



LIBRARIES

UNIVERSITY OF WISCONSIN-MADISON

First annual report of the state forester of Wisconsin, 1906.

Wisconsin. State Board of Forestry
Madison, Wisconsin: Democrat Printing Company, State Printer,
[s.d.]

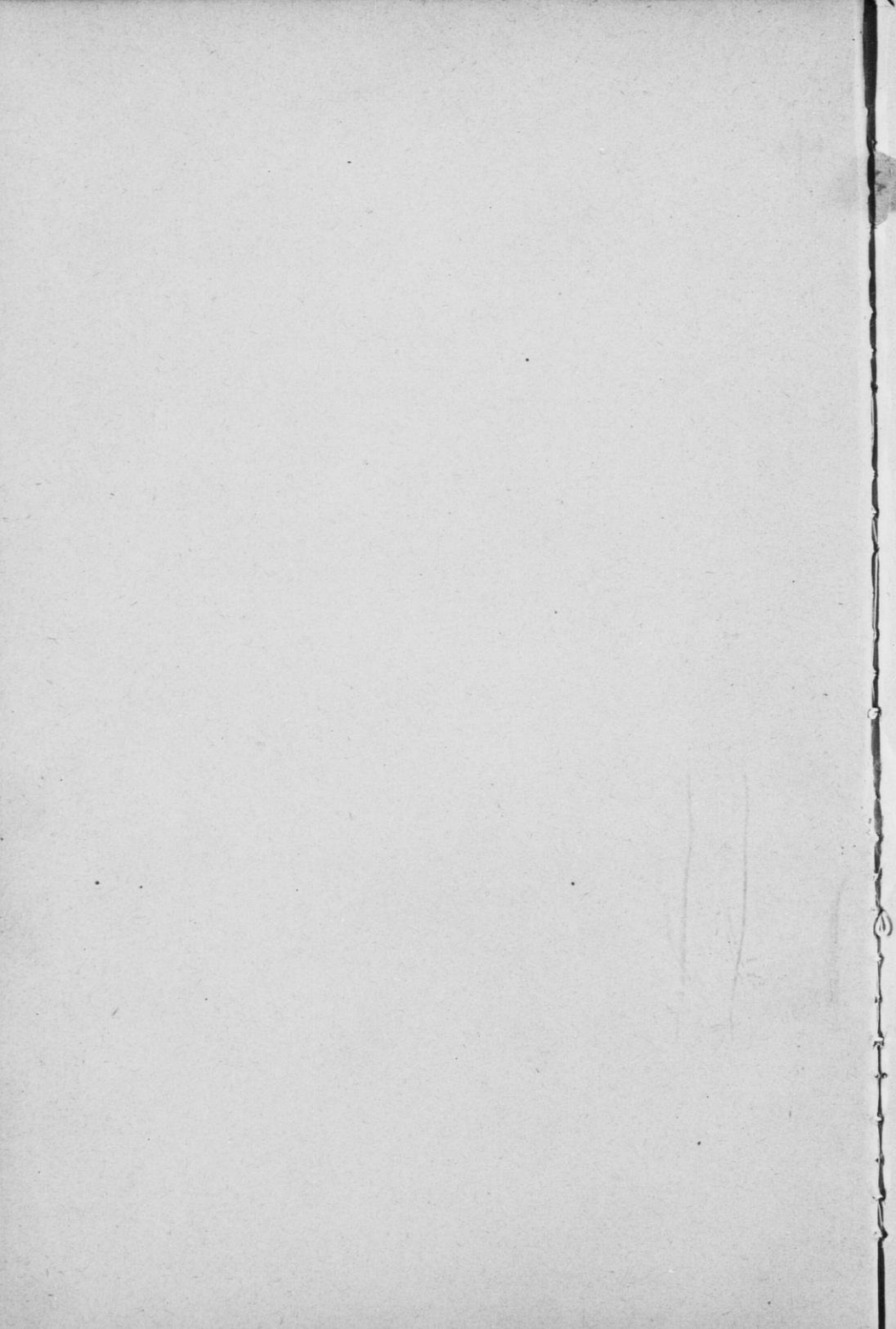
<https://digital.library.wisc.edu/1711.dl/6NUPYTDVEA4IE8S>

Based on date of publication, this material is presumed to be in the public domain.

For information on re-use, see
<http://digital.library.wisc.edu/1711.dl/Copyright>

The libraries provide public access to a wide range of material, including online exhibits, digitized collections, archival finding aids, our catalog, online articles, and a growing range of materials in many media.

When possible, we provide rights information in catalog records, finding aids, and other metadata that accompanies collections or items. However, it is always the user's obligation to evaluate copyright and rights issues in light of their own use.



FIRST ANNUAL REPORT

OF THE

STATE FORESTER

OF

WISCONSIN.

Board of Forestry

1906 — 12



MADISON, WISCONSIN:
DEMOCRAT PRINTING CO., STATE PRINTER.
1906.

STATE BOARD OF FORESTRY.

MEMBERS OF THE BOARD.

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

WILLIAM ARNON HENRY,
Dean State Agricultural Department.

EDWARD ASAHEL BIRGE,
Director State Geological Survey.

LAFAYETTE M. STURDEVANT,
Attorney General.

GEORGE BEYER,
Oconto.

EDWARD MERRIAM GRIFFITH,
State Forester.

FRANK B. MOODY,
Assistant State Forester.

MILDRED A. CASTLE,
Clerk.

219050

JUL -9 1918

RBW7

F76

1906

see also

129571

May 25, 1909

in report for 1908

LIBRARY
COLLEGE OF AGRICULTURE
UNIVERSITY OF WISCONSIN
MADISON

CONTENTS.

What forestry is	5
State forest policy	8
Fire warden system	9
Forest reserves	10
Grant of government lands for forestry.....	13
Summary of forest fires	15
Timber trespass	18
State lands within Indian reservations	20
Co-operative work on the Indian reservations	21
State parks	24
Lectures on forestry	25
Assistant state forester	26
Preservation of stream flow	26
Natural reproduction	29
Reforestation	31
Waste in lumbering	32
Forestry for the corporation	37
Forestry and the railroads	40
Forestry for the individual	43
The farm woodlot	47
Increased growth after lumbering	50
Increase in stumpage values	53

APPENDIX.

State forestry laws	59
---------------------------	----

OFFICE OF THE STATE FORESTER,

MADISON, WIS., Nov. 8, 1906.

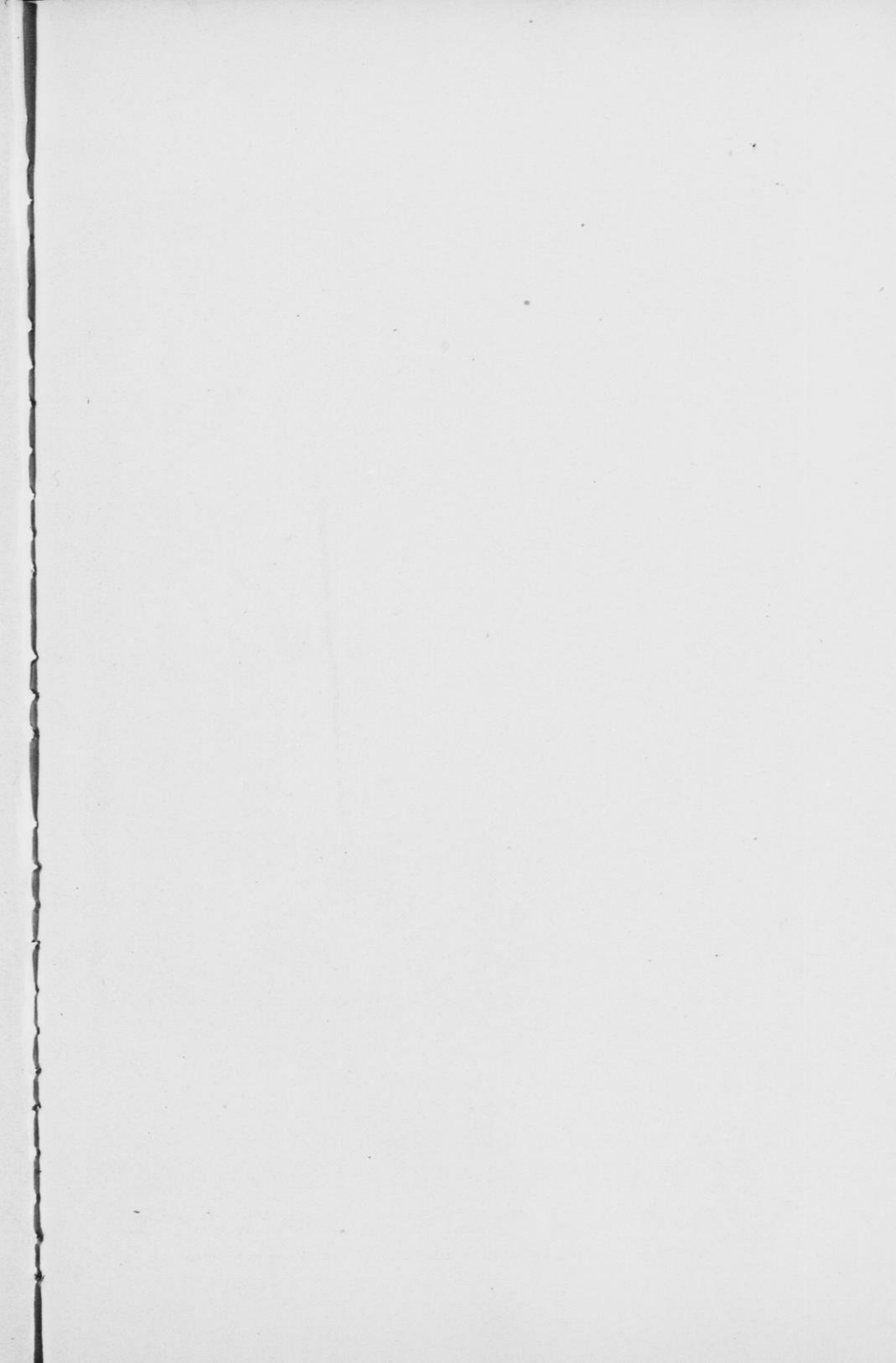
STATE BOARD OF FORESTRY.

GENTLEMEN: I have the honor to submit herewith my First Annual Report as required by Section 2, Chapter 264, Laws 1905.

Very respectfully,

E. M. GRIFFITH,

State Forester.





Virgin white pine forest. Millions of acres of such magnificent forests have been destroyed in northern Wisconsin, but they can be grown again under forestry management.
(Photographs reproduced by permission of the Forest Service, U. S. Department of Agriculture.)

REPORT OF THE STATE FORESTER.

WHAT FORESTRY IS.

Forestry is the systematic management of forests to obtain successive crops of timber. One of the most enthusiastic supporters of the forestry movement in this country, because he knows our country so well and appreciates fully the need of forest protection, is President Roosevelt and the following is a portion of what he had to say on the subject in an address delivered before the American forest congress in 1905: "You all know, and especially those of you from the west, the individual whose idea of developing the country is to cut every stick of timber off of it and then leave a barren desert for the home maker who comes in after him. That man is a curse and not a blessing to the country. The prop of the country must be the business man who intends so to run his business that it will be profitable for his children after him. That is the type of business that it is worth while to develop. The time of indifference and misunderstanding has gone by. If the present rate of forest destruction is allowed to continue, with nothing to offset it, a timber famine in the near future is inevitable. Fire, wasteful and destructive forms of lumbering and the legitimate use taken together, are destroying our forest resources far more rapidly than they are being replaced. It is difficult to imagine what such a timber famine would mean to our resources, and the period of recovery from the injuries which a timber famine would entail would be measured by the slow growth of the trees themselves. Remember that you can prevent such a timber famine occurring by wise action taken in time, but once the famine occurs, there is no possible way of hurrying the growth of the trees necessary to relieve it. You have got to act

in time or else the nation would have to submit to prolonged suffering after it had become too late for forethought to avail."

Only a few years ago Wisconsin was one of the greatest timber states in this country and even the lumbermen and woodsmen, who were directly and personally interested in the supply of timber, could not realize that the "pineries" which seemed so vast would in a few years be a thing of the past. But thousands of axemen were cutting their way on all sides into the great virgin forests and back of them, fed by their "slashings," came the arch enemy fire and completed the devastation, until today, where the great pines once stood, are vast areas of burned over cuttings. These unproductive wastes should be a matter of concern, not alone to the owner and county in which they lie, but to the whole state as well, for forests are crops just as much as wheat or corn and although they take a long time to mature, still, if managed systematically and conservatively, they will furnish annually a supply of mature timber and thus save to the state the many industries which depend upon the forests for their raw material.

The aims of forestry are manifold, but the two most important are to "conserve the forests by wise use and protect the water supply" and, keeping these important points in mind, it is to be hoped that the state will pursue a broad forest policy and gradually acquire large forest reserves which will protect the headwaters of the rivers and important streams. If the state gradually purchases large areas of natural forest land, restocking all denuded areas as soon as the slash is destroyed, it will not only be building prosperity for the future, but can confidently count on receiving a very generous return on the investment in the shape of mature timber.

In this connection it is interesting to know what some of the foreign countries, where forestry is practiced, receive from their forests: Belgium, with only 62,000 acres of state forest, receives a net yearly income of \$155,000; Switzerland, with 94,000 acres, \$124,000; Baden, with 231,000 acres, \$909,000; showing for these countries net yearly incomes of \$2.50 to \$3.90 per acre. The province of Ontario in Canada, where practical forestry is carried out, received a revenue from its forests in 1905 amounting to \$2,800,000. Hon. Andrew White, Forest Commissioner, reports that 7,000,000 acres have been set aside as a forest reserve

and that it contains over 10 billion board feet of white pine. It is not surprising that with such far sighted management, there are no state taxes in Ontario.

In many respects Wisconsin has the same problems of forest protection and incentive for solving them, that New York state had when she organized her department of forest, fish and game some years ago, so that we can profit largely by her experience and will do well indeed if we can acquire such a magnificent forest reserve. The Adirondack forest preserve, as it is called, contains about 1,500,000 acres and the necessity of protecting the forests, and so the water supply, is now so well understood by the people of the state that they are demanding that all the woodlands on the mountain slopes and plateaus be owned and cared for by the state. Also, 800,000 acres are included within private preserves, and as they are splendidly managed, they form an important factor in the preservation of the Adirondacks and at the same time return their owners a good revenue from the sale of the mature timber. There are 27,000 hotels and boarding houses in the Adirondacks and in 1902 it was estimated that 193,000 people went there for recreation and health. In the northern part of Wisconsin we have a wonderful lake region, which even the Adirondacks cannot surpass, and thousands of people go there every summer, so that from this source alone, many of the residents derive a comfortable income. New York state took action in time to save a great region of virgin forest, but Wisconsin must do the best she can with cut-over, burned and swamp lands, which must be very carefully protected from fire and in many cases replanted.

It is one of the tenets of forestry that no land should be held permanently under forests which is more suitable for agriculture, and every parcel of land within the state forest reserve will be examined with this in mind, so that land which is valuable for agriculture may be withdrawn and offered for sale. By such careful selection, the creation of an adequate state forest reserve will in no way retard the development of northern Wisconsin but, on the other hand, the state's forest policy of cutting conservatively, and so always having something to cut, will in a few years give to all the settlers near the reserve, plenty of good paying work during the winter, when it is most needed. Every state has

areas that are not arable and such, but only such, should be held permanently under forests.

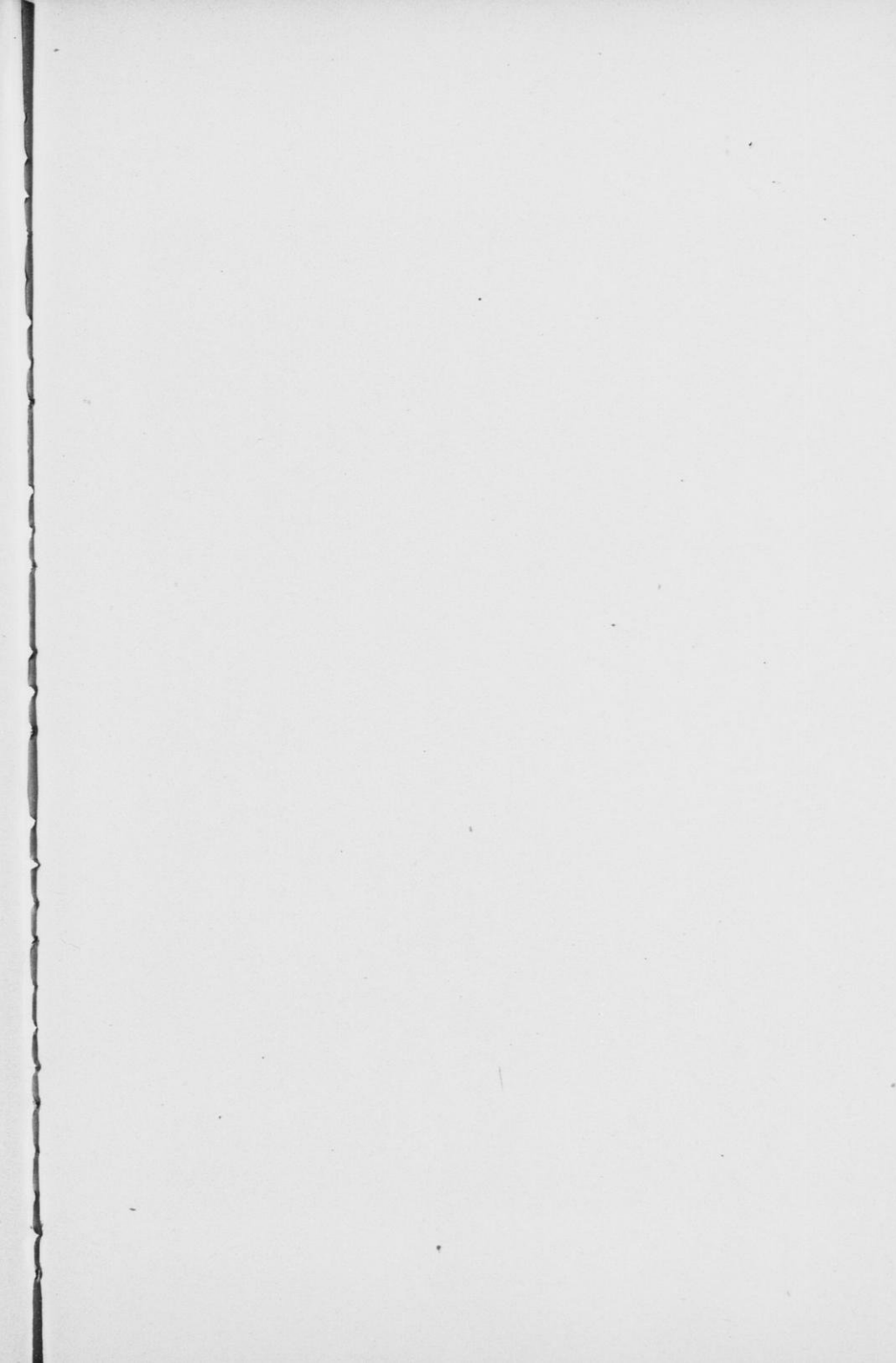
STATE FOREST POLICY.

