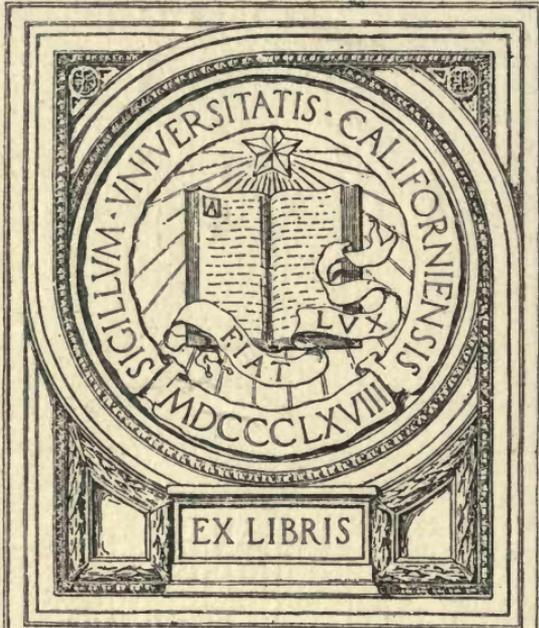


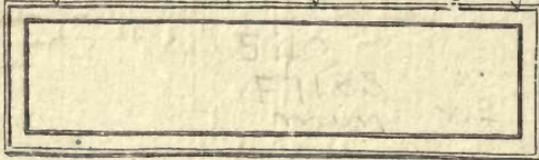


GIFT OF  
*Walter Mulford.*

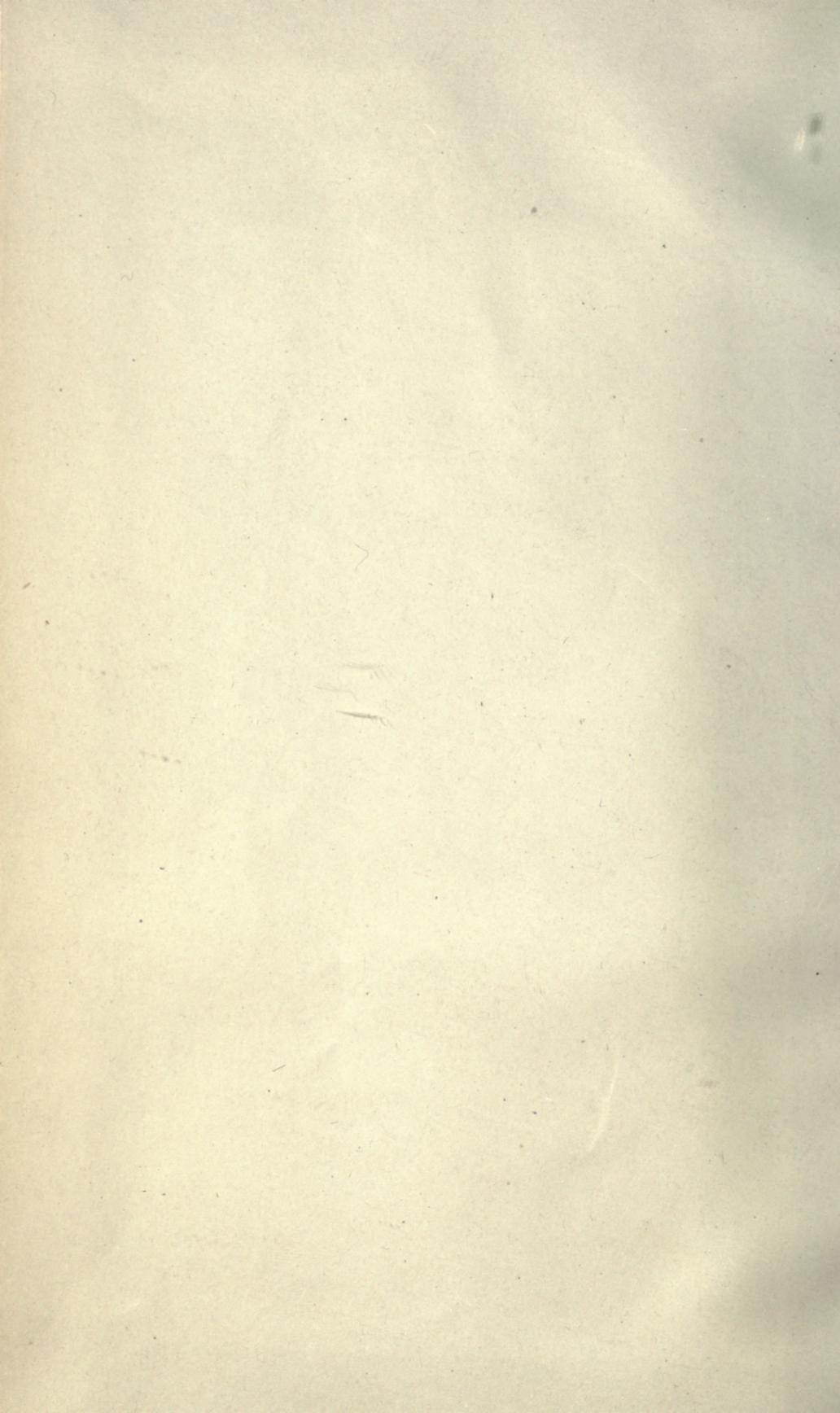


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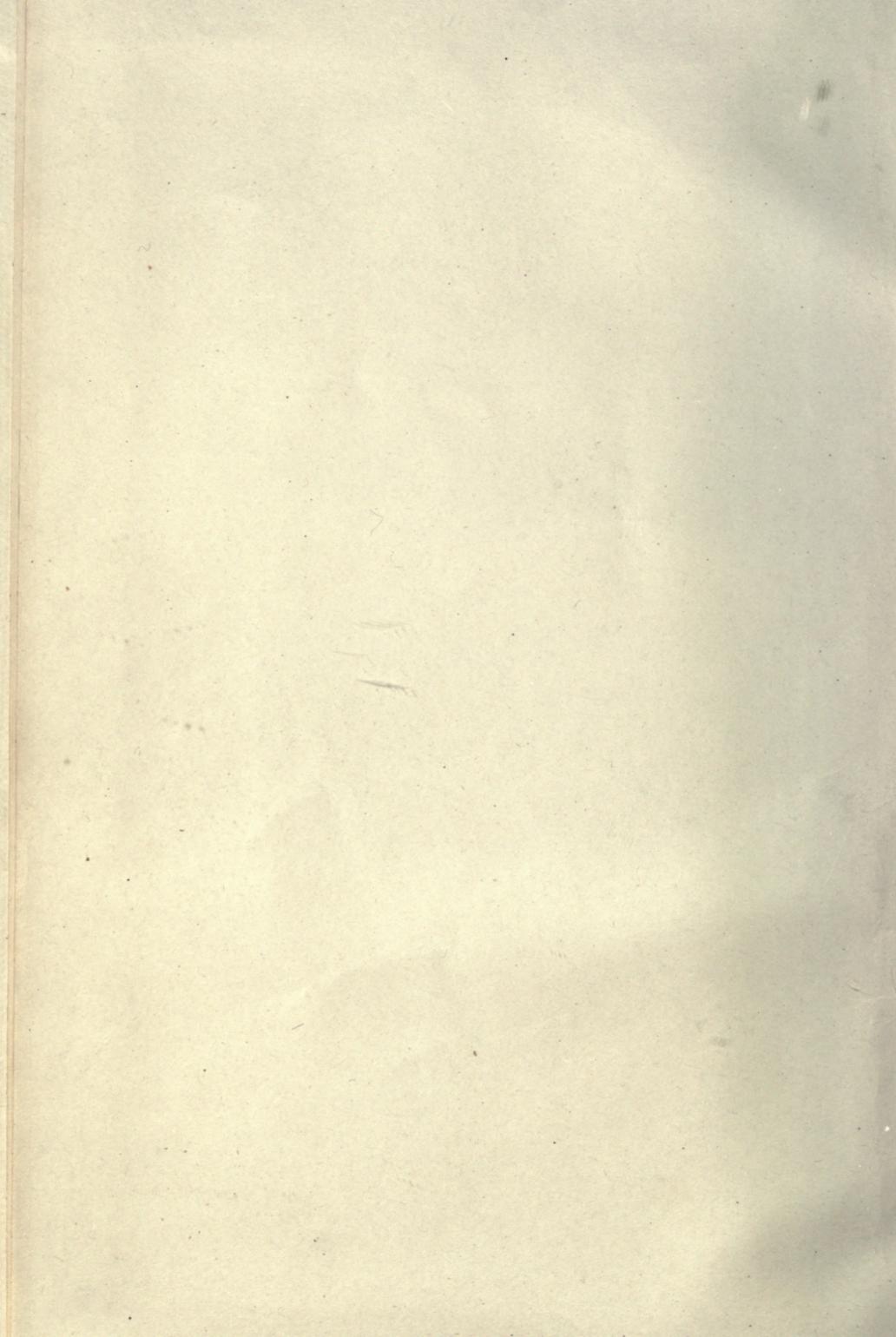
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MINNESOTA

ANNUAL REPORTS

VOL. III

State of Minnesota

1903

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Minnesota. 1903.

Eleventh Annual Report of the Forestry Commission-  
er of Minnesota for the year 1905.

Thirteenth Annual Report of the Forestry Commis-  
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In the Black Forest near the City of Freudenstadt in western part of Wurtemberg, Germany. Railroad right-of-way planted with maple and locust trees to guard against setting fire by sparks from locomotives. These woods on the right-of-way are cleared twice a year of combustible material such as sticks, leaves, etc.



Forest scenery along the St. Paul & Duluth (now Northern Pacific) Railroad, ruined by forest fires in 1894 or previously. Photographed in 1899 for the annual report of the Chief (Forest) Fire Warden of Minnesota.

# FORESTRY

*Walter Mumford*

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## NINTH ANNUAL REPORT.

OF THE

### CHIEF FIRE WARDEN

OF

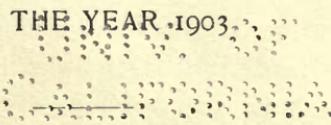
#### MINNESOTA

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UNDER THE ACT OF THE LEGISLATURE ENTITLED  
"AN ACT TO PROVIDE FOR THE PRESERVATION OF FORESTS OF THIS STATE AND FOR  
THE PREVENTION AND SUPPRESSION OF FOREST AND PRAIRIE FIRES,"  
APPROVED APRIL 18, 1895, AND AS AMENDED BY  
THE ACT OF APRIL 21, 1903

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FOR THE YEAR 1903.



ST. PAUL, MINN.:  
PRINTED BY THE PIONEER PRESS COMPANY.  
1904.

STATE OF MINNESOTA,  
OFFICE OF CHIEF FIRE WARDEN,  
ST. PAUL, MAY 17, 1904. }

*Hon. S. G. Iverson, State Auditor and Forest Commissioner:*

SIR: As required by section 3 of the Act for the Preservation of Forests, etc., approved April 18, 1895, amended by the Act of April 21, 1903, I have the honor to submit, herewith, my annual report for the year 1903.

Very respectfully,

C. C. ANDREWS,

*Chief Fire Warden.*

70 .VINE  
ANDREWS

NINTH ANNUAL REPORT  
OF THE  
CHIEF FIRE WARDEN  
OF MINNESOTA.

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The standing timber in Minnesota is worth easily \$100,000,000, and it is this property which the fire warden system seeks to protect. The state itself owns 2,500,000 acres of land, a part of which is forested and protected by the fire warden system. The state last November sold \$600,000 worth of timber from its own land, and has in all received \$4,000,000 for just the timber sold from exclusively its lands which it received as a gift from the United States. The state will continue for many years to sell timber of various kinds from these lands, and is on this particular account deeply interested in preventing damage by forest fires.

The local service in preventing and fighting fires, both forest and prairie, is rendered by the town supervisors, who are ex-officio fire wardens, and by those whom they summon to assist, and in unorganized territory by fire wardens specially appointed. This service is paid for in the first instance by the counties in which it is rendered, and the state pays to the counties two-thirds of such expense. Up to last year the state paid to the counties

only one-third of such expense. It is expected that the counties now will be more prompt and liberal in paying such service. In an ordinary year it may be assumed that the two-thirds of expense the state has to reimburse to the counties will amount to \$4,000. The other expenses pertain to the office of Chief Fire Warden, and include his salary, clerk hire, traveling expenses, postage, printing of warning notices, blanks, circulars, etc., and an edition of 4,000 copies of his annual report.

The item to cover all these expenses is found in the general appropriation act under the head of "Forest Preservation"; and I think the public will be surprised to learn that it amounts to only \$5,000. It is an amount—I will not say wholly—but very inadequate for the efficient execution of the law. I recommend that the appropriation for each of the next two fiscal years for "Forest Preservation" be \$10,000, and I trust that you will strongly indorse the recommendation. The amount which the legislature appropriates depends principally upon the Senate Committee on Finance and the House Committee on Appropriations. I have not failed to appear repeatedly before those committees to urge a larger appropriation.

Nobody knows when an exceptionally dangerous season may occur. It will not do to wait until it has come. Every spring the local fire wardens in about six hundred towns must be furnished with notices, instructions and blanks and kept on the alert so that in case a drouth should occur they will be active in preventing dangerous fires. The economical use of money is in the prevention of fires.

Our neighbor the province of Ontario expends \$30,000 and upwards a year in the prevention and extinguishment of forest fires.

## FOREST FIRES ELSEWHERE.

Before referring to the situation in this state in respect to fires, I would call to mind the excessive drouth, attended with very destructive forest fires, which prevailed in Oregon and Washington in the autumn of 1902, and the similar condition in the eastern states and Lower Canada in the spring and early summer of 1903. We are liable any year to experience a similar drouth, and should be prepared for it.

## FOREST FIRES IN MINNESOTA, 1903.

Although wet weather prevailed during the latter part of the summer and in the season of harvesting, there were dry spells in the spring and late autumn. The number of forest fires reported by fire wardens was 52, which burned over an area of 15,585 acres and did damage to the amount of \$28,292. At 27 of these fires, being a little more than half, a fire warden was present to assist in extinguishing and controlling the fire. Of these fires 11 were caused by clearing land, 9 by railroad locomotives, 7 from other known cause, and 25 originated from cause unknown.

The number of prairie fires reported was 35, which burned over 26,308 acres and did damage to the amount of \$4,666. At 14 of these fires a fire warden was present, and assisted in extinguishing and controlling the same. They were caused, 9 from burning brush, straw or stubble, 4 by railroad locomotives, 3 by hunters, 6 from other known cause and 13 from cause unknown.

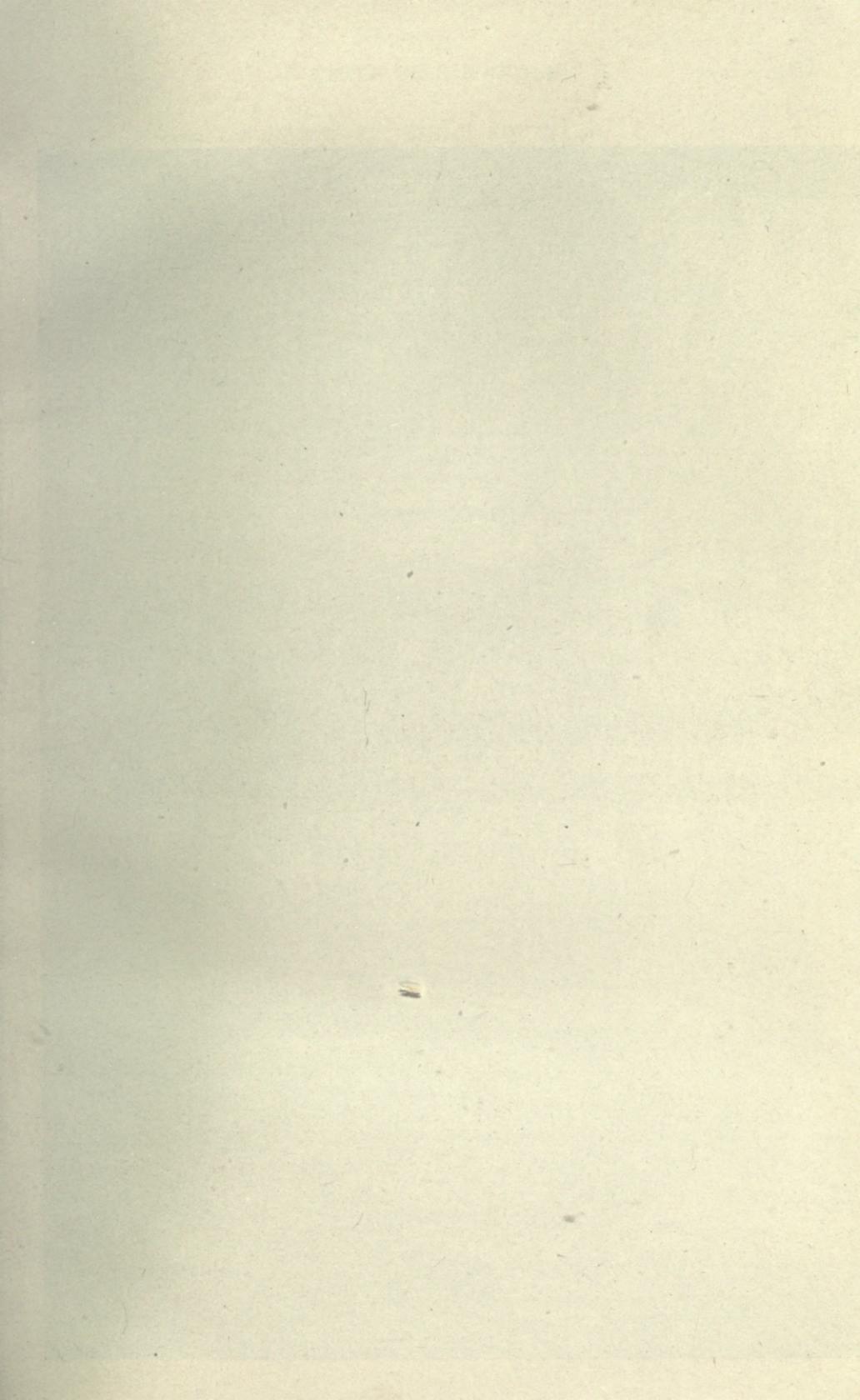
## PROSECUTIONS.

There were 8 prosecutions for causing forest and prairie fires, and 4 convictions obtained. There is naturally great reluctance on the part of fire wardens to prosecute

their neighbors or fellow citizens for carelessness in causing fires, but how shall we abate the habit of negligence in the use of fire in dry weather unless it is made known that an offender will be held to account? If we leave the law a dead letter, what is going to prevent some terrible catastrophe in an extremely dry period? Are not humanity and kindness really on the side of a rigorous rather than a lax enforcement of the law? No man has a right to be setting fire either to brush or meadows in very dry weather. Any person of good conscience and common sense who sets fire to clear land or for other purpose will take such precautions by piling his brush, digging and carefully burning fire breaks as will prevent fire getting beyond his control.

The law as it now stands reads as follows: "Any fire warden who knows or has information of facts and circumstances which he believes can be established, and which if so proven would show beyond a reasonable doubt that any person has caused a fire in violation of this act, shall immediately go before a justice of the peace and make complaint thereof." The law requires that fire wardens shall, "without delay, inquire into the cause of each forest and prairie fire within their districts, and shall immediately report the same to the Chief Fire Warden." These officers have no discretion in the matter. The law is imperative, and they must, if they do their duty as respectable citizens and officers, prosecute people who carelessly cause forest or prairie fires, if evidence can be obtained.

It sometimes happens that witnesses will not swear in a trial of the case to just what they have previously stated. Convictions may not always be certain, but it does good in a community in such cases to have it understood that an honest and impartial effort will be made to have the law rigidly enforced. In this way we may prevent another Hinckley fire.





A view of Cass Lake from high ground. Much of the beautiful scenery in this locality has been mutilated by "dead and down" logging. Photographed, September, 1900, for the annual report of the Chief Fire Warden of Minnesota.

## RAILROAD RIGHT OF WAYS.

Section 12 of the fire warden law requires railroad companies (which of course includes logging railroad companies) to keep their right of way to the width of 50 feet on each side of the center of the main track cleared of combustible materials. This is found to be a rather difficult provision to enforce. While some roads are kept cleared of combustible material in an exemplary manner, there are companies which are habitually neglectful in this regard. Railroad companies keep posted at their stations along their lines warning notices, furnished by the state, against forest and prairie fires, and which set forth, among other things, that any railroad company failing to keep its right of way cleared of combustible materials is liable to a fine not exceeding \$100. What must the public riding over these roads think to read these notices, and then to see by the rubbish and combustible material left along the right of way that the company fails to live up to the law? On the other hand, where a company keeps its right of way thoroughly cleared of combustible material and in a trim condition, how valuable the example is, aside from the security against fires. It should not cost very much to do this work, and neglect of the railroad company faithfully to have it done does not indicate that scrupulous care which the public has a right to expect of corporations which are, above all others, supposed to exercise the strictest care that is possible.

With a view of having railroad companies observe more strictly this provision of law requiring their right of ways to be kept cleared of combustible materials a blank, like the one printed below, was furnished to the fire wardens whose towns are traversed by railroads. Pursuant to this 12 reports were received showing that the right of way was not clear of combustible material, and 24 reports

were received showing that the right of way was clear of combustible material; but the instructions do not require any report except in case the right of way is not cleared of combustible material. In cases where evidence of neglect was reported the facts were laid before the proper county attorneys, with request that prosecutions be instituted.

The enforcement of this provision of the law depends very much upon the assistance which is furnished by county attorneys.

STATE OF MINNESOTA.

Fire Warden's Report of Combustible Materials on Railroad Right of Way.

Section 12 of the Fire Warden Law (chapter 196, General Laws of Minn., 1895, as amended by the act approved April 21, 1903) requires every railroad company to keep its right of way to the width of fifty feet on each side of the main track cleared of all combustible materials. This requirement is set forth in the notices freshly posted each year at every railway station, and its disregard is likely to be noticed by the public to the discredit of the fire warden service, let alone the pecuniary damage that might result. Fire wardens are hereby instructed to promptly report any violation of this provision. They will be held strictly responsible for its enforcement. Especially will the chairman inspect in a dry season, and before dangerous weather, any railroad right of way in his town where there is adjoining property over which fire would be likely to spread and do damage if started on the right of way, and if combustible material, whether dry grass, weeds, bushes or other kind, is found on the right of way, to immediately report the facts to the Chief Fire Warden in the form below. In such case there should be an additional respectable witness of the combustible materials. The fire warden who discovers the presence of combustible materials in a case as above stated will promptly warn the section foreman or other proper railroad employe or officer to remove the same, and will observe and report to the Chief Fire Warden whether, and when, such material is removed. Respectfully,

C. C. ANDREWS,  
Chief Fire Warden.

ST. PAUL, May 7, 1903.

To the Chief Fire Warden, St. Paul, Minn.:

On the .....day of.....190.... the undersigned personally inspected the right-of-way of the (state name of railroad company)..... railroad, in the town of.....being Township No.... Range....in the County of.....for the distance of (state about the number of miles or rods inspected) about..... and between.....and..... (indicate locality as nearly as practicable). Combustible materials consisting of (state whether dry grass, weeds, bushes or what kind, and how high and abundant, and whether standing, cut or in heaps).....

were found (state whether on one, and which, or both sides of the right-of-way and what breadth of the right-of-way from center of the track).....

Such combustible material extended along the right-of-way a distance of about (state number of rods or miles).....

and between (indicate by village, stream, farm or other object) ..... and.....

Adjoining the right-of-way where such combustible material was found there was on (state which side) the.....side (state whether timber, bushes, stubble, grain in shock or stack, hay in shock or stack, or what property and whose, if you know, that could be damaged or endangered by the spread of fire, and about to what extent. If there was property on both sides of the right-of-way that could be endangered by fire spreading from combustible material on the right-of-way, so state and describe the same. Be particular and follow these instructions carefully).....

.....

.....

.....

The weather was.....

Name and address of the witness who accompanied the undersigned is.....

P. O..... Signature.....

Date..... Named of Organized Township.....

SUMMARY OF FOREST FIRES, 1903.

COUNTY AND TOWN.	Date.	Acres	Damage.	Cause.
Aitkin County— Millward.....	June 5.....	40	\$75	Unknown.
Anoka County— Bethel.....	May 8.....	320	12	Burning hay.
Beltrami County— Black Duck.....	May 7.....	3	None	Clearing land.
Black Duck.....	May 17.....	3	None	Children playing.
Black Duck.....	July 22.....	20	500	Railroad locomotive.
Black Duck.....	July 27.....	120	1,800	Unknown.
Frohn.....	May 19.....	500	200	Clearing land.
Grant Valley.....	April 17.....	70	300	Railroad locomotive.
Grant Valley.....	April 22.....	100	500	Railroad locomotive.
Grant Valley.....	May 7.....	30	250	Railroad locomotive.
Hagalie.....	July 15.....	20	100	Unknown.
Hornet.....	June 4.....	25	10	Clearing land.
Lammers.....	July 29.....	640	200	Railroad locomotive.

## SUMMARY OF FOREST FIRES, 1903—Continued.

COUNTY AND TOWN.	Date.	Acres.	Damage.	Cause.
<b>Carlton County—</b>				
Knife Falls.....	June 4.....	160	None	Clearing land.
Knife Falls.....	June 28.....	40	None	Unknown.
<b>Cass County—</b>				
Twp. 146, R. 31....	July 28.....	320	150	Unknown.
Twp. 145, R. 30....	Nov. 4.....	10	50	Railroad locomotive.
<b>Clearwater County—</b>				
Leon.....	June 22.....	160	35	Unknown.
Moose Creek.....	May 16.....	160	30	Unknown.
Moose Creek.....	May 23.....	80	10	Burning meadow.
Shevlin.....	.....	120	None	Burning brush.
<b>Cook County—</b>				
Hovland.....	June 7.....	640	1,000	Unknown.
Maple Hill.....	June 1.....	200	None	Clearing land.
Maple Hill.....	August 23.....	5	10	Land cruisers.
Maple Hill.....	August 30.....	1	5	Land cruisers.
Tofte (58-5).....	June 7.....	160	1,800	Burning rubbish.
Tofte (60-3).....	June 7.....	2,000	10,000	Clearing land.
<b>Itasca County—</b>				
Campbell.....	June 3.....	600	800	Clearing land.
Moose Park.....	June 7.....	½	None	Unknown.
Nashwauk.....	April 27.....	300	2,000	Unknown.
Nashwauk.....	June 1.....	350	1,000	Unknown.
Nashwauk.....	June 7.....	280	2,000	Unknown.
Third River.....	May 15.....	160	50	Clearing land.
<b>Kittson County.....</b>				
Arveson.....	May 7.....	1,500	300	Unknown.
Deerwood.....	April 17.....	160	50	Unknown.
<b>Lake County—</b>				
Two Harbors.....	May 31.....	100	None	Railroad locomotive.
<b>Morrison County—</b>				
Buckman.....	Nov. 20.....	2,000	400	Unknown.
Clough.....	Nov. 18.....	600	80	Clearing land.
<b>Roseau County—</b>				
Herim.....	Oct. 19.....	1,500	200	Unknown.
<b>St. Louis County—</b>				
Canosia.....	June 29.....	30	25	Railroad locomotive.
Duluth.....	June 7.....	20	Slight	Unknown.
Herman.....	June 28.....	2	20	Railroad locomotive.
Lakewood.....	June 7.....	40	50	Unknown.
Midway.....	April 27.....	60	20	Campers.
Missabe Mountain..	June 7.....	160	1,000	Unknown.
Missabe Mountain..	June 21.....	160	500	Unknown.
Sparta.....	June 7.....	200	2,000	Unknown.
Twp. 54, R. 21....	June 7.....	1,200	600	Unknown.
Twp. 55, R. 18....	June 26.....	100	60	Unknown.
Twp. 61, R. 14....	June 30.....	7	50	Unknown.
<b>Todd County—</b>				
Browerville.....	May 2.....	1,000	Brush	Unknown.
Burnhamville.....	April 27.....	100	50	Clearing land.

Total acres burned over, 15,585. Damage, \$28,292.

Classification of causes:

Clearing land, 11.

Railroad locomotives, 9.

Other causes, 7.

Unknown, 25.

REPORT OF FIRE WARDENS AND OTHERS OF FOREST  
FIRES FOR 1903.

AITKIN COUNTY.

Ernest Rainins, chairman, town of Millward, June 24:

On the 3d instant, about 3 o'clock, p. m., a fire started on section 5, which burned over 40 acres and destroyed nearly 15 acres of fine, green, old birch and balsam; damage \$75. I was working on section 6 and saw heavy, black smoke beginning to rise from section 5; I immediately went to the fire, which was burning briskly on land cut over last winter. It was extinguished by watching and holding it. Eight persons assisted. I notified the chairman of the town of Beaver to be ready if more men should be needed. The weather was dry and windy, and had been dry for about two weeks. I believe someone walking over the land started the fire with no reason for so doing.

ANOKA COUNTY.

W. S. Fenderson, chairman, town of Bethel, May 8.

A fire today, caused by someone burning hay land on section 13, burned over half a section of meadow and light timber; damage \$12. It came near burning a house, barn and outbuildings; was extinguished in 6 hours by two men digging a trench. Weather dry and windy for five days. The fire did not burn deep enough to kill the timber.

## BELTRAMI COUNTY.

D. D. Rolfe, president, village of Black Duck, September 23:

May 7th a fire on section 12, caused by clearing land and burning brush, burned over about 3 acres of light timber; damage nominal. It was extinguished by using the street engine and hose. Weather dry and windy; had been dry all spring.

Same, September 23:

A fire May 17th burned over about 3 acres of partly cleared land on section 12; damage nominal. Origin unknown, probably by children playing. Fire was extinguished in 6 hours, thirty-one persons assisting, by using the street engine, hose and buckets. Weather dry and windy; had been dry all spring.

Same, September 23:

On the 22nd and 23rd of July a fire started at 1 o'clock on section 18 and burned over about 20 acres of heavy cedar timber; damage \$500. The fire is supposed to have been started by the train. It was extinguished in 28 hours by twenty-two persons, using the street engine, hose and buckets and chopping down trees. Weather dry.

Same, September 23:

On the 27th of July a fire on section 13 burned over about 120 acres of heavy cedar timber and destroyed poles and posts; damage \$1,800. It was caused, as near as we can find out, from a chimney in one of the cedar camps or from a freight train. Weather dry with high wind. It was extinguished in 7 hours by two hundred persons assisting, and by using the hose and mains, street engine and bucket brigade.

J. W. Speelman, chairman, town of Turtle Lake, September 8:

The summer was very dry until August 1st.

Nelson Willett, chairman, town of Frohn, May 12:

On the 9th instant at 10 o'clock a fire originating on section 28 burned over 500 acres of heavy timber and destroyed some camps and small timber; damage \$200; caused by clearing land. It was extinguished in 12 hours by the use of shovels on road ways. Weather dry and windy; had been dry for a week.

A. P. Reeve, fire warden, town of Hagalie, July 16:

Yesterday noon a fire on section 35 burned over about 20 acres of cedar slashings and destroyed a small amount of cedar poles and posts; damage \$100. The fire was extinguished in 3 hours by the help of twenty-five or thirty persons by back-firing and carrying water. Weather very dry, light windy gusts. The fire would have been very serious if not checked at the start. I saw the smoke and was there when it had about a quarter of an acre burned over, and being on horseback I made quick time in getting men out. The fire started near the corner of section 36 and endangered \$3,000 worth of timber.

Gust Dohrman, chairman, town of Grant Valley, May 9:

Fires April 17th and 27th caused by sparks from a Great Northern locomotive did damage estimated at from \$75 to \$100. The weather was very dry. The fires were extinguished by the use of shovels and water carried in buckets.

Henry Plumer, chairman, town of Hornet, May 8:

June 4th a fire caused by clearing land on section 25 burned over 10 acres of light cedar and destroyed a very few logs and killed a few trees; damage \$25. It was extinguished in 24 hours by the help of five persons, putting water on the dry road ahead of the fire. Weather

dry for two weeks. There is much slashing in our town this spring. Should present dry weather continue there will soon be danger of fire here.

Same, June 26:

On the 14th we had a small fire which was soon put out. It was started at the pulp camps.

Andrew Larson, chairman, town of Lammers, August 3:

July 29th, in the afternoon, a fire on sections 18 and 19 burned over 600 acres of brush and destroyed about 20 tons of hay—clover and timothy; damage \$200. There was also a fire on sections 7 and 8; came from the adjoining township on the west, but did no damage. It has been impossible to extinguish it; but now we have some rain, so I think it is dead now. Weather has been dry the whole summer. I might say this country has never been so dry. I have been out three days around those fires and we thought we had them all out, but when we got a warm day they started up again. The first mentioned fire was supposed to have been started by a railroad locomotive.

#### CARLTON COUNTY.

John Blomberg, chairman, town of Knife Falls, October 30:

On the 4th of June a fire on section 1 burned over 160 acres of brush and light timber. It was thought that the fire was started by the wind from a clearing belonging to a settler living in the same section, who was clearing land and burning brush at the time. It was extinguished in 12 hours by the help of eight persons carrying water, digging ditches and covering fire with the dirt; also felling trees. Weather dry and windy; had been dry about 4 weeks.

Same, October 30:

June 28th a fire on section 1, town 49, range 17, burned over 40 acres of brush and light timber. Was extinguished by carrying water, digging and felling trees and brush. Weather dry and windy; had been dry about 7 weeks. There was no loss sustained, as the land owners as a rule would like to have such lands burned over if it can be done safely; but they have to turn out and fight the fire in order to hinder the possibility of burning their homes.

Henry Baldwin, chairman, town of Twin Lakes, June 26:

If the present dry weather continues I fear we will have some fires to fight.

E. N. Rogers, president, village of Scanlon, July 7:

Your circular letter of recent date received and contents carefully noted. In reply will say that you may depend upon me to help you all that I can to suppress fire in and around our village. We have had two fires within the last thirty days and have had to call out from fifty to one hundred men at each time; in fact, to-day we had a fire and found it necessary to take out all of our dry lumber crew, amounting to seventy-five men, for one hour.

#### CASS COUNTY.

C. H. Beaulieu, Bena, September 12:

On the 5th instant in the afternoon a fire on section 26, town 145, range 28, set by sparks from a railroad locomotive, burned over half an acre of peat bog; no damage. It was extinguished in 3 hours by three men using brush brooms and water. Windy weather; had been dry over 10 days.

George Stein, president village of Cass Lake, July 28:  
(Telegram)

Forest fire raging four days north end of large island in Cass lake; also one up Turtle River, both raging badly owing to extremely dry weather. No settlers in this territory, what shall I do to preserve forest?

Same, July 29: (Telegram)

Had force of men out to-day, killed fire on Star Island. Will look after Turtle River fire to-morrow.

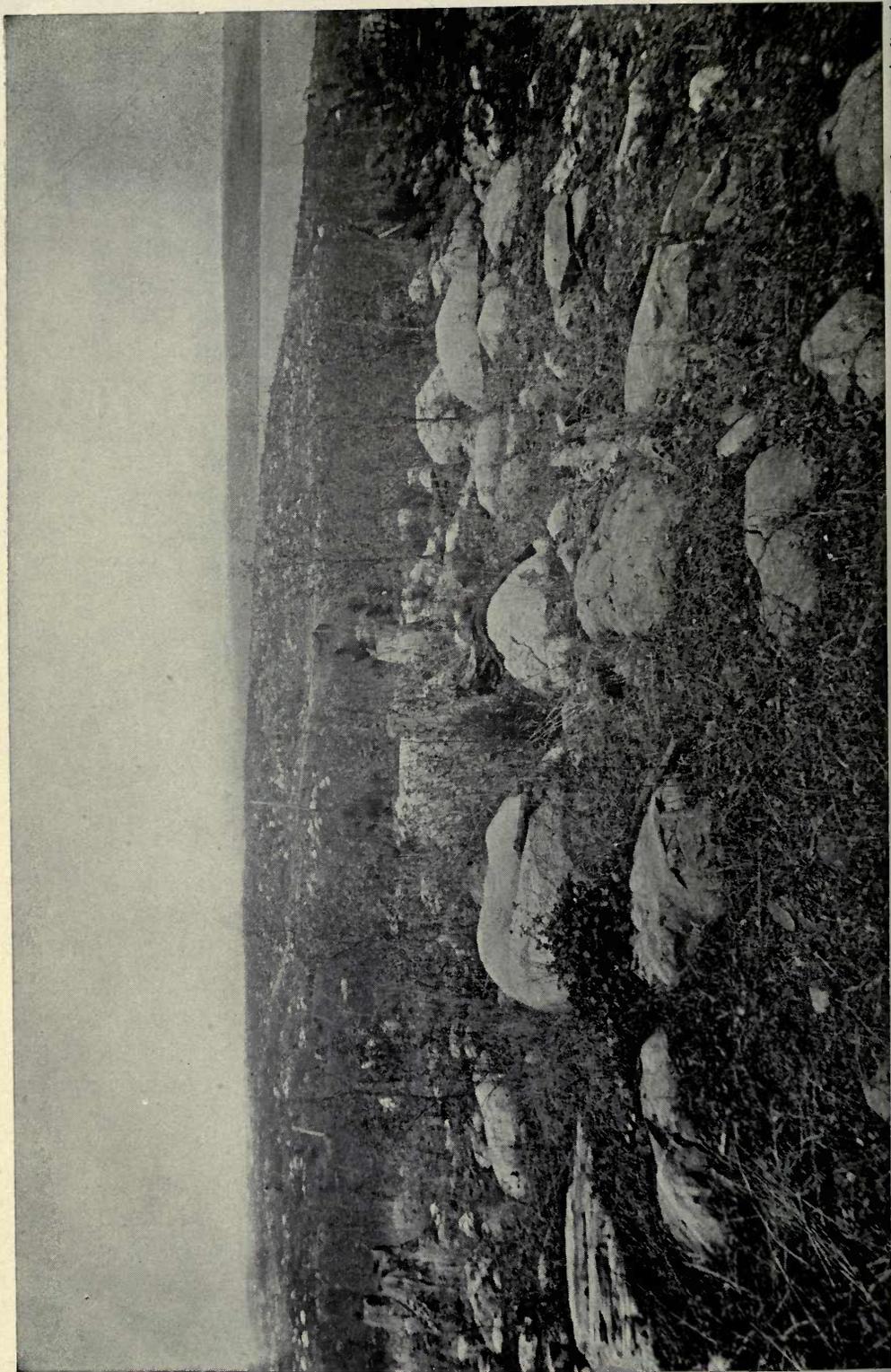
Same, July 31:

In the matter of fire on Star Island. After subduing the fire last Wednesday I left three men on the ground as a patrol. They have had more or less of fire fighting to do ever since. The dry leaf mould that has accumulated for years is the cause, as the fire seems to be under this mould, and finally breaks out and then being whipped by a breeze starts the fire. The men left there go over the ground constantly and when fire is discovered it is promptly handled. This method of warfare will no doubt have to continue until we get a good heavy shower. In the meantime I will keep them there and furnish them with plenty to eat.

Same, August 12:

The fire burned over a territory about one mile long and half mile wide. A swamp on the west and Lake Helen on the north prevented it from spreading further in that direction, which gave us the south and east ends to fight. Where the fire raged the fiercest luckily happened to be in the smaller brush and the jack pine, the high winds prevalent from the south keeping it away from the Norways and white pine to a great extent. When we arrived on the scene the fire was just getting a good start among a nice lot of Norways. Before same was extinguished we lost about three trees and a dozen or more





Cut-over, non-agricultural pine land, now useless, near Ely. If planted with pine would earn a good revenue. There are probably a million acres of rocky, non-agricultural land in the West that have been abandoned by him.

were badly scorched and burnt. Had the wind been from the north I am afraid it would have been quite a difficult matter to have saved much of the Norways. I made diligent inquiries among the whites who had been camping on the island up to that time, but none of them appeared to acknowledge camping in the vicinity where the fire started, nor do I believe they did, because the location would not be desirable. Indians were picking a great many berries in that locality and I feel quite certain it resulted through some carelessness on their part.

Same, November 4: (Telegram)

Bad forest fire raging in white pine near Cuba, five miles east. Will leave with force of men about 10:30 per train furnished gratis. If necessary will increase force in morning. Weather conditions favorable.

Same, November 5: (Telegram)

Fire subdued. Will leave couple of patrols in charge.

Same, November 6:

The fire was near what is called Cuba siding; burnt on south side of track over an area of about 10 acres. Considerable slashings and dry stubs in the vicinity, where some years ago dead and down logging was done to some extent. Fire destroyed the seedlings, but neither Mr. Bruce (of the Forestry Bureau) nor myself could find where it destroyed the hardy white pine. Weather conditions were fine; had there been a wind it would have taken quite a force and much time to check it. Fire may have originated from railroad engine sparks; also from travelers or tramps, who just now continually build camp fires en route. Two such "hobo" fires were burning between here and the scene of the forest fire on the night we went there.

## CLEARWATER COUNTY.

Alfred Forander, chairman, town of Moose Creek, May 23:

About noon the 16th instant a fire on section 34 burned over 160 acres of heavy and light timber; destroyed 5 or 6 cords of wood.

Same, June 5;

May 23d a fire on section 35 burned over 80 acres and destroyed about 500 poplars of pole size. There is a big slough one mile across and four miles long and the fire came in on us from that slough. It was extinguished in three hours by back-firing. The wind was high.

F. A. Norquist, chairman, town of Pine Lake, August 10:

It is very dry here this summer.

Same, August 24:

The weather has been quite dry until to-day, it is raining hard.

O. J. Larson, chairman, town of Shevlin, July 30:

A fire on section 13 (township 147, range 36), July 15, burned over 120 acres of brush land; no damage. It was caused by burning brush piles. As the weather was very dry and windy part of the time it could not be put out, but was kept under control until it rained. Weather dry for about a month and windy part of the time.

## COOK COUNTY.

Ole E. Erickson, chairman, town of Hovland, June 29:

June 7th a fire, cause unknown, burned over 640 acres of principally green timber on sections 11 and 12; damage \$1,000. It was extinguished June 16th by the help of six persons, five being part of a lumber crew. It was kept back in the daytime as best we could, but at night and early morning we could do the most active work. There was a good deal of dry, fallen cedar. There had been about two weeks or more of dry weather before the fire

and it was dry and windy at the time, but we got a rain storm on the night of the 16th.

August Johnson, chairman, town of Maple Hill, June 15:

June 1st a fire on section 2 burned over 100 acres of brush land, but destroyed nothing of real value. It was extinguished thirteen days after it started, by the help of forty-seven persons, with water and shoveling dirt on the fire.

Same, August 27:

On Sunday, the 23d we discovered fire in section 11-62-1 E., near Elbow Lake, and I sent at once an assistant to extinguish the same. Five acres of green timber was undermined by fire so that the trees fell to the ground, but to-day the fire is out, and I have two watchmen to watch it for further spread. Weather very dry and windy. Also report from 64-1 E., section 2, where there is also fire. It is very difficult to get there on account of road and waterways. It is about thirty miles from here, but I will do my best to attend to it. This fire has been set by cruisers, and the guilty party I may be able to locate, and I will report to you.

Same, September 9:

August 30th a fire caused by land cruisers on section 11, town 64, range 1 E., burned over an acre of light timber and destroyed a few trees. It was extinguished in three days after it started. Weather very dry and windy.

H. O. Engelson, fire warden, town of Tofte, June 13:

June 7th a fire on section 6, town 58, range 5, burned over 160 acres of light timber and buildings; damage \$1,800. It was caused by the burning of a small pile of rubbish in front of men's sleeping camp of a lumber company. Weather extremely dry and windy, had been dry for more than a week. Fire was extinguished by carrying water from Lake Superior and by the rain which came in the evening.

C. A. A. Nelson, fire warden, town of Tofte, June 17:

On the 7th instant a fire on section 27, town 60, range 3, caused by burning brush, spread over 2,000 acres of light timber land and destroyed a logging camp with implements and two homestead houses; did damage to the amount of \$6,000, including \$4,000 worth of buildings. It was extinguished in nine days, eleven persons assisting, by digging up dirt, cutting down timber and carrying water. The weather was dry and windy, had been dry for two or three weeks.

#### ITASCA COUNTY.

James Troy, chairman, town of Bridgie, October 30:

There has been no fire in this town, but in the town adjoining on the west (151-30) ties were made last winter in section 36, through which the railroad runs, and the slashing is all over the whole section, which would cause great damage to the state timber if it caught fire. It should be looked into, as fire could easily start and run east into the settlement of Bridgie, and great damage be done.

H. C. Grove, chairman, town of Campbell, June 11:

On the 4th instant a fire caused by burning brush on section 25, town 155, range 25, burned over about 600 acres of brush, jack pine and some Norway, mostly small timber and some down timber; damage \$800. Weather dry and had been dry for some time, with hardly any wind. It was extinguished in four days after it started, with the help of about twenty persons, using axes and shovels and cutting down timber and digging trenches; some places a team and plow were used. The fire was fought more or less all the time until it was put out by rain. This is the only organized town for miles around. Parts of the country are sandy and covered with jack pine and in dry weather very dangerous in case of fire. There

is no wagon road in here; the mail is packed here from Mizpah to Ripple (P. O.) It is in town 154, range 25. Big Falls is in section 2, town 154, range 25; Ripple, the post office, is in the same section. The road from here to Black Duck is swampy and can only be traveled afoot.

Henry Cole, chairman, town of Moose Park, June 9:

On the 7th instant, about noon, a fire on section 17 burned over half an acre of brush and slashings; no damage done. It was extinguished with the help of seven persons by carrying water in pails, there being a creek close by. It was almost impossible to put the fire out, as it hung to the roots and moss. Weather dry and windy, has been dry all spring, with no rain to amount to anything.

S. R. Elliott, Sup't Crosby Mine, Nashwauk, April 29:

April 27th a fire came from the south of our property, which is situated in sections 31 and 32, town 57, range 22, and destroyed much cord wood belonging to us.

Same, May 13:

The fire of April 27th burned only about 75 cords of wood which we had cut. It would have burned all of our buildings if we had not fought it with our whole force of about 100 men. Two dwelling houses were destroyed and much cord wood belonging to other parties.

C. E. Walton, chairman, town of Nashwauk, May 11:

I have inquired into this fire you have mentioned, but it is almost impossible to find out anything about it, for there are so many tramps and lawless gangs around here camping through the woods. This fire started south of us, near the railroad track, but cannot find out any more about it.

Same, June 1:

A fire on this date burned over part of sections 31 and 32; destroyed an ice house; also from 300 to 400 cords

of wood. It is still burning; damage \$1,000. It is impossible to find out how it was caused. Thirty-three persons assisted in controlling the fire with buckets and hose from the mines. Had to let it run as far as the mine before we could stop it. Weather dry and windy; dry about two weeks.

Same, June 9:

On Sunday, the 7th instant, a fire burned over 140 acres in section 31, 140 acres in section 32 and 340 acres in section 29, of both heavy and light timber, and destroyed two of our houses at the lower mine; damage to mining property \$2,000. Number persons assisting in controlling the fire was from 200 to 300. It was finally extinguished by rain. Weather dry and very windy.

F. S. Arnold, chairman, town of Third River, July 11:

On or about May 15th a forest fire ran through the southwest quarter of the southeast quarter of section 24. So far as I can ascertain no great damage was done, but I am unable to state how the fire originated.

#### KITTSON COUNTY.

Frank Peterson, chairman, town of Arveson, May 11:

On the 7th instant a fire burned over 1,500 acres of brush and prairie and some poplar groves. Twelve persons assisted in putting the fire out with help of team and breaking plow; also by using wet sacks. Weather dry, with west wind.

B. M. Bathum, chairman, town of Deerwood, April 22:

April 17th at 9 A. M., a fire on section 3 burned over 160 acres of light timber and brush. Have investigated but am unable to find out who set the fire. Neighbors claim it was set by a party driving on the road. It was put out in five hours by the help of eight persons.

## LAKE COUNTY.

L. St. Jaques, chairman, town of Two Harbors, June 22:

May 31st a fire on section 15, town 53, range 11, burned over 100 acres of cut-over timber and was caused by sparks from an engine. No damage. It was extinguished in one day with the help of six persons by back-firing. Weather dry.

## MORRISON COUNTY.

Samuel Tedford, chairman, town of Clough, December 1:

On the 18th of November a fire, caused by burning brush on section 5, burned over 600 acres; destroyed 10 tons of hay. Damage \$80. It was extinguished by the help of eight persons by water and other means. Weather windy and dry.

J. O. Baker, chairman, town of Morrill, November 23:

On the 20th instant a fire on section 36 burned over an area of five miles in length by 4 rods to  $1\frac{1}{2}$  miles in width of meadow and light timber; destroyed about 50 tons of hay. Damage \$400. I cannot find the party who set the fire; nobody seemed to know anything about it. The fire was extinguished in twelve hours by individuals—about fifteen fighting it for the protection of their own property. Weather dry for seven or eight weeks, very high wind.

## ROSEAU COUNTY.

Thomas Larson, chairman, town of Deer, November 4:

On the 19th of October in the afternoon, a fire burned over 1,500 acres of brush, meadow and light timber; destroyed about 75 tons of hay. Damage \$200. It burned to a big slough, when it stopped. It came from the town of Herim. The weather had been dry about a week and the wind blew hard from the northwest, which

brought the fire into our town, where all the hay was destroyed. We have spent three days trying to find out who set the fire, but are unable to find out.

ST. LOUIS COUNTY.

Edward Olson, president, village of McKinley, in township of Biwabik, June 27:

We are in no danger at present from forest fires. The fire the first part of this month caught in slashings from the Elba Iron Company and burned over about 80 acres of ground, but no valuable timber was destroyed.

Olof Shirley, fire warden, town of Canosia, June 29:

If this dry weather keeps on we shall have some bad forest fires on account of the M. & W. R. R. locomotives. They are setting fire every day at certain places where the sparks fall in combustible material. I do not think they have the right kind of spark arresters on.

Henry Kirke, chairman, town of Duluth, June 15:

On the 7th instant a fire on section 34, about seven miles from where I live, burned over from 15 to 20 acres old choppings; destroyed some cedar ties—there was no valuable timber; very high wind all day. Weather had been dry ten or twelve days. The fire was finally put out by rain.

C. G. Almquist, chairman, town of Herman, June 2:

There have been some small fires along the line of the logging railroad from Scanlon, doing small damage; but if dry weather starts in there might be danger of some big fires caused from it.

Same, July 1: .

June 28th at 4 P. M., a fire on section 20, probably caused by the logging train, burned over two acres of light timber; destroyed five cords of wood and some pine. Extinguished by shoveling earth over it. Weather dry but no wind.

David Jamieson, chairman, town of Lakewood, October 27:

June 7th a fire on section 18 burned over 40 acres of light timber; destroyed a small quantity of hardwood. Damage possibly \$50. Was extinguished in 12 hours after it started by heavy rain. The weather had been dry for about two weeks before the fire and was windy the day of the fire.

H. B. Hill, chairman, town of Midway, October 23:

April 27th a fire on section 29 burned over 60 acres of brush land; was probably set by hunters or campers. It was extinguished in five hours with the help of fifteen persons by water.

A. J. Sullivan, chairman, town of Mesaba Mountain,  
June 12:

On Sunday, the 7th instant, a fire on section 35, on the south shore of Lost Lake, burned over 160 acres of brush and old slashings; damage \$1,000. A strong wind was blowing from the northwest and the fire burned fiercely through the old slashings, including some timber and cordwood, until it reached the green timber on the south, where it died. The fire lasted about six hours. A number of men and the owner went to fight the fire but could make no noticeable impression. The weather was not dry. It rained heavily about six days previous. Wind very high.

Same, June 27, Telegram:

Fire north of Genoa confined to slashings. Very little loss to pine. I have had men looking after it all week. Impossible to stamp it out, as weather is very dry, with high winds prevailing. Will write report.

Same, June 30:

On the 21st instant about 1 p. m., a fire originating on section 27—cause unknown—perhaps from wad of a hunter's gun—burned over 160 acres of slashings; de-

stroyed very little standing timber. Damage perhaps \$500. Weather very dry, with high wind prevailing. Four men watched the fire and it was finally extinguished in a week by heavy rains.

D. E. Mouser, Sparta, June 26, Telegram:

Forest fire burning fiercely north of Genoa. Place you inspected. Spread to the large pine.

Same, June 27, Telegram:

Fire mostly out; unless wind rises will be all right.

John Hillman, Floodwood, June 15:

On the 7th instant a fire originating on section 7, town 54, range 21, burned over 1,200 acres of cut-over land; destroyed 200,000 feet of pine. Damage \$600. Four persons assisted in controlling the fire. Rain started and extinguished it.

