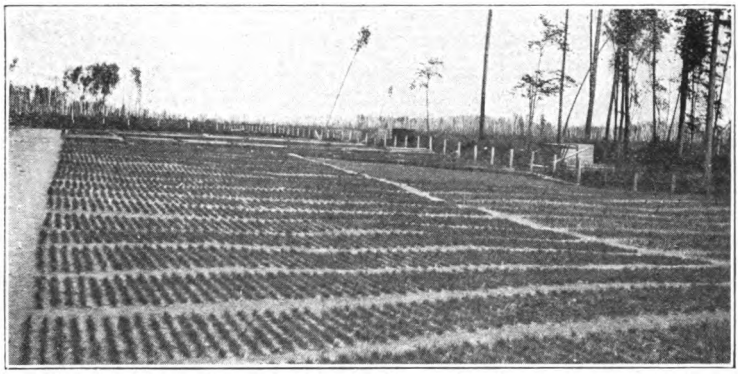
Forest Nurseries.

Where there have not been severe repeated forest fires within the forest reserve region, the second growth and natural reproduction are in most cases fairly satisfactory so that little if any planting will be necessary, but on some areas the fires were so severe that all the young growth of any real value was destroyed and of course in such cases planting is the only remedy. It would be far too expensive to purchase planting material from commercial nurseries, and therefore in the spring of 1911 a large nursery was started at the Headquarters camp at Trout lake, Vilas county, under the direct supervision of F. B. Moody, Assistant State Forester, and the results from the start have been remarkably successful, and the plants have been raised at an unusually low cost as will be noted from the following table.

1 YEAR SEEDLINGS.

	Number	Cost to raise per M.
White pine	632,000	$.46
Scotch pine	190,000	.45
Western yellow pine	60,000	.55
Norway spruce	11,000	1.06
Colorado blue spruce	40,000	.40
European larch	400	.88





VIEWS OF STATE NURSERY AT TROUT LAKE.

Young pine must be grown in the nursery for two years before being planted. About 2,500,000 seedlings are now being grown.

2 YEAR SEEDLINGS.

	Number	Cost to raise per M.
White pine	436,000	$.47
Norway pine	576,000	.47
Scotch pine	145,000	.46
Western yellow pine	13,000	.56
Norway spruce	20,000	1.07

2 YEAR TRANSPLANTS.

	Number	Cost to raise per M.
White pine	21,000	$1.25
Scotch pine	20,000	1.24
Western yellow pine	68,000	1.33

The above figures represent the actual cost of raising the plants, including all labor, but do not include the cost of land, clearing, water system, fencing, fertilizer, etc. The exact amount that must be added to cover all such expenses, depreciation, etc., cannot be determined until the plants are ready for planting but it will probably be about an annual charge of 15 cents per thousand plants. It is expected that the Trout lake nursery will raise from 1,250,000 to 1,500,000 trees each year and this number will be sufficient to reforest from 1,000 to 1,200 acres annually. So far very little trouble has been experienced in raising trees in this nursery. Damping off, a fungus disease which attacks young conifers the first season, has killed some of the seedlings, but has not been at all serious. The disease was cured by frequent watering and also scattering powdered sulphur over the seedlings. Grasshoppers killed some of the two year old white pine during the summer of 1912 by eating the bark and often girdling the young trees. There seemed to be no remedy to check this loss except screening the beds.

The ground has already been cleared for a forest nursery which will be started in the spring of 1913 at the Tomahawk lake ranger station. This nursery will contain from 3 to 3½ acres and should have an annual output of from 500,000 to 750,000 trees. In addition to these two large nurseries it is intended to establish smaller nurseries at all the other ranger stations.

It is the intention of the State Board of Forestry to sell trees, at slightly above cost, to citizens of Wisconsin who may wish to reforest their non-agricultural lands within the state.

Forest Planting.

The first plantations on the forest reserve were made in the spring of 1911 and as the state had no plant material of its own it was necessary to purchase all the stock used. As the plants were poorly packed and were ten days on the road, the losses were much greater than they would be under normal conditions.

The following species were planted in 1911 along the northeast shore of Trout lake:

White pine	181,200
Norway pine	1,000
Western yellow pine	5,000
Norway spruce	5,000

The western yellow pine were an experiment, but have done remarkably well, the plants being very strong and stocky, and it seems quite likely that this species may prove very valuable for reforesting the cut-over and burned lands within the forest reserves.

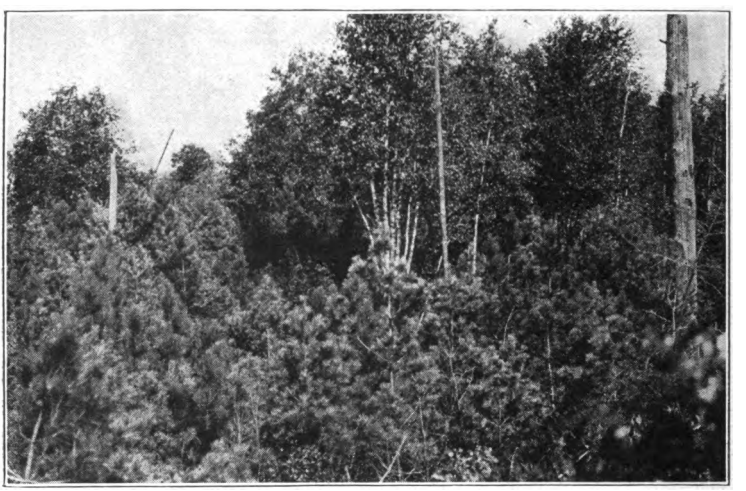
In the Trout lake forest nursery we now have over 140,000 plants of this species, so that within the next five years we can test it thoroughly.

During the spring of 1912 some 18,000 Scotch pine were planted at Trout lake, and as the plants were in good condition the losses were very small. This species has proved very successful in Michigan where it has been planted on sandy soil similar to that at Trout lake, so that it is not an experiment, but we want to compare its growth, freedom from disease, etc., in northern Wisconsin with that of white, Norway and western yellow pine, and even jack pine.

In order to have a fairly large and permanent experimental plantation it is proposed to reforest, in the spring of 1913, a long point in Star lake, Vilas county, which contains about 100 acres, and the following plants grown in the state nursery will be used:

White pine	50,000
Norway pine	50,000
Western yellow pine	10,000
Scotch pine	5,000
Norway spruce	5,000

A permanent accurate record of this plantation will be kept and it should prove a very valuable guide to all future tree planters of northern Wisconsin.



NATURAL PRODUCTION OF YOUNG PINE.

Where fires are kept out forest reproduction quickly occurs.

Throughout the forest reserves the first areas to be planted will be the lake shores where they have been cut over and burned, for in their present condition they are eyesores and should be reforested as soon as possible.

Natural Reproduction.

As stated in the report of the State Forester for 1907–08:

Natural reproduction, especially of pine, on the cut-over lands of northern Wisconsin is surprisingly good where forest fires have not run, but unfortunately such sections are the exception rather than the rule, and the fires of 1908 have destroyed thousands of acres of the most promising young growth. It may be said in general that over large areas natural reproduction is not complete, that is, there are blanks which have not restocked and which must be planted artificially in order to get an even stand, but every acre naturally reforested is a direct saving in time, labor, and money.

The value of such young growth together with the loss of soil fertility has led this office to repeatedly warn settlers in northern Wisconsin of the enormous annual loss caused by surface fires which they were apt to look upon as of little or no consequence. A great deal more attention is paid to such fires than in the past, but still there are even some town boards who object to fire wardens "wasting time and money" in putting out fires which are burning on cut-over lands, and such men seem to think that no damage is being done unless merchantable timber is being destroyed. Each year thousands of acres of not only pine seedlings, but also young timber which has been growing for from ten to twenty years is burned over and is a total loss, and there is nothing which can be cut and saved, as is the case with merchantable timber. The value of young growth is none the less real because it is prospective, and if Wisconsin is to have forests in the future, together with the industries dependent upon them, the forest fire problem must be solved so that the new forests with which nature is trying to reclothe the cut-over and barren lands will be carefully protected.

Since the above was written the forest fires of 1910 burned over 892,000 acres, and as a result an enormous amount of promising young timber was destroyed. Fortunately both 1911 and 1912 have been wet seasons with very little damage from forest

fires, but dry years will certainly come again, and the future wealth of the state absolutely depends on the protection of the young growing trees.

On the state forest reserves the Forestry board employs forest rangers whose duty it is to promptly detect and extinguish all forest fires and this has been made possible by a very complete fire protection system. Where severe repeated forest fires in the past have not destroyed all of the seed, the young pines are coming up, but where there is no pine or other valuable species, it will be necessary to plant.

It cannot be too strongly stated or frequently repeated that pine will always follow pine if the lands are not too severely burned over. But where all the pine seed has been killed by fires that burned deep into the soil, then Nature steps in and the light seed of the popple is carried upon the land from long distances. The popple is a fire seed, which Nature uses to quickly reclothe burned over soil, and it serves admirably as a shelterwood for more valuable species, especially pine, which is frequently found growing up under it.