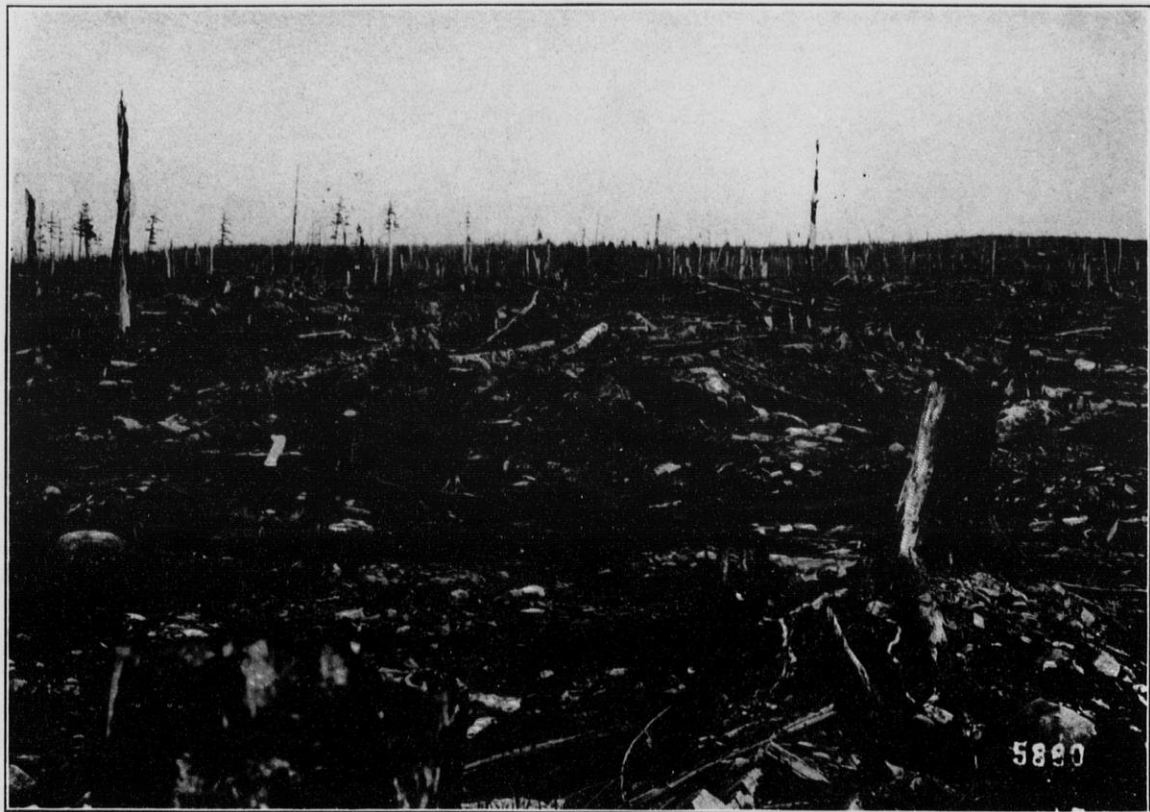
If it was simply a question of the amount of forest land which should be maintained in the state, it would not be necessary to plant, for with proper cutting and care of the young growth, the remaining forests would insure the future. But in order that the state shall eventually reach its highest development, it will be necessary to replant all barren wastes which are only fit for the growth of forests and cut off the forests from the lands which are suitable for agriculture.

There still remain in Wisconsin some splendid forest tracts but, unfortunately, they do not lie in the lake regions, which must be protected on account of being the headwaters of many of our most important rivers, and, even more to the point than location, they are hardwood forests, which in almost every case indicates that their soil will make good farming land.

It is extremely unfortunate for forestry that it is the hardwood forests which have been left until the last, for, although they are particularly well suited for protection from fire, good reproduction, etc., they are also in almost every case well adapted to agriculture and should be used for that purpose. The "pineries" with a sandy soil, which have been cut and burned over, the very rocky lands and certain classes of swamps, will form the future forests and the quicker they are restocked and brought under systematic management, the better it will be for the state.

The state still owns large tracts of swamp land, some with a scattering forest growth, but more open peat swamps, varying in depth from a few inches to 25 or 30 feet. The most profitable utilization of these is an extremely important question and a very difficult one as well, for no two swamps are just alike, and while some can be used for cranberry marshes, are valuable for the peat, or suitable for farming, others are only fit for forest growth. A careful examination will be made of all swamps within the forest reserve, in order to determine what can be done with these large, unproductive areas.





As ordinary lumbering often leaves the woods. The large, most valuable timber cut and the remainder totally destroyed by repeated fires.



As forestry leaves the woods. Young timber saved and brush piled ready to be burned to prevent destructive forest fires.



FIRE WARDEN SYSTEM.

The forestry law provides that the state forester shall also be state fire warden and that he shall appoint one or more town fire wardens for those organized towns in which he deems it necessary. The fire wardens have authority to call upon any citizen to assist them in fighting forest fires and both they and those whom they summon receive such compensation as the town board may allow, not to exceed 25 cents per hour. Fire wardens post warning notices, have the power of sheriffs to arrest without warrant, and, most important of all, can absolutely prohibit the setting of any fires during a dangerously dry time.

Over 300 fire wardens have now been appointed, nearly all in the northern part of the state, and they have done excellent work in posting notices, fighting forest fires and by warning the settlers against carelessness in burning brush at all seasons of the year. They are gradually educating the people to the needless and fearful waste of property through forest fires. Over 20,000 forest fire notices, printed both on cloth and cardboard, have been sent out by this office to be posted in railroad stations, post offices, school houses, camps, and along forest roads and trails. Each fire warden is supplied with copies of the forestry law, instructions as to carrying out the provisions of the act, special warning notices, and blanks for statement of services, which must be approved by the state forester before they are paid by the town boards.

Care has been taken to appoint only thoroughly competent, trustworthy fire wardens, without any thought of political preference and, with the exception of their tendency to share the general indifference about fires in young growth and on cut-over lands, the work in posting notices, taking preventive measures and calling out the citizens to fight fire, has been effective. It is most encouraging to report that in several instances forest fires have been extinguished by volunteers, who served without asking any compensation.

Some of the town boards apparently wish to have the appointment given to men in return for political services, as four men who had been appointed after being strongly recommended, attempted, with the approval of their town boards, to grossly over-

charge their towns for posting notices and fighting fires. This is the reason why the forestry law in Sec. 8 provides that, "The town fire wardens shall first submit to the state forester itemized accounts for their own services and the services of their assistants, and no accounts shall be paid out of the treasury of the town in which such services have been rendered without a written approval of the state forester."

It was found that railroad section crews were in the habit of burning piles of ties on the right of way and that many times such piles were left to burn without being watched, so that cases occurred where the fire spread to the adjoining forest. The matter was taken up with the various superintendents and the request made that ties should not be burned until after the first fall of snow and always under careful supervision. This request was complied with and it is a pleasure to state that in every case the railroad officials have been most willing to co-operate with this office to lessen the annual loss from forest fires.

Successful forestry in this state depends to a very large extent upon the solution of the forest fire problem, especially as owners of cut-over lands are beginning to consider the question of planting. The protection that such owners receive for their timberlands, through the fire warden system, is in many cases the only return which they receive for their taxes and it is to be hoped that they will co-operate with this office to make the service as efficient as possible. Upon the whole, Wisconsin has an excellent fire warden system and with competent, energetic wardens and a strong local sentiment to support them, much good can be done.

FOREST RESERVES.

Under the provisions of the present forestry law, chapter 264, laws of 1905, all the state lands north of town 33 constitute the forest reserve. These lands are divided as follows among the several counties:

	Acres.		Acres.
Ashland.....	4,941	Lincoln.....	10,326
Bayfield.....	4,768	Marinette.....	4,783
Burnett.....	25,828	Oneida.....	35,719
Douglas.....	7,029	Polk.....	1,520
Florence.....	3,762	Price.....	27,634
Forest.....	35,656	Sawyer.....	12,317
Gates.....	3,404	Vilas.....	15,142
Iron.....	26,039	Washburn.....	12,497
Langlade.....	2,700		

This makes a total, with fractional acres, of 234,072 acres. The rapid increase in area of the forest reserves in the last two years has been most encouraging. In 1904 the commissioners of the public lands, in accordance with the provisions of chapter 450, laws of 1903 (the first forestry law), set aside as a forest reserve some 40,000 acres in Forest, Oneida and Vilas counties. In May, 1904, the commissioners, upon my request, added some 22,000 acres in Iron county. The legislature of 1905 added to the forest reserve all the state lands north of town 33, and in June, 1906, congress passed Senator La Follette's bill, granting to the state of Wisconsin for forestry purposes 20,000 acres of vacant government land. Thus, in a little over two years, the forest reserves have grown from 40,000 acres to 254,072 acres.

Section 3 of the forestry law provides that "those state lands within said forest reserve which after examination by the state forester are found by him to be more suitable for other purposes than for the purpose of the state forest reserve because of their character, condition, extent or situation, may be sold by the commissioners of the public lands, upon the recommendation of the state forester and with the approval of the state board of forestry." It is one of the tenets of forestry that no land which is valuable for agriculture should be permanently held under forest, the reason being that there is so much land in every country and state which is only suitable for the growth of trees. Therefore, all lands which are found to be suitable for agriculture and those which are so scattered that they will not be useful as part of the forest reserves, will be sold and as provided by law, the proceeds will go into a forest reserve fund "which shall be disbursed only for the purchase of lands to be added to the state forest reserve and for the improvement and protection of said reserve and for the employment of the necessary assistance therefor, by or upon the order of the state forester, with the approval of the state board of forestry."

Already 24,730 acres of land in Burnett, Douglas and Marinette counties, which after examination were found to be either suitable for agriculture or too scattered, have been offered for sale and it is expected that within a short time there will be a considerable fund with which to purchase desirable lands to add to the forest reserve.

In Oneida, Vilas, Iron and Price counties, including 26,000 acres of state lands within the Lac du Flambeau Indian reservation, the state owns over 130,000 acres, most of it being in a fairly compact body. Within this area is one of the most wonderful lake regions in the world and, as they constitute a great reservoir system on the headwaters of the Wisconsin river, they and the surrounding forests should be carefully protected. The destruction of the forests of northern Wisconsin has been on a tremendous scale, particularly on the headwaters of the Wisconsin, and, therefore, a small forest reserve here would fall far short of remedying existing evils. The state should gradually acquire in this region a forest reserve large enough to adequately protect the watershed of this, our greatest river, as such a considerable part of the prosperity of the state is dependent upon its constant, even flow. The tremendous influence which the forest has in preserving and regulating stream flow is explained more fully in the section, "Preservation of Stream Flow." A large enough forest reserve will be able in time to supply many of the important industries which are dependent upon the forests for their raw material. New York state already has a forest reserve of 1,500,000 acres in the Adirondack lake region, protecting the headwaters of the Hudson river, and is steadily buying more timberland.

In Burnett county the state has reserved all its lands along the St. Croix and Clam rivers, the latter being an important tributary of the St. Croix. The St. Croix is an important tributary of the Mississippi river, so that the creation of a forest reserve will assist in diminishing the disastrous floods along the Mississippi. Valuable waterpowers are found along the St. Croix and these should be carefully protected and in time the forest reserves along the St. Croix and Clam rivers will be able to supply a large amount of timber for manufacture in Burnett county. So far as expedient, the proceeds from the sales of lands, timber, etc., in any county will be used for the purchase of other timberlands in the same county.

The state has received the promise of the donation of a considerable area of land along the Brule river in Douglas county and if this is done, a forest reserve will be created in order to preserve the natural beauties of this most attractive stream.

It should always be borne in mind that the main object of the state forest reserves is, first, to preserve the stream flow in our important rivers by protecting their headwaters and, second, to reserve a supply of timber for the important industries which are dependent upon the forests for their raw material.

GRANT OF GOVERNMENT LAND FOR FORESTRY.

The following bill was introduced in congress by Senator La Follette and after considerable discussion on the floor of the house was passed and approved June 27th, 1906:

Public.—No. 304.

An Act granting lands to the state of Wisconsin for forestry purposes.

Be it enacted by the senate and-house of representatives of the United States of America in congress assembled, That the secretary of the interior be, and he is hereby, directed to cause patents to issue to the state of Wisconsin for not more than twenty thousand acres of such unappropriated, unoccupied, nonmineral public lands of the United States north of the township line between townships thirty-three and thirty-four north, fourth principal meridian, as may be selected by and within said state for forestry purposes. The lands hereby granted, except as herein provided, shall be used as a forest reserve only, and should the state of Wisconsin abandon the use of said lands for such purpose, alienate or attempt to alienate or use the same or any part thereof for purposes other than that for which granted, except upon consent of the secretary of the interior, as hereinafter provided, the same shall revert to the United States. If it shall be made to appear to the satisfaction of the secretary that any tract or tracts of the land hereby granted are better suited for agricultural than for forestry purposes, or by reason of their isolation are not available for forest reserve purposes, he may by order consent to the sale of such tract or tracts by the state of Wisconsin upon condition that the proceeds of such sale shall be used by the said state in the reforestation of the permanent forest reserves established by said state, and that in event the lands hereby granted shall revert to the United

States the said state will account for all such moneys and will pay over to the United States all sums derived from the sales of these lands and not actually used in reforestation.

Approved, June 27, 1906.

In the discussion before the house the point was emphasized that as the state of Wisconsin was creating forest reserves at the headwaters of the Wisconsin, Chippewa and St. Croix rivers, all of which are important tributaries to the Mississippi, it was assisting in lessening the annual flood damage on that river caused by the rapid destruction of the forests along its course. That the government had spent vast sums in the effort to protect the southern states from the terribly disastrous spring freshets in the Mississippi; that the question was a national one and that therefore it was perfectly just and proper for the government to aid the state of Wisconsin in protecting the forests and so regulating the flow of her rivers. Upon the passage and approval of the act, Governor Davidson requested the commissioner of the land office at Washington to have lists prepared of the vacant government lands north of town 33, so that the state board of forestry could select the 20,000 acres allowed. By July 23rd, the state board of forestry had received from the United States land office at Wausau, township plats showing all the vacant government lands north of town 33, approximately as follows:

	Acres.		Acres.
Ashland	674.97	Marinette	1,760
Barron	40	Oneida	3,584.52
Bayfield	6,720	Polk	680
Burnett	4,670.82	Price	2,051.77
Douglas	3,920	Rusk	40
Florence	160	Sawyer	2,468.75
Forest	560	Vilas	2,160
Iron	800	Washburn	1,045.02
Langlade	40		
Lincoln	80	Total	31,455.60

These lands were then platted on a very large forest reserve map of northern Wisconsin, in order to see how they lay in conjunction with the other state lands which had already been set aside for forestry purposes. The isolated and widely scattered lands were first looked over to determine if they were valuable timberlands but in almost every case it was found that all the timber of value had been stolen. All the government lands adjoining or near to the state lands and within the areas where the permanent forest reserves will be located, were selected and in

addition the best of the isolated and scattering lands. The following list shows the acreage of the lands selected in each county:

	Acres.		Acres.
Ashland.....	417.27	Oneida.....	3,404.27
Bayfield.....	760.09	Polk.....	686.40
Burnett.....	4,276.40	Price.....	1,632.69
Douglas.....	1,909.79	Sawyer.....	2,216.90
Forest.....	326.18	Vilas.....	2,031.16
Iron.....	817.14	Washburn.....	937.40
Langlade.....	40		
Lincoln.....	95.60	Total.....	19,968.39
Marinette.....	447.10		

As provided in the act granting these lands, any tract or tracts of land which are better suited for agricultural than for forestry purposes, or by reason of their isolation are not suitable for a forest reserve, may be sold with the consent of the secretary of the interior and the proceeds shall only be used for the reforestation of the permanent forest reserves established by the state. This wise provision will give us in time a very considerable fund for reforesting the denuded and burned over areas within the forest reserves.

SUMMARY OF FOREST FIRES.

Most of the area which was burned within the last two years had been cut over and unfortunately the people have come to look upon fires on such lands as a matter of course and as doing practically no damage unless they are destroying mature, merchantable timber. As a matter of fact, a forest fire in mature timber, provided there is not a bad slash on the ground, injures the timber by burning around the boles of the trees but as a rule does not kill them. Fires in young growth, however, almost invariably destroy a large proportion of the timber and in many cases, as no seed trees remain, the blanks which are formed by the fire are left bare for many years, until the remaining young growth has reached sufficient size to produce seed and thus restock these areas. The following year after mature timber has been cut, the ground is often covered with self sown seedlings and the least fire will kill them, thus destroying all chance for a second crop or else delaying it for many years.

That the people are so indifferent to fires in young growth and on cut-over lands is the most discouraging feature of the forest fire problem in this state, but this feeling must change when they

come to realize the loss, both to the owners and the whole community, not only in young timber but in soil fertility as well. Timber values are now almost double what they were five years ago and are constantly rising, so that only ignorance would feel indifference to the destruction of young timber, and if the owners half appreciated their loss, they would take advantage of the provisions of the law and collect full damages from the responsible parties.

In 1904 there were appointed 249 fire wardens and their annual reports are summarized as follows:

	Appointed.	Reported.	No. fires.	Acres burned.	Cost of service.
Ashland.....	3	3	1	20	
Barron.....	6	4	1	1	
Bayfield.....	8	8	20	10,330	\$326 54
Burnett.....	6	6	4	2,000	
Chippewa.....	10	10		20	
Clark.....	16	12			4 00
Douglas.....	4	3	6	3,760	123 25
Dunn.....	8	7	5	1,420	15 00
Eau Claire.....	8	6	12	700	11 31
Florence.....	3	3	4	60	12 00
Forest.....	6	5	1	80	18 00
Iron.....	5	3	2	200	
Jackson.....	10	7	6	3,800	5 00
Langlade.....	9	7	6	170	25 25
Lincoln.....	8	6			
Marathon.....	20	13	1	1	
Marinette.....	9	7	13	5,280	69 01
Oconto.....	5	4			
Oneida.....	12	10	19	12,740	67 35
Polk.....	18	13	8	4,580	57 50
Portage.....	8	8	3	400	
Price.....	14	10	8	485	16 00
Rusk.....	1	1			
Sawyer.....	2	2			
Shawano.....	17	15	2	120	2 00
Taylor.....	10	5			
Vilas.....	4	3	9	2,210	90 00
Washburn.....	4	4	7	8,300	24 00
Waupaca.....	7	5	1	100	
Wood.....	8	8			1 00
Total.....	249	198	140	56,777	\$867 20

As will be seen from the following table, by far the greatest number of forest fires, of which the origin could be determined, were caused by settlers clearing land, while the hunters and campers came next but did a relatively small amount of damage; for the settlers not only started most of the fires but were responsible for those which caused the greatest loss.

CAUSE OF FOREST FIRES.

Settlers clearing land	21 or 50 2	per cent.
Hunters and campers	7 or 17.5	per cent.
Settlers burning for pasture	4 or 10	per cent.
Logging crews	2 or 5	per cent.
Engines	2 or 5	per cent.
Indians	2 or 5	per cent.
Pipes or cigars	1 or 2.5	per cent.
Lightning	1 or 2.5	per cent.
Miscellaneous		2.3 per cent.
		100 per cent.

Thus the settlers by clearing land and burning for pasture, caused 60.2% of all the forest fires.