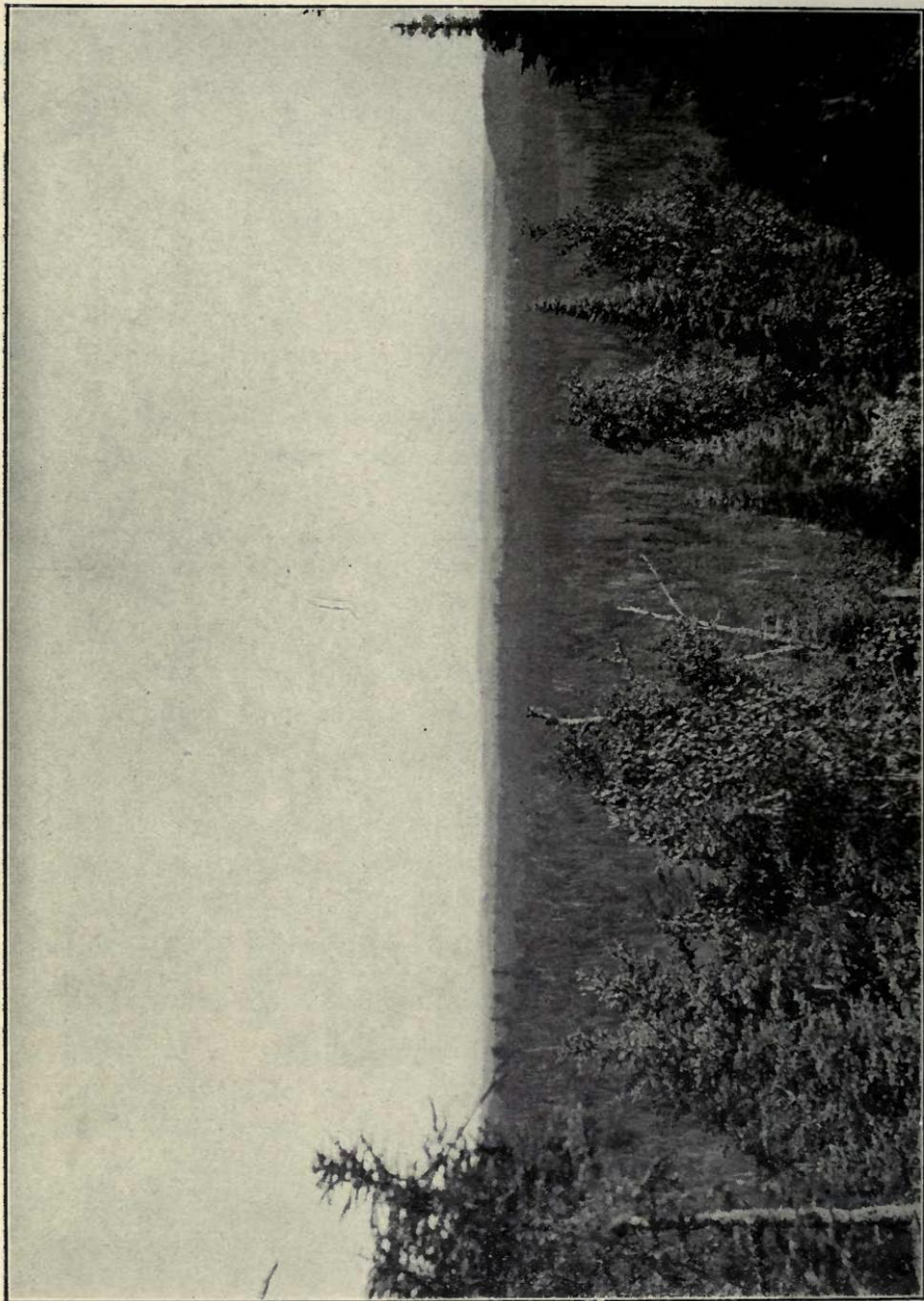
Chas. Lauren, fire warden, Zim, June 29:

June 26th a fire in the northwest part of town 55, range 18, burned over 100 acres of brush, slashings and light timber; destroyed 6,000 feet of pine and a few cedars. Damage \$60. Weather dry and windy; had been dry for about three weeks. The fire was running along both sides of the logging railroad where timber had been cut last winter. It was controlled by making fire breaks and was finally extinguished by rain.

Chas. Heise, Tower, October 10:

The last Sunday in June we had a fire in section 4, town 61, range 14, and when I saw the smoke I got help from one of the camps and we worked about four hours and had it all out. There were about seven acres burned over. We had no large fires during the season, which was prevented by my putting out small fires.





Southeastern part of Lake Superior Forest Reserve, looking north from high bank of river leading from Wigwam Lake. Photographed July 15, 1903. for the annual report of the Chief Fire Warden of Minnesota.

## TODD COUNTY.

Hans Hammer, chairman, town of Little Elk, May 19:

May 2nd a fire in the southwest part of the town burned over 1,000 acres of brush but did no damage. The weather had been dry for some time and windy. A heavy rain extinguished the fire, since which time there has been plenty rain.

Frank Krutzer, chairman, town of Burnhamville, May 18:

On the 27th of April a fire on section 28, caused by clearing land, burned over 100 acres of light timber; damage \$50. It was extinguished by plowing and with water. Weather dry and windy.

## SUMMARY OF PRAIRIE FIRES, 1903.

COUNTY AND TOWN.	Date.	Acres.	Damage.	Cause.
Anoka County—				
Linwood .....	May 13.....	15	Slight	Burning meadow
Clay County—				
Barnesville.....	April 26.....	1,200	\$25	Unknown.
Elkton .....	Oct. 31.....	500	210	Burning stubble.
Hawley.....	Oct. 31.....	50	200	Unknown.
Riverton.....	April 27.....	3,000	50	Unknown.
Riverton.....	Oct. 31.....	1,500	1,500	Burning stubble.
Ulen.....	Oct. 21.....	60	50	Burning stubble.
Kittson County—				
Clow .....	Oct. 19.....	2,000	500	Boys.
Deerwood.....	April 17.....	1,600	.....	Unknown.
Hazelton .....	Sept. 30.....	300	91	Hunters.
Hazelton .....	Nov. 1.....	60	None	Unknown.
Jupiter .....	Nov. 14.....	320	None	Unknown.
Norway .....	May 15.....	500	100	Burning brush.
Pelan .....	Oct. 31.....	500	75	Burning stubble.
Percy.....	Oct. 25.....	1,200	None	Unknown.
Richardville .....	April 21.....	40	None	Unknown.
St. Joseph.....	Oct. 10.....	800	200	Burning break.
Teien .....	July 28.....	120	125	Smoker.
Marshall County—				
Agder.....	Oct. —.....	1,000	None	Hunters.
Augsburg.....	Nov. 10.....	620	50	Burning fire break.
Foldal.....	Oct. 10.....	200	25	Burning straw.
Grandplain.....	Oct. 22.....	500	None	Hunters.
Morrison County—				
Ripley.....	April 15.....	40	None	Small boy.

SUMMARY OF PRAIRIE FIRES, 1903—*Continued.*

COUNTY AND TOWN.	Date.	Acres.	Damage.	Cause.
Otter Tail County— Carlisle.....	Nov. 3.....	3	None	Railroad locomotive.
Polk County— Argus.....	Oct. 15.....	1,000	70	Railroad locomotive.
Onstad.....	Sept. 24.....	800	500	Railroad locomotive.
Red Lake County— North.....	May 20.....	400	None	Clearing land.
Terrebonne.....	July 15.....	160	240	Unknown.
Roseau County— Dewey.....	Oct. 28.....	400	100	Clearing land.
Polonia.....	Mch. 9.....	40	50	Clearing land.
Polonia.....	Oct. 10.....	1,200	200	Unknown.
Polonia.....	Oct. 29.....	400	80	Unknown.
Wilkin County— Manston.....	April 4.....	6,000	200	Unknown.
Mitchell.....	April 4.....	200	None	Unknown.
Prairie View.....	Sept. 24.....	80	25	Railroad locomotive.

Total acres burned over, 26,308. Damage, \$4,666.

Classification of causes:

Burning brush, straw or stubble, 9.

Railroad locomotives, 4.

Hunters, 3.

Other causes, 7.

Unknown, 13.

REPORT OF FIRE WARDENS AND OTHERS OF PRAIRIE  
FIRES FOR 1903.

ANOKA COUNTY.

J. R. Broadbent, chairman, town of Linwood, May 14:

Yesterday a fire on section 32 burned over 15 acres of meadow and would have destroyed a bridge had it not been extinguished. As it was, no damage was done.

## CLAY COUNTY.

R. Sieber, chairman, town of Barnesville, May 4:

April 26th a fire in the south part of the town burned over 1,200 acres and destroyed hay of the value of \$25. It went across the creek to section 23. I could not find out how it was set. There was a strong wind.

Leander Swartz, chairman, town of Elkton, November 3:

On the 31st of October a fire caused by burning stubble, the weather being dry, burned over several hundred acres in the north part of the town and destroyed about 70 tons of hay; damage \$210. Many persons helped extinguish the fire by plowing and whipping with wet sacks. The party who caused the fire was tried and fined \$45 and costs.

W. Fountain, chairman, town of Hawley, November 2:

October 31st about 4 o'clock P. M., a fire burned over 40 or 50 acres of wild meadow and destroyed 40 tons of hay; damage \$200. It was extinguished in about four hours by plowing and back-firing. A whole threshing crew and others volunteered. The weather was dry and had been dry about two weeks; but little wind. The fire originated, it is supposed, near Downer, Minnesota, six or eight miles southwest of where it touched our town. It just touched one corner of the township.

Same, November 16:

I find that the fire which I reported the 2d instant was caused by a party who set fire to burn off the land when he had made a fire break of only six furrows. He was fined \$45 and cost.

Edward Weaver, chairman, town of Riverton, April 27:

On the 26th instant a fire which originated on section 36 burned over seven sections and destroyed two stacks of hay of the value of \$50. It was extinguished in twelve

hours with plows, sacks and brooms. Weather had been dry for a week.

Same, November 2:

October 31st a fire burned over 1,500 acres of prairie and destroyed twenty-eight hay stacks; damage \$1,500. It was controlled by twenty-five persons, using six plows and wet sacks and by back-firing. Weather dry with high wind. (Same fire reported by L. Swartz.)

E. Rost, chairman, town of Ulen, October 25:

On the 21st instant a fire caused by a boy 15 years old, plowing and who started a fire to burn off the dead grass and weeds, burned over 60 acres and destroyed two hay stacks of the value of \$40 to \$50. Sixteen persons assisted in extinguishing the fire.

#### KITTSOON COUNTY.

Richard Sylvester, chairman, town of Clow, October 21:

On the 19th instant a fire supposed to have been set by two boys 12 and 14 years old, burned over 2,000 acres of prairie and meadow and destroyed 150 tons of hay; damage \$500. The fire ran as far as the prairie went. Weather dry and windy for about four weeks.

John Stramquist, chairman, town of Deerwood, April 25:

On the 7th instant a fire originating on section 24 burned over 1,600 acres of brush and prairie. Weather dry and windy. It was extinguished by ten persons putting it out along roads and fields.

Isaac Ristad, Fire Warden, town of Hazelton, October 19:

On the 30th of September a fire burned over two-thirds of section 27 and destroyed about eight tons of hay and thirty acres of green timber; damage \$91. All that I can learn is that there were three chicken hunters who set the fire, but I cannot find any way to identify them. Thirty-five persons assisted in putting out the fire. It was

extinguished in nine hours after it started, with sacks, brush and two teams and plows. It was dry and very windy all that day, but it had been damp weather about a week before.

Ole Krogstad, chairman, town of Hazelton, November 10:

On the 1st instant at 3 P. M., a fire burned over 60 acres of prairie on section 16. After thorough investigation the cause cannot be discovered. Three persons assisted in putting it out, using brooms made of willows.

Louis Swanson, chairman, town of Jupiter, November 17:

On the 14th instant a fire burned over 320 acres on section 23. Seventeen persons assisted in putting it out. The weather was dry and calm.

N. G. Bengtson, town clerk, town of Jupiter, December 9:

As to the fire reported by Mr. Swanson of November 14th, it was very hard to say what damage it might have done if it had not been extinguished; one thing is sure, had the wind started up and blew hard lots of hay stacks would have been burned and probably some houses. As it was, very little damage was done. It burned only some old grass. The land belongs to speculators and there is no cultivation done on that section.

Isak T. Tolland, chairman, town of Norway, May 18:

May 15th, a fire caused by burning brush and roots on section 2, town of Deerwood, burned over 500 acres of brush and swamp on section 35 of this town; damage \$100. It was extinguished with the help of nine men. Weather dry and windy for about five days.

C. E. Kelso, chairman, town of Pelan, December 10:

On the 31st of October a fire originating on section 22 burned over 500 acres of prairie and brush and destroyed one homestead shanty and about twelve tons of hay; damage \$75. The fire could not be controlled in this

town and went into another town. Weather dry and windy, had been dry for about three weeks.

Same, January 2, 1904:

The party accused of setting the fire of October 31st has been tried and acquitted.

B. Nelson, chairman, town of Percy, October 30:

On the 25th of October a fire which came from the north, town 162, range 46, into this town on section 5, where the land is unsettled, spread over sections 8, 9 and 10. It was extinguished in the evening by the work of nine persons by back-firing and using wet sacks, thus saving 140 tons of hay. If the fire had not been checked in time it would have done damage to hay and buildings. There was wind from the northwest and it has been dry for four weeks. The fire burned over about 1,200 acres of meadow and brush land. There has been fire in North town over two weeks.

Geo. Richards, chairman, town of Richardville, May 1:

April 21st a fire burned over a few sections of prairie in the northwest part of the town; no damage done here. The weather was quite windy. I cannot find out who started the fire nor exactly where it started from. I was not at home, being away to a funeral that afternoon.

John Zalewski, chairman, town of St. Joseph, October 10:

At 9 o'clock today a fire originating on section 8 burned over 800 acres of meadow and brush and destroyed 50 tons of hay and some poplars; damage \$200. South wind and dry for one week. The fire went to Manitoba. It is believed to have been caused by a person burning a fire break around a haystack.

Louis E. Johnson, chairman, town of Teien, August 15:

July 28 a fire on section 36, caused by a farmer from Dakota cutting hay, burned over 120 acres of prairie and meadow and destroyed 30 tons of hay in stack and 40

tons standing; damage \$125. It was extinguished in three hours with the help of fifteen or twenty persons by plowing and by using wet sacks. Weather windy and dry; had been dry for a long time.

## MARSHALL COUNTY.

Bernhard Knudsen, chairman, town of Agder, November 2:

In October a prairie fire burned over about 1,000 acres of swamp but destroyed nothing of value. The weather was dry and windy the whole of last month.

Chas. Warner, chairman, town of Augsburg, November 14:

On the 10th of August a fire caused by two boys trying to burn around their haystack in section 1 burned over 620 acres and destroyed three stacks of hay; damage \$50. It was extinguished in eight hours by ten persons with plows and wet sacks. Weather quite windy.

Amund Johnson, chairman, town of Foldal, October 15:

On the 10th instant about 10 o'clock a. m., a fire supposed to have started from an old burning strawstack spread over 200 acres of brush and prairie and destroyed one haystack; damage \$25. The weather was dry, with strong wind.

Henry Roller, chairman, town of Grand Plain, October

21:

October 18th a fire set by hunters burned over 500 acres of prairie and swamp in township 156, range 42. It was extinguished in two days by twelve persons by plowing, back firing and beating with wet sacks. A dwelling house was saved and 150 tons of hay. Weather very dry and windy and had been dry most of the time.

## MORRISON COUNTY.

J. A. Adams, chairman, town of Ripley, May 2:

April 15th a field fire burned over 40 acres and died out. Supposed to have been set by a small boy; no damage. There had been a heavy rain three days before the fire occurred. The fire by which an old lady lost her life was half a mile distant from this fire and was set by herself. It destroyed no property and was not a prairie fire.

## OTTER TAIL COUNTY.

William Zimmer, chairman, town of Carlisle, November 4:

On the 3rd instant a fire caused by sparks from a railroad locomotive burned over 3 acres but did no damage. It was extinguished by one person with wet sacks and shovel. Weather dry and windy for about 2 weeks.

## POLK COUNTY.

S. M. Clover, chairman, town of Angus, October 26:

On the 15th instant a fire, thought to have caught from sparks from a locomotive on the G. N. R. R., burned over 1,000 acres; destroyed about 70 tons of hay and 1 barn worth \$70. It was extinguished in 10 hours by eight persons by plowing in front of it with a 4-horse gang plow and a 3-horse breaking plow, confining it within certain limits. Weather dry and very windy.

Sever Quarberg, chairman, town of Onstad, September 29:

September 24th about 10 o'clock a. m., a fire caused by an N. P. locomotive burned over 800 acres and destroyed about 125 tons of wild hay of the value of \$500. It was extinguished in 4 hours by twelve persons and six teams plowing furrows and dousing with wet sacks. Weather dry and windy; had been dry for about 8 days.

## RED LAKE COUNTY.

Mrs. E. Avetson, St. Hilaire, May 1:

A prairie fire has been set and has burnt all the hay I had.

John S. Smith, chairman, town of North, October 28:

May 20th a fire supposed to have been set by a farmer clearing hay land burned over 400 acres but did no damage. The weather was dry and windy; had been dry for about three weeks before.

Louis Parenteau, chairman, town of Terre Bonne, November 12:

July 15th a fire burned over 160 acres of hay land and destroyed about 35 tons of hay already cut; damage \$240. Cause unknown. Four persons assisted in putting the fire out. Having no water, had to plow around it and use brush brooms. Weather dry and had been dry for a couple of months.

## ROSEAU COUNTY.

Julius Johnson, chairman, town of Dewey, November 2:

On the 28th of October a fire caused by clearing land burned over about 400 acres of prairie and destroyed 18 tons of hay; damage \$100. It went out after reaching a wet slough. The weather was dry and windy, had been dry for about three weeks.

Henry Brufladt, Siggstad, October 16:

A prairie fire was started about eight miles south of here across the Roseau swamp on the 10th of October, the wind being the hardest we had this summer, and struck my grove and jumped the fire break and came near destroying all my property. I saved all except my hay—50 loads of number one hay destroyed—leaving me with hardly any for the winter for ten head of cattle and

five horses. It is noticed that a fire is started in the same neighborhood nearly every fall.

Joseph Kansy, chairman, town of Polonia, November 6:

On the 29th of October a fire on section 36 burned over 400 acres and destroyed 20 tons of hay; damage \$80. It was extinguished in four hours by eight persons with water and wet sacks. Weather for 'about a month has been dry and windy.

Same, November 15:

The fire of October 10th which damaged Henry Bruf-ladt, living on section 4, township 162, range 44, started as nearly as I can trace it on the northwest quarter of section 33, township 161, range 44. A prairie fire was started at 11 a. m., and it burned over 1200 acres of swamp and meadow. The weather was dry and windy and had been dry for about two weeks. It did damage to the amount of \$200 to Henry Brufladt by burning 50 tons of his hay.

John Dietz, Fire Warden, town of Polonia, May 9:

May 7th a fire set to clear land before breaking burned over 40 acres and did damage to the amount of \$50. It was extinguished by three persons with sacks and blankets. It came within 100 feet of buildings. The weather was very dry and windy and it was very hard to stop the fire, but we did it.

#### TRAVERSE COUNTY.

John Keaveny, chairman, town of Tintah, August 24:

Two days ago threshing was done close to the right of way of the public road and straw lies two feet in depth on public highway. A cigar stump thrown from the hand of a careless smoker would start a fire which with a south wind would perhaps burn all the town that lies west of the railroad track in the village. It looks very risky.





A splendid stand of primeval white pine on rocky non-agricultural land near Hibbing. Illustrates a leading principle of forestry, namely that in the present ways of timbering, such a stand is a better investment than a fourth row of land unfit for agriculture can yield a handsome and sustained revenue if devoted to forest.

[He was instructed that there is a provision in the statutes against encumbering a highway, and that, if he would report the facts to the county attorney with request to act, he would undoubtedly adopt proper proceedings to remove danger; also that he was required by section 6 of the fire warden law to take "precautions to prevent fires," and when the weather was favorable he could cause the straw to be burned.]

## WADENA COUNTY.

N. R. Carper, chairman, town of Wing River, May 1:

At this time of the year there are numerous fires. People generally burn their meadows, and sometimes the fire gets away and occasionally burns a stack of hay. Now these fires are in every direction. There is no timber here of any value except for fire wood. Only the other day there were many fires, and one man lost his hay. I did not learn of it for a couple of days. Please inform me as to the best course to pursue.

[He was instructed to use his best discretion and go to any fire if he thought the occupant of the land was a person liable to be careless.]

## WILKIN COUNTY.

Herman Buth, chairman, town of Manston, June 24:

On the 4th of April, a fire in the west half of the town, which came across section 36 in the town of Mitchell, burned over 10 sections and destroyed hay, grain and bridges; damage \$200. It was extinguished by ten persons plowing and breaking and beating with sacks and water.

G. J. Czicholzki, chairman, town of Mitchell, June 30:

A fire April 4th burned over a narrow strip of section 14 but destroyed nothing. It was so close to the town line it was hard to tell in what town it started.

Walter Peake, chairman, town of Prairie View, November 24:

September 24th a fire on section 33 caused by sparks from a railroad engine burned over 80 acres of prairie and destroyed about 10 tons of hay; damage \$25. This was the only fire we have had this year. Dry weather at that time.

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LAWS OF DIFFERENT STATES FOR THE PREVENTION OF  
FOREST FIRES.

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MAINE.

The law of the State of Maine of March 25, 1891, constituted the Land Commissioner as Forest Commissioner, with \$200 increase of salary, which amount was doubled in 1903.

The selectmen are made fire wardens in their towns, the town to be divided into three districts according to roads, streams or lot lines, of which the town clerk shall make a permanent record, and a fire warden is assigned to each district. Their services are to be paid at the same rate as other official service, but no town is to pay for extinguishing forest fires in any one year an amount greater than two per cent upon its valuation for taxation. Those who assist in extinguishing fires are paid by the town, but not exceeding fifteen cents per hour.

For unorganized places the county commissioners may appoint not exceeding ten fire wardens in any one county, with same power as in towns, to be paid the same rate as in towns, the county to pay one-half of the expense, and the owner of the land on which the fire occurred the other half.

Any person who builds a camp or cooking fire on or adjoining any woods and fails to extinguish it is liable to a fine not exceeding \$100 or imprisonment one month.

The Forest Commissioner, with the advice of the Superintendent of Public Instruction, shall take measures for awakening an interest in behalf of forestry in the public schools, academies and colleges, and of imparting some degree of elementary instruction upon this subject therein.

Important new legislation was enacted by Maine in 1903. The law of March 26, of that year, made it the duty of the Forest Commissioner to appoint forest wardens "in all plantations and unorganized townships," who are to patrol the forests, prevent and extinguish forest fires and to hold office during his pleasure. They are to receive \$2 a day for each day of actual service, and may summon to their assistance citizens, to be paid fifteen cents for each hour of service. All expense incurred to be paid from the funds appropriated for the Forest Commission. The legislature of 1903 appropriated, as an "emergency fund for the prevention and extinguishment of forest fires," \$10,000 for the year 1903, and the same amount for the year 1904. It also appropriated for "public instruction in forestry" \$2,500 for the year 1903 and an equal amount for the same purpose for the year 1904. These amounts are in addition to the appropriation for the expense of the Forest Commissioner's office.

#### CONNECTICUT.

The law of Connecticut of June 17, 1901 (chapter 175), required the Board of Control of the Agricultural Experiment Station at New Haven to appoint "a man qualified by scientific training and practical experience to be State Forester," with authority to buy land in the state "suitable for the growth of oak, pine and chesnut lumber, at a price not exceeding \$4 per acre," and to plant the land with seeds or seedlings of such trees, or such other trees as he may deem expedient, at a cost not

exceeding \$2.50 per acre. He was required to protect such lands from forest fires, from trespassers, etc. The sum of \$1,000 annually was appropriated for carrying out the provisions of the law. The law was amended by the act of June 3, 1903, by striking out the limitation of expense for planting the land with seed or seedlings and by adding a provision to allow him to employ such local assistance as he deems necessary for the protection of the land from fire or trespass.

#### NEW YORK.

The State of New York in 1885 made town supervisors fire wardens, and that system was in use until 1896, when the Forest, Fish and Game Commission was authorized to appoint a fire warden for each town in the sixteen counties containing land belonging to the forest preserve. In the other towns the supervisors still act as fire wardens. The pay of fire wardens is \$2.50 per day during the time they are on duty, and those who assist in the prevention and suppression of fires are paid \$2 a day. The expense of fire warden service is paid by the town in which the service is rendered; and the state pays the towns one-half of such expense. The office of Superintendent of State Forests was created at the beginning of New York's forestry system. His salary is \$3,000 a year. In 1900 the office of Chief Fire Warden was created, with a salary of \$1,500 a year. He has supervision of the town fire wardens. The state also employs three forestry experts. The appropriation for the salaries and expenses of these five officers in 1903 was \$12,800; and for one-half of the town expenses in suppressing fires \$5,000. These items of course do not include printing expenses nor for any experimental field work.

## NEW JERSEY.

The law of New Jersey of April 3, 1902, authorizes any city, township or other municipality to raise money for preventing, fighting and extinguishing forest fires; and where money has been so appropriated to appoint a suitable person as fire marshal, who may appoint deputies and aids to assist in the prevention and extinguishment of such fires, and who shall be paid reasonable compensation. He shall report concerning forest fires to the governing body which appointed him. It is made the duty of the justices of the peace to investigate the origin of fires, and they are clothed with authority for such purpose; and if they find sufficient evidence they may have the offender held to await the action of the next grand jury. The fire marshal has the power of a constable, and he may serve the necessary papers in course of an investigation. The state appropriates twice the amount raised by any municipality for the prevention and extinguishment of forest fires, provided that the amount paid by the state to any one municipality in any one year for such purpose shall not exceed \$200; and provided that the total amount paid by the state in any one year shall not exceed the sum of \$10,000.

## PENNSYLVANIA.

In Pennsylvania the constables are made fire wardens. The towns there first pay the expense and the state pays one-half. There is a Forestry Commissioner and a Forestry Reservation Commission, of which the Forestry Commissioner is president, that is authorized to purchase any suitable land for forest preservation at not exceeding \$5 per acre.

The appropriations made by the legislature of Pennsylvania for the department of forestry for the two fiscal years beginning June 1, 1903 (and not including expenses

for preventing and extinguishing forest fires), amounted to \$23,216. In addition, the expense of printing and binding eight thousand copies of the report of the department of forestry for each of said fiscal years is to be paid out of the printing fund. Also the law of May 13, 1903, appropriated \$16,000 to erect buildings on the Mont Alto State Forestry Reservation and to provide practical instruction in forestry therein; the instruction not to cost exceeding \$10,000 for the two fiscal years ending June 1, 1905.

The Act of April 15, 1903, limits the amount of money which the State Forestry Reservation Commission shall expend for the purchase of land for forestry reserves to \$300,000 a year.

#### MICHIGAN.

The legislature of the state of Michigan has enacted a law which was approved June 18, 1903, and which, with a few exceptions, is a copy of the Minnesota fire warden law as it was previous to the amendments adopted by the last legislature. The exceptions are these: The law applies only within the territory lying north of the north line of township 20 north. It makes the Land Commissioner Forest Commissioner, and authorizes him to appoint a deputy to be known as the Chief Fire Warden, and who receives a salary of only \$500 a year; persons who are employed to assist in extinguishing fires are paid \$2 a day; services of fire wardens and helpers to be paid by the town—state to pay one-third. Where a town embraces more than one surveyed township, the supervisors may appoint a fire warden for such additional township.

#### WISCONSIN.

The last legislature of Wisconsin enacted an important forestry law, which was approved May 22, 1903. It

establishes a department of State Forestry with a board of five commissioners, consisting of the Attorney General, Secretary of State, State Treasurer, and two to be appointed by the Governor, who are authorized to appoint a Superintendent of State Forests, with a salary of \$2,500 a year, and who is ex-officio Forest Warden. It is his duty to enforce the law for the prevention and extinguishment of forest and marsh fires and to appoint one or more fire wardens in each town in twenty-nine of the northern counties which are named. They can summon any resident of the town or immediate vicinity to assist in preventing or extinguishing fires. Fire wardens and those who assist in extinguishing fires are paid not exceeding twenty-five cents per hour, which shall be paid out of the treasury of the town in which the service is rendered, but not exceeding \$100 for each town of thirty-six sections shall be paid in any one year. Fire wardens are to be paid not exceeding twenty-five cents per hour for posting notices furnished by the superintendent.

“All public lands remaining unsold and all lands so withdrawn from sale and such other lands as the state may hereafter acquire for that purpose shall constitute the State Forest Reserve.”

The Superintendent of state forests is to establish one or more experiment stations on lands that belong to the state forest reserve, for the purpose of conducting researches into the best methods of forest management under the conditions prevailing in the various portions of Wisconsin.

He is to remove and sell all dead and down timber on the reserve.

The sale of all lands belonging to the state except lands that are in fact swamp lands and lands suitable for agriculture, wood lots convenient to farm homes and isolated tracts, not exceeding 80 acres each, shall cease after this act shall have gone into effect.

The sum of \$3,000 is appropriated to carry out the provisions of the act, in addition to the salary therein provided.

#### COLORADO.

The law of Colorado of April 11, 1903, makes sheriffs, under-sheriffs and deputies fire wardens of their respective counties in case of prairie or forest fires, and empowers them to call to their aid in extinguishing such fires such persons in their county as they may deem necessary. The sheriff is paid \$5 a day for such services and his deputies \$3 a day; the county commissioners to allow the same; and such other expenses as they deem just.

The Forest, Fish and Game Commissioner of Colorado receives a salary of \$1,800 a year, and \$4,500 a year is appropriated for the salaries of "Forest and Game Wardens."

#### WASHINGTON.

The devastating forest fires which prevailed in the State of Washington in the fall of 1902, led that state to enact the law of March 16, 1903, "to protect forests from fire." It constitutes the State Land Commissioner as ex-officio State Forest Fire Warden. County Commissioners may appoint deputy fire wardens, prescribe the territory to be patrolled by them and fix their compensation. State land cruisers are made ex-officio forest patrolmen. The State Forest Fire Warden is to enforce the law and investigate the origin of forest fires. County Commissioners in timber counties may fix a close season during which any person shall not burn any slashings or choppings without first obtaining permission in writing from the county board. Fire wardens must patrol their districts, post warning notices, warn campers or other users of fire and impress help to stop fires. The State Forest Fire Warden must enforce all laws for the protec-

tion of forests within the state and investigate the origin of all forest fires. "Any person who shall on any land within the state set or leave any fire that shall spread and damage or destroy property of any kind, not his own, shall be punished by a fine of not less than \$10 nor more than \$500."

The expenses incurred in carrying out the provisions of the law "shall be met as other expenses of cruising or caring for the state lands." The items in the appropriation act for the two years ending March 31, 1905, out of which one must suppose these expenses are to be paid, are as follows, namely: "Salary and expenses of agents selecting lands, and United States Land Office fees, \$12,000. Appraisalment, sale and lease of state lands, \$20,000."

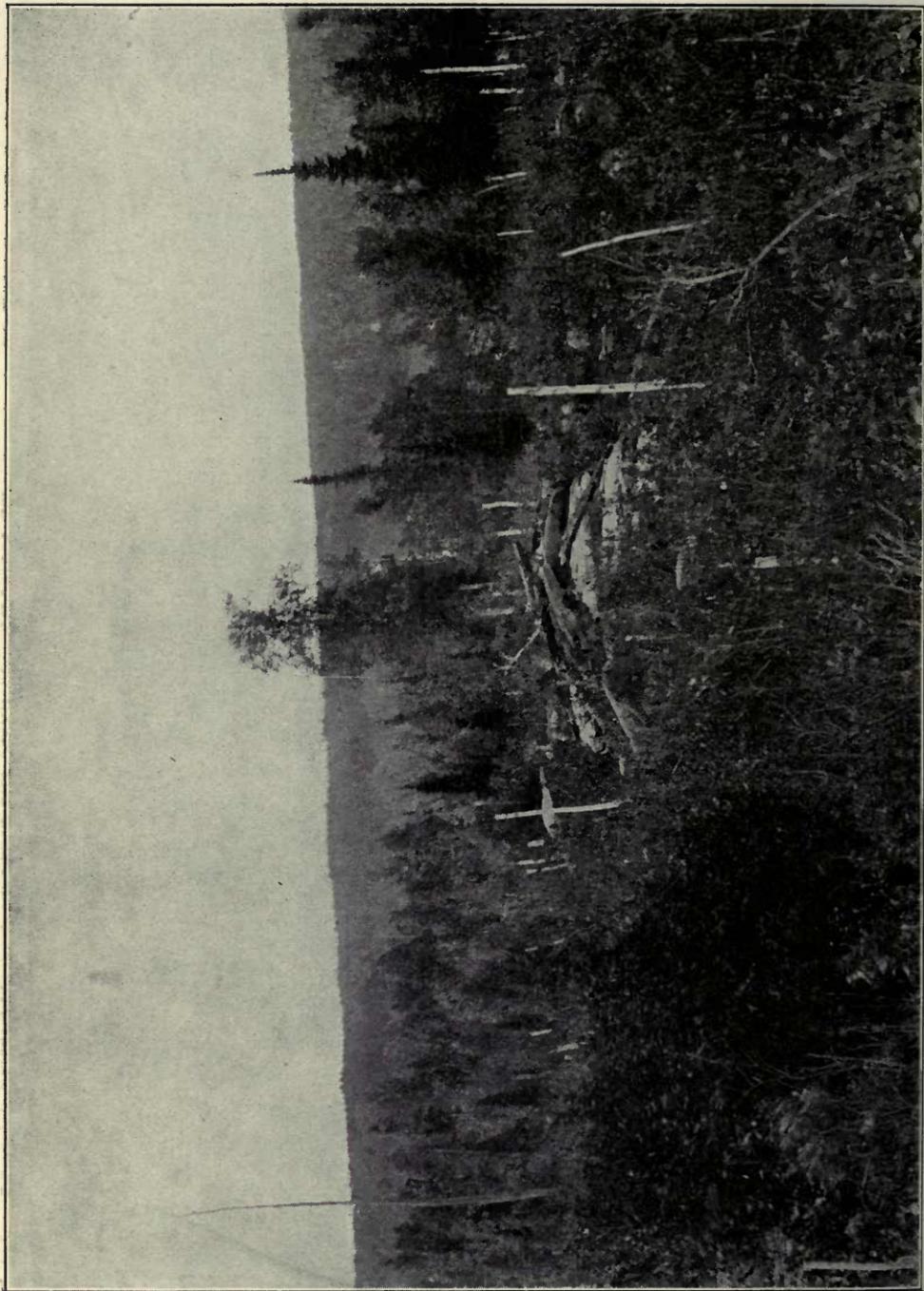
#### ONTARIO.

The Province of Ontario having more than twice the territorial extent of Minnesota, with extensive forests, her system of fire prevention should be of particular interest. As early as 1878 a law for the prevention of forest fires was enacted, but, not providing means for its enforcement, it became, to a great extent, a dead letter; and in that condition matters remained until the year 1885, when a system was devised by the Crown Land Department for the employment of rangers to be appointed by that department on the recommendation of the "timber licensees" or lumbermen—the lumbermen to pay half the expense of the service and the government half. For some years the government advanced pay for the whole cost and undertook to collect one-half of the expense from the lumbermen, but now the lumbermen pay their half direct to the rangers. The system remained simply one of practice until the year 1900, when it was enacted as a law. Under this law, for the prevention and suppression of fires on the lands of the Crown not under timber license,

the Commissioner of Crown Lands may appoint such number of persons as he may see fit, to be called fire rangers, who shall be subject to his instructions, and may pay them for their services out of any moneys voted by the Legislative Assembly therefor. Where Crown lands are under timber license or other form of authority to cut or remove the timber therefrom the Commissioner may appoint such number of fire rangers as the timber licensee or holder of such other form of authority may request, and in the absence of such request the Commissioner may appoint such number of rangers as the public interest requires; "and in such cases one-half of the remuneration to be paid such fire rangers and one-half of the expenses necessarily incurred by them in the performance of their duties shall be payable by the licensee or holder of authority as aforesaid, and one-half by the said Commissioner out of the moneys voted by the Legislative Assembly for the purpose; or the said Commissioner may pay the whole amount of such remuneration and expenses, and may charge the timber licensee or holder of authority as aforesaid with one-half the said amount, which shall be and remain a charge on the timber limit or other area covered by said authority until paid, as fully and effectually as if the same were for unpaid timber dues or ground rent, and in respect of the recovery thereof the said Commissioner shall have all the rights, powers and authority now possessed by him for the recovery of unpaid timber dues or ground rent under the Crown Timber Regulations or otherwise."

The fire rangers are required to enforce the law "and in all cases coming within their knowledge to prosecute every person found guilty of a breach thereof." They may summon such help for the prevention and suppression of fire as they may deem necessary, and all persons so summoned and helping shall receive such remuneration





Lake Superior Forest Reserve. View from elevation of 70 feet on south bank of Isabella River, July 12, 1903. Photographed for the annual report

as the fire ranger or rangers may deem proper. The fire rangers shall perform such other duties and receive such wages as may be provided by regulations to be made under the Act by the Lieutenant Governor in Council.

By order in Council the government can appoint a ranger as magistrate, if competent, and he is able to appoint his assistant a constable to assist in arresting and bringing to justice people who violate the Act. The Ontario system appears to give good satisfaction. In 1886 the number of rangers employed was 45 and the cost \$9,847, half of which was borne by the licensees. The service grew so that in 1902 the number of rangers was 234 and the government's part of the expense was \$34,200. Forty fires were reported that year and 10,000,000 feet of pine were damaged, the estimated loss being \$10,000. In 1903 the government's part of the expense was \$31,257. The number of rangers employed was 270—May 1 to September 30—of whom 244 were employed on licensed lands, the licensees (timber cutters) paying half the expense.

There is another law in Ontario by which on the petition of one-third of the ratepayers a town may appoint not less than two fire guardians to prevent and extinguish fires set on land.

#### MINNESOTA.

It will be seen from the foregoing that there was important legislation in several states in 1903 for the prevention and extinguishment of forest fires. The effect of such legislation will be watched with interest. The system in Ontario appears to be one of the most liberally sustained of any. I think the criticism which an experienced legislator would make of some of the systems would be their failure to sufficiently provide for the payment of fire warden service. It has been my impression that towns would not have money in their treasury for the

payment of fire warden expenses unless the money were specifically raised for the purpose. To raise money for such purpose would require a vote at the annual town meeting and the proposition might fail just in the towns where the money was most needed.

The Minnesota system makes the State Auditor Forest Commissioner and authorizes him to appoint a Chief Fire Warden to represent his authority. Supervisors of towns, mayors of cities and presidents of village councils are constituted fire wardens. Chapter 64 of the laws of 1903 changes the manner of electing supervisors, so that after three years from now each will hold his office for three years instead of one year as heretofore. The act provides that "there shall be elected in the year 1904, at the annual town meeting in each town, three supervisors, one of whom shall be elected for three years, one for two years and one for one year, so that one shall go out each year. \* \* \* At each annual town meeting thereafter one supervisor shall be elected for three years to fill the place of the one whose term expires at that time." This law secures increased experience in the supervisors, and of course should make them more efficient as fire wardens.

In unorganized territory the Chief Fire Warden appoints necessary fire wardens, and he may appoint needed fire wardens in any organized town. In brief, the fire wardens are to take precautions to prevent fires, post notices, warn those whom they think are liable to be careless, patrol or cause to be patrolled their districts in dangerous weather, go to and extinguish forest or prairie fires when they occur, and they have power to call to their assistance any able-bodied male person over 18 years of age. They are to make complaint before a justice of the peace against anyone carelessly causing a fire where they have information of facts that will probably sustain the same.

The chairman has to inquire into the cause of each fire without delay and immediately report the same to the Chief Fire Warden with other facts. Fire warden service is paid for in the first instance by the county commissioners, and the state afterwards pays the county two-thirds of the amount. Besides, the law carries an annual appropriation of \$5,000 to enable the Chief Fire Warden to prevent or suppress forest and prairie fires, "during a dry and dangerous season, when forest and prairie fires are prevailing or are liable to break out"; also an annual appropriation of \$1,000 to enable him to ferret out and prosecute violations of the law where local authorities neglect to prosecute them. This is but a short summary of the law, which was strengthened by twelve amendments enacted by the last legislature, and which were printed in full in my previous report.

I think the principal weakness of our Minnesota system has been the uncertainty of pay for fire warden service. In a few counties the commissioners have in previous years arbitrarily refused to pay for any service. In other counties fire wardens have been humiliated by having accounts that were already small unreasonably cut down. I must say that the service has been considerably impaired by the illiberal action of county commissioners. I have heard quite able and experienced men say that it would be better if the state were to pay the whole expense. However, the tendency appears to be towards more considerate action by county commissioners, and now that the state pays two-thirds of the expense I think it may be hoped that the fire wardens will be promptly and fairly paid for their services. Anyhow the new provision of law should have a fair trial.

## EXPENSE OF MINNESOTA'S FIRE WARDEN SYSTEM.

The State Auditor's printed reports show the expenditures under the fire warden law. The expenses which the various counties have incurred under the law has averaged only \$2,000 a year, and the expense which the state has incurred has averaged about \$6,000 in round numbers. Total \$8,000; of which at least \$1,500 a year has been incurred for printing. We have seen that the expense of Ontario's system for preventing and suppressing forest fires amounted to, in 1902, \$68,400, half of which was paid by the Government. For actual work in the field, therefore, Minnesota has expended only about a fifth part as much as the Government of Ontario. I am satisfied that if the appropriations for fire warden service were more liberal, and if fire wardens could be certain of reasonable compensation, the service would be more efficient.

The reports of fire wardens during the eight years that the fire warden law has been in operation show that the number of acres burned over by forest fires amounted in the aggregate for the eight years to 370,613, but consisting mostly of cut-over land and meadows; and that the damage amounted in the aggregate to \$251,602, being an average of \$31,200 per year.

## VERY DANGEROUS WEATHER.

Let us imagine that we are in the midst of a very dangerous season; that there has been no rain for about a month and that everything in the woods is in a combustible condition. Campers and tourists, hunters, land seekers, mineral prospectors and cruisers are all active, and in hundreds of places some new settler may be engaged in clearing land. The risk of fire will be very great. Under such conditions what are the fire wardens to do? They should have seasonably warned any care-

lessly disposed persons against setting fires; they should cause their districts to be patrolled as they have authority to do, and they should be especially active in having any forest fire extinguished at the earliest moment and before it gets beyond control. But suppose a fire has gained considerable headway and is burning over several acres of fallen timber and slashings and is really such a fire as cannot be extinguished? If a gale should rise such a fire would be likely to spread and cause disaster. Then in such a case the fire wardens should try to have plenty help, and before the wind has risen go a sufficient distance in advance of the fire and make an extra sufficient fire break. This had better be done in the evening or very early in the morning, when the weather is likely to be calm. In making a fire break in such case advantage should be taken of any natural formation, such as a stream, hillside or road.

The fire wardens of a town should, before there is danger of any fire, carefully consult together and agree upon the best plan of action to be taken at a critical moment. They should be just as well prepared as possible for an emergency, and if they seasonably think the matter over seriously they will realize how important is the prevention of fires. One thing which they certainly can do is to make themselves familiar with the fire warden law, so as to know what their duties are.

Town supervisors as fire wardens now have plenty of authority, and they will be responsible for dangerous fires originating in their town.

Under the present law fire wardens and those who assist them can be reasonably sure of their pay. The state, as before said, now pays two-thirds of the local expense which counties incur for fire warden service; and there is besides a fund of \$5,000 which the state will directly expend if necessary for the prevention and extinguishment

of fires in a dry and dangerous season. This, it must be remembered, is for an extraordinary season. For ordinary seasons the appropriation, as I have stated at the beginning of this report, should be increased.

#### WHAT IS FOREST PRESERVATION.

The greater part of the standing timber in this country belongs to private owners, who will cut it as fast as they find a good market.

When a timber tree has ceased to earn good interest by its growth, it has reached its fiscal age, and ought to be cut.

What we mean, then, by forest preservation is the protection of forests from fire, the reservation and treatment on forestry principles of such of the remaining public timber lands as are better adapted for forestry than for agriculture, and the acquisition by states by purchase of any considerable tracts of private nonagricultural lands in their limits, especially at the sources of rivers, and holding and using the same for forestry.

Strictly speaking, forestry looks only at dollars and cents. At the same time, it yields indirect benefits which concern everyone. The forest beautifies landscape, improves climate, enriches soil, maintains water courses, makes covert for game, affords means of recreation.

The significance of forestry is that it utilizes waste land—land that is too hilly, too rocky or too sandy for agriculture. If a forest of pine should now be started on such land it would in eighty years reach merchantable size. The population of this country increases eighteen per cent every ten years. By the time the forest had matured our population would be 287,000,000. What an increased demand for forest products at that period!

## THE ORIGINAL PINE FORESTS DISAPPEAR.

One of the richest pine timber regions of the northwest was the Saginaw and Huron Shore districts of Michigan. In 1893 there was cut in that district, 858,000,000 feet of pine; but the supply of pine timber had so diminished during the next ten years that in 1903 only 52,000,000 feet were cut. The number of feet of pine logs cut in Minnesota the season 1902-1903 was 2,000,000,000. The amount of pine lumber cut in the year 1903 by the mills in the districts of Duluth, Minneapolis, above Minneapolis and St. Croix was 2,200,628,000 feet; being over two billion feet. A comparatively small amount of this may have been from the forests of Wisconsin. A liberal estimate places the remaining standing pine in Minnesota at 28,000,000,000 feet. Anyone can judge for himself therefore, how soon this forest capital will be exhausted and say whether it is not time to begin a system of reforestation by utilizing waste land in the production of pine timber.

## PRACTICAL FORESTRY.

In a certain sense it is forestry when we cultivate trees for a wind break on the prairie or to add beauty to a lawn or to prevent the earth from washing away on steep hillsides; but strictly speaking forestry is the science of raising timber trees for profit. Forestry is the science of deriving good money returns from land which cannot profitably be cultivated in raising grain or other field crops.

Let us suppose that the state or some institution of learning holds a thousand acres of natural forest, that it does not need to convert the timber immediately into money but is able to treat it on scientific forestry principles. Now, how will it begin to manage this forest?

That depends upon the character of the soil, the size of the timber and the condition of the lumber market. An examination of the forest by a skilled forester shows that 500 acres, or one-half of it, consists of mixed pine and hardwood timber growing on good loamy soil with clay subsoil suitable when cleared for agriculture; and that the other half consists of wholly pine forest on soil that is too sandy for agriculture.

We are to assume all the while that this forest is to be treated so as to yield, not for to-day only, but for a long series of years, the largest financial return without impairment of the capital; in other words, we are not to kill the goose that lays the golden egg. Very well, how then shall we proceed? We are to suppose that the half of the forest on good soil contains yellow birch, basswood, maple, poplar and some oak trees, mixed with considerable pine; and the pine is from 80 to 100 years old, of good merchantable size, and that it is not earning by its growth more than about two per cent interest on its value; that most of the hardwood trees are mature, that many of them are suitable for timber and the balance good for fuel. Now, it is plain that if these trees are within reasonable reach of a market and there is a fair demand for such timber then they should all be cut and their value turned into money at the first convenient period, and that the land on which they stand should be used in the future for raising wheat, grass or some other field crop. Because, of course, a larger income can be got from the land in raising annual field crops than in raising crops of trees, which on such land would require 50 years to reach merchantable size.

Now, about the other half of the forest on sandy soil which is too light for farming purposes. On these 500 acres we find that the trees are mostly red pine, commonly called Norway pine (improperly so-called however,





An ideal forest of Norway pine and thick undergrowth of white pine, from one to three feet high, on the island in Cass Lake. Photographed, September, 1900, for the annual report of the Chief Fire Warden of Minnesota.

because the pine of Norway is the same as the Scotch pine), and here and there a few white pines. The trees are for the most part only about fifty years old, stand pretty close and are earning fully five per cent interest net by their growth. The proper thing to do with them therefore is to let them remain about thirty years longer, at the end of which time they will be from 12 to 15 inches in diameter breast high and can then be cut and sold to the best advantage. At that period they can be said to have reached their fiscal age, because after trees are eighty years old their growth is too slow to yield good interest. As the soil is only fit for bearing pine these trees when cut should be succeeded by another crop of pine, and so on perpetually; and doubtless the best economy will be to cut them gradually, fifty acres or so a year,—and beginning always on the side opposite to the prevailing winds—so that the ground can become reseeded from the adjoining trees and a new crop raised naturally. If, however, a new crop does not start naturally, then cutting must be followed either by sowing seeds in spots, three to five feet apart over the ground, or by planting seedlings or transplants about the same distance apart. If young trees come up naturally from the seed as abundantly as they should there will be about one thousand trees on each acre when they are 40 years old; at which age if a thinning is made by cutting and removing the poor, deformed and diseased trees the rest will grow in a more thrifty manner.

Of course care must be taken that this perpetual forest shall not be damaged by fire. A good plan for this object would be to maintain a road around the forest.

Managed according to forestry principles this 500-acre tract of sandy non-agricultural land will perpetually yield three per cent net compound interest annually on the capital it represents.

## A NORMAL FOREST.

The best treatment, however, of this five hundred acre tract of perpetual forest would be to get it into the condition of a normal forest at the earliest practicable period. A normal forest is one that is fully stocked, that contains different age classes of trees, so that enough mature trees can be cut annually or in a certain series of years to yield a steady income on the capital invested without impairment of the capital. The rotation period for pine on such soil should be eighty years; and as soon as this forest is in a normal condition six and a quarter acres of mature timber can be cut annually for ever. An acre of such forest should, at the end of its eighty years' growth, yield on an average 20,000 feet board measure. The yield of six and a quarter acres therefore would be 124,000 feet, which at \$5 per 1,000 feet would amount to \$620 as the annual gross income from the forest, exclusive of intermediate thinnings and fishing and hunting privileges. From this gross income of \$620 deduct \$124 as the annual average expense of care of the forest, also taxes (which on sound principles should only be on the revenue), and we have left \$496 as the net amount of annual interest, at three per cent, on a capital of \$16,530, representing the value of the forest.

Forestry enjoys this advantage over agriculture: The field crop must be harvested when ripe, even though market prices are ruinous; but the forest crop can stand and grow, if only a little, till prices are good. It may be expedient not to cut our regular six and one-quarter acres of forest each year, but wait ten years, or even longer, and then, when the market for timber is very good, cut enough to make up for the inactive years.

To bring a forest into a strictly normal state the following rule, cited by Professor William Schlich (*Manual of Forestry*, vol. 3, page 318), can be followed: "If the

normal growing stock is present in a forest, then the actual, or real, increment must be utilized; if the real growing stock is greater than the normal, more than the real increment must be removed; if the real growing stock is smaller than the normal, less than the real increment must be utilized until the deficiency has been made good."

#### NURSERIES.

If one has to plant many acres with pine or spruce trees it will be economical to raise them in a nursery. In such case the ground for the nursery should be prepared with the same care as for a vegetable garden, but should not be manured. Good natural and rather light loamy soil is the best for a nursery. Seed should be sown in beds, and in rows four to six inches apart, after the frost is out of the ground in the spring and when the ground is not wet. As young coniferous plants are very delicate and liable to be killed by the sun unless shaded, a screen, either of laths or of brush, must be kept over them during the first weeks after they are up. While they remain in the original bed the plants are called "seedlings," but they should not stay in the original beds longer than two years. When one or two years old they can be planted on the ground where they are to remain, or they may be planted and remain one year in other beds, when they are called "transplants," and then planted for forest. Planting had better be done in moist weather. The skilled workman never allows the hair roots of plants or trees to be exposed even for a moment to the sun or dry air.

#### WHAT FORESTRY MEANS FOR MINNESOTA.

What forestry means for Minnesota is simply this: The remaining original pine timber will be cut in the next fifteen years. Some second growth pine, if protected

from fire, will then be cut from year to year, but it will not be as good as the original growth and there will not be enough of it for home consumption. Lumber will be dearer and our great lumber industry will decline. There are, however, fully three million acres of waste land in scattered localities which if planted with pine would in time become normal forests, yielding forever a supply sufficient for our home need. Such forests would by their growth perpetually yield a net annual revenue on the capital invested of three per cent, compound interest, besides many indirect benefits. On such waste, sandy land it will take on an average about eighty years for a crop of pine trees to grow to merchantable size. Individuals cannot wait so long for a crop and they will not engage in the business. The state, to whom time does not occur, must undertake the work by purchasing waste land and planting it with pine. The Minnesota forestry board is ready to go to work, but, until there is some man in the legislature who will make forestry a specialty and fight for it with energy, we shall not get the necessary money for forestry.

#### RANK WHICH FORESTRY SCIENCE CAN GIVE OUR COUNTRY.

When thirty years ago the United States sent her naval vessels over distant seas to observe the transit of Venus, Europe gave her the highest praise for such sacrifice for science. Wherever Americans have profited by science they rank with any other people. To keep our army and navy up to date we have maintained scientific military and naval academies for a long period. Homage is paid to our ships of war abroad because our naval service has had every benefit that science could furnish. So, when our forests shall have had scientific care for a sufficient time we shall rank with the most advanced countries in forestry. "A nation's character," said Henry Clay, "is

the sum of its splendid deeds." To clothe the waste places of our country with thrifty revenue-yielding forest would be a splendid deed!

#### NATIONAL FOREST RESERVES.

The compiled statutes of the United States, page 1539, provide that "no public forest reservation shall be established except to improve and protect the forest within the reservation or for the purpose of securing favorable conditions of water flows, and to furnish a continuous supply of timber for the use and necessities of citizens of the United States; but it is not the purpose or intent of these provisions, or of the act providing for such reservations, to authorize the inclusion therein of lands more valuable for the mineral therein, or for agricultural purposes, than for forest purposes."

Any mature timber in a United States forest reserve may be sold at its appraised value. Any person, under the regulations of the Interior Department, can enter a forest reserve for all lawful purposes, including that of prospecting, locating and developing the mineral resources thereof; and, more than that, can have free use of timber and stone carrying on his work. Besides, the Interior Department may restore to the public domain any public lands in a forest reserve, which, after due personal examination by a competent person, shall be found better for mining or for agricultural purposes than for forest use. The setting apart of lands that are suitable for the purpose as a forest reserve is, therefore, beneficial to the public, though it may not be beneficial to the speculator in timber.

#### FORESTERS NEEDED.

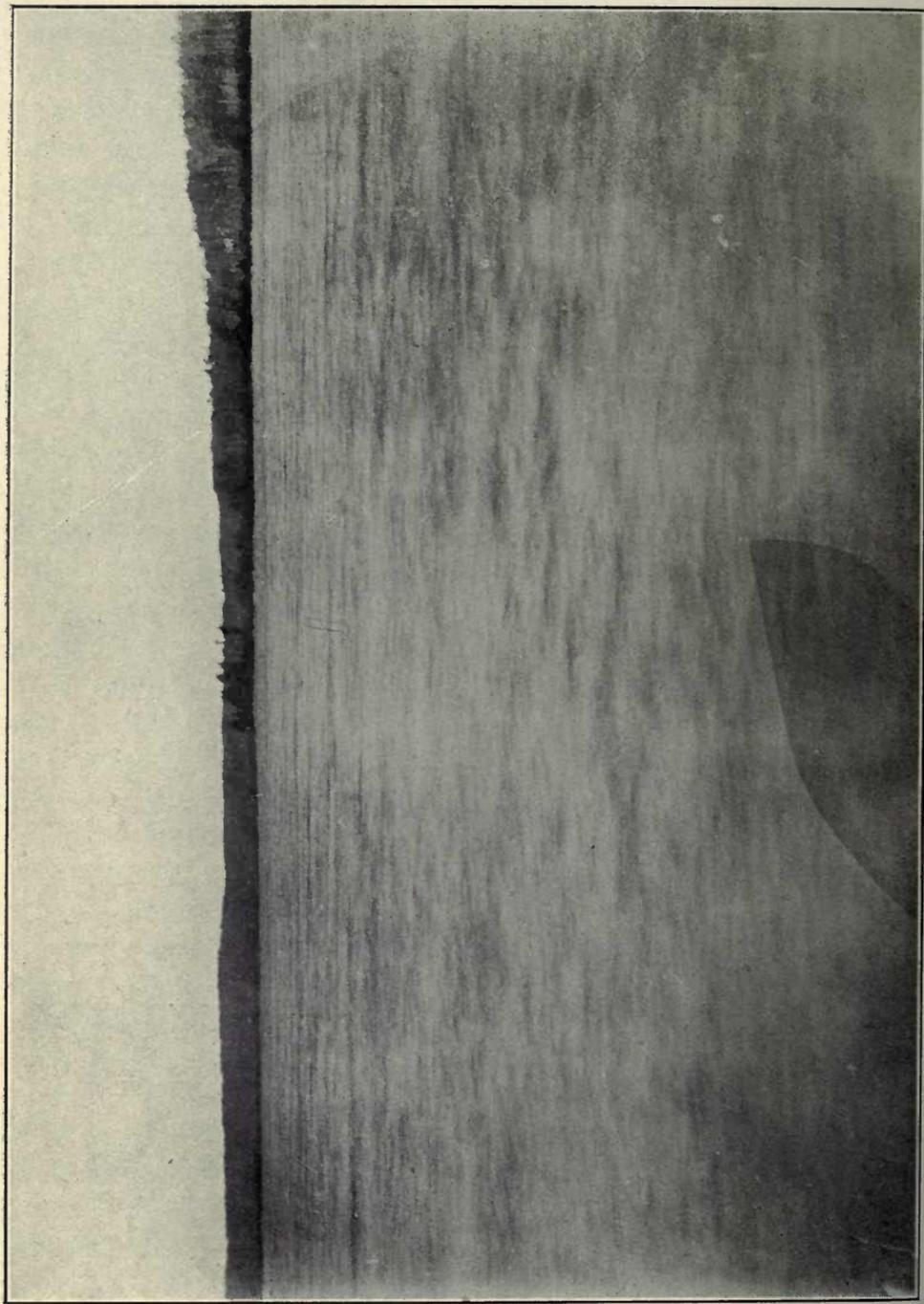
Some of the brightest young men in Minnesota are studying forestry. The United States government will soon want fully 300 trained foresters to have charge of the

national forest reserves. There are now 62,000,000 acres of such reserves in the Rocky Mountains and farther west, and they are likely to increase. A trained forester is to have charge of a range not exceeding on an average about 170,000 acres—depending somewhat on natural boundaries—at which rate there should be employment now for 360 foresters or chiefs of range, to manage properly the present reserves. But at present there are probably not more than thirty foresters in the country qualified for the position.