The natural reproduction of the forest lands of northern Wisconsin is simply a question of adequate fire protection, and it is felt that the necessary protection can never be secured until a well organized system of forest fire patrols has been provided for each and every forest region in Wisconsin.

Fire Protective System.

In 1910 there were only a few roads within the state forest reserve and as a complete system of roads, fire lines and telephone lines was absolutely necessary in order to protect the reserve from forest fires, this work has been pushed as rapidly as the men and funds at the disposal of the forestry board would permit.

During the field seasons of 1911 and 1912 we have completed 159½ miles of road, 118 miles of fire lines and 56 miles of telephone lines, and it is believed that this is a greater amount of permanent protective work than has been accomplished by any other state in an equal length of time.

Road Building.

Within the forest reserve there were fortunately many miles of old logging railroad grades and with a comparatively small

BUILDING A ROAD AND FIRE LINE IN THE FOREST RESERVE.

amount of work these have been made into very fair wood roads, and they will prove excellent fire lines as well. The state will save thousands of dollars by being able to utilize these old railroad grades, and although many of them are so located that they cannot be used as roads, still most of them will be cleared of brush and other inflammable material and used as fire lines.

In 1911 approximately 108 miles of road were built, and 51 miles in 1912, at a cost of about $118 per mile.

Naturally the cost of road construction varies very greatly where in one case an old railroad grade can be utilized, while in another the road must be built through heavy brush or timber. The cost of construction under varying conditions is shown in the following typical cases:

Road and fire line built on an old railroad grade from Star lake to Camp 12. Distance 8 miles.

Character of work.	*Total Cost.*	*Cost per mile.*
Cutting brush	$56.85	$7.10
Removing ties	58.08	7.26
Removing rock and sod	9.20	1.15
Plowing and dragging	49.85	6.23
Board of men	85.90	10.73
Board of team	33.40	4.17
Total	$293.28	$36.64

On most of these old railroad grades the brush is very thick. This must first of all be cut out to make a good wide road, then piled and later on burned. The heaviest part of the work is removing the ties, which are often heavy birch trees which have become firmly imbedded in the turf. The ties are piled up along the road and when thoroughly dry are burned. After the rock and sod have been removed, the road is plowed and dragged and then with a little use the road packs firmly and becomes a very useful highway as well as an excellent fire line.

It will be noted that the cost of building the above road on an old railroad grade was $36.64 per mile, and it is interesting to compare the cost of the following road which was built through very brushy country, especially as the work was done under the same forest ranger with practically the same crew of men:

Portion of the road from Star lake to Sayner. Distance 2¾ miles.

Character of work.	*Total cost.*	*Cost per mile.*
Cutting brush	$113.95	$41.44
Removing stumps	44.85	16.31
Plowing and dragging	32.20	11.71
Scraping	70.05	25.47
Shovelling and grubbing	125.70	45.71
Dynamiting	19.00	6.91
Burning brush	26.45	9.62
Board of men	215.30	78.29
Board of team	86.95	31.62
Total	$734.45	$267.08

As a road from Star Lake to Sayner was badly needed, and as it will be very generally used by the public, more time and money was spent on it than would usually be the case.

However, probably every railroad grade which has been utilized in making a road has saved the state at least $150 per mile.

Fire Line Construction.

During 1911 and 1912 approximately 118 miles of fire lines have been constructed, of which 94 miles were built in 1911 and 24 miles in 1912, at an average cost of $87.70 per mile.

The greater part of the fire lines follow the old railroad grades and many of these are really secondary roads and can be used as such when desirable.

However in a good many places it has been found necessary to construct fire lines where there were no railroad grades, and in such cases the fire line has always been built so as to connect two lakes, or one lake with a river, road or other boundary from which the fire could be fought and checked.

The forest reserve contains several hundred lakes, besides a number of rivers and many smaller streams, which makes it a comparatively easy matter to divide the reserve by means of roads and fire lines, into a large number of blocks or districts, so that a forest fire can be held in the district in which it starts.

Telephone Construction.

In 1911 and 1912 there were constructed 56 miles of telephone line at an average cost of $36.77 per mile. The detailed cost of an average line is as follows:

Cost of telephone line from Headquarters camp, Trout lake, to Sayner. Distance 9 miles.

Character of work.	*Total cost.*	*Cost per mile.*
Cutting and skidding poles to road	$78.30	$8.70
Digging holes, hauling and setting poles	75.60	8.40
Stumpage value of poles	40.50	4.50
Stringing wire	49.12	5.46
Cost of wire	43.38	4.82
Cost of knobs	2.70	.30
Cost of nails	.54	.06
Total	$290.14	$32.24

The telephone lines extend from Headquarters camp to the ranger cabins, lookout towers, and nearest towns, and a switchboard at Headquarters camp makes it possible to connect any of the lines.

BUILDING A ROAD AND FIRE LINE IN THE FOREST RESERVE.

Steel Lookout Towers.

During the summer of 1912 four 55 foot steel lookout towers have been built on some of the highest hills within the forest reserve, and these towers are so located that nearly the entire area of forest reserve lands in Oneida and Vilas counties can be observed from them.

The average cost of the towers has been $136.90, the detailed cost of a typical tower being as follows:

Cost of tower	$66.32
Labor setting up tower	52.51
Cement for foundations	9.55
Lumber for platform	3.05
Total	$131.43

From all the towers the country can be seen for 10 miles in almost any direction, and during dangerously dry weather the observers report immediately, by telephone, any fire or smoke that may be seen.

Cutting Old Stubs.

Old dead stubs are one of the most prolific means of spreading forest fires, as the fire quickly runs up the dead bark to the top of the tree and a slight wind will carry the burning bark for long distances. During 1911 and 1912 old stubs, chiefly birch, were cut back for 6 rods on each side of 83 miles of roads and fire lines, at an average cost of $5.34 per mile. With these old stubs out of the way there will be little probability, in many sections of the reserve, of a forest fire jumping over the road or fire line.

Slash Burning.

Where the slash from old lumbering operations is very heavy, and especially where it adjoins timber or other valuable property, it is necessary to pile and burn it so that it shall not be a constant menace to the forest reserve. During 1911 over 1200 acres of dangerous slashings were destroyed, and 135 acres in 1912, at an average cost of $4.88 per acre. The reason the cost was so heavy was on acount of the work being done on the worst areas where the slashings were heaviest, and also because the lumbermen had made no attempt to pile the slash and therefore it all had to be rehandled.

Portable Telephones.

After two years of experimenting the Western Electric company has perfected a portable telephone for the use of forest rangers and patrols, and two of these instruments have been tested on the telephone lines of the state forest reserves. It is a beautifully made instrument, packed in a leather case, which is easily carried on the ranger's back or fastened to a saddle. A ranger will often find a fire that is near a telephone line though it may be several miles to the nearest camp where there is a telephone instrument. We will suppose that the ranger finds the fire burning in some old slashings, and that he sees that he cannot extinguish it alone, but must have three or four men with axes, shovels and collapsible canvas water buckets. If he had to go several miles to the nearest camp in order to telephone for the men, he would lose much valuable time. Equipped with a portable telephone he goes to the nearest telephone line and gets the connection by simply throwing a heavy cord, which is weighted, over the line, and by sticking a steel rod into the ground. He then rings up the nearest ranger, or the Headquarters camp, reports just where the fire is, and help is rushed to him by horses or railway speeders. The ranger then goes back to the fire and works to keep it from spreading until help arrives.

It will thus be seen that the portable telephone is another important cog in the system of forest fire prevention and control, and that it is the ranger's fire alarm box. First, prevention, and second, promptness in getting well equipped fire fighters to the fire, are the problems in the big forest just as they are in the big city.

Forest Rangers' Fire Fighting Equipment.

The state forest reserves have been divided into districts with a forest ranger in charge of the work in each district. As is fully explained in this report the fire protective system consists of roads, fire lines, trails, lookout towers and telephone lines, but occasional fires will always occur, and the rangers must be properly equipped to fight and extinguish them.

At each ranger cabin there is a supply of fire fighting tools such as axes, shovels, water pails, and so forth, and at all the chief railroad stations within the forest reserve area there are

big tool boxes, fully equipped and ready to be shipped to any point along the line at a moment's notice.

The rangers must get to a fire with the least possible delay and therefore those who are located near a railroad line have railroad speeders and the other men have horses.

Field glasses for detecting small fires at a considerable distance, and portable telephones for quickly summoning help, have both proved very useful, and the men on the lookout towers will be equipped with telescopes, as they can then detect fires over a wide range of territory.

The ranger is also furnished with an ax, shovel and collapsible canvas water bucket, which he can carry on his railroad speeder or pack on his horse.

Federal and State Fire Protective Work.

Congress under the provisions of the Weeks law authorized the U. S. Department of Agriculture to coöperate with the various states in protecting timberlands upon the headquarters of navigable streams from forest fires. The act provides however that no part of the appropriation shall be used in any state that has not established a forest fire patrol system of its own and therefore only a few states were able to qualify.

Wisconsin's application for assistance in protecting the headwaters of the Wisconsin and Chippewa rivers was approved by the U. S. Forest Service and during the fire seasons of both 1911 and 1912 the Wisconsin State Board of Forestry has been allowed $5,000 with which to employ Federal patrolmen.