In 1905 over 300 fire wardens had been appointed and a summary of their annual reports follows:

County.	No. of fires.	Acres burned	Amount of timber destroyed.*	Other loss.	C t of service.
Ashland					\$ 2 50*
Barron	3	2,930	\$800	\$ 200	15 00
Bayfield	13	24,160	1,400 M. ft.; 200 car loads; \$300.	1,600	409 00
Burnett	8	3,100	30 M. Jack pine	Several M. ft. lumber	16 00
Chippewa	1				17 50*
Clark		100			7 50*
Douglas	23	10,660	4 to 5 million ft., 200 cds.	2 cattle. Cabin. Fencing.	286 40
Dunn	3	4,560	25 to 30 acres timber....	Fencing	60 50
Eau Claire	6	500			10 00
Florence	9	470	1,700 cds.	Building. 7 tons hay.	18 50
Forest	3	620	50 M. ft.	50 M. ft. logs. 500 cds. 2 log barns.	45 37
Iron					
Jackson	10	1,545	Underbrush	Fencing	8 75
Langlade	6	10	Hardwood	10 acres marsh ..	16 50
Lincoln					10 50*
Marathon	5	350	Sapling. Young growth.	Fencing	7 25
Marinette	8	3,505	1,200,000 ft. timber	\$8,000. Logs.	102 25
Oconto	5	740	50 M. pine. Cut-over lands	500 ft. lumber.	44 25
Oneida	9	2,449	55 M. pine. Small growth.	Fencing. Hay shed.	81 25
Polk	13	12,143	25 M. ft. small Jack pine.	300 cds. wood ..	40 60
Portage	11	705	Hardwood Small oak ..	\$1,800	
Price	5	169	8 M. ft. Birch and Hemlock.		38 50
Rusk	2	400	Hardwood. Hemlock ..	Logging camp ..	11 00
Sawyer					63 25*
Shawano	2	40	Cedar poles		16 68
Taylor	3	9	Second growth		17 40
Vilas	3	100			144 00
Washburn	9	6,860	50 M. young Jack pine. ..	Fencing. Pasture	21 25
Waupaca					
Wood					18 00*
Total	160	76,125			\$1,529 70

* For posting warning notices.

It would be an excellent plan if the lumber companies and large timberland owners of Wisconsin would co-operate with the state, as is done in Maine, by appointing and paying their own fire wardens, to serve during the dangerously dry season, and placing them under the direction of the state fire warden, so that the whole system of protection could be systematically organized. One man can patrol 10,000 acres and, as he should be employed usually from about the 15th of May to the 15th of November, or six months, at say \$50.00 per month, the cost would be \$300.00. This would be at the rate of 3 cents per acre, which is surely a low rate of insurance when the value of the property is taken into consideration.

TIMBER TRESPASS.

For many years timber trespass, or the stealing of timber, for some unaccountable reason has been treated most leniently and in Wisconsin both the government and state have suffered enormous losses in this way, so much so that it is exceptional to find a forty, owned by either, which has not been trespassed upon and frequently every stick of merchantable timber has been cut.

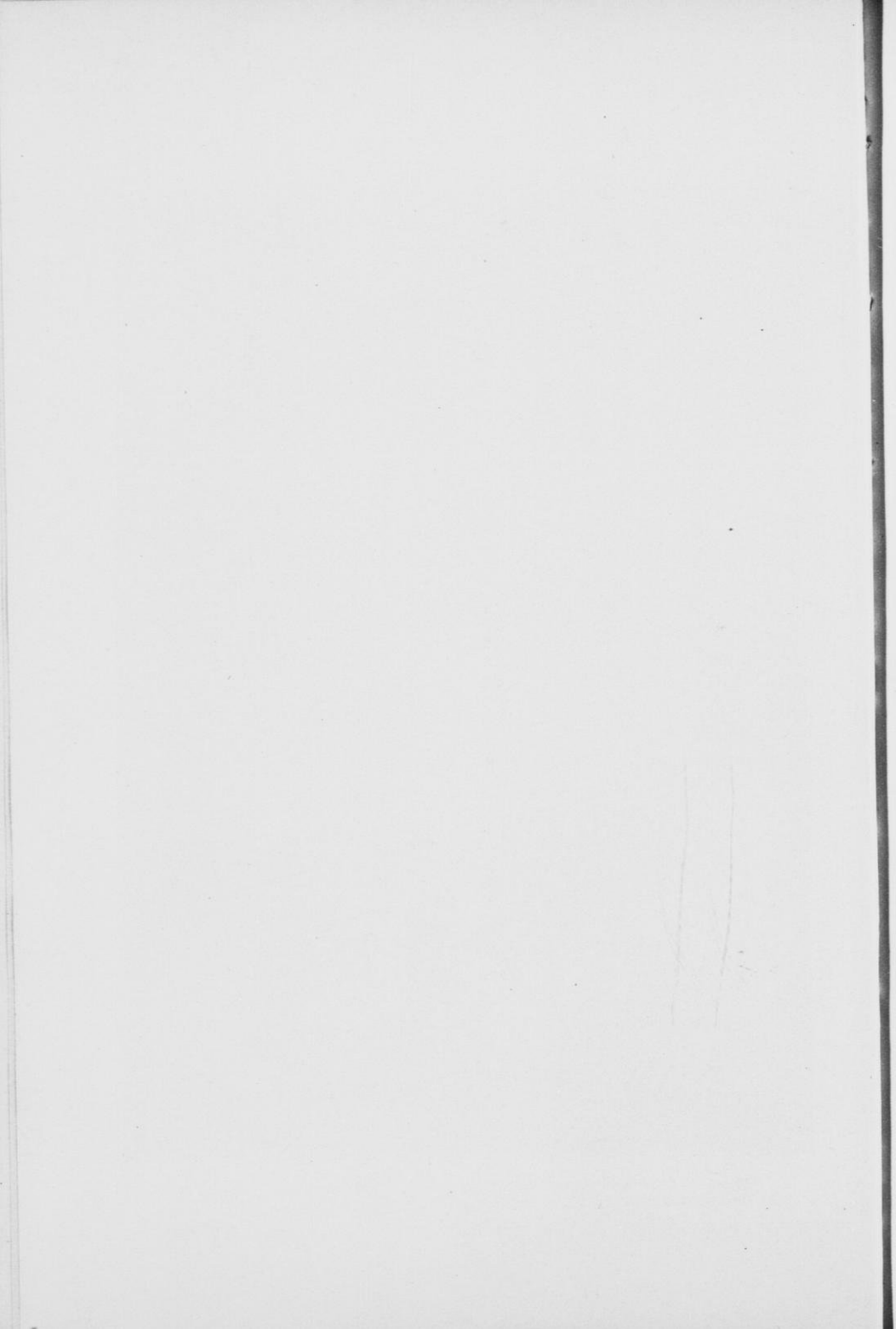
The state for many years placed a premium on such thievery, for it was customary to settle with trespassers upon the mere payment of the stumpage value of the timber. This worked as an open invitation for lumber companies and individual loggers, for they reasoned that their chances of being caught were slight and even if they were caught, they would only have to pay what the timber was worth.

Of course, many cases occur where a lumber company cuts over the line unintentionally and in such cases the only thing that can be done is to charge them merely a fair stumpage price for the timber which they have cut.

The hardest persons to deal with are poor settlers, who are not financially responsible and are encouraged to cut timber which does not belong to them by the lumber company to whom they sell the logs. Such settlers are often miserably poor and as the law provides both criminal as well as civil action, the poor man would go to jail while the rich man would escape with the payment of a fine. This, of course, is unjust and therefore the state



Spruce and balsam forest killed by fire. Humus burned to a depth of one foot.



board of forestry, at a meeting held April 9th, 1906, passed the following resolution: "That in view of the statement by the state forester that during the past winter there has been considerable trespass on state forest reserve lands, and that as in the past it has been the custom throughout the state to settle with trespassers for merely the actual stumpage value, and as such procedure has tended to encourage trespass, therefore, it is resolved by the state board of forestry that hereafter the board will ask the district attorney of the county in which the trespass is committed, to bring criminal action in addition to such damages as may be collected under the civil liability for forest trespass."

This means that in the future both criminal and civil action will be brought against all persons who commit willful timber trespass on state forest reserve lands, rich and poor alike, and it is believed that one or two prison sentences will do more to put a stop to this custom than any number of fines. The law in regard to criminal action is as follows:

"Criminal Action; forest trespass. Section 19, Chapter 264, Laws of 1905. Every person who unlawfully and willfully cuts, injures or destroys any kind of wood or timber standing, lying or growing upon the lands of another, or of the state, or of the United States, or upon any public highway, or unlawfully and willfully injures or destroys or carries away any of the products of such wood or timber lands, is guilty of a misdemeanor, and upon conviction shall be fined not less than \$25 nor more than \$1,000, or be imprisoned not less than fifteen days nor more than three years, or by both such fine and imprisonment."

The law in regard to civil liability is as follows:

"Civil liability for forest trespass. Section 20, Chapter 264, Laws of 1905. In addition to the penalties provided in section 19 for willful trespass on forest lands, the state, the county or the private owners, upon whose lands the willful trespass was committed, may recover in a civil action double the amount of damages suffered. This section shall not apply to the cutting of wood or timber from uncultivated woodland for the repair of a public highway or bridge upon or adjacent to the land."

In the five months from May to October, 1906, the sum of \$4,815.02 has been collected for timber trespass on state forest reserve lands, committed either by lumber companies or settlers logging for them. This timber was cut during the winters of 1904-05 and 1905-06, and in every case where the trespass was willful, double the market price of the stumpage has been

charged. Thus, if white pine was cut worth \$12. per M, the trespasser has been obliged to pay \$24. per M, or if it was tamarack worth \$7., then \$14., etc. So far, legal action has not been necessary, as the trespassers could not deny that they had cut the timber, and were willing to settle out of court, but in future, as stated, both criminal and civil action will be brought.

Many of the largest and best lumber companies in the state are becoming more and more interested in the subject of forestry and they are co-operating with this office in putting a stop to timber trespass on forest reserve lands. The man who deliberately steals timber is gradually coming into his own, and is looked upon as twin brother to the horse thief.

STATE LANDS WITHIN INDIAN RESERVATIONS.

Under the swamp land grant of 1850, Wisconsin was granted all the swamp lands within the state which were owned by the federal government. Among the lands so granted were thousands of acres within what are now the Indian reservations, but these reservations were not set aside and ceded to the Indians until 1854. Clearly, then, the state would seem to have the prior and undisputed claim to these lands and yet the department of the interior holds that while the title appears to rest in the state, the Indians have the possessory right so long as the reservations remain intact and they even go so far as to contend that the right of possession carries with it the right to use the timber on these lands for their own use or to sell it.

Under the state forestry law of 1905, all state lands north of town 33 were set aside as a forest reserve and therefore all the disputed lands within the Lac du Flambeau, Lac Courte Oreille and La Pointe Indian reservations come under the control of the state board of forestry. The state would probably not object to the Indians using these lands as much as they pleased for hunting, camping, etc., but cutting the timber for their own use or selling it, is quite another matter. The action of the government in this matter is most unjust, both to the state and to the Indians as well, for the lands were clearly given to the state in 1850 and then included in reservations which were given to the Indians in 1854. But it should be remembered that these lands

were first given to the state, that hers is the prior claim and that the government should recompense the state for the land, which it had no right to cede to the Indians.

Nor is the matter a small one, for the lands within the Indian reservations which were granted to the state in 1850 comprise the following acreage:

Menominee Reservation.....	16,378 acres.
Lac du Flambeau Reservation.....	20,666 acres.
Lac Courte Oreille Reservation	1,400 acres.
La Pointe Reservation	8,559 acres.
Total	47,003 acres.

As a large part of these lands is still heavily timbered, they are worth considerably over one million dollars. I would most strongly recommend that at the next session of the legislature a bill should be passed providing that in case the state was fully recompensed by the government, the state would relinquish all claim to these lands, and that the amount so received from the government should be used exclusively for the purchase of lands to be added to the state forest reserve. In this way the state would have a large sum with which to purchase lands so as to consolidate its forest reserves and the Indians would receive what in justice should be theirs, though the government had no right to cede it to them in the first place.

CO-OPERATIVE WORK ON THE INDIAN RESERVATIONS.

Through an agreement between the department of the interior and the forest service of Washington, D. C., on the part of the federal government and the state board of forestry on the part of the state, it has been arranged that the forest service should have charge of the sale and cutting of timber on all Indian reservations and that the state board of forestry should cooperate in this work in Wisconsin. The forests on the Menominee, Lac du Flambeau, Red Cliff, La Pointe and Lac Courte Oreille Indian reservations comprise some of the finest which are left in the state, especially on the Menominee reservation, and it is to the interest of the state to see that the timber is cut carefully under forestry regulations.

The Menominee reservation has not been allotted to the individual Indians but is owned by the tribe. The Indians do their

own logging, selling the logs to the highest bidder after they have been banked on the drivable streams, and it is to the interest of the whole tribe to see that the cutting is done conservatively and carefully, so that they will not only receive the highest possible revenue from their valuable forests, but also protect them for future cutting. It is a difficult matter, however, to make Indians cut as carefully as they should, though the work has shown an improvement in the last few years.

It can be safely said that the forests on this reservation are the finest in the state and as they are at the headwaters of the Wolf river, they are important in conserving a uniform stream flow and also in supplying industries in that part of the state with their raw material. Gradually, forestry regulations should be introduced in the logging operations and only the mature, ripe timber, of which there is an enormous amount, should be cut, the slash piled and burned to prevent forest fires, and the cuttings so arranged that the growth and reproduction of the most valuable species will be favored.

Up to the present time only pine and hemlock have been cut, as all logs had to be driven, but now two railroads are building across the reservation and therefore, even if sawmills are not built, there will be a ready sale for the fine hardwoods which predominate in the western portion. As the Indians log their own timber, there is every reason why they should use the most careful forestry methods, for, properly managed, their forests will always be of great value both to the tribe and the state.

On the Lac du Flambeau reservation there was originally a fine stand of timber but the lumbering operations were fearfully wasteful, with the inevitable result that forest fires followed and destroyed as much, if not more, than the contractors cut. Under the new contracts and since the co-operative work was arranged, the contractors have been obliged to pile and burn the slash and thus it is hoped that a large amount of young timber in the southern and western portions can be protected.

The soil on this reservation is very sandy, unsuitable for farming and therefore there is the more necessity that the forests should be carefully protected, so that the Indians may be able to support themselves by means of their lumbering operations. The Lac du Flambeau reservation embraces a number of large

lakes which are important feeders of the Wisconsin and Chippewa rivers, so that the safeguarding of these reservoirs through the proper management of the forests is an all important matter to the state.

The Lac Courte Oreille reservation was very heavily cut and burned over in past years, especially in the western and northern portions but as the old cuttings were confined to pine, there remains a large amount of hemlock and hardwoods, the heaviest stands being in the southern and eastern portions. Under the terms of the new contracts, the contractors are not allowed to cut any white or Norway pine under 10 inches in diameter, the idea, of course, being to protect the young pine until it reaches mature size. There is also a clause in the contracts which provides that no unnecessary damage shall be done to the young growth by the lumbering operations but unfortunately no provision is made for burning the slash and as a result, the young growth is very liable to be either seriously injured or totally destroyed by forest fires.

The soil is much like that of the Lac du Flambeau, namely, sand with little or no clay, which is very unproductive and not at all suitable for farming. Therefore, the protection of the forests for future use is all important. The Lac Courte Oreille reservation also embraces several large lakes, which are important feeders of the Chippewa river.

The La Pointe reservation contains, next to the Menominee, the largest body of timber on any reservation in Wisconsin. It was heavily cut over in past years for the large pine, but there is still a fairly heavy stand of small pine, hemlock and hardwoods, with scattering spruce, tamarack, cedar and balsam. The present contracts provide that the contractor shall pile and burn the slash and the new contracts will stipulate that the forest service shall mark all the timber which is to be cut, so that the small, immature trees, especially the pine, which at present are being cut, may be saved.

Much of the soil on this reservation is a good clay, suitable for farming, and as there are large sections from which the timber has almost entirely disappeared, through heavy cutting followed by fire, the Indians have an excellent opportunity to make some good farms. But, as anyone can testify who has become ac-

quainted with them, they do not seem to have any faculty or taste for farming, but are more inclined to work in the woods than anywhere else.

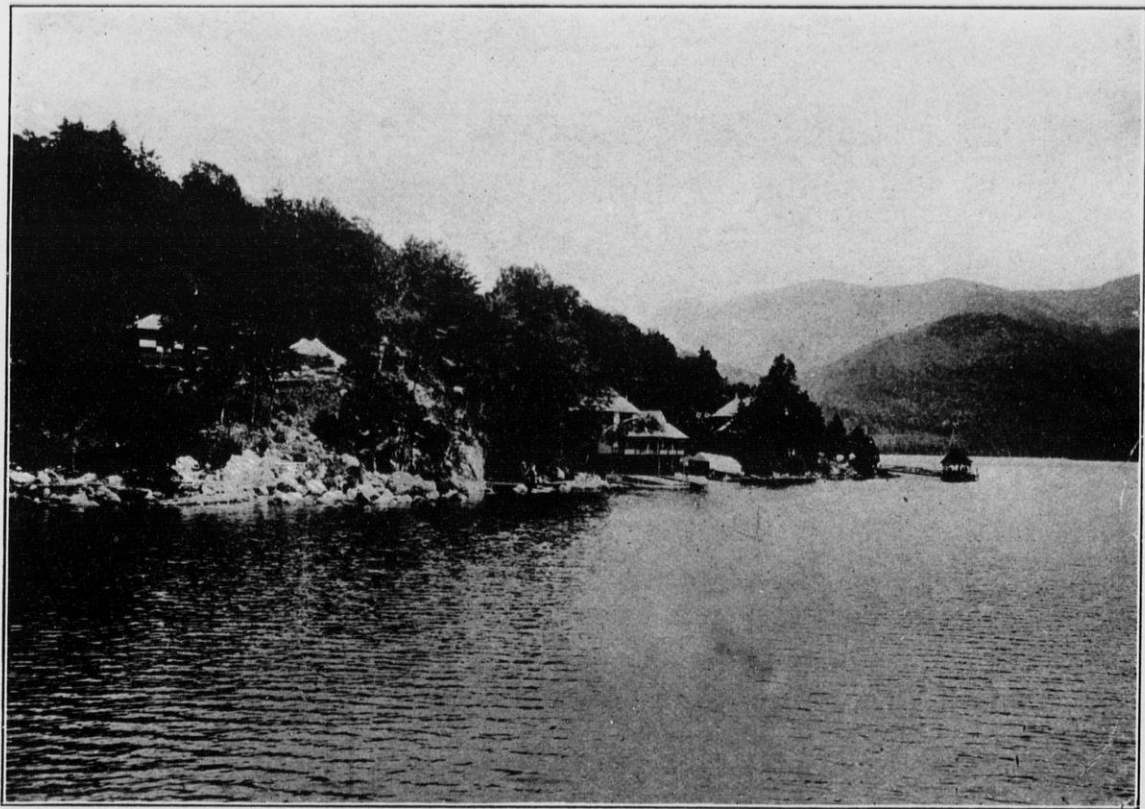
The Red Cliff reservation has been so heavily cut over that only a small amount of hardwood and cedar remains, but the soil is a good clay and therefore, after the lumbering operations are completed, the land will be of considerable value.

It is the plain duty of the government, as guardian of the property of the Indians, to see that the timber on the reservations is cut as carefully as possible, so that the Indians will always have work and a steady income from the lumbering operations, and the state should assist as much as possible, for the protection of the stream flow and a steady supply of raw material are both extremely important.