Forestry promises to be one of the most attractive of scientific careers for young men in this country. It is a profession in which the tenure will be permanent and the service fairly well paid; but it will require, of course, years of hard study to become qualified for the service. A forester should be a good practical surveyor. He should know how to measure trees and estimate their contents, how to make a map of the forest and necessary roads, how to make and execute working plans for the forest and to manage the same in a way to secure a sustained yield. Besides technical knowledge of trees and tree culture, he must be acquainted with the kindred sciences, such as agriculture, geology, mineralogy and botany. He must know how to protect the forests from the ravages of insects as well as from fire and trespass, how to get rid of noxious animals and how to protect valuable game. These are some of the things he must know.

Assuming that a boy had graduated at the high school, he ought in four years of study and practice, one of which should be a year of practice in the woods, to become a fairly competent forester. With such training I think he would be sure of \$1,200 a year as a forester in the service of the United States, with the prospect of rising in his profession for distinguished merit.





Shore of Bald Eagle lake, Lake Superior Forest Reserve, July 11, 1903. Photographed for the annual report of the Chief Fire Warden of Minnesota.

The appropriations which congress made for the present fiscal year for the care of forest reserves and for the forestry bureau amounted in the aggregate to \$892,000.

#### LAKE SUPERIOR FOREST RESERVE.

Favored by perfect July weather, my trip into the wilds of Lake County was through a region that could well be called Minnesota's Adirondacks. Embarking four miles east of Ely in two modern canoes, with an experienced canoeman for each, and with a photographer, the route was via the Cashaway and Birch rivers, Gabbro and Bald Eagle lakes, the Isabella river, Lake Bellissima, Elbow and intermediate lakes to Cross river, thence to its mouth at Lake Superior; traversing parts of eleven townships, five of which are unsurveyed, and most of the country being in the proposed Lake Superior Forest Reserve. The surface is undulating with elevations varying from 1600 feet to 2200 above the sea. Granite ledges are frequent and granite boulders often fringe the banks of lakes and streams. The country generally is a handsome primeval forest, with some swamps of dwarf spruce and burnt areas interspersed, the prevailing kind of trees being spruce, balsam, jack pine, white birch, poplar, cedar and tamarack. There is but little of white and Norway pine. Alder bushes abound in low places and along river and lake shores. The ash, elm and maple are seen in more fertile spots, but not frequently. A few spruce and cedars were seen that were a little over two feet in diameter, breast high, but generally the trees are not of large size so far as could be judged in travelling many miles through the woods in the twenty portages—some of which, on account of obscure trails, fallen trees and labyrinth of roots, were difficult. Climbing to an occasional height, an extensive view could be gained of the landscape. The sombre coloring of coniferous woods was relieved by

the lighter foliage of white birch and poplar, and the moving shadows cast by the clouds made an impressive scene.

The region is rich in lakes and streams. Bald Eagle lake, which is about three miles in length and wide in proportion, has such a handsomely wooded sloping shore and fine islands, and looked so cheerful on the bright summer day we entered it, that I thought its name could well be changed to the Lake of Smiles. Bellissima lake is still larger, with more islands and equally as beautiful. There are many other large, fine lakes, some of which are stocked with whitefish.

Over a dozen moose were seen on the trip, always near water, and nearly as many deer. Also ducks and partidges were seen. The country is fairly well stocked with fur-bearing animals, such as the black bear, martin, lynx, otter, beaver and fox. If set apart as a forest reserve the region would prove a great game and fish preserve, and no doubt a favorite resort for tourists. There is any amount of water power in the rivers, especially in Cross river, where the spruce could be made into pulp.

The forest reserve law provides for the utilization at its appraised value of all merchantable timber in a reserve. If any considerable area of agricultural land is found in a forest reserve it is to be restored to the public domain.

#### ALONG THE RAINY RIVER.

I went the latter part of September, fifty miles through a timber country on the line of the Canadian and Northern Railway from Beaudette to Warroad (on Lake of the Woods), in the northern portion of Beltrami and Roseau counties. The road has been in operation a year, but I saw scarcely any trace of recent fire along the line of route. This was the first time I had visited just that portion of the state, although it was the third time I had visited Rainy River. For the greater part of the distance

the land is suited for agriculture. I would except from the agricultural areas a few tracts that are exclusively in jack pine. It is generally level. The prevailing timber is poplar, then richly tinted and handsomer for scattered basalms and spruce. There are considerable bodies of good spruce; also of cedar and tamarack alternating with some inviting hardwood tracts. There is also some good pine, the manufacture of which at one place at least along the line of road has begun. This timber ought to have an increased value when the great water-power at Koochi-ching—now called International Falls—shall be developed. The agricultural character of the land and the quality and quantity of the timber along the line of this railway on the Ontario side are equally as good.

This railroad is developing quite an important part of northern Minnesota. The scenery of the Rainy River, the islands and shores of which are prettily wooded, is decidedly beautiful, especially after it has received the autumn coloring.

## EUROPEAN FORESTRY.

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No intelligent friend of forestry supposes that the science of forestry will, for a long time, produce in this country the results which are seen in many of the densely peopled states of Europe, but a knowledge of these splendid results is very instructive and stimulating, and for that reason I have taken pains to diffuse such information. The science of forestry is the same everywhere, but its application depends upon the conditions which are found in different countries. Let us assume that there is a natural coniferous forest on non-agricultural land in Germany in which 75 per cent of the trees are mature and 25 per cent have not reached merchantable size. According to scientific forestry the 75 per cent of mature trees will be cut just as soon as the market would justify and the 25 per cent of trees of unmerchantable size would be left to grow till they should be fit to cut. A similar natural forest in this country would be treated in the same way, if treated according to forestry principles; and some lumbermen, such as those, for example, who hold pine lands in the valley of the St. Croix river or on its tributaries in this state, and who have gone back every fifteen or twenty years to make a second, third or fourth cutting on the same land, are managing their forests in this way. In cases where pine lands are remote from streams of capacity for floating and where the pine is reached by temporary logging railroads, clean cutting is made of both large and small trees; but lumbering of this latter description is in violation of forestry principles. If a trained forester were to commence cutting a mature forest he would not begin on that side of it which is exposed to the prevailing wind, because if

he did every cutting would freshly expose the remaining forest on the side of the cutting to dangers from the wind. Instead of that he would begin on the side opposite the prevailing wind, leaving the forest border, long years hardened to the wind on the windward side, as a protection to the forest. Now, that is a principle of scientific forestry and is just as applicable in this country as in Europe. Again, a trained forester in Germany would manage the cutting so as to promote natural seeding from the nearest trees left standing, and that principle is just as applicable in this country as in Europe. If a person in this country were to begin to manage a natural forest on forestry principles he would first have it surveyed; he would ascertain the number, contents and situation of the mature trees; he would gradually make necessary roads; he would make a map of his forest and prepare working plans for its administration and ascertain where he could sell the mature trees at the highest price; these would be the essentials that he would perform, and he would be doing just the same as a German forester would do with a forest in Germany. Owing to the denser population, cheaper wages, better roads, and very much higher value of land and forest products, the results of forestry are very much different there from what they are in this country, or will be for many years. But the cause of forestry in this country will be greatly promoted by diffusing a knowledge of European forestry; and for that reason I reprint from my last report sketches—obtained at great pains and in many instances direct from the respective governments—of the forests and forestry of several European states. A few sketches have been slightly abridged.

## BAVARIA.

## STATE FORESTS.

Bavaria, whose attractive capital, Munich, is frequented by so many Americans, has 6,000,000 inhabitants. Its state forests comprise 2,150,000 acres, and are mostly managed as "selection" forests. Large forests are to be found in all parts of the kingdom; but as a general rule the mountainous districts in the south (Alps), the north (Spessart) and northeast (Bohemian forest) are covered with the densest forest. Of the whole area of the country 33 per cent is covered with forest. The prevailing kind of trees, or 77 per cent, are coniferous. The remainder comprise various kinds of deciduous trees—those losing their foliage in winter. Among the conifers, red and white pine are most frequent. Among the deciduous trees the beech occupies the greatest space. The oak is also cultivated quite extensively for tanning purposes. The average estimated value of the forest land is \$50 per acre. The annual aggregate expense of administering the forests (1891) including salaries of officials, wages of workingmen, local taxation, new purchases, etc., amounts to \$4,965,204. The total revenue from the forests the same year amounted to \$8,187,349. Number of acres sown or planted to forests in 1892 was 14,800, more than three-fourths of which area was planted with coniferous trees. In the case of the red pine and the white pine, reforestation is mainly done in the natural way. In the case of the fir (*pinus sylvestris*) it is always effected artificially; in the case of the beech, always in a natural way (seed from standing trees); in the case of the oak, generally by artificial sowing. There is a continuity of forest products and a steady increase of the revenue which the state derives from its forests. This is due, first to an increase of prices, secondly to an increase of the yearly

crop. The latter must chiefly be regarded as a result of the present condition of the forests, which are being and have been steadily improved; also of the economy which was practiced in former times. Where reforestation is effected by seeding from the standing trees, the crop is generally cut in lengthy strips, usually not exceeding about thirty yards in width. As a general rule the administration of the state forests makes it a principle to avoid cutting in large blocks clean. In regard to compulsory tree planting, it may be said that every forest area, the trees of which have been cut, no matter whether state or private property, must be reforested in a short time, unless evidence can be furnished that the land would be better adapted to agricultural purposes.

The damage caused by forest fires is quite insignificant, being in 1890 only \$974, in 1894 only \$1,686. The principal cause of such fires is the carelessness of the workmen employed in the forests and of individuals and parties making excursions, particularly on Sundays. There are no data at hand as to the number of such fires caused by railroad locomotives, and although some fires are no doubt so caused, the number is certainly very small.

The administration of the Bavarian state forests constitutes one of the departments of the ministry of finance. It is directly subordinate and responsible to the latter, no other authorities intervening. The highest forest official who may be regarded as being at the head of the forest administration, responsible, of course, as stated, to the minister of finance, bears the title "Ministerialrath,"—ministerial or cabinet councilor. The chief director of the Bavarian administration of state forests is "Ministerialrath" Ganghofer. His starting salary is 7,740 marks. After a sixteen years' service the salary advances to 8,820 marks. Next in rank are the so-called "Oberforstrathe," with a starting salary of 6,660 marks, which, after a sixteen years' service, is increased to 7,740 marks.

## PRIVATE FORESTS.

The aggregate extent of private forests was 3,149,400 acres in 1892. In addition to the state and private forests there are about 800,000 acres of forests belonging to separate towns and villages. The forests which are owned by great landholders are managed on forestry principles. These forests, however, only comprise a very limited area, somewhat less than 400,000 acres. Most of the private forests are the property of small landholders. The average value per acre of private forests is somewhat less than that of the state forests. The net income rate varies widely. The data at hand are too few and too unreliable to admit of arriving at any conclusion with regard to the average. Opinions vary as to whether the total forest product of the country increases or decreases. In general the extent of the private forests seems to be somewhat decreasing. This would, of course, also appear to entail a decrease of the total forest product. Forest lands are only allowed to be changed into agricultural lands when proof can be furnished that the agricultural crop may be expected to exceed in value the forest crop. Between 1886 and 1891 7,000 to 8,000 acres of private forests were newly planted or sown.

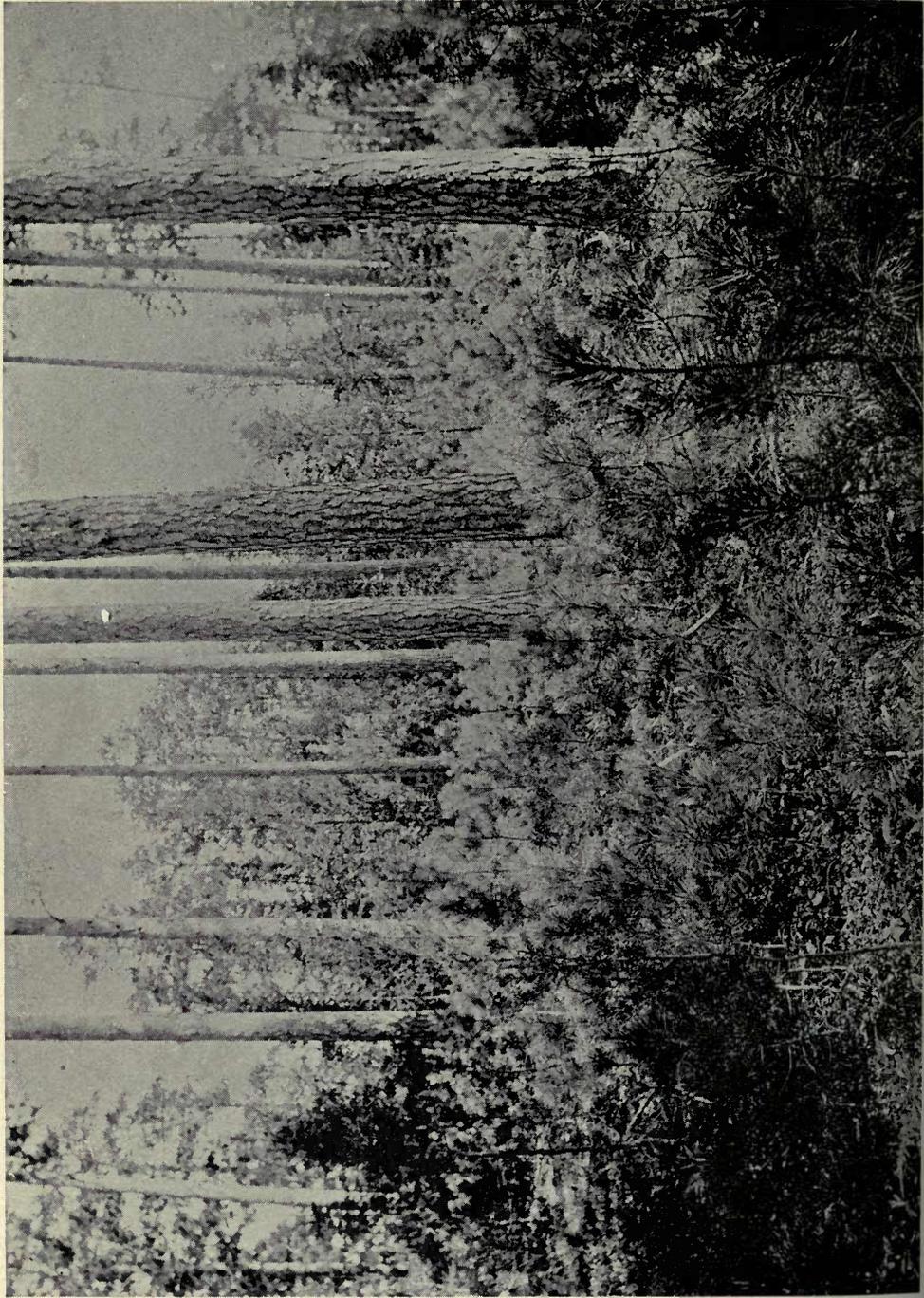
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DENMARK.

## STATE FORESTS.

The experience of a country which had adopted important forestry regulations almost at the very beginning of the last century and which has successfully, through tree planting, resisted the invasion of desolating sand drifts from the sea shore must prove of much value. It was, therefore, with a high degree of satisfaction that I lately received from the Department of Agriculture of





Young and mature Norway pines on a school section (given to the State of Minnesota by the United States) in Beltrami County. Illustrates what many misinformed people deny, that pine will succeed in the north. Photographed 1928, for the annual report of the Chief Forester, Warder of Michigan, and published in the annual report of the Chief Forester, Warder of Michigan.

Denmark, answers kindly furnished in the English language to some questions that I had submitted. I have put the information in its present form.

The aggregate extent of the state forests of Denmark is 142,140 acres, besides 2,962 acres for public parks. Of these, 67,700 acres are old forests, 74,440 acres are new plantations, especially on heathy tracts. The planting of forests had already commenced one hundred years ago, but has quite particularly increased since 1850. Forty-five per cent of the state forests are situated on the Danish islands; 54 per cent on the peninsula of Jutland, of which latter only 10.6 per cent are old forests, the rest are new heath plantations not yet thoroughly planted up. Beech comprises 37.7 per cent, oak 3.3, ash, maple, birch, elm and alder 4.8 per cent, and conifers 54.2 per cent. Conifers did not exist in Denmark 150 years ago, so that the extensive area of conifers in the state forests at present has been produced artificially. For the planting up of heaths the mountain pine (*pinus montana*) and the spruce (*picea excelsa*) are particularly utilized. The annual aggregate expense of administration averaged \$40,000 per year for the period 1893-97. Annual aggregate revenue averaged per year for the period 1893-97: revenue \$258,416, expenses \$195,370. The smallness of the net revenue arises partly from the fact that about half of the state forests are still so young as to yield only a small revenue, partly from extensive new areas being cultivated every year. The area annually sown or planted to forest averaged 2,285 acres per year for the period 1897-1900. Regeneration from self-sown seed is only used in the case of the beech (*fagus silvatica*) and of the silver fir (*abies pectinata*). In all other cases, forests are regenerated by means of planting plants or sowing seeds.

There is a sustained yield. Every tenth year a working plan is prepared for cuttings and cultivations of the next decennium. In working out these plans it is taken

into consideration, as far as may be, that there should be such areas and stocks of wood in store for the future as are available for the decennium. Within such a decennial period the yield of the cuttings varies according to circumstances; as a rule, however, there is but little differing one from the other. The extent of the state forests being on the increase, the proceeds will naturally increase. The forests are divided into parts of 10—100 acres in size, according to the nature of the soil or the species and age of the stock of wood. Within each decennial period a certain number of such divisions are destined for cutting, and the latter is commonly to be finished and the areas restocked with plants at the end of the period.

Private persons are prohibited by the law of September 27, 1805, from cutting away those remnants of the old forests of the country still existing in the said year. In cases of offence, means are placed in the hands of the government to force the owners to restock the cleared area under control of the state officer in charge. Consequently but very few forest areas have disappeared in the course of the nineteenth century. The many new plantations in Jutland which have risen by means of government subventions disbursed through the "Hedeselskabet," are subject to the same prohibition of clearing. Finally, under the guidance of a board of administration not appertaining to the state forestry service, the government has caused the waste sandy downs on the west coast of Jutland to be planted in order to subdue the sand drift in those parts, which had in former times caused great devastation. At the close of 1899 about 27,000 acres of sand downs had been planted with a good result. Damages by forest fires occur every year, but they have hitherto been rather insignificant. On account of the dense population of the country the casual forest fires are quickly quenched. The principal cause of such fires is care-

lessness of various kinds. It is notorious that several forest fires have been caused by sparks from locomotives, but no number can be stated.

The administration of the state forests is under the Department of Agriculture; its yearly budget is voted under the general budget of finances and its officers are appointed by the king. The state forestry is managed by three forest masters, twenty-three superior foresters, sixty-nine foresters and 306 keepers. The superior foresters have the use of a house free of charge, together with a lot of arable land (30-100 acres) upon which they pay the ordinary taxes, besides a salary of \$950-\$1,250. The salary of the forest masters is \$1,450, to which is added an allowance for traveling and other lawful expenses. The three forest masters give in an annual report on the operations of the local ranges under their supervision. Three reports are prepared in the department and printed in a condensed form as a supplement to the public accounts. Every tenth year is issued a review of the state forestry in the past decennium. The "Tidskrift Skovvasen" (forestry periodical), published in Copenhagen by Mr. C. V. Prytz, professor of forestry in the Royal Agricultural and Forestry Academy, and "Hedeselskabets Tidskrift" (periodical of the society for the cultivation of heaths), published by "Det danske Hedeselskab" at Aarhus, are the periodicals. The revision of the decennial working plans for state forestry, which is simultaneous with the preparation of the working plan for the next ten years, is undertaken by a "Skovtaxator" (appraiser of forests), classed directly under the department, and four assistant clerks. A second "Skovtaxator" with one clerk is constantly occupied in the experimental line, in examinations of the growth of trees and the economy of divers modes of forest husbanding, altogether in support of practical forestry.

## PRIVATE FORESTS.

The aggregate extent of private forests is 505,900 acres, of which, by the statistics of 1896, beech (*fagus silvatica*) comprises 44 per cent; oak, ash, maple, birch and alder comprise 18 per cent, and spruce (*picea excelsa*), pine (*pinus sylvestris* and *montana*), silver fir (*abies pectinata*), larch (*larix Europea*), etc., 38 per cent. Three-fourths to four-fifths of these forests are managed on forestry principles. The extent of private forests by the official statistics was, in 1888, 414,837 acres, and, in 1896, 454,874 acres. By the law of September 27, 1805, before mentioned, and which is still in force, private persons are prohibited from cutting their parts of the old forests of the country standing at that time, aggregating at that date an area of about 280,000 acres. This area comprises (besides the old forest area of the state, about 100,000 acres) the remnants of the original forests of the country still existing. Since 1850 very considerable areas have been planted with forests, both by the state and by private persons, especially in the heathy tracts of the peninsula of Jutland. In these tracts an area of 108,500 acres has, since 1868, been planted by private persons, however under the guidance and control of the "Hedeslskab" (society for the cultivation of heaths), which is aided by the state (for the year 1900 to the extent of \$73,000); and of the above area 54,600 acres were thoroughly cultivated at the close of 1898.

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FRANCE.

The total extent of the forests of France (exclusive of the colonies) is about 23,500,000 acres, which represents about 17 per cent of the surface of the entire territory.

These forests are divided in: Forests of the state, 2,700,000 acres; forests of the municipalities and of the public

institutions, 4,700,000 acres; forests of individuals, 16,100,000 acres. The forests of the state and those of the municipalities and of the public institutions are managed and supervised by the Administration of Forests. France only extends over 9 degrees in latitude, but, as it has very high chains of mountains, the result is that it possesses all the climates of Europe, from the hottest to the coldest, and that a great variety exists in the species of trees that compose the forests.

The principal varieties of these species are: In the warm region, comprising the borders of the Mediterranean sea and of the Gulf of Gascony, the cork oak (*quercus suber*), the evergreen oak (*quercus ilex*), the cluster pine (*pinus pinaster*) and the Aleppo pine (*pinus halepensis*).

In the temperate region, comprising the plains, the rolling grounds and the lower parts of the mountains, the common European oak (*quercus ruber*), the European white oak (*quercus pedunculata*), the beech (*fagus silvatica*), the hornbeam (*carpinus betulus*), the common European ash (*fraxinus excelsior*).

In the cold region, comprising the middle and upper parts of the mountains, up to the extreme limit of vegetation, the silver fir (*abies pectinata*), the Norway spruce fir (*abies excelsa*), the beech (*fagus silvatica*), the Scotch pine (*pinus sylvestris*), the mountain pine (*pinus montana*), the larch (*larix Europea*).

#### STATE FORESTS.

The total area of the forests of the state, 2,700,000 acres, is composed of 2,100,000 acres of productive forests and of 600,000 acres of protective forests, situated in the mountains or on the dunes of the ocean; of lands recently purchased by the state on the banks of torrents and whereon timber is now being planted.

The forests yield annually to the state:

Timber (cubic feet) .....	33,800,000
Fire wood (cubic feet).....	62,300,000
	<hr/>
Total .....	96,100,000

This represents nearly an annual production of 46 cubic feet of wood per acre of productive forest. The state forests produce in addition thereto oak bark, which is used in the tanning of leather; cork, rosin and several other small products; also hunting rights are leased.

The gross annual income in money is \$5,500,000, or \$2.62 per acre of producing forest. In some forests this average is largely exceeded and it attains as high as \$8 per acre.

The expenses are as follows, viz.:

Labor.....	\$1,240,000
Forest instruction .....	35,000
Sundry works.....	360,000
Reforestation of mountains .....	700,000
Taxes paid to departments and municipalities.....	360,000
Sundry expenses .....	60,000
	<hr/>
Total .....	\$2,755,000

But of all these expenses a large share is applied either in administering the forests of the municipalities or in executing works of real public utility in the "protection forests," or in reforestation mountain lands (to prevent slides and the like). If we make these several deductions we find that the expenses incurred in the producing forests do not exceed \$1,500,000 or 71 cents per acre. The net annual income of these forests is therefore \$2.62 less 71 cents, equal to \$1.91 per acre.

The state forests are carried on either as high forest or as coppice, and are managed under regulations made by the President of the Republic. Cuttings are made yearly. In forests rich in wood there is cut every year an amount equal to the increment or growth; in forests poor in wood

they cut less than the increment in order to gradually increase the forest. The endeavor is made also to increase the production of the timber wood by reducing that of the fire wood. The "high tree forests" are cut down at periods ranging from 120 to 150 years.

The work is directed in a way that will insure natural reforestation from the seeds that fall from the standing trees. Not only the trees that have attained the age determined by the rules are cut down, but also the dead ones and those which are dying, and those that prevent the growth of neighboring trees. In temperate climate the annual cutting of high trees is on a limited area; a large number of trees are cut down simultaneously. In very cold climates and where winds are to be feared, only a few trees are taken away at a time on the same point, and cutting is then done on a larger area.

The low forest, coppice and second growth are cut in rotations, ranging from 25 to 35 years. The reserved trees, which are very numerous, are cut on an average every 100 years, but some selected trees are allowed to attain and even pass 200 years.

The labor performed in the forests consists in the construction and maintenance of forest roads, water saw-mills, houses for watchmen, replanting. Fortunately, owing to the system of culture now in use, artificial reforestation has but little importance in forests, properly speaking, but sowing and planting in the small open spaces, or on the points where a few more valuable species are to be introduced, or where the soil of the forest is better adapted to some varieties, there sowing and planting are more frequent. The average cost of such work is \$10.00 per acre.

Very considerable reforestation is made on mountain lands, where the state plants trees to regulate the action of the waters and stop the ravages of torrents. For that purpose \$700,000 are expended every year, the

largest part of which is used in the purchase of land, and the other part in dams to regulate the streams, and in plantations to settle and retain the soil. The state purchases yearly, on an average, 16,000 acres. The average cost of reforestation is \$20 per acre, and \$18 must be added thereto for work in improving the streams, building roads, etc. Planting is preferred to sowing on calcareous or chalky soil.

The administration of the forests forms part of the Department of Agriculture. It has charge not only of the direction and care of the forests of the state and of those belonging to municipal corporations and public institutions, but also the overseeing of the fishing in the rivers and creeks. At its head is a director, residing in Paris, who has under him: A central service composed of 3 administering general inspectors, 10 inspectors, 5 assistant inspectors and 17 clerks.

An exterior service composed of:

First—Personnel superior or of administration—32 forest keepers, 200 inspectors, 215 assistant inspectors, 250 general wardens.

Second—Personnel inferior or of surveillance—3,500 foremen and wardens, paid by the state; 3,700 foremen and wardens, paid by the municipal corporations and public institutions.

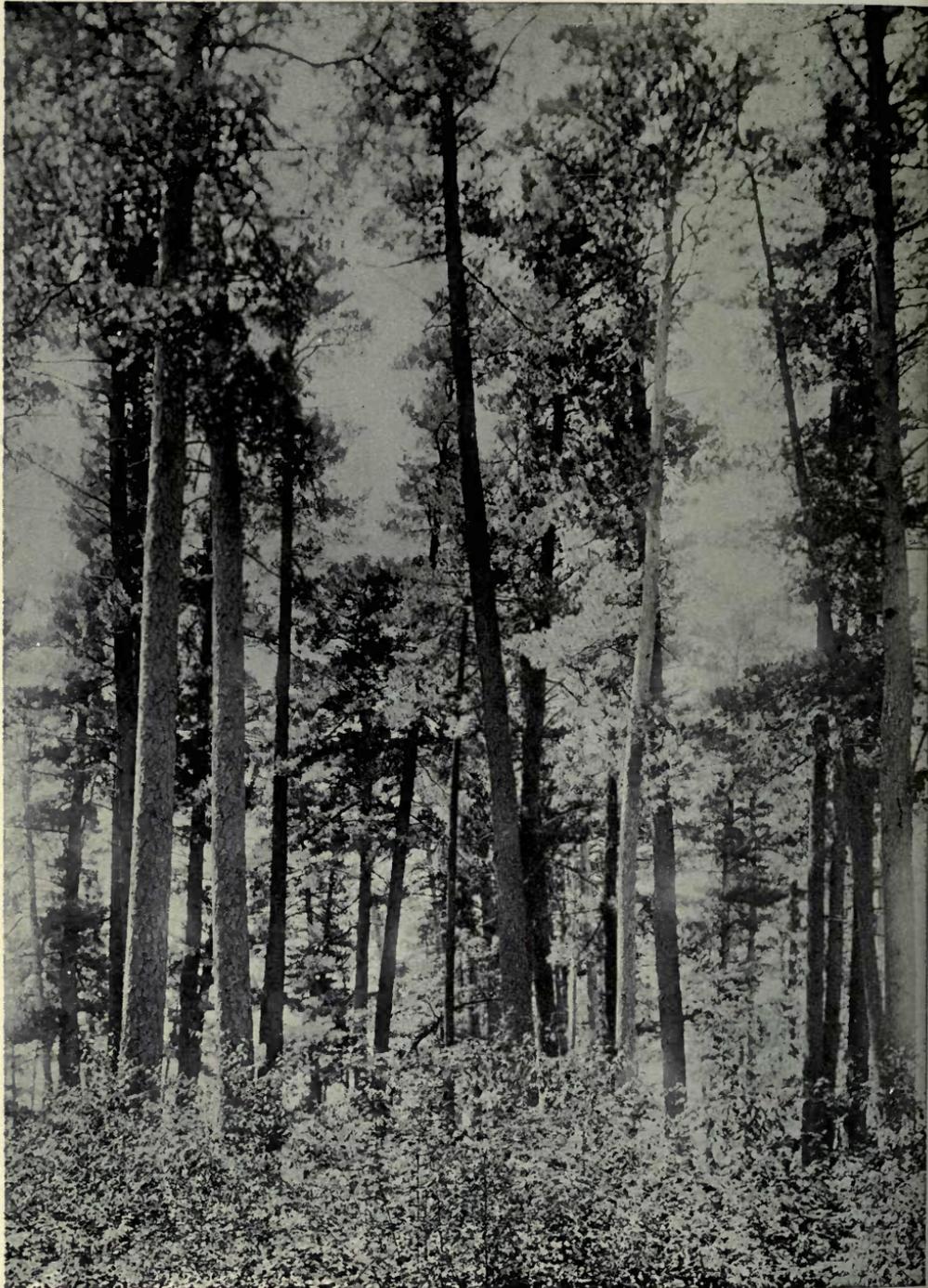
The annual salaries paid are as follows:

SUPERIOR OFFICIALS.

Director.....	\$3,000
Administrators.....	1,800 to 2,600
Forest keepers.....	1,600 to 2,400
Inspectors.....	800 to 1,200
Assistant inspectors .....	600 to 800
General wardens .....	300 to 520

Exclusive of some additional allowances for traveling expenses.





White pine on the south shore of Cass Lake. Some of Minnesota's most charming scenery. Photographed, 1899, for the annual report of the Chief Fire Warden of Minnesota.

## INFERIOR OFFICIALS.

Foremen and wardens paid by the state an average of ..	\$160.00
Foremen and wardens paid by the municipal corporations and public institutions .....	116.00

The foremen and wardens receive in addition thereto allowances of firewood, tillable land, pasture grounds, etc.

Those in the employment of the state have free rent in houses built in the forest, or in lieu thereof they receive as compensation a cash equivalent.

The superior officials are entitled to a retreat pension at the age of 60 years, and the inferior officials at the age of 55 years.

France has three forestry schools. One school of higher instruction at Nancy; one school of secondary instruction, and one school of primary instruction. The two latter schools are established in the department of Loiret, on the possessions of the administration at Barres.

## FORESTS OF MUNICIPAL CORPORATIONS AND OF PUBLIC INSTITUTIONS.

The forests of municipal corporations and of public institutions comprise 4,700,000 acres. They are supervised by the Forest Service on the same conditions and according to the same principles as the state forests. They contain about 200,000 acres of forests for protection, and their producing area is thereby reduced to 4,500,000 acres. They produce annually, timber, 42,000,000 cubic feet; fire wood, 128,000,000 cubic feet, and together, 170,000,000 cubic feet. This represents nearly an annual production in wood of 38 cubic feet per acre of productive forest. The annual cash value of the product, including the bark, cork and rosin, is \$6,400,000, or \$1.42 gross income per acre. The net income is about \$1.14 per acre. The forests belonging to the municipalities and public institutions are under regulations approved by the president of the republic. These regulations and those of the state

forests have been established with a view of insuring a continuous annual production and even of increasing that production in the forests where it is not yet sufficient.

#### PRIVATE FORESTS.

Private individuals are at liberty to manage their forests as they please. But they are prohibited from cutting and taking trees from forests which are necessary to maintain and regulate water flow, to protect lands against the encroachments of the sea and sands, to defend the territory, or which are necessary for the public health. The destruction of private forests has become rarer and rarer and the proprietors acknowledge now that on soils of poor quality the income from forests is greater than that from arable land. As a result the area of private forests, instead of decreasing, increases from year to year by reason of the timbering of lands on which agriculture pays but small profits.

The income from private forests in quantity and in money is not exactly known. It is, however, known that on the same area they pay less than the state forests. Private individuals in their anxiety to get returns are inclined to cut down the wood when it is too young, and in the forests where coppice wood is raised they do not leave a sufficient reserve, and oftentimes leave none at all. One can notice, however, that the principles of silviculture are spreading more and more in the culture of private forests. The large forests are subjected to the same mode of management and are treated like the state or municipal forests. On the whole the annual production is regular and tends to become better in both quantity and quality.

#### FOREST FIRES.

In the temperate and in the cold regions of France (that is, in the larger portion of the territory) the fires are but few and cause slight damage. The long periods of

drought are not frequent, the numerous roads that run through the forests make very good lines of defense, and the villages that surround the massive wooded areas furnish at the first alarm devoted laborers. The railroad companies, being held responsible for damage by fire caused by flying sparks from their locomotives, take particular care, and in exposed places cut the grass and brush along their roadbeds.

The forestry code forbids, under penalty of \$4 to \$20, carrying or lighting matches in or within a distance of 200 metres from the forests.

In the forest camps of the state, municipal corporations or public institutions, it is forbidden to the workers to light fire outside of the buildings or shops, the location whereof is indicated by the forest service.

In the warm region the dangers from fires are greater. As a preventative against them more roads are built, trenches 20 to 50 metres wide and kept free from grass and brush are made around the forest, along railroad lines, on the dividing lines between forests belonging to several owners, and also from distance to distance in the large and dense forests belonging to the same proprietor. The use of fire in forest camps and in agricultural camps situated within 200 meters from the forests is forbidden during the months of June, July, August and September. A special watch is organized, and telegraphic lines penetrating the center of the forests admit of alarm of fire at its start and call for help. If the working force appears to be insufficient the military authority furnishes the deficiency and sends on the spot soldiers who act according to the directions of the forest service.

#### COLONIES.

France, fully convinced that the preservation of forests is in all lands of the highest importance, has organized a forest service in its possessions outside of Europe—in Al-

geria, Tunis, Madagascar, Indo-China, Reunion. In Algeria the organization is exactly similar to that of France, and calls for an annual expenditure for salaries and works of \$600,000.

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## HESSE-DARMSTADT.

### STATE FORESTS.

The state forests of the Grand Duchy of Hesse-Darmstadt occupy 165,000 acres, and are situated in the Rhine valley (on alluvial sand), in the Vogelsberg mountains (on basalt and red sandstone), and in the Odenwald mountains (on granite, syenite and red sandstone). The prevailing species are beech, occupying 40 per cent, Scotch pine, occupying 34 per cent, and oak, occupying 16 per cent of the area under forest; whilst the remaining 10 per cent consist of spruce, fir, larch, alder and birch forest. It is a noteworthy fact, proved from the writings of Cæsar, Tacitus and of early German authors, that there were no coniferous trees present in their time except yew. Pine was introduced only from the 15th century on. The average value per acre is about \$100; but there are great differences according to quality of soil, transportation facilities and density of population. The annual aggregate expense of administration is \$148,500; and the annual aggregate revenue is \$561,000. There are planted annually to forest 750 acres, the planting extending over the entire surface of the ground. On 2,500 acres, according as "blanks" in natural regenerations are stocked, partial planting takes place. There are used on an average per annum: 110,000 pounds of seeds of broad leaved species; 4,000 pounds of seeds of coniferous species; 5,000,000 broad leaved seedlings; 5,000,000 coniferous seedlings. The annual expense for starting new generations of trees

aggregates \$22,000. Beech is invariably raised from the seed dropping from mother trees evenly distributed. Scotch pine is planted when one year old, over 10,000 seedlings being used for each acre. Spruce and fir are planted when four years old, or seeds are sown in strips being about four feet apart. Oak is either planted as a seedling two feet to three feet high, or acorns are dibbed in, the method used depending on local conditions. All plants are raised in forest nurseries, kept under the care of local forest rangers. Comparatively large areas are covered with oak-coppice forest, which is copped every 15 to 20 years, with a view of obtaining tanning bark. White pine and douglas fir have been introduced with splendid success. American red oak and hickory seem to answer the local conditions fairly well.

In certain densely populated sections, where soil fit for agriculture is scarce, field crops (potatoes and rye) are raised together with tree crops during the first three to five years following the cutting of mature trees. Rows of potatoes alternating with rows of pine seedlings are frequently seen. This combination reduces the expense of reforestation. It secures for the seedlings a soil of high porosity, whilst it exhausts, on the other hand, the mineral contents of the ground and the accumulated layer of humus.

Reforestation is effected on about 40 per cent of area by seed from standing trees; on about 10 per cent of area by coppicing and on about 50 per cent of area by artificial sowing and planting. The annual yield is strictly sustained. The yield per acre per annum is 74 cubic feet, of which not less than 60 cubic feet is used as fuel. The value of cordwood piled up along forest roads is about \$2.50 per cord. The value of logs cut and hauled to forest roads is about \$11.25 per 1,000 feet board measure. As to the usual method of cutting a crop, about 30 per cent of the yield is made up of stuff obtained from thin-

nings. The remaining 70 per cent consists of mature trees. Wherever regeneration is effected from self-sown seed, the mature trees are gradually removed. Where planting is resorted to, a clean sweep is made of all mature trees over areas aggregating about 25 acres on an average. Large clearings are considered a mistake, as it is difficult to restock them.

With regard to compulsory reforestation the following may be said: Private forests must be planted up within three years after the removal of a mature crop. Exemptions from this rule may be granted, upon application, by the State Forestry Bureau. Waste land planted up by the owner is, once for all, exempted. If a forest owner hesitates to replant his clearings within three years after the cutting of the trees, he is subject to a fine. The forest authorities will replant the clearing at the owners' expense, the owner being allowed the choice of species. Any treatment of forests likely to result in permanent unfitness for the production of timber, is prohibited.

Little damage is done, generally speaking, by forest fires. On the average annually 54 fires are reported, running over 45 acres altogether, and resulting in an annual loss of \$533. In 28 cases out of 272 cases the forests were so badly damaged that it was considered wise to cut the trees and replant the area thus cleared. The principal cause of forest fires is carelessness of smokers. A few only of such fires are annually caused by railroad locomotives, perhaps three annually.

The rank of the forest officer corresponds entirely with the rank of officials in other branches of the public service. The average salary per year of the "Oberforstrat" is \$1,300, of the "Oberforstmeister" \$1,125, of the "Oberforster" \$825, and the office and transportation expenses of the last two named are \$350 and \$200 respectively. No official report is published, either annually or periodically.

## PRIVATE FORESTS.

The extent of private forests is as follows: Communal forests, administered by state foresters, 235,000 acres; entailed forests, owned by families, 132,000 acres; ordinary private forests, owned by individuals, 70,000 acres; total, 437,000. All communal forests and all entailed forests are managed on forestry principles, furnishing a sustained yield. The condition of the ordinary private forests is deteriorating, as the productiveness of the soil is abused by pasture, removal of litter and incomplete density of leaf canopy. Communal and entailed forests are worth as much as state forests, namely, about \$100 per acre. The value of private forests owned by individuals is considerably less. The average rate of net income is about  $2\frac{1}{2}$  per cent. The total product of the country is well sustained.

Considerable sums are derived in state and communal forests from hunting and fishing leases. The foresters of all grades enforce, *ex-officio*, all fish and game laws. The subaltern foresters, as a general rule, are taken from the army.

The wages of the common laborer average about 50 cents per day. In the mountainous sections wood fuel is cheaper than coal. In the state forests \$24,700 are annually spent for new roads, or for macadamizing old roads. The state oberforster is at the same time the manager of all municipal or village forests lying within his district. The sale of forest produce, however, is done by the mayors of towns and villages. A splendid system of well graded public roads, covered with stone in the Tellford system and maintained at an annual expense of \$270 per mile, facilitates economic forestry to a very high degree.

## ITALY.

## STATE FORESTS.

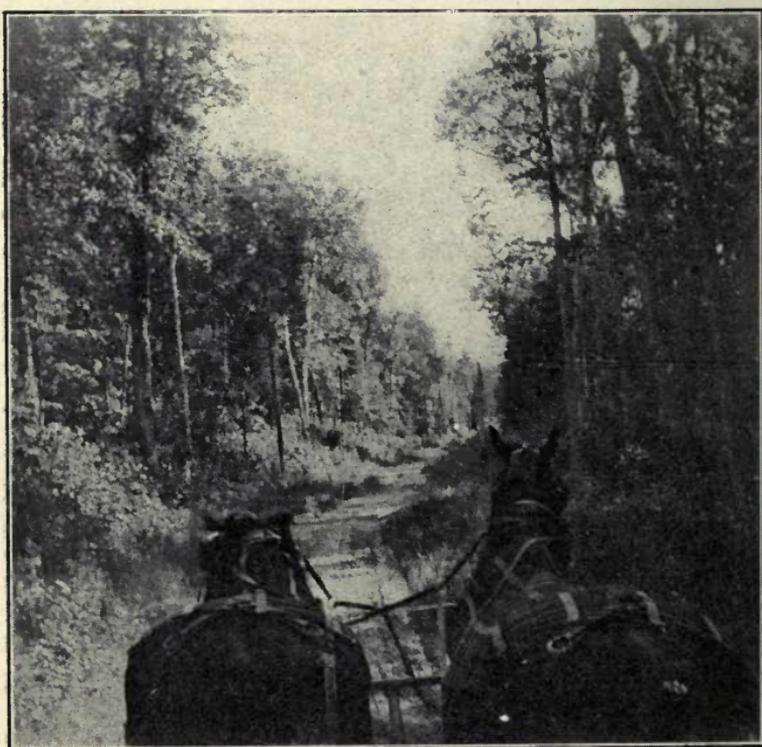
It was a peculiar pleasure to receive, as I lately did, from the Ministry of Agriculture at Rome, an account of the forestry of Italy, that beautiful country which dates back thousands of years and whose woods have been sung by Horace and Virgil. The aggregate area of the state forests is 128,960 acres, principally situated in Tuscany—provinces of Florence, Arezzo, Grosseto, Pisa and Leghorn; and Venice—provinces of Belluno, Treviso and Udine. These lands are regarded as inalienable. The prevailing kinds of trees are oak, beech, pine, larch and fir. The total annual expense of administration averages about \$80,000. The annual sale of the raw material from the state forests averages \$150,000. The number of acres annually reforested with trees is 150. The method of reforestation varies according to the different species of trees and the local conditions; but seeding, whether artificially or naturally, is used only for the oak and the beech. For other kinds, such as the fir, pine, larch and chestnut, reforestation is done by planting. Generally good care is taken to maintain a sustained yield. In regard to cutting, the practice is to cut only those trees which have reached fiscal maturity and those that are dead or about to die.

The damage caused by forest fires amounts to about \$80,000 a year. The causes are principally accidental. Only a very small number of forest fires are caused by railway locomotives. The forest service has much importance in the protection of mountainous land and in the control of water. The annual salary of the chief inspector of the forests of the first class is 6,000 lire; that of the chief inspector of forests of the second class, 5,000 lire; that of inspector of forests of first class, 4,000 lire.





Rainy Lake Falls, showing glimpse of the village of International Falls formerly called Koochiching. Photographed September, 1903, for the annual report of the Chief Fire Warden of Minnesota.



Hard wood forest between Bena and Leech Lake River allotted to the Chippewa Indians. Photographed for the Chief Fire Warden's annual report August, 1903.

The Minister of Agriculture generally publishes a detailed report on the administration of the forests every five or six years.

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## NORWAY.

### STATE FORESTS.

The extent of the state and semi-public forests of Norway is 2,587,500 acres. Of these, 837,500 acres are located in the provinces of Tromso and Finmark; 140,000 in that of Norrland; 285,000 in North Drontheim, and 225,000 acres in South Drontheim and Romsdal, and about 397,500 acres in Hedemarken. The prevailing kind of trees are pine (*pinus sylvestris L.*), spruce (*Abies excelsa D. C.*), and two species of birch. The average estimated value of the forest land is \$2.70 an acre. The annual aggregate expense of administration is about \$108,000, and the annual aggregate revenue varies from \$60,000 to \$67,500. The number of acres annually sown or planted to forest varies from 150 to 175 acres. Reforesting is almost entirely effected by natural seeding from standing trees, and, when artificial culture is employed, by planting trees. The crop of forest production is periodical, and depends partly on the market prices of lumber. The forest administration tries to prevent the yearly average yield exceeding the net increase of the forest. Cutting must in part depend on the demand. Where it does not pay to cut smaller trees, the mature ones are principally cut, while at the same time, as far as possible, diseased and injured trees, as well as such as would hinder in the growth, are removed. Where, on the other hand, trees of smaller size can be profitably sold, small blocks are cut clean in order better to promote new growth.

The law of July 20, 1893, on the preservation of "Protecting Forests" and against the destruction of forests, has special provisions relating to "Protecting Forests," by which are meant forests serving as a protection against snow avalanches, stone slips, alteration of river beds, shifting sand, or as a special protection to other forests or to inhabited country. "Protecting Forests" are also such as bound districts and mountain forests, which, from their situation on the slopes of high mountains or in the neighborhood of the sea, or in the far north, grow so slow that they would die out if neglected. Under "Protecting Forest Lands" are also included bare fields, to be planted in the future to serve as other "protecting forests." The municipal council selects three men, who, after consulting the public forest officer, propose the localities within the district to be considered as "protecting forests." The municipal council has then to fix the boundaries of the forests, and on the proposition of the forest inspector of the district to determine the rules for its management. These regulations must have the sanction of the king to be valid. The municipal council can also make reservations, subject to the king's approval, against the destruction of the forests in general. Such municipal regulations relating to "protecting forests" and forests in general may probably also include compulsory regulations as to planting and sowing of forests already cut down. No other laws relating to forest culture exist in Norway.

The damage caused by fires in the public forests is inconsiderable. Many years there is none; and the damage done to private forests is of small account and unreported. The principal cause or causes of such fires is carelessness of owners, fishermen, cowherds, etc., as well as the burning of heather for cultivation of the land. The law of July 14, 1893, on "Fires in Forest and Fields," with the supplemental law of July 27, 1896, has provisions relating to the prevention and extinction of forest fires.

The central administration of the forests is directly under the department of the interior, without intermediate officers. The service is under the charge of the chief (the director of the forests), and there are 4 forest inspectors, 25 forest officers, 1 forest engineer, 2 assistants, 7 forest planters and 363 forest guards. The yearly salary of the chief (the director) is \$1,450, without additions. The inspector's salary is \$800, increasing up to \$970. The forest officers, \$480, increasing to \$800. All these functionaries have their traveling expenses paid when traveling in the service of the state. The officers and the inspectors hand in every year a report to the director, who publishes a report on forest matters generally every third year. The only forest periodical in Norway at present is the "Tidsskrift for Skovbrug," (Periodical for Forestry), published by the Norwegian Association for Forestry.

#### PRIVATE FORESTS.

The aggregate extent of private forests is 18,000,000 acres, of which about 276,000 acres are managed on forestry principles. The average value per acre is from \$4.28 to \$5.36, and the average annual rate of net income is from 55 to 60 cents per acre. The cutting undoubtedly exceeds the natural increase of the forests. The supply of wood is consequently decreasing, and the size of the trees decreases. The government purchases annually forests to the amount in value of \$21,440. It has three large and several smaller nurseries. These supply the required number of plants to the public and to private parties. It has also four seed establishments, which supply the public and private demand for tree seeds. It also has two elementary schools of forestry, and it tries through its functionaries to instruct forest owners in rational management of the forests.

## PRUSSIA.

## STATE FORESTS.

The extent of the state forests of Prussia is 6,955,227 acres. Included in this, however, are 715,637 acres not designed for tree culture. In addition, the extent of forests belonging to municipalities is 2,563,812 acres; belonging to churches, 207,752 acres; belonging to corporations, 555,900 acres; private forests, 10,828,730 acres; making an aggregate extent of 21,111,421 acres in the whole kingdom.

The prevailing kinds of trees in the state forests are Scotch pine, larch, beech, red pine, fir and oak. The value of the land varies so much, rising from a small amount to \$700 per acre, that it is impossible to give an average estimated value. The annual aggregate expense of administration (state forests) is as follows: The office expenses and maintenance, including expense for education in forestry, etc., averaged in the years 1893 to 1897, per annum, \$8,500,000. The annual aggregate revenue in the years 1893 to 1897 amounted to \$17,200,000, being at the net rate of \$1.50 per acre of actual forest. The number of acres sown or planted with forest annually during the years 1893 to 1895 was 44,830.

The foresting of the beech is mostly effected from standing trees, though artificial sowing and planting are also done. The oak is either reforested by seed from standing trees, or artificially through sowing or by planting. The Scotch pine is first cut clean and reforested by sowing or planting, and the red pine the same. Sowing from standing trees is not common. In regard to the continuity of forests products, the forestry department endeavors to obtain the highest possible continuous net income. The usual method of cutting is in blocks clean.

Under the head of compulsory tree planting the following laws are referred to: The Forest Protection Law of

July 6th, 1875; the law of August 4th, 1876, concerning the administration of forests owned by municipalities and public institutions in the provinces of Prussia, Brandenburg, Pomerania, Posen, Silesia and Saxony.

The average annual damage caused by forest fires in the years 1892 to 1896 was as follows: Totally or mostly destroyed, 2,992 acres; only slightly damaged, 117 acres; only the surface destroyed, 522 acres. The average annual number of forest fires in the years 1892 to 1896 was 36, the causes of which were as follows: 12 unknown, 2 railroads, 5 incendiary, 16 caused by carelessness, 1 lightning. During the years 1892 to 1896 the annual average number of forest fires caused by railroad locomotives was 2.

The officers in the forest service are equal in rank to the other high grade officers in the government service. The foresters have clerical rank. The salary of "Oberforster" (district manager) ranges according to length of service from 2,700 to 5,700 marks. Unfavorably situated officers receive an additional amount, the maximum of which is 600 marks annually. In addition there is usually free residence and fuel. The salary of the "Oberforstmeister" (chief inspector) is from 4,200 to 7,200 marks, according to length of service, which is calculated from the time of qualification for the office of "Forstrath" (councillor). The "Oberforstmeister" and "Forstrath" are each allowed an amount not exceeding 2,900 marks for traveling expenses.

#### PRIVATE FORESTS.

The extent of private forests in Prussia, as above stated, is 10,828,780 acres. About one-half of these forests are managed on forestry principles, and their average value is somewhat less per acre than that of the state forest. On the larger estates the area devoted to forests gradually

increases, while on the smaller estates the forest area probably decreases.

Some of the forests of Prussia are attractive resorts for travelers, and especially pedestrians, who enjoy the excellent roads. Of the celebrated Thuringian chain, which is 70 miles in length by from 8 to 25 miles in breadth, a writer says: "The successive hills melt into each other in gentle undulations, forming a continuous and easily traced comb, and only the northwest slopes are precipitous, and seamed with winding gorges. This mountain range incloses many charming and romantic valleys and glens; the most prominent feature of its picturesque scenery is formed by the fine forests, chiefly of pines and firs, which clothe most of the hills."

Prussia comprises nearly two-thirds of the entire extent of the German Empire, yet its area lacks considerable of being twice that of Minnesota. Thirty-one per cent of its soil is predominantly sandy, and on the whole probably is not as good as that of Minnesota; yet it sustains a population twenty-five times as large as that of Minnesota. This fact might well find a lodgment in the minds of our statesmen, that whereas Prussia annually derives a net revenue of \$1.33 an acre from her 6,000,000 acres of state forest, our state, from about an equal area of land in its borders, adapted to forest, derives no regular net revenue at all.

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## DUCHY OF SAX-MEININGEN.