Each year from about May 1st to December 1st twelve Federal patrolmen are employed to assist an equal number of forest rangers who are in the permanent employ of the state.

During the fire season of 1911 there was so much rain that it was not necessary for the men to devote much of their time to patrol work, and therefore it was possible to make a great deal of headway in starting the fire protective system. Following is a somewhat detailed report of the results of the work in 1912:

Fortunately, during the summer of 1912, there was plenty of rain in Wisconsin, and it was so well distributed that there was very little danger from forest fires, except during June, and the first part of July. During those six weeks there were from ten to twelve small fires on the protective area, but they were quickly found and extinguished. The well distributed rains made it possible for the forest rangers and patrolmen to devote a large

share of their time to building up the protective system with the result that the following work was accomplished:

Miles new road built	49½
Miles new fire lines built	31
Miles old roads dragged or plowed	41
Miles old fire lines widened or cleaned	21
Miles new telephone lines constructed	16½
Miles old telephone lines repaired	15
Miles new trails made	11
Acres of slashings burned	615
Acres of clearing done	18
Lookout towers constructed	4
Bridges built	5

We now have 159½ miles of road completed, 118 miles of fire lines, 56 miles telephone lines, with connections from Headquarters camp to rangers' cabins, lookout towers and nearest towns. We have completed four ranger cabins, and have two more under construction.

Patrol Work.

Twelve state forest rangers, twelve federal patrolmen, and one private patrolman have been engaged in the patrol work during 1912. When not engaged in patrol work the men were employed in building up the protective system as outlined above.

The few settlers within the protective area, as well as the large number of summer visitors, have come to realize quite clearly the value of the patrol system, and are much more careful in burning brush and about leaving their camp fires burning.

There has been a marked improvement in this respect since 1911, and those living in, or using the protective area for camping, hunting, or fishing have been requested by means of notices, to help in preventing forest fires. Each ranger and patrolman has made it a point to call on each settler or camper in his district to inform him as to the law in regard to forest fires, and to enlist his support.

Lookout Work.

No lookout towers were built in 1911, but during 1912 four have been constructed. They are all 55 foot steel towers, which are connected by telephone with the Headquarters camp, ranger cabins and nearest towns, and which are so located that nearly all of the protective area can be observed from some one of the four towers. During June and the first part of July, patrolmen were assigned to duty in these towers from time to time, but during the remainder of the season there has been so much rain that lookout duty has not been necessary.

Fire Fighting.

During June and July there were only from ten to twelve fires on the protective area, and none after that until two fires occurred in November. All of these were small fires, which were quickly extinguished by the rangers and patrolmen, without the necessity of hiring any extra help. The expenditures in 1912 for the patrol and protective work during the time that the Federal patrolmen were employed was as follows:

State expenditures, approximately	$16,326.00
Federal expenditures, approximately	4,422.00
Total	$20,748.00

The Federal expenditures were only for the salaries of the Federal patrolmen, while the state expenditures covered the salaries of the forest rangers together with the cost of building roads, fire lines, trails, telephone lines and lookout towers. One private owner paid the salary of a patrolman throughout the entire fire season, and it is expected that by 1913 a number of other private owners and large timberland owners will coöperate in this way.

There are no rural mail carriers within the protective area, but in other parts of the state the carriers should be a great assistance in promptly noting and reporting fires.

The railroads of Wisconsin, particularly within the protective area, have shown a keen interest in coöperating in fire prevention, and after several years' efforts, and the expenditure of thousands of dollars, they have developed spark arresters, which although not perfect are a long step in advance and have reduced the number of forest fires set by railroad locomotives to a very marked degree. The law now provides that all locomotives on main lines must be equipped with the most efficient spark arresters, and that locomotives on branch lines or spurs in the forest region must have screens over the smoke stacks, so as absolutely to prevent the escape of all sparks. This last provision of the law has worked particularly well, and during 1911 and 1912 the railroads did not cause a single bad forest fire in the protective area. The railroads have also appointed inspectors at each division point and roundhouse, whose duty it is to examine each locomotive each day during the fire season, in order to see that all spark arresters and screens are in good condition.

Men in each section crew have been designated to act as fire patrols along the railroad lines in case of dangerously dry

weather, but during both 1911 and 1912, it was not deemed necessary to call on the railroads for such service.

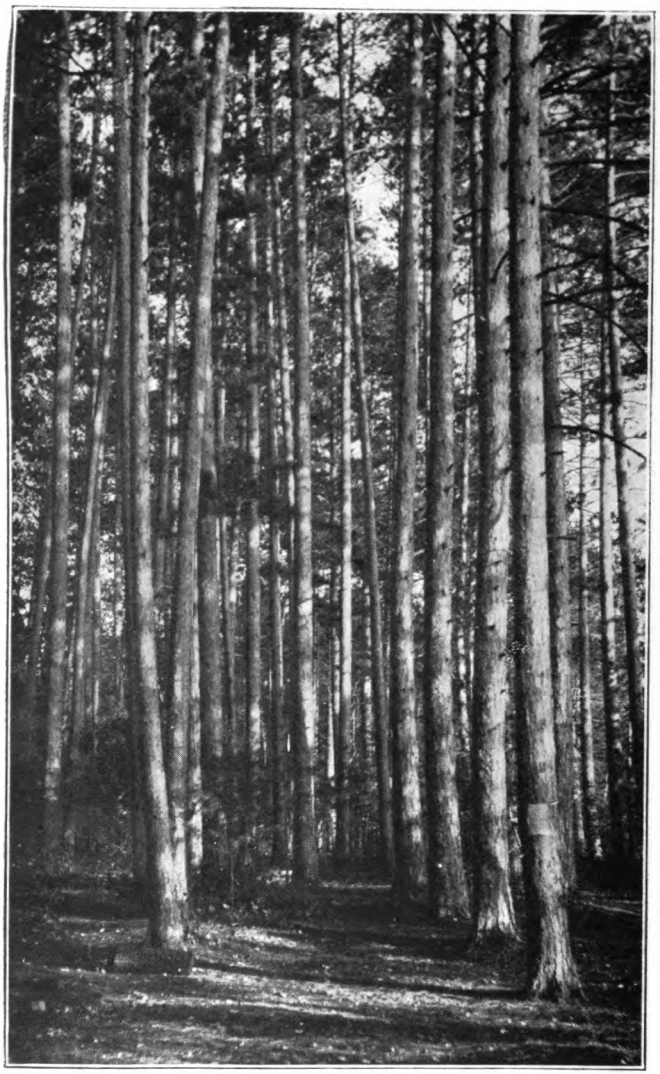
The Federal fire coöperation has been extremely valuable to Wisconsin, especially for the following reason: The protective area at the headwaters of the Wisconsin and Chippewa rivers comprises some 1,260,000 acres, and as the state only has 12 forest rangers it would have been impossible for them to adequately patrol this large area, and their work would have been confined to approximately 260,000 acres of state lands, leaving 1,000,000 acres of privately owned lands unprotected. With the assistance of the 12 Federal patrolmen, it has been found possible to divide the entire area of 1,260,000 acres into districts, so that all portions, including both state and privately owned lands, have received equal protection.

The 1,000,000 acres of privately owned lands, many of which are heavily timbered, are worth on a conservative basis at least $5.00 per acre, and therefore it can be stated that the Federal coöperation has enabled Wisconsin to protect 1,000,000 acres of timberland upon the headwaters of the Wisconsin and Chippewa rivers, both of which are important tributaries of the Mississippi river, and worth at least $5,000,000, which would have been impossible without this coöperation.

As the Federal patrolmen received $4,431.25 in 1911, and $4,238.50 in 1912, the cost of protecting the 1,000,000 acres of privately owned lands has been less than 1½ cent per acre per annum.

In 1913 the same protective area of 1,260,000 acres must be patrolled, and it is hoped that we may have another season of well distributed rainfall, so that the fire protective system of roads, fire lines, telephone lines and lookout towers may be extended. It is extremely important that the fire protection system should be completed as rapidly as possible, and therefore it is hoped that the Forest Service will be able to increase the allotment of Wisconsin for 1913 to at least $8,000, as this would permit the employment of 15 Federal patrolmen for 7 months, or from about April 15th to November 15th. The state would then increase its forest ranger force to at least 15, and would continue as in the past, to give most of the rangers and patrolmen crews of from four to seven men apiece, so that the building of the protective system of roads, fire lines, etc., should be pushed as rapidly as the state forestry funds will allow.

During 1913 Wisconsin will have available for all of its for-



MATURE PINE ON TROUT LAKE.

This timber is now worth over $450 per acre.

estry work, outside of the funds appropriated for the purchase of lands, about $75,000, and of this amount it is expected that at least $25,000 will be available for the fire protective work.

Summary of Summer Resort Business.

The forest reserve region should become in time a great summer resort for people throughout the entire Mississippi valley, as it has a fine, bracing, dry climate, pine forests and sandy soil, and is blessed with many of the finest chains of lakes in the entire country. Vilas county in particular has a greater area of water than land, and long trips can be made by launch or canoe. There is plenty of sport both for hunters and fishermen, and the resorts furnish good beds and excellent board at reasonable prices.