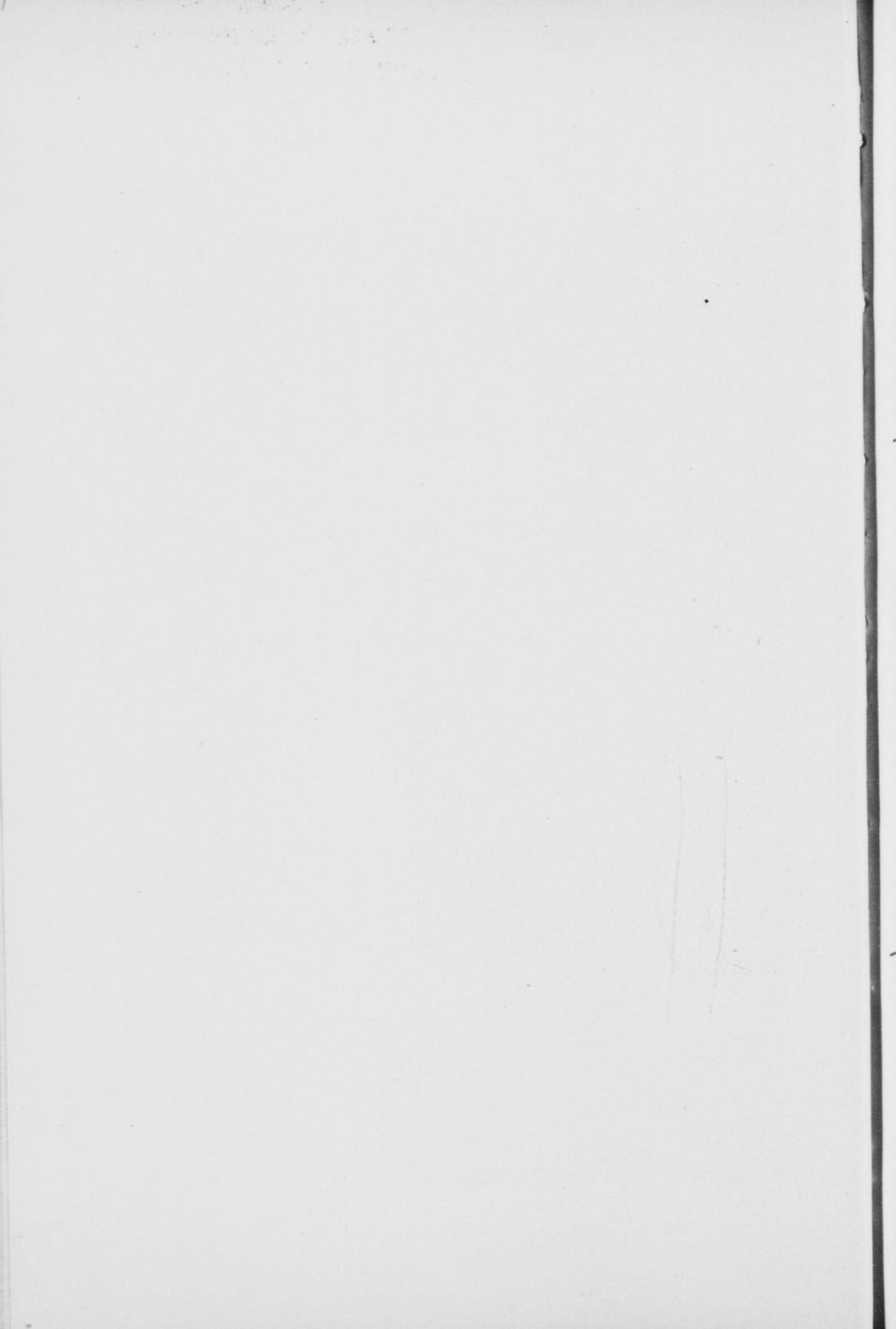
It is the plain duty of the government, as guardian of the property of the Indians, to see that the timber on the reservations is cut as carefully as possible, so that the Indians will always have work and a steady income from the lumbering operations, and the state should assist as much as possible, for the protection of the stream flow and a steady supply of raw material are both extremely important.

STATE PARKS.

Section 4a of the forestry law provides as follows: "The state board of forestry shall visit points of natural interest in the state and examine into and consider the propriety and desirability of securing such places as public parks. Said board may further investigate as to the price and report its conclusions to the next session of the legislature." After the forestry law was passed, the legislature also passed another law providing that the governor should appoint a commission consisting of three members to examine and report upon the desirability of acquiring Devil's Lake and the Dells of the Wisconsin as state parks and Governor La Follette appointed me as one of the members of the commission. The state park commission have made a number of trips to Devil's Lake and the Dells of the Wisconsin and will make a report to the governor in regard to them, and I have also, in connection with my work as state forester, vis-



Summer cottages on Lake Placid in the Adirondack Forest Reserve, N. Y. There are also 27,000 hotels and boarding houses in the Adirondacks and in 1902 it was estimated that 193,000 people went there for recreation and health.



ited other points which had been recommended as well suited for parks, but have found that there are very few places, at least in northern Wisconsin, which are at all suited for parks, but many, notably wild timberlands around beautiful lakes, which should be included within the forest reserves.

In fact, a state forest reserve is in many respects a state park but it is very seldom that a state park can also be considered or managed as a forest reserve. Wisconsin already owns an interest in one park, the Inter-state park at the Dalles of the St. Croix, 300 acres of which is owned by Minnesota and 600 acres by Wisconsin. It is a beautiful spot, wonderfully well suited for a state park but unfortunately it is on the extreme western side of our state and not easily reached. But it is well that Wisconsin co-operated with Minnesota in securing this park in time and as the population of the state increases, it will become of more real value.

Devils Lake and the Dells of the Wisconsin are very centrally located, are most beautiful spots and the legislature should see to it that they are protected for all time for the people of the state.

LECTURES ON FORESTRY.

As the practice of forestry in this country is comparatively recent, it is important in starting the work in a new region to educate the people to a correct understanding of the subject, so that they may realize how important it is to the welfare of the state that the forests should be protected through careful use and that forestry is really conservative lumbering and in no sense horticulture or landscape gardening, as is so often the general impression.

During the winter of 1905-06 I delivered a number of lectures on forestry, both in a regular course at the university and also before various clubs and associations in a number of the larger cities of the state. Over forty students took the course at the university, which was confined to the fundamental principles of forestry, sixteen lectures being given, covering a period of eight weeks. Several students who attended had decided to take up forestry as their life work; others from the college of

agriculture wanted to study the best methods of managing wood lots in connection with farming; while others expected to go into lumbering.

From various sources the suggestion has been made that a forest school should be established at the university. I feel, however, that it would be unwise to do so at this time, as there are now a number of first class forest schools in this country, which are fully able to train all the foresters that there is any demand for at present. Lectures given throughout the state, especially when illustrated with lantern slides showing the exact difference between the ordinary methods of lumbering and forestry, do a great deal of good, as they educate the people to a realization of the great need of forest protection in this state.

ASSISTANT STATE FORESTER.

On May 16th, 1906, Mr. F. B. Moody, having passed the state civil service examinations, was appointed assistant state forester. Mr. Moody was born in New Portland, Maine, in 1879, his father being a lumberman, and he has always been accustomed to work in the woods, having cut timber, driven logs on the rivers of Maine, estimated and scaled timber and helped in its manufacture. First he graduated from Bates University, then entered the school of forestry at the University of Michigan, from which he graduated in 1906. He has had two field seasons with the government forest service and passed the United States civil service examinations in forestry.

During the past summer Mr. Moody has devoted all of his time to field work on our state forest reserves and in co-operative work on the Indian reservations. He has proved both capable and trustworthy and in future will have direct charge of all work in the woods.

PRESERVATION OF STREAM FLOW.

Many people do not understand in just what way forests preserve and regulate stream flow, and they imagine that it is brought about largely through the influence of forests in causing and increasing rainfall. In the arid plains, where for months the soil is parched dry, the cooling influence of great

bodies of forest have unquestionably a slight effect in causing rainfall. But in Wisconsin, surrounded as we are on the east and north by great lakes, the influence of the forest in causing or increasing rainfall is probably so very slight that it need not here be taken into consideration. However, everywhere and under all conditions, the forest acts as a great sponge in holding moisture and giving it off gradually, thus saving forested countries from the disastrous effects of floods at one season and low water at another. Anyone who will go into the dense forest in early spring will find the snow melting slowly when it has long since disappeared in the open country. The melting snow and the falling rain in the forest, work down slowly through the humus and soil and are carried by the roots to some depth, often to underground channels, to appear weeks or months later in the form of springs or in small streams. Thus, streams which rise in forested regions have a fairly even flow throughout the year, while others, rising in regions where the timber has been destroyed, have violent floods in the spring while the snows are melting, or during a rainy season, and shrink to a mere trickle of water during hot, dry months.

This most important function of the forest in regulating stream flow is so well known in foreign countries, where the forests have been intelligently managed for hundreds of years, that in many sections the owner of forests on an important watershed is prohibited by law from clean cutting it. He is allowed to cut conservatively under the advice and management of the forestry department, but it is wisely held that no person has the right to destroy forests on an important watershed, thus causing floods and jeopardizing the property of so many others.

In this country the most careful records have been taken for ten years of stream flow in forested and non-forested watersheds in the San Bernardino mountains of California, and the results are most interesting, as will be seen from the following tables.

ANNUAL RAINFALL AND RUN-OFF ON FORESTED AND NON-FORESTED
CATCHMENT AREAS IN THE SAN BERNARDINO MOUNTAINS, CALIFORNIA.

Area of catchment basin.	Condition as to cover.	Precipitation.	Run-off per square mile.	Run-off in percentage of precipitation.
Sq. miles.		Inches.	Acre feet.	Percent.
0.70	Forested.....	46	731	28
1.05	Forested.....	46	756	30
1.47	Forested.....	46	904	36
.53	Non-forested.....	33	1,192	69

It will be noted from the above that the run-off in the non-forested basin was 69%, while in the forested basins it was only from 28 to 36%, a tremendous gain for the streams protected by forests. But still more instructive is the following table:

RAPIDITY OF DECREASE IN RUN-OFF AFTER THE CLOSE OF THE RAINY SEASON.

Area of catchment basin.	Condition as to cover.	Precipitation.	April run-off per square mile.	May run-off per square mile.	June run-off per square mile.
Sq. miles.		Inches.	Acre feet.	Acre feet.	Acre feet.
0.70	Forested.....	1.6	153-	66-	25-
1.05	Forested.....	1.6	146-	70-	30-
1.47	Forested.....	1.6	166-	74-	30-
.53	Non-forested.....	1	56-	2-	0

This table shows the wonderful influence that forests have in regulating and sustaining stream flow. The second month after the rain had ceased to fall, the forested areas were giving off from 66 to 74 acre feet and the non-forested only 2. In June, three months after the rain had ceased to fall, the forested areas were still showing from 25 to 30 acre feet, while the flow from the non-forested area had entirely ceased.

The water powers of our rivers are one of the most valuable assets of the state but, as can readily be seen, unless the forests at the headwaters of these rivers are protected, the melting snows in the spring will cause freshets for a few weeks and then during the summer months the water will be so low that mills using water power must either shut down entirely or else run only a portion of the time. The development of the water powers of Wisconsin is in its infancy and as the lumber industry dies out and we look

more and more to manufacturing, all water powers, large and small, will become increasingly valuable and the necessity of protecting them more apparent.

At present, some of the water powers of our most important rivers give a relatively even power only from the fact that at the headwaters dams have been constructed at the outlet of the lakes, so as to store the spring freshets until the summer months when it is most needed. But this is only a temporary makeshift and it will readily be seen that it is very unwise to allow a few companies owning dams to thus virtually control all the water powers on any river. The systematic control of these important matters, for the benefit of all, is purely a state function and, as previously stated, is the first point to be considered in the forestry work of this state.

NATURAL REPRODUCTION.

The statement is often made that pine will not follow pine, and that when the old pine is removed, poplar or aspen usually comes up. The latter is true but it does not mean that pine will not follow pine, but simply that the repeated forest fires following lumbering operations, destroy all the pine seed and the young seedlings. Surrounding old burns are covered with poplar or aspen, their seed is very light, often being carried for miles by the wind, and, as a result, burned country is nearly always covered by these species. But where fire does not follow lumbering in the pineries, the young pines come up readily and often the reproduction is magnificent.

It is only a question of putting a stop to the forest fires and, therefore, foresters have made so much of the vital importance of piling and burning the slash, the neglect of which has been the direct cause of the destruction of millions of acres in the northern part of the state. As stated in another section, the Government forest service and lumber companies have found that in many parts of the country and under widely varying conditions it costs to pile and burn the slash from 12 to 25 cents for each thousand feet of logs cut and removed.

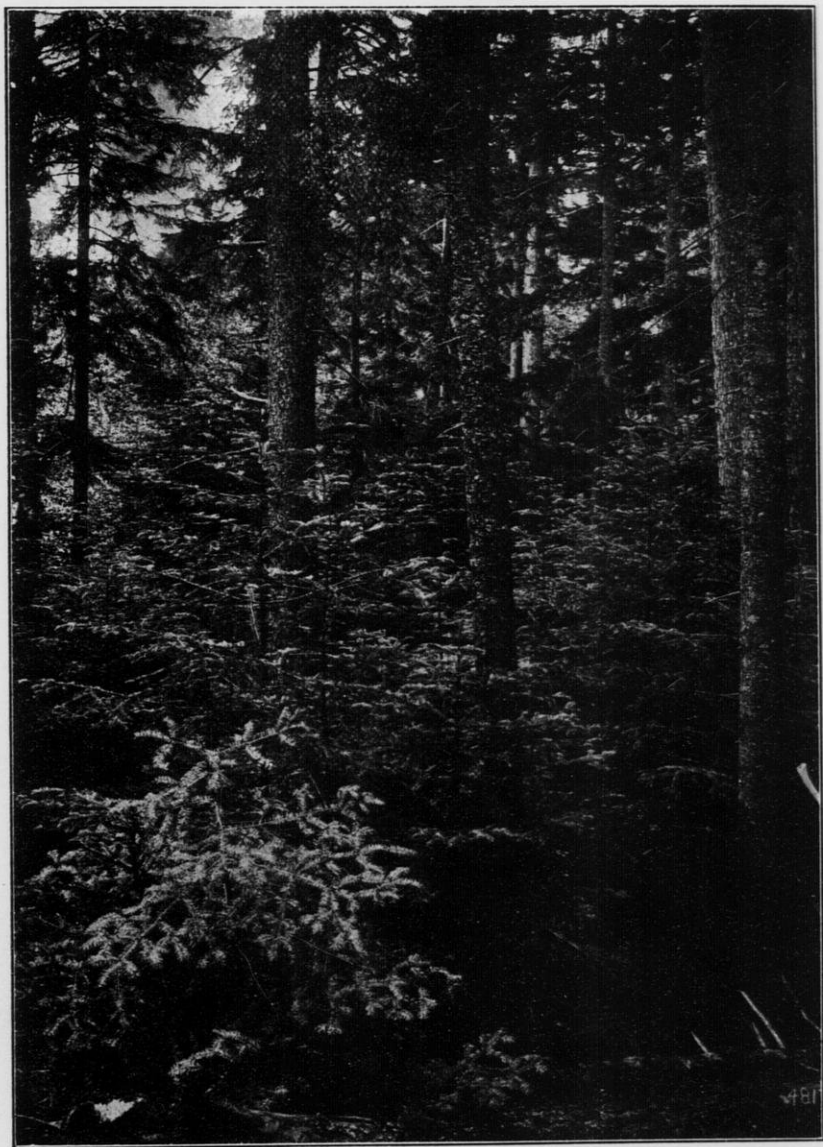
If two or three trees per acre, which, on account of being crooked or limby would yield only one or two logs of any value,

are marked and left for seed trees, and the slash piled and burned, the cut-over land will soon be covered with young growth and there will be little if any necessity of planting. In this respect, in many sections of northern Wisconsin, chance has accomplished just what the forester would strive for. Early in the lumbering operations only the best trees were taken and those that were left acted as seed trees; the slash was either largely consumed by early fires or else it rotted down in sections that were protected by surrounding lakes or adjoining cleared or burned over land. As a result of such fortunate conditions, thousands of acres are now well stocked with a fine stand of young timber.

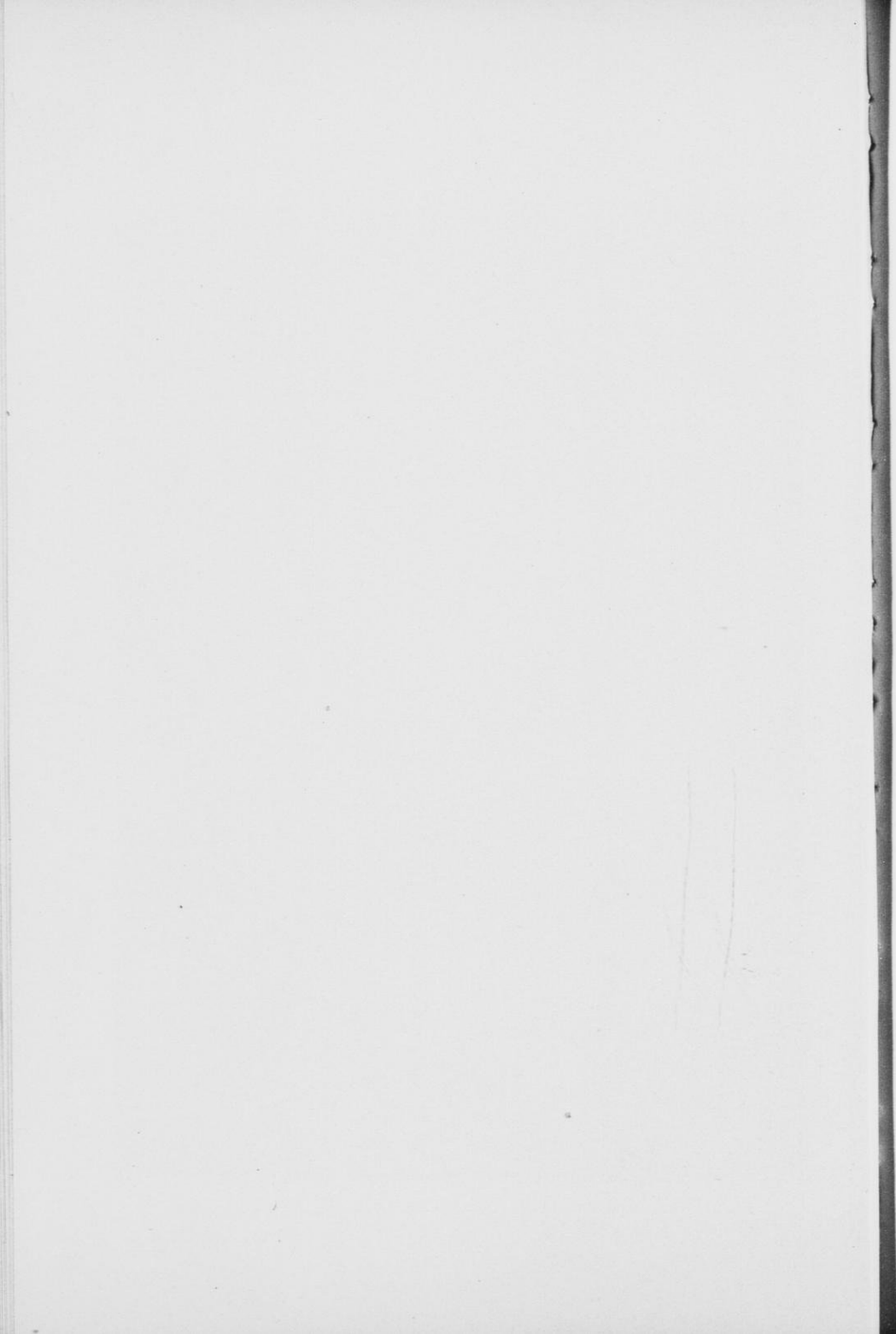
Examples of particularly fine stands of second growth white pine and Norway coming up on cut-over land, are to be found in every county and are unusually noticeable in the northern part of Lincoln county near Tomahawk, on the Flambeau Indian reservation in Vilas county, near Grand Rapids, on the Menominee Indian reservation in Shawano county and in many other sections of the state, proving that Wisconsin can in a great measure regain her wonderful forests by means of common sense rules in lumbering and protection from forest fires.