The area of state forests is 106,530 acres; of communal forests, 84,460 acres; of private forests, 71,850 acres; miscellaneous, 1,480 acres; in the aggregate, 264,310 acres, being equal to 42.4 per cent of the total area of the state. The state forests comprise 24 units of ad-

ministration, in charge of 24 superior forest officers. The highest functionary in forestry matters is the president of the forestry bureau. The bureau is composed of five forest counsellors, two of whom act as forest inspectors at the same time, each one supervising 12 of the above named 24 forest officers. The annual yield of the state forests is 5,779,669 cubic feet of lumber and fire-wood cut in ripe forests, and 1,288,904 cubic feet of fire-wood and pulp-wood obtained from thinnings. These figures correspond with an annual yield of about 155 feet board measure of lumber plus 0.40 cords of fire-wood per acre per annum. The state forest officers at the same time control the management of the communal and private forests within the state. All grades of forest officers have certain police duties concerning forests, fish and game preservation.

The municipalities owning forests are required to appoint well trained foresters for the management of their forest realties.

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## SAXONY.

### STATE FOREST.

The aggregate area of the state forest is 432,000 acres. The forests are scattered over the Erz mountains themselves and over their outskirts. They are further situated in a few smaller and separate mountain ranges and in the plains. The altitude at which the state forests are found ranges from 100 to 1,200 meters, or from 328.1 feet to 3,937.2 feet, above sea level. The first group of forests, in the Erz mountains, is pretty compact and comprises 200,000 acres. The second group, in the outskirts of the Erz mountains and in some smaller distinct mountain ranges, comprises 136,000 acres; and the third group, in

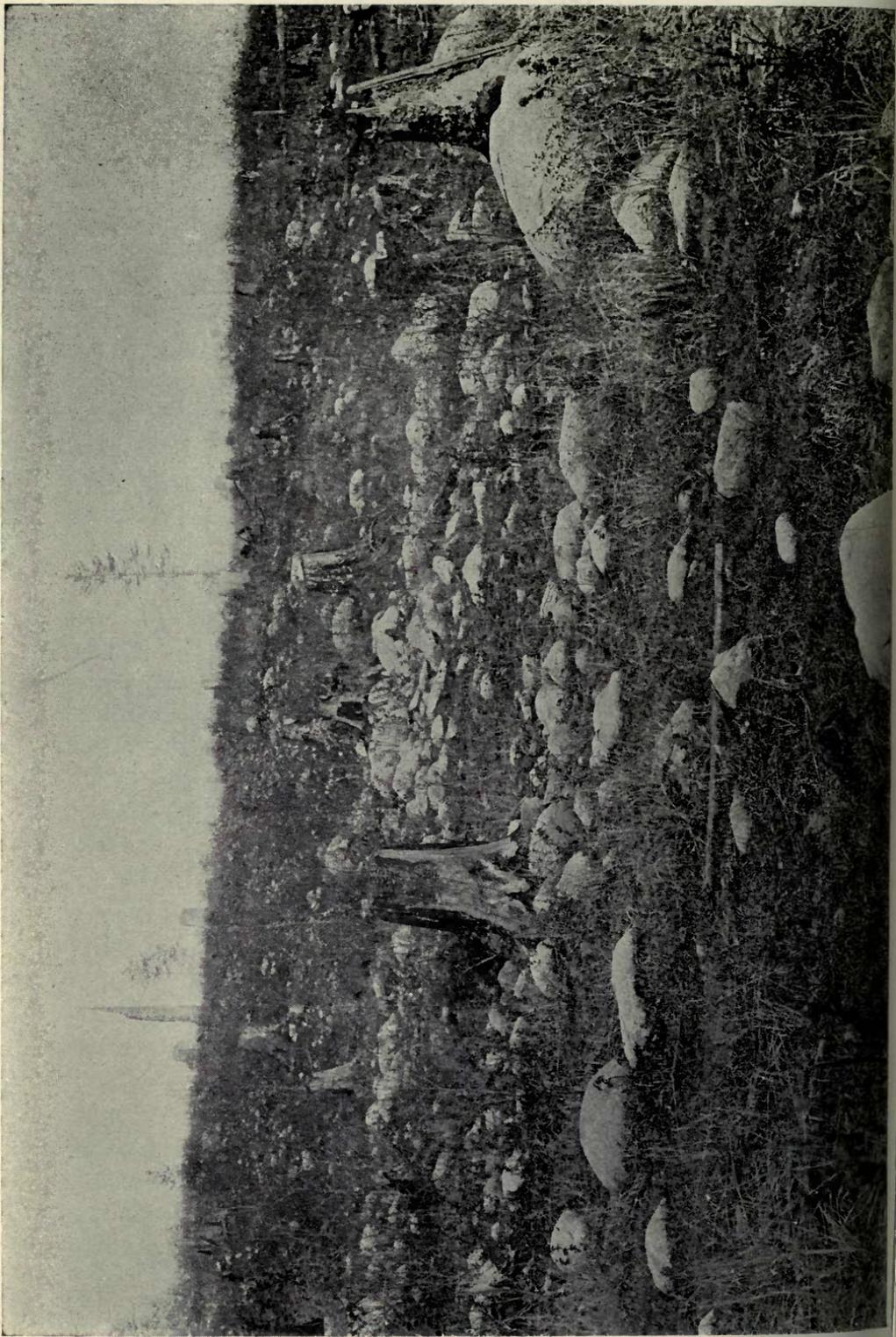
the plains, comprises 96,000 acres. The soil consists of decomposed granite, granulite, gneis, mica-slate, clay-slate, grauwacke, porphyry, sandstone and some basalt. In the plains there is diluvium and alluvium. Only a very small portion of the forest area might be deemed fit for agricultural use.

The principal tree species are spruce, *picea excelsa* (Link); Scotch pine, *pinus silvestris* (L.); silver fir, *abies pectinata* (D. C.); larch, *larix europæ* (D. C.); rothbuche, *fagus silvatica* (L); oaks, *quercus pedunculata* (Ehrh.), and *qu. sessiliflora* (Sm.); hornbeam, *carpinus betulus* (L.); ash, *fraxinus* (L.); several maples, namely: *acer pseudoplatanus* (L), *A. platanoides* (L); further, several species of elm, *ulmus*; of birch, *betula*; and of linden, *tilia*. The prevailing species is spruce.

The value of the state forests, including timber and soil, aggregates \$76,490,000. Hence the value per acre is \$177. The annual expenses for administration for the year 1896 were \$1,040,000. In the year 1896 the annual gross revenue amounted to \$2,986,000; the annual net revenue to \$1,946,000.

The entire area planted annually varies according to circumstances. On the average it will reach 6,900 acres. Of these 6,900 acres 800 acres are planted up with seeds and 6,100 acres are planted up with plants. About 20 per cent of the above figure 6,900, or 1,380 acres, consist of blanks in plantations previously made where the original planting has failed. Thus it appears that the area planted for the first time after the removal of the old crop is only 5,520 acres. The question whether plants or seeds shall be employed for restocking cleared ground depends on the condition of the soil. As a general rule, seeds are planted only on such areas which do not produce grass and weeds to a large extent and which at the same time are of sufficient fertility and well protected against late frost. The sowing or planting of seeds must





be done not later than in the second year after the final removal of the former tree crop. Strips about three feet wide or places about six feet square are cultivated with a spade before the seed is thrown on them. Only in rare cases the entire area to be planted with seeds is ploughed and harrowed and the seeds spread over it broadcast. The plants used for planting up a clearing are as a rule two years old or older. The age of the plants selected depends on the condition of the area to be planted aside from depending on the species itself. Spruce, Scotch pine, fir and larch or tamarack, as a general rule, are used two to five years old; beech, oak, ash and maple, as a general rule, are used three to six years old. The plants are raised in nurseries. Only in rare cases they are taken from areas previously planted with seed in the open forest. The number of plants used per acre ranges between 600 and 4,000, according to the species, the size of the plants used and the condition of the area to be planted.

Regeneration from self-sown seed is only used in the case of the beech (*Fagus silvatica*). In all other cases forests are regenerated by means of planting plants or sowing seeds.

There is no law or rule in Saxony for compulsory reforestation after clearings.

There is not much damage done by forest fires. It averages \$300 per year. Forest fires of a larger extent have happened very rarely. As a rule, forest fires are caused by the careless use of matches by tobacco and cigar smokers. Very few fires are caused by sparks from locomotives; on the average perhaps three per year.

The yield or annual cut is fixed by working plans prepared for periods of ten years and renewed after the lapse of such periods. Within these periods the annual yield is almost constant. At the end of a period, however, a new working plan might provide for either a higher or

lesser yield. It is an iron-clad rule that on the whole the cut shall not exceed the increment of the forest.

Trees are cut as low down as possible above the surface of the soil; the instrument used is the saw. The stump and the root are dug out afterwards wherever such work is remunerative, viz., where the wood obtained can be sold at a paying rate. In Saxony regular forest management began with the beginning of the century in a systematic way; consequently the forests now existing are almost even aged and composed of trees of almost even size; hence there is no objection to clearing an entire area of given size, say of two or three acres, at once, removing from it every tree standing on it. In exceptional cases, pieces of forest not entirely mature may be sacrificed with a view of saving others from the dangers threatening from storms and insects.

The average age of maturity in Saxony for conifers (spruce) is eighty to ninety years. However, there are cases in which this rule is not adhered to. The size of trees when fit for the axe depends entirely on the species, on the condition of the locality, the means of transportation, etc. Previous to the final cutting, and beginning with the twenty-fifth year of a piece of forest, and ending at the sixtieth year of the forest, thinnings take place at intervals of about ten years with a view to allow increased light and increased space to the most promising specimens of the growing stock. Specimens growing less vigorously, dying or dead, are removed at the same time wherever it pays.

There is no difference in the rank of the forest officer compared to that of any other state officers employed in the technical branches of the government. The state forestry service is divided into a lower and higher branch. The professional training for the first one is a merely practical training, whilst the latter necessitates scientific preparation of a high class. The requirements with reference

to this scientific preparation are as follows: Graduating from a state gymnasium; six months of practical instruction under a forest officer on one of the state forest ranges; twelve months' study at a university; two and a half years' study at the forest academy at Tharandt, at which two examinations must be passed; three years of practical professional training under a forest officer and at the bureau of forest working plans at Dresden; examination by the state authorities. After this preparation, as soon as there is a vacancy, appointment as government officer might follow, to begin with as assistant of an Oberförster (Superior Forester); then as superior forester, and so on up to the higher ranks of chief of a forest territory or chief of the bureau of forest working plans. The latter officers have the title of "Superior Forest Master." The highest technical authority controlling the local and territorial officers is called "State Forest Master." There are 108 local ranges in Saxony allotted to 11 territorial districts. The former are in charge of a superior forester (Oberförster), the latter in charge of a superior forest master. The central bureau of the entire state forestry service is under the Secretary of Finances.

The salary of a superior forest officer averages \$1,015 (from \$1,150 to \$1,180), to which must be added an allowance of \$566 for traveling expenses, horse keeping and the use of a house free of rental. The salary of the Superior forest master averages \$1,486, ranging from \$1,274 to \$1,698, to which must be added a traveling allowance of \$708 and the use of a house free of charge.

In the case of physical disability the forest officers draw a pension depending on the duration of their state service and on the salary received so far. This pension is at least 30 per cent of the salary. In no case does it amount to over 80 per cent. The latter figure is paid after thirty-nine years or more of state forestry service. At the age

of sixty-five years the state forestry officer is entitled to a pension in case he desires to retire, even if his constitution would enable him to continue in the service.

No annual report of the Saxony forest administration is published.

“Das Tharandter Jahrbuch” is considered the best periodical on forestry.

As further information, it may be stated that the administration of a forest range, by the superior forester under the supervision of the superior forest master, is outlined by “the working plan” which is prepared by the bureau of forest working plans at Dresden, containing prescriptions for a period of ten years. The superior forest officer co-operates in the preparation of this working plan, which has to be submitted to the secretary of finances. The preparation of a working plan is based on a thorough knowledge and a thorough scrutinizing of the conditions of the forest range, which often takes several months. The forest working plan contains a statement showing the areas of the different compartments or units of the forest range; it contains a description of these compartments and maps of the same; all sections of the forests are examined with reference to their increment. All these investigations made, the forests or sections of forests to be cut during the next decade of years are selected and pointed out specifically. Further, there is stated specifically what compartments or sub-compartments are to be thinned out, what areas are to be planted up, and by what means regeneration is to be effected in each single case. Deviations from the prescriptions of a forest working plan must not be made unless authorized by the secretary of finances. Every working plan is controlled by the state forest master in the range itself. Besides, in the midst of the ten years period, or after the lapse of five years, such a control by the highest forest officer of the state takes place, so as to find out whether and in how

far the prescriptions of the working plan have been followed and whether deviations might be advisable.

The sale of the forest produce (timber, fuel, bark, stones, etc.) is done by the superior forest officer with the help of a local state cashier, who is holding an office absolutely independent from the forestry service and is directly subordinate to the secretary of finances. This arrangement makes embezzlements practically impossible. The sale of timber and fuel takes place, after they are cut and piled up, by means of public auction. The cutting and piling of timber and fuel is done by common hands working under a contract. Any planting, on the other hand, is done by day workers, under the supervision of the local rangers, so as to warrant careful work.

#### PRIVATE FORESTS.

According to a statement made for the year 1893, the total area of the private forests in Saxony is 539,000 acres. All forests owned by municipalities and villages and other corporations, and a considerable fraction of the larger private forests, are managed according to true forestry principles. All administrations of municipal, town and village forests are controlled by the state. The working plans for these forests are prepared by the bureau of forest working plans at Dresden. In these cases, the forest working plan is approved of by the secretary of the interior, and not by the secretary of finances, as would be the case for state forests.

It is impossible to give any data as to the average value per acre of communal and private forests. Neither are data available as to their average annual yield. Generally speaking, the yield of private and communal forests is considered to be lower than from state forests. Wherever there are working plans the cut is steady, and even during the period over which the working plan extends.

Where there are no working plans, the cut depends entirely on the pleasure of the owner.

Small holdings of forests, especially those of the peasantry, are deteriorating. Parts of such forests are changed into fields or meadows; other sections are purchased by the state, communities or wealthy private individuals.

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## GRAND DUCHY OF SAX-WEIMAR.

The area of state forests is 110,910 acres, of private forests 120,510 acres, in the aggregate 231,420 acres, being equal to 25.6 per cent of the total area of the state. The state forests comprise 37 units of administration, in charge of 37 superior forest officers, trained at the forest academy of Eisenach.

The control of the local forest administration is effected through six forest inspectors, the highest authority in forestry matters being represented by a forestry bureau, attached to the office of the secretary of finances. Forest working plans are prepared and their execution controlled by the "Commission of Forest Working Plans," at Eisenach, the director of the forest academy being at the same time chief of that commission. The annual yield of the state is 5,864,177 cubic feet of lumber and firewood, corresponding with about 125 feet board measure timber plus 0.31 cords fire-wood per acre per annum.

The main duties of the superior forest officers consist of: Care of the property; maintenance of boundary lines; preventing the acquisition of prescriptive rights to pasture, litter wood, etc., by outsiders, and preventing forest offenses; maintenance of the growing stock of timber; forest utilization and forest regeneration, as prescribed by the working plans; sale of forest produce and control of the book-keeping.

## SWEDEN.

## STATE FORESTS.

The aggregate extent of the state forests of Sweden in 1895 was 18,080,753 acres. The area of state forests is annually increasing by extensive purchases of private forest. The prevailing kinds of trees are spruce (fir), pine and birch. The estimated value of the state forests is \$4 per acre. The figures in this statement are for the year 1895, in which the aggregate expense of forest administration was \$185,397, and the aggregate revenue was \$1,126,636. The number of acres sown or planted to forest was 10,875. The number of acres damaged by fire was 1,200, and the amount of damage was about \$10,000. Neglected camp fires and carelessness when burning fields for cultivation are the principal causes. Only three fires were caused by railroad locomotives. The state forests are divided into 9 districts and 74 ranges ("revir"). The chief of a district is an officer entitled "Öfverjägmästare," with annual salary of \$1,707 and rank corresponding to the rank of major in the army; the chief of a range ("revir") is an officer entitled "Jägmästare," with a salary of \$1,200 and rank corresponding to that of captain in the army. Before any one can be appointed as "Jägmästare" he must have passed successfully the examinations required after a year's attendance at one of the forest schools, the examinations required during a two years' course at the College of Forestry at Stockholm, and must have practiced forestry a year on a range. Foresters or guards receive a salary of \$160. The state provides dwellings in the vicinity of the forests for officers and foresters. At the head of the forest administration is a director general, with salary of \$2,400, and having rank corresponding to that of a major general in the army;

and a chief of bureau, with salary of \$1,867 and rank corresponding to that of a lieutenant colonel in the army.

There is a continuity of forest product based upon certain plans of cultivation. Reforesting is effected partly by sowing, partly by planting, but principally by seeds from standing trees, assisted by planting. The usual method of harvesting the forest crop is, in the southern part of the country, by cutting in blocks clean; in other parts of the country by cutting trees only down to a certain size fixed by law. The total forest product of the country is sustained, and it is increasing.

#### PRIVATE FORESTS.

The aggregate extent of private forests is 58,715,135 acres and their average value per acre is estimated at about \$5. About twenty-five per cent of private forests is managed on forestry principles. A royal committee is preparing a project of forest laws to promote re-growth of private forests.

#### FORESTS OF THE UDDEHOLM COMPANY, SWEDEN.\*

The forests of the Uddeholm Stock Company are situated in nine parishes in the province of Vermland and in two parishes of the province of Dalarne. Karlstad, on Lake Wenern, about fifty (English) miles distant, and Gothenberg, about one hundred and eighty miles distant, are the nearest export harbors. Lake Wenern is connected with the Baltic and also the North Sea by the Gotha and Trollhatte (canals). The company owns fifty-six miles of railroad—Nordmark-Klarelfven—with thirteen stations, which transports all sorts of goods, especially iron and lumber, to and between the works. The company owns 400,000 acres of land in Vermland and 25,000

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\*Information furnished in Swedish by Dr. Fredrik Loven, chief forest master, through Mr. Gust. Jansson, manager of the Muukfors Iron Works.

acres in Dalarna. About 60,000 acres have been acquired within the last ten years. Of the entire area, not exceeding 60,000 acres consist of naked tracts, fields, meadow, also unproductive surface of moss, lake and rocky elevations; while at least about 375,000 acres consist of natural forest-bearing land. Hereof perhaps 15,000 to 18,000 acres are pasture land. Pine comprises 70 per cent of the forest, and spruce 30 per cent of all trees large enough for the saw. The birch is the prevailing species within the pasture, but among the birch conifers are generally found.

The Uddeholm Company's lands lie on both sides of the Klar river along its middle course. The parish of Råmen, in Vermland, and the boundary of Dalarna terminate the extent of the property on the east and the two judicial districts of Fryksdal on the west. About 375,000 acres lie in one body. Only a very little public forest and some belonging to farmers are included therein here and there. The rocky elevations consist of primary rocks, principally granite and gneiss, with interspersed hills of hyperite. West of the Klar river red iron gneiss is almost the prevailing rock, but east of the same river granite prevails, in large part solid, not crystalline, but there are large tracts of primary granite poor in feldspar. On granite, pine prevails to the extent of 75 to 80 per cent, while on gneiss spruce occupies at least 40 per cent of the surface. On the "hyperite" hills spruce of large growth prevails. The soil in the forest is composed partly of the disintegrated rock such as above mentioned and partly of deposits of older or later water courses. Much of the soil is gravelly; much also is sandy. The Klar river within the region of the Uddeholm forest is 400 feet above the sea, and on the east and west sides rise very steep hills which at a distance, generally of a thousand yards, attain a height of from 1,000 to 1,500

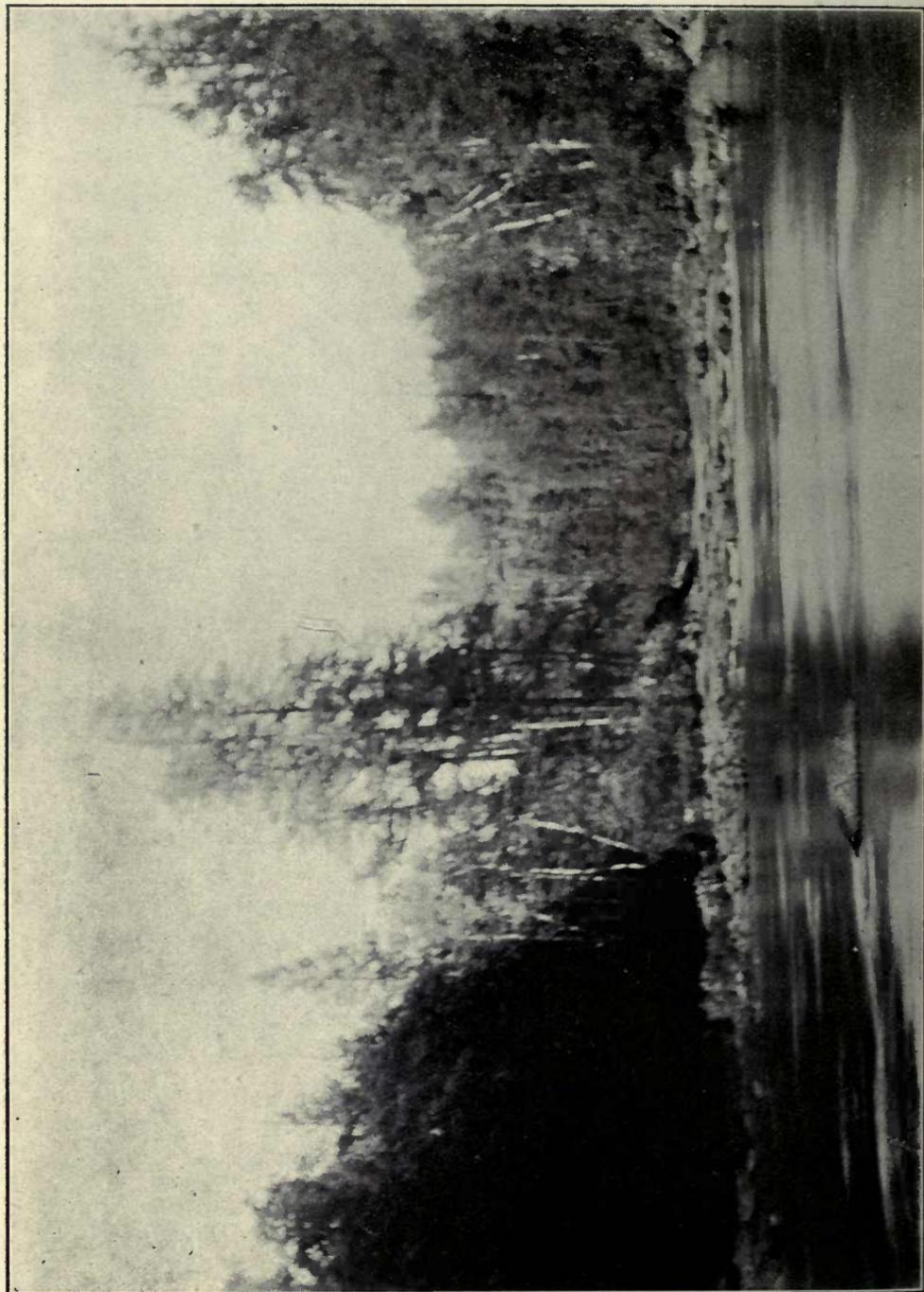
feet above the sea; thereafter they take a plateau form, but are very often broken by water courses or bogs. The whole region is thereby in a large degree of that cut or broken character which one can readily obtain an illustration of by ascending one of the principal heights. The highest and only actually barren-topped mountain in the company's forest is Harfjellet, 2,200 feet above the sea. Another, Tönnet mountain, 1,700 feet above the sea, is called a "fjell" (barren-topped or snow-covered mountain), but it is not actually that, for it is partly forest-covered.

Agriculture takes a subordinate place; the land most suitable for cultivation is generally along the banks of the larger streams. About 700 persons occupy small farms as tenants and are obliged to produce certain quantities of charcoal, in general 6,600 bushels each, and in all 4,620,000 bushels. They are also obliged to transport the coal to the works. Besides, there are several hundred forest laborers with smaller premises on which one of two cows and several smaller animals are fed. About 14,000 persons live and gain their livelihood on the company's property.

About 3,000 acres (2,700 to 3,000 "tunnland"; one tunnland being equal to 1.22 acres) are consumed or cut over annually; though it is not easy to say just how much, because clean cutting and selection cutting (cutting only the larger trees) are both practiced. On an average every tunnland (1.22 acres) ought at the end of every rotation period—120 years for pine and 90 years for spruce—yield from 4,000 to 4,500 cubic feet of lumber.

The forest is handled by means of cutting trees that hinder the growth of others or which are themselves defective ("hjelp och rensningsgallringar"), and thinning to admit light ("ljushuggningar"), consisting of two to three careful timber cuttings with an interval of 15 to 20 years,





Rapids in Isabella River, Lake Superior Forest Reserve, July 11, 1903. Photographed for the annual report of the Chief Fire Warden of Minnesota.

which end either by leaving seed trees or in clean cutting. The best stands of pine are finally cut at the age of from 130 to 140 years, and the middling at the age of 120 years, and the poorer at the age of 100 years. The spruce stands in which thinning is much practiced are nevertheless very sensitive to damage from excess of light, wherefore timber cutting must be undertaken with great care and skill, otherwise drought occurs. Spruce is cut at the age of 70 to 100 years, according to its quality. During the past ten years there has been cut yearly 12,000,000 cubic feet of lumber of various sorts, namely, of saw and building timber, 2,000,000 cubic feet; spruce for paper pulp, 850,000 cubic feet; telephone and telegraph poles, 125,000 cubic feet; firewood, 2,275,000 cubic feet; wood for charcoal, 6,600,000 cubic feet; miscellaneous, 150,000 cubic feet. Besides, there was each year brought to the works and consumed stub-wood to the amount of 1,500,000 cubic feet.

Certainly not more than 15, or at the highest 20, per cent of the cut-over area becomes restocked by natural seeding. The cuttings are not so large but what the by-standing trees can in an essential degree contribute to renewal, and, besides, very often 15 to 20 seed trees are left on each 1.22 acre tract. The difficulties which forest culture meets with in this locality are very stony land, spring and summer drought, spring frost, sometimes, as during the previous year, excessive rain, mossy or swampy land and land heavily pastured by cows and sheep. On the other hand, the forest area is not much troubled with heath, strong growth of grass, insects, etc. In regard to sowing, the twigs are burned immediately after the frost is out of the ground, and while the ground is damp. Generally the following year the cleared area is sown with pine and spruce seed. On pine land spruce seed is mixed to about 50 per cent. On land which is suitable

for both, 60 to 70 per cent of spruce seed is used. On pure spruce land 15 to 20 per cent of pine seed is mixed in. On cleared land, to prevent injury from drought, long, narrow seed strips—made by hatchets—are used about a yard apart, not large squares; but when heath or grass growth is to be feared then planting is to be preferred. For hacking of these seed strips are selected places which are suitable for the growth of the seeds and protection of the plants, such as the north side of shading objects,—for example, stumps, windfalls, fixed rocks, etc. The seed is laid on the south corner of the seed strip so that seed and plant will be better shaded. When sown on rocky land it has to be raked and covered by hand. On even ground the seed strips should be made in a direction from east to west, and the seeds not deep, harrowed down along the south border of the strips. On the other hand, on steep descents the seed strips should be laid horizontally, so that the seed, in case of heavy rain, shall not be washed down the hill. During the latest ten years there have been yearly about 2,400 acres sown with from 800 to 900 kilograms of conifer tree seed.

The planting of forest trees takes place on the company's land on a small scale and only where strong growth of grass hinders the growth of young forests. That is usual on good spruce land. There are planted four-year-old transplants from four to five feet apart, so that the number of plants on a tunnland (1.22 acres) varies between 2,250 and 3,500. The average number of trees standing on an acre at the time of cutting is very different, depending on previous cuttings. To more fully answer this question as to old forest on gravelly land which has not been subjected to other cuttings than the thinning of too crowded trees and cuttings of defective trees, the number of trees on two tracts, each of two and a half acres extent, have been counted with the following

result: First tract, average pine land, pure stand of pine; average age, 135 years; average height, 85 feet; diameter measured 5 feet from ground. There were found 8 trees with diameter of 5 inches, 13 of 6 inches, 20 of 7 inches, 27 of 8 inches, 34 of 9 inches, 42 of 10 inches, 44 of 11 inches, 44 of 12 inches, 53 of 13 inches, 40 of 14 inches, 30 of 15 inches, 16 of 16 inches, 11 of 17 inches, 3 of 18 inches, 2 of 19 inches; total, 385 trees, containing 9,178 cubic feet. Second tract, good pine land; young spruce successively grown up; pine of average age of 130 years and average height 85 feet; there were found 3 pines and 37 spruces 5 inches in diameter, 44 pines and 58 spruces 6 inches, 61 pines and 37 spruces 7 inches, 77 pines and 28 spruces 8 inches, 76 pines and 11 spruces 9 inches, 82 pines and 7 spruces 10 inches, 83 pines and 6 spruces 11 inches, 73 pines and 3 spruces 12 inches, 53 pines and 1 spruce 13 inches, 30 pines 14 inches, 14 pines 15 inches, 9 pines 16 inches, 5 pines 17 inches, 1 pine 19 inches, 2 pines 20 inches (in diameter); total, 613 pines and 188 spruces, in all 12,013 cubic feet.

Thus were found about 300 trees left per "tunnland" of about 5,300 cubic feet, which, according to an average age of 133 years, shows a yearly average growth of 40 cubic feet per "tunnland" (1.22 acres). If, on the other hand, timber cutting is done once or twice before the final cutting, as is usual, the number of trees at the last is much less. To prevent forest fires, during very dry weather, strict watch is kept by 30 forest guards and by extra ones, and in addition all of the company's dependents are obliged, when a forest fire breaks out, to send notice to the forest guard or forest manager and assist in extinguishing it. Generally the precautions are effective in preventing such fires. No forest fire worthy of mention has occurred in twenty years.

The company's land has been used for forest more than

100 years. It cannot be said what the net revenue is per acre, as the greater part of the product is used at the works in form of coal or fuel. The average yearly growth per "tunnland" ought to be 40 cubic feet, of which one fourth, or 10 cubic feet, should be saw timber of the net value of 1.50 kronor; 10 cubic feet of building timber, worth 1 kronor; 20 cubic feet of wood, worth 0.70 kronor, or, for the 40 cubic feet, 3.20 kronor (equal to \$0.85).

The income from game is not large. There are shot annually 12 elks, many hares and game birds.

### SWITZERLAND.

The Swiss Confederation is composed of twenty-two cantons, which are separate and sovereign states; and while each canton has legislative authority over forests, the Confederation also exercises legislative authority over them in certain regards. Under article 24, of the Federal Constitution of May 29, 1894, the Confederation controls only the forests of the high regions, which are about 65 per cent of the total forest area of Switzerland. It is true that since the popular vote of July 11, 1897, which revises the said article 24, the Confederation has from now on the right of inspection of the forest police of the whole of Switzerland.

The federal law of March 24, 1876, which puts into execution the above-named article 24 of the constitution, was promulgated for the forests of the high regions. By the terms of that law the inspection by the Confederation extends over the entire territory of the cantons of Uri, Schwytz, Unterwald, Glaris, Appenzell, Grisons, Tessin and Valais and over the mountainous parts of the cantonal territories of Zurich, Berne, Luzerne, Zoug, Friburg, St. Gall, Jura and Vaud; but the law does not apply to the forests of the plains of the last mentioned

states, nor to the forests of the cantons of Soleure, Bale, Schaffhouse, Argovia, Thurgovia, Neufchatel and Geneva.

The Confederation is not actually the owner of any forests, but a few of the separate states are owners. The forest domains are part of the national wealth, and comprise 91,587 acres. There are also in the cantons the forests of the municipalities and of the corporations, comprising 1,403,772 acres. Besides there are private forests, comprising 609,855 acres. The total area of forests is therefore 2,105,220 acres, or about 20 per cent of the total area of Switzerland.

Forests are found everywhere in Switzerland. The parts most heavily timbered are the mountain chains of Jura and of the cantons of Schaffhouse, Soleure, Argovie and Neufchatel. Forests are found starting at 200 meters above sea level (in the canton of Tessin) and reach as high as 2,100 meters in the high mountains. In Argovia they even reach 2,300 meters in altitude.

The more common varieties of trees are among the resinous kinds, the opicea, the fir, the larch, the Scotch and mountain pines, the Siberian pine; among the deciduous kinds, the birch and the chestnut tree; this last kind grows especially in the canton of Tessin.

The value of forest land varies greatly and depends on the location, the nature of the soil, thickness of the settlements, the increase of these settlements and on the trade in timber and other products of the forest. The value per hectare ( $2\frac{1}{2}$  acres) may range accordingly from 300 francs to 6,000 francs.

In regard to expenses of administration, a distinction must be made between the expenses incurred by the Confederation and those incurred by the cantons. In 1897 the expenses incurred by the Confederation for forest administration amounted to \$56,000.

The following are the net receipts from forests in 1896 as to a few cantons :

Zurich, 180,900 francs, or 91.06 francs per hectare of forest.

Berne, 893,000 francs, or 71 francs per hectare of forest.

Soleure, 33,400 francs, or 44 francs per hectare of forest.

St. Gall, 71,000 francs, or 84.60 francs per hectare of forest.

Argovie, 241,000 francs, or 78.73 francs per hectare of forest.

Vaud, 236,000 francs, or 32 francs per hectare of forest.

The net receipts from town and municipal corporation forests in 1896 were :

Canton of Grisons, 1,200,000 francs, or 10.40 francs per hectare of forest.

Canton of Argovie, 2,378,000 francs, or 70.60 francs per hectare of forest.

On an average about 412 acres of forest have been created annually during the past twenty years, at the expense of the federal treasury.

In order to regenerate the forests, both planting and natural seeding are practiced, as may be most effective.

In the lowest countries, where clean cutting is practiced, planting is resorted to. Where real dangers exist from avalanches, land-sliding, etc., which do not permit complete denudation, and where gardening is required, natural modes of regeneration are generally used, and sowing is seldom done.

Reforestation by the Confederation in high mountain regions costs on an average 400 francs per hectare for 6,000 to 7,000 plants set in their places.

The federal and cantonal legislatures prescribe a sustained production for the forests of the state, of the towns and of the municipal corporations. If, through winds, snow-slidings or otherwise, too much timber has been destroyed, less cutting is done in the following years, in order that as rapidly as possible the forest may regain the number of trees fixed by the management. The forests are operated in various ways, according to localities and ac-

ording to the size of timber that is to be grown, viz., high forest, under-growth and coppice.

In accordance with the terms of the federal law, the forest area cannot be reduced. The cleared land must consequently be reforested except in cases where an equal area of land is covered into forest. Furthermore, the cantons as well as the Confederation have the right to compel the creation of protective forests wherever they are needed for public utility.

Forest fires seldom occur. Of those which do occur the principal causes are carelessness in lighting fires in the immediate vicinity of the forests, and lack of care in the woods. It is rare that a forest fire is occasioned by locomotives.

The administration charged to execute the federal forest law is the Federal Inspectorate of Forests, forming a part of the Swiss federal department of the interior. Nearly all the cantons have for their territories a forest administration. In the small states one single technical official is at the head of the service, but in the larger cantons the administration is under the direction of one or more chief forest inspectors or chiefs of the service and of several district foresters or forest inspectors. An inferior personnel instructed for the federal zone in courses lasting two months is attached to this technical personnel, and is organized to execute the work of forest economy.

A few cities or towns with extended and important forests have also a self forest administration, at the head of which is a person of technical forest training. Among them are Zurich, Berne, Lausanne, St. Gall, Winterhue, Friburg, Coire, Soleure, Schaffhouse.

The Chief Federal Inspector of Forests has an annual salary of 8,000 francs and fees of eight francs per day, and eight francs per night, when he has to be absent, for his service; he gets his traveling expenses reimbursed,

his first assistant has a salary of 6,400 francs and is similarly indemnified for his inspection trips.

The three inspectors of the canton of Berne receive each 5,300 francs per annum. They receive extra pay, six francs per day and four francs per night, for all inspections made outside of their city, and their traveling expenses are reimbursed.

The high forester or chief inspector of the canton of St. Gall, who has a salary of 5,000 francs, receives ten francs per day and four francs per night, besides his traveling expenses, when out inspecting.

The Federal Inspectorate of Forests publishes every year a report on its management. The majority of the cantonal inspectors do likewise.

In the matter of taxes, the cantons are sovereign in their own limits. Taxation therefore differs according to the cantonal territory to which it applies. In all these states a tax on the forest is imposed, and in most states that tax is combined with the tax on income. But for one and the same forest only one of these two modes of taxation is generally applied. A few examples will show: In the canton of St. Gall the state has paid to the towns in which it has forests a tax of 1.20 francs per hectare. In Argovie the state pays to the towns where its forests are situated a tax of 2.40 to 3.20 francs per 1,000 francs of forest value. On the other hand, the towns only pay to the state a tax of 40 centimes per 1,000 francs of forest value. The private forest proprietor pays to the state 40 centimes and from 2.40 francs to 3.20 francs to the towns per 1,000 francs of forest value; and in addition thereto he is taxed on the income in the amount of one per cent of the average two per cent of gross declared value of the forest, but neither the state nor the towns pay a tax on the income of their forests.

## WURTEMBERG.

Wurtemberg lies west of Bavaria, and is the third German state in point of area, its population being a little over 2,000,000. Its greatest length from north to south is 140 miles, and its greatest breadth is 100 miles. One-third of the Black Forest (so called from the dark foliage of its pines), and which forms a sort of a triangle, lies within Wurtemberg, two-thirds being in Baden. The Black Forest has a total length of 93 miles, and its breadth varies from 13 to 46 miles.

## STATE FORESTS.

The aggregate extent of the state forests is 418,904 acres, and they extend over the entire kingdom. Fifty-nine per cent of the forests consists of pine, 20 per cent being pitch pine and 9 per cent white pine. The estimated value of the forest land varies from \$29 to \$58 per acre. The annual aggregate expense of administration of the forest amounts to \$1,183,574. Of this \$364,140 is paid to wood-cutters, \$147,560 is expended on roads, \$90,440 in forest culture, \$259,468 for pay of officials, \$148,468 for forest guards. The revenue was \$2,928,352, yielding a net revenue, after for 1895-1896 deducting all expenditures, of \$1,744,788, or \$3.63 per acre. The number of acres annually sown to forest is 296, and the number of acres planted to forest 6,177.

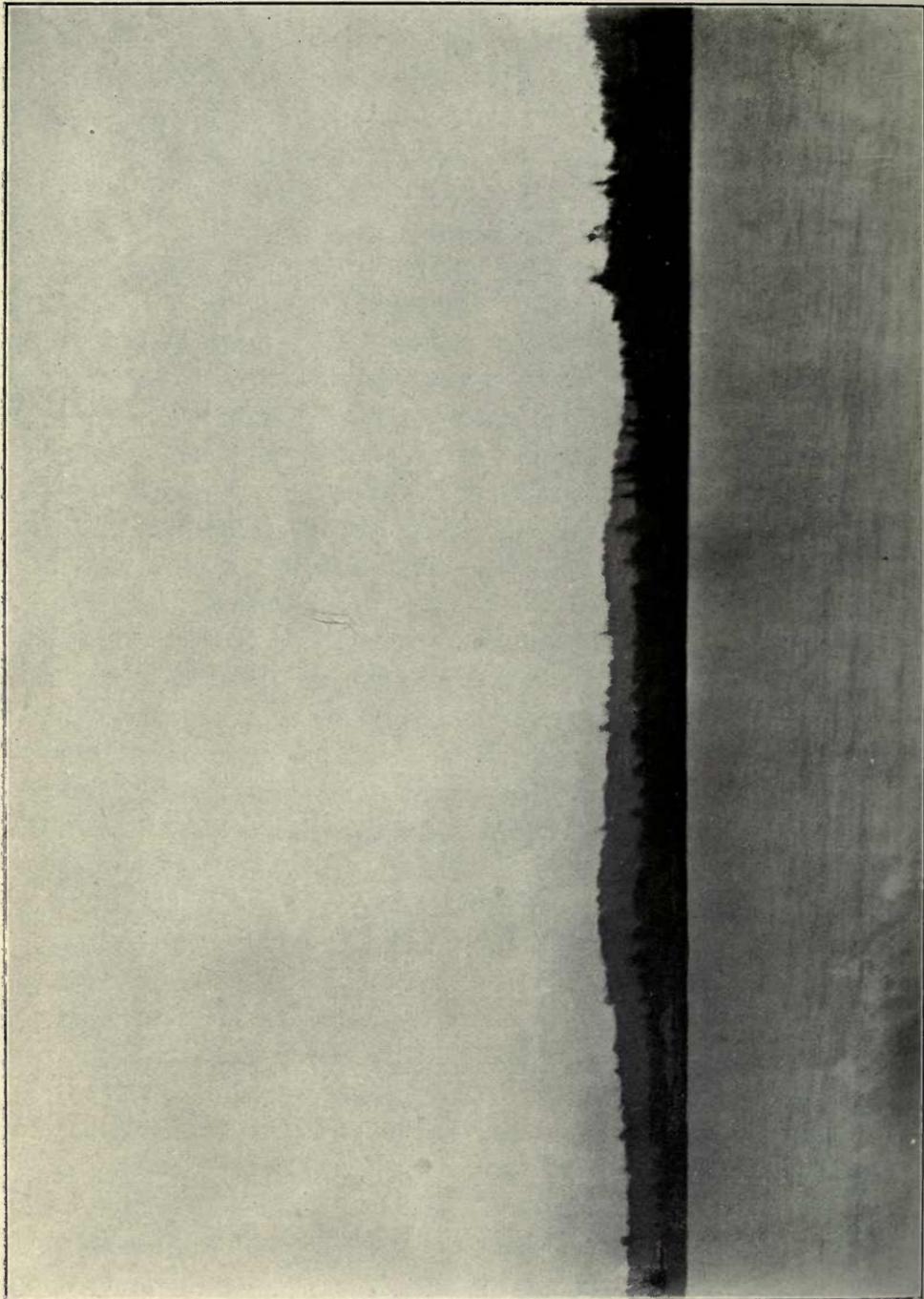
In regard to reforestation, when the natural seeding of the desired kind of wood occurs in proper time the same is used; otherwise planting or artificial growing takes place. Natural sowing is estimated at about 25 per cent; artificial renewing amounts to about 75 per cent. The latter is almost exclusively done by planting, whereas sowing in free woodland is very seldom applied. It is a principle to maintain (as far as the division of the age of the plantings

permit) an equal annual cutting. At present the cutting is fixed at 1.94 cubic meters per acre. The cutting is contracted for with laborers living in the neighborhood of the woods. By good management there are at a given plot generally trees of about the same age: If the natural seed falling is intended to be used, the larger trees, either single or in crops, are cut out in a direction against the prevailing winds; the remaining trees are thinned and gradually cut out as the growing young trees may demand. If the natural seed falling is not taken into consideration, the wood crop is cut clean in narrow strips, also in a direction against the prevailing winds, and the cutting of the second and following strips is postponed until the young plantings can dispense with the side protection of the old woods. It is a principle that replanting follows immediately after the cuttings. Moreover, the state buys every year about 400 acres of woodland to increase and round off the forests.

The amount of damage annually caused by forest fires is only \$642.60, and the principal cause of such fires is carelessness and negligence while smoking and lighting fires in or near the forests. In the last ten years, out of 120 forest fires only 8 were caused by sparks from locomotives, and of these only one caused considerable damage (about \$3,570).

In regard to the rank in the forest service, as compared with other branches of the public service, it may be said that the forest officials rank in general equally with those state officials who are graduates of the university. The Department of Forests is directed by one president, four technical and four administrative members and one commander of the forest guards. The salary of the president is \$1,844.50 per year; the salary of the members of the Board of Direction is from \$1,190 to \$1,618. A work entitled "The Forests of Wurtemberg," published by





Lake Superior Forest Reserve looking north on Elbow Lake. Distant highland is the shore of Wigwam Lake. Photographed July 14, 1903,  
for the annual report of the Chief Forest Fire Warden of Minnesota.

Rueger, Stuttgart, 1880, gives a fair review of the situation of the forestry of the country. It may here be stated that in respect to net revenue Saxony and Wurtemberg stand at the head of forest administration and forest culture in general.

#### PRIVATE FORESTS.

The aggregate extent of private forests is 528,794 acres, of which 210,000 acres are administered by technical forest officials; the remainder is also administered in a proper manner. As the permission of the government is required for cutting and replanting of forest lands, and this permission is only given under the condition that an equal area to what has been cut shall be planted, the aggregate area of forest land remains the same throughout the whole country; but portions of it are gradually coming into the possession of the state government.

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#### FREDERICK THE GREAT, THE FATHER OF GERMAN FORESTRY.

Frederick the Great promulgated laws in 1740 and 1754 for regulating the cutting of wood, which previously had been done as everyone pleased, without any regard to replanting. In place of such improvident practice he established rotations of 70 years; that is, he provided that forests should have 70 years in which to mature before being cut, also prescribed methods of thinning so that the young and healthy growth of oak and beech would be better protected. Later instructions were issued in 1764, 1770, 1780, 1783. In addition to this he instituted communal forests under the care of wardens, forbade private owners from every wasteful cutting and placed under the care of the state a portion of the forests in Silisia which previously

had belonged to private parties. Frederick the Great ordered the division of the national forests into compartments or blocks, each of which was to acquire the age of 70 years before being cut. But inasmuch as it was found that 70 years were not sufficient for the proper growth of the trees, each of these main compartments were subdivided into two compartments, so that a period of growth running 140 years was established.

There had been, in more ancient times, laws relating to forests for certain parts of Prussia, the first dating 1547. These related to the right of using the forest and necessity of replanting, more than to general systematic care. One can therefore properly claim that Frederick the Great is the father of the German forests, as it was he who created the existing forestry laws and made them apply to private as well as to state forests.

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### THE WORKING PLAN.

The "Manual of Forestry" in five volumes, by Dr. William Schlich, principal professor of forestry at the Royal Indian Engineering College, Cooper's Hill, England, and formerly Inspector General of Forests to the Government of India, is the best work on the subject in the English language. Dr. Schlich has kindly given me permission to copy from his third volume an account of the "working plan" as used in forestry, and what follows on that subject is taken from that volume.

Forest working plans regulate, according to time and locality, the management of forests in such a manner that the objects of the industry are as fully as possible realized. The working plan for a protection forest, or a park-like forest, is altogether different from that of a forest which

is managed on economic principles. The latter is the kind with which we have here to do.

The working plan report is a document which gives necessary information and which describes the system of management in such detail as may be required in each case. For forests which are of great value, and which yield high returns, very detailed plans should be drawn up; for forests which give as yet only small returns, simple plans would be indicated.

## WORKING PLAN REPORT.

### INTRODUCTION.

#### I.—GENERAL DESCRIPTION.

1. Name and situation of forest; name of proprietor.
2. Boundaries.
3. Area.
4. Configuration of the ground.
5. Rock and general character of the soil.
6. Climate.
7. Legal position of forest, rights and privileges.
8. Surrounding population and its requirements.
9. Markets, lines of export.
10. Prices of the several classes of produce.
11. Cost of extraction and of transport to markets; supply of labor.
12. General description of forest growth.
13. Injuries to which the crop is exposed.
14. Rate of growth.
15. Yield tables, volume tables. form factors, reducing co-efficients, etc., used in the calculation of the volume and increment of the woods.
16. Organization and strength of the forest staff.

#### II.—DETAILED DESCRIPTION OF COMPARTMENTS.

#### III.—DIVISION AND ALLOTMENT OF AREAS.

## IV.—DESCRIPTION OF THE METHOD OF TREATMENT.

1. The objects of management.
2. Choice of species.
3. Choice of silvicultural system.
4. Determination of the rotation.
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## V.—SPECIAL WORKING PLANS.

1. Plans of utilization.
  - a. Final cuttings.
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3. Plan of other works.
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## VI.—MISCELLANEOUS.

1. Reorganization of the forest staff.
2. Financial forecast.
3. Proposals for the control of the execution of the working plan.
4. Miscellaneous observations.

WORKING PLAN FOR A PORTION OF THE STATE FORESTS OF  
THE HERRENWIES RANGE IN THE BLACK FOREST,  
GRAND DUCHY OF BADEN.

PERIOD 1884—1893.

WITH THE RESULTS OF THE ACTUAL WORKING.

GENERAL DESCRIPTION.

1. *Area and Boundaries.*

The areas are recorded as follows:

(a) Productive area . . . . .	1,747 acres
(b) Unproductive area . . . . .	nil. "
(c) Other areas, including fields, meadows, etc. . . . .	2 "

Total area . . . . . = 1,749 acres

Alterations in the above figures will probably become necessary when a fresh survey is made.

The outer boundaries are in order, but the internal boundaries require rectification.

## 2. *Locality.*

The forest here in question occupies on the whole the slopes lying between a hill range on the south and the river Schwarzenbach on the north. The highest point of the hill range, the Hoher Ochsenkopf, has an elevation of 3,465 feet above the sea, while the lowest part, near the Schwarzenbach, is only 2,000 feet above the sea, the mean elevation being placed at 2,600 feet.

The slopes, on which the forest is found, are mostly steep, level spots being only found on the summits of the hills, and toward the lower end, where granite and Bunter Sandstein meet.

The area is drained by the Schwarzenbach (a feeder of the Raumünzach) with its two feeders, the Gartenbach and Dobelbach. The first mentioned runs from west to east, and the two latter, more or less, from south-west toward north-east. It follows that the forest in the valley of the Schwarzenbach has generally a north aspect, and in the valleys of the Gartenbach and Dobelbach a northwest aspect on one side, and a southeast aspect on the other side of the streams. All the forest areas (except those situated at the highest elevations and which are of no importance) are protected by intervening ranges against the prevailing winds.

Up to a mean elevation of 2,500 feet, granite is the principal rock, which is sometimes (though rarely) pierced by porphyry. Above the afore-mentioned elevation the granite underlies upper Bunter Sandstein (Vogesen Sandstein), and the latter accordingly prevails in the larger part of the forest area.

The granite is generally rich in orthoclase and oligoclase, and therefore decomposes readily, and furnishes mostly a deep soil rich in mineral elements. The decomposition is facilitated, and the quality of the soil improved, by the remarkably numerous springs which appear between the granite and the Bunter Sandstein. Hard slow decomposing quartzite is of rare occurrence.

The Bunter Sandstein is characterized by rapidly and greatly changing mineral composition, consisting sometimes of readily decomposing rock yielding a deep clay soil, in other cases of hard quartz-gravel, frequently found on the surface in the numerous bolder-drifts. The Bunter Sandstein has numerous rents and fissures in all directions, so that it is rapidly drained, and the disintegration and decomposition are only rarely assisted by springs, which at the best are scanty and intermittent. It follows that the Bunter Sandstein soils, even when formed by the easily decomposed and minerally rich clay sandstone, never equal the best quality of the granite soil; moreover, they change frequently and very suddenly, and without any visible cause, into almost unproductive areas.

On the flat hill tops, layers of fine white sand (produced by the disintegration of the gravelly sandstone) frequently produces an impermeable stratum, preventing the water from percolating, thus causing bogs (or "Grinde") which often extend over considerable areas and are almost unproductive.

The quality of the soil, therefore, ranges between good and unproductive, in the following proportion:

Good and fairly good to medium	=	78	per cent.
Medium to indifferent	=	12	"
Indifferent to unproductive	=	10	"

The climate is rough, and is characterized by long winters with an abundant snowfall, and by rapid changes of temperature; at the same time it is throughout favorable for forest vegetation, especially for conifers.

### 3. *Species.*

The details will be found in the description of compartments. Generally speaking, the spruce and silver fir are the prevailing trees, the former being more abundant in the middle and upper parts, the latter at the lower elevations. The beech is associated with them locally and in varying proportions. Scotch pine is found in the granite region chiefly upon dry, steep, rocky slopes with a southerly aspect, and in the sandstone region, especially on dry ridges and the top of the mountains, as well as here and there in other localities. The three conifers attain a maximum height of 140 feet, with regular shaped and little tapering stems. Toward the upper limit of the area the height growth diminishes rapidly, dwindling down to 20 or even 15 feet on the high plateaux. Here the mountain pine and the birch are also found. Reproduction is generally good, except at the higher elevations. A marked difference is found between northern and southern slopes, the growth and reproduction being far more vigorous on the former than on the latter.

The silver fir is much exposed to cancer. Windfalls and snow breakage are fairly moderate, while the damage from insect attacks is very small. During the years 1874-83, the following proportion existed between the different classes of fellings:

Cuttings caused by insect attacks	=	1	per	cent	of	total	fellings.
“ “ snow breaks	=	12	“	“	“	“	
“ “ windfalls	=	16	“	“	“	“	
Cancer and other diseases and injury	=	19	“	“	“	“	
Other cuttings	=	52	“	“	“	“	
Total	=	100	“	“	“	“	

### 4. *Method of Treatment and Rotation.*

The situation and the species necessitate the area being treated under the high forest system. The quality gradations, as indicated under 2, are so conspicuous locally that it is possible (as well as desirable in order to secure a proper idea of the condition of the forest), to group the growing stock according to its characteristics as produced by the quality of the locality, and according to the method of treatment thereby indicated. The actual basis of this grouping is the yield, and based upon it, the net income or financial result of the management. In this sense the forest may be divided into the following three groups:

*a. Areas Subjected to an Intensive Management.*—To this group belong all areas which, in virtue of their quality (as indicated mainly by the height growth of the trees on fully stocked areas) are capable of producing large timber; areas on which carefully conducted regeneration fellings will produce natural regeneration within a reasonable period of time, and where the cost of any artificial assistance in regeneration is commensurate with the anticipated returns. As lowest limit of this group a normal increment of 43 cubic feet per year and acre, calculated for a rotation of 120 years, has been fixed. The area thus included in the group amounts to 78 per cent of the whole. It is with this area, and the growing stock standing on it, that the management must more especially reckon, and from which the

largest possible sustained yield must be secured. With a suitable composition of the growing stock and a careful application of sylvicultural principles, that object may be obtained under an average rotation of 120 years.

As regards the sylvicultural treatment, and especially the regeneration of the woods, two different classes of forest or growing stock (corresponding with two qualities of locality) stand out prominently.

*First:* Forest of spruce with a strong admixture of silver fir (the latter occasionally predominating) more or less frequently interspersed with beech and more rarely with Scotch pine.

*Secondly:* Forest in which spruce predominates with a slight admixture of silver fir and here and there of Scotch pine, but devoid of beech.

The first class of forest occurs in the granite area and on those parts of the Bunter Sandstein (clay sandstone), which have deep, easily decomposed soils fit to be classed as good. The characteristic features of this class of forest are the occurrence of beech and deep soils, rarely covered with boulders or debris, lying mostly at the lower elevations; natural regeneration can here be successfully effected in a comparatively short period of time.