The summer resort business in northern New York state, which is largely within their forest reserves, amounts to approximately $10,000,000 a year, this amount being paid by the tourists, as they are called, in railroad fares, to hotels, boarding houses, etc. New Hampshire does about as well and the summer business gives the old state of Maine nearly $20,000,000 a year.

The summer resort business within the forest reserve area of Wisconsin is in its infancy but should grow very rapidly now that the state is building up a permanent forest reserve, which will be protected from the forest fires that were rapidly ruining that beautiful region.

In order to get at least an approximate idea of the summer resort business within the forest reserve area one of the cruisers employed by the State Board of Forestry in connection with his other work has either personally visited or corresponded with every resort owner in this region. Blanks were prepared which have been filled out by 91 of the resorts, and this opportunity is taken to thank the resort owners for their hearty coöperation in making the investigation a success. As the blanks have just been received it is only possible to include in this report a brief summary of the investigation. Later on it is hoped to publish a report that will include the name and location of each resort, number of guests that can be accommodated, and other information that will be useful to summer tourists visiting the forest reserve.

The following table shows the average annual summer resort business within the forest reserve region:

Number of resorts	91
Number of buildings	639
Number of guests that can be accommodated at one time	4,372
Number of guests accommodated in year	13,131
Gross receipts in year	$356,025

Following are the rates that are charged:

Board and room.	
Per day, $1.25 to $3.00, average	$2.00
Per week, $8.50 to $14.00, average	12.00
Guides	
Per day, $2.50 to $3.00, Average	$2.50
Boats.	
Per day, 50c to 75c, Average	$.50
Per week, $2.50 to $3.50, Average	3.00

The hotels in the small towns within the forest reserve area, which get a large share of their business from the summer tourists, together with the livery stables and boat liveries, report a gross annual business of $59,075. It is probably safe to estimate that 50% of this amount or $29,537, is paid by summer tourists.

It is also estimated that on an average each guest at a resort spends $12.00 for railroad tickets and berths, and $10.00 for hunting and fishing licenses, hire of guides and incidentals. Based on these estimates the annual summer tourist business within the forest reserve area amounts to about the following:

Railroad and Pullman fares	$157,572
Board and room at resorts	356,025
Hotels, liveries, and boat liveries	29,537
Hunting and fishing licenses, guides, etc	131,310
Total amount of business	$674,444

It should be clearly understood that the figures in the above table, except the $356,025 for board and room, are simply estimates, but it is believed that they are fairly close to the truth, and certainly the annual business must amount to somewhere between $600,000 and $700,000.

There are hundreds of lakes within the forest reserve area, and when these are protected, together with the forests, and as the hunting and fishing constantly improves, the resort business should increase to a very large figure.

State Aid for Schools and Local Government.

The state has been purchasing large tracts of land in northern Oneida and Vilas counties for the state forest reserves, and in order to consolidate and block up the reserves the state

should own about the following acreage of land in the counties which are within the boundaries of the reserve:

Vilas	506,000 acres
Oneida	345,000 acres
Forest	253,000 acres
Iron	115,000 acres
Price	70,000 acres
Total	1,289,000 acres

A few small communities within the forest reserves, notably Woodruff, Sayner, Star Lake, Manitowish and Mercer, are going to find it very difficult to raise sufficient funds to provide good schools and to pay the expenses of local government on account of the state's owning so much land upon which no taxes can be paid. During 1911 and 1912 the State Board of Forestry has built 159½ miles of roads within the forest reserve area at a cost of approximately $18,821. This region was very badly in need of roads and those that have been constructed by the state have not only opened up the country for the few settlers, but have been of great assistance to the resort owners and the thousands of summer visitors. In building these roads the state has relieved the towns of a very heavy expense, and it is felt that this work of development, which was so badly needed, is fully appreciated by the settlers and other resident owners, but as they very justly say, there still remains the cost of schools and local government, in which the State Board of Forestry has had no authority to assist.

There are only a few children of school age in any of the small towns within the forest reserve, and therefore the fair share which the state should pay towards the schools, and the cost of local government should not be large. Upon just what basis the state's share should be fixed seems to be rather difficult to determine, for while in some large towns there are few children and low costs of government, in other small towns there are a good many more children and as heavy, if not heavier, costs of government. It would seem as if a just way to determine the state's share would be to take the total cost of schools and local government in any town, and the state's proportion would be determined by the percentage of land which it owned in that town. However, such a rule as this would not be just to the state in every case, and the correct solution of this problem will demand the best efforts of the legislature.

EDUCATIONAL.

Forest Ranger School.

The Regents of the University have established a department of Forestry in the College of Agriculture for the purpose of organizing courses of study for the training of Forest Rangers, and also to give instruction to both long and short course students in agriculture, in the care of woodlands, especially the management of farm woodlots.

The practice of forestry by the owners of timber land, the organization and rapid development of definite forest policies by the states, and the organization of forest fire protective associations, are bringing about a demand for young men who have had practical training in Forestry. It will be the aim of the Ranger School to meet this demand by preparing men for such secondary positions as rangers, guards, tree planting experts, nursery foremen, and other positions with lumber companies, commercial nurserymen, and the owners of timber estates. Young men who have already gained some experience in woodcraft and in practical lumbering operations will find this course of especial value, as they will receive training which will fit them for the more expert quality of service which is demanded by modern methods of handling timber holdings.

This two year course is not offered as a complete education in Forestry. On satisfactorily completing the course, the student will be a trained ranger or guard, or an expert in tree planting and forest nursery practice, but he will not be a professional forest engineer.

The life of a ranger is a life in the woods, and no one should enter the school with any misunderstanding in this respect. Students who are not physically able to do hard woods work and who do not care for the rough outdoor life, are advised not to enter the course.

Facilities for the Course.

The Ranger Course will be offered in coöperation with the State Board of Forestry, field instruction being given on the state forest reserves. It is not expected, however, that the men trained in this work will be used exclusively in the State Forest Service.

By this coöperation with the State Board of Forestry, special facilities are offered for the student to gain practical training in forestry. A term of instruction will also be given each year at the College of Agriculture, thus providing facilities for instruction not only in Forestry, but also in the other closely allied subjects.

The state forest reserves now comprise about 400,000 acres, principally located at the headwaters of the Menominee, Wisconsin, and Chippewa rivers, in the counties of Forest, Oneida, Vilas, Iron, and Price. The reserves are divided into districts with a forest ranger or patrolman in direct charge of the field work in each district.

A large forestry headquarters building with boathouse, barn, storehouse, wood and ice house, etc., has been erected at Trout lake, in Vilas county. Here is located the main forest nursery which contains some 2,500,000 young trees that will be planted on lands denuded through lumbering, followed by forest fires. Another forest nursery will be started at the Carr lake ranger station in the spring of 1913, and it is planned to have eventually at least, a small forest nursery at each ranger station.

Comfortable houses for the rangers, with barns, wood and ice houses, etc., have already been built at the following ranger stations: Little Carr lake, Plum lake, Oxley and Rest lake; and during the winter of 1912–13, houses will be built at Star lake and Carroll lake. All ranger stations are connected by telephone with the nearest towns and with the forestry headquarters building.

General Plan of Course.

The Forest Rangers' Course includes work during two years, arranged each year according to the following plan:

(1) Work at the University from January 7, 1913, to April 15.

(2) Work on the state forests under the direction of the Professor of Forestry and in coöperation with the State Board of Forestry, from April 16 to July 31.

During the field instruction period, the student will receive board and lodging, but will be expected to devote practically one-half of such period to practical work in connection with the instruction work.

(3) From August 1 to November 30 the student may continue his work on the forest wholly under the direction of the State Board of Forestry. For this period he will receive, in addition to maintenance, $40.00 per month.

During the season of 1913, from August 1 to November 30, the State Board of Forestry cannot take over ten or twelve students; and this number will be selected at the end of the field instruction period, depending upon progress made and standing during the course.

Location of Field Work.

The field instruction will be conducted for the most part at the field Headquarters Camp of the State Board of Forestry, which will be placed at the disposal of the school. This camp is in the center of the state forest reserve region, and is located on Trout lake, which is some twelve miles north of Woodruff, Wisconsin, a station on the Chicago and North Western Railroad. The region offers an exceptional opportunity for the student to study all phases of forestry, especially from the standpoint of fire protection, which is the greatest problem confronting lumbermen and foresters. Side trips will be taken to all points of the reserve and much of the time will be spent in tents during the summer months.

After the close of the field instruction period selected students will be assigned work under the direction of the State Forest Rangers during August, September, October, and November. Exceptional opportunities will be given the student to gain practical field experience in the various lines of forestry management, such as making roads, trails and fire lines, building bridges, telephone lines, and lookout towers; establishing section lines and corners, fighting fires and patrolling, burning slash, and studying the tree growth and logging methods.

The nursery work will be carried on at Trout lake and Toma-

hawk lake throughout the season, and practical work in cone collecting, seeding, care and protection of seedlings, planting, transplanting, and field planting will be an important feature of the work of the student.

Tuition and Fees.