Lumbermen and woodsmen, as a rule, do not notice young growth, especially seedlings four or five inches high, for they are accustomed to look only for merchantable timber and the young growth has usually meant nothing to them but a hindrance in logging. Such men see thousands of acres covered with poplar, aspen, birch and cherry and take it for granted that this is the only growth which is coming up on the land. But if they would take the pains to walk through this advance growth, which is really nothing more than fire weed, they would find in many cases great numbers of young pine, all the way from little seedlings to trees 10 and 12 feet high. Nature has provided species in the aspen, poplar, birch and cherry which can quickly reclothe burned over land and, after acting as a nurse to the valuable pine that comes up under its shade, die down, having performed their function.

Fortunately, the white pine, which is our most valuable timber tree, has a very strong power of reproduction, more so than the Norway with which it comes into direct competition. The following species all reproduce themselves well and if a few seed trees are left when the mature timber is removed, very little plant-



Spruce and balsam with fine reproduction. The mature timber should be removed in order to give the young growth a chance.



ing will be necessary to secure a second crop: white and Norway pine, Jack pine, cedar, tamarack, soft and sugar maple, birch, basswood, elm. The following species reproduce themselves only fairly well and must be given a start or protected from the other species, or they will be crowded out: hemlock, spruce, balsam, red and white oak, ash, butternut and hickory.

Where hemlock occurs in a mixed forest and the other mature timber is cut, roads built, etc., the mature timber is seriously affected by the changed conditions, especially the sudden addition of light, as its root system is very sensitive and, as a result, a large number of the trees die. But the hemlock reproduces itself fairly well and the young growth coming up in more or less of a pure stand and becoming accustomed to a considerable amount of direct sunlight from the beginning, is not nearly so sensitive and will grow to maturity. This can readily be seen in the forest, for it is the old trees which have grown up under dense shade that so easily succumb when the surrounding trees are removed.

REFORESTATION.

Reforestation must play an important part in the forestry work of Wisconsin, for much of the state land which constitutes the forest reserves has in many cases not only been cut over but also repeatedly burned until it has been left almost a waste, without any young growth coming up. However, until the reserves can be consolidated, fire lines cut and rangers regularly employed, it will be a dangerous experiment to plant lands that are covered with old tops, brush, etc., and are liable to be burned over at any time. The large number of lakes within and surrounding the main forest reserves will be of great assistance in dividing the timberlands into compartments, so that a forest fire can often be held to the one it originates in. Fire lines, which are broad strips cut through the forest and then burned over, can be run from lake to lake, so that they will, with the lakes, form a barrier around tracts of timber and keep out all forest fires. Of course, there are lands which have been burned over so heavily that all the old slash has been consumed and there is almost no fuel for a fire to feed upon. Such lands could be planted but the first work should be done in the main forest reserves, when they have been

brought into compact shape and can be systematically guarded and protected. When the time arrives for the state to commence planting operations, I would recommend that one or two large nurseries be established and that the state should sell plants at cost to lumbermen, timberland owners, farmers and others who may wish to reforest their lands.

To those whose land is in proper condition for reforestation, the following may be of interest and benefit. As a general rule, planting will be found to be much more satisfactory than sowing, and this is especially true where mixed woods are to be formed, as, with plants, the exact mixture desired can be secured easily. The results from broadcast sowing are apt to be very disappointing except on fairly well cleared and prepared land, as on brush covered land only a small portion of the seed reaches the soil. Where a large amount of planting is to be done, a nursery should be started in order to reduce the cost of the plants to as low a figure as possible.

In 1903, the forest, fish and game commission of New York state started their first planting operations and put out 500,000 seedlings on one tract, the following species being used: white pine, Scotch pine, Norway spruce, Douglas fir, European larch and black locust. "It required 747 days labor, including foremen, laborers and water boys, to set out the 500,000 seedlings, or 669 plants per day for each man and boy on the job. The total expense of the plantation, including purchase price of seedlings, cartage on same and labor, amounted to \$2,496.22, or less than half a cent per plant. The seedlings having been set out at intervals of six feet, there were 1210 plants per acre and hence the ground actually occupied by the half million seedlings includes only 414 acres. But owing to frequent obstructions, swampy places and thickets of sapling trees, the boundaries of the territory planted embrace nearly 700 acres." The New York state commission bought these plants and the cost was considerably more than it will be now that they have their own nurseries.

WASTE IN LUMBERING.

Only a few years ago, when the forests seemed inexhaustible to the lumbermen, they were extremely wasteful, taking only the

finest trees and leaving all logs which were not straight and clear to rot in the woods. As a natural consequence of leaving such an enormous amount of slash on the ground, fearfully destructive forest fires were the rule rather than the exception, so that in nearly every case the smaller timber which was not at that time merchantable, was destroyed and it is doubtful if 40% of the standing timber was utilized. The state as a whole thus lost millions of dollars, for the timber which was wasted and destroyed would now be worth more than the original cut.

Today, when the remaining forests are so valuable, wasteful methods in lumbering are inexcusable, not only from a technical but from a financial standpoint as well, and yet such waste is going on constantly in many parts of the state. As a rule, such waste does not now occur in logging pine, for the lumbermen are picking up the old, burned logs which were left in former operations, defective trees and are even recovering logs which sank in the rivers and lakes; in fact, in every way are saving the little that they can from the former great waste.

But within the last few years, they have begun to cut hemlock on a large scale and, although they are cutting closer than when they first began to operate on pine, still, in the aggregate, the waste is enormous and as the supply of hemlock is very limited, the shortage will come within a very few years and seriously affect not only the lumber industry but still more the tanneries and especially the paper mills. Pine is valuable only for its lumber but hemlock, though an inferior lumber, is extremely important as a pulp timber and its bark a staple for tanning. The paper mills of this state use annually about 100,000,000 feet of hemlock, that wood comprising 50% of the total consumption and as the state has only an insignificant supply of the only other woods which are suitable for pulp, spruce and balsam, it is of the greatest importance that the hemlock should be protected and used as economically as possible. The great supplies of hemlock in Pennsylvania, upon which the tanneries of this country have depended very largely for their supply of bark, have almost entirely disappeared, so that what we have in Wisconsin is doubly important.

Spruce, balsam, poplar and hemlock are the only trees which are used to any extent in the manufacture of paper. Poplar was

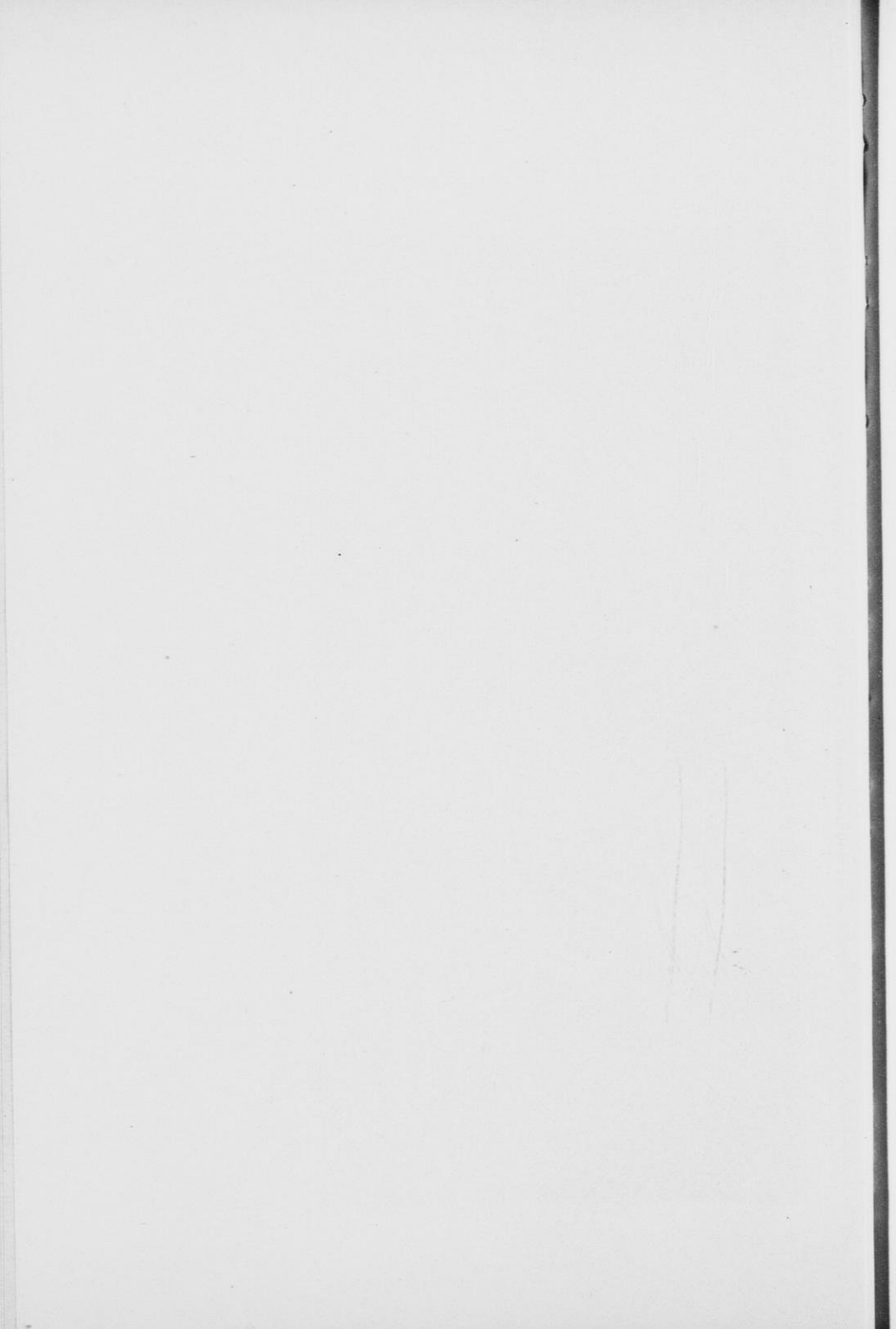
tried successfully, but the supply is too limited to influence the industry; some fairly good pulp has been made from Jack pine, so that this wood may form part of the future supply, but extensive experiments have failed to show that any other species can be used. This being so, it would seem the wisest plan to have the spruce, balsam and particularly the hemlock, used only for the manufacture of paper, but at present most of the hemlock is sawed into lumber and in many cases the tops and defective butt logs, which would make good pulp, and all the bark, are left in the woods and wasted.

A few years ago, it was not uncommon to see oak tanned leather, but the supply of oak bark was rapidly exhausted and today most of the hides are tanned in an extract made from hemlock bark. The supply of hides is in the east principally, on account of the great stockyards being in Chicago, and as the supply of hemlock in the east is very limited, the tanneries in the near future will probably have to ship the extract of hemlock bark from the Pacific coast. This being so, the supply of hemlock bark in Wisconsin should be carefully harvested on account of its increasing value, but as a matter of fact, there is a very small amount of bark peeled.

It is the rule rather than the exception that the owners and managers of lumber companies devote most of their time to the sawmill and office, and the work in the woods is left to the walking boss and camp foremen and as a consequence, it is doubtful if there is any other large business where the quality of the work varies so tremendously as in logging. Some foremen watch the crews carefully and see to it that the stumps are cut low, the timber run well up into the tops, that all logs, skids, etc., are picked up, lay out their roads well and do as little damage to the young growing timber as possible. Others, perhaps working on the same tract of timber, are exactly the opposite, allow the crews to cut as they please, which means an enormous amount of timber wasted in the stumps and tops, that only the best butt logs will be taken, and everything else smashed or allowed to rot in the woods. Of course, where the slash is not piled and burned, the lumbermen know by experience that severe fires are almost sure to follow and, therefore, it is useless to save the young timber. Granting this, there is all the more reason why everything should



Logged and repeatedly burned. The humus destroyed and no reproduction. Such barren and unproductive wastes are a serious loss to the whole state. They should be included in the forest reserve and planted.



be cut and removed which will pay a profit. But to utilize only from 60 to 70% of the merchantable timber and then expect the remainder and all the young timber to be destroyed by forest fires, is by no means good business, to say nothing of the lasting damage that is done to the whole state.

The foremen and the men in the logging camps neither appreciate nor care very much about the wonderful rise in timber values within the last few years, which has made possible the closest utilization of timber, which a few years ago would never have been thought of. But the manager does, or should, know and he should be able to appreciate the loss that is sure to follow when he employs an old time foreman and then allows him to cut as he pleases.

As repeatedly stated, unless the land is valuable for agriculture, it is folly in Wisconsin, with the prevailing prices for stumpage and which are certain to advance, to fail to pile and burn the slash and thus save the young timber, and yet even where this is done, the lumbermen often waste just the timber they are working to save. For example, a lumber company limited the diameter to which they would cut and burnt all the slash in order to save the young growth but they allowed the crews to cut thousands of straight, clean, young white pine for corduroy and car stakes, and yet there was any amount of almost worthless young growth, which it would have been a decided benefit to remove from the forest, which could just as easily have been cut for corduroy, and the car stakes should have been sawed at the mill from inferior material.

The hardwoods of Wisconsin have lately come into great demand and are increasing rapidly in value and as it is much more difficult to avoid waste in logging hardwoods than pine, it is to be hoped that the lumbermen will adopt more modern methods and utilize everything that is profitable.

In 1900, speaking of the erection of factories for making barrel staves and wood alcohol, the forest preserve board of New York said: "These two industries are associated in each case, in order that the entire product of the land may be utilized, the larger timber, including all the hardwood timber, being used for staves, while the cordwood and smaller material is used in the retorts of the "acid" or "wood alcohol" factory. There is no tree so small

but that it is cut, as the smallest limbs will furnish fuel for the fires under the retorts. As a result, the cutting for these factories ends in a complete denudation of the tract, everything being taken, even to the small saplings, which are split into barrel hoops. Nothing is left but a stump field, strewn with the dead brush from the twigs and tops."

The forest preserve board were buying from the lumber companies their timberlands after the mature timber had been cut and naturally they were averse to having the land so denuded of all young growth. Also, farming in the Adirondacks, on account of its cold northern climate is carried on to a very small extent and, therefore, even where there was a good soil, it was a wrong policy to destroy all timber. But in northern Wisconsin, good farms are being made wherever there is a suitable soil and therefore, where timber is being logged on land really suitable for agriculture, it would be a great saving if the owners would adopt more intensive methods instead of allowing so much valuable material to be totally destroyed by forest fires.

In New York, New Hampshire, Maine and Vermont, white birch is very generally cut for spools and the industry has become one of considerable importance. In 1902, the forest commissioner of Maine said in his report: "White birch is used largely by the hardwood novelty mills of the state, yet its greatest utilization is in the manufacture of spools. The spool factories of Maine annually produce about 800,000,000 spools, valued at more than \$1,000,000. Besides being used in the production of spools, much white birch is cut into spool bars for shipment to Europe. Other hardwoods are used to a greater or less extent in the manufacture of small articles, but the consumption of white birch leads the field in this particular line."

In the New England states some lumber companies utilize the tops by making kindling wood in their mills, which is then shipped to the large cities and usually retails at two bundles for five cents. This is especially valuable where the cutting is limited so as to secure future crops of timber, for the large tops, particularly in hardwoods, which would be a source of continual danger in case of forest fires, are disposed of at a profit.

The lumbermen and timberland owners of Wisconsin should bear in mind that the state is becoming settled, that even northern

Wisconsin is no longer a string of lumber camps, and that, therefore, the small remaining tracts of timber will increase steadily in value and should be managed conservatively and intensively and not slashed over as in the past. The forests of Maine and New York are paying a higher rate of interest than ever before, for the reason that the demands for timber, both in old and new channels, are increasing every year as the population and modern business demands increase. The owners of timberlands in these states quite generally have steady incomes from their properties, as they have come to appreciate, through experience, that it is a penny wise and pound foolish policy to try to secure all the returns in one cutting, thus wasting so much young timber, but rather to cut conservatively every ten or twenty years, removing only the mature timber and at the same time improving the forest as the stumpage values rise.

Timberland owners do not get the best returns in new countries where there is a vast amount of virgin forest, but rather after the country becomes settled and timber scarce. Wisconsin is now in that condition and, therefore, the old, reckless methods of lumbering when there were vast stretches of unbroken forest are inexcusable and if persisted in, will mean that in a few years Wisconsin will be obliged to import all but the most inferior grades of lumber.

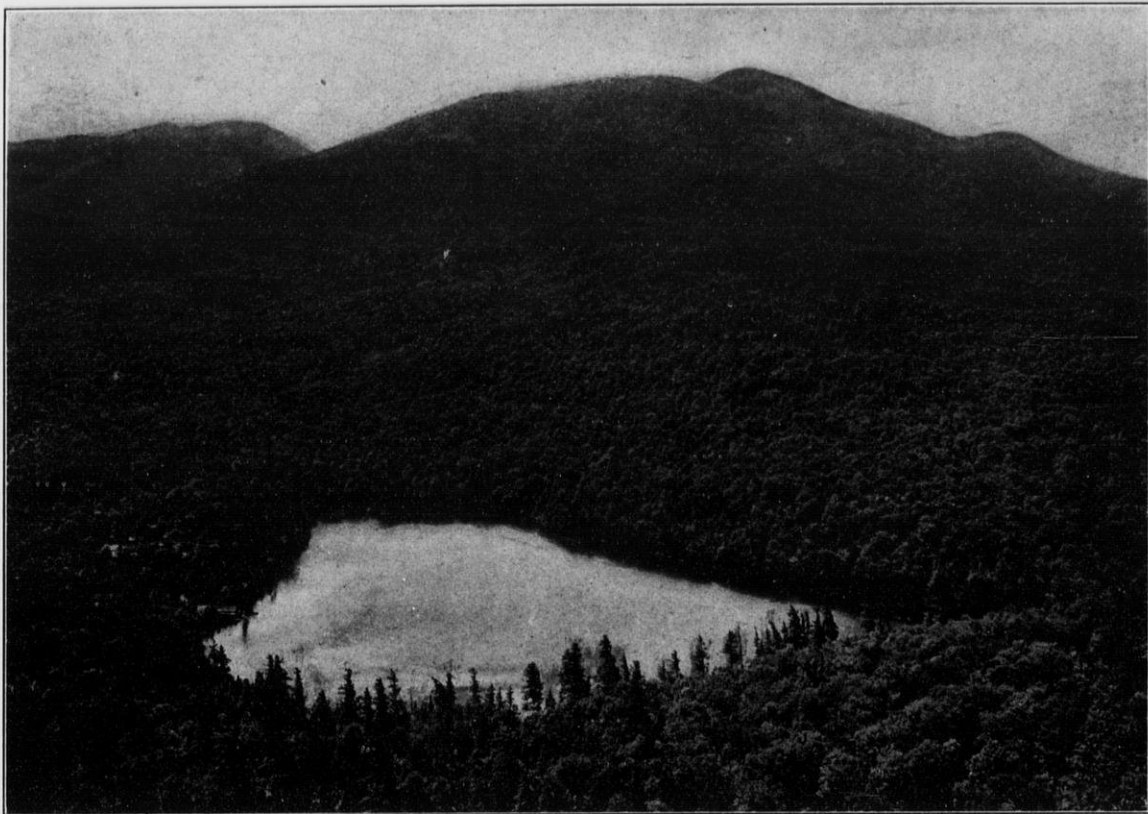
FORESTRY FOR THE CORPORATION.