The second class of forest occupies the stony slopes of the Bunter Sandstein area, and in exceptional cases the quartzite parts of the granite area. Here the soil is generally covered with loose boulders and rock debris of varying size. These areas are nearly all found at the middle to upper elevations. The conditions described demand the maintenance of an uninterrupted canopy up to the age of maturity, and a careful execution of the regeneration cuttings spread over a prolonged period of time, or else weeds will spring up, which make regeneration very difficult, and at any rate expensive.

On the whole, however, careful management is sure to be successful in securing natural regeneration in all the areas pertaining to this group; for this purpose, as well as for the production of valuable timber, a rotation of 120 years on an average is considered of sufficient length. The length of the regeneration period differs considerably in the different parts, varying on the whole from 30 to 50 years.

*b. The second group* consists of woods growing on soils, which, even under the most careful management, cannot be expected to produce trees of first or even second quality. The trees here produced are of such limited height growth, that the production of valuable timber is out of the question. The woods are found in the upper, and here and there in the lower part of the Bunter Sandstein area, where the soil is covered with large masses of the debris of gravelly sandstone, which is not easily decomposed, and where the slightest interruption of the canopy overhead is followed by the appearance of a dense growth of bilberry and heather.

Nevertheless, these areas are capable of yielding timber of the inferior classes, as well as firewood, and the returns which may reasonably be expected from them, justify the application of a method of treatment which, while avoiding any interruption in the canopy and all expensive cultural operations, facilitates natural regeneration; in other words the treatment under the selection system by removing all trees which are deteriorating or incapable of increasing in value. It is difficult to fix any definite rotation, but it is estimated that the trees will take about 150 years to reach maturity.

The lowest quality limit for this group has been fixed at 7 cubic feet increment per acre and year, while the upper limit is, as already indicated, 43 cubic feet. The area comprised in this group amounts to 12 per cent of the total area.

*c. The third group* comprises the so-called "Grinden," that is to say the highest parts of the ridges, which are mostly level and have a tendency to bogginess. They are covered by a dense growth of bilberry and heather, and are incapable of producing more than a stunted tree growth, which yields only a scanty quantity of firewood, frequently not covering the price of preparing it; hence financial considerations are entirely out of the question, the areas being protected merely for the sake of preserving some cover on the hill tops. The group comprises all parts which produce an annual increment per acre of 7 cubic feet and under; they amount to 10 per cent of the total area.

In so far as the management aims at the production of valuable material, and at favorable financial results as regards outlay for artificial regeneration (where natural regeneration has failed), for improvement, tending, etc., only the areas in the first group can be considered. But in the treatment of those forests which pertain to the principal mountain region of the Black Forest, representing a certain drainage area, the task of forestry goes beyond mere financial considerations. It has in fact been recognized that it is necessary to keep areas of this class well wooded for the sake of a proper husbanding of the water supply in the streams. Accepting this further task, the forest administration has endeavored, during the last 50 years, to afforest the poorly stocked and frequently entirely bare areas at the higher elevations of the Bunter Sandstein region. In so far as the cultural operations were confined to the boulder drifts of the Bunter Sandstein, they were moderately successful, but the cultural attempts made in the "Grinden" prior to 1870 turned out failures. Since 1873 the cultural operations in the Grinden present a more hopeful aspect, owing to the experience gained by former failures, and it seems desirable to continue them in the future.

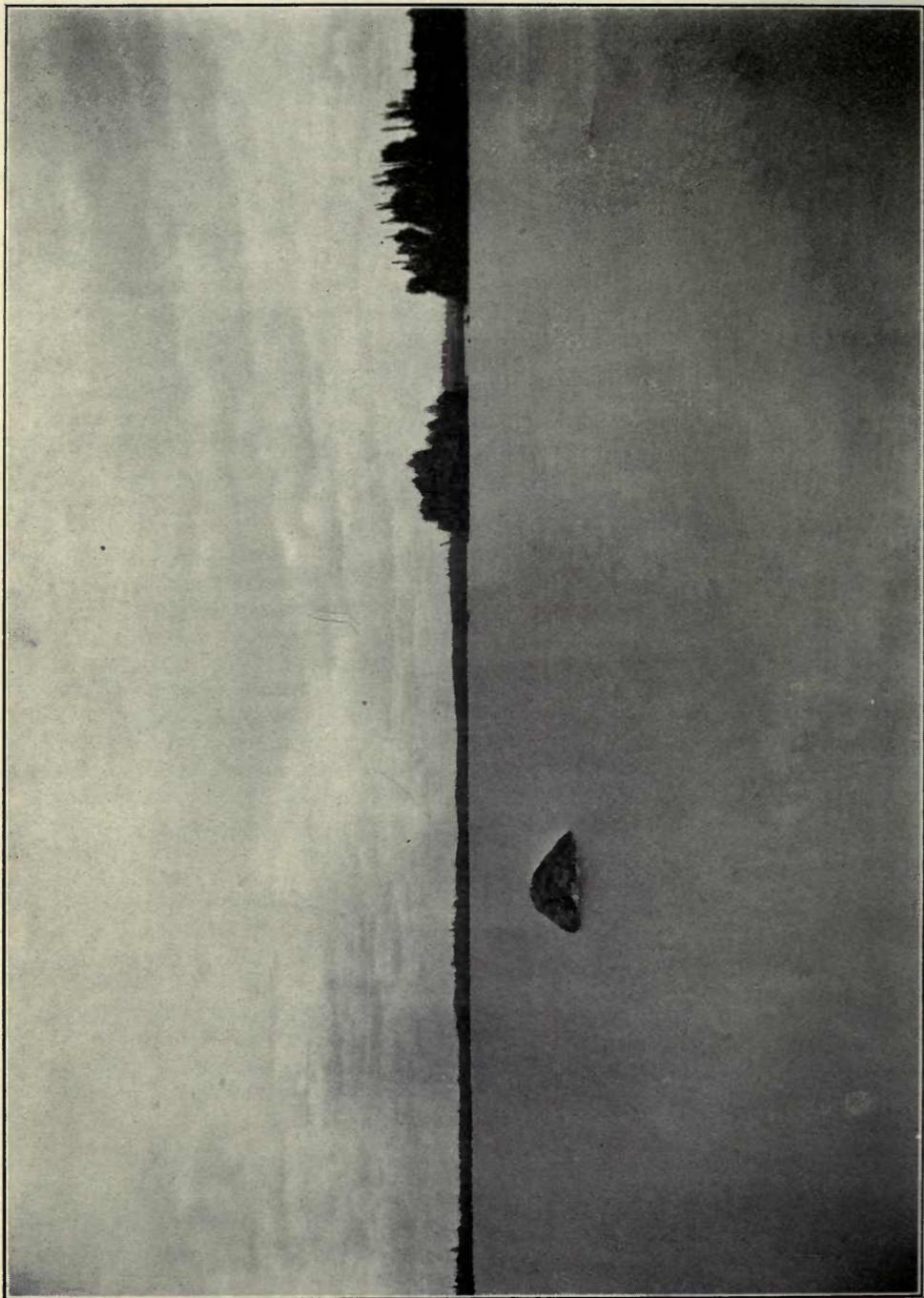
The working plan deals in detail only with the forest area subjected to intensive management, but the group worked under the selection system has also been adequately noticed in the general provisions.

The working plan lays special stress upon the execution of improvement fellings, more particularly the removal of cancerous silver firs. For this purpose the ordinary thinnings are utilized; but over and above these, cancerous trees must also be removed from the old woods, where otherwise no further thinnings would be required. In regeneration fellings the trees to fall first under the axe must be those attacked by cancer. Even then not nearly all cancerous trees can be removed during the next ten years. This fact teaches the management that in future a sharp attack must be made on all cancerous trees at the time of the first and second thinnings, even if a temporary interruption of the canopy should thereby be caused. On the rich deep soils of the granite area, which are almost exclusively concerned in these remarks, even an interruption of the canopy extending over a somewhat lengthy period would not be a misfortune, and preferable to the maintenance of a full canopy consisting to a considerable extent of cancerous trees. The existence of enormous quantities of such trees on the granite area was one of the reasons which led to the yield being fixed at its present rate.

## 5. Utilization.

*a. Yield of Major Produce.*—The actual yield during the last 40 years has been as follows:





Shore of Lake Bellissami, Lake Superior Forest Reserve, July 13, 1903. Photographed for the annual report of the Chief Fire Warden of Minnesota.

Compartment.	YIELD, IN SOLID CUBIC FEET.					Area in Acres.
	1844-53.	1854-63.	1864-73.	1874-83.	Total.	
1. Schwarzenbronn....	213,836	122,369	149,843	79,141	565,189	65
2. Schwarzenberg.....	311,518	158,778	200,738	158,955	829,984	211
3. Riesenkopf.....	12,502	47,288	206,242	65,617	331,649	76
4. Mehlskopf.....	.....	.....	.....	.....	.....	84
5. Grünwinkel.....	19,742	124,629	57,423	202,252	404,046	202
6. Dobelbach.....	26,875	42,697	30,195	69,952	169,692	178
7. Hoher Ochsenkopf..	.....	.....	.....	.....	.....	101
8. Kleingartenkopf....	34,256	2,331	1,448	1,024	39,059	76
9. Kleingarten.....	375,637	188,825	256,603	195,578	966,693	362
10. Grossgarten.....	62,544	46,688	26,417	59,118	194,767	175
11. Sachsenbronn.....	34,927	47,783	111,551	106,194	300,255	95
12. Gartenbach.....	86,311	83,345	494,665	156,412	820,733	172
	1,178,198	814,733	1,534,920	1,094,216	4,622,067	1,747
Average per year.....	117,820	81,473	153,492	109,422	115,552	.....
Average per year and acre.....	67.44	46.64	87.86	62.63	66.14	.....

From the appended statistical table it will be seen that the estimated increment of the next ten years amounts to 1,086,130 cubic feet.

The actual growing stock amounts to 9,488,731 cubic feet

The normal " " 7,892,160 "

The surplus of " " 1,596,571 "

The surplus of growing stock is due to a surplus of woods over 100 years old. With favorable prices for timber, the removal of this surplus in the shortest possible time would be advisable, so as to prevent loss of increment, and take unnecessary capital out of the forest, but as prices run low at present, it appears judicious to keep the greater part of it over for a while.

A consideration of the several compartments showed that the removal of the following material during the next ten years is advisable on silvicultural grounds:

Final cuttings . . . . 1,146,000 cubic feet

Intermediate cuttings . . . . 154,000 "

Total . . . . 1,300,000 "

As this amount exceeds the expected increment by 213,870 cubic feet, equal to about one-seventh of the surplus of growing stocks, the yield has been fixed at 1,300,000 cubic feet, or annually:—

Final cuttings . . . . 114,600 cubic feet

Intermediate cuttings . . . . 15,400 "

Total . . . . 130,000 "

If in the course of the 10 years prices should rise, there would be no objection to reduce the surplus of growing stock further by additional cuttings.

The disposal of the yield is effected as follows:

1) Free grant to the Roman Catholic Priest at Herrenwies, =	1,500	cubic feet.
"    "    "    "    School    "    =	1,000	"
(2) Sale by public auction and occasionally by private sale, =	127,500	"
Total annual disposals . . . . .		130,000

*b. Minor Produce.*—The principal items are forest pasture and the removal of litter, the utilization of which is permitted to the Herrenwies settlers, as a privilege.

According to government orders the privilege of forest pasture may be exercised only to such extent as the condition of the forest and the requirements of regeneration may permit. The district forest officer indicates from time to time the localities in which the privilege may be exercised. The privilege of removing litter free of charge is exercised under the same conditions. The exercise of these privileges is nowhere injurious, and may be continued during the next ten years.

The grass growing in blanks, on roads and in plantations has hitherto been sold for the benefit of the State, and, under suitable supervision, the practice may be continued.

The removal of building stones, the sale of plants, etc., is insignificant.

#### 6. *Division into Compartments.*

The contemplated new division into compartments must be postponed until the projected road system has been completed.

#### DESCRIPTION OF COMPARTMENTS.

Block and Compartment.		Area in Acres.	Description of Wood.
Name.	No.		
<i>I. Ochsenköpfe.</i>			
Schwarzenbronn . . . . .	1	65	Spruce with silver fir, some beech, Scotch pine, larch. About .6 of area 30—50 years old, some trees older. About .4 of area 10—30 years old. Above the road fairly complete stocking; in youngest parts still suffering from frost; below road still some blanks caused by late cutting out of old trees; in the latter part still 120—150 years old spruce and silver fir in the final stage; these show a decreasing increment. Growth on the whole fairly good.
Schwarzenberg . . . . .	2	211	<i>a</i> = 130 acres; 15—40 years old spruce and silver fir with some Scotch pine and beech; some lately planted, younger, a few up to 60 years old. About 25 acres planted. Where the shelter wood has been removed, stocking generally complete, in the rest still patchy with patches of bilberry intervening. Growth generally between good and fairly good; along Herrenwies meadows partly only fair, the spruce still suffering from frost. In the north-western part, below the road, on the Riesenkopf road, and in the south-east along Dobelbach, on about 87 acres 110—140 years old spruce and silver firs of decreasing increment are standing in the final stage.

## DESCRIPTION OF COMPARTMENTS—Continued.

Block and Compartment.		Area in Acres.	Description of Wood.
Name.	No.		
Riesenkopf.....	3	76	<p><i>b</i> = 81 acres (in three parts), spruce and silver fir with a few beech and Scotch pine, generally 50–75 years old, but some small groups only 30–50 years old; generally well stocked, here and there somewhat thin and patchy. Growth between good and fairly good. On 3 acres on the Dobelbach, 80–90 years old spruce, cover complete and growth good.</p> <p><i>a</i> = 47 acres; 100–130 years old spruce and silver fir, some older; on the whole cover fairly complete; toward compartment Schwarzenberg somewhat thin, but on about 10 acres with a fair young crop of silver fir and spruce up to 15 years old. Growth fairly good, on the higher part inferior. About 5 acres along the road is a windfall area, now stocked with some silver fir and spruce growth.</p> <p><i>b</i> = 24 acres; 9–20 years old spruce (a few older), with some Scotch pine and larch, mostly well stocked, showing good to fairly good growth.</p> <p><i>c</i> = 5 acres; Grinde, in upper part heather covered, with 100 and more years old short and stunted Scotch pine, some spruce and mountain pine. On the whole poorly stocked. Part underplanted with 20–40 years old spruce, which show very poor growth.</p>
Mehlskopf.....	4	34	<p>50–90 years old (and more), mountain pine with some spruce, Scotch pine, birch and mountain ash; toward compartments 3 and 5 cover fairly complete, in the southern and south-western parts interrupted by larger and smaller areas of heather. Growth inferior.</p>
Grünwinkel.....	5	202	<p><i>a</i> = 186 acres; 110–150 years old, some older, spruce and silver fir, some beech with a few Scotch pine. In irregular final and seeding stage, in the southern part cover still fairly complete in strips. On .4 of the area stocked with up to 30 years old silver fir and spruce and a few beech. Growth of old trees still fairly good; on some stony ridges (about 7 acres) middling and inferior; young growth mostly only middling.</p> <p><i>b</i> = 16 acres on the highest part in the south and west, Grinde; heather-ground with 100 and more years old crippled Scotch pine, spruce, some mountain pine and birch; in some parts up to 60 years old advance growth thinly stocked. Here and there traces of plantings, 24 years old spruce.</p>
Dobelbach.....	6	178	<p><i>a</i> = 133 acres; 100–130 years old, some up to 200 years, spruce and silver fir, some Scotch pine; on the whole cover fairly complete; only in the western third along Grünwinkel through windfalls and dry wood cuttings somewhat thin and patchy; in the thin parts as yet little, up to 15 years old, advance growth in single trees. Growth good to fairly good. (<i>Ilex</i> found).</p> <p><i>b</i> = 27 acres (consisting of the upper south-eastern portion and a ridge running from it in a north-western direction to the centre of the compartment), 100–130 years old (some older), short-stemmed spruce with some Scotch pine and silver fir forming a thin, often very thin, wood; in parts younger up to 60 years old spruce, or an incomplete miserable under-</p>

DESCRIPTION OF COMPARTMENTS—*Continued.*

Block and Compartment.		Area in Acres.	Description of Wood.
Name.	No.		
Hoher Ochsen.....	7	101	<p>growth of 25 years old spruce and Scotch pine (experimental planting). Growth middling to inferior.</p> <p><i>c</i> = 18 acres (uppermost part on the south) Grinde; heather land with 100 years and more old crippled Scotch pine, some spruce, birch thinly stocked; here and there remnants of 25 years old planted spruce and Scotch pine.</p> <p>70 and up to over 100 years old Scotch pine and mountain pine with spruce, some birch, sometimes forming a very thin wood of single trees, sometimes in smaller or larger groups; everywhere intersected by heather places and blanks. Growth inferior; even crippled.</p>
Kleingartenkopf.....	8	76	<p>100—120 years old, in some parts younger, some over 300 years old, spruce with Scotch pine, few silver fir, some mountain pine. In the western third and on the eastern point still fairly well stocked, some groups even well stocked; otherwise the wood is very thin and open. Growth middling to inferior; here and there an incomplete miserable undergrowth of 30—50 and more years old spruce and Scotch pine (planted).</p>
Kleingarten.....	9	362	<p><i>a</i> = 161 acres; spruce and silver fir, some beech. Mostly 50—80 years old, in strips and single trees up to 100 years old, others only 30—50 years old. In the eastern part are about 50 acres 80—100 years old. Everywhere spruce and silver fir standards up to 150 years old, mostly showing good growth. Almost throughout rather thinly stocked, here and there patchy, in consequence of late final cuttings and removal of cancerous silver firs. Growth mostly good, only toward the southern higher part decreasing.</p> <p><i>b</i> = 122 acres (in 3 places); spruce and silver fir with some beech, <math>\frac{15-40}{\text{average} = 30}</math> years old, some groups up to 50 years; mostly fully stocked. 120—150 years old (some older) mostly pruned spruce and silver firs in the final stage are standing almost everywhere over the above younger growth. The strip along Dobelbach is finally cleared. Growth good; of the old trees fairly good.</p> <p><i>c</i> = 79 acres (upper part toward the south), 120—300 years old pruned Scotch pine and spruce, few silver fir and birch, thinly stocked, often open; on the whole poorly undergrown with 20—50 years old spruce (mostly planted), a few silver fir; the latter in some places form, with up to 100 years old spruce, the picture of a selection forest. Soil much covered with heather. Growth middling to bad; rarely fairly good.</p> <p>On 6 acres near compartment Dobelbach on the main path, 100 and more years old spruce, with a few Scotch pine and silver fir, form a thin canopy and show middling growth.</p>
Grossgarten.....	10	175	<p><i>a</i> = 108 acres; spruce and silver fir 80—110 years old, some up to 150, some beech and a few Scotch pine. Partly fully stocked, but the greater part somewhat thin, in the lower part very thin; and here spruce and silver fir advance growth up to 50 years old in single trees and groups. Growth good to fairly good; in</p>

## DESCRIPTION OF COMPARTMENTS—Continued.

Block and Compartment.		Area in Acres.	Description of Wood.
Name.	No.		
Sachsenbronn.....	11	95 (and 2 acres other areas.)	<p>the upper parts with stones (Halde), partly middling only.</p> <p><i>b</i> = 37 acres. (Ridge through middle of compartment and strip on south, southwest, and northwest.) 90—110, some up to 200 years old, spruce and Scotch pine, some silver fir, in the uppermost part some mountain pine in a thin, patchy, and often very thin wood; most of inferior growth; here and there traces of 30—40 years old spruce plantings.</p> <p><i>c</i> = 30 acres (adjoining compartment Kleingarten). A wood resembling a selection forest, of spruce and silver fir with beech, the trees 30—50 years old prevailing; little quite young. The 100—120 years old and older trees appear single and in groups. Growth good; above the cattle track inferior.</p> <p>100—120 years old (some up to 200 years), spruce and silver fir, also some beech, namely:</p> <p>On 42 acres, final stage, partly pruned, throughout with <math>\frac{10-30}{20}</math> years old (in the western part up to 40 years old), silver fir and spruce young growth; about 25 acres in the position of the seeding stage brought about by windfalls and dry wood cuttings; on 5 acres 80—100 years old, generally complete cover; in the thinner stocked parts is found up to 15 years old silver fir and spruce young growth; on 12 acres (southeastern corner, near compartment Gartenbach) generally canopy complete, here and there with a little advance growth.</p> <p>On 10 acres (in the west), 70—80 years old, some older spruce with silver fir, fairly complete canopy.</p> <p>On 7 acres (western point), 12—40 years old (in groups and single up to 60 years old), mostly irregular young growth of spruce with some silver fir, forming a fairly complete stocking.</p> <p>Growth of old trees good to fairly good, in the pruned portions partly less good; growth of young wood fairly good.</p>
Gartenbach .....	12	172	<p>110—140 years old spruce, silver fir, some older, some Scotch pine, the latter prevailing in places in the upper part, few beech; in the northern two-thirds in the final stage, partly in seeding stage. In these two-thirds about 85 acres are stocked with young growth of spruce and silver fir pretty completely, in the eastern part very fully; in the southern third still fairly complete cover, but on the western slope, already somewhat thin, as yet little young growth. Growth in northern two-thirds good, in the southern third good to fairly good; in the upper part, in the southeast, only middling.</p> <p>In the middle of the compartment are 3 windfalls and 1 beetle clearing, together 12 acres; of these, 7 acres fairly well stocked with up to 25 years old spruce and silver fir.</p>





ANNUAL REPORT OF  
SPECIAL WORKING PLAN.

COMPARTMENTS.	DESCRIPTION OF CUTTINGS, CULTIVATION, ETC.	CUTTINGS.		Cultivation. Acres.	Draining Ditches, Feet.	Road Construction. Feet.
		Final. Cubic feet.	Inter-mediate Cubic feet.			
1. Schwarzenbronn..	Final cutting in regenerated part.....	34,000	.....	.....	.....	.....
	Filling up blanks with spruce.....	.....	.....	3	.....	.....
	Thinning and cutting of cancerous silver firs....	.....	10,000	.....	.....	.....
	Total.....	34,000	10,000	3	.....	.....
2. Schwarzenberg....	<i>a</i> Thinning of shelter-wood and partial final cutting.....	35,000	.....	.....	.....	.....
	Filling up blanks with spruce and Scotch pine.	.....	.....	10	.....	.....
	<i>a</i> and <i>b</i> Thinning and removal of cancerous trees.....	.....	53,000	.....	.....	.....
	Total.....	35,000	53,000	10	.....	.....
3. Riesenkopf.....	<i>a</i> Seeding cutting, and partly final cutting.....	53,000	.....	.....	.....	.....
	<i>b</i> and <i>c</i> Rest.	.....	.....	.....	.....	.....
Total.....	53,000	.....	.....	.....	.....	
4. Mehliskopf.....	Rest.	.....	.....	.....	.....	.....
5. Grünwinkel.....	<i>a</i> Thinning of shelter-wood, seeding cutting in the fully stocked parts by the removal of cancerous and large trees.....	318,000	.....	.....	.....	.....
	<i>b</i> Rest	.....	.....	.....	.....	.....
	Total.....	318,000	.....	.....	.....	.....
6. Dobelbach.....	<i>a</i> Thinning and removal of cancerous trees.....	19,000	19,000	.....	.....	.....
	<i>b</i> and <i>c</i> Rest.	.....	.....	.....	.....	.....
	Construction of an export road to meet the main road.....	.....	.....	.....	.....	4,900
Total.....	19,000	19,000	.....	.....	4,900	
7. Hoher Ochsenkopf	Rest.	.....	.....	.....	.....	.....
8. Kleingartenkopf..	Rest.	.....	.....	.....	.....	.....

## SPECIAL WORKING PLAN—Continued.

COMPARTMENTS.	DESCRIPTION OF CUTTINGS, CULTIVATION, ETC.	CUTTINGS.		Cultivation. Acres.	Draining Ditches. Feet.	Road Construction. Feet.
		Final. Cubic feet.	Intermediate Cubic feet.			
9. Kleingarten.....	a Cutting of all old standards and cancerous trees.....	45,000	.....	.....	.....	.....
	Thinning.....	.....	3,000	.....	.....	.....
	b Thinning of shelterwood and partially final cutting.....	198,000	.....	.....	.....	.....
	Filling up blanks with spruce.....	.....	.....	12	.....	.....
	c Cutting out of old defective trees where young growth exists... Construction of an export road to meet the main road.....	14,000	.....	.....	.....	.....
Total.....	257,000	3,000	12	.....	9,500	
10. Grossgarten .....	a Thinning and removal of cancerous trees.....	47,000	47,000	.....	.....	.....
	b Rest.	.....	.....	.....	.....	.....
	c Removal of standards and cancerous trees... Thinning.....	25,000	15,000	.....	.....	.....
	Construction of an export road.....	.....	.....	.....	.....	5,000
	Total.....	72,000	62,000	.....	.....	5,000
11. Sachsenbrunn ...	In the regeneration area: thinning of shelterwood and partially final clearing; in the rest seeding cutting.....	163,000	.....	.....	.....	.....
	Filling up blanks with spruce.....	.....	.....	3	.....	.....
	Construction of an export road.....	.....	.....	.....	.....	3,500
	Total.....	163,000	.....	3	.....	3,500
12. Gartenbach.....	Continuation of regeneration cuttings and removal of cancerous trees.....	195,000	.....	.....	.....	.....
	Thinning in fully stocked parts .....	.....	7,000	.....	.....	.....
	Filling up blanks with spruce and Scotch pine. Construction of an export road.....	.....	.....	8	.....	3,000
	Total.....	195,000	7,000	8	.....	3,000

## SUMMARY OF THE PROVISIONS OF THE

COMPARTMENT.	PROVISIONS OF WORKING PLAN.					
	Cuttings.			Cultiva- tion. Acres.	Drain- ing. Feet.	Road Con- struction.
	Final. Cubic Feet.	Inter- mediate. Cubic Feet.	Total Cubic Feet.			
1. Schwarzenbronn.....	34,000	10,000	44,000	3	.....	.....
2. Schwarzenberg.....	35,000	53,000	88,000	10	.....	.....
3. Riesenkopf.....	53,000	.....	53,000	.....	.....	.....
4. Mehliskopf.....	.....	.....	.....	.....	.....	.....
5. Grünwinkel.....	318,000	.....	318,000	.....	.....	.....
6. Dobelbach.....	19,000	19,000	38,000	.....	.....	4,900
7. Hoher Ochsenkopf...	.....	.....	.....	.....	.....	.....
8. Kleingartenkopf.....	.....	.....	.....	.....	.....	.....
9. Kleingarten.....	257,000	3,000	260,000	12	.....	9,500
10. Grossgarten.....	72,000	62,000	134,000	.....	.....	5,000
11. Sachsenbronn.....	163,000	.....	163,000	3	.....	3,500
12. Gartenbach.....	195,000	7,000	202,000	8	.....	3,000
Total.....	1,146,000	154,000	1,300,000	36	.....	25,900

NOTE.—The excess was due to heavy windfalls; it will not derange future





Barids in Cross River, Lake Superior Forest Reserve, July 15, 1903. Photographed for the annual report of the Chief Fire Warden of Minnesota.

## WORKING PLAN AND OF THE EXECUTION.

RESULTS OF ACTUAL WORK DONE.						COMPARISON OF PROPOSED AND EXECUTED CUTTINGS.		Remarks.
Cuttings.			Culti- vation. Acres.	Drain- ing. Feet.	Road Con- struc- tion. Feet.	Cut too much. Cubic Feet.	Cut too little. Cubic Feet.	
Final. Cubic Feet.	Inter- mediate. Cubic Feet.	Total. Cubic Feet.						
33,034	12,549	45,583	4.4	.....	.....	1,583	.....	
54,517	75,000	129,517	5.0	.....	.....	41,517	.....	Excess due to windfalls and snow-break.
132,900	.....	132,900	1	.....	.....	79,900	.....	Excess due to windfalls and snow-break.
.....	.....	.....	.....	.....	.....	.....	.....	.....
177,169	.....	177,169	1	.....	.....	.....	140,831	Held back, on account of ex- tra fellings in other compts.
86,606	68,301	154,907	.....	.....	5,008	116,907	.....	Excess due to windfalls.
.....	.....	.....	.....	.....	.....	.....	.....	.....
342,444	21,635	364,079	8.4	.....	9,679	104,079	.....	Excess: wind- falls and construction of road.
95,852	.....	95,852	.....	.....	5,299	.....	38,148	Thinning held over.
111,049	.....	111,049	9	.....	3,691	.....	51,951	Held back on account of ex- cess in other compartments
197,660	.....	197,660	.....	.....	2,953	.....	4,340	.....
1,231,231	177,485	1,408,716	18.9	.....	26,625	108,716	.....	.....

arrangements, as there is yet a considerable excess of growing stock in the forest.

## SAMPLE PAGE OF THE DETAILED CONTROL BOOK.

1. *Schwarzenbronn.*

Year.	Description of Cuttings, Cultivation, etc.	CUTTING.		Cultivation. Acres.	Draining Ditches. Feet.	Road Construction. Feet.
		Final Cubic feet.	Inter- mediate Cubic feet.			
<i>Provision of Working Plan.</i>						
	Final cutting in regenerated part ..	34,000	.....	.....	.....	.....
	Filling up blanks with spruce .....	.....	.....	3	.....	.....
	Thinning and cutting of cancerous silver firs .....	.....	10,000	.....	.....	.....
	Total .....	34,000	10,000	3	.....	.....
<i>Execution.</i>						
1884	Final cutting .....	14,297	.....	.....	.....	.....
1884	Dry and windfall wood .....	813	.....	.....	.....	.....
1885	Windfalls .....	665	.....	.....	.....	.....
1886	Final cutting, thinning .....	6,166	832	.....	.....	.....
1886	Windfalls .....	547	.....	.....	.....	.....
1887	Windfalls .....	1,363	.....	.....	.....	.....
1888	Final cutting, thinning .....	7,759	11,717	.....	.....	.....
1888	Planting .....	.....	.....	1.7	.....	.....
1888	Windfalls .....	82	.....	.....	.....	.....
1889	Dry wood, windfalls .....	649	.....	.....	.....	.....
1889	Planting .....	.....	.....	2.2	.....	.....
1890	Windfalls .....	693	.....	.....	.....	.....
1890	Planting .....	.....	.....	.1	.....	.....
1891	Planting .....	.....	.....	.2	.....	.....
1892	Planting .....	.....	.....	.1	.....	.....
1893	Planting .....	.....	.....	.1	.....	.....
	Total .....	33,084	12,549	4.4	.....	.....

# INDEX.

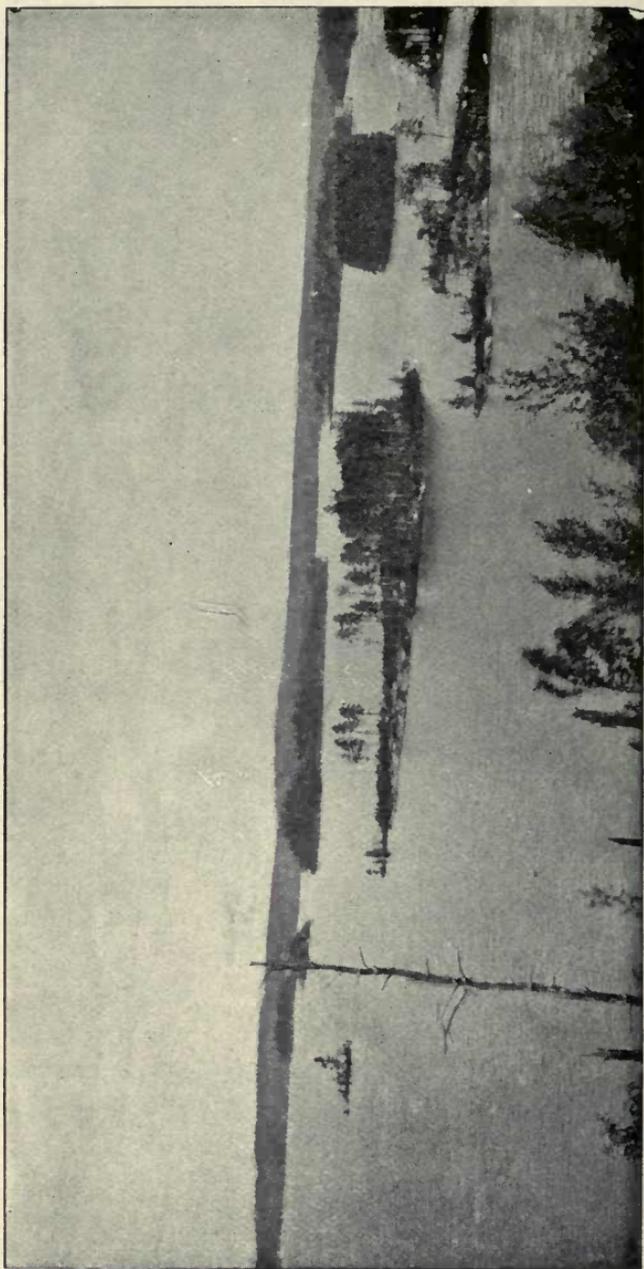
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Burntside Lake in St. Louis County, Minnesota, popular resort for trout fishing. A part of the State's Burntside Forest, being land granted to Minnesota by Congress in 1904, for forestry purposes, borders on this lake. Alexander Winchell, Geologist of Michigan, pronounced this lake more beautiful than the Thousand Islands of the St. Lawrence River.

FORESTRY

*Walter Mulford*

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# ELEVENTH ANNUAL REPORT

OF THE

## FORESTRY COMMISSIONER

[FORMERLY CHIEF FIRE WARDEN]

OF

## MINNESOTA

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UNDER THE ACT OF THE LEGISLATURE ENTITLED  
"AN ACT TO PROVIDE FOR THE PRESERVATION OF FORESTS OF THIS STATE AND FOR  
THE PREVENTION AND SUPPRESSION OF FOREST AND PRAIRIE FIRES,"  
APPROVED APRIL 18, 1895, AND AS AMENDED BY  
THE ACT OF APRIL 21, 1903.  
AND BY CHAPTER 22 OF THE REVISED LAWS OF MINNESOTA, 1905.

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FOR THE YEAR 1905

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ST. PAUL, MINN.:  
PRINTED BY THE PIONEER PRESS COMPANY  
1906

STATE OF MINNESOTA,  
OFFICE OF FORESTRY COMMISSIONER, }  
ST. PAUL, MAY 1, 1905.

*Hon. S. G. Iverson, State Auditor:*

SIR: As required by section 3 of Chapter 22, Revised Laws of Minnesota, 1905, I have the honor to submit, herewith, my annual report for the year 1905.

Very respectfully,

C. C. ANDREWS,

*Forestry Commissioner.*

ELEVENTH ANNUAL REPORT  
OF THE  
FORESTRY COMMISSIONER  
OF MINNESOTA.

---

Dry weather, continuing fully three weeks in some localities and with occasional strong wind prevailed in the forest regions during the spring of 1905. It is a singular fact that the worst forest fire of the year should have started within the city limits of Duluth. A man whose home appears to have been in Wisconsin was clearing a small tract of land not far from the Lakewood pumping station, and although the weather was very dry and the wind high, he set fire to brush on the 24th of May. He did not have sufficient force at hand to control the fire which rapidly spread and soon threatened the pumping station; damage to which however, was prevented by the Duluth fire department. The fire rapidly spread eastward into Lake county. It burned over in all 3,000 acres in St. Louis county and fully 35,000 acres in Lake county, and was to a considerable extent, controlled by the energetic efforts of fire wardens and their helpers in the towns of Lakewood and Two Harbors. Naturally, exaggerated reports of damage were circulated; but most of the country burned over was land from which the original pine had been cut. The chairman of the town of Lake-

wood estimated the damage done by the fire in St. Louis county at \$5,000. Mr. Axel Essen, chairman of the town of Two Harbors, who had experience as a woodsman, made a thorough investigation of the damage done by the fire in Lake county and he reported that the area burned over was between 35,000 and 40,000 acres and that the damage done by the fire was \$15,700. Sufficient evidence was promptly procured as to who caused the fire; and complaint against him was drawn by the city attorney of Duluth and placed in the hands of an officer, but the offender had gone into Wisconsin or would have been arrested. There is evidence enough to convict him and if he returns to the State he will be tried. (Extradition does not apply in such case.) His setting the fire under such circumstances was simply an act of weak judgment. He was an old man and it would have been more to his credit if, instead of leaving the State he had frankly responded to the summons of the law.

According to the reports of fire wardens the number of acres burned over by forest fires in this State was 102,968; damage \$58,680. Number of acres burned over by prairie fires 39,449; damage \$7,515.

By far the greater part of the country burned over by these forest fires was cut-over land from which the heavy timber had been removed some years ago. Generally the principal damage done is to young pine which has started up from seed. Unless one is very observing in passing through such country he would not notice how much re-growth of pine there is. Pine does its slowest growth during its first ten years, at the end of which time, it is but little more than a foot high. A fire which destroys many acres of such re-growth does more damage than the casual observer would suppose.

During the prairie fire of the 14th of November in the town of Esplee, in the eastern part of Marshall county, a

little girl returning from school was so badly burned that she died in twenty-four hours; her father who ran to save her had his hands very badly burned.

Most fires are caused by clearing land and burning meadows. If a settler uses proper care a fire will not get beyond his control. The most ordinary person ought to know better than to set fire in dry and windy weather. It is a person of but little conscience who at any time will set fire and let it run wild.

The law makes town supervisors — of whom there are three in each town — fire wardens and requires them to take precautions to prevent forest and prairie fires. These men are the tribunes and high officials of their towns, elected by their fellow citizens to conduct the public business of their towns. In old New England they are called the "select" men. For the time being they are looked up to as men in authority; and as they travel through their towns attending to the town business they can easily, and it is their duty to, caution people who are liable to be careless in their work of clearing land, burning meadows and the like. The law is wise in constituting these officers fire wardens and they ought to feel that they are responsible, and that public opinion holds them responsible, in a very high degree for having their towns free from damaging fires. Fresh instructions with blanks and return stamped envelopes are sent to these officers and to fire wardens in unorganized territory every spring from this office.

Considering the great activity in our forest regions in the development of the country in so many ways, I think we have been very fortunate in the comparatively small number of damaging fires that have occurred. Increased care each year appears to be exercised.

Good main roads would be great preventives against the spread of dangerous fires.

The law of the last legislature requiring the State to pay for the services of fire wardens and their helpers in preventing and extinguishing fires on the approval of this office and collecting half the amount from the counties in which the service was rendered, promises to be an improvement. The pay is small it is true; but there are some things which in an emergency a citizen owes to his town and country. Regulations provide that services for fighting fire shall not be paid unless the fire be duly reported by the fire warden at the time it occurs. I believe also the rule will work well which requires payment of such claims to be deferred until the end of the season. If a man works half a day in fighting fire he is entitled to seventy-five cents; and as he is liable to be called upon at different times through the season, it seems preferable that he should wait and be paid for the whole amount in one warrant rather than that the State should have to issue a warrant for each item. There are exceptions to all rules, and if a party is leaving the State or if there are other good reasons, he can be paid without delay. Accounts must state not only the date but the kind of service rendered — whether for posting notices, patrolling or for fighting fire. Correct accounts that have been sent in at the end of the season have been paid and State warrants sent to the respective parties without a day's delay, and I have to thank the State Auditor's office for its promptitude in issuing these warrants.

## SUMMARY OF FOREST FIRES, 1905.

COUNTY AND TOWN.	Date.	Acres.	Damage.	Cause.
<b>Aitkin County—</b>				
Haugen.....	April 19.....	240	\$175	Unknown.
Haugen.....	April 20.....	450	None	Unknown.
McGregor.....	March 22.....	30	20	Unknown.
Kimberly.....	April 18.....	640	None	Unknown.
Millward.....	April 5.....	15	100	Clearing land.
<b>Beltrami County—</b>				
Bemidji.....	April 25.....	2,000	500	Unknown.
Bemidji.....	April 26.....	500	400	Railroad locomotive.
Frohn.....	April 19.....	200	100	Clearing land.
Liberty.....	May 8.....	1,000	120	Clearing land.
Grant Valley.....	June 1.....	440	60	Unknown.
Northern.....	April 18.....	1,200	500	Burning meadow.
Northern.....	April 23.....	2,000	50	Unknown.
Port Hope.....	April 22.....	200	200	Unknown.
Port Hope.....	May 23.....	80	500	Railroad locomotive.
Roosevelt.....	April 26.....	20	250	Clearing land.
Summit.....	May 31.....	400	500	Unknown.
Taylor.....	May 10.....	350	1,000	Unknown.
Taylor.....	May 25.....	1,200	1,000	Unknown.
Taylor.....	May 27.....	600	700	Unknown.
Township 146—31...	June 1.....	2,000	500	Unknown.
Turtle Lake.....	May 28.....	30	30	Campers.
<b>Benton County—</b>				
Granite Ledge.....	April 18.....	200	150	Unknown.
<b>Carlton County.....</b>				
Holyoke.....	April 23.....	300	100	Fishermen.
Holyoke.....	April 23.....	300	500	Unknown.
Holyoke.....	April 25.....	400	300	Fishermen.
Lake view.....	April 21.....	3,000	500	Unknown.
Red Clover.....	April 24.....	90	100	Burning meadow.
Skilton.....	April 17.....	200	75	Unknown.
Twin Lakes.....	April 23.....	300	600	Unknown.
Twin Lakes.....	April 27.....	100	300	Clearing land.
Wrenshall.....	June 1.....	100	50	Clearing land.
<b>Cass County—</b>				
Byron.....	April 20.....	500	50	Burning meadow.
Byron.....	April 22.....	1,000	500	Burning meadow.
Cass Lake.....	May 8.....	40	50	Clearing land.
Township 145-27....	April 23.....	500	500	Burning brush.
Township 139-26....	May 28.....	1,500	500	Clearing land.
Township 134-30....	April 23.....	600	300	Fishermen.
Township 135-29....	April 20.....	800	400	Fishermen.
Township 145-32....	May 2.....	20	.....	Railroad locomotive.
Poplar.....	April 23.....	600	2,000	Burning meadow.
Walker.....	May 31.....	200	75	Unknown.
<b>Clearwater County—</b>				
Bear Creek.....	April 24.....	300	75	Hunters.
Bear Creek.....	May 31.....	600	25	Railroad locomotive.
Copley.....	April 26.....	320	200	Unknown.
Copley.....	May 31.....	300	300	Clearing land.

## SUMMARY OF FOREST FIRES, 1905.

COUNTY AND TOWN.	Date.	Acres.	Damage.	Cause.
<b>Clearwater County—</b>				
Eddy .....	April 21 .....	80	None	Unknown.
Holst. ....	April 23. ....	40	\$200	Burning fire break.
Itasca .....	April 24. ....	1,000	.....	Unknown.
Moose .....	May 25 .....	200	None	Unknown.
<b>Chisago County—</b>				
Sunrise.....	April 17.....	100	75	Unknown.
<b>Cook County—</b>				
Grand Marais.....	June 6.....	750	200	Unknown.
Hovland.....	June <sup>1</sup> 2.....	40	None	Clearing land.
Maple Hill.....	May 23.....	100	None	Clearing land.
Maple Hill.....	May 23.....	1,300	3,000	Logging locomotive.
<b>Crow Wing County—</b>				
Bay Lake.....	April 20.....	650	500	Unknown.
Deerwood.....	April 18.....	400	300	Railroad locomotive.
Crow Wing.....	April 18.....	600	None	Fishermen.
Emily.....	April 14.....	80	None	Burning meadow.
Klondike.....	April 23.....	1,160	15	Unknown.
Pelican.....	April 22.....	130	None	Clearing land.
Roosevelt.....	April 26.....	20	50	Clearing land.
Sibley.....	May 31.....	100	75	Railroad locomotive.
Watertown.....	April 25.....	1,000	300	Unknown.
<b>Hubbard County—</b>				
Arago.....	April 19.....	100	None	Burning meadow.
Badoura.....	April 23.....	2,500	.....	Unknown.
Crow Wing Lake....	April 26.....	160	300	Unknown.
Farden.....	April 21.....	1,000	150	Clearing land.
Farden.....	May 31.....	350	600	Unknown.
Guthrie.....	April 21.....	8,000	200	Burning meadow.
Helga.....	May 31.....	1,200	500	Unknown.
Lake Hettie.....	May 21.....	300	50	Fishermen.
Mantrap.....	April 30.....	300	None	Unknown.
Nevis.....	May.....	640	50	Unknown.
Rockwood.....	May 30.....	1,200	1,000	Unknown.
<b>Isanti County—</b>				
Bradford.....	April 22.....	200	75	Unknown.
<b>Itasca County—</b>				
Evergreen.....	May 15.....	25	250	Burning R. R. right of way.
Grand Rapids.....	April 22.....	200	.....	Unknown.
Iron Range.....	May 24.....	1,200	750	Unknown.
Lake Jessie.....	May 30.....	2,000	500	Unknown.
Manitou.....	July 25.....	200	400	Clearing land.
Third River.....	May 22.....	300	100	River drivers.
Third River.....	June 2.....	200	None	Unknown.
Watrous.....	May 23.....	100	25	Clearing land.
Township 53-22....	April 20.....	200	30	Unknown.
Township 53-25....	April 24.....	1,500	1,500	Unknown.
Township 61-22....	April 22.....	100	500	Unknown.
Township 159-24....	May 23.....	100	150	Unknown.

## SUMMARY OF FOREST FIRES, 1905.

COUNTY AND TOWN.	Date.	Acres.	Damage.	Cause.
Lake County—				
Crystal Bay.....	May 24.....	1,000	\$2,000	Unknown.
Townships 53, 54 & 55 ranges 9, 10 & 11..	May 24.....	35,000	15,700	Clearing land.
Morrison County—				
Clough.....	April 21.....	12	60	Unknown.
Clough.....	April 23.....	1,000	100	Unknown.
Platte.....	March 13.....	400	90	Unknown.
Ottertail County—				
Butler.....	April 24.....	600	100	Unknown.
Rush Lake.....	April 25.....	500	300	Unknown.
Pine County—				
Barry.....	March 28...	80	500	Clearing land.
Mission Creek.....	March 14.....	200	70	Burning meadow.
Red Lake County—				
Emardsville.....	April 21.....	200	250	Unknown.
Emardsville.....	April 22.....	1,200	400	Unknown.
Emardsville.....	April 23.....	160	200	Unknown.
Roseau County—				
Algoma.....	April 23.....	200	150	Clearing land.
St. Louis County—				
Canosia.....	May 27.....	20	None	Unknown.
Canosia.....	May 29.....	15	None	Railroad locomotive.
Culver.....	June 2.....	400	50	Unknown.
Duluth.....	April 20.....	5	1,000	Unknown.
Duluth.....	May 19.....	10	10	Campers.
Industrial.....	April 23.....	150	300	Railroad locomotive.
Kugler.....	June 7.....	160	15	Unknown.
Lakewood.....	May 24-June 3	3,000	* 5,000	Clearing land.
Nichols.....	April 25.....	40	None	Railroad locomotive.
Solway.....	May 23.....	150	600	Unknown.
Township 60-14.....	June 2.....	150	3,000	Unknown.
Township 56-17.....	April 20.....	100	None	Unknown.
Township 56-17.....	October 7....	300	10	Campers.
Todd County—				
Birchdale.. .....	April 26.....	160	50	Hunters.
Germania.....	April 19.....	80	20	Clearing land.
Wadena County—				
Huntersville.....	April 23.....	600	200	Unknown.
Leaf River.....	April 19.....	400	100	Unknown.
Lyons.....	April 19.....	236	50	Clearing land.
Lyons.....	April 23.....	1,000	150	Clearing land.
Rockwood.....	April 24.....	600	None	Unknown.
Wadena.....	April 20.....	500	15	Clearing land.

\*Subsequent report from the town chairman put damage at \$19,000.

Total acres burned over 102,968.

Damage \$58,680.

Classification of causes:

Clearing land 25.

Burning meadows 10.

Railroad locomotives 10.

Fishermen and hunters 7.

Intentional 1.

Other causes 6.

Unknown 61.

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REPORT OF FIRE WARDENS AND OTHERS OF FOREST  
FIRES FOR 1905.

BELTRAMI COUNTY.

O. J. Tagley, village president, Nymore, May 4:

April 25th fire was discovered in section 2, town 146, range 33, about 2½ miles northeast of here. It had gotten much headway and as a strong wind was blowing it took us several hours, fighting the fire and plowing furrows before we had it under control. Including the meadow land I should judge that the fire burned over fully five sections, and the timber loss and hay destroyed amounted to several hundreds of dollars. April 26th a fire about 2 miles south of Nymore spread over nearly 2 miles of meadow land; also destroyed considerable standing timber, burned nearly 100 cords of wood and the home of Olof Larson was only saved after hard work. I took six men with me and we worked very hard for several hours before we had the fire under control.

A. G. Rutledge, Bemidji, June 1:

There was a very bad fire at Nymore (which is a mile east of Bemidji) yesterday afternoon and evening. Mr. O. J. Tagley, President of the village council of Nymore,

with about 30 men fought the fire all the afternoon and well on in the evening. I am informed that two boys set the fire, but that their indentity is unknown, as they ran from where the fire started and made good their escape. A large amount of jack pine and other timber was destroyed, and it was only by hard work that over 1,000 cords of wood was saved as well as several buildings. Had not a large number of men acted promptly there is no telling how far the fire would have spread. The weather is very warm and the wind is strong.

Gust Dohrman, chairman, town of Grant Valley, June 6:

June 1st and 2nd a forest fire on section 14 burned over 440 acres of timber and brush and destroyed 30 cords of wood. Not certain how it was caused. The parties who ought to know claim it was set by campers or hunters. It was extinguished in two days by plowing and back-firing. Weather dry and windy.

A. R. Tillotson, fire warden, town of Northern, May 11:

On the 18th of April a forest and brush fire caused by setting fire to meadow burned over 1,200 acres. It was extinguished by backfiring and throwing earth and water on the fire. Weather dry and windy; had been dry three weeks or more.

S. S. Carter, chairman, town of Taylor, May 26:

A fire the 10th instant burned over 350 acres and did damage to the amount of \$1,000; was extinguished with the help of six persons. There is quite a lot of talk as to who set the fire but as yet it has not been ascertained.

Same June 1:

Fire has been raging through this township for two weeks; have been fighting fire most of the time and have not had much time to investigate. We have had no

rain for nearly three weeks. Everything dry. Will find out all I can as to the party who set the fire.

Chas. Lundquist, chairman, town of Summit, June 6:

On the 31st of May a forest fire on section 7 burned over 400 acres of heavy timber. Destroyed pine, cedar and hardwood; damage \$500 to standing timber. As there is cedar slashings on both sides of the railroad track, it might have been caused by sparks from locomotive. Weather dry and windy for two weeks.

#### CARLTON COUNTY.

John Skelton, village president, Barnum, April 27:

I have been doing my best to prevent forest fires; notifying all in this vicinity of the danger and cost of fires if not kept under control.

Chas. Carpenter, chairman, town of Holyoke:

On the 23rd of April a forest fire burned over 300 acres of light timber and 200 acres of good timber; damage \$500. It was extinguished in two days with the help of two persons. The weather was dry for two weeks before and windy at the time of fire.

W. M. Cain, village president, Carlton, April 26:

We have had a good deal of fire around Carlton and vicinity but have got it under control. We have been doing quite a little work to prevent the spreading of fire in our locality and will continue to endeavor to prevent as much as possible the setting and spreading of fire.

E. T. Walker, chairman, town of Red Clover, April 28:

On the 24th instant at 11 o'clock a fire on section 34 burned over 90 acres and did damage to the amount of

\$100. It was caused by burning old grass and was extinguished in five hours with the help of three persons. Weather dry and windy and had been dry about twenty days. The past fifteen days were very dry and smokey. Heavy smoke hung over the land most of the time. Many small fires kept me continually on the lookout.

## CASS COUNTY.

Chris Burns, fire warden, Cass Lake, June 5:

On May 8th I patrolled between Cass Lake and Ferris on both sides of track; found everything all right. On 9th heard of a farmer two miles west burning slashings and proceeding there found he had lost control of the fire, although working hard — himself, wife, one girl and two boys. I hastened back to railroad and got section crew and we fought it with the farmer's help and got it under control. Weather was calm or it might have done great damage. We were at it about three hours. The 10th came back by way of Wolf Lake to Cass Lake and saw no fires; 11th came to Cass Lake and was called to Ball Club on the G. N. railroad about thirty miles from Cass Lake; found a man had been burning brush after his logging operations and the fire got away from him and burned over probably 200 or 300 acres; also burned sixty thousand feet of lumber on skids belonging to another party and pretty nearly burned his dwelling and outhouses. The fire spent itself on the east by Ball Club river and on the north by the G. N. railroad. Stayed at Ball Club three days patrolling and putting out fire in rotten logs; 15th patrolled to Six Mile Lake and return; 16th to Leech Lake dam and return; 18th returned from Bena to Cass Lake; 29th patrolled to Cuba and Santiago and cautioned a lumber company where they were logging about brush burning. The

Forestry Bureau has men here also seeing to the burning; they are very careful men attached to the Bureau here. 30th patrolled from Santiago south to Cass river. Cautioned the Indians in regard to putting out their fires; 31st from Cass river to Bena. June 1st and 2nd patrolled around Bena.

I omitted to say that during my time away from Cass Lake there was a forest fire south of town; it burned over a large area and was fought for two days by the custodian of the ten sections and forestry men and men from Cass Lake. I wish to state that everywhere I have been the people have helped me without cost.

Parker Waite, Brainerd, April 28:

It is not an easy matter to get men out here to fight fire, as the farmers live some distance apart and they have been watching fire to keep it out of their own places. I had to get four men out Monday afternoon to fight fire and when it gets in old slashings with a strong wind blowing it is impossible to check it. I have made inquiries as to the setting of fires but nobody seems to know.

J. A. Gilberg, chairman, town of Poplar, April 25:

On the 23rd instant a forest fire originating on sections 35 and 16 burned over 600 acres of timber; destroyed all timber. The cause can only be guessed at — some one probably burning his meadow, as it was no uncommon thing to see a meadow burning for a few days past. A heavy wind came up that day and many of the people were at church when the fire swept through the timber. Several did all they could to check the fire. No rain for at least three weeks. The fact is for the past week all of Cass county was a pillar of smoke from the Crow Wing river to Walker south and north, and if a true account could be made thousands of dollars worth of timber was destroyed.

## COOK COUNTY.

Cook County Herald, June 10:

“Considerable anxiety has been caused by numerous small brush fires in this section recently. The extremely dry weather that has prevailed caused the authorities and others interested to be extremely watchful, and this vigilance has prevented the spread of a number of incipient blazes that might have proven disastrous to property interests of the community.”