Tuition for residents of Wisconsin	Free
Tuition for nonresidents	
First term (at University)	$7.50
Second term (in field)	7.50
Incidental fee (for all students)	
First term (at University) (including medical and gymnasium fees)	4.00
Second term (in field)	2.50
Laboratory fees (for all students)	
First term (at University)	5.00
Second term (in field)	7.50
Key and breakage deposit (balance refundable)	2.00
Other expenses	
Books, approximately	15.00
Board and room (at Madison) approximately, per month	25.00
Board and room (in field) furnished free at headquarters camp by State Board of Forestry as compensation for practical work done.	

A list of rooms and boarding places, to aid students in securing desirable accommodations at the University, will be furnished upon application. All students live in private homes, as the University has no dormitories.

Mail should be addressed to the College of Agriculture, Madison, Wisconsin, and marked "Ranger Course."

Courses of Study.

First Year.

Dendrology and Silviculture	Woodcraft.
Soils	Meteorology.
Land Surveying and Mapping	Fish and Game.
Introduction to Forestry	First Aid to Injured.
Physics	Mechanical Drawing.

Second Year.

Forest Measurements (Cruising)	Silviculture.
Utilization (Lumbering)	Forest protection.
Tree diseases	Forest Law.
Forest Entomology	Forest Administration Policy.

Every student will be given a thorough physical examination by the medical examiner, and will be required during the Uni-

versity term to take two half-hour periods per week of development exercises and athletic drill. These activities are carried on in the stock pavilion which has been equipped with facilities for this purpose, including gymnastic and athletic apparatus, lockers, and shower baths. Lectures on hygiene and the laws of efficient living will be given by members of the department of Physical Education.

The Ranger Course will be in charge of Assistant Professor F. B. Moody, formerly Assistant State Forester of Wisconsin. The courses in Soils, Land Surveying and Mapping, Mechanical Drawing, Entomology, Tree Diseases, and Physics will be given in various departments of the College of Agriculture, and all other courses in the department of Forestry.

Description of Courses.

First Year.

Dendrology (In department of Forestry). Characteristics of the important timber trees of the lake states. Forest regions of the U. S., their commercial importance and distribution in Wisconsin. Detailed study of the species of trees native to Wisconsin. Field practice.

Silviculture (In department of Forestry). Relation of forests to factors of soil and climate. Factors influencing growth and distribution of trees. Seed production, time of seeding, cost of gathering seed, raising of seedlings, transplanting, field planting. Methods of handling species especially adapted for Wisconsin conditions. Field practice.

Soils (In department of Soils). Origin, classification, physical and chemical composition. Relation between forest growth and soil condition. Effects of tillage and fertilizers. Differentiation of agricultural and forest lands. Field practice.

Land Surveying and Mapping (In department of Agricultural Engineering). Land survey; Scheme of U. S. public land and other surveys in the U. S. Problems involved in relocation of old land surveys. Methods of relocating adapted to forest work. Demarcation of forest boundaries. Use of surveying instruments, such as hand level, compass, transit, aneroid barometer; theory and practice of compass, and chain surveying.

Field work will include running lines, pacing, locating and establishing section corners, topographic mapping.

Mathematics (In department of Forestry). Mathematical operations of simple surveying.

Introduction to Forestry (In department of Forestry). Brief history of forestry and its development in Wisconsin.

Second Year.

Forest Measurements, Cruising (In department of Forestry). Use of various log rules. Method of measuring logs, lumber, bark, piling, etc. Determination of rate of growth in height and diameter of trees and volume of single trees and stands. Field practice.

Utilization (In department of Forestry). Logging and milling (cutting and skidding). Methods of manufacture of pulp, lumber, veneer, charcoal, woodenware, etc. Uses of the various wood produced within the state and points of production. Wood preservation. Logging tools and implements (costs).

Tree Diseases (In department of Plant Pathology). Local diseases of the more important timber trees. Life history and methods of control.

Forest Entomology (In department of Economic Entomology). Description and life history of insects injurious to forest trees of the lake states region. Methods of control.

Forest protection (In department of Forestry). From fires, wind, insects, etc. General scheme for state forest reserve. Fire lines, purpose of; how constructed, where located, costs. Source of danger from fire, campers, fishermen, hunters, settlers, locomotives, lightning.

Telephone lines. Construction. System used—ground line, pole line, tree line. Equipment used per mile and per station, costs. Maintenance. Fire tools, cost.

Roads. Laying out, grading, building, purpose of, cost per mile. General plan of roads for reserve.

Lookout towers. Location. Construction, steel and wood; specifications of; cost. Methods of locating fires, use of maps, etc. Reports.

Ranger cabins and barns. Requirements for ranger. Methods of construction and costs.

Physics (In department of Forestry). Lectures on the elementary principles of solids, related to the subject of forestry. Pulleys, lever, resultant of forces, friction, jack screws, humidity. (For students who have not had high school physics.)

Meteorology (Special lectures). Weather forecasting and observation. Storms, winds, humidity.

Fish and Game (In department of economic Entomology). Care and propagation. Habits, usefulness and protection.

Forest Law (Special lectures). Leases, titles, conveyances, abstracts. Federal laws and laws of states regarding fires, trespass and taxation.

Forest Administration and Policy (In department of Forestry). Organization of state service. Qualifications. General plan of development of the Forestry Board.

First Aid to the Injured (Special lectures).

Woodcraft (In department of Forestry). Camp practice and cookery, packing, care of horses. Supplies for field trips and costs of supplies and camp outfits. (Given in the field.)

Lectures on Forestry.

During 1911 and 1912 a number of lectures on forestry were given throughout the state to various clubs and associations, and in nearly every case lantern slides were used to illustrate the difference between ordinary lumbering operations and forestry methods. The public as a whole know very much more about the general principles of forestry than they did a few years ago, as so much has been written about the conservation of natural resources, but there is still a rather general impression among many people that forestry is horticulture or landscape gardening. Of course this is an absolutely wrong impression, as forestry is the management of timberlands so as to insure successive crops of timber, and a continual campaign of education is necessary in order that the people of the state may appreciate the great economical questions that are involved in the conservation and systematic management of the forest resources of Wisconsin.

The staff of the Forest Products laboratory, which is located at Madison, during the winters of 1910–1911 and 1911–1912, gave some sixty lectures on the general principles of forestry, the course being open to all students of the University, and they

also gave a technical course, of about the same number of lectures, on the utilization of forest products and wood preservation, to the junior and senior students, in the College of Engineering.

Study of Farm Woodlots.

During the summer of 1912 Professor O. L. Sponsler, of the Department of Forestry, University of Michigan, made a preliminary study of the condition and present management of farm woodlots in three typical counties of Wisconsin, namely, Sauk, Lincoln and Manitowoc. A large amount of data was secured which shows quite clearly what must be done to improve the condition of the farm woodlots in each of these counties. It is intended to publish this information in the form of bulletins, one for each county, and to send them to the farmers. Following is Professor Sponsler's general report with his conclusions and recommendations:

Typical Woodlots of Wisconsin.

During the summer of 1912 a study was made of the farmers' woodlots and of the economic or other factors relating to their development or lack of development. The work was done under the supervision of the State Forester.

Three counties were covered,—Sauk, Lincoln and Manitowoc, chosen because they represent more or less typical regions of the state. Sauk county is representative of a considerable area of hilly country, part of which is more suitable for growing timber than agricultural crops; Lincoln county, of a region on the frontier of farming, where timber interests and farm interests meet; Manitowoc county is representative of a hardwood pine country after it has been under cultivation for a generation or more.

The work was of a general nature leading to a more detailed study of the individual woodlot and of the influences acting upon its development. Data was collected in each county to show the present condition of the wooded areas, and their treatment; the attitude of the farmer toward his woodlot; locations were noted for later detailed work, which will determine the value of the different methods of treatment of woodlots and the kind of woodlot best suited to the locality.

This report is in the nature of a summary of the data collected and the conclusions drawn from them. It should be understood that before recommendations other than of a most general and approximate nature can be made, sufficient data from specific detailed field studies must be collected.

Improvement of the woodlots throughout the state might then be obtained by a persistent diffusion of the recommendations and conclusions. Model or demonstration woodlots would be of great value to show the woodlot owner in his own locality what could be done with a little proper care.

Sauk County.

Sauk county, situated in the south central part of the state, contains about 24 full townships. The Wisconsin river forms its southern boundary. The rainfall averages 30 inches, of which half comes during the 21 weeks of growing season between May 10 and October 1. Corn yields well and quite a little tobacco is grown in this county.

About half of the county is rather steep slope land, one-fourth quite level table lands, and the remaining fourth is level river bottoms and prairie. The table lands are from 200 to 400 feet above the valleys and prairies.

Practically all of the land that is fit for the plow is now under cultivation. The land can be roughly classified as follows:

Total area of county	532,000 acres	100%
Cities and villages	6,000 acres	1%
Cultivated	180,000 acres	35%
Woodland	88,000 acres	17%
Brush and pasture lands	220,000 acres	40%
Swamp, sand barrens, rock	38,000 acres	7%

In the western part of the county the farms average about 120 acres, the table-lands and valleys are cultivated and the slopes left are covered or partially covered with woods. This part is essentially a dairy country and all land available is used for pasture.