The main reasons why it will pay the individual to practice forestry are stated in a following section, and the same reasons and others apply much more forcibly in the case of a corporation owning timberlands. Let us, for example, consider the case of a large paper mill, lumber, furniture or leather company, which is dependent upon the forest for its raw material, either in the shape of logs, pulpwood or bark. In the first place, such a company or corporation is often dependent upon one or more water powers for running their mills and they should, therefore, own as much timberland as possible on the headwaters of the river from which they are drawing their power, so as to insure that their waterpowers will be even and constant at all times of the year. And

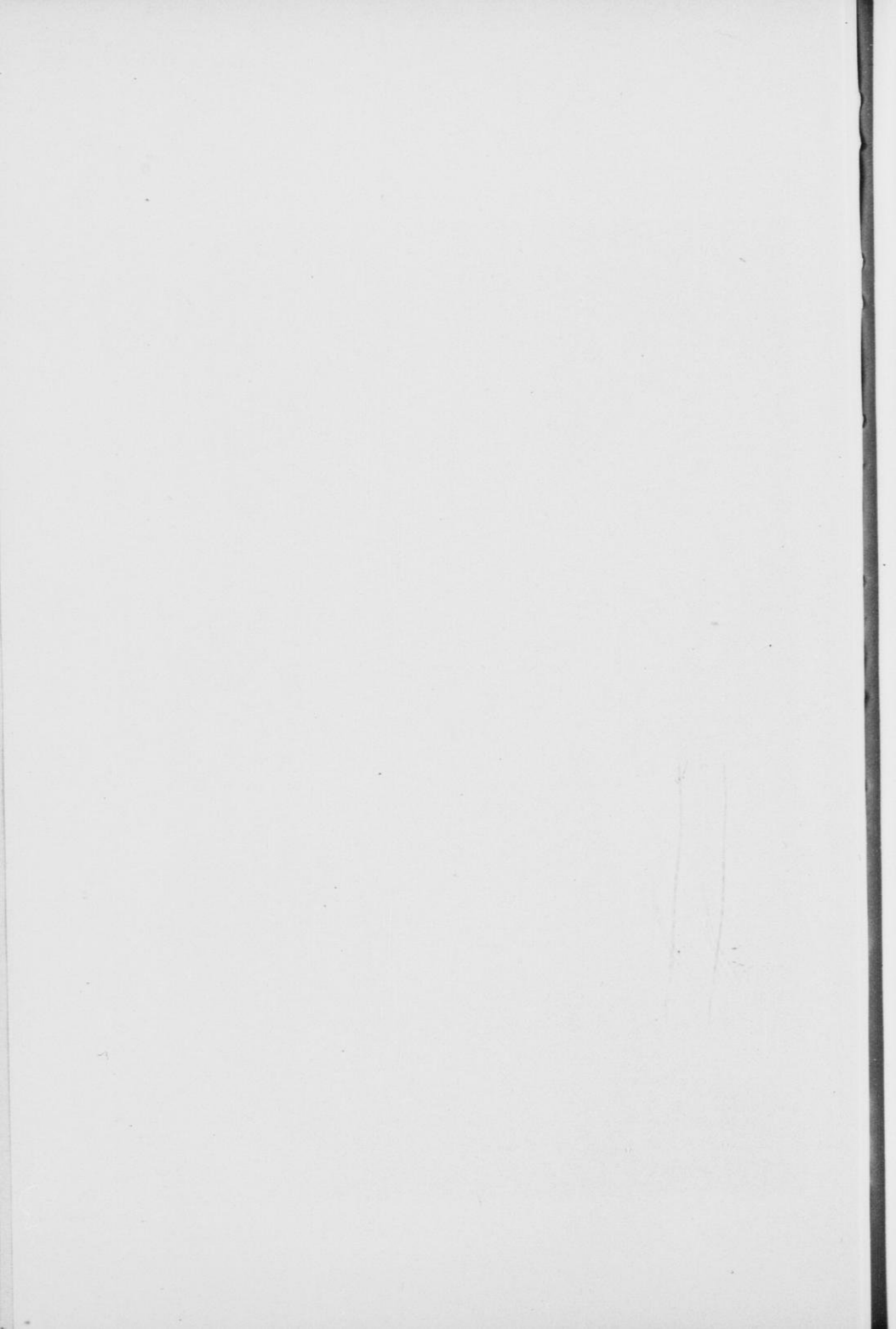
this, as elsewhere stated, is one of the most important functions of forestry.

Then, a corporation must of necessity look to the future much more carefully than an individual, for they expect to carry on their business for a long term of years if not indefinitely. Therefore, as a constant and sure supply of raw material is all important to a corporation, they should acquire as rapidly as possible a large enough area of timberland so as to supply their own timber from the yearly growth and thus place their business upon a permanent basis as far as the raw material is concerned.

Such a corporation should, first of all, employ a forester to make a careful study of the forests, the rate of growth, power of reproduction, etc., and to determine how much should be cut each year, based upon the annual growth and the area of timberland. For example, let us say that over a large area we find that each acre on the average will produce 50 board feet of timber per year and our mill requires 20,000,000 board feet per year. Then by simple division we find that we must own 400,000 acres of timberland, to place our cutting upon a permanent basis. This is simply the theory of a sustained yield but, of course, in actual practice we would not cut over the entire area in any one year but would cut all the mature timber over a large enough area each year to give us our 20,000,000 feet. The forester, after studying the rate of growth, would be able to determine the diameter to which each species should be cut so as to insure the best future growth and also the most favorable financial return upon the capital invested. As a rule, all trees of any one species, above the diameter determined upon for that species, would be cut but it would be preferable to have a forester mark the trees to be taken, for in some localities trees above the diameter should be left for seed and in others, perhaps, some below the diameter could just as well be removed. This can easily be done by a forester and axeman, working ahead of the cutting crews, and though a hard and fast diameter limit can be held to, still better results can be secured if the varying conditions are given consideration by having the timber marked. A corporation looking to the future and knowing perfectly well that the price of timber will increase, cannot afford to cut so as to destroy its holdings.



Within the heart of the Adirondack Forest Reserve, N. Y.



The lumber mills have been in the habit of moving from one part of the country to another as the supply of timber was exhausted, leaving devastation behind them, but the time has come when it is getting more and more difficult to find virgin fields to jump to and the lumberman of the near future, if he wishes to continue in business, will have to cut conservatively and so place his business upon a permanent basis. However, to build a lumber mill only requires a relatively small capital and as it can be located and run almost anywhere, irrespective of waterpower, it is in its nature somewhat migratory. But a large paper mill requires a very heavy outlay to build the mill, for machinery and for a large and valuable waterpower. Thus, the locations for paper mills are both limited and fixed, and when a valuable water power has been acquired and the mill built, the question of a sufficient and lasting supply of pulpwood within a reasonable distance, becomes all important. Therefore, the paper mill companies should be the first to see that forestry is particularly well adapted to their business, as it will insure them a steady supply of raw material. Then, too, in cutting pulpwood the timber can be more completely utilized than when only saw logs are taken. It is especially important for a paper mill company to own as much of the timber as possible on the headwaters of the stream upon which their mill is located, so that they may protect their water power.

Many of the above arguments apply equally well to a company manufacturing furniture or wooden ware, for their business is such that they need not be anywhere near as wasteful in cutting timber as a lumber company and, as their demands upon the forest are relatively small, they can easily place their work upon a permanent basis.

At present, most of the large leather companies in this country tan their hides with an extract made from hemlock bark, and in order to insure their supply, many of them own large tracts of timberland. Hemlock is what they want and, therefore, they should cut so as to favor the growth of hemlock as much as possible, but as a matter of fact, their lumbering operations are usually carried on with apparently no thought for the reproduction and future growth of hemlock.

Forestry is a good, practical business proposition for anyone who wants an unusually safe long time investment and therefore

it is more suitable for corporations, who are always looking well into the future, than it is for the average individual.

FORESTRY AND THE RAILROADS.

It is only within the last few years that the railroads of this country have begun to seriously consider the subject of forestry and they have come to it through necessity, as it is increasingly difficult for them to secure the timber which they need, especially cross tie timber. In order to have good and safe tracks they must have good ties and the demands upon the forests for this one item alone are enormous. Mr. Howard Elliott, president Northern Pacific Railway, states that "the total consumption of ties for renewals only, by all of the railroads of the United States, is at least 100,000,000, to which add 20,000,000 for additional tracks and yards, and for the construction of new railroads, and the total is equivalent in board measure of more than 4,000,000,000 feet. The significance of these figures is more apparent when it is remembered that about 200 ties is the average yield per acre of forest, varying greatly in different localities, so that to supply this single item necessitates the denudation annually of over 500,000 acres of forest. But the cross tie supply is only one of the forest products required by the railroads. There are bridge timbers, fence posts, telegraph poles, building timbers of all kinds, including car material, all of which together it is estimated will equal in board measure the cross tie item, so that it is possible that the railroads of the United States require for all purposes, under present practices, the entire product of almost 1,000,000 acres of the forest annually." Dr. Herman von Schrenk, the foremost authority in this country on the subject of timber preservation and particularly in reference to the needs of railroads, says, "Up to within recent times most of the tie and construction timbers used by the railroads were timbers like the white oak and long leaf yellow pine. These were used because they combined great durability with strength and good wearing qualities. They were abundant along the lines of the roads and were obtainable in large quantities and at a comparatively low cost. A purchasing agent had no difficulty, not more than ten years ago, in getting any number of first class white oak ties in the middle or central states at from 35 to 60

cents. While the price for such timbers is not yet excessive, owing to local supplies, it is nevertheless becoming increasingly difficult to obtain large regular supplies of such timbers, and with an ever increasing demand, the question has been asked for several years, and with increasing anxiety, where the supply is to come from in the future. As a result of the uncertainty in getting a sufficient number of ties which could be used in the natural condition, many roads turned towards the so-called inferior woods, like red and water oak, beech, gum, the softer pines, hemlock, etc. None of these woods can be used without preservation, because they decay with great rapidity when in contact with the ground. It is a fortunate circumstance that these so-called inferior woods, because of their greater porosity, can be treated with chemicals so as to preserve them very effectively. Some day we may duplicate the conditions prevailing in eastern France, where the treated beech ties last until another crop of beech ties furnishes a new supply. Preservation will therefore be an almost indispensable factor in any consideration of future supply, and when one considers the good results obtained, its importance will be fully realized.

TABLE SHOWING ANNUAL CHARGES.

Timber and treatment.	Length of service.	Original cost.	Cost of treatment.	Annual charge.
White oak, untreated	10 years	\$0.85		\$0.121
Red oak or loblolly pine, untreated	5 years	.40		.124
Red oak or loblolly pine with zinc chloride treatment	10 years	.40	\$0.16	.085
Red oak or loblolly pine with zinc creosote treatment	16 years	.40	.25	.065
Red oak or loblolly pine with creosote treatment	20 years	.40	.45	.069

The conclusion to be drawn from such a table is that the treated timber in every case is cheaper in the long run than the untreated timber; furthermore, that the better treatments, although more expensive at first, are very much cheaper in the long run."

The Pennsylvania Railroad Company, which is one of the greatest systems in this country, after looking into the matter very carefully, have decided to grow on their own land a considerable part of the tie timber which they require. They use annually

east of Pittsburg and for repairs alone, over 3,000,000 ties besides 500,000 for new work. Three years ago they started to plant seedling locust trees, two or three years old, which cost when planted about 8 cents each. Most of the trees have been planted ten feet apart or about 400 to the acre, but in 1904 some 54,871 trees were planted six feet apart and 88,127, eight feet apart. The total number of trees planted to date is approximately as follows:

Fall, 1902	13,610	Fall, 1904	153,535
Fall, 1903	43,364	Spring, 1905	200,000
Spring, 1904	70,021	Fall, 1905	600,000

This road figures that at present, allowing 10 per cent for the immediate future increase, they will need about 3,850,000 ties per year and that their requirements will be constantly increasing. With their present consumption of 3,850,000 ties and figuring three ties to the tree, 1,300,000 trees must be cut each year. As it takes the yellow locust about thirty years to reach tie size, the Pennsylvania must have 39,000,000 growing trees and plant 1,300,000 each year, which would require about 97,500 acres for the purpose. Several other railroad systems have followed the example of the Pennsylvania, not so much with the idea of growing all the ties which they require as to show the farmers and other land owners along their lines how profitably their waste land can be utilized.

Many of the railroad companies, especially the Land Grant roads, own great tracts of timberland and now that they are well started, not only in timber preservation, but also in raising their ties, it is only natural that they should manage their forests systematically.

The federal forest service is carrying on extensive experiments in seasoning and treating ties at Escanaba, Michigan. This work was started in Wisconsin, but the tests are being made at Escanaba, where there is a large tie treating plant. The railroads are co-operating in this work, as they fully realize that something must be done to make the ties, and so the supply, last longer. It is particularly fortunate that the inferior woods, on account of being so porous, can be treated much more thoroughly than the more valuable hardwoods, so that the Lodgepole pine of the Rockies, which a few years ago was a much despised tree, is now in great

demand for ties. The people of Wisconsin have come to look upon the Jack pine as of very little value, but it has been proved that it makes a fair quality of paper pulp and it is more than probable that on account of its porosity it will take treatment well and make an excellent tie.

FORESTRY FOR THE INDIVIDUAL.

As the supply of timber decreases and the price steadily advances, owners of timberland are, more and more, studying the subject of forestry, as they realize that they cannot afford to continue to cut in the old way and thus destroy so much of the valuable young timber. This office has received letters from corporations and individuals, asking advice as to the best method of re-foresting cut-over lands but, as a rule, it would be a pure waste of money to attempt to either seed or plant until the slash of the old lumbering operations has been disposed of. That is the pity of it, that not having burned the slash or left any seed trees, they now find that in order to turn their waste lands into productive, timber bearing areas, they must go to the heavy expense of collecting and burning old slash and then either plant or sow. It is all so unnecessary, for, if the owner when logging would only pile and burn the slash (at an expense of not to exceed 25 cents per M feet for all logs cut) and leave a few crooked or limby trees for seeding purposes, nature would do the work herself and the land would be growing a new crop of timber a year or two after the first cut. This is all that the forester, as a rule, advises the individual timberland owner to do, for usually an individual cannot go to the expense of planting and then wait 40 to 50 years for the first cut. But when the slash is burned and the land restocked with self sown seed, the owner at once has a property which is much more valuable than a desolate, burned waste. A few farsighted men are today buying land which is covered with a good reproduction of some valuable timber like white pine, Norway or hemlock, for they realize that within a few years all thrifty, valuable young timber will command a good price. The one thing that every owner of timberlands should always remember is that it is the worst kind of financial policy to cut young, rapidly growing timber. When this is once fully realized, for-

estry will become the rule and not the exception, for if the young growth be saved to increase rapidly in volume, then of a necessity only the mature timber will be removed and common sense would dictate that the slash must be piled and burned, so as to protect the young timber which is left standing from destruction by forest fires. This is conservative lumbering or forestry, which is based upon the knowledge that forests are a crop and that only the mature, ripe crop should be harvested.

Forestry is a very safe and sure long time investment, yielding as a rule from 5 to 6% on the investment and so in these "get rich quick" days, it appeals more strongly to the government, state or large corporation than it does to the individual owner. But many a man who will tell you that he cannot afford to hold his timber for a second cut is placing his money in a savings bank or insurance company and in neither case does he receive 5% on his money, which the young timber would pay him, not taking into consideration any increase in value of stumpage, which is almost certain to be steady and rapid.

The individual owner may only intend to log once and then sell his land but even in that case it is still a foolish policy to cut young, growing timber. Cutting only the mature timber is more expensive, as the logging is scattered, but the extra cost is more than made up by the increased growth of the young timber which is left standing.

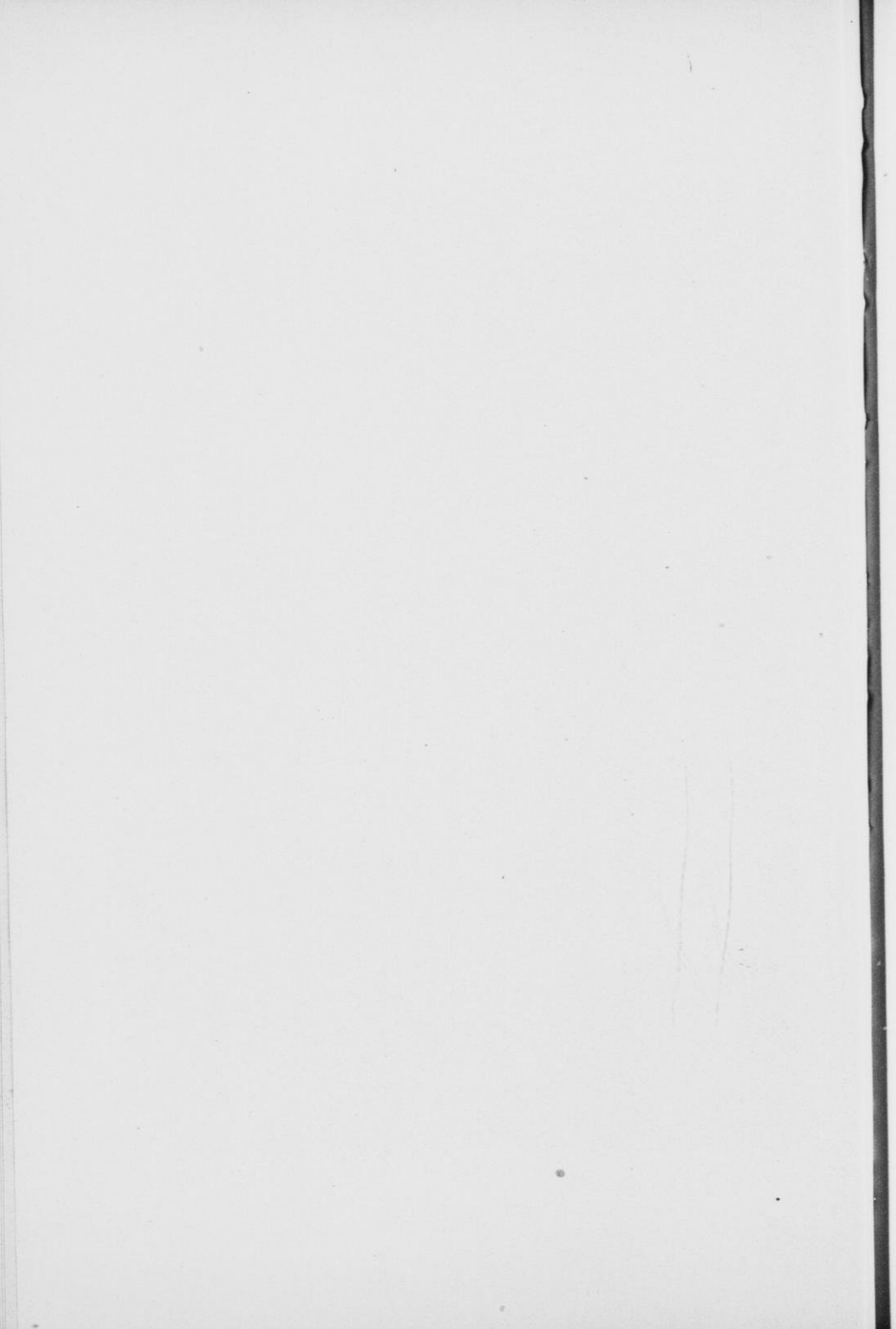
Many individual owners in New York, Maine and New Hampshire have a steady, permanent income from their timberlands and would never think of allowing any contractor to take all the trees at one time, but hold them to the more or less mature timber, stating in the contract the diameter to which the cutting is limited.

Many lumbermen state that there are three factors which deter them from adopting forestry methods, viz., time, taxes and fire. The first is no deterrent, for it is a poor, foolish policy to cut young, unripe timber, even if you do not mean to hold the land for a second crop, for in any event land is now worth much more when it has growing timber on it.