## CROW WING COUNTY.

William Eisner, chairman, town of Pelican, April 26:

On the 22nd instant a brush fire burned over 130 acres but did no damage. Caused by clearing land and fire getting beyond control; was extinguished in four hours by backfiring. The weather has been dry now for three weeks and some days heavy wind.

William Baumgarten, fire warden, town of Roosevelt,  
June 19:

On the 26th of April a forest fire burned over 20 acres, destroying some of the best Norway. It was caused by a man clearing land who set fire and then went to dinner. Weather dry and windy. He was convicted and sent to jail.

## HUBBARD COUNTY.

Frank W. Beden, chairman, town of Arago, August 5:

On the 19th of April a fire caused by burning meadow spread over 100 acres of swamp. If the fire had not been put out it would have burned 200 cords of wood and a school house. On the 23rd of April a fire supposed to have been set by fishermen burned over 150 acres and

destroyed 100 acres of young Norway pine and one barn. Weather very dry and windy. No rain for three weeks.

F. D. Sanger, chairman, town of Guthrie, May 3:

April 21st a forest fire supposed to have been caused by burning meadow burned over about 8,000 acres. Nearly the whole town assisted in its control; it was finally extinguished by heavy rain. Weather very dry and windy; had been dry all spring.

Same May 30:

In regard to damage done by the fire of April, it was not as large as at first thought. A rough estimate by myself and others placed the damage at about \$200. In many places it was a benefit to the country. One party reported \$200 damage, but when we came and looked it over he concluded the fire had done him \$200 worth of good and others were about the same.

#### ITASCA COUNTY.

A. R. McDonald, U. S. Commissioner, Little Fork,  
April 28:

I am very much interested in the protection from forest fires of timber and other property in the town of Cingmars. During the past winter extensive logging operations were conducted in the town and through the accumulation of tree tops and other inflammable materials the danger has been materially increased, necessitating extra vigilance on the part of the town officials.

John McDonald, chairman, town of Grand Rapids,  
April 28:

The 22nd instant a dangerous forest fire broke out in some old pine timber cuttings within a half a mile of the village of Grand Rapids. A stiff wind was blowing from

the north toward the village at the time and it was necessary that prompt action be taken to prevent the fire extending into the village and destroying other valuable property. Accordingly I employed thirteen men to fight the fire and it was successfully extinguished. Its origin is not known to me.

## LAKE COUNTY.

Axel Essen, chairman, town of Two Harbors, June 3.

On the 24th and 25th of May a forest fire burned over 35,000 acres and did damage to the amount of \$15,700. The country was extremely dry and it was very windy and the fire spread rapidly. It required hard labor to control it and save some of the homes of the settlers; a few of whom lost all they had. The town supervisors acting as fire wardens were present and took charge of the work and called to their assistance twenty-seven persons.

Thos. Owens, (sup't D. I. R. R. Company) Two Harbors, May 25:

On the 24th instant there was a very strong wind blowing from the southwest and a bad looking forest fire in this vicinity. Some logs burned at Lakewood. Our company lost about 2,500 ties. This is the only damage we have at present. The fire covered a distance of about 40 miles along, but not near the right of way.

(Note, this fire originated in the city limits of Duluth and will be further noticed under head of St. Louis county.)

## PINE COUNTY.

P. A. Christianson, village president, Hinckley, April 26:

Regarding fires about Hinckley would say that they are of no importance. There is unusual activity in this

locality this spring in clearing land for meadow and agricultural purposes and small fires have run more or less at large. So far there has been no damage resulting, except a bridge over the Grindstone river, between sections 21 and 28, town 41, range 20, which was unprotected against fire. Should any fire of consequence occur, will promptly notify you.

ST. LOUIS COUNTY.

E. Morcom, Tower, May 11:

So far there has been no forest fire on the skirts of the city. There has been a little forest fire a few miles west of the city on the Tower and Itasca road in unorganized territory; but very little damage has been done. These fires very often originate by parties lunching by the roadside who leave without putting out their fires.

M. H. Schussler, village president, Floodwood, April 29:

We have had several fires in and around Floodwood and we have been compelled to fight fires three or four weeks previous to the showers we had a day or so ago. The present rain has stopped all forest fires for the time being, but wish to assure you that I will take all proper precautions to check any fires or prevent any fires I possibly can.

From a special fire warden, Duluth, June 1:

To-day I was up in the Lakewood district and obtained the name of the man who set the fire within  $1\frac{1}{2}$  miles of the Lakewood pumping station; (the fire which extended into and burned over 35,000 acres in Lake county.) He left the country the day after the fire taking his belongings with him. I have two men here who saw him

light the fire and they are willing to testify in court. I have other evidence that will convict him. He was clearing a small piece of land. His two employes refused to set the fire because the wind was so high, so he set it himself.

Same June 5:

I filed complaint with the city attorney against the party who set the Lakewood fire. He has gone to Wisconsin where he owned a saloon about two years ago. Before leaving he sold the land on which he started the fire.

A fire started on the Jean-Duluth stock farm. It was set by the foreman, but I found he took all precautions possible. He was burning a small pile of stumps in the center of a large clearing which was freshly plowed; he also had six men watching the fire but a sudden gust of wind carried some sparks into the woods beyond. It did very little damage.

#### TODD COUNTY.

W. S. Brown, chairman, town of Germania, April 22:

On the 19th about noon a fire originating on section 6 burned over 80 acres and did damage to the amount of \$20. It was extinguished in six hours with the help of four persons beating with wet grain sacks and switches. Weather dry and windy; had been dry three weeks.

## SUMMARY OF PRAIRIE FIRES, 1905.

COUNTY AND TOWN.	Date.	Acres.	Damage.	Cause.
Becker County— Atlanta .....	Nov. 20.....	150	\$120	Unknown.
Beltrami County— Lee .....	Nov. 1.....	200	25	Unknown.
Clay County— Cromwell .....	Nov. 7.....	20	50	Children.
Elkton .....	Nov. 21.....	600	200	Railroad locomotive.
Flowing .....	Nov. 15.....	500	1,000	Camp fire.
Moland.....	Nov. 15.....	600	800	Camp fire.
Kittson County— Clow.....	Nov. 21.....	2,000	300	Railroad locomotive.
Norman County— Green Meadow.....	April 25.....	500	100	Unknown.
Spring Creek.....	April 26.....	900	50	Unknown.
Sundal.....	April 25.....	2,240	700	Unknown.
Ottertail County— Deer Creek .....	Nov. 20.....	8	42	Railroad locomotive.
Homestead.....	Oct. 30.....	80	6	Unknown.
Polk County— Belgium .....	April 24 .....	3,000	250	Unknown.
Belgium .....	Nov. 1.....	1,000	30	Railroad locomotive.
Helgeland.....	May 27.....	100	None	Burning meadow.
Kirtsonville.....	Oct. 6.....	6	400	Railroad locomotive.
Red Lake County— River Falls.....	April 15.....	640	117	Burning meadow.
River Falls.....	April 29.....	200	None	Burning meadow.
Rocksbury.....	May 2.....	200	100	Railroad locomotive.
Township 153-39....	Nov. 4.....	4,000	None	Unknown.
Roseau County— Jadis .....	Nov. 10.....	400	200	Camp fire.
Lind.....	April 20.....	1,000	200	Unknown.
Skagen.....	April 14.....	600	40	Intentional.
Swift County— Clontarf .....	April 19.....	700	160	Unknown.
Wilken County— Prairie View .....	Nov. 1.....	1,000	1,500	Railroad locomotive.
Winona County— Rolling Stone.....	April 11 .....	40	175	Unknown.
Yellow Medicine Coun- ty— Fortier .....	April 25.....	320	None	Unknown.

Total acres burned over, 39,449. Damage, \$7,515.

## Classification of causes:

Burning meadows, 4.

Camp fires, 3.

Railroad locomotives, 9.

Other causes, 4.

Unknown 19.

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 REPORT OF FIRE WARDENS AND OTHERS OF PRAIRIE  
FIRES FOR 1905.

## CLAY COUNTY.

Jorgen Jensen, chairman town of Moland, November 18:

On the 15th instant a fire originating on section 31 in town 141, range 46, being the town of Flowing, burned over 640 acres in the northeast part of this town and destroyed hay in stack of value variously estimated up to \$2,500. It was extinguished with the help of twenty-two persons and two teams by breaking and burning. It had been dry a long time. Wind very heavy. The fire would have done more damage if it could have got over the Great Northern tracks.

Same November 24:

I went to the party accused of setting the fire and had a talk with him about it. He agreed to go with me before a justice of the peace and plead guilty to the charge of being careless and causing fire, so I took him to Moorhead and he was fined \$5.

## KITTSOON COUNTY.

B. Nelson, chairman, town of Percy, April 25:

On the 19th instant at noon a fire burned over about 4000 acres of brush and meadow land. The only damage

was the destruction of about fifty fence posts. The fire was burning for three days and was extinguished by back-firing and using wet sacks. About twenty persons helped to save their homes. The weather was dry and windy and had been dry three weeks.

#### MARSHALL COUNTY.

L. J. Tenald, chairman town of Esplee, November 6:

A fire which started the 3rd instant and burned all night burned over 4,000 acres of swamp, meadow and brush. Destroyed a house, stable and ten tons of hay; damage \$150 to \$175. Between fifteen and twenty people assisted in putting it out. Weather dry and windy.

Same November 15:

On the 14th instant a fire originating on section 17 burned over 5,000 acres and destroyed hay of the value of \$250. About fifteen people assisted in putting the fire out. Weather dry and windy; had been dry about four weeks. I have made inquiries but it is difficult to fix responsibility for the fire.

Same November 16:

During the fire of November 14th the little daughter of John Byland was returning from school and was so badly burned that she died in twenty-four hours. Her father went to meet and save her and had his hands so badly burned doing so that he had to be taken to Thief River Falls hospital. If rain had not come in the evening the whole country would have been burned up. Have tried to ascertain who caused the fire.

John Simonson, chairman town of Excel, May 4:

April 19th a fire on section 9 burned over 320 acres. There was no time to call help and it was extinguished by

myself and wife with wet sacks and plenty of water. The weather was dry and windy, had been dry about four weeks. N. C. Rood chairman town of Nelson Park, April 29:

April 24th a fire on section three burned over 300 acres and did damage to the amount of \$50. A couple of small boys were herding cattle on the sand ridge and one of the boys had a pipe along and lighting the same the smallest boy happened to drop the match in the grass and it was very dry and windy that day. About twenty people helped extinguish the fire, which was done in four hours. The weather has been dry all spring.

Carl R. Anderson, chairman town of Thief Lake, May 12:

On the 3rd of May a fire on section 13 burned over 100 acres and was caused by burning around hay stacks. Weather dry and windy; had been dry all spring.

#### NORMAN COUNTY.

Ole Aurne, chairman town of Sundal, May 12:

April 25th a fire originating on section 17, vacant land, burned over 2,000 acres and destroyed brush, meadow and poplar grove; damage \$700. Sixteen persons were working to control the fire. It was all they could do to save their own property. They had no time for anything else. I cannot find out who set the fire. The weather has been dry one month and high wind.

#### OTTER TAIL COUNTY.

Addison Petrie, chairman town of Compton, November 22;

The 20th instant a fire on section 24 burned over about seven or eight acres and destroyed seven tons of hay. Eight persons helped whip it out. Weather dry two weeks and hard wind.

## ROSEAU COUNTY.

Oluf Efshen, chairman town of Jadis, November 14:

The 10th instant a fire on section 29 burned over 400 acres of meadow and destroyed 100 tons of hay. Was extinguished with the help of twelve persons. The weather was dry and windy; had been dry for a month.

Same December 27:

The party accused of causing the fire of November 10th was tried, found guilty and fined \$50 and costs amounting to \$65 in all. The case was prosecuted by the county attorney.

Axel Wahl, chairman town of Lind, April 29:

On the 10th instant a fire originatind on section 4 burned over parts of several sections and destroyed one building and several timber groves. It is impossible to find out how it started. There were fourteen persons assisting in putting it out. Weather dry and windy; had been dry for three weeks.

Gust Anderson, chairman town of Skagen, May 5:

The party who caused the fire of April 14th, which did damage to the amount of \$40 was prosecuted, but after one continuance of the case and the State not being prepared for trial on the date to which it was continued, the defendant was discharged.

Same August 24:

The man who set the fire was prosecuted, plead guilty April 28th and afterwards went before the county attorney and plead guilty and was fined \$5 and costs.

## WADENA COUNTY.

Peter Gedde, chairman, town of Lyons, April 28:

The 23rd instant a forest fire burned over about 1,000 acres in the northern part of the town; damage \$150. It

was extinguished by five persons setting back fires and plowing. The weather has been dry and windy all spring.

N. R. Carper, chairman, town of Wing River, April 22:

On the 20th instant about three o'clock a fire on section 17 caused by a settler clearing brush land and from whom the fire got away, burned over 500 acres and did damage amounting to \$15. It was extinguished by teams plowing and by whipping it out. The settler promptly paid the damage in full satisfaction to the loser and would have paid the parties who stopped the fire but they would not take pay, as he is a minister. The weather has been very dry for about two weeks.

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FORESTRY COMMISSIONER.

Chapter XXII of the Revised Laws of Minnesota, 1905, which went into effect March 1st, 1906, changed the title of the Chief Fire Warden to that of Forestry Commissioner. It authorizes the State Auditor to appoint such officer and makes his duties the same as had been required of the Chief Fire Warden, except that it expressly requires him to "disseminate information concerning forestry." The Chief Fire Warden was appointed, and entered upon his duties as Forestry Commissioner March 8th, 1906.

SHORES OF CROOKED LAKE AND OF LAC LA CROIX.

In the latter part of June and first part of July, 1905, I made a trip by canoe along a portion of the northern boundary of the State and from occasional landings and ascent to high points was enabled to see the character of quite an extent of the interior. The route was via Fall, Basswood and Crooked lakes into Lac La Croix, thence

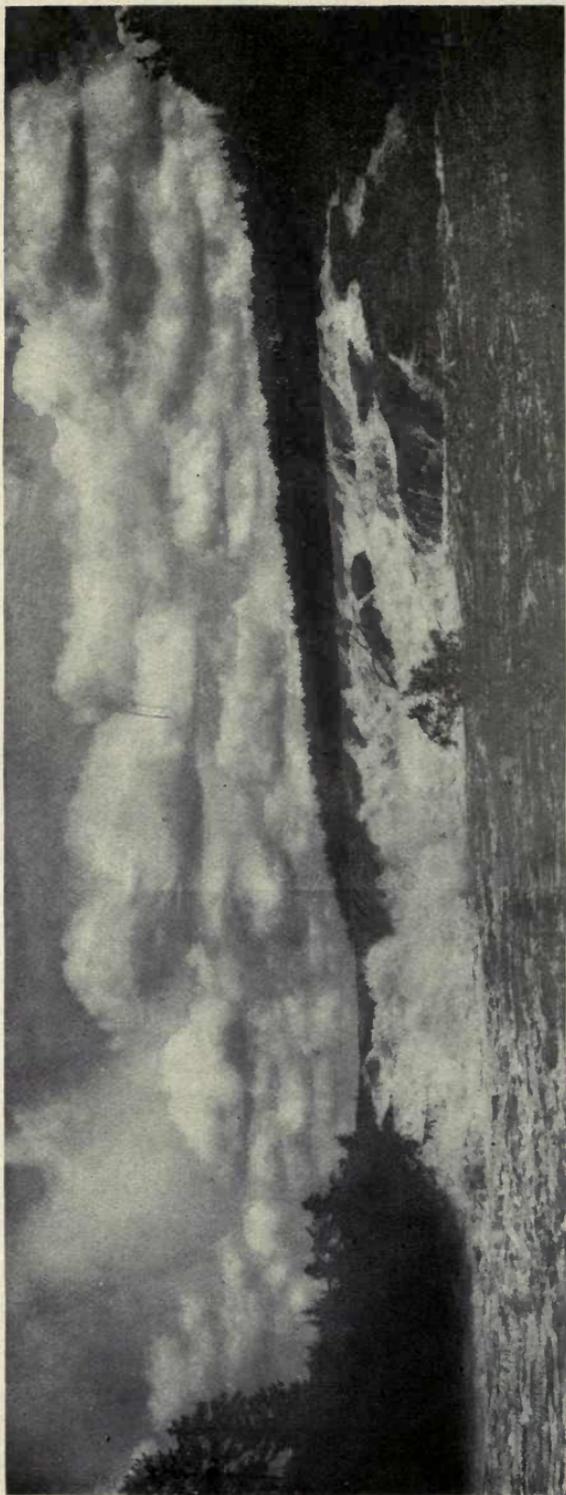
into Loon, Little Vermillion and Crane lakes and intermediate rivers, in all about one hundred miles. The water was at high stage and the weather favorable, there being only a little rain one night and a brief shower one day. There were about eight portages and mostly short ones.

The general elevation of the country varies from thirty to sixty feet above lake level, but there are portions two hundred or three hundred feet high. The surface is considerably broken, underlaid with granite, on which bare patches of ledge are occasionally seen, both on the lake shore and in the interior. It is timbered with Jack and Norway pine and poplar, with here and there other kinds of large-leaved trees, while often near the water's edge are bunches of yellowish-green foliage of the ash. No cutting of timber has been done, but on the main land are extensive areas burned over ten years ago or upwards, and which are now only a little covered with a young growth of trees.

In all these lakes, especially in Lac La Croix, are many rocky islands, thickly and beautifully wooded with Norway pine, which has been growing probably two centuries; but there is a clear area of water surface on Lac La Croix, about six miles in length by three in breadth. Curtain falls, the outlet of Crooked lake, have great volume and a fall of about thirty feet, and are striking. Notwithstanding the scars left by fire, the south shore of Lac La Croix, and especially the western part, is pleasing. Precipitous and bold rock, thirty feet or more high, sometimes constitutes the shore of both mainland and islands.

The islands, of which as many as twelve are vacant lend the chief beauty to the scenery. They are principally valuable for scenery, and as such are of great value. To denude them of timber would be of public injury, for





Curtain Falls; Outlet of Crooked lake into Lake La Croix, Northern boundary of Minnesota (Township 66, Range 12) Photographed July, 1905.

that locality, as regards scenery, recreation and health is one of the most important in Minnesota. As the soil on these islands of almost solid rock is very thin, and in some places there is no soil at all, it would be centuries, if ever, before these islands could recover their present beauty, if the timber were allowed to be cut.

I am very sorry to say, therefore, that a few of these islands, and for a trivial consideration—either under the stone or timber law or by laying script—have been allowed to pass into the hands of private parties, who expect to cut the timber that is standing upon them. These trees do not average more than about a foot in diameter. That whole region of country should belong to the State and be held as a pleasure resort for the people. The greater part of the land bordering on Lac La Croix is truly classified by the government surveyors as “third or fourth rate, rocky and mountainous.” As it does not contain much valuable timber it has not been wanted either by lumbermen or actual settlers, and still belongs to the United States.

The Ontario side of this country has never been open to settlement nor has the timber thereon been offered for sale and the islands and shores are more handsomely wooded than on the Minnesota side. At my suggestion the government of Ontario has undertaken to consider the advisability of setting apart its islands in Crooked Lake and Lac La Croix, and its shores on those lakes for forest reserve and park purposes, in case the lands on the Minnesota side shall be set apart for similar purposes.

At the request of the Minnesota State Forestry Board Honorable A. J. Volstead, who is a member of the committee on public lands, introduced a bill in Congress granting to the state of Minnesota for forestry purposes such of the vacant public lands in the fifteen townships (most of

which are fractional) bordering on and south of Crooked lake and Lac La Croix as are shown by the field notes of the government surveyors to be third or fourth rate.

#### IN THE PINE WOODS.

I went on the 19th of April, a warm, clear day, over the Duluth and Northeastern Railway, from Cloquet to Rush Lake, a place in township 54, range 15, about 30 miles due north of Duluth. Extensive logging operations in the original pine forest have been going on for some time and will continue uninterruptedly summer and winter. This pine region lies between the Cloquet and White Face rivers, occupying a moderate elevation or ridge four or five miles wide and extending about three townships in length east and west. It is well watered by the tributaries of the two rivers mentioned, and at time of the visit at high stage. The soil is a dark loam and the land will mostly be available for agriculture when the timber is removed. A great deal of the pine is mixed with birch and other hard wood. There are some swamps thinly covered with dwarf spruce. There is also considerable cedar and tamarac.

The pine is nearly all white and many of the trees about 200 years old. The forest is indeed magnificent. I learned of one 40 acre tract that yielded two million feet board measure, and of the value standing at the time it was cut of \$16,000. I was credibly informed of a section (640 acres) in this forest—and which of course was exceptional—for which \$110,000 was refused three years ago, and which cost the original purchaser from the United States, possibly 20 years ago, \$1.25 an acre.

On the 20th instant I went over a small part of the Fond Du Lac reservation, which lies west of Cloquet, and from which a large growth of pine timber was cut about

20 years ago. The soil which I saw was a light colored loam in which natural reforestation from seed readily occurs. Considerable of the ground is fairly well stocked with Norway and white pine from 15 to 20 years of age, and if left to grow and protected from fire, will in 30 years from now and when the trees should be 12 inches in diameter breast high, yield on an average 20,000 feet board measure to an acre and will be worth, assuming that the stumpage value at that time will be \$12 per thousand feet, \$240 per acre. This shows how important it is to prevent fire from running over a young growth of pine. Because it has no present market value many thoughtless people suppose it to be valueless.

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#### FORESTRY IN SOME OF THE OTHER STATES.

The State of New York has the largest forest reserve of any of the separate States, the area now being a little over 1,500,000 acres, principally in the Adirondack Mountains, and of which about half was obtained by purchase at prices ranging from \$1 to \$7.50 per acre. It is the policy of the State to increase its forest reserve by additional purchase, and liberal appropriations are being made for the purpose. The forest Commission of New York has started some nurseries of pine and spruce and has successfully done some planting of pine on cut-over and abandoned farm lands. About half a million young trees were to be planted this year.

The State of Pennsylvania now owns 750,000 acres of forest reserve acquired by purchase at an average price of about \$2 per acre. The State has thus far expended \$1,500,000 in the purchase of these lands; and its Department of Forestry hopes to extend its holdings of forest reserves to about 6,000,000 acres. The sum of \$300,000 a

year is appropriated for the purchase of such lands. As in the State of New York the purchase of forestry lands by the State of Pennsylvania is regarded not as an expenditure but as an investment. The Forestry Commission of Pennsylvania began planting only two years ago and has now planted about 70 acres with white pine, which work is expected to increase from year to year. With a view to having trained foresters to conduct its forestry work the State has established the Mont Alto Forest Academy, which is under the charge of Mr. Geo. H. Wirt, the State Forester. Only Pennsylvania boys between the ages of 17 and 25 years are admitted to the Academy. Tuition, books, stationery, board and lodging are free which the student pays for by manual labor in the forest. Each student must furnish his own horse and equipment and care for the same; but stable, forage and shoing are free. There are now 27 students. The Academy which has been in operation only three years makes a specialty of the business or practical part of forestry.

I visited, last year, parts of the forest reserves of the two last mentioned states and was favorably impressed by the forestry work being done.

The State of Michigan now has a forest reserve of about 39,000 acres situated in Roscommon and Crawford counties, in the north central part of the State on the headwaters of the Muskegon river. The reserve though not in one body, comprises an expanse of sandy pinery lands which once bore magnificent forests of white and Norway pine. Some reforestation by artificial planting is being done on the reserve each year. About 28,000 acres have been surveyed, mostly by forestry students of the University and Agricultural College. Additions to the reserve are gradually being made. There are 6,000,000 acres of State tax title lands in Michigan, a portion of

which are expected to become a forest reserve. Michigan has a Forestry Commission of three members and a Forest Warden who is also professor of forestry in the State University.

By the forestry law of Wisconsin, enacted in 1905, the State lands north of Town 33 were constituted a forest reserve, which now comprises 284,072 acres. Any of these lands found to be suitable for agriculture and any so scattered as to be unsuited for forestry, may be sold and the proceeds used to buy other lands to be added to the forest reserve — a very excellent plan. In Oneida, Vilas, Price and Iron counties are about 120,000 acres in a fairly compact body and on the headwaters of important rivers. The forestry law appropriates annually \$9,800. The Forestry Board consists 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. The Board appoints a State Forester, whose technical training shall be determined by the Secretary of the United States Department of Agriculture. He has a salary of \$2,500 a year. There is also an assistant Forester with a salary of \$1,500 and a clerk with salary of \$800. The Forester appoints fire wardens and they are paid by the towns in which their service is rendered.

#### LOSING TIME.

With regard now to the situation in Minnesota it may be said, tree planting can be done only during a few weeks in the spring. Lack of labor prevents its being done on a large scale. Consequently a beginning should be made without further delay. The State is losing time.

The forestry staff is anxious to begin, but it has not been able thus far to obtain money from the Legislature

for tree planting. If the people wish progress in forestry they must require their representatives to appropriate the necessary money. They should have their senators and representatives pledged before election.

The situation is about like this. The State, through its Forestry Board, has charge of 1,000 acres of forest reserve (Pillsbury donation), situated about 18 miles northwest of Brainerd, the most of which should be planted with pine and spruce immediately, and on which about 10 acres are being planted this spring, with a little money saved from the Forestry Board's small fund for contingent expenses. The State also has the 20,000 acres of Burntside Reserve, granted by Congress, the most of which should be immediately planted. The longer land remains bare the poorer it grows.

About how and at what cost would the planting of pine and spruce be done? The plants would be two or three years old. Spots a foot square would be dug, and if necessary cleared, in which to set them. Where the ground is bare the spots should be only four feet apart and where there are bushes — poplar or other small, short lived trees that will serve as protection a few years — the spots may be eight feet apart. Two plants will be set in a spot; in exposed situations four plants in a spot. About 5,000 plants would thus be required for planting an acre. The cost of planting, including plants, would be from \$8 to \$10 per acre.

For permanent improvements — including roads, fire-breaks and planting — there should be appropriated for each of the fiscal years 1908 and 1909, for the Pillsbury Reserve, \$5,000 and for the Burntside Reserve, \$10,000.

But so far as regards Minnesota's great forestry interests, the above is but a mere drop in the bucket. Nature made Minnesota one of the great forest and pine growing

States. The third in rank of her great industries has its source in her forests. The virgin pine, in many instances of two hundred years growth, now paying good wages to 25,000 laborers, will be gone in about a dozen years; and the great question of the day is how to wisely form a partnership with nature in the work of reforestation.

While there are about 12,000,000 acres of arable land in central and northern Minnesota not yet under cultivation, there are fully 3,000,000 acres in scattered localities of waste, rocky, hilly or sandy land that is only suitable for the production of coniferous forest, and which the State should acquire as an investment and hold perpetually in forest. On an average only about 20 per cent. of cut-over pine land reforests itself with pine naturally. The greater part requires artificial planting. More than a century's experience of different European countries shows that such forest will yield an average net annual revenue on the capital it represents of from two to three per cent. compound interest, besides the many indirect benefits of affording wages for many thousand people, improving soil and climate, beautifying scenery, maintaining waterflow in streams and affording covert for game. Good roads and the suppression of noxious animals are also a part of forestry.

Then why not begin? Why not have some regard for the future?

How would Minnesota have had its present school fund of sixteen million dollars, and destined to become thirty million dollars, if statesman-like men forty years ago had not laid its foundation?

— It all depends upon the Legislature.

## WORKING PLAN FOR BURNTSIDE FOREST.

The forestry land—20,000 acres—granted to the State of Minnesota by the Act of Congress April 28, 1904, was selected in two townships in the northern part of St. Louis County, in the vicinity of Burntside Lake, and has therefore been named Burntside Forest. Mr. T. L. Duncan, of Northome, Itasca County, who had done satisfactory work for the state on the Pillsbury reservation, was employed to make a survey and forest working plan for the tract and was so occupied, with three assistants, during July, August and September of last year. Although his report was published complete by the Forestry Board as a separate bulletin, the following extract from it is here quoted;

## FROM MR. T. L. DUNCAN'S REPORT ON THE BURNTSIDE FOREST.

The surface is rough and rocky, broken by knobs, hills and ridges of granitic rocks, and strewn with boulders. The situation of the Forest on the north slope of the Giant's Range, places it in a region characterized by bare rock and scanty soil, rocky and in some respects mountainous—explorer Nicollet described it as the "region of rocks and lakes."

The soil on the higher ground is thin as a rule, although beds of sand were found on some slopes, and in a few places a gravelly clay was noted. In some of the drier bottoms the surface is strewn with large, bare boulders to an unknown depth, no soil being apparent between the stones. In other bottoms these boulders have been covered with a mat of mosses hiding the empty air space below, into which fallen rain sinks away and flowing streams disappear. In the swamps the usual swamp muck of varying depth was found. Rocks laid bare by fires are being covered rapidly with soil through the growth and decay of lichens, mosses and other rock plants, and in this soil tree seed, especially jack pine and aspen, readily germinates at an early stage. The percentage of bare rock surface is small and will, if fires are kept out, almost disappear in 10 or 12 years.

The elevation of this region is about 1,400 feet above sea-level, and about 800 feet above Lake Superior. The drainage, however, is not to Lake Superior, but northward into the Rainy river basin.

The rough, broken surface is very favorable to the accumulation of water in ponds and lakes of which there are 43 included within or bounding the Burntside Forest. Most of these lakes are irregular in outline and with rock bound shores. They drain from one to another, in some cases by small rapid streams, falling from rock to rock or boiling among the boulders, and in other cases by deep, slow streams with an almost continuous level. These lakes and connecting streams are of great importance to the Reserve—they have forced the rocky walls and levelled the way for winter logging roads, and their flow carries the "drive" in the summer; they make excellent firebreaks and afford ready communication from one part to another; they are the favorite resort of big game and hence the chief attraction and main arteries of travel for the tourist and sportsman.

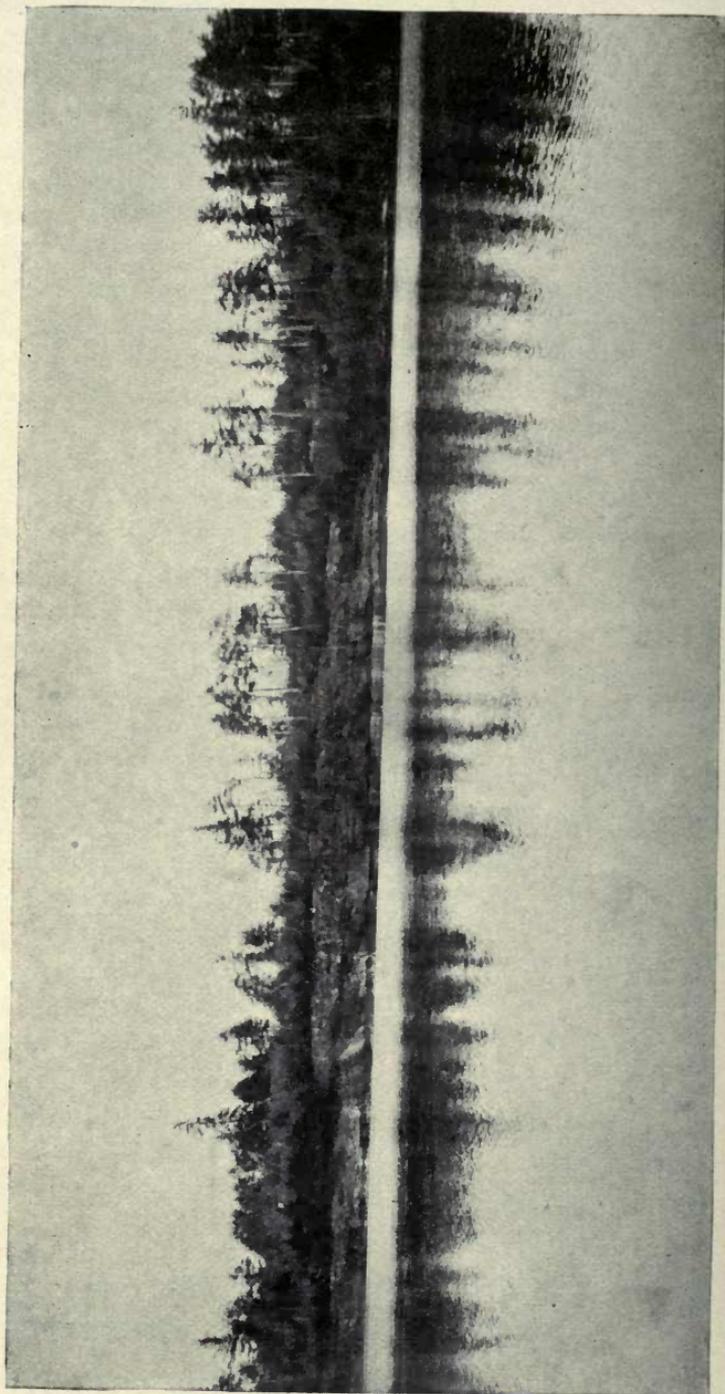
#### TOWNSHIP 63-14.

Burntside Lake, the largest bordering the Forest and said to be the prettiest lake in Minnesota, has an elevation of 1,370 feet above the sea, and drains east and north to the Rainy river. The south-eastern portion of Township 63-14 drains directly into Burntside lake, the principal stream being Tamarack creek which is navigable for canoes for about 2 miles up its course. The east central part of this township is drained through Crab Lake into Burntside. Bottle lake in section 22 empties into lake Saca in section 14 by a small stream which disappears for some distance among boulders near the upper end, and is lost in a swamp at its lower end from which the water seeps into lake Saca. From Saca, a short stream with a stony, unnavigable channel, leads to the southwest arm of Crab lake.

From the northeast arm of Crab lake a stream flows into Burntside lake. This Crab creek is navigable for canoes in the upper portion for about three-fourths of a mile, and also in the lower stream for over a mile, the balance of the channel being stony and rapid. Phantom lake lying in sections 21 and 22, drains westward by a small, stream, unnavigable in the Reserve, which runs through a deep valley toward Vermilion lake.

Commencing in sections 15, 16 and 17 the waters seek another direction and find their way northward through the Cameron chain of lakes and rivers, at the head of which is Schlamm lake, sections 8 and 9. Schlamm lake is a shallow sheet of dark-colored water, nowhere more than 6 or 7 feet deep, and generally about three feet, while in the western end the bottom is a slimy brown bog coming to the surface. This lake is drained eastward by Cameron river into lake Lunetta. The first half mile Cameron river is wide and deep, and navigable for canoes and row boats down to a stony rapids which continues for about a quarter of a mile, after which the stream again widens and deepens to a fair channel until near Lunetta lake, where further passage is barred by a growth of vegetation which has completely bridged over the flow. This natural dam could be cleared out at small cost and the channel made continuous. Lake Lunetta is a small but pretty body of water with numerous springs along its north and west shores. Phiza lake in section 15 feeds Lunetta by a small creek of clear water flowing through a bed of boulders. A clear, deep channel of almost level water, half mile long connects Lake Lunetta with Wolf lake in section 11. A pine-covered ridge of rounded boulders and sand separates Wolf lake from the northwest arm of Crab lake, over which the canoe route is carried by a short portage of 100 paces. Cameron river, however, does not flow into Crab lake, but continues its course through Wolf lake northward to Korb lake, in section 1. Where the river leaves Wolf lake it is narrow and shallow for a distance of about 50 paces and light canoes scrape the gravelly bottom, but below it widens and deepens into a large stream. Just before reaching Korb lake boulders in the bottom break the flow into shallow rapids where it is necessary to lighten loads and even to portage in low stages of the river. From Korb lake Cameron river passes into section 31 of Township 64-13 and maintains a good size until near the entrance into Clear lake where it runs aground for 200 paces over a bed of boulders. Clear lake is a beautiful stretch of water extending for five miles westward in Township 64-14. One arm of Clear lake reaches south and borders the Reserve in section 2. From Krystal lake in section 7, 8, 17 and 18 a stream, which could be made navigable in high water flows north into Glenmore lake and thence west toward the Vermilion basin. In section 6 two lakes drain the northwest corner also to the west.





Shore of Lac la Croix on Northern boundary of Minnesota showing the characteristic rocky surface, being a sample of the land the Forestry Board has asked to have granted to the State by Congress for forestry purposes. Photographed July, 1905.

## TOWNSHIP 64-13.

The North Arm of Burntside lake extends four miles northeasterly from the main lake into sections 25 and 26 of this township and two streams furnish opportunity for winter roads from sections 24 and 25. Several small creeks flow off the high ground in section 34 into the North Arm. The rocky ridge between Burntside and Slim lakes rises more than 100 feet above the level of the former lake, but is cut through by a stream in section 26 which connects the two lakes with a fall of about 50 feet. Slim lake is a long, narrow sheet of water, 3 miles in length and varying up to a half mile in width, with high rocky shores. Profile lake is separated from Slim by a narrow neck of land and is drained into it by a small rapid stream flowing through a depression in section 14.

Horseshoe lake lying in sections 15, 16, 21 and 22, drains into Rice lake in section 8 by a large stream partly navigable for canoes. A mud or floating bog obscures its entrance into Rice lake. Rice lake in sections 7, 8, 17 and 18, drains all the west central part of the township and is emptied by a large stream flowing to the north. There is a short rapids on this stream in section 8, otherwise it is navigable for canoes and logs. It flows through an open marsh in section 5 and 8, into Lake Lapona, from which a large navigable stream of strong current flows north. Big Lake lying mainly in Township 65-13 reaches down into sections 3 and 4 and drains all the northeast part of Township 64-13.

The southwest part is drained by Twin lakes through Sabawa lake into Cameron river in section 31, the connecting stream being navigable for canoes over most of the course.

All the streams which have been mentioned here as navigable or partly navigable for canoes are also navigable for logs or capable of improvement for that purpose.

Township 63-14 divides naturally into four logging districts which we may designate the Tamarack creek, Crab lake, Cameron valley, and west slope districts. Township 64-13 divides into five districts: Sections 24 and 25 with landing on Burntside lake; east slope in sections 27, 28, 33 and 34, landing on Burntside lake; Twin lakes driving west to Clear lake; sections 10, 15, 21, 22, 27, 28 and 34, landing on Slim lake and driving to Burnt-

side lake; and the northwest part of the township, landing on Rice and Lapona lakes from whence the logs may be driven to Big lake. These divisions will be modified by the presence of artificial means of transportation at the time logging is done.

The natural flow of water to the north and west may bring this territory into future communication with the markets of northwestern Minnesota, North Dakota and Canada, but the facilities for moving logs and lumber in that direction have not yet been developed. The principal market at present is to the east with Lake Superior as the chief outlet from Minnesota. Logs now cut in the Burntside country are rafted across Burntside lake to the Burntside river and driven down that stream to Long lake, three dams and sluiceways enabling the drive to pass the rapids. In Long lake the logs are again rafted to Fall river and sent down to Fall lake where large sawmills are in operation at Winton. A three mile spur owned by lumbermen, connects Winton with the Duluth and Iron Range Railroad at Ely, and carries out the product of these mills.

The iron mining industry and its dependent populations at Ely and other points on the Vermilion range, and the nearby Mesaba Range provide a local market of some extent for building material and firewood. Railroad ties, posts, poles and pulpwood are salable at any shipping point on the railroad.

Some logging has been done in sections 26, 27, 28, 34 and 35 in Township 63-14, on lands adjoining the Reserve, and the logging roads used leading to Tamarack creek would be useful in getting timber from the southeast portion of that district. Logging has been done in sections 25, 26, 27 and 34 in Township 64-13, with roads leading to Burntside lake; and loggers are now improving the stream between Slim and Burntside lakes by the erection of three dams and sluices with a view to extensive operations on Slim and Big lakes, the logs to be taken down this stream.

The shores of Crab lake are well stocked with good white and red pine on lands adjoining the Reserve, owned largely by lumbermen who will no doubt improve Crab creek to float their logs into Burntside lake. A low ridge of sand, 3 or 4 feet in height above the lake level, separates the southern of the two east bays of Crab lake from the slope into the lower valley of Crab creek, so that if desired for small operations a winter road could be cut

here that would land logs on to the lower reaches of that creek without incurring the expense of improving the upper part of the stream.

The present stand of lumber in the Burntside Forest is too small and scattering to call for much roadmaking for its removal, but when a mature crop in a fully stocked forest is about to be cut the size of the prospective output will warrant the improvement of the waterways or the building of railroads to any part of the Reserve.

#### ROADS.

With the exception of the ways already mentioned there are no roads in the Burntside Forest and no public roads approaching within several miles of it. The Ely-Tower road passes about three and one half miles to the south, and a branch from this road runs to Burntside lake in section 23 of Township 63-13 at a point 4 or 5 miles distant from any part of the Reserve. Connection may be made with this road by boat over Burntside lake. The shortest haul to the railroad from the nearest part of the Forest is about 5 miles, and it will be seen from this fact that the marketing of cordwood, ties, etc., will be expensive. These minor products from the existing forest will be taken out for a few years at little, if any profit, but it will be necessary to open some roads at once, not only for the purpose of removing thinnings, but also to get in supplies and equipment to be used in the improvement and planting of the forest.

#### CANOE ROUTES.

The Burntside Forest is usually reached by canoe from Ely, crossing Long Lake and portaging into Burntside lake. Crab lake is portaged into over a rough trail nearly a mile long in sections 18 and 19 of Township 63-13, and from Crab a large portion of the Forest is easily accessible by canoe and portage. A good portage also leads from the north arm of Burntside lake to Slim lake and thence to Profile and Big lakes. Away from the lakes trails are few, and traveling on foot is difficult and slow on account of the dense growth of young trees and shrubs, and the roughness of the ground.

It is very important that trails should be opened and regular circuits established for the convenience of rangers in patrolling the forest during dry seasons.

#### SETTLERS.

There are practically no settlers in the vicinity of the Reserve. The soil does not invite permanent settlement, and the homesteaders who formerly located in these townships went elsewhere to seek a living as soon as they had acquired title.

None of the land of the Burntside Forest has ever been used for agricultural or settlement purposes, notwithstanding the fact that the public land survey had been extended to these townships about 15 years ago. The lands were considered by cruisers, locators and land seekers to be worthless, and there was not enough timber on any subdivision to induce the lumberman or timber speculator to take any interest whatever in them. The tracts selected for forestry purposes were what had been left untaken after a dozen years or more had given the public an opportunity to pick out everything that appealed to the individual as of value. But these lands are valuable—they are very valuable for the purpose for which they were selected. These rocky hills and shores, these boulder-bestrewn valleys and swamps, these sandy wastes are capable, under careful management, of producing a profitable growth of timber. Some of these lands had grown a valuable crop of pine only to have it destroyed by fire; some of them are growing up now with a healthy stand of young trees; and neighboring tracts of similar character and similarly situated are covered with a dense forest of white and red pines. The forester will take these lands which no farmer would ever dream of cultivating, and plant young seedlings in the crevices of the rock, among the boulders, in the sands and in the swamps, and by constant oversight and care rear them to a magnificent timber dimension.

#### THE FOREST.

In the Burntside Forest as it stands we may distinguish one main type with the Jack Pine as the characteristic tree. In a minor sense there are several types—the Old Forest, Red Pine, White Pine, 35 Year Jack Pine, 10 Year Jack Pine, Spruce

Swamp, Poplar Woods, but over all the Jack Pine type predominates as a forest of the whole. Practically all the tract is under forest of some age and species, although small areas of open swamp occur here and there. The area is given at about 20,000 acres, but accurate surveys of the numerous lakes found in the interior of sections and not indicated on the official plats, and corrections of the many errors made by Government surveyors may vary this quantity somewhat. About 87 per cent of the whole area may be designated as pine land, that is, land which, in its present condition is capable of raising white and red pine; and 13 per cent as swamp land.

White and red pine occur in small groves along the shores of lakes, on ridges and in ravines, or as single trees throughout the forest. Most of this pine is mature and represents an age of 200 years or over. Of the merchantable white pine there is about 450,000 feet board measure, and of red pine about 825,000 feet.

These trees cannot be said to form a distinct forest anywhere on the Burntside tracts, as the groves are of too small extent but on adjoining lands forests of both species occur. Usually the red pine is more inclined to a pure stand than the white pine, but they occur with each other and in mixture with other species—the white pine more often reaching its best development in mixture with hardwoods, spruce, fir and other pines. The reproduction of white and red pines is poor over most of the Forest and is excellent in only a few localities. On 385 sample acres examined particularly for reproduction in favorable places an average of 4 white pine trees up to 4 inches in diameter were found per acre, and of red pine 22/100 trees per acre. This average stand of less than 5 pines per acre is not sufficient and to secure a well stocked forest of pine it will be necessary to replant the larger portion of the whole area. The large standing white and red pines would reseed a considerable acreage during a good seed year if fires were kept out, but where these trees now are there is often no signs of young growth, the seedlings no doubt having been destroyed by fire, and the ground is now so thickly covered with young jack pine, poplars, alders and other brush that the more valuable pines do not get opportunity to start.

In a few secluded ravines and in isolated patches where surrounding lakes afforded protection, or where providential rains and dying winds prevented fires from reaching, remnants of a

former forest are to be found. This Old Forest consists of a mixture of white and red pines with spruce, fir, jack pine, paper and yellow birches, aspen, maple, ash, elm and other trees. The old white and red pines, or "monarchs," of 200 years and upwards, form an upper story to this forest, while the mixture comprising the lower story will range up to 150 years in age. The area of the Old Forest is small but it is important to note its existence as evidence in support of the belief that a good forest cover may be maintained on these lands and valuable timber grown if fires are kept under control.

Jack pine occurs in three ages or groups. The jack pine of the Old Forest is about 130 years old. It averages from 12 to 14 inches in diameter and will cut from 2 to 4 logs per tree, but is not important as a timber producer. The volume of merchantable jack pine in the Burntside Forest is estimated at 110,000 feet.

The 35 year jack pine, the principal tree of the forest, ranges everywhere and is found in the swamps as well as on the peaks and ridges. The age seems to vary from 32 to 38 years, but we have grouped it all as the 35 year class. In favorable locations trees of this class reach 10 inches in diameter, but it more often occurs as small poles of 4 or 5 inches in diameter. In some parts of the Reserve these jack pine poles completely cover the ground to the exclusion of other species, and again we find it in mixture with aspens, maples, and birch of the same age, with an undergrowth of spruce and tamarack. This 35 year forest has been eaten into by forest fires and thinned out in places to scattering trees under which a new growth of jack pine and aspen has sprung up.

The age of the jack pine indicates, approximately, times when fires swept over the country, and in recent years these seem to have been more frequent than formerly for the younger jack pine varies in large stands from 8 to 12 years, but for convenience we have grouped these younger trees in the third class of jack pine, the 10 year class. Below these three groups there are still younger trees of all ages. The 10 year jack pine is from 1 to 2 inches in diameter, and is frequently so thick on the ground that it is difficult to pass through it.

The jack pine is much subject to having its top blown off by the wind, and where many of these tops lie on the ground in one

place they become very dangerous and prolific in extending fires. The policy should be to remove all jack pine as soon as its place may be taken by more valuable species. It does not produce much saw timber, but the thinnings may be converted into firewood and find ready sale when transportation facilities are provided to get it into market.

The jack pine, however, has some good qualities. It germinates readily in any soil, grows fast, produces seed early and freely, and rapidly covers the ground after fires. It is energetically invading the swamps and roughly disputing their possession with the spruce and tamarack which had long looked upon the wet ground as their exclusive privilege, and has been so successful in the fight that we are warranted in applying the term "Jack pine swamp" to some of these areas.

These jack pine swamps have a bottom covered with boulders and little or no soil among the stones. Here the water lies and keeps alive the mosses that creep over the rocks, forming with the interlacing roots a heavy mat in which the jack pine and other seeds find lodgment and germination.

Growing up after the fires, and in mixture with jack pine, aspens, birches, maples, and a few other trees form groves in which the aspen is the most common. But as these trees will in time succumb to the pines we have treated them as a feature only of the jack pine forest. The poplars are short-lived and do not appear to have ever attained much size in this region. Some birch in the Old Forest reaches 12 inches in diameter and might become a valuable timber if encouraged on favorable soil, but I think that it should be entertained here only as an undergrowth of the pine.

Scattered through the forest, in depressions and along the shores of lakes and streams where the waters do not have free flow, the timber trees are spruce, tamarack and arborvitae (cedar), of which the black spruce is in the lead. These areas are usually small in extent and irregular in outline. They too, like the poplar groves, are, with the exception of a few muskegs, features of the jack pine forest. As we have before mentioned, the jack pine, and also the white pine and other trees are pushing into the swamps, so that with the exception of the very wet ground, the larger portion of the swamp area will become in a few years pine land. The attainment of this result may be

materially hastened by some intelligently applied assistance from a forester.

The timber in the swamps is small. The spruce is suitable for pulpwood, and we have an estimate of 4,900 cords. The tamarack is estimated at 10,900 ties, and the cedar at 600 poles and 800 fence posts.

In the muskegs the spruce and tamarack trees are very small, and will never make merchantable timber unless the water is drained off. The area of irreclaimable muskeg and lands subject to overflow where timber will not grow rapidly does not exceed 200 acres. The muskeg spruce has been attacked this summer by a red rust and much of it will be found dead next season, but this will entail no great loss for the trees are small and have little prospect of future growth.

#### STAND OF TIMBER.

The stand of timber on 602 sample acres taken in strips across the forest averages 35.04 trees per acre of all sizes from 5 inches

#### TREES PER ACRE.

Diameter, Inches.	White Pine.	Red Pine.	Jack Pine.	Spruce.	Balsam Fir.	Tamarack.	
5	.23	.42	10.77	2.09	.19	.65	
6	.10	.29	8.08	1.25	.17	.60	
7	.02	.12	3.12	.63	.14	.30	
8	.01	.06	1.41	.36	.03	.33	
9	.01	.03	.63	.32	.03	.36	
10	.02	.01	.22	.15	.01	.20	
11	.01	....	.05	.07	....	.16	
12	.05	.04	.05	.07	.01	.25	
13	.02	.03	.02	.02	....	.06	
14	.03	.03	.03	.01	....	.10	
15	.02	.03	.01	}	....	.01	
16	.05	.03	.02		....	.04	
17	.01	.02	....	}	....	}	
18	.03	.05	....		.02		....
19	..	.01	....		....		....
20	.02	.04	....	....	....		
21	.02	.01	....	....	....		
22	.02	.02	....	....	....		
23	.01	.01	....	....	....		
24	.02	}	....	....	....		
25	....		.01	....	....	....	
26	.01		....	....	....	....	
27	....	....	....	....	....		
28	.01	....	....	....	....		
29 to 36	.01	....	....	....	....		
	.73	1.26	24.41	4.99	.58	3.07	

up in diameter at breast height, and of these 70 per cent are included in the 5 and 6 inch classes. 2 per cent is white pine, 3.6 per cent red pine, 69.7 per cent jack pine, 14.3 per cent spruce, 1.6 per cent balsam fir, and 8.8 per cent tamarack. The merchantable timber, elsewhere mentioned, was not computed from data on these sample acres as the distribution of the larger trees is not sufficiently uniform to secure accuracy in that way, but was obtained from actual count of the trees and classification into diameter sizes and logs per tree. The computation of volume was then made by the assistance of volume tables prepared from actual measurements of trees.

From the smaller material on these sample acres we may safely foretell a probable crop of white and red pine in 80 years of 600,000 feet. This shows the need for replanting the forest with pine—each acre should carry a stock of 18,000 feet in 100 years, and under careful supervision 40,000 feet might be possible. On lands adjoining the Reserve sample tracts were measured out and the stand of pine computed and found to run from 35,000 to 52,000 feet per acre, with from 140 to 175 trees and an age of 200 years.

There may be cut now from the 35-year old jack pine 3,500 cords of firewood, and in 25 years the 10-year old jack pine should cut 9,000 cords of firewood, if left to grow. Jack pine cordwood is selling in Ely at \$3.50 a cord. There is considerable small birch on the Reserve, but no estimate has been made as to the quantity. This may be cut with the jack pine cordwood and marketed at \$5.00 a cord.

#### FIRES.

It is no doubt directly due to forest fires that the Burntside lands do not now bear a good stand of merchantable pine. The present growth of jack pine, shows, in different parts, stands of even aged trees, and it is generally recognized that these uniform stands of young trees come in after fires. As further evidence of the destruction by fire we find the ground under these young jack pines covered with charred trunks and stumps of large timber. In section 9-63-14 about 70 acres were burned over two years ago, and the new growth has not made much start. In sections 31 and 32-64-13 fire ran over about 350 acres last spring, burning everything clean. From this last fire brands were blown

some distances into the woods, igniting and burning small tracts unconnected with the main burn. We can only guess at the origin of these fires, and it will be by constant vigilance on the part of a good ranger service that they will be prevented in the future. The State Forest Reserves will become in time favorite outing resorts, and among the visitors will be some less careful than others, so that a campaign of education as to the dangers of fire and the importance of extinguishing the spark before it becomes a flame cannot be waged too strongly nor commenced too early.

The original survey stakes placed by the United States surveyors have been burned out in a great many cases, so that it was frequently difficult to find corners. Where sufficient evidence of the original location of a stake was found we put in a new one and piled stones about it, and we piled stones about a great many of the old stakes to preserve the corner. It will be necessary to resurvey some of the lines and to put in permanent monuments at all corners—these monuments should be of stone or metal so as not to be destroyed by fires.

#### MANAGEMENT OF BURNTSIDE FOREST.

With the foregoing facts before us I may offer a few suggestions for the management of these lands. I would recommend that the pine lands be fully stocked with white and red pine seedlings with a view to a final crop in not less than 100 or 120 years. The margins of swamps, lakes and streams should be stocked with arborvitae, tamarack and spruce. The number of pine trees per acre should be not less than 500, and in the more open country it would be well to put them in as close as 6 feet apart. The expense of planting may run from \$6.00 to \$10.00 per acre—there has been no planting done in that part of the state so that I am unable to say definitely what the expense may be.

For intermediate crops a mixed stand of spruce, birch, maple, tamarack, jack pine, and aspen should be maintained—as a nurse crop while the young pines are growing, and as an undergrowth to crowd them properly as they grow older. The jack pine and aspen should be gradually replaced with spruce and valuable hardwoods. The present stand of mature timber should be retained until assured that the ground below has been reseeded, or removed only to make room for replanting.

A nursery should be established on some convenient tract for the purpose of raising the young trees necessary for planting, and I would suggest that a place be cleared on lot 10 in section 14-63-14 where a sandy north slope is available. There is also good ground in sections 8 and 18 of the same township, and in sections 25 and 28 of township 64-13. Young pines may be gathered from neighboring lands if taken before logging has been done, as fires may follow and destroy them.