In the eastern part the farms are generally smaller. The method of farming is rapidly changing over to dairy farming although very large areas here are without water.

This brings up the problem of the value of combined woodlot and pasture. It is generally held among foresters and by a large percentage of the farmers that the greatest income from the land is not derived when woodlots are pastured. This should be determined by experimental areas.

The woods are mainly hardwoods with a little jack pine on the north side and south side of the county. The amount of woods distributed over the county varies with the distance from the railroads. The amount of land cleared seems to be governed by the distance from a shipping point for wood products. In this county the townships within a five mile haul of railroads contain less than 15 per cent of wooded land, while those farther away run from 20 to 30 per cent wooded. From the agriculturists' viewpoint, the country as a whole has almost the ideal proportion of woodland, i. e., nearly 20 per cent.

By far the greater area of timberland is under oak. The ridges and hills, generally nonagricultural lands, are covered with young stands of oak, 30 to 50 years old, much of it will yield 25 to 30 cords per acre or more. The ridges in the vicinity of Baraboo are covered for many square miles with this kind of growth in almost unbroken stands. The land is divided into small plots of 10 to 90 acres and owned by farmers who live often several miles away.

This type of woods has reached a stage at 30 to 50 years old, where the advice of the well trained forester is needed in its treatment. At present it is in excellent condition, but unless proper care is taken the stand will rapidly deteriorate, and the result will be a large area of "oak openings" such as are now common in the older settlements of Ohio and southern Michigan, non-productive and undesirable.

The four or five townships on the north side of the Baraboo river are rather sandy and have scattered woodlots of scrubby oaks and in places considerable jack pine. About one-tenth of this poor area is covered with woods.

There is another long, narrow, sandy area of less extent in the southern part of the county along the bluffs of the Wisconsin river. A great deal of this sandy country is not fit for agriculture, although attempts are made and failures noted. It does, however, grow pine at a fair rate. At present the woods are in an open and altogether unprofitable condition and no attempt is made to improve them.

In a few valleys and on richer slopes there are still left small areas of maple-basswood or elm-ash woods, which have not been cleared for the plow. Some of them are in excellent condition, but most of them are culled or too open. In some places white pine has formed an important part of the woods.

Although several thousand cords of fuel wood are shipped out of the county each winter, the cities and villages report a scarcity of firewood. A few portable saw mills and several stationary mills take care of the local work. Generally throughout the county the wood is used up to the best advantage. Very little dead stuff is left in the woods and cordwood is cut down to two inch sticks. Often the tree is cut to produce the best in logs, then ties, then fuel wood. The latter, however, is the chief product.

There will be very little land cleared in the future. The farmers want to keep the woodlots they now own to raise wood; and many realize that they must have young trees, middle-aged and old ones, if they expect to cut year after year. Many realize, too, that in order to have small trees start, they must keep the cattle out of the woodlot. Only a few stop to consider the effect of grass in the woodlot, or the benefit of a dense fringe of limby trees or brush on the border of the woods. A number of farmers cut only the large trees and allow the small ones to grow. A few cut clean and allow the sprouts to form the next generation of woods.

The woodlots in Sauk county are not in a deplorable condition, by any means. It is true however that most of them could easily be made to yield more than they do at present. Very few farmers have any definite idea of the amount of wood they take from the woodlot year after year, and still less of the amount of wood their woodlot is growing every year.

Work on typical areas of woods on the Baraboo ridge in the eastern part of the county, in the sandy regions, and on the slopes of the western ridges, should be carried on to show in dollars and cents how much the woodlots are now earning and how much they could earn under proper treatment.

Further, a careful study of the coppicing power of the oak in various parts of the county should be made. This is extremely important to the future of the oak woods now existing. When this information is once gathered it should be persistently distributed to woodlot owners. A few demonstration areas, state owned, on which typical methods of care of the woodlot are shown, would pay the state well. A rather radical suggestion for this county, but not at all impractical, is that the county own a good share of the sandy lands especially, and perhaps some of the oak ridges, and take care of them on good forestry princi-

ples, either through a county forester or through the State Board of Forestry.

The care of woodlots in Sauk county could not be improved to any appreciable extent by legislation, that is, through partial or complete exemption of taxes. A man on the ground with figures showing what woodlots are earning and what they can earn will accomplish much and cost little.

Lincoln County.

Lincoln county, situated in the north central part of the state, contains 30 full townships. The rainfall averages 32½ inches, annually, of which 15½ inches fall during the 15 weeks growing season between June 1 and September 20.

The surface of the county is rolling with generally low hills. The northern half of the county is fully 20 per cent swamp, the southern half a trifle more than 5 per cent; some of these may be drained. A rough classification of the land follows:

Area of county	564,000 acres	100%
Swamp, rough, rocky	113,000 acres	20%
Cultivated	20,000 acres	4%
Timber and brush land	423,000 acres	76%

About 80 per cent of the county is agricultural land and only 20 per cent is owned as farms, and only four per cent is broken by the plow. Lumber companies, land companies, speculators and large interests hold over 425,000 acres, while farmers hold 125,000 acres as farms. The farms are naturally more or less segregated.

From the viewpoint of development there are three classes of land, distributed in fairly well defined regions.

1. Unimproved, mostly timberland, some brush land.
2. Partially improved, now undergoing development.
3. Old, well developed farms.

The partially improved farms are scattered throughout the region, and occupy only about one-third of it.

The farms are generally large, 120 to 160 acres, although there are some less than 80 acres. Dairy farming seems to be the future method.

The forests in the county are four-fifths hardwood, or hardwood and hemlock, the remaining one-fifth is a strip on the north side of the county of jack pine and Norway pine stands. The swamps of spruce and tamarack would reduce both the hardwood and pine areas by about proportional amounts.

Very little of the sandy pine lands are improved, although a considerable amount is cut-over.

The hardwood and hemlock lands in the western half of the county are covered with a stand of timber that will take the lumbermen owners about twenty years to cut; in the eastern half the lands are mostly cut-over and settled, with scattered farms. A few townships in the south and southeast have been quite densely settled for a generation, and here although there are not as many woodlots as is desirable, they are generally in good condition.

In the area partially developed the land is in several stages of improvement from forest and brush land to stump pasture and tilled land. The forest is a necessity here to provide an income while part of the land is being cleared. A great deal of the woods left for the farmer has been exploited, leaving culled or young stands.

The woodlots in the southern area of improved lands are generally older with good stands of hard maple, yellow birch, basswood and hemlock. There are large areas of aspen scattered through the farm areas, and in many places the aspen is the only wood growing on the farm.

The woodlots in the hardwood area are found to be in the following conditions:

1. Burned-over lands now grow up to aspen of various ages.
2. Cut-over clean and now grown up to young yellow birch, basswood, hard maple, and some hemlock, often spots of aspen.
3. Cut-over for logs only, leaving culls which will make bolt wood and fuel.
4. Cut-over for white pine only, leaving a hardwood-hemlock stand of log timber and small stuff.

Ash, elm and soft maple enter into the composition, especially of the third class mentioned, that in which only logs have been removed.

Little thought is given to the woodlots, except as to how they can be exploited. Very few are suffering from grazing, because there is a large area of woods and few cattle. On the new farms the tendency is to clear the land as rapidly as it can be afforded, and generally the land that is not cleared is covered with brush and young stuff that would not pay immediately for its own clearing.

The wood that is cut is used up fairly well, for there is a market for everything, even to shaky, punky stuff, which can be sold for lime-kiln fuel wood. A local market is created for bolt wood by the manufacture of boxes, handles, hubs, excelsior, woodenware, etc., while the tannery takes the hemlock bark.

There is too much wood all around the people here in Lincoln county, and too great a desire to get the land cleared, to get them to consider with much seriousness the necessity of looking forward to a future supply. On almost every farm there will be an area left for woodlot, much of it will be young, because that is the only timber it would not pay to cut now. There is little that can be done now in this type of partially developed country for the betterment of woodlot conditions, unless it is a material aid in fire protection and a persistent system of warnings against killing out the young growth by grazing. If this is carried out, the forest growth will take care of itself, for it has several species prominent throughout (hard maple, yellow birch, basswood and hemlock) that, by their development of crown, keep the woods in prime condition with almost no help from man.

Exemption from taxes of a limited area for each farm might be a stimulus to the preservation of woodlands. Definite knowledge should be obtained in this county concerning the growth of the four or five important species, so that when the demand comes for the application of this knowledge the state will be in a position to aid immediately.

Manitowoc County.

Manitowoc is situated on Lake Michigan, about midway between the north and the south ends of the state. It contains about 16 full townships, with over 30 miles of lake front, and extends inland on an average about 20 miles. The rainfall averages 30 inches, of which 15 inches comes during the 22 weeks of growing season between May 9 and October 10. Small grains, oats, barley and rye are the chief crops.

The surface of the county is level, or rolling with low hills, the slopes of which are rarely too steep for agriculture. The waste lands, mostly swamps, some rough, broad river valleys, and some sandy areas make up about 10 per cent of the county.

A rough classification follows:

Total area of county	370,000 acres	100%
Waste land, swamps, etc.	37,000 acres	10%
Cities and villages	5,000 acres	2%
Woodlots	43,000 acres	12%
Cultivated (1911 crop report)	162,000 acres	44%
Pasture land mostly, with little brush land	123,000 acres	32%

The farms average from 80 to 100 acres in size. Dairying is the main method of farming, and all are old farms.