Taxes, the second objection, is unfortunately a very valid reason in many sections of the state for not practicing forestry. Many town assessors seem to feel that they must tax the timberland owner, especially the non-resident owner, as heavily as possi-



Forestry management on Indian Reservations. The group of five white pine have been left to seed the cut-over land, and the brush is piled ready to be burned.



ble and naturally in self-defense the owner is forced to cut his timber and so reduce the taxes to a reasonable amount. Then, when it is too late, the towns find that they have "killed the goose that laid the golden egg." However, the loss of the taxes on the timber is but a drop in the bucket compared to the irreparable damage to many communities from losing the industries which depended upon the forests for their raw material. To appreciate this one only needs to visit towns in which the sawmills have shut down on account of lack of timber.

Of late years the end of the timber has been largely hastened on account of the excessive taxes placed upon it. The whole system of forest taxation in this country is wrong, for it puts a premium on forest destruction. Would not our farmers have something to say and would they be as prosperous as they are, if their growing wheat and corn were taxed every day? And yet a crop of timber which may take from 40 to 150 years to grow and be ready for harvesting, is taxed every year. In order to be perfectly just and also to encourage the owner to let his timber grow until it is mature, and then cut conservatively, so as to place his business upon a permanent basis, there should simply be a tax on the land and none on the timber until it is cut. This is in line with the practice in England, Germany, France, Switzerland, Austria, Russia and Japan. Germany, which is the most progressive in this respect, taxes timberlands according to the gross or net revenue. This question is a most important one and its correct solution will hasten the general adoption of forestry by many years.

The third and last reason for not adopting forestry, viz., fire, seems more difficult to solve than it really is. Lumbermen have been in the habit of stating that forestry would never be a success until the forest fire problem was solved, but it is just because they did not adopt forestry methods that such fearfully destructive fires have followed their lumbering operations. If, twenty years ago, the state of Wisconsin had passed a law providing that in all lumbering operations the slash must be piled and burned, there would still be millions of acres of standing timber in the northern part of the state, which is now a burned, desolate waste. Several attempts were made to pass such a law, but in every instance it was killed by the lumbermen.

When the slashings are burned, only surface fires can follow and these do only a relatively small amount of damage. With any sort of proper care, hardwood forests should be almost immune from destructive fires and even in pure coniferous forests, the most dangerous of all, burning the slash and a close watch by means of fire wardens during the dangerously dry seasons, reduces the danger to a minimum.

The United States Indian department is now providing in all new contracts that loggers on Indian reservations must pile and burn the slash, and that this is entirely feasible and practical was testified to by Mr. F. E. Weyerhaeuser of St. Paul in his address before the American forest congress in Washington, January, 1905, when he said: "The next obstacle [to forestry], more important because harder to overcome, is fire. I am frank enough to say that in this matter lumbermen themselves are largely responsible, sometimes even to the extent of fighting reform. For example: two years ago a bill was proposed in Minnesota providing for the burning of slashings. Because of the opposition of the lumbermen, it was never reported out of the committee. Since then the government has required the burning of slashings on the Leech Lake Indian reservation. The wise and moderate regulations suggested by the Bureau of Forestry were introduced with complete success. It was a splendid object lesson. A wisely drawn bill presented to the legislature today would be supported by the best of lumbermen." In Wisconsin the slash is being piled and burned on both the Bad River and Flambeau Indian reservations.

Of course, it would never do to let the fire run through the slash without piling it, for such a fierce fire would be the result that all the young growth would be destroyed. The slash should be piled in the winter when the logging is being done and then must be burned in the spring before the forests become thoroughly dry. If summer logging is carried on, the slash should be piled as the cutting proceeds and burned as soon as possible on wet days when the fire will not run. If the timberland owner will pile and burn his slashings, he will be fairly safe from forest fires and the additional protection which the state and town afford him is explained under the section "Fire Warden System."





A fine forest of Jack pine poles. Formerly this timber was much despised but now commands a ready sale.

THE FARM WOODLOT.

The rapidly increasing value of timber is causing the American farmer to begin to pay some attention to the care of his woodlot, which in nearly every case is such a valuable component part of the farm. Many of the settlers in the northern part of Wisconsin are quite as much lumbermen as farmers and receive a large part of their income from the sale of saw logs, pulpwood, cordwood and bark, and they should be particularly interested in forestry, as they naturally expect to own and operate their woodlots for many years.

Farmers should always remember that their timber is a valuable asset, becoming daily more so through the rapid depletion of the forests, and that where their timber grows on soil unsuited or poorly adapted to agriculture, it will oftentimes pay them far better to cut carefully and systematically, thus securing a steady financial return, than to cut everything at once and then clear land which nature, doubtless, intended for forest growth.

The farmers of Maine, New York and New Hampshire have very much the same conditions and problems and have found out by experience that their timberlands are money producers, and that it is much better to have a small area of good plow land than a lot of sand or rock which should never have been cleared. The abandoned farms in New England are a striking example of just such fearfully costly mistakes and nature herself is now restocking them with forests, as if pointing out to man his error.

In discussing the treatment of the woodlot, only such points will be considered as apply to farm timberlands in all sections of the state. In each case, the farmer must determine for himself whether it will be more profitable for him to grow the largest possible amount of timber on his land or if he should strive first of all to secure quality. This will depend upon the character of his timber and the local market, for if the object is to grow cordwood, quantity is what he wants, but if saw logs, then usually quality. In either case, the young forest should be kept very dense, so that only a small amount of sunlight can reach the ground, thus forcing the trees to grow rapidly in height. Thus a well-stocked, more or less even aged forest will have the greatest amount of timber per acre, and where quantity is desired, the timber should be

thinned out, as soon as such thinnings will pay for themselves, before the fierce struggle for existence begins, which lessens the increase in wood in the whole forest, though forcing the survival of the fittest. In other words, such thinnings will allow the trees to gain in diameter more rapidly, thus making quantity of wood, while if the forest had been kept dense and the struggle allowed to continue until the trees had reached their height growth, the stems of the survivors would have been unusually long and clear, and then after thinning would increase rapidly in diameter with little danger of forming side branches.

Most people do not understand that trees grown in open woods and in clearings will always form branches, often nearly to the ground, on account of having so much side light, which develops the dormant buds under the bark, and that in order to grow clear lumber, woods must always be kept dense.

FOREST MANAGEMENT.

Most woodlots are altogether too park like, with a few scattered trees, large and limby, only fit for cordwood, and a heavy covering of grass on the soil. Grazing in such woods does very little harm, as there is practically no young growth to be injured, but where the farmer expects to make anything out of his woodlot, he should exclude all cattle and even horses where there is much young growth.

A valuable tree takes up no more room than a worthless one and therefore all the trees which are over-mature, decaying, crooked, large crowned and of a poor species, should be taken out as soon as possible without opening up the forest too rapidly and thus allowing the soil to dry out. In many cases the blanks so formed will be restocked by self sown seed from the more valuable trees which have been left standing, or they can be sown or planted either with nursery plants, transplants raised on the farm or wild seedlings from nearby forests. Where a heavy grass has been allowed to form in open, park like woods, it must be either burned off, where there is no young timber to be killed, or else plowed under, in order that the self sown seed may reach the soil and germinate.

The best grade of white pine grows in Wisconsin, it is a valuable timber which will always be in demand, and for various other reasons it is recommended for planting. When two year old nursery plants are bought and labor hired, planting 1,210 white pine per acre (six by six feet), costs from \$7 to \$9. But when the plants are raised on the farm, or wild seedlings gathered, the cost will be reduced to from \$4 to \$6 per acre.

Hardwoods can be grown very easily by gathering the nuts or acorns in the woods and planting them in the ground to a depth of from 1½ to 3 inches.

On all farms there are also certain sections which are not arable and it is a very easy and inexpensive matter to plant them up, thus either securing a future supply of timber or else making the farm more readily salable. Whenever possible, the woodlot should be on the highest land on the farm, which is not arable, so that the snow water which will be held within it as in a great sponge may sink to the lower cultivated fields during the hot months when the crops are often so badly in need of water. When the woodlot has been fully stocked with valuable species, the greatest care should be taken to keep the stand dense and at first, in order to prevent the trees from forming side branches, it may pay to do a certain amount of pruning, though such an operation would, of course, be out of the question for a lumberman over any large area of forest.

Pruning pine or other conifers will often pay and is very easy, as a man with a sharp axe can cut off the limbs cleanly, close to the bark, as high as he can reach; but pruning hardwoods is not so satisfactory, much more difficult and should only be undertaken when it is very certain that it will pay. Pruning should be done when the trees are young, so that the wounds will heal over rapidly, and only such trees should be pruned as are expected to form part of the final crop.

IMPROVEMENT CUTTINGS.

As previously stated, the first cuttings on nearly all woodlots, as they are usually in bad shape from neglect, should remove the worthless and inferior trees which are simply taking up space in the forest which might be occupied by valuable species. The

trees to be cut should be marked by the owner, or some one who will use careful judgment, and all cuttings should be done in deep snow, so as to avoid all possible injury to the young growth.

In a dense stand of young timber which has reached the pole stage, the struggle to dominate is often so severe that the growth of the forest is seriously retarded, so that whenever the operation will pay for itself, thinnings should be made in order to give the best young trees a chance for much more rapid development. Such thinnings should be made most carefully, removing the dead, dying and suppressed trees in order to favor the best which are shooting ahead, but in no case forming large blanks which would dry out, thus losing humus and soil fertility and checking reproduction. Later on, when the trees thus favored in the thinning are reaching merchantable size, reproduction cuttings should be made, so as to restock the area with self sown seed of the best species and to do it so that the ground is fully restocked before the old timber is removed.

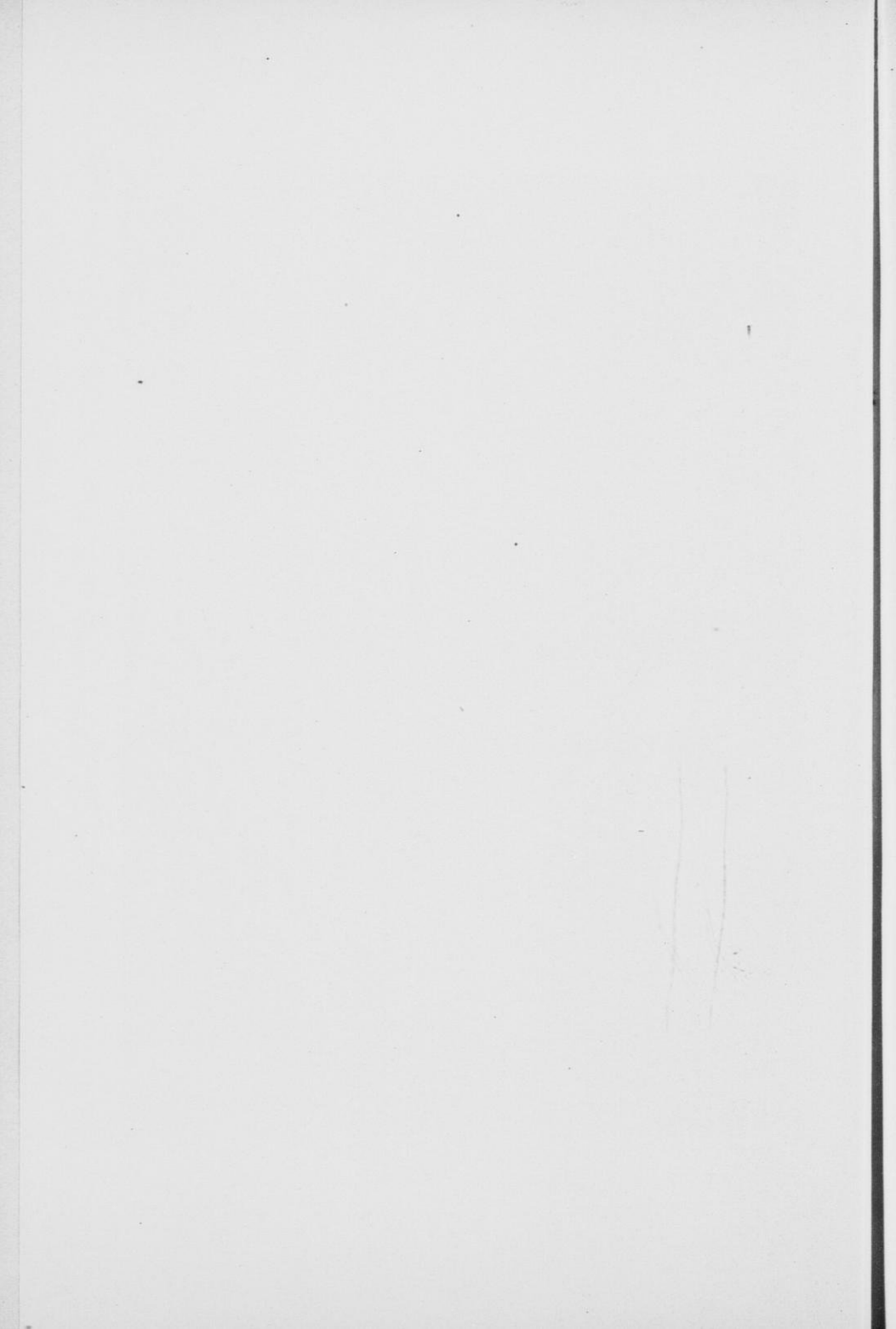
When the over-mature, large crowned, defective and worthless trees have been removed, the remaining timber, especially the young growth which has been more or less shaded and suppressed, will receive more sunlight and thus the rate of growth will be increased. After a careful examination in the forests of the Adirondack mountains of New York, it was found that fully 20% of the remaining trees were affected and that on the average the rate of growth was increased 50%. This is an extremely important point to bear in mind, for it means a corresponding increase in the interest on the capital invested.

INCREASED GROWTH AFTER LUMBERING.

As previously stated, one of the important reasons for limiting the logging operations to the large, more or less mature timber, is because the smaller trees which are left standing will grow so much more rapidly after the large timber has been removed. This increased growth is accounted for simply from the fact that the humus disintegrates more rapidly and that the small timber which has grown up somewhat under the shade of the dominant trees, receives a large increase of di-



White pine and Norway thrown by a cyclone. Very difficult to log and great danger of forest fire.



rect sunlight and room to spread both its root system and crown. The timberland owner, therefore, who cuts small timber is robbing himself of the increased growth and, hence, the added volume which he might have.

In 1898 Gifford Pinchot, the present head of the U. S. forest service, made a working plan for a tract of 40,000 acres of timberland in the Adirondack mountains of New York, owned by Dr. W. S. Webb. During the preparation of this working plan, 2,000 small trees, which had been left in the first lumbering operations, were cut and carefully measured to determine how their rate of growth had been affected by the cutting. The rate of growth of 298 trees in the original forest was also determined, so as to compare the results, which are extremely interesting, as will be seen from a study of the following table:

(Figures compiled from "The Adirondack Spruce.")

Diameter of tree. Inches.	In the virgin forest, number of years re- quired to grow one inch in diameter. Column 1.	After first cutting, number of years re- quired to grow one inch in diameter Column 2.
5	12	10
6	13	6
7	12	6
8	10	5
9	9	5
10	8	5
11	8	5
12	6	4
13	6	6
14	7	
15	8	

It will be seen from column 1 that in this particular region it takes a spruce tree of 5 inches in diameter 12 years to grow one inch while a 12 or 13 inch tree only requires 6 years, just half as much. Spruce in the Adirondaeks is chiefly valuable for pulp and the pulp and paper companies were in the habit of cutting down to 5 inches, thus taking trees which had not begun to get their maximum growth. Taking into consideration the amount which could be obtained on the first cut and the rate of growth, it was recommended that the cutting be limited to trees of 12 inches in diameter, which was done. Now, looking at column 2, we find that the rate of growth of trees

left after the first cutting is greatly increased, in several instances from 75 to 100 per cent., which means just that much increase on the capital invested. A 6 inch tree, which required 13 years in the virgin forest to increase one inch in diameter, will add just as much to its volume, after the first cutting and when it receives more light, in 6 years. In the same way, a 7 inch tree, requiring 12 years in the virgin forest, only takes 6, after the first cutting. As the trees become larger in diameter, the difference is less, until we find that a 13 inch tree requires both in the virgin forest and with more open conditions, 6 years to increase one inch in diameter, proving that trees which have grown for a long time under dense shade cannot shoot ahead when the shade is removed. This also proves that in the case of spruce in the Adirondacks, it is well enough to cut to 12 or 13 inches, as the trees have passed their time of fastest growth, but that it would be a great mistake to cut below this limit.

In Wisconsin, we are more directly interested in the rate of growth of white and Norway pine, hemlock, etc., than in spruce, which constitutes only a small portion of our timber. At present, figures on the rate of growth of all the merchantable species in Wisconsin are being compiled but are not yet completed for publication.

In 1896 Messrs. Pinchot and Graves made a careful study of the white pine in Pennsylvania and the following facts and figures are taken from their book "The White Pine." "The lumber length of a tree increases with the diameter. In the table which follows, the lumber length is regarded as the length from the level of the ground to the uppermost end of the merchantable timber, which was taken at the point determined by the actual practice of the lumbermen in each case. For the sake of convenience in determining the lumber length of standing trees, the stump has been disregarded.

DIAMETER BREAST HIGH IN INCHES.

10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
68.3	72	75.2	77.2	79	80.5	81.5	82.3	83	83.5	84	84.5	84.8	85	85.3	85.5

LUMBER LENGTH IN PER CENT OF TOTAL LENGTH.

"This table presents the relatively smaller loss from trees of large diameter under the present demands of the market. A glance at it shows that, while over 85 per cent of the length of a tree 40 inches in diameter is valuable for lumber, the proportion falls to 80.5 per cent at the diameter of 20 inches, and to 68.3 per cent when the diameter is only 10 inches. The comparatively slow increase of the percentage of lumber length after a diameter of 20 inches has been reached is interesting in connection with the slow rate of height growth in old trees."

And later on, speaking of the relation of the sap-wood to the total volume of the tree, they say: "We find that, with increase in the diameter of a tree, the percentage of sap-wood falls off, as shown by the following table:

DIAMETER BREST HIGH IN INCHES.

10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
VOLUME OF SAP-WOOD IN PER CENT OF THE TOTAL VOLUME OF WOOD.															
37	34	31.3	28.8	26.6	24.6	22.9	21.5	20.2	19.2	18.2	17.5	16.8	16.1	15.5	15

"Since the best grades of lumber are required to be free from sap-wood, the figures in this table exhibit clearly one of the reasons why a better product is cut from large logs than from small ones. They show that in spite of the steady increase in the number of rings of sap-wood as a tree grows older, it forms a less and less important part of the whole bulk of the tree."

All the available data proves in one way and another that often times the young timber which is cut actually does not pay for the cost of its removal and that in every case, young timber which is left standing increases rapidly in growth, which means increased returns on the capital invested.

INCREASE IN STUMPAGE VALUES.

Mr. James T. Barber, president Northwestern Lumber company, Wisconsin, when speaking on this subject before the American forest congress in Washington in 1905, quoted the experience of Cornell with white pine lands in Wisconsin as

showing the wonderful rise in stumpage. In 1865 Hon. Ezra Cornell, who founded the university named after him, purchased with scrip and for the university, 500,000 acres of pine lands in Wisconsin. The scrip cost him 60 cents per acre, which, at the very low estimates then customary, made the pine stumpage cost from 6 to 10 cents per thousand feet. The 500,000 acres have now been practically all disposed of at a clear profit, after paying all expenses, taxes, etc., of \$5,500,000, and some of the last sales of the pine stumpage have been at from \$10 to \$12 per M. Now, in 1906, the best white pine stumpage has risen to from \$15 to \$18 per M and it is not at all improbable that within the next few years it will have risen to \$20.

The supply of white pine, however, is decreasing so rapidly in Wisconsin that within a very few years it will cease to be an important factor in the lumber industry of the state and hence the rise in stumpage prices of other species, already so marked, will be far more important.