I would recommend that a headquarters camp be built on Crab lake near the proposed nursery with a residence for the chief ranger and his men, an office and sleeping quarters for the State Forester when superintending operations here, a barn and tool house. These buildings need not be expensive and some of them could be built partly of logs cut in the vicinity. Cabins of small size should be built in several parts of the Forest to house foresters and rangers when on duty away from the main camp. The buildings, with necessary tools, vehicles, team of horses, boats and furnishings will cost about \$3,200.

A good road from the headquarters camp to connect with the Ely-Tower road will be 7 or 8 miles long and will cost from \$500 to \$1,200 a mile to build. In addition to this road there should be about 10 miles of main roads in each township which need not be so expensive at the start. There should also be 50 miles of trail opened along the principal section lines and from lake to lake, so as to make all parts easily accessible to the foresters and visitors. A large part of the road work, the cutting of trails, the improvement of canoe routes and portages and the surveying of the land should be done by the rangers under the supervision of a forester.

Success in the management of a forest is to be attained only by constant care from the time the seed is put into the ground until the final crop is harvested, and the oversight must be continuous. It will not do to put in seed or young trees and leave nobody there to watch them. There should be a permanent forestry corps organized with a forester at the head and assistants for all branches of the work. This will require an outlay of money for a time until the forest becomes productive, but the forest should become self-supporting, and the final crop of timber pay a net profit on the outlay. The net gain of forests has been variously estimated at from \$1.33 to \$3.63 per acre annually, but

that for large tracts of land. The administration of the Burntside Forest of 20,000 acres will cost as much as a tract of 200,000 acres but it has the advantage of no initial outlay for the land and no taxes to pay, so that we may expect it to compare favorably with other forests in the matter of net annual revenue.

Private holdings within the present limits of the Reserve, and adjoining it should be acquired by the State for forestry purposes, and added to the Burntside Forest, so as to give a more compact form. Steps should also be taken to secure an appropriation for the purchase of all lands now held by the State Land Department in this vicinity. The writer had occasion to examine a number of such pieces belonging to the State, and found them to be of the same general character as the Burntside Forest absolutely valueless or agriculture and consequently unsalable.

#### ATTRACTIONS.

The Burntside country has its attractions, and special effort should be made by the Forestry Board to present those attractions to the public. The State Forest Reserves should be devoted not alone to the business of raising timber, but to the pleasure of all the people. They should be made popular as summer-resorts, parks and hunting grounds. Ely, with its important iron-mining industry and its location on beautiful Long Lake, has acquired considerable reputation among summer visitors, much of which is due also to its proximity to famous Burntside lake, and with improved waterways, roads, and trails a larger number of tourists and sportsmen would be attracted through Ely to Burntside Forest.

The healthseeker will find here rest and recuperation from the care and monotonous toil of the city, and the invigorating freshness of the woods will attune his wearied nerves to renewed effort in the battle of life. There is no languor here—no tired feeling—the summer climate is ideal. During the hot season of this year when people were suffering and even dying of heat in the large cities the temperature was moderate in the Burntside country, and outdoor work was carried on without discomfort.

#### FISH AND GAME.

As before stated this region is wholly undesirable to the farmer, and of human inhabitants there are none within the limits

of the Reserve and very few in the vicinity, but the numerous lakes and the seclusion of the woods make it an admirable place for a natural game and fish preserve. The lakes are well stocked with fish—trout in Burntside lake, and the woods abound with deer, moose, bears and feathered game. These animals seem to have little fear of man—fish come to the surface near the shores when bread crumbs and fragments of meat are thrown to them—the deer will flag you over a ridge and look back to see what you are doing. I have stood face to face at short range with a bull moose who shook his ears in stupid foolishness when I tried to scare him away, and trotted off in an indifferent manner when finally convinced that he should move.

Bears are numerous and appear to be useful to the forest. They, in common with the busy ant and other small creatures, are very assiduous in the making of soil in the forest. The insects first attack the dead wood and mine it through and through, the bears follow and tear the old logs and stumps into fragments in search for food. During the past summer probably every rotten log in the Forest was, in this way, turned over, broken up and scattered on the ground to decay more rapidly. The bears are tame and might become friendly if encouraged. I sat on a log one morning and talked to the largest and handsomest black fellow ever seen—the bears here have the finest of black furs and brown noses. He came pushing through the brush not 30 paces away, but stopped short at my hail and with head erect and big ears forward gazed in amazement at me. Nothing disturbed him—he would not scare—he would neither advance nor retreat, a veritable monarch of the forest, he felt secure in his strength and still peaceably inclined stood on his dignity. When I requested him to move on he put his head a little on one side and with nose to the ground coolly snorted—so I came away from there, one eye ahead, the other on the bear, who still stood his ground as long as I was in sight, head up, big ears forward and a puzzled look on his face—it was incomprehensible why I should hurry.

## FORESTRY IN EUROPE.

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Of the sketches of forestry in sixteen European states which have appeared in my recent annual reports those of eleven countries—Alsace-Lorraine, Baden, France, Hesse, Italy, Norway, Prussia, Saxony, Sax-Meiningen, Switzerland and Wurtemberg, as printed in this report have been wholly revised or contain additional information kindly furnished by their respective forestry directors.

### ALSACE-LORRAINE.

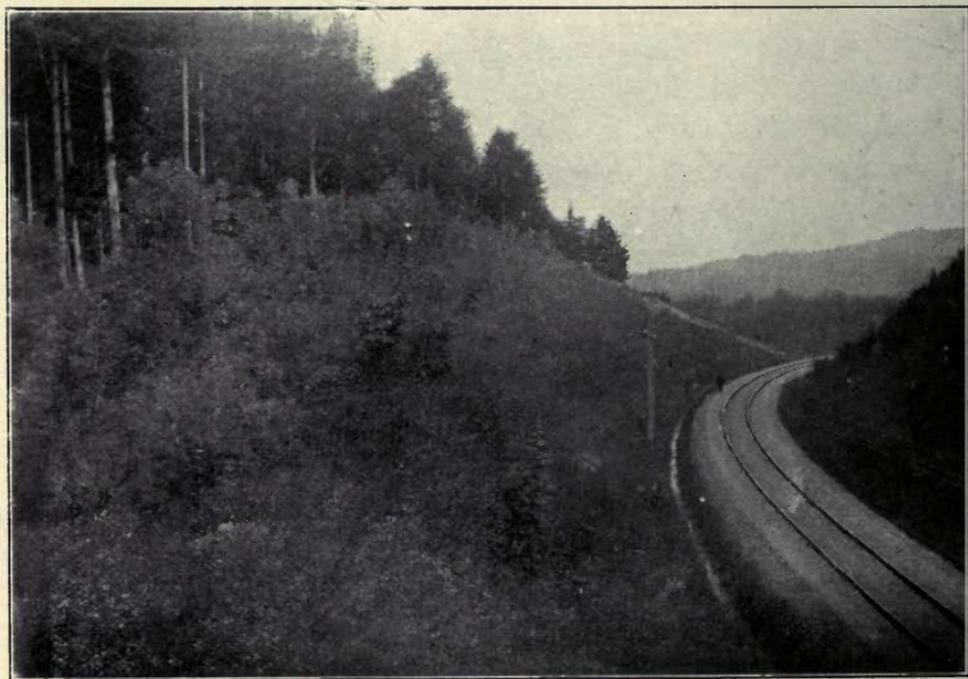
#### STATE FORESTS.

Aggregate extent 343,545 acres, also the state possesses together with several towns and villages 40,630 acres of undivided forests, situated in the valleys of the Rhine and Mosel rivers and on the Vosges Mountains. The prevailing kinds of trees are beech, oak, pine (*pinus sylvestris*), fir (*abies pectinata*) and spruce (*picea excelsa*). The average estimated value per acre is about \$100. Annual aggregate expense \$1,480,000; annual aggregate revenue, \$2,333,000; average net profit per acre, \$2.40. The number of acres annually sown with seeds, 1,025; planted with seedlings, 2,915 acres. On 265 acres the surface of the ground is roughly opened with spade, plow, harrow or hoe with a view to facilitate the germination of self-sown seeds. On about 50 per cent of the entire area, reforestation is effected by self sown seed from standing trees; on about 35 per cent of the entire area planting trees; and on about 15 per cent planting seeds is resorted to.





Shore of Loon Lake into which Lac la Croix flows, Northern boundary of Minnesota, showing character of land the Forestry Board has asked to have granted to the State by Congress for forestry purposes. Photographed July, 1905.



In the Black Forest near the City of Freudenstadt in western part of Wurtemberg, Germany. Railroad right-of-way planted with maple and locust trees to guard against setting fire by sparks from locomotives. These woods on the right-of-way are cleared twice a year of combustible material, such as sticks, leaves, etc.

There is a continuity of forest produce. The annual yield or cutting of the forest is not allowed to exceed the annual production. A decrease of the growing stock, by over-cutting the forest, would be considered a criminal offense on the side of the forest administration. The general increase of the productiveness of the forest, however, permits of a gradually, but slightly, increased annual output. The forests consist of more or less averaged sections termed "compartments." Every compartment yields periodically (say in the 40th, 50th, 60th, 70th, 80th and 90th year of tree life) a certain "intermediate yield," composed of immature trees, removed by way of thinnings. When the remaining trees reach financial maturity, they are removed either by a clean sweep or gradually, the removal proceeding hand in hand with the development of the second growth started underneath the mature trees (fir and beech).

The cutting of forests, with a view of using the soil for agriculture or pasture thereafter, is strictly prohibited since 1803, unless, under certain stated conditions, permission to the contrary effect is granted by the civil government. Any forest ground cleared from tree growth must be planted up within three years after such clearing, if in the opinion of the forest administration regeneration from self-sown seeds cannot be depended upon. The owner of unproductive lands, when proposing to plant such lands to forest, receives certain contributions out of the treasury of the state. Plantations made on the tops and on the steep slopes of mountains, also plantations made on dunes and on unproductive prairies densely clothed with ligneous weeds, are free from taxes for 30 years. The amount of damage annually caused by forest fires is very little; no data available. The principal cause of such fires, when they do occur, is the careless use of matches and cigars thrown away burning. Very few such fires are annually caused by rail-

road locomotives; no data available. It may be estimated that in Alsace-Lorraine, as in Prussia, 10 per cent of all forest fires are caused by sparks from locomotives.

The forest service is entirely co-ordinate and equal to the other branches of the public service. The average salary per annum of the "Land Forst Meister" (forest councillor) is \$2,200; of the "Oberforstmeister" \$1,800 of the Forstrat \$1,500 the "Oberforster" (district manager) \$830; and the allowance for office and traveling expenses of each officer is \$500. 27 "Oberfoerster" have the use of unfurnished house, 37 an equal compensation.

#### PRIVATE FORESTS.

The aggregate extent of private forests is 766,635 acres, of which 544,670 acres are managed on forestry principles, being owned by towns, villages or public institutions. The forests owned by private individuals proper, aggregating 221,965 acres, are managed at the will of the owner except as above stated. The average value per acre is uncertain; it depends on growing stock, accessibility, quality of soil, etc. However the average value of the private forests may be roughly estimated at \$275 per acre. The average annual rate of net income is between one and one-half and four per cent. The total forest product of Alsace-Lorraine is well sustained. The municipal forests yield 70 cubic feet per acre per annum. This quantity is equivalent to about 140 feet of lumber, board measure, and one-half a cord of fuel. The population of Alsace-Lorraine is 1,641,000. The area of the entire territory is 3,628,000 acres of which 1,110,180 acres are under forest. The annual yield of raw material is 61.1½ cubic feet per acre. Of this amount 45 per cent consists of timber, and 55 per cent of fuel, corresponding with about 170 feet timber, board measure, and four-tenths cord of fuel. The cost of cut-

ting timber and fuel, inclusive of sawing into logs, piling along wood roads, etc., amounts to 1.5 cents per cubic foot. At this price the workmen earn 52 cents per day. The value of timber, without bark, dragged to forest roads, is 11 cents per cubic foot, on an average. The value of fuel, piled up along roads, is 5.4 cents per cubic foot, or about \$3.42 per cord. (The stumpage of timber is worth about \$12 per 1,000 feet, board measure.) In the state forests about \$100,000 are spent annually for road improvement and forest railroads. In the private forests the exclusive right of hunting is periodically leased to the highest bidder, under certain restrictions. Likewise in about half of the state forests the "Oberforster" manages the right of hunting by order of the government. In the state forests these leases yield annually 10 cents per acre. In the season of 1903, for instance, there were killed, in the administered districts of the state forests aggregating 188,440 acres, 242 head of red deer, 679 head of roe deer, 298 head of wild boar, 1890 hares and 10 capercaillies, tetrao urogallus (mountain cock), besides a number of minor animals.

A forester of scientific education (Oberforster) has, on an average, under his charge 13,933 acres of forests, managed on forestry principles and being owned by the state, by towns, villages or public institutions.

In the state forests there are steadily employed for every 1,000 acres of forest, 35 experienced forest laborers. Their pay is generally and on an average not higher than that of ordinary laborers 50-55 cents per day.

With respect to the proportion which exists in coniferous forest between reforestation by natural seeding and reforestation by planting, positive data cannot be furnished, except that reforestation of the fir (*abies pectinata*) is principally natural seeding.

## AUSTRIA.

## STATE FORESTS.

The entire forest area of Austria is, in round numbers, 24,000,000 acres, of which the state administers 2,573,940 acres of actual forest, and of which 800,000 acres belong to religious, educational or charitable endowments. Under the Department of Forestry there are eight territorial offices, and under these eight territorial offices there are 186 local offices. The largest area under the supervision of a single territorial officer is 628,225 acres; the smallest area under the supervision of a territorial officer is 191,498 acres, whilst the average is 452,762 acres.

Including unproductive soil a local range comprises in one case as much as 120,726 acres. If only the productive forest area is drawn into calculation, the maximum size of a local range is 58,993 acres, whilst the minimum is only 1,030 acres. The average size of the forest area under the management of a single local officer is 13,880 acres.

There are two distinct groups of forests administered by the state authorities—one in the east, comprising lands in Galizia and Bukowina, and one in the west, comprising the Alps. Besides, there are some smaller forests lying in the southern and the northern sections of the empire.

Twenty-six per cent of the state and fund forests are lying in the plains and at the foot hills.

Forty-nine per cent of them are lying in the mountains, at medium elevations, growing under conditions favorable to tree growth.

Twenty-five per cent of them are lying in the highest mountain region, extending up to the limit of tree growth.

The species covering most ground is the European spruce (*Picea excelsa*), occupying 49 per cent of the entire forest area. Beech is next, occupying 20 per cent. Then follows the fir, occupying 19 per cent, and the larch, occupying 5 per cent. A small area only is in possession

of the pines (only 3 per cent). The balance of 4 per cent is occupied by alder, linden, maple, oaks, elms, aspens, willows, etc. It appears from these figures that the Austrian state and fund forests consist of coniferous woods to the amount of three-quarters and of hard woods to the amount of one-quarter.

In the Alps spruce reaches up to an elevation of 2,000 meters (or 6,562 feet), and in the Karpath mountains to an elevation of 1,500 meters (or 4,921.5 feet). It forms, especially on the high mountain ranges, pure forests in many cases. However, it is often found mixed with other conifers and with hardwoods. In the very highest mountains it shows a poor growth, short boles and bad form, the diameter increasing rapidly from the root to the top. The branches are running down to the ground and are covered with lichens. Spruce thrives best on slightly sloping ground protected from high winds, where the underlying ground is a sandy loam formed from slate. Here the tree shows long, straight and clean boles. However, spruce is found thriving in almost all situations.

Silver fir (*Abies pectinata*) is mostly found mingled with beech, horn-beam and spruce. It does not run as high up in the mountains as the spruce will do. However, it is found in the Karpath mountains at an elevation of over 1,500 meters (or 4,921.5 feet). Pure forests of fir are found only in a few places (Vienna forest, Karpath mountains and Krain).

Larch (*Larix Europæa*) is scarcely ever found forming pure forests. Its favorite ground is an eastern and northern slope where spruce is the predominating species. Under these conditions it rises as high up as 2,200 meters (or 7,218.2 feet). Larch is thriving splendidly on calcareous and sandy loam, especially on well shaded slopes. Larch avoids wet, sunny, and such localities which are exposed to rough winds.

Scotch pine (*Pinus sylvestris*) is found in the Alps and

in some dry and poor localities elsewhere. It is running up to an altitude as high as 1,200 meters (or 3,937.7 feet, in southern Tyrol even as high as 1,700 meters (or 5,577.7 feet), here attaining the size of a dwarf only. In the sandy plains of Galizia, Scotch pine shows a good growth and furnishes fine timber.

The black pine (*Pinus Austriaca*) is very scarce on the whole. On the south slopes of the Vienna mountains it forms small forests. It is fond of the sunny side and of calcareous ground.

It is impossible to ascertain the value per acre of the state and fund forests. This value depends on the locality, on the means of transportation, on the condition of the lumber market, etc. Even an average figure giving an idea of the value of the said forests cannot be given. If the annual net yield per acre is taken as a basis for the valuation of our forests at a rate of 3 per cent, then the average value of the state and fund forests per acre will amount to \$8.91. It is likely to range between \$3.50 and \$20 per acre, according to the possible yield.

During the twenty years between 1874 and 1893 there was expended annually on an average:

I. For forestry proper, namely, forest utilization, transport of forest products, charcoal burning, maintenance of forestry buildings, silviculture, etc.	\$732,578.17
II. For agriculture, namely, expenses for administration and for maintaining buildings.....	9,675.45
III. For other branches, namely, for technological industries, for shooting grounds, fishing, timber yards, etc. ....	87,193.67
IV. For administration, including the salaries for all local officers, rangers, guards, etc., their traveling expenses, the expense of keeping up buildings used by these officers, etc. ....	418,499.05
V. For public expenses (taxes and charity expenses).	259,867.44
VI. Money refunded .....	756.13

VII. Extraordinary expenses (purchase of real estate, new buildings, new surveys, demarkation of boundary lines, forest working plans, prescriptive rights, etc.) .....	143,845.88
VIII. Administration at headquarters (expenses at the territorial offices and at the ministry of agriculture) .....	151,340.20

Grand total expense.....\$1,803,755.89

During the same period—namely, during the twenty years between 1874 and 1893—the mean annual gross receipts amounted to:

I. From forestry (sale of fuel and timber, of charcoal, of minor forest produce, etc.) .....	\$1,727,805.73
II. From agriculture (rentals from land leased, etc.) .....	161,592.16
III. Technological industries (rents of buildings and establishments, rents from shooting and fishing licenses, rents from yards, etc.) .....	291,747.02
IV. Money refunded.....	6,524.15
V. Extraordinary revenue .....	19,492.24

Total receipts.....\$2,207,161.30

To the latter figures there must be added the value of the prescriptive rights under which the inhabitants of certain villages have the privilege of taking timber, fuel, grass, etc., from the forest without refunding any money for such taking, estimated at..

	290,336.40
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Therefore grand total gross receipts.....\$2,497,497.70

Deducting from this amount the expenses previously mentioned, there remains a net revenue of..... \$693,741.81

Thus the entire state and fund forests of the Austrian empire have netted on an average, during the above named period of twenty years, 26.8 cents per acre per year.

During the five years lying between 1887 and 1893 there were planted up annually on an average 15,614 acres, by means of planting seeds or planting seedlings, at an expense of \$28,586.01 for labor only. To these planting ex-

penses there must be added the annual expenses incurred for the following items, namely:

I. For raising, transplanting and nursing plants in nurseries proper.....	\$17,894.78
II. For preparatory work, as drainage, subsoiling, making mounds to plant upon, etc .....	1,694.96
III. For cleaning and attending to the young forest previous to the age of, say, 20 years.....	6,406.72
IV. Spades, picks, mattocks and other tools.....	834.02

Adding these items to the above named figure of \$28,586.01, the grand total expense for replanting amounts to \$55,416.49, or to \$3.55 per acre.

Of the entire forest area of 2,590,182 acres, six-tenths of one per cent are planted up annually. Of these, 40.5 per cent were planted with seeds and 59.5 per cent were planted with seedling plants. For planting seeds there were used annually 23,669 kilograms of coniferous seeds; further, 561 hectoliters of acorns and 10,543 hectoliters of walnuts. The number of seedlings planted annually averages 17,604,196, planted out on 9,294 acres.

Regeneration is effected partly from self-sown seed under the cover of mother trees, partly from coppice shoots, partly by planting and sowing after clear cuttings as indicated above. Besides, where natural regeneration fails, planting seeds or seedlings takes place. The number of acres either wholly or partly cut over annually is 18,212. Of these, 55 per cent, or 10,108 acres, are planted up artificially by means of sowing and planting, whereas 45 per cent, or 8,104 acres, are regenerated from self-sown seed or from coppice shoots.

The difference between the area planted up annually, namely, 15,614 acres, with the area replanted annually after a clear cutting just mentioned, namely, 10,108 acres, amounts to 5,506 acres, and may be explained partly from the fact that on a considerable fraction of the 8,104 acres just mentioned artificial help is needed when natural

regeneration fails, partly from afforestation of areas not occupied by forest crops heretofore.

The total amount of the annual harvest, or annual cut, on the whole area under the state forest management is pretty constant, whilst it is more or less subject to changes in the different territories or forest ranges, according to market conditions. Owing to the system of roads and railroads in the forest of Galizia and of the Bukowina being extended annually, the annual utilization of forest produce in the state and fund forests is expected to increase in the future. The annual cut depends on figures prescribed by forest-working plans. It is never allowed to surpass the yield capacity of the forest.

Aside from charcoal burning, forest products are sold before manufacturing takes place. The trees to be cut are felled, freed from branches, and cut up into logs, and, if so desired, split up and freed from bark at the expense of the owner of the forest. "Timber" consists of: (1) Timber fit for building purposes which is not cut up into logs; (2) saw logs, the length of which depends more on the conditions of the logs than the inspection rules; (3) "work wood," which means timbers fit for carriage work, for turnery, etc.; (4) split timber, used especially for cooperage purposes. "Fuel" consists of wood for burning and for charcoal making. The former is cut up into pieces one meter (or 3.281 feet) long, the bark not being removed. According to the diameter of the log from which the fuel is taken, it is sold either split or unsplit. It is piled up according to quality, in distinct and separate piles. Fuel for charcoal burning is cut into pieces two or three meters long.

Relative to the reforestation of ground allotted to forestry, the main rules are found in paragraphs 2, 3 and 4 of the imperial "Patent," dated Dec. 3, 1852, which run as follows: Paragraph 2: "Without special permission,

no forest ground must be devoted to other purposes than timber production. If forest ground is used for other purposes than timber production, the owner shall be fined 30 cents to \$1.50 per acre. After such unlawful use the ground must be replanted within a time prescribed by the local authorities. If reforestation does not take place within the time thus prescribed a second punishment shall take place."

Paragraph 3: "Areas cleared from forests are to be planted up with timber species within five years after the clear cutting in the case of forests owned by the state or by the communities. Wherever there are clearings left from olden times they must be planted up within a period equal to the time fixed for the rotation of crops or fixed as the age of maturity of trees. In the case of private forests, a longer space may be allowed according to circumstances. Whosoever neglects this prescription shall be punished in the same way as if he had used forest ground for other purposes than for timber production." Paragraph 4: "No forest must be devastated; i. e., it must not be treated in such a way as might endanger or render impossible the continuation of timber production. If there is such danger, the fine to be imposed upon the owner of the land shall be the same as if forest ground was used for other purposes than timber production, or as if afforestation was omitted after a clear cutting. Aside from the fine, afforestation shall be made by force, if necessary, the owner bearing the expenses."

If the treatment was such as to render timber production impossible for the future, a fine up to \$3 per acre shall be imposed upon the owner. Under these rules or laws the local authorities have planted up during the years 1891 to 1895:

In state and fund forests, 231 acres; in communal forests, 28,269 acres; in private forests, 126,949 acres.

Preventives against forest devastation were taken:

In state and fund forests, on 1,393 acres; in communal forests, on 328,487 acres; in private forests, on 1,003,342 acres.

The statistics for the years 1891 to 1895 show that there occurred 3,007 forest fires, running over an area of 19,310 acres, and causing a loss of \$163,904. On the yearly average, 601 forest fires have run over an area of 3,862 acres, involving \$32,781 damage.

These fires were caused: By carelessness, in 1,210 cases; intentionally, in 181 cases; by sparks from locomotives, in 118 cases; by lightning, in 26 cases; by unknown agents, in 1,472 cases.

The officers of the state forest administration have a general rank equal to all technical branches of government administration. The forest officers in Austria are divided into two groups, one of which is attending to the administration of the Austrian state and fund forests, while the other is charged with the control and enforcement of all laws and rules enacted with reference to forestry. The latter forest officers are joined to the local political administration.

All government officers are allotted to different grades or ranks, the rank depending on their merit and their age, and being combined with a certain title and with a definite income peculiar to that rank. Forest officers are found in the following ranks: Tenth rank, forest assistants engaged in the administration of state and fund forests, drawing a salary of \$364 to \$405 per annum, to which there must be added an additional pay varying from \$64 to \$162, according to the time which the officer has spent in government service; ninth rank, head foresters entrusted with the local administration, drawing a salary of \$445 to \$526, with an additional pay varying from \$81 to \$202; eighth rank, a forest master, or inspecting officer, draws a salary of \$567 up to \$729 and an ad-

dition from \$97 to \$243; seventh rank, a forest counselor draws a salary of from \$810 to \$972 and an additional pay of from \$142 to \$283; sixth rank, a superior forest counselor draws a salary of from \$1,134 to \$1,458, in addition to a pay of from \$162 to \$324, depending on time of service. The traveling expenses, daily allowances on journeys, etc., differ according to the rank of the officer. Many of the local officers are living in government buildings, paying a rent equal to one-half of the additional pay above mentioned.

#### PRIVATE FORESTS.

At the close of 1895 the entire forest area of Austria was 23,993,442 acres. Deducting from this figure the area of the state and fund forests, aggregating 3,782,369 acres (out of which 862,236 were unproductive area), there remain 20,211,072 acres, which are composed of communal forests to the extent of 3,456,782 acres, and private forests to the extent of 16,754,290 acres.

There are treated according to forestry principles proper: In the case of communal forests, 14.5 per cent, equal to 500,818 acres; in the case of private forests, 38.4 per cent, equal to 6,434,070 acres. In these forests all work is done according to working plans, periodically made by officers of a training equal to that of the government forestry officers. In 85.6 per cent of the communal forests (2,955,964 acres) and in 61.6 per cent of the private forests (10,320,220 acres) no working plans exist. The work is done without reference to scientific forestry, more or less at haphazard after empirical rules.

The price of private forests depends on the quality of the soil, the age of the forest, and on the locality, viz., on the market conditions and on the industrial development of the section in which the forest is situated. Thus it is impossible to give even an approximately correct figure representing the value of private forests. Forest land

has been sold actually at prices ranging between \$5 and \$340.

The annual net revenue drawn from forestry varies just as much as the value of the forest itself. It is impossible to give any exact figure showing the annual net revenue from private or communal forests. A net revenue of equal to two or three per cent of the capital invested in forestry may represent a fair average.

The annual production of timber and fuel in the Austrian forests has somewhat declined of late. Savings are made everywhere to make good former over-cutting. Besides, the regulations of the forest laws are now being enforced, and under these enforced laws the utilization of forest produce had to be diminished. In the year 1890 the total harvest of timber and fuel from 24,173,333 acres of forest aggregated 29,341,590 cubic meters, or 1,035,758,127 cubic feet. In the year 1895, on the other hand, there were cut from 23,993,442 acres only 27,523,241 cubic meters, or 971,570,407.3 cubic feet.

It may be stated that the smaller figures, representing the area of the forest in 1895, are explained by the fact that the political authorities, whenever they think it fit, after consulting the foresters in charge, approve of a change of forest land into agricultural or pasture land. Besides, the diminished area is partly explained by mistakes made formerly in the survey of the forests.

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## DUCHY OF BADEN.

### STATE FORESTS.

The aggregate extent of the state forests of Baden is 248,000 acres, located in the Black Forest, the upper val-

ley of the Rhine and in the Odenwald. The prevailing kind of trees is the spruce. Reforesting is effected by seed from standing trees; also by planting trees; in some rare cases by artificial sowing, the latter in the case of Scotch pine. There is a gradual increase of crop. The usual method of cutting the crop consists in cutting the mature trees and covers at periods, as a rule, from thirty to forty years, with longer or shorter intervals. Cutting in blocks clean (pines and Scotch firs) in exposed stormy situations is less frequent. According to paragraph 29 of the forest law of Baden of the year 1833, no part of any forestis allowed to be kept uncultivated.

The forest service ranks equally with other branches of the public service, and is comprised in Class D of the tariff of salaries. Seven members of the Administration of Forests and Domains (which forms a part of the Treasury Department) are the highest forest officers. They bear the title of Councillors of the Forest Board, and have a salary not exceeding \$1,380, and \$147 for expenses.

Besides the state forest there are community and corporation forests, covering a total surface of 555,069 acres, which are managed on the same principles as the state forests.

#### PRIVATE FORESTS.

About one-third of all private forests is managed on forestry principles. The total forest product of the country increases gradually.

## BAVARIA.

## STATE FORESTS.

Bavaria, whose attractive capital, Munich, is frequented by so many Americans, has 6,000,000 inhabitants. Its state forests comprise 2,150,000 acres, and are mostly managed as "selection" forests. Large forests are to be found in all parts of the kingdom; but as a general rule the mountainous districts in the south (Alps), the north (Spessart) and northeast (Bohemian forest) are covered with the densest forest. Of the whole area of the country 33 per cent is covered with forest. The prevailing kind of trees, or 77 per cent, are coniferous. The remainder comprise various kinds of deciduous trees—those losing their foliage in winter. Among the conifers, red and white pine are most frequent. Among the deciduous trees the beech occupies the greatest space. The oak is also cultivated quite extensively for tanning purposes. The average estimated value of the forest land is \$50 per acre. The annual aggregate expense of administering the forests (1891) including salaries of officials, wages of workingmen, local taxation, new purchases, etc., amounts to \$4,965,204. The total revenue from the forests the same year amounted to \$8,187,349. Number of acres sown or planted to forests in 1892 was 14,800, more than three-fourths of which area was planted with coniferous trees. In the case of the red pine and the white pine, reforestation is mainly done in the natural way. In the case of the fir (*pinus sylvestris*) it is always effected artificially; in the case of the beech, always in a natural way (seed from standing trees); in the case of the oak, generally by artificial sowing. There is a continuity of forest products and a steady increase of the revenue which the state derives from its forests. This is due, first to an increase of prices, secondly to an increase of the yearly

crop. The latter must chiefly be regarded as a result of the present condition of the forests, which are being and have been steadily improved; also of the economy which was practiced in former times. Where reforestation is effected by seeding from the standing trees, the crop is generally cut in lengthy strips, usually not exceeding about thirty yards in width. As a general rule the administration of the state forests makes it a principle to avoid cutting in large blocks clean. In regard to compulsory tree planting, it may be said that every forest area, the trees of which have been cut, no matter whether state or private property, must be reforested in a short time, unless evidence can be furnished that the land would be better adapted to agricultural purposes.

The damage caused by forest fires is quite insignificant, being in 1890 only \$974, in 1894 only \$1,686. The principal cause of such fires is the carelessness of the workmen employed in the forests and of individuals and parties making excursions, particularly on Sundays. There are no data at hand as to the number of such fires caused by railroad locomotives, and although some fires are no doubt so caused, the number is certainly very small.

The administration of the Bavarian state forests constitutes one of the departments of the ministry of finance. It is directly subordinate and responsible to the latter, no other authorities intervening. The highest forest official who may be regarded as being at the head of the forest administration, responsible, of course, as stated, to the minister of finance, bears the title "Ministerialrath,"—ministerial or cabinet councilor. The chief director of the Bavarian administration of state forests is "Ministerialrath" Ganghofer. His starting salary is 7,740 marks. After a sixteen years' service the salary advances to 8,820 marks. Next in rank are the so-called "Oberforstrathe," with a starting salary of 6,660 marks, which, after a sixteen years' service, is increased to 7,740 marks.

## PRIVATE FORESTS.

The aggregate extent of private forests was 3,149,400 acres in 1892. In addition to the state and private forests there are about 800,000 acres of forests belonging to separate towns and villages. The forests which are owned by great landholders are managed on forestry principles. These forests, however, only comprise a very limited area, somewhat less than 400,000 acres. Most of the private forests are the property of small landholders. The average value per acre of private forests is somewhat less than that of the state forests. The net income rate varies widely. The data at hand are too few and too unreliable to admit of arriving at any conclusion with regard to the average. Opinions vary as to whether the total forest product of the country increases or decreases. In general the extent of the private forests seems to be somewhat decreasing. This would, of course, also appear to entail a decrease of the total forest product. Forest lands are only allowed to be changed into agricultural lands when proof can be furnished that the agricultural crop may be expected to exceed in value the forest crop. Between 1886 and 1891 7,000 to 8,000 acres of private forests were newly planted or sown.

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DENMARK.

## STATE FORESTS.

The experience of a country which had adopted important forestry regulations almost at the very beginning of the last century and which has successfully, through tree planting, resisted the invasion of desolating sand drifts from the sea shore must prove of much value. It was, therefore, with a high degree of satisfaction that I lately received from the Department of Agriculture of

Denmark, answers kindly furnished in the English language to some questions that I had submitted. I have put the information in its present form.

The aggregate extent of the state forests of Denmark is 142,140 acres, besides 2,962 acres for public parks. Of these, 67,700 acres are old forests, 74,440 acres are new plantations, especially on heathy tracts. The planting of forests had already commenced one hundred years ago, but has quite particularly increased since 1850. Forty-five per cent of the state forests are situated on the Danish islands; 54 per cent on the peninsula of Jutland, of which latter only 10.6 per cent are old forests, the rest are new heath plantations not yet thoroughly planted up. Beech comprises 37.7 per cent, oak 3.3, ash, maple, birch, elm and alder 4.8 per cent, and conifers 54.2 per cent. Conifers did not exist in Denmark 150 years ago, so that the extensive area of conifers in the state forests at present has been produced artificially. For the planting up of heaths the mountain pine (*pinus montana*) and the spruce (*picea excelsa*) are particularly utilized. The annual aggregate expense of administration averaged \$40,000 per year for the period 1893-97. Annual aggregate revenue averaged per year for the period 1893-97: revenue \$258,416, expenses \$195,370. The smallness of the net revenue arises partly from the fact that about half of the state forests are still so young as to yield only a small revenue, partly from extensive new areas being cultivated every year. The area annually sown or planted to forest averaged 2,285 acres per year for the period 1897-1900. Regeneration from self-sown seed is only used in the case of the beech (*fagus silvatica*) and of the silver fir (*abies pectinata*). In all other cases, forests are regenerated by means of planting plants or sowing seeds.

There is a sustained yield. Every tenth year a working plan is prepared for cuttings and cultivations of the next decennium. In working out these plans it is taken

into consideration, as far as may be, that there should be such areas and stocks of wood in store for the future as are available for the decennium. Within such a decennial period the yield of the cuttings varies according to circumstances; as a rule, however, there is but little differing one from the other. The extent of the state forests being on the increase, the proceeds will naturally increase. The forests are divided into parts of 10—100 acres in size, according to the nature of the soil or the species and age of the stock of wood. Within each decennial period a certain number of such divisions are destined for cutting, and the latter is commonly to be finished and the areas restocked with plants at the end of the period.

Private persons are prohibited by the law of September 27, 1805, from cutting away those remnants of the old forests of the country still existing in the said year. In cases of offence, means are placed in the hands of the government to force the owners to restock the cleared area under control of the state officer in charge. Consequently but very few forest areas have disappeared in the course of the nineteenth century. The many new plantations in Jutland which have risen by means of government subventions disbursed through the "Hedeselskabet," are subject to the same prohibition of clearing. Finally, under the guidance of a board of administration not appertaining to the state forestry service, the government has caused the waste sandy downs on the west coast of Jutland to be planted in order to subdue the sand drift in those parts, which had in former times caused great devastation. At the close of 1899 about 27,000 acres of sand downs had been planted with a good result. Damages by forest fires occur every year, but they have hitherto been rather insignificant. On account of the dense population of the country the casual forest fires are quickly quenched. The principal cause of such fires is care-

lessness of various kinds. It is notorious that several forest fires have been caused by sparks from locomotives, but no number can be stated.

The administration of the state forests is under the Department of Agriculture; its yearly budget is voted under the general budget of finances and its officers are appointed by the king. The state forestry is managed by three forest masters, twenty-three superior foresters, sixty-nine foresters and 306 keepers. The superior foresters have the use of a house free of charge, together with a lot of arable land (30-100 acres) upon which they pay the ordinary taxes, besides a salary of \$950-\$1,250. The salary of the forest masters is \$1,450, to which is added an allowance for traveling and other lawful expenses. The three forest masters give in an annual report on the operations of the local ranges under their supervision. Three reports are prepared in the department and printed in a condensed form as a supplement to the public accounts. Every tenth year is issued a review of the state forestry in the past decennium. The "Tidskrift Skovvasen" (forestry periodical), published in Copenhagen by Mr. C. V. Prytz, professor of forestry in the Royal Agricultural and Forestry Academy, and "Hedeselskabets Tidskrift" (periodical of the society for the cultivation of heaths), published by "Det danske Hedeselskab" at Aarhus, are the periodicals. The revision of the decennial working plans for state forestry, which is simultaneous with the preparation of the working plan for the next ten years, is undertaken by a "Skovtaxator" (appraiser of forests), classed directly under the department, and four assistant clerks. A second "Skovtaxator" with one clerk is constantly occupied in the experimental line, in examinations of the growth of trees and the economy of divers modes of forest husbanding, altogether in support of practical forestry.

## PRIVATE FORESTS.

The aggregate extent of private forests is 505,900 acres, of which, by the statistics of 1896, beech (*fagus silvatica*) comprises 44 per cent; oak, ash, maple, birch and alder comprise 18 per cent, and spruce (*picea excelsa*), pine (*pinus sylvestris* and *montana*), silver fir (*abies pectinata*), larch (*larix Europea*), etc., 38 per cent. Three-fourths to four-fifths of these forests are managed on forestry principles. The extent of private forests by the official statistics was, in 1888, 414,837 acres, and, in 1896, 454,874 acres. By the law of September 27, 1805, before mentioned, and which is still in force, private persons are prohibited from cutting their parts of the old forests of the country standing at that time, aggregating at that date an area of about 280,000 acres. This area comprises (besides the old forest area of the state, about 100,000 acres) the remnants of the original forests of the country still existing. Since 1850 very considerable areas have been planted with forests, both by the state and by private persons, especially in the heathy tracts of the peninsula of Jutland. In these tracts an area of 108,500 acres has, since 1868, been planted by private persons, however under the guidance and control of the "Hedeslskab" (society for the cultivation of heaths), which is aided by the state (for the year 1900 to the extent of \$73,000); and of the above area 54,600 acres were thoroughly cultivated at the close of 1898.

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FRANCE.

The total extent of the forests of France (exclusive of the colonies) is about 23,600,000 acres, which represents about 17 per cent of the surface of the entire territory.

These forests are divided in: Forests of the state, 2,800,000 acres; forests of the municipalities and of the

public institutions, 4,800,000 acres; forests of individuals, 16,000,000 acres. The forests of the state and those of the municipalities and of the public institutions are managed and supervised by the Administration of Forests. France only extends over 9 degrees in latitude, but, as it has very high chains of mountains, the result is that it possesses all the climates of Europe, from the hottest to the coldest, and that a great variety exists in the species of trees that compose the forests.

The principal varieties of these species are: In the warm region, comprising the borders of the Mediterranean sea and of the Gulf of Gascony, the cork oak (*quercus suber*), the evergreen oak (*quercus ilex*), the cluster pine (*pinus pinaster*) and the Aleppo pine (*pinus halepensis*).

In the temperate region, comprising the plains, the rolling grounds and the lower parts of the mountains, the common European oak (*quercus robur*), the European white oak (*quercus pedunculata*), the beech (*fagus silvatica*), the hornbeam (*carpinus betulus*), the common European ash (*fraxinus excelsior*).

) In the cold region, comprising the middle and upper parts of the mountains, up to the extreme limit of vegetation, the silver fir (*abies pectinata*), the Norway spruce fir (*abies excelsa*), the beech (*fagus silvatica*), the Scotch pine (*pinus sylvestris*),<sup>3</sup> the mountain pine (*pinus montana*), the larch (*larix Europea*).

#### STATE FORESTS.

The total area of the forests of the state, 2,800,000 acres, is composed of 2,200,000 acres of productive forests and of 600,000 acres of protective forests, situated in the mountains or on the dunes of the ocean; of lands recently purchased by the state on the banks of torrents and whereon timber is now being planted.

The forests yield annually to the state:

Timber (cubic feet).....	38,100,000
Fire wood (cubic feet).....	64,200,000
Total.....	102,300,000

This represents nearly an annual production of 46½ cubic feet of wood per acre of productive forest. The state forests produce in addition thereto oak bark, which is used in the tanning of leather; cork, rosin and several other small products; also hunting rights are leased.

The gross annual income in money is \$6,000,000, or \$2.72 per acre of producing forest. In some forests this average is largely exceeded and it attains as high as \$8 per acre.

The expenses are as follows, viz:

Personnel.....	\$1,240,000
Forest instruction.....	36,000
Sundry works.....	336,000
Reforestation of mountains.....	651,000
Taxes paid to departments and municipalities.....	405,000
Sundry expenses.....	57,000
Total.....	\$2,725,000

But of all these expenses a large share is applied either in administering the forests of the municipalities or in executing works of real public utility in the "protection forests," or in reforestation mountain lands (to prevent slides and the like). If we make these several deductions we find that the expenses incurred in the producing forests do not exceed \$1,500,000 or 70 cents per acre. The net annual income of these forests is therefore \$2.72 less 70 cents, equal to \$2.02 per acre.

The state forests are carried on either as high forest or as coppice, and are managed under regulations approved by the President of the Republic. Cuttings are made yearly. In forests rich in wood there is cut every year an amount equal to the increment or growth; in forests poor in wood

they cut less than the increment in order to gradually increase the forest. The endeavor is made also to increase the production of the timber wood by reducing that of the fire wood. The "high tree forests" are cut down at periods ranging from 120 to 150 years.

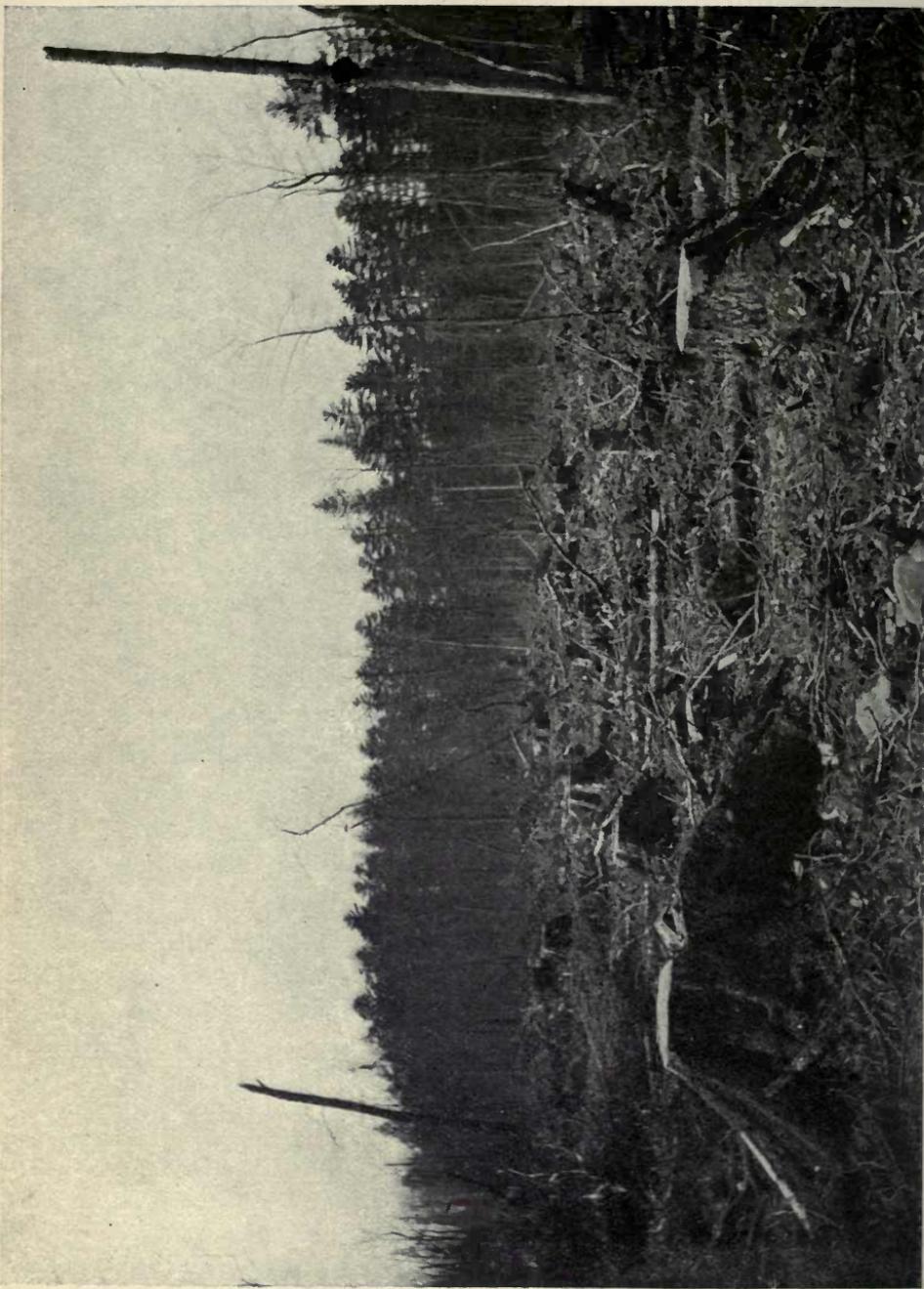
The work is directed in a way that will insure natural reforestation from the seeds that fall from the standing trees. Not only the trees that have attained the age determined by the rules are cut down, but also the dead ones and those which are dying, and those that prevent the growth of neighboring trees. In temperate climate the annual cutting of high trees is on a limited area; a large number of trees are cut down simultaneously. In very cold climates and where winds are to be feared, only a few trees are taken away at a time on the same point, and cutting is then done on a larger area.

The low forest, coppice and second growth are cut in rotations, ranging from 25 to 35 years. The reserved trees, which are very numerous, are cut on an average every 100 years, but some selected trees are allowed to attain and even pass 200 years.

The labor performed in the forests consists in the construction and maintenance of forest roads, water saw-mills, houses for watchmen, replanting. Fortunately, owing to the system of culture now in use, artificial reforestation has but little importance in forests, properly speaking, but sowing and planting in the small open spaces, or on the points where a few more valuable species are to be introduced, or where the soil of the forest is better adapted to some varieties, there sowing and planting are more frequent. The average cost of such work is \$10.00 per acre.

The State and Communal forests are organized and managed so as to obtain regeneration by means of natural seeding. A sufficient number of trees are left standing that they may entirely cover the ground with their seed.





Dangerous condition in regard to fire the country is left in after the pine has been cut in present method of logging. View in Township 53, Range 15. Photographed April 19, 1903, for the annual report of the Forestry Commissioner of Minnesota.

It may happen that those trees are thrown down by a hurricane or destroyed by fire. In that case recourse must necessarily be taken to planting, but that case does not often occur. In the private forests the same method is generally applied as in the State and Communal forests. However, as these forests are felled at a very early age, the proprietors must restore them by planting. This only occurs in the regions of plains where pine forests are grown on barren ground with a view of yielding the largest possible revenue.

A forester, with scientific knowledge, *i. e.* a ranger or assistant conservator (*Garde general ou Inspecteur adjoint*—these two officers fulfilling the same functions) has on an average to administer an area of 19,000 acres of State forests, Communal forest or forests belonging to a public establishment. They generally have at their command three chief guards and ten or twelve forest guards.

Properly speaking there are no workmen who devote themselves especially to forest work. Most of them only come into the forests in the bad season; in summer time they work in the fields. The number of workmen employed for 1,000 acres can therefore not be given exactly. It varies according to the regions and the longer or shorter time that the workmen devote to the forest work. Many forests being surrounded with villages, many woodcutters repair to their homes every evening. However, when the forests are very large and require work too far situated from the villages, the workmen, in order to avoid too great loss of time in the morning and evening, construct huts in which they spend the night and cook their meals. The charcoal-burners, obliged to watch day and night over the kilns, always live in the forests.

Very considerable reforestation is made on mountain lands, where the state plants trees to regulate the action of the waters and stop the ravages of torrents. For that purpose \$700,000 are expended every year, the

largest part of which is used in the purchase of land, and the other part in dams to regulate the streams, and in plantations to settle and retain the soil. The state purchases yearly, on an average, 16,000 acres. The average cost of reforestation is \$20 per acre, and \$18 must be added thereto for work in improving the streams, building roads, etc. Planting is preferred to sowing on calcareous or chalky soil.

The administration of the forests forms part of the Department of Agriculture. It has charge not only of the direction and care of the forests of the state and of those belonging to municipal corporations and public institutions, but also the overseeing of the fishing in the rivers and creeks. At its head is a director, residing in Paris, who has under him: A central service composed of 2 conservators, 3 administering general inspectors, 12 inspectors, 7 assistant inspectors and 19 clerks.

An exterior service composed of:

First—Personnel superior or of administration—32 conservators, 200 inspectors, 210 assistant inspectors, 232 general wardens.

Second—Personnel inferior or of surveillance—3,650 foremen and wardens, paid by the state; 3,700 foremen and wardens, paid by the municipal corporations and public institutions.

The annual salaries paid are as follows:

SUPERIOR OFFICIALS.

Director.....	\$3,000
Administrators.....	1,800 to 2,600
Conservators.....	1,600 to 2,400
Inspectors.....	800 to 1,200
Assistant inspectors.....	600 to 800
General wardens.....	300 to 520

Exclusive of some additional allowances for traveling expenses.

## INFERIOR OFFICIALS.

Foremen and wardens paid by the state an average of ..	\$160.00
Foremen and wardens paid by the municipal corporations and public institutions .....	116.00

The foremen and wardens receive in addition thereto allowances of firewood, tillable land, pasture grounds, etc.

Those in the employment of the state have free rent in houses built in the forest, or in lieu thereof they receive as compensation a cash equivalent.

The superior officials are entitled to a retreat pension at the age of 60 years, and the inferior officials at the age of 55 years.

France has three forestry schools. One school of higher instruction at Nancy; one school of secondary instruction, and one school of primary instruction. The two latter schools are established in the department of Loiret, on the possessions of the administration at Barres.

## FORESTS OF MUNICIPAL CORPORATIONS AND OF PUBLIC INSTITUTIONS.

The forests of municipal corporations and of public institutions comprise 4,800,000 acres. They are supervised by the Forest Service on the same conditions and according to the same principles as the state forests. They contain about 200,000 acres of forests for protection, and their producing area is thereby reduced to 4,600,000 acres. They produce annually, timber, 45,000,000 cubic feet; fire wood, 125,000,000 cubic feet, and together, 170,000,000 cubic feet. This represents nearly an annual production in wood of 37 cubic feet per acre of productive forest. The annual cash value of the product, including the bark, cork and rosin, is \$6,500,000, or \$1.41 gross income per acre. The net income is about \$1.14 per acre. The forests belonging to the municipalities and public institutions are under regulations approved by the president of the republic. These regulations and those of the state

forests have been established with a view of insuring a continuous annual production and even of increasing that production in the forests where it is not yet sufficient.

#### PRIVATE FORESTS.

Private individuals are at liberty to manage their forests as they please. But they are prohibited from cutting and taking trees from forests which are necessary to maintain and regulate water flow, to protect lands against the encroachments of the sea and sands, to defend the territory, or which are necessary for the public health. The destruction of private forests has become rarer and rarer and the proprietors acknowledge now that on soils of poor quality the income from forests is greater than that from arable land. As a result the area of private forests, instead of decreasing, increases from year to year by reason of the timbering of lands on which agriculture pays but small profits.

The income from private forests in quantity and in money is not exactly known. It is, however, known that on the same area they pay less than the state forests. Private individuals in their anxiety to get returns are inclined to cut down the wood when it is too young, and in the forests where coppice wood is raised they do not leave a sufficient reserve, and oftentimes leave none at all. One can notice, however, that the principles of silviculture are spreading more and more in the culture of private forests. The large forests are subjected to the same mode of management and are treated like the state or municipal forests. On the whole the annual production is regular and tends to become better in both quantity and quality.

#### FOREST FIRES.

In the temperate and in the cold regions of France (that is, in the larger portion of the territory) the fires are but few and cause slight damage. The long periods of

drought are not frequent, the numerous roads that run through the forests make very good lines of defense, and the villages that surround the massive wooded areas furnish at the first alarm devoted laborers. The railroad companies, being held responsible for damage by fire caused by flying sparks from their locomotives, take particular care, and in exposed places cut the grass and brush along their roadbeds.

The forestry code forbids, under penalty of \$4 to \$20, carrying or lighting matches in or within a distance of 200 metres from the forests.

In the forest camps of the state, municipal corporations or public institutions, it is forbidden to the workers to light fire outside of the buildings or shops, the location whereof is indicated by the forest service.

In the warm region the dangers from fires are greater. As a preventative against them more roads are built, trenches 20 to 50 metres wide and kept free from grass and brush are made around the forest, along railroad lines, on the dividing lines between forests belonging to several owners, and also from distance to distance in the large and dense forests belonging to the same proprietor. The use of fire in forest camps and in agricultural camps situated within 200 meters from the forests is forbidden during the months of June, July, August and September. A special watch is organized, and telegraphic lines penetrating the center of the forests admit of alarm of fire at its start and call for help. If the working force appears to be insufficient the military authority furnishes the deficiency and sends on the spot soldiers who act according to the directions of the forest service.

#### COLONIES.

France, fully convinced that the preservation of forests is in all lands of the highest importance, has organized a forest service in its possessions outside of Europe—in Al-

geria, Tunis, Madagascar, Indo-China, Reunion. In Algeria the organization is exactly similar to that of France, and calls for an annual expenditure for salaries and works of \$600,000.

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## GRAND DUCHY OF HESSE.

The forests of the Grand Duchy of Hesse, (population 1,119,893 in 1900) situated in the valleys of the rivers Rhine and Main (on diluvial and alluvial sand), in the Taunus (on slate, Devon), in the Vogelsberg mountains (on basalt and red sandstone) and in the Odenwald mountains (on granite and red sandstone) comprise 612,020 acres or 31 per cent of the entire area of the State.

Of this area 177,880 acres are Crown and State forests, managed for and in the interest of the State; 234,955 acres are communal forests, owned by municipalities or public institutions; 135,285 acres are private forests of the 1st class, entailed forests in possession of families, and 63,900 acres are private forests of the 2nd class (ordinary private forests), owned by individuals.