The county was originally covered with a good forest of hardwoods, hemlock and white pine. In the development of the country, the composition of the remaining woods was changed by various conditions, so that now on the sandy lands of the northeast townships, white pine is very common in mixture, and there are a few woodlots of pure white pine. The north third of the county has a considerable amount of hemlock and white pine mixed with the hardwoods. In the remaining two-thirds the hardwoods make up the woodlots.

Taking the county as a whole not more than 12 per cent of the area is covered with woodlots, just a trifle more than one-half as much as there should be for the best agricultural conditions. The center tier of townships is almost bare of woodlots, scarcely five per cent is covered. The part of the county north of this strip is better supplied (about 16 per cent covered) than that south (about 10 per cent in woods).

The composition of the woodlots varies considerably, due to the culling out of the different species. There are, for example, small woodlots of pure white cedar, pure hemlock, pure black ash, pure tamarack and stands of almost any combination of these four species; then there are pure maple, pure beech, and pure white pine, and also mixtures of these three; very often hemlock is in mixture with the three last mentioned. There are also a few woodlots of oak, especially in the west and south part. Occasionally small areas of birch and aspen are kept for woodlots.

Most of the woodlots are made up of old culled stuff which has been pastured until entirely free of young growth. There are, however, a few that are in excellent condition in that they have a good distribution of good species of all ages and form dense woods.

Comparatively little thought is put on the woodlot. A few farmers keep the cattle out in order to allow young trees to grow. A few use a little selection in cutting in so far as choosing large trees instead of small. Occasional patches of cedar are trimmed up to post height in order to get cleaner post material.

Almost one-half of the farmers in the county use coal for heating purposes. Very few places in the county are more than five or six miles from the railroad. The cities and villages fur-

nish good local markets, with their various wood-using industries, for bolt wood, fuel wood and logs.

Before very much improvement will be made on the woodlots of this county, it will be necessary to obtain definite figures on what woodlots of certain types are now earning and on what they can be made to earn. It will be necessary to show how much in dollars and cents is lost by the present method of management, or rather mismanagement, and how this method can be changed to one that will turn the loss to a profit. At the present time the farmers in a large part of the county are at the mercy of the coal market and this condition is on the increase. The acreage of woodlands is insufficient, even if growing at their best, to supply the population outside of the cities and villages with fuel alone, to say nothing of the wood for other uses on the farm.

The matter of cedar for fence posts should be investigated for it seems to be a promising source of profit.

A total exemption of taxes on woodlots with limitation would probably help as a stimulus to bring about better management of existing woodlots, and help to increase the acreage of woodlands.

At least five or six of the common types of woods mentioned above, that is, pure maple, pure hemlock, pure pine, pure cedar, and representative mixtures, should be thoroughly studied for the amount of wood produced annually per acre in their present condition, and in typical excellent conditions.

Summary.

1. The woodlots are for the greater part in poor condition. They are growing half a cord of wood or less per acre each year, when they should grow about a whole cord or more.

2. Many counties represent a distinct region in which the kind of woods and the condition of woodlots differ greatly.

3. Each kind or condition of woodlot needs a different method of treatment in order to make it serve its best use.

4. There is a general lack of knowledge among the owners of woodlots concerning the amount of wood in cords, or other unit of measure, that will grow each year on an acre.

5. There is also a lack of knowledge concerning the simple means of keeping a woodlot in its best growing condition.

6. There is a marked neglect of keeping account of the amount of material taken from the woods.

7. Some method of exemption from taxes of woodlots may help to improve the conditions, but there does not seem to be demand for it among the owners of woodlots.

Recommendations.

I. (a) Collect data on the amount of wood grown annually per acre in woodlots representing the most common condition in each region. Express this amount both in cords and in dollars and cents.

(b) Collect similar data in woodlots that are now in the best growing condition.

(c) Determine the species which will produce the greatest profits in each region.

(d) Determine the best method of improving the poorer woodlots.

II. (a) Persistently distribute this information among woodlot owners in small but frequent doses.

(b) Start model or demonstration woodlots in every county if possible, at least in every region of different forest types, and show by actual management of the woodlot the practical value of the information that has been distributed.

(c) To owners who ask for it, give advice and instruction, preferably directly to the owner while on the woodlot.

Experimental State Woodlots.

The best utilization of the thousands of farm woodlots in Wisconsin is not only extremely important to the owners themselves, but to the whole state as well, for if these woodlots are well managed they are going to furnish a very considerable part of the future timber supply of the state. In many of the northern counties the state owns a few scattered forties, some of which are timbered, and it is proposed that from forty to eighty acres of such land should be used by the state as demonstration woodlots to be operated in coöperation with the state or County Agricultural Experiment stations. It is rather difficult to explain to any farmer, by means of a report or bulletin just how he should manage his woodlot, but it becomes a simple matter when you can take him upon timberland that is being properly man-

aged, and let him see good and bad methods, and in addition give him all the costs of operation, net profits, and so forth.

The State and County Agricultural Experiment stations should give a short field course on woodlot management, using the state demonstration areas for nearly all of their work.

The farmer's woodlot, especially in the northern part of the state, should not only supply him with all the saw logs, timbers, fence posts, cordwood, etc., that he will ordinarily use, but he should also have considerable material to sell and will find that his woodlot is his bank upon which he can draw in time of necessity.

STATISTICS.

FINANCIAL STATEMENT.

Table 1. *Receipts.*

	Fiscal Year. 1910-1911	Fiscal Year. 1911-1912
Fines and Penalties (For Trespass)	$19.02	$1,835.33
Departmental Sales:		
Sales of products:		
Timber	7,728 50	12,532 31
Burned timber		4,673 06
Hay	406 95	111 26
Fuel		163 50
Land:		
Sales	109,462 54	32,813 32
Contract payments		7,092 33
Right of way		19 37
Rents	95 00	166 00
Interest on bank deposits	1,390 33	1,308 29
Dues on land certificates		1,297 00
Miscellaneous:		
Refund on supplies		83 35
Refund on freight		.71
Credit for empty bags		95 30
Payment for lost badge		3 00
Telephone		10 10
Sale of supplies		33 02
Total	$119,102 34	$62,237 25

Note. Tables 1, 2 and 3 are for fiscal years, in accordance with the method adopted by the State Board of Public Affairs in preparing a State budget, whereas all following tables are for the calendar years for which this biennial report is made.

Table 2. *Expenditures* (Capital).

	Fiscal year 1910-1911	Fiscal year 1911-1912
Land and Land Improvements:		
Land	$89,485 81	$79,433 84
Land improvements		
Reforestation		
Roads, trails and fire lines		
Bridges		
Water supply system		
Structures and (Attached) Fixtures:	2,822 19	12,826 48
Headquarters' camp		
Men's house		
Rangers' cabins		
Cabins on purchased land		
Barns and sheds		
Barn		
Woodhouse		
Ice house		
Boathouse		
Lookout towers		201 60
Machinery and Equipment (Permanent):		
Telephone system		181 51
Constructed		
Acquired through gift		
Laboratory Apparatus:		
Furniture and furnishings		421 57
Office at Madison		
Headquarters camp		
Office		
Household		
Land, Tools, and Equipment:		
Headquarters camp	1,261 13	979 57
Barns and sheds		
Wagons, sleds, etc		
Harness		
Total	$93,569 23	$94,184 57

Table 3. *Expenditures.* (Operation).

	Fiscal Year 1910-1911	Fiscal Year 1911-1912
General Administration:		
Salaries of officers	$4,000 00	$6,416 43
Salaries and wages of office employes	2,140 00	2,631 51
Traveling expense	1,245 37	3,149 21
Stationery and office supplies	150 85	230 81
Postage	375 76	384 13
Telephone and telegraph	68 49	27 15
Express, freight and drayage	212 14	593 54
Printing (other than stationery)	540 52	817 91
Sundry supplies and expenditures	1,317 53	1,749 45
Field Work.		
Salaries and Wages:		
Salaries of rangers	1,340 70	10,947 05
Salaries of forest assistants		848 00
Salaries of cruisers	5,419 57	6,356 37
Wages of laborers	128 33	13,773 80
Salaries for miscellaneous services	2,823 75	291 73
Compassmen	546 54	
Traveling expenses:		
Expenses of rangers	48 93	981 07
Expenses of assistants		169 29
Supplies and Expenses:		
Subsistence		8,507 47
Feed		491 14
Trees and seeds	1,354 34	217 07
Advertising	57 85	44 05
Total	$21,770 67	$58,627 18

LANDS

Table 4. LANDS PURCHASED AND SOLD, 1911-12.