Only a few years ago hemlock was considered of very little value but now it is being extensively manufactured into lumber and 100,000,000 feet is used annually for pulpwood. Since 1903 hemlock stumpage has risen from \$1.50 to \$4 and even at the latter price, it is comparatively cheap, taking into consideration the price at which pine is selling and the triple demand for hemlock, namely, for lumber, pulp wood and bark for tanning. Therefore, the rise in hemlock stumpage will probably be both rapid and constant, for, as the supply of pine for lumber and spruce for pulp wood rapidly diminishes, the demand will become greater and greater.

In many portions of the state cedar is becoming very scarce, while in others there is still an ample supply, so that prices differ widely, but on the whole it may be said that within the last three years cedar stumpage has risen from \$3 to \$5. The great value of tamarack is at last being appreciated, as is shown by its rapid rise in price, for in the last few years it has risen from \$2 to \$5, \$6, \$7 and even in some cases to \$11 per M.

Extensive operations in hardwoods are comparatively recent and hence the stumpage can still be bought at a relatively low





At least a fringe of timber should be left around our beautiful northern lakes. The shores are then much more valuable for cottage and camp sites.

figure but it is safe to say that the chances are all in favor of a much more rapid rise in the near future.

As Mr. Barber pointed out in his address, pine stumpage has steadily risen for fifty years, irrespective of the ups and downs of the lumber market and this has been the history of all timber, not only in Wisconsin but all over the United States. This being the case, it has seemed the most short sighted policy for lumber companies to slash their timber lands, taking only the best logs and destroying the young growing timber, and in many cases, especially when the market for lumber was low, they have butchered their timber to no purpose, for they would have made more money if they had held the stumpage.

Certainly, owners of stumpage must soon come to realize that they cannot afford to sell to lumber companies without some restrictions on the cutting, for otherwise their timberlands will be either destroyed or at least seriously injured in the lumbering. As previously stated, the owners of spruce lands in New York and Maine limit the diameter to which their timber shall be cut. The following contract is used by this office in selling timber on state forest reserve lands:

CONTRACT BETWEEN THE STATE BOARD OF FORESTRY OF WISCONSIN AND

..... of, ..

This agreement made and entered into this.. day of, 190.., between the State Board of Forestry of Wisconsin, party of the first part, and, party of the second part.

Witnesseth, that the said party of the first part agrees to sell to the party of the second part, under the following rules, the mature white and Norway pine, tamarack and spruce on the following described lands,, at the following prices, which have been bid by the party of the second part, viz.:

White pine	\$12.15 per M. ft.
Norway pine.....	11.05 per M. ft.
Tamarack.....	5.05 per M. ft.

The logs shall be scaled by the Scribner decimal C rule and it is hereby understood and agreed that the cost of scaling shall be equally divided between the parties of the first and second parts.

The party of the second part agrees to cut the timber in accordance with the following rules:

RULES FOR LOGGING.

1. No trees shall be cut which are not marked for cutting by the party of the first part.

2. If unmarked trees are cut, they shall be scaled and paid for at double the stumpage price for the species cut.

3. All trees marked and containing merchantable timber shall be cut.

4. No trees containing merchantable timber shall be left lodged in the woods. Care shall be taken not to injure young growth while cutting or hauling the timber. No white or Norway pine, spruce, cedar, tamarack, hemlock or basswood shall be used for bridges, corduroy, skids, slides, or for building camps or dams, unless the scarcity of less valuable timber makes its use absolutely necessary. All merchantable timber used for skids shall be cut into logs and scaled. Any logs left in the woods or along the roads will be scaled.

5. The party of the second part agrees to pile all slash as the cutting proceeds and to burn the same at such times and in such manner as the party of the first part may direct.

6. The violation of any of the above rules if persisted in, shall be deemed a sufficient cause for annulling the contract.

Actually marking every tree which is to be cut is far more satisfactory than merely limiting the diameter, and is not difficult or expensive, as a crew of three men can readily mark from 40 to 60 acres a day, according to the stand, and the work should not cost over 12 cents an acre.

Appendix



State Forestry Laws.

CHAPTER 264, LAWS of 1905.

AN ACT creating a forestry board, to appoint fire wardens and trespass agents and making an appropriation therefor.

The people of the state of Wisconsin, represented in senate and assembly, do enact as follows:

State board of forestry. SECTION 1. There shall be a state board of forestry, consisting of the president of the state university, the director of the state geological survey, the dean of the state agricultural department, the attorney general and one other member to be appointed by the governor. Said board shall select its own president and shall perform the duties hereinafter provided; and shall meet on the second Monday in January, April, July and October of each year, and at such other times as may be necessary. They shall receive no compensation except their actual expenses to be audited by the secretary of state and paid out of the state treasury.

State forester and his duties. SECTION 2. There shall be a state forester, who shall be a technically trained forester, appointed by the state board of forestry, and whether any candidate for this position is a technically trained forester shall be determined by certificate from the secretary of the United States department of agriculture. He shall receive a salary of twenty-five hundred dollars per year, and the actual and necessary traveling and field expenses, incurred in the conduct of his official business; be empowered to appoint a clerk whose salary shall not exceed eight hundred dollars per annum; be supplied with suitable offices in the capitol building; be entitled from the superin-

tendent of public property to such stationery, postage and other office supplies and equipment as may be necessary; be authorized to purchase all necessary field supplies, equipment and instruments; be furnished by the state all necessary printed forms and notices and the publications hereinafter provided; and shall act as secretary of the state board of forestry. He shall, under the supervision of the state board of forestry, execute all matters pertaining to forestry within the jurisdiction of the state; direct the management of the state forest reserve; collect data relative to forest destruction and conditions; take such action as is authorized by law to prevent and extinguish forest fires and to prevent forest trespass; cooperate in forestry as provided under section 5 of this act; advance as he may deem wise, by the issuing of publications and by lectures, the cause of forestry within the state; and may, upon invitation of the board of regents of the University of Wisconsin supervise such courses in forestry as may hereafter be provided for at said university. He shall prepare annually a report to the state board of forestry on the progress and condition of state forest work, and recommend therein plans for improving the state system of forest protection, management, replacement and taxation. The state board of forestry shall report annually a summary of such facts to the governor.

State forest reserve. SECTION 3. The sale of all lands belonging to the state north of town 33 shall cease upon the passage of this act, and such lands north of town 33 shall constitute the state forest reserve; provided, that those state lands within said forest reserve which after examination by the state forester are found by him to be more suitable for other purposes than for the purposes of the state forest reserve because of their character, condition, extent or situation, may be sold by the commissioners of the public lands, upon the recommendation of the state forester and with the approval of the state board of forestry. The state forester shall, under the supervision of the state board of forestry, direct the management of the state forest reserve, to which end he may employ the necessary assistance, and may upon said reserve institute conservative lumbering, make and maintain forest nurseries, plantations and fire lines and execute other silvicultural and protective measures necessary to the highest permanent usefulness of said reserve to the state. In such conservative lumbering the state forester is authorized, under the supervision of the state board of forestry, to remove or cause to be removed, when and in such manner as he may deem advisable, wood, timber, or other products from said reserve. Such wood, timber or other products shall be sold to the highest bidder upon contracts executed and signed by the state forester,

on behalf of the state, subject to the approval of the state board of forestry.

Grants of land for state forest reserve. SECTION 4. The state board of forestry is hereby authorized, when in its judgment it is advisable to accept on behalf of the state any grant of land within the state, which shall become a part of the state forest reserve; provided, that no such grant shall be accepted until its title has been examined by the attorney general and a report made to said board of the results of such examination.

Public parks. SECTION 4a. The state board of forestry shall visit points of natural interest in the state and examine into and consider the propriety and desirability of securing such places as public parks. Said board may further investigate as to the price and report its conclusions to the next session of the legislature.

Cooperation in forestry. SECTION 5. The state forester shall, acting under the supervision of the state board of forestry, whenever he deems it necessary to the best interests of the people and the state, cooperate in forest surveys, forest studies and forest protection, and in the preparation of plans for the protection, management, replacement of trees, woodlots and timber tracts, with any of the several departments of the federal or state governments or the governments of other states, and with counties, towns, corporations and individuals.

Assistant state forester. SECTION 6. There shall be an assistant state forester, who shall be a technically trained forester, appointed by the state forester with the approval of the state board of forestry. He shall receive a salary of fifteen hundred dollars per year, and the actual and necessary traveling and field expenses, incurred in the conduct of his official business. He shall perform such duties as may be assigned to him by the state forester, and shall represent the latter in case of disability or absence.

State and town fire wardens. SECTION 7. The state forester shall also be state fire warden, and the assistant state forester shall be assistant state fire warden. The state forester shall appoint one or more town fire wardens for those organized towns in which he deems it necessary, or for such portions of organized towns as he may define, and he may remove any fire warden from office. He shall give the necessary instructions to said fire wardens and supervise the execution of their work.

Powers and duties of town fire wardens. SECTION 8. Each town fire warden, before entering upon his duties, shall take an oath of office and file the same with the state forester. All town fire wardens shall take prompt and effective measures against the spread and illegal setting of forest, marsh or swamp fires within their own and adjoining towns and have the power of sheriffs to arrest without warrant for violations of the provisions of this act. They shall have authority to call upon any able bodied citizen, in territory in which they act, to assist in extinguishing forest, marsh or swamp fires in such manner as they may direct. The town fire wardens shall first submit to the state forester itemized accounts for their own services and the services of their assistants, and no accounts shall be paid out of the treasury of the town in which such services have been rendered without a written approval of the state forester. The town fire wardens and those assisting them shall receive such compensation for their services in carrying out the provisions of this section as the town board shall allow, not to exceed 25 cents per hour for the time actually employed; provided, that the total of such accounts shall not exceed one hundred dollars for each thirty-six sections in any one year in any one town. The state forester is authorized to approve for payment not to exceed 50 per centum of the clear proceeds of any fine collected in an action brought for a violation of any of the provisions of sections 17 or 18 of this act, or sections 4405a or 4406, statutes of 1898, relating to setting, failure to put out or care of fires, where the evidence to secure a conviction is furnished by a town fire warden or any other person.

Liability of town fire wardens and citizens. SECTION 9. Any town fire warden who shall refuse to carry out the provisions of the preceding section or any able bodied citizen who shall refuse to render assistance as provided by said section, shall be punished by a fine of not less than ten, nor more than fifty dollars, or by imprisonment in the county jail for not less than ten days or more than thirty days, or by both such fine and imprisonment.

Fire warning notices. SECTION 10. Each town fire warden shall post or cause to be posted conspicuously in those parts of his town where fires are likely to occur, all notices furnished him for that purpose by the state forester, and he shall receive therefor compensation at the rate provided in section 8 of this act.

Report of fire wardens. SECTION 11. Every fire warden, immediately after each fire within his territory, shall forward to the state forester a detailed report of said fire, and shall report annually on or

before the first day of December a summary of all forest fires and such other matters as the state forester may direct.

Trespass agents. SECTION 12. The state forester shall also be state trespass agent and the assistant state forester, assistant state trespass agent. As state trespass agent, the state forester shall appoint, and may remove from office, such trespass agents as he may deem expedient. He shall give the necessary instructions to said trespass agents and shall supervise the execution of their work. The state forester is authorized to approve for payment to any trespass agent or other person, upon whose evidence successful action is brought for trespass upon any portion of the state forest reserve, not to exceed 25 per centum of the amount collected for such trespass, which payment shall be made by the state treasurer. Provided that in no case shall such payment exceed five hundred dollars (\$500.00).

Oath and liability of trespass agents. SECTION 13. Every person appointed as trespass agent under authority of this act, shall, before entering upon his duties, take and subscribe the following oath of office: "I do solemnly swear that I will support the constitution of the United States and of the state of Wisconsin; that I will not engage, either directly or indirectly, in the purchase for my own benefit or for the benefit of any other person, of any state lands or products from said lands, so long as I remain a trespass agent, and that I will faithfully and to the best of my ability discharge the duties of such position, so help me God." Such oath of office shall be filed with the state forester. Any trespass agent who violates the terms of his oath regarding the purchase of state lands or products therefrom, shall be punished by a fine not less than three times the price paid for said land, or three times the market value of said products, or by imprisonment in the county jail for not less than thirty days or more than ninety days, or by both such fine and imprisonment.

Powers of trespass agents. SECTION 14. All trespass agents shall have the power of sheriffs to arrest without warrant for any violation of the provisions of this act. It shall be the duty of every trespass agent to immediately report to the state forester and the district attorney of the county in which such trespass is committed, all cases of trespass upon state lands, which come to his knowledge, and to furnish these officers with information required by them concerning said trespass.

District attorneys to prosecute. SECTION 15. Whenever an arrest shall have been made for any violation of any provision of this act, or

whenever any information of such violation shall have been lodged with him, it shall be the duty of the district attorney of the county in which the criminal act was committed to prosecute the offender or offenders. If any district attorney should fail to comply with the provisions of this section he shall be guilty of a misdemeanor and upon conviction shall be fined not less than \$100 nor more than \$1,000, or be imprisoned not less than thirty days nor more than one year, or both in the discretion of the court. The penalties of this section shall apply to any magistrate, with proper authority, who refuses or neglects without cause to issue a warrant for the arrest and prosecution of any person or persons when complaint, under oath, of violation of any terms of this act has been lodged with him.

Destruction of warning notices. SECTION 16. Any person who shall maliciously or wilfully destroy, deface, remove or disfigure any sign poster or warning notice posted under the provisions of this act shall be guilty of a misdemeanor and punishable upon conviction by a fine of not less than \$15 nor more than \$100, or by imprisonment in the county jail for a period of not less than ten days nor more than three months, or by both such fine and imprisonment.

Engines in forest land; burning weeds, etc. SECTION 17. It shall be unlawful for any logging locomotive, donkey or threshing engine, railway locomotive and all other engines, boilers and locomotives operated in, through or near, forest, brush or grass land, which do not burn oil as fuel, to be operated without a netting of steel or iron wires so constructed as to give the most practicable protection against the escape of sparks, cinders or fire from the smoke stacks thereof, and each such engine shall be provided with adequate devices to prevent the escape of fire from ash pans and fire boxes. Every railroad company shall, at least once in each year, as far as practicable, cut and burn or remove from its right of way all grass and weeds and burn and remove therefrom all brush, logs, refuse material and debris within a reasonable time, and whenever fires are set for such purpose shall take proper care to prevent the escape thereof from the right of way. 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. Engineers, conductors or trainmen who discover that fences or other material along the right of way or on lands adjacent to the railroad are burning or in danger from fire shall report the same to the agent or person in charge at their next stopping place at which there shall be a telegraph station. Railroad companies shall give particular instructions to their section employes for the prevention and prompt extinguishment of fires, cause notices, which shall be fur-

nished by the state fire warden, to be posted at their stations, and when a fire occurs along the line of their road, or on lands adjacent thereto, for which fire they are responsible, they shall concentrate such help and adopt such measures, as shall most effectually arrest its progress. The state fire warden, or his assistant, whenever it shall appear necessary, shall inspect the right of way of any railroad company for the purpose of ascertaining whether the provisions of this section have been complied with. Any person wilfully failing to comply with the requirements of this section shall be deemed guilty of a misdemeanor and shall be punished, upon conviction, by a fine of not less than fifty nor more than five hundred dollars, or by imprisonment in the county jail not exceeding one year, or by both such fine and imprisonment. Any corporation by its officers, agents or employes, wilfully violating the provisions of this section shall be liable to a fine of not less than fifty dollars nor more than five hundred dollars for each and every such violation, to be collected in a civil action in the name of the state.

Civil liability for forest fires. SECTION 18. In addition to the penalties provided in the preceding sections of this act, the United States, the state, the county or private owners, whose property is injured or destroyed by such fires, may recover, in a civil action, double the amount of damages suffered, if the fires occurred through wilfulness, malice or negligence. Persons or corporations causing fires in violation of this act shall be liable to the state in an action for debt, to the full amount of all damages done to state lands and for all expenses incurred by the towns fighting such fires.

Criminal action; forest trespass. SECTION 19. Every person who, unlawfully and wilfully cuts, injures or destroys any kind of wood or timber standing, lying or growing upon the lands of another, or of the state, or of the United States, or upon any public highway, or unlawfully and wilfully injures or destroys or carries away any of the products of such wood or timber lands is guilty of a misdemeanor, and upon conviction shall be fined not less than \$25 nor more than \$1,000 or be imprisoned not less than fifteen days nor more than three years, or by both such fine and imprisonment.

Civil liability for forest trespass. SECTION 20. In addition to the penalties provided in section 19 for wilful trespass on forest lands, the state, the county or the private owners, upon whose lands the wilful trespass was committed, may recover in a civil action double the amount of damages suffered. This section shall not apply to the cut-

ting of wood or timber from uncultivated woodland for the repair of a public highway or bridge upon or adjacent to the land.

Disposals of moneys from management of state forest reserve. SECTION 21. All moneys received from the sale of wood, timber, minerals or other products, and from the sale of state forest reserve lands, and penalties for trespass thereon, as hereinbefore provided, except when otherwise disposed of by constitutional provision, shall be paid into the state treasury and shall constitute a forest reserve fund which shall be disbursed only for the purchase of lands to be added to the state forest reserve and for the improvement and protection of said reserve and for the employment of the necessary assistance therefor, as hereinbefore provided, by or upon the order of the state forester, with the approval of the state board of forestry.

Appropriation. SECTION 22. There is hereby appropriated out of any funds in the state treasury not otherwise appropriated an annual appropriation of nine thousand eight hundred dollars to pay the annual salaries provided by the terms of this act, and for carrying out the provisions of this act. If all of said sum be not expended in any one year the balance not so expended may be used for the purpose aforesaid in any subsequent year.

SECTION 23. Paragraph 18 of section 1038; sections 1469, 1470, 1471 and 1816a, Wisconsin Statutes of 1898; sections 7 and 9 of chapter 432, laws of Wisconsin of 1901; chapter 450, laws of Wisconsin of 1903, and all acts and parts of acts inconsistent or in conflict with the provisions of this act are hereby repealed.

SECTION 24. The repeal of said sections and acts shall not affect any act done or right accrued or established, or any proceeding, suit or prosecution had or commenced in any civil or criminal action or proceeding previous to the time when such repeal shall take effect; but every such right or proceeding shall remain as valid and effectual as if the provision so repealed had remained in force.

SECTION 25. This act shall take effect and be in force from and after its passage and publication.

The two following sections, statutes of 1898, were not repealed and form an important part of the forestry law:

Section 4405a, statutes of 1898, provides as follows: Whenever the fire warden of any town becomes convinced that a dangerously dry time exists in its vicinity, and that it is imprudent to set fire on any land, he shall post or cause to be posted, a notice in three public places in such town forbidding the setting of any such fire therein, and after the posting of such notices no person shall set any fire upon any land in said town, except for warming the person or cooking food, until written permission has been received from one of the fire wardens of said town. All persons who start camp fires shall exercise all reasonable precautions to prevent damage therefrom, and shall extinguish the same before leaving them. Every person violating any provision of this section shall be punished by a fine of not more than \$50 or by imprisonment in the county jail not more than six months for each offense.

Section 4406, statutes of 1898, provides as follows: Any person who shall build a fire on any lands in this state not his own or under his control, except as hereinafter provided, shall before leaving the same, totally extinguish it, and upon failure to do so shall be punished by a fine not exceeding \$100 or by imprisonment in the county jail not exceeding one month, or by both such fine and imprisonment. Any person who shall negligently or wilfully set fire to or assist another to set fire on any land, whereby such land is injured or endangered or shall wilfully or negligently suffer any fire upon his own land to escape beyond the limits thereof, to the injury of the land of another, shall be punished as hereinbefore provided and be liable to the person injured for all damage that may be caused by the fire.