	Acreage Jan. 1, 1911.	Acreage sold.	Acreage acquired.	Acreage Jan. 1, 1913.
Ashland	$5,401.20	1,235.00		4,166.20
Bayfield	3,161.21	1,601.47		1,559.74
Burnett	19,073.96	12,776.13		6,297.83
Douglas	9,475.66	1,368.78	80.00	8,186.88
Florence	3,559.16		80.00	3,639.16
Forest	35,427.34		1,919.29	37,346.63
Iron	29,910.06	479.61	924.00	30,354.45
Langlade	2,299.40	880.98		1,418.42
Lincoln	2,477.86	920.66		1,557.20
Marinette	4,494.21			4,494.21
Oneida	53,310.63	374.80	20,418.81	73,354.64
Polk	1,960.74	118.17		1,842.57
Price	27,474.45	9,152.58	320.00	18,641.87
Rusk	2,894.47	440.00		2,454.47
Sawyer	13,519.14	1,707.88	171.95	11,983.21
Vilas	59,956.05		71,602.08	131,558.13
Washburn	8,988.30	5,139.48		3,848.82
Total	283,383.84	36,195.54	95,516.13	342,704.43

Note.—The above table does not include the state lands within the Indian Reservations, which total 47,003 acres.

Table 5. AMOUNT RECEIVED OR DUE FROM LAND SALES, 1911–12.

	1911	1912
Ashland	$ 1,852.00	$ 2,146.00
Bayfield	2,113.00	1,842.00
Burnett	32,653.00	13,731.00
Douglas	2,965.00	2,330.00
Florence		
Forest		
Iron	1,197.00	1,762.00
Langlade	1,579.00	1,524.00
Lincoln	937.00	1,644.00
Marinette		
Oneida	2,371.25	
Polk	130.00	484.00
Price	10,115.00	13,869.00
Rusk		2,322.00
Sawyer	5,528.00	2,785.00
Vilas		
Washburn	8,369.00	7,089.00
	$69,809.25	$51,528.00
Total		$121,337.25

Of the above amount of $121,337.25, only a portion has been actually received, as a law went into effect June 28, 1911, by which certain state lands could be sold on 20 years' time, and as a matter of fact only $71,564.54 has been paid into the Forest Reserve fund, and $17,138 of the balance will not become a part of the Forest Reserve fund, as it was received for school lands or other lands than forest reserve, that lie north of town 33.

The price received for all lands sold averages $3,357 per acre. (54.80 acres of the land disposed of was given in exchange for other lands.)

Only three descriptions of purchased land have ever been sold by the state. The cost of these descriptions in 1908, was $352.11; the price received in 1910 was $408.

Table 6. SUMMARY OF ACQUISITIONS OF LAND, 1911 AND 1912.

	Acres.
Land purchased in 1911	49,882.92
Land purchased in 1912	44,529.93
Land acquired by Federal grant (The acquisition of this land practically completes the grant of 20,000 acres to the state made by Act of Congress approved June 27, 1906)	852.78
Land acquired by Federal grant (All unsurveyed and unallotted islands in inland lakes north of town 33. Acreage not yet determined)	.....
Land acquired by exchange	130.50
Land transmitted from Land Office records	120.00
	95,516.13
Amount of land held under option	None
Amount of land held under contract	(See Tables 8 and 9)

Table 7.

NAMES OF PERSONS FROM WHOM LAND WAS PURCHASED IN 1911 AND 1912.

	No. of acres.	Price per acre.	Price
Matt Plunkett	80	$2.50	
Buswell Lumber & Manufacturing Company	600	2.50	
†Ross Lumber Company	10		$30.
Alexander Stewart Lumber Company	640	3.00	
Yawkey-Bissell Lumber Company	8,550.54	2.50	
Land, Log and Lumber Company	15,893.95	3.75	
Robert Stamp	400	2.50	
G. F. Sanborn	102.30	3.00	
B. F. Wilson	2,194.30	6.50	
Yawkey Lumber Company	2,317.76	3.75	
Turtle Lake Lumber Company	80	3.50	
Turtle Lake Lumber Company	284	3.00	
A. E. Doolittle	85.25	3.50	
C. H. & W. L. Houlton	440.72	4.00	
Blue Grass Land Company	3,678.09	2.50	
Blue Grass Land Company	35.75	3.00	
Blue Grass Land Company	402.92	3.50	
*N. A. Colman	Island		$1,000.

Table 8.

NAMES OF PERSONS FROM WHOM LANDS ARE BEING PURCHASED UNDER LAND CONTRACTS.

	No. of acres.	Price per acre.	Amount paid Principal.	Interest.	Amount Due.
G. F. Sanborn Company	27,655.32	$3.50	$70,076.11	$3,853.34	$20,000.00
Land, Log & Lumber Co.	19,679.52	4.60	10,000.00		80,525.79
H. W. Wright Lumber Co.	11,241.66	3.50	10,000.00		39,345.81

Table 9.

NAMES OF PERSONS FROM WHOM LANDS ARE BEING PURCHASED UNDER LAND CONTRACTS, NO PART OF THE PURCHASE PRICE HAVING BEEN PAID.

	No. of acres.	Price per acre.	Amount Due.
Yawkey-Bissell Lumber Company	139.02	$2.50	$347.55
Goodyear Lumber Company	230.10	2.60	598.20

† This government description is platted as 40 acres but there is actually only 10 acres of high land.

* This purchase was an island in Star lake and included all the timber on the island except the pine. The pine timber, also, was purchased from the A. H. Stange company and partly paid for by an exchange of timber on another description of state land.

Table 10.

NAMES OF PERSONS FROM WHOM LAND WAS RECEIVED IN EXCHANGE.

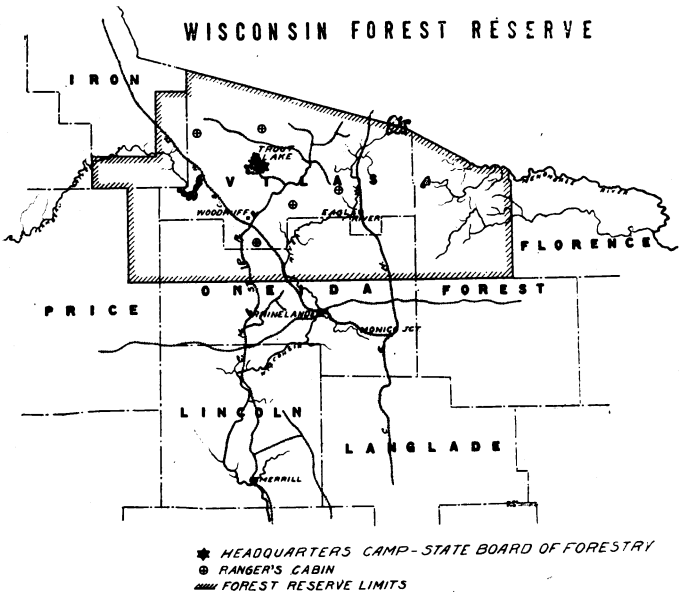
	No. of acres.
Turtle Lake Lumber Company	80.00
Ella L. Woodzicka	50.50
Commissions paid in connection with land purchases	None.
Total acres owned by the State, north of town 33	342,746.49 acres
Total amount invested therein	$421,857.79
Average amount invested per acre	1.637
Average cost per acre of lands purchased 1911-12	3.828
Average cost per acre of all lands purchased (exclusive of 3 purchases of heavy standing timber)	$3.32
Average cost per acre of all lands purchased (inclusive of 3 purchases of heavy standing timber)	3.45

The lands purchased within the last two years include a large acreage covered with good second growth timber, and include also hundreds of miles of lake shore frontage.

Table 11. LOCATION OF LANDS PURCHASED.

	Acres.
Iron county.	
T. R.	
42-4 E.	480.00
43-4 E.	444.00[1]
Forest county.	
T. R.	
36-12 E.	81.65
36-13 E.	480.00
37-13 E.	200.00
39-12 E.	40.00
39-13 E.	80.00
40-12 E.	1,517.64
Oneida county.	
T. R.	
36- 4 E.	40.00
36- 8 E.	80.00
36- 9 E.	40.00
37- 7 E.	40.00
37- 8 E.	75.61
37- 9 E.	320.00
38- 5 E.	80.00
38- 6 E.	935.36
38- 7 E.	2,582.66[2]
38- 8 E.	939.15
39- 4 E.	120.00
39- 6 E.	2,554.20
39- 7 E.	2,580.20
39- 8 E.	1,059.73
39- 9 E.	505.00
39-11 E.	1,348.30
Vilas county.	
T. R.	
39-10 E.	355.45
40- 4 E.	1,604.13
40- 6 E.	3,564.19
40- 7 E.	12,591.70
40- 8 E.	2,718.93
40- 9 E.	1,455.60
40-10 E.	167.70
40-11 E.	1,408.76
41- 6 E.	8,004.25
41- 7 E.	12,626.13
41- 8 E.	10,179.94
41- 9 E.	1,388.17
41-10 E.	240.00
41-11 E.	1,040.00
42- 5 E.	80.00
42- 6 E.	160.00
42- 7 E.	986.75
42- 8 E.	5,168.44
42- 9 E.	134.70
42-10 E.	760.00
42-11 E.	2,418.51
42-12 E.	160.00
43- 5 E.	640.00
43- 6 E.	635.00
43- 7 E.	3,096.19
43- 8 E.	168.45

[1] 80 acres acquired by exchange.
[2] 50.50 acres acquired by exchange.



MAP OF WISCONSIN FOREST RESERVE.