The broad-leaved trees, beech, oak, ash, alder, birch, maple, horn-beam, etc. are covering about 60 per cent of the area under forest, the remaining 40 per cent consist of conifers, pine, spruce, fir, larch, etc.

The average estimated value of the Crown and State forest land is \$150 per acre, but there are great differences according to quality of soil, age and condition of growing stock, transportation facilities and density of population.

The annual aggregate expense of administration and protection, for wood-cutting, cultivation, construction and repairing of forest roads, etc., amounted in 1903 to \$534,153 and the aggregate net revenue for the same year to \$364,191. The average rate of net income is about 2½ per cent.

For regeneration by means of planting and sowing; 3½ million seedlings and 50,000 Kilograms of seed of broad-leaved species, 11½ million seedlings and 2,500 Kilograms of seed of coniferous species were used at an expense of \$65,167. Full reforestation—over the entire surface of the ground—is carried out upon about 700 acres; filling up of blanks in natural or artificial regeneration upon about 2,000 acres per annum. Regeneration by seed dropping from the mother trees is only applied in the case of the beech; in all other cases sowing or planting is resorted to.

Scotch pine seedlings are mostly planted when one year old four feet apart on strips of ground about 12 inches broad and well prepared to a depth of 12 inches. Sowing on similar strips of ground occurs in exceptional cases.

Spruce, fir, white pine and larch are planted when 3 to 4 years of age.

Oak is invariably planted by seed, by setting the acorns from 3 to 4 inches apart, in 3 close rows on strips of ground thoroughly loosened by the hoe. All other broad-leaved species are planted at an age of from 2 to 5 years.

Areas to be replanted after clearing off the mature trees are not allowed to exceed the size of 7 to 8 acres, because larger clearings are considered to be suffering

more heavily from drying, from weeds and from increase of injurious insects.

Experiments of cultivating and acclimating foreign species of trees, for instance Douglas fir, red oak, Japanese and Siberian larch, etc., etc., have been so far not discouraging. Common acacia, Canadian poplar and white pine are well naturalized. The culture of Douglas fir is increasing from year to year.

The needed plants are raised in forest nurseries, kept under the care of the local forest rangers. Should the stock not be sufficient, the supply is to be furnished by responsible private nurseries.

The comparatively large areas covered by oak-coppice forest, for obtaining the formerly high priced tanning bark, is decreasing from year to year. The introduction of substitutes for tanning bark has reduced the price of oak-bark to that degree that the working up of it by the present high wages is hardly advisable.

In the southern part of the Odenwald mountains, on the warm, dry and steep slopes of the Neckar valley, where the oak-coppice forest is to be found to a large extent—a section of the country of comparatively poor soil for agriculture—rye and buckwheat are raised for a few years after coppicing the oak. For that purpose the bark and the salable wood being removed and the twigs scattered about, the tract is burned over and the seed grain hoed into the ground. As soon as the sprouts of the oak-stumps have attained the length of a few feet, agricultural use of the ground is given up.

On account of the decline of the price for oak-bark, blanks in oak-coppice forests are no longer filled by oak plants, but in the main by Scotch pine plants. In this way the change of the oak-coppice forest into pine forest

is frequently effected, excluding of course, after pine plants have been brought in, any further agricultural use of the forest ground.

Another combination of field crop—potatoes—with forest trees during one or two years following the cutting of mature trees is in some parts of the country customary, less for the object of raising a paying crop of potatoes than for the benefit of the pine seedlings, planted in rows, alternating with rows of potatoes, for which it secures a soil of a high and beneficial porosity. To neutralize the exhaustion of the soil by the potatoes, the elements taken from the soil by that crop are resupplied by artificial manuring.

Reforestation is effected on about 40 per cent of the area by seed from standing trees (beech), on about 10 per cent by coppicing and on about 50 per cent artificially and chiefly planting. The annual yield is strictly sustained and is not allowed to exceed the annual growth. It is made up of material obtained from thinnings (about 40 per cent) and of mature trees (about 60 per cent). The average yield per acre and per annum is 88.6 cubic feet, 75 per cent of which is used as fuel. The average value of cordwood, piled up along forest roads, was in 1903, \$6 per cord, the average value of logs, cut and hauled to forest roads, \$9.40 per 1,000 feet board measure.

The average proceeds for minor forest products, such as grass, grass seed, litter, stones, etc., etc., are of some significance, while those derived from hunting leases are quite considerable.

The laborers, inhabitants of the neighboring villages, employed in wood-cutting, in culture-work, in building

and repairing forest roads, etc., are earning on the average about 75 cents a day.

The average sum of wages paid annually per 1,000 acres of forest amounts to about \$200. By the rate of wages of 75 cents per day, the stated amount represents the working time of one man for 267 days—nearly for one year. Since actually the chief work is performed between fall and spring, a comparatively large force has to be employed during the stated business season, while for the rest of the year the work is rather scarce.

The management of the Crown, State and Communal forests, is performed by the government Oberforster, under supervision of the ministry of finances, section for administration of forest and cameral estates. This section is formed by eight members, to-wit, one Ministerialrat (a forest officer) as chairman, six Oberforstrat and one lawyer.

As stated above, there are 234,955 acres of communal forests owned by municipalities or public institutions and being of the same value as the State forests. They are managed and supervised by the State forest officers; the sale of forest products however lies in the hands of the legal representatives of the proprietors. As an equivalent for managing their forests, the owners have to pay yearly a fixed amount per acre into the State treasury.

The private forests of 1st class (135,285 acres) entailed forests in possession of families and managed on forestry principles by technically and scientifically educated officers, paid by the proprietors, represent a similar value per acre as the State forests.

The remaining 63,900 acres of forests—ordinary private forests—mostly forest lots of small extent, are in the hands of individuals and to a certain extent used at the will of the owners. The condition of that class of

forest is usually a poor one, the value considerably lower than that of the other classes of forest, in consequence of abuse by removal of every particle of litter and impoverishment of soil.

In cases when the owner of private forests of the 2nd class is willing to sell his forest lots, and municipalities are not purchasers, the State is mostly a ready buyer.

The damage caused by forest fires is not of very great account. During the years 1903 and 1904 from the total area of forests 143 fires were reported, causing a loss of \$3,000. Of these fires, 20 with a loss of \$1,175, were caused by railroad locomotive sparks.

Carelessness of smokers visiting the forests for recreation is the principal cause of most of the forest fires and the greatest number of fires occur during the months of April and May, the time of the beginning of vegetation, a season bringing numerous visitors to the forests.

The comparatively small losses caused by visitors has to be placed to the account of the high esthetical worth of the forest, offered to mankind by its majestic beauty, by its pure and refreshing enjoyment.

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## ITALY.

### STATE FORESTS.

The aggregate area of the state forests is 128,960 acres, principally situated in Tuscany—provinces of Florence, Arezzo, Grosseto, Pisa and Leghorn; and Venice—provinces of Belluno, Treviso and Udine. These lands are regarded as inalienable. The prevailing kinds of trees are oak, beech, pine, larch and fir. The total annual expense of administration averages

about \$80,000. The annual sale of the raw material from the state forests averages \$150,000. The number of acres annually reforested with trees is 150. The method of reforesting varies according to the different species of trees and the local conditions; but seeding, whether artificially or naturally, is used only for the oak and the beech. For other kinds, such as the fir, pine, larch and chestnut, reforesting is done by planting. Generally good care is taken to maintain a sustained yield. In regard to cutting, the practice is to cut only those trees which have reached fiscal maturity and those that are dead or about to die.

Only a very small number of forest fires are caused by railway locomotives. The forest service has much importance in the protection of mountainous land and in the control of water. The annual salary of the chief inspector of the forests of the first class is 6,000 lire; that of the chief inspector of forests of the second class, 5,000 lire; that of inspector of forests of first class, 4,000 lire. The Minister of Agriculture generally publishes a detailed report on the administration of the forests every five or six years.

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## NORWAY.

### STATE FORESTS.

The extent of the public and semi-public forests, according to the latest returns, cover an area of 546,932 hektars of coniferous trees and 369,967 hektars of foliferous trees (almost exclusively birch), making together 916,899 hektars, estimated at a total value of Kr. 34,720,837, no consideration having been taken to rights of use (usufruct) connected with the forests. The average value of the woodland makes thus about Kr. 37,86 pr. hektar.

The total expenditure in connection with the management and administration of the forests for the financial year 1904-1905 amounted to Kr. 644,700,53, while the revenue yielded by the forests during the same period was Kr. 1,109,147,85.

Of the above expenditure, however, about Kr. 190,000 were paid as grants to private forestry, purchase of woods and other objects, which do not concern the direct management of the public forests.

During the year 1904, 1,529,245 trees were planted out (chiefly pine, *pinus sylvestris*, and spruce *abies excelsa*,) with which has been covered an area of about 3,058 hektars and 41,30 kilograms of seed have been sown over an area of 21 hektars at a total cost of Kr. 28,883,61.

During the same year ditches have been dug in bogs and sour (seepy) ground and brooks cleared in a length of 91,142 running meters.

The regeneration is effected chiefly by natural seeding from the remaining trees and the mode of felling the trees is mainly on the basis of the selective cutting system.

The staff of the office for woods and forests consists of 1 Skogdirektor (director of forests), 4 Skoginspektorer (inspectors of forests), 26 Skogforvaltere (managers of forests), 1 Skogtaxator (valuer of forests), 4 Skogassistenter (forest assistants), 13 Skogplantere (forest planters) and 418 Skogvogtere (forest keepers). With exception of the forest keepers the whole of the staff is made up of men more or less thoroughly trained for this special line. On each of the "Skogforvalters" to whom the management of the public forests is entrusted, falls on an average 31,415 hektar. The distribution of the area is, however, very uneven.

There are no permanent laborers in connection with the forest and woods office of the State. Provided the

trees from the public forests are not sold standing on the root, the felling and the conveyance (transport) of the wood is contracted for, while the planting and sowing, as well as the work in the nurseries, are carried out at daily wages, which as a rule is not higher than the earnings of ordinary day laborers, viz, (about Kr. 3,00 a day.) Where there forests are situated far away from inhabited places, cabins have been erected for the use of the laborers, and cottages for the staff.

The State has four great and several smaller nurseries, and for the drying of tree seeds two large and four smaller establishments which supply the necessary seed for public use and are also able to set apart a great portion for private consumption, especially of spruce seed.

In accordance with Section 3 of the Act of Storthing of July 20, 1893, rules and regulations for the protection of the forests have up to now been adopted in 77 districts, and in accordance with Section 8 of said Act ordinary forest regulations in 37 districts, together *114 districts*.

The majority of these regulations aim at prohibiting the cutting of trees under certain dimensions, still with the modification that cutting of trees, not holding the proper measure, is allowed in most cases where they have been selected by the overseer, who is paid by the district in question. The said Act of the Storthing is not considered to allow binding regulations, for replanting and sowing of destroyed forests to be included in the above regulations.

In accordance with the Act of Storthing of July 14, 1893, with supplementary Act of July 27, 1896, regulations for the prevention and extinguishment of forest fire have hitherto been adopted in 164 districts. The regulations provide for compulsory attendance of able-bodied men in case of forest fire. It has been found that these

regulations have greatly contributed to limit the spreading of forest fires.

The State has a High School and two elementary schools which give instructions in forestry. Such instruction is also given by several agricultural schools.

#### PRIVATE FORESTS.

A society has been formed called "Det norske Skogselskab" (the Norwegian forest society) comprising the whole country with branches in 15 Amter (counties). The society has 18 nurseries and supports about 50 private nurseries. Two establishments for the drying of seeds are in operation. During the year 1904 the forest societies planted out about six million plants and sowed 415 kil. seed by which an area of about 1800 hektar of bare ground is considered to have been cultivated. During the same year ditches have been dug in bogs or in sour (seepy) ground and brooks cleared in a total length of about 259,000 meters or 259 kilometers.

"The Norwegian Forest Society" publishes a journal for forestry, of which 5,400 copies have been printed and is published monthly. In addition thereto a review "Forstligt Tidsskrift" is published by two graduates in forestry for their own account, and which is published in quarterly issues.

In order to assist private people in the management of their forests, 11 Amtskogmestere (district inspectors of forests) have been appointed, whose salary and traveling expenses are defrayed one-half by the State, whereas the other half is paid by the county in question.

## PRUSSIA.

## STATE FORESTS.

The extent of the state forests of Prussia is 6,955,227 acres. Included in this, however, are 715,637 acres not designed for tree culture. In addition, the extent of forests belonging to municipalities is 2,563,812 acres; belonging to churches, 207,752 acres; belonging to corporations, 555,900 acres; private forests, 10,828,730 acres; making an aggregate extent of 21,111,421 acres in the whole kingdom.

The prevailing kinds of trees in the state forests are Scotch pine, larch, beech, red pine, fir and oak. The value of the land varies so much, rising from a small amount to \$700 per acre, that it is impossible to give an average estimated value. The annual aggregate expense of administration (state forests) is as follows: The office expenses and maintenance, including expense for education in forestry, etc., averaged in the years 1893 to 1897, per annum, \$8,500,000. The annual aggregate revenue in the years 1893 to 1897 amounted to \$17,200,000, being at the net rate of \$1.50 per acre of actual forest. The number of acres sown or planted with forest annually during the years 1893 to 1895 was 44,830.

The area of evergreen forests annually reforested from self-sown seeds is extremely small in comparison with the sections which are replanted either by seeds or seedlings. In the case of Scotch Pine (*Pinus Sylvestris*) artificial regeneration by seeds or seedlings forms the rule. An exception is made only within a small territory where the June bug (*Melolontha vulgaris*) has appeared, during the last years, doing considerable damage in the Eastern part of Prussia (Heath Forests, Johannisburger Heide). The natural regeneration of the Scotch Pine has been adopted within this territory as a means of preventing the attacks

of the June bug. When the June-bug-danger has passed by, we shall return without a doubt, to artificial regeneration of Pine. The natural regeneration of conifers prevails, however, preferably within the mountain forests, where regeneration of the Silver Fir (*Abies pectinata*) is concerned.

The foresting of the beech is mostly effected from standing trees, though artificial sowing and planting are also done. The oak is either reforested by seed from standing trees, or artificially through sowing or by planting. In regard to the continuity of forest products, the forestry department endeavors to obtain the highest possible continuous net income. The usual method of cutting is in blocks clean.

Under the head of compulsory tree planting the following laws are referred to: The Forest Protection Law of July 6th, 1875. the law of August 4th, 1876, concerning the administration of forests owned by municipalities and public institutions in the provinces of Prussia, Brandenburg, Pomerania, Posen, Silesia and Saxony.

The average annual damage caused by forest fires in the years 1892 to 1896 was as follows: Totally or mostly destroyed, 2,992 acres; only slightly damaged, 117 acres; only the surface destroyed, 522 acres. The average annual number of forest fires in the years 1892 to 1896 was 36, the causes of which were as follows: 12 unknown, 2 railroads, 5 incendiary, 16 caused by carelessness, 1 lightning. During the years 1892 to 1896 the annual average number of forest fires caused by railroad locomotives was 2.

The officers in the forest service are equal in rank to the other high grade officers in the government service. The foresters have clerical rank. The salary of "Oberforster" (district manager) ranges according to length of

service from 2,700 to 5,700 marks. Unfavorably situated officers receive an additional amount, the maximum of which is 600 marks annually. In addition there is usually free residence and fuel. The salary of the "Oberforstmeister" (chief inspector) is from 4,200 to 7,200 marks, according to length of service, which is calculated from the time of qualification for the office of "Forstrath" (councillor). The "Oberforstmeister" and "Forstrath" are each allowed an amount not exceeding 2,900 marks for traveling expenses.

The average size of State Forests placed in charge of a scientifically trained forester amounts to 9750 acres. Within the entire State Forests, during the year 1904, there were employed 156,772 workmen (and workwomen) working on 10,479,589 workdays. In other words, there have been employed, per 1,000 acres of State Forests, 22 workmen (and workwomen) engaged on 145 workdays.

The workmen obtain a sufficient wage scale. In order to attach the workmen and their interests to the forest, a number of small farms are being leased to them at a cheap price. Within the entire State Forest Administration of Prussia, there are kept, altogether, 631 houses for forest workmen, containing 1323 dwellings.

#### PRIVATE FORESTS.

The extent of private forests in Prussia, as above stated, is 10,828,780 acres. About one-half of these forests are managed on forestry principles, and their average value is somewhat less per acre than that of the state forest. On the larger estates the area devoted to forests gradually increases, while on the smaller estates the forest area probably decreases.

Some of the forests of Prussia are attractive resorts for travelers, and especially pedestrians, who enjoy the ex-

cellent roads. Of the celebrated Thuringian chain, which is 70 miles in length by from 8 to 25 miles in breadth, a writer says: "The successive hills melt into each other in gentle undulations, forming a continuous and easily traced comb, and only the northwest slopes are precipitous, and seamed with winding gorges. This mountain range incloses many charming and romantic valleys and glens; the most prominent feature of its picturesque scenery is formed by the fine forests, chiefly of pines and firs, which clothe most of the hills."

Prussia comprises nearly two-thirds of the entire extent of the German Empire, yet its area lacks considerable of being twice that of Minnesota. Thirty-one per cent of its soil is predominantly sandy, and on the whole probably is not as good as that of Minnesota; yet it sustains a population twenty-five times as large as that of Minnesota. This fact might well find a lodgment in the minds of our statesmen, that whereas Prussia annually derives a net revenue of \$1.50 an acre from her 6,000,000 acres of state forest, our state, from about an equal area of land in its borders, adapted to forest, derives no regular net revenue at all.

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### DUCHY OF SAX-MEININGEN.

The area of state forests is 106,530 acres; of communal forests, 84,460 acres; of private forests, 71,850 acres; miscellaneous, 1,480 acres; in the aggregate, 264,310 acres, being equal to 42.4 per cent of the total area of the state. The state forests comprise 24 units of administration, in charge of 24 superior forest officers. The highest functionary in forestry matters is the president of the forestry bureau. The bureau is composed of five forest councillors, two of whom act as forest inspectors at the same time, each one supervising 12 of the above

named 24 forest officers. The annual yield of the state forests is 5,779,669 cubic feet of lumber and fire-wood cut in ripe forests, and 1,288,904 cubic feet of fire-wood and pulp-wood obtained from thinnings. These figures correspond with an annual yield of about 155 feet board measure of lumber plus 0.40 cords of fire-wood per acre per annum. The state forest officers at the same time control the management of the communal and private forests within the state. All grades of forest officers have certain police duties concerning forests, fish and game preservation.

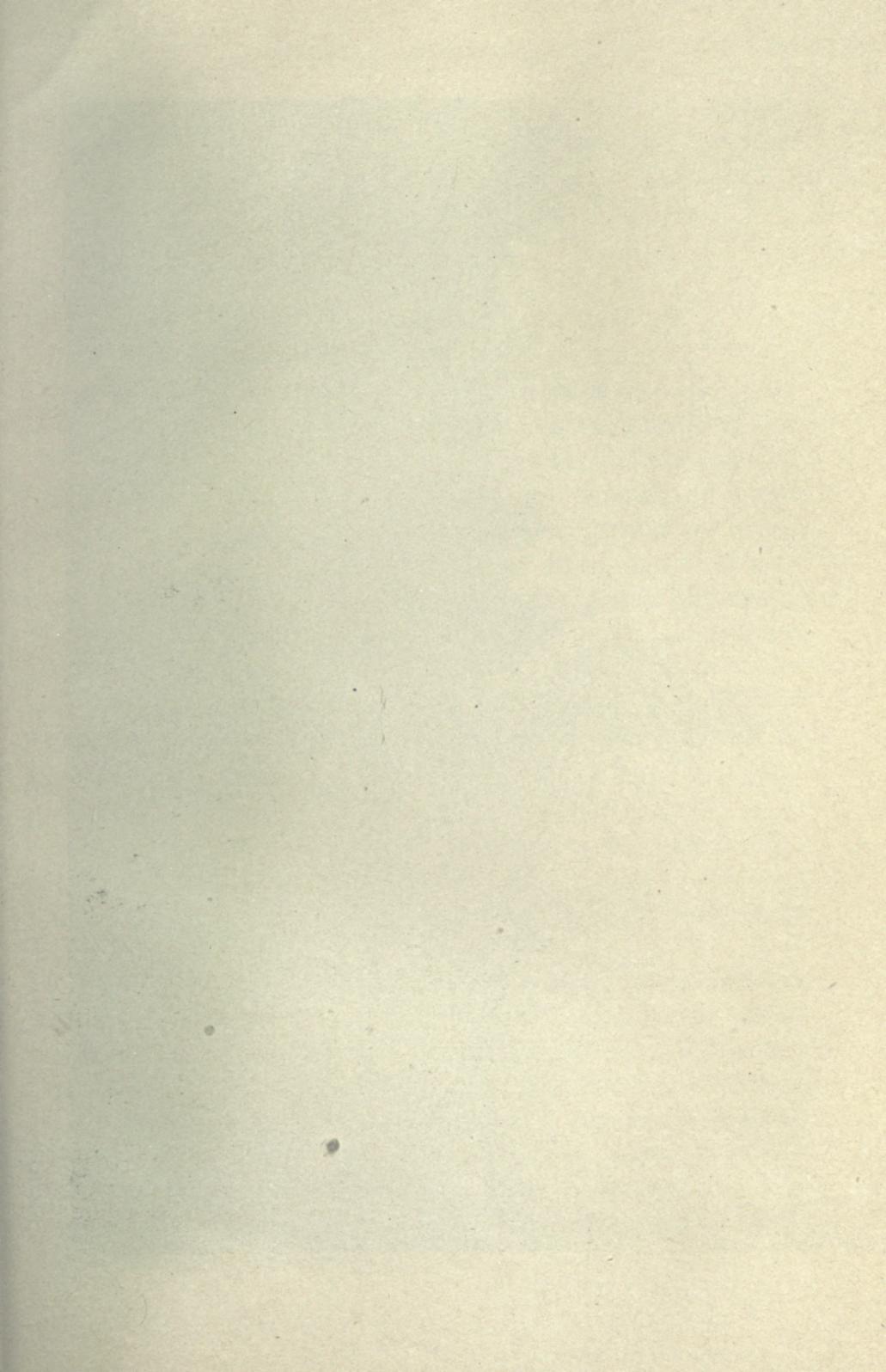
The regeneration of cutover Silver Fir (*Abies pectinata*) forests is obtained principally from self-sown seed. The Silver Fir is planted only where the species is absent at the present moment, and where the admixture of the species with other kinds already at hand appears to be desirable.

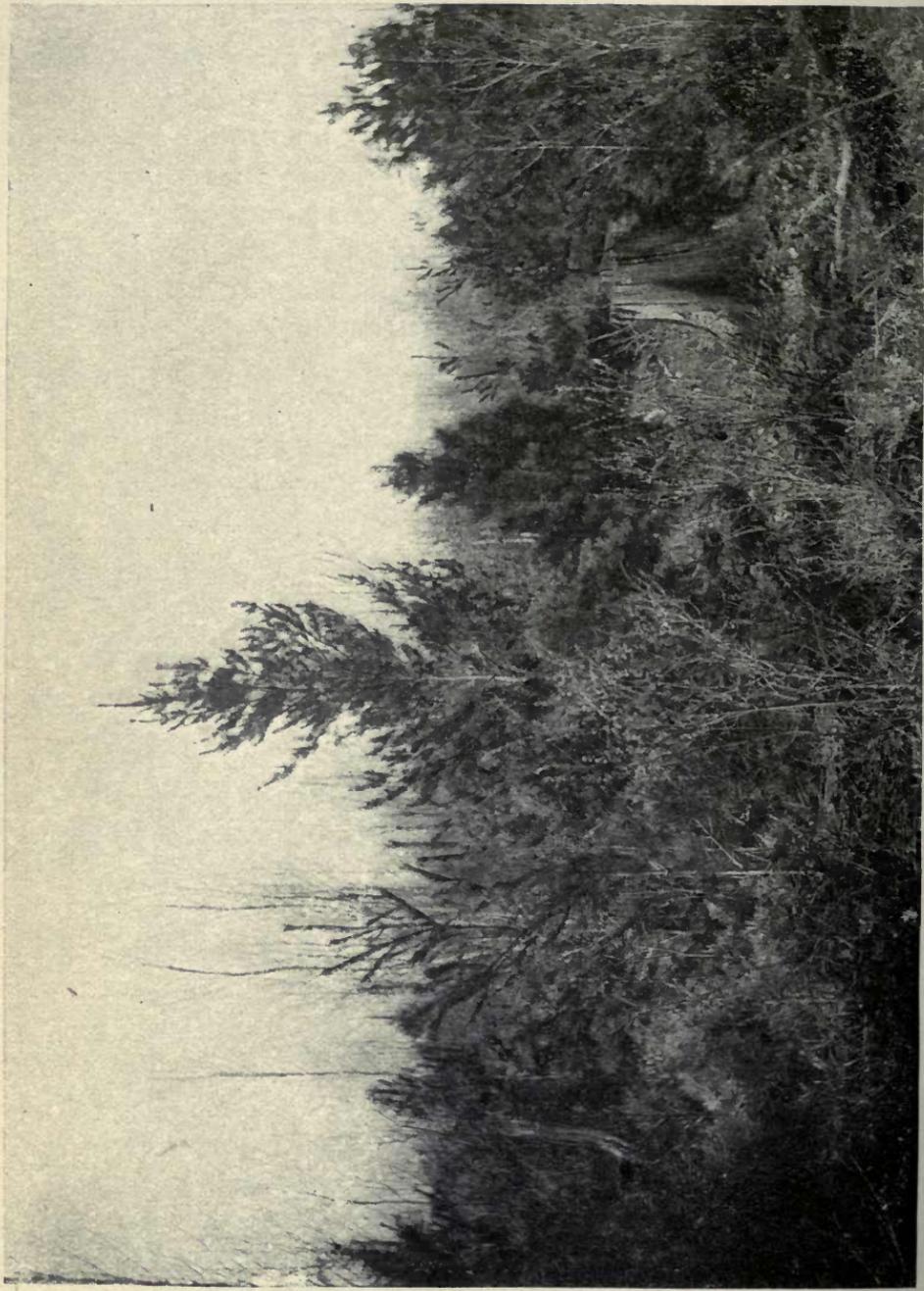
The reforestation of Norway Spruce (*Picea excelsa*) is obtained usually by the planting of seedlings. Still, wherever advance growth, starting from self-sown seed, is found to be at hand in suitable groups and bunches, there such advance growth might be used to good advantage as a means of partial regeneration.

The regeneration of Scotch Pine (*Pinus sylvestris*) is effected partly by the planting of seed and partly by the planting of seedlings.

All State Forests and Communal Forests—the latter being the property of towns, villages, cities, corporations or of funds of an educational or religious character—are administered by and are placed in charge of forest officials possessing a thorough, scientific and technical education in forestry.

The number of the forest workmen continuously employed in the forest changes from time to time. On the





Natural reproduction of White, Norway and some Jack Pine on the Fond du Lac Indian reservation (near Cloquet) from which pine was cut about twenty years ago. Keep out fire and about twenty per cent of the area of cut over pine land would become well restocked with pine naturally. Photographed April 19, 1906, for the annual report of the Forestry Commissioner of Minnesota.

1st of October, 1905, there were employed, altogether, 844 workmen. These workmen are domiciled, usually, in the nearby villages.

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## SAXONY.

### STATE FOREST.

The aggregate area of the state forest is 442,000 acres. The forests are scattered over the Erz mountains themselves and over their outskirts. They are further situated in a few smaller and separate mountain ranges and in the plains. The altitude at which the state forests are found ranges from 100 to 1,200 meters, or from 328.1 feet to 3,637.2 feet, above sea level. The first group of forests, in the Erz mountains, is pretty compact and comprises 235,000 acres. The second group, in the outskirts of the Erz mountains and in some smaller distinct mountain ranges, comprises 113,000 acres; and the third group, in the plains, comprises 94,000 acres. The soil consists of decomposed granite, granulite, gneis, mica-slate, clay-slate, grauwacke, porphyry, sandstone and some basalt. In the plains there is diluvium and alluvium. Only a very small portion of the forest area might be deemed fit for agricultural use.

The principal tree species are spruce, *picea excelsa* (Link); Scotch pine, *pinus silvestris* (L.); silver fir, *abies pectinata* (D. C.); larch, *larix europæa* (D. C.); rotbuche, *fagus silvatica* (L); oaks, *quercus pedunculata* (Ehrh.), and *qu. sessiliflora* (Sm.) hornbeam, *carpinus betulus* (L.); ash, *fraxinus* (L.); several maples, namely: *acer pseudoplatanus* (L.), *a. platanoides* (L.); further, several species of elm, *ulmus*; of birch, *betula*; and of linden, *tilia*. The prevailing species is spruce.

The value of the state forests, including timber and soil, aggregates 1903, \$86,306,000. Hence the value per acre is \$195. The annual expenses for administration for the year 1903 were \$1,270,800. In the year 1903 the annual gross revenue amounted to \$3,338,500; the annual net revenue to \$2,067,700.

The entire area planted annually varies according to circumstances. On the average it will reach 6,500 acres. Of these 6,500 acres 500 acres are planted up with seeds and 6,000 acres are planted up with plants. The question whether plants or seeds shall be employed for restocking cleared ground depends on the condition of the soil. As a general rule, seeds are planted only on such areas which do not produce grass and weeds to a large extent and which at the same time are of sufficient fertility and well protected against late frost. The sowing or planting of seeds must be done not later than in the second year after the final removal of the former tree crop. Strips about three feet wide or places about six feet square are cultivated with a spade before the seed is thrown on them. Only in rare cases the entire area to be planted with seeds is ploughed and harrowed and the seeds spread over it broadcast. The plants used for planting up a clearing are as a rule two years old or older. The age of the plants selected depends on the condition of the area to be planted aside from depending on the species itself. Spruce, Scotch pine, fir and larch, as a general rule, are used two to five years old; beech, oak, ash and maple, as a general rule, are used three to six years old. The plants are raised in nurseries. Only in rare cases they are taken from areas previously planted with seed in the open forest. The number of plants used per acre ranges between 1500 and 2500, according to the species, the size of the plants used and the condition of the area to be planted.

Regeneration from self-sown seed is only used in the case of the beech (*Fagus silvatica*) and of the silver fir (*abies pectinata*). In all other cases forests are regenerated by means of planting plants or sowing seeds.

There is no law or rule in Saxony for compulsory reforestation after clearings.

There is not much damage done by forest fires. It averages \$300 per year. Forest fires of a larger extent have happened very rarely. As a rule, forest fires are caused by the careless use of matches by tobacco and some cigar smokers. Fires are caused by sparks from locomotives; on the average perhaps ten per year.

The yield or annual cut is fixed by working plans prepared for periods of ten years and renewed after the lapse of such periods. Within these periods the annual yield is almost constant. At the end of a period, however, a new working plan might provide for either a higher or lesser yield. It is an iron-clad rule that on the whole the cut shall not exceed the increment of the forest.

Trees are cut as low down as possible above the surface of the soil; the instrument used is the saw. The stump and the root are dug out afterwards wherever such work is remunerative, viz., where the wood obtained can be sold at a paying rate. In Saxony regular forest management began with the beginning of the nineteenth century in a systematic way; hence there is no objection to clearing an entire area of given size, say of two or three acres, at once, removing from it every tree standing on it. In exceptional cases, pieces of forest not entirely mature may be sacrificed with a view of saving others from the dangers threatening from storms.

The average age of maturity in Saxony for conifers (spruce) is eighty to ninety years. However, there are cases in which this rule is not adhered to. The size of trees when fit for the axe depends entirely on the species,

on the condition of the locality, the means of transportation, etc. Previous to the final cutting, and beginning with the twenty-fifth year of a piece of forest, and ending at the sixtieth year of the forest, thinnings take place at intervals of about ten years with a view to allow increased light and increased space to the most promising specimens of the growing stock. Specimens growing less vigorously, dying or dead, are removed at the same time wherever it pays.

There is no difference in the rank of the forest officer compared to that of any other state officers employed in the technical branches of the government. The state forestry service is divided into a lower and higher branch. The professional training for the first one is a merely practical training, whilst the latter necessitates scientific preparation of a high class. The requirements with reference to this scientific preparation are as follows: Graduating from a state gymnasium; twelve months' study at a university; three years study at the forest academy at Tharandt, at which two examinations must be passed; three years of practical professional training under a forest officer and at the bureau of forest working plans at Dresden; examination by the state authorities. After this preparation, as soon as there is a vacancy, appointment as government officer might follow, to begin with as assistant of an Oberförster (Superior Forester); then as superior forester, and so on up to the higher ranks of chief of a forest territory or chief of the bureau of forest working plans. The latter officers have the title of "Superior Forest Master." The highest technical authority controlling the local and territorial officers is called "State Forest Master." There are 109 local ranges in Saxony allotted to 17 territorial districts. The former are in charge of a superior forester (Oberförster), the latter in charge of a superior forest master. The central bureau

of the entire state forestry service is under the Secretary of Finances.

The salary of a superior forest officer averages \$1,075 (from \$900 to \$1,250), to which must be added an allowance of \$600 for traveling expenses, horse keeping and the use of a house free of rental. The salary of the Superior forest master averages \$1,524, ranging from \$1,500 to \$1,800, to which must be added a traveling allowance of \$1,200 and the use of a house free of charge.

In the case of physical disability the forest officers draw a pension depending on the duration of their state service and on the salary received so far. This pension is at least 30 per cent of the salary. In no case does it amount to over 80 per cent. The latter figure is paid after 40 years or more of state forestry service. At the age of sixty-five years the state forestry officer is entitled to a pension in case he desires to retire, even if his constitution would enable him to continue in the service.

An annual report of the Saxony forest administration is published in the "Tharandter forstliches Jahrbuch." This periodical is a distinguished periodical on forestry.

As further information, it may be stated that the administration of a forest range, by the superior forester under the supervision of the superior forest master, is outlined by "the working plan" which is prepared by the bureau of forest working plans at Dresden, containing prescriptions for a period of ten years. The superior forest officer co-operates in the preparation of this working plan, which has to be submitted to the secretary of finances. The preparation of a working plan is based on a thorough knowledge and a thorough scrutinizing of the conditions of the forest range, which often takes several months. The forest working plan contains a statement showing the areas of the different compartments or units of the forest range; it contains a description of these com-

partments and maps of the same; all sections of the forests are examined with reference to their increment. All these investigations made, the forests or sections of forests to be cut during the next decade of years are selected and pointed out specifically. Further, there is stated specifically what compartments or sub-compartments are to be thinned out, what areas are to be planted up, and by what means regeneration is to be effected in each single case. Deviations from the prescriptions of a forest working plan must not be made unless authorized by the secretary of finances. Every working plan is controlled by the state forest master in the range itself. Besides, in the midst of the ten years period, or after the lapse of five years, such a control by the highest forest officer of the state takes place, so as to find out whether and in how far the prescriptions of the working plan have been followed and whether deviations might be advisable.

The sale of the forest produce (timber, fuel, bark, stones, etc.) is done by the superior forest officer with the help of a local state cashier, who is holding an office absolutely independent from the forestry service and is directly subordinate to the secretary of finances. This arrangement makes embezzlements practically impossible. The sale of timber and fuel takes place, after they are cut and piled up, by means of public auction. The cutting and piling of timber and fuel is done by common hands working under a contract. Any planting, on the other hand, is done by day workers, under the supervision of the local rangers, so as to warrant careful work.

#### PRIVATE FORESTS.

According to a statement made for the year 1900, the total area of the private and communal forests in Saxony is 520,000 acres. All forests owned by municipalities and villages and other corporations, and a considerable frac-

tion of the larger private forests, are managed according to true forestry principles. The administrations of municipal, town and village forests, also the administrations of the private forests are not controlled by the state, but the bureau of forest working plans at Dresden, prepares the working plans for the larger of these forests.

It is impossible to give any data as to the average value per acre of communal and private forests. Neither are data available as to their average annual yield. Generally speaking, the yield of private and communal forests is considered to be lower than from state forests. Wherever there are working plans the cut is steady, and even during the period over which the working plan extends. Where there are no working plans, the cut depends entirely on the pleasure of the owner.

Small holdings of forests, especially those of the peasantry, are deteriorating. Parts of such forests are changed into fields or meadows; other sections are purchased by the state; communities or wealthy private individuals.

## GRAND DUCHY OF SAX-WEIMAR.

The area of state forests is 110,910 acres, of private forests 120,510 acres, in the aggregate 231,420 acres, being equal to 25.6 per cent of the total area of the state. The state forests comprise 37 units of administration, in charge of 37 superior forest officers, trained at the forest academy of Eisenach.

The control of the local forest administration is effected through six forest inspectors, the highest authority in forestry matters being represented by a forestry bureau, attached to the office of the secretary of finances. Forest working plans are prepared and their execution controlled by the "Commission of Forest Working Plans," at Eisenach, the director of the forest academy being at the

same time chief of that commission. The annual yield of the state is 5,864,177 cubic feet of lumber and fire-wood, corresponding with about 125 feet board measure timber plus 0.31 cords fire-wood per acre per annum.

The main duties of the superior forest officers consist of: Care of the property; maintenance of boundary lines; preventing the acquisition of prescriptive rights to pasture, litter wood, etc., by outsiders, and preventing forest offenses; maintainance of the growing stock of timber; forest utilization and forest regeneration, as prescribed by the working plans; sale of forest produce and control of the book-keeping.

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## SWEDEN.

### STATE FORESTS.

The aggregate extent of the state forests of Sweden in 1895 was 18,080,753 acres. The area of state forests is annually increasing by extensive purchases of private forest. The prevailing kinds of trees are spruce (fir), pine and birch. The estimated value of the state forests is \$4 per acre. The figures in this statement are for the year 1895, in which the aggregate expense of forest administration was \$185,397, and the aggregate revenue was \$1,126,636. The number of acres sown or planted to forest was 10,875. The number of acres damaged by fire was 1,200, and the amount of damage was about \$10,000. Neglected camp fires and carelessness when burning fields for cultivation are the principal causes. Only three fires were caused by railroad locomotives. The state forests are divided into 9 districts and 74 ranges ("revir"). The chief of a district is an officer entitled "Öfverjägmästare," with annual salary of \$1,707 and rank corresponding to

the rank of major in the army; the chief of a range ("revir") is an officer entitled "Jägmästare," with a salary of \$1,200 and rank corresponding to that of captain in the army. Before any one can be appointed as "Jägmästare" he must have passed successfully the examinations required after a year's attendance at one of the forest schools, the examinations required during a two years' course at the College of Forestry at Stockholm, and must have practiced forestry a year on a range. Foresters or guards receive a salary of \$160. The state provides dwellings in the vicinity of the forests for officers and foresters. At the head of the forest administration is a director general, with salary of \$2,400, and having rank corresponding to that of a major general in the army; and a chief of bureau, with salary of \$1,867 and rank corresponding to that of a lieutenant colonel in the army.

There is a continuity of forest product based upon certain plans of cultivation. Reforesting is effected partly by sowing, partly by planting, but principally by seeds from standing trees, assisted by planting. The usual method of harvesting the forest crop is, in the southern part of the country, by cutting in blocks clean; in other parts of the country by cutting trees only down to a certain size fixed by law. The total forest product of the country is sustained, and it is increasing.

#### PRIVATE FORESTS.

The aggregate extent of private forests is 58,715,135 acres and their average value per acre is estimated at about \$5. About twenty-five per cent of private forests is managed on forestry principles. A royal committee is preparing a project of forest laws to promote re-growth of private forests.

## FORESTS OF THE UDDEHOLM COMPANY, SWEDEN.\*

The forests of the Uddeholm Stock Company are situated in nine parishes in the province of Vermland and in two parishes of the province of Dalarne. Karlstad, on Lake Wenern, about fifty (English) miles distant, and Gothenberg, about one hundred and eighty miles distant, are the nearest export harbors. Lake Wenern is connected with the Baltic and also the North Sea by the Gotha and Trollhatte (canals). The company owns fifty-six miles of railroad—Nordmark-Klarelfven—with thirteen stations, which transports all sorts of goods, especially iron and lumber, to and between the works. The company owns 400,000 acres of land in Vermland and 25,000 acres in Dalarne. About 60,000 acres have been acquired within the last ten years. Of the entire area, not exceeding 60,000 acres consist of naked tracts, fields, meadow, also unproductive surface of moss, lake and rocky elevations; while at least about 375,000 acres consist of natural forest-bearing land. Hereof perhaps 15,000 to 18,000 acres are pasture land. Pine comprises 70 per cent of the forest, and spruce 30 per cent of all trees large enough for the saw. The birch is the prevailing species within the pasture, but among the birch conifers are generally found.

The Uddeholm Company's lands lie on both sides of the Klar river along its middle course. The parish of Råmen, in Vermland, and the boundary of Dalarne terminate the extent of the property on the east and the two judicial districts of Fryksdal on the west. About 375,000 acres lie in one body. Only a very little public forest and some belonging to farmers are included therein here and there. The rocky elevations consist of primary rocks, principally granite and gneiss, with interspersed

\*Information furnished in Swedish by Dr. Fredrik Loven, chief forest master, through Mr. Gust. Jansson, manager of the Munkfors Iron Works.

hills of hyperite. West of the Klar river red iron gneiss is almost the prevailing rock, but east of the same river granite prevails, in large part solid, not crystalline, but there are large tracts of primary granite poor in feldspar. On granite, pine prevails to the extent of 75 to 80 per cent, while on gneiss spruce occupies at least 40 per cent of the surface. On the "hyperite" hills spruce of large growth prevails. The soil in the forest is composed partly of the disintegrated rock such as above mentioned and partly of deposits of older or later water courses. Much of the soil is gravelly; much also is sandy. The Klar river within the region of the Uddeholm forest is 400 feet above the sea, and on the east and west sides rise very steep hills which at a distance, generally of a thousand yards, attain a height of from 1,000 to 1,500 feet above the sea; thereafter they take a plateau form, but are very often broken by water courses or bogs. The whole region is thereby in a large degree of that cut or broken character which one can readily obtain an illustration of by ascending one of the principal heights. The highest and only actually barren-topped mountain in the company's forest is Harfjellet, 2,200 feet above the sea. Another, Tönnet mountain, 1,700 feet above the sea, is called a "fjell" (barren-topped or snow-covered mountain), but it is not actually that, for it is partly forest-covered.

Agriculture takes a subordinate place; the land most suitable for cultivation is generally along the banks of the larger streams. About 700 persons occupy small farms as tenants and are obliged to produce certain quantities of charcoal, in general 6,600 bushels each, and in all 4,620,000 bushels. They are also obliged to transport the coal to the works. Besides, there are several hundred forest laborers with smaller premises on which one of two cows and several smaller animals are fed. About

14,000 persons live and gain their livelihood on the company's property.

About 3,000 acres (2,700 to 3,000 "tunnland"; one tunnland being equal to 1.22 acres) are consumed or cut over annually; though it is not easy to say just how much, because clean cutting and selection cutting (cutting only the larger trees) are both practiced. On an average every tunnland (1.22 acres) ought at the end of every rotation period—120 years for pine and 90 years for spruce—yield from 4,000 to 4,500 cubic feet of lumber.

The forest is handled by means of cutting trees that hinder the growth of others or which are themselves defective ("hjelp och rensningsgallringar"), and thinning to admit light ("ljushuggningar"), consisting of two to three careful timber cuttings with an interval of 15 to 20 years, which end either by leaving seed trees or in clean cutting. The best stands of pine are finally cut at the age of from 130 to 140 years, and the middling at the age of 120 years, and the poorer at the age of 100 years. The spruce stands in which thinning is much practiced are nevertheless very sensitive to damage from excess of light, wherefore timber cutting must be undertaken with great care and skill, otherwise drought occurs. Spruce is cut at the age of 70 to 100 years, according to its quality. During the past ten years there has been cut yearly 12,000,000 cubic feet of lumber of various sorts, namely, of saw and building timber, 2,000,000 cubic feet; spruce for paper pulp, 850,000 cubic feet; telephone and telegraph poles, 125,000 cubic feet; firewood, 2,275,000 cubic feet; wood for charcoal, 6,600,000 cubic feet; miscellaneous, 150,000 cubic feet. Besides, there was each year brought to the works and consumed stub-wood to the amount of 1,500,000 cubic feet.

Certainly not more than 15, or at the highest 20, per cent of the cut-over area becomes restocked by natural

seeding. The cuttings are not so large but what the by-standing trees can in an essential degree contribute to renewal, and, besides, very often 15 to 20 seed trees are left on each 1.22 acre tract. The difficulties which forest culture meets with in this locality are very stony land, spring and summer drought, spring frost, sometimes, as during the previous year, excessive rain, mossy or swampy land and land heavily pastured by cows and sheep. On the other hand, the forest area is not much troubled with heath, strong growth of grass, insects, etc. In regard to sowing, the twigs are burned immediately after the frost is out of the ground, and while the ground is damp. Generally the following year the cleared area is sown with pine and spruce seed. On pine land spruce seed is mixed to about 50 per cent. On land which is suitable for both, 60 to 70 per cent of spruce seed is used. On pure spruce land 15 to 20 per cent of pine seed is mixed in. On cleared land, to prevent injury from drought, long, narrow seed strips—made by hatchets—are used about a yard apart, not large squares; but when heath or grass growth is to be feared then planting is to be preferred. For hacking of these seed strips are selected places which are suitable for the growth of the seeds and protection of the plants, such as the north side of shading objects,—for example, stumps, windfalls, fixed rocks, etc. The seed is laid on the south corner of the seed strip so that seed and plant will be better shaded. When sown on rocky land it has to be raked and covered by hand. On even ground the seed strips should be made in a direction from east to west, and the seeds not deep, harrowed down along the south border of the strips. On the other hand, on steep descents the seed strips should be laid horizontally, so that the seed, in case of heavy rain, shall not be washed down the hill. During the latest ten years there have been yearly about 2,400 acres

sown with from 800 to 900 kilograms of conifer tree seed.

The planting of forest trees takes place on the company's land on a small scale and only where strong growth of grass hinders the growth of young forests. That is usual on good spruce land. There are planted four-year-old transplants from four to five feet apart, so that the number of plants on a tunnland (1.22 acres) varies between 2,250 and 3,500. The average number of trees standing on an acre at the time of cutting is very different, depending on previous cuttings. To more fully answer this question as to old forest on gravelly land which has not been subjected to other cuttings than the thinning of too crowded trees and cuttings of defective trees, the number of trees on two tracts, each of two and a half acres extent, have been counted with the following result: First tract, average pine land, pure stand of pine; average age, 135 years; average height, 85 feet; diameter measured 5 feet from ground. There were found 8 trees with diameter of 5 inches, 13 of 6 inches, 20 of 7 inches, 27 of 8 inches, 34 of 9 inches, 42 of 10 inches, 44 of 11 inches, 44 of 12 inches, 53 of 13 inches, 40 of 14 inches, 30 of 15 inches, 16 of 16 inches, 11 of 17 inches, 3 of 18 inches, 2 of 19 inches; total, 385 trees, containing 9,178 cubic feet. Second tract, good pine land; young spruce successively grown up; pine of average age of 130 years and average height 85 feet; there were found 3 pines and 37 spruces 5 inches in diameter, 44 pines and 58 spruces 6 inches, 61 pines and 37 spruces 7 inches, 77 pines and 28 spruces 8 inches, 76 pines and 11 spruces 9 inches, 82 pines and 7 spruces 10 inches, 83 pines and 6 spruces 11 inches, 73 pines and 3 spruces 12 inches, 53 pines and 1 spruce 13 inches, 30 pines 14 inches, 14 pines 15 inches, 9 pines 16 inches, 5 pines 17 inches, 1 pine 19 inches, 2 pines 20 inches (in diameter); total, 613 pines and 188 spruces, in all 12,013 cubic feet.

Thus were found about 300 trees left per "tunnland" of about 5,300 cubic feet, which, according to an average age of 133 years, shows a yearly average growth of 40 cubic feet per "tunnland" (1.22 acres). If, on the other hand, timber cutting is done once or twice before the final cutting, as is usual, the number of trees at the last is much less. To prevent forest fires, during very dry weather, strict watch is kept by 30 forest guards and by extra ones, and in addition all of the company's dependents are obliged, when a forest fire breaks out, to send notice to the forest guard or forest manager and assist in extinguishing it. Generally the precautions are effective in preventing such fires. No forest fire worthy of mention has occurred in twenty years.

The company's land has been used for forest more than 100 years. It cannot be said what the net revenue is per acre, as the greater part of the product is used at the works in form of coal or fuel. The average yearly growth per "tunnland" ought to be 40 cubic feet, of which one fourth, or 10 cubic feet, should be saw timber of the net value of 1.50 kronor; 10 cubic feet of building timber, worth 1 kronor; 20 cubic feet of wood, worth 0.70 kronor, or, for the 40 cubic feet, 3.20 kronor (equal to \$0.85).

The income from game is not large. There are shot annually 12 elks, many hares and game birds.

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## SWITZERLAND.

The Swiss Confederation is composed of twenty-two cantons, which are separate and sovereign states; and while each canton has legislative authority over forests, the Confederation also exercises legislative authority over them in certain regards. In conformity with the prescriptions of the federal law of October 11, 1904, all forests of Switzerland are placed under the supervision of the Confederation.

The Confederation itself is not actually the owner of any forests, but some of the separate states are owners. The forest domains are part of the national wealth, and comprise 96,497 acres. There are also in the cantons the forests of the municipalities and of the corporations, comprising 1,414,677 acres. Besides there are private forests comprising 604,014 acres. The total area of forests is therefore 2,115,188 acres, or about 20 per cent of the total area of Switzerland.

Forests are found everywhere in the high mountains. Forests are found standing at 200 meters above the sea level (in the canton of Tenin) and reach as high as 2,100 meters in the high mountains. In Grisons (Engadine) they even reach 2,300 meters in altitude.

The more common varieties of trees are among the resinous kinds, the Norway Spruce (*Picea excelsa*) the Silver Fir (*Abies pectinata*) the Larch, the Scotch and Mountain pines, the Cimbrian pine; among the deciduous kinds, the beech and the chestnut trees; this last kind grows especially in the canton of Tessin.

The value of forest land varies greatly and depends on the location, the nature of the soil, thickness of the settlements, the increase of these settlements and on the trade in timber and other products of the forest. The value of per hectare (2½ acres) may range accordingly from 300 francs to 6,000 francs.

In regard to expenses of administration, a distinction must be made between the expenses incurred by the Confederation and those incurred by the cantons. In 1904 the expenses incurred by the Confederation for forest administration amounted to \$112,600.

The following were the net receipts from State Forests in 1903 as to a few cantons:

Berne, 787,000 francs or 60 francs per hectare of forest.

Soleure, 31,500 francs or 38.33 francs per hectare of forest.

St. Gall, 58,000 francs or 59.62 francs per hectare of forest.

Schaffhouse, 113,100 francs or 45.33 francs per hectare of forest.

Argovie, 151,600 francs or 49.73 francs per hectare of forest.

Thurgovie, 83,000 francs or 65.90 francs per hectare of forest.

Neuchatel, 58,000 francs or 30.26 francs per hectare of forest.

The net receipts from towns of their forests in 1903 were:

Winterthur, 99,100 francs or 91.07 francs per hectare forest.

Schaffhouse, 35,000 francs or 77.05 francs per hectare of forest.

St. Gall, 104,800 francs or 144.36 francs per hectare of forest.

Coire, 49,200 francs or 43.65 francs per hectare of forest.

On an average about 593 acres of forest have been created annually during the past thirty years, at the expense of the Confederation, the cantons and the owners of the grounds.

In order to regenerate the forests, both planting and natural seeding are practiced, as may be most effective.

In the lowest countries, where clean cutting is practiced, planting is resorted to. Where real dangers exist from avalanches, land-sliding, etc., which do not permit complete denudation, and where gardening is required, natural modes of regeneration are generally used, and sowing is seldom done.

Reforestation by the Confederation in high mountain regions costs on an average 400 francs per hectare for 6,000 to 7,000 plants set in their places.

The federal and cantonal legislatures prescribe a sustained production for the forests of the state, of the towns and of the municipal corporations. If, through winds,

snow-slidings or otherwise, too much timber has been destroyed, less cutting is done in the following years, in order that as rapidly as possible the forest may regain the number of trees fixed by the management. The forests are operated in various ways, according to localities and according to the size of timber that is to be grown, as high-forest, coppice with standards and coppice.

In accordance with the terms of the federal law, the forest area cannot be reduced. The cleared land must consequently be reforested except in cases where an equal area of land is converted into forest. Furthermore, the cantons as well as the Confederation have the right to compel the creation of protective forests wherever they are needed for public utility.

Forest fires seldom occur. Of those which do occur the principal causes are carelessness in lighting fires in the immediate vicinity of the forests, and lack of care in the woods. It is rare that a forest fire is occasioned by locomotives.

The administration charged to execute the federal forest law is the Federal Inspectorate of Forests, forming a part of the Swiss federal department of the interior. Nearly all the cantons have for their territories a forest administration. In the small states one single technical official is at the head of the service, but in the larger cantons the administration is under the direction of one or more chief forest inspectors or chiefs of the service and of several district foresters or forest inspectors. An inferior personnel instructed in courses lasting two months is attached to this technical personnel, and is organized to execute the work of forest economy.

A few cities or towns with extended and important forests have also a self forest administration, at the head of which is a person of technical forest training. Among

them are Zurich, Berne, Lausanne, St. Gall, Winterthur Fribourg, Coire, Soleure, Schaffhouse.

The Chief Federal Inspector of Forests has an annual salary of 8,000 francs and fees of eight francs per day, and eight francs per night, when he has to be absent, for his service; he gets his traveling expenses reimbursed, his first assistant has a salary of 6,400 francs and is similarly indemnified for his inspection trips.

The three inspectors of the canton of Berne receive each 5,300 francs per annum. They receive extra pay, six francs per day and four francs per night, for all inspections made outside of their city, and their traveling expenses are reimbursed.

The high forester or chief inspector of the canton of St. Gall, who has a salary of 5,000 francs, receives twelve francs per day and five francs per night, besides his traveling expenses, when out inspecting.

The Federal Inspectorate of Forests publishes every year a report on its management. The majority of the cantonal inspectors do likewise.

In the matter of taxes, the cantons are sovereign in their own limits. Taxation therefore differs according to the cantonal territory to which it applies. In all these states a tax on the forest is imposed, and in most states that tax is combined with the tax on income. But for one and the same forest only one of these two modes of taxation is generally applied. A few examples will show: In the canton of St. Gall the state has paid to the towns in which it has forests a tax of 1.20 francs per hectare. In Argovie the state pays to the towns where its forests are situated a tax of 2.40 to 3.20 francs per 1,000 francs of forest value. On the other hand, the towns only pay to the state a tax of 40 centimes per 1,000 francs of forest

value. The private forest proprietor pays to the state 40 centimes and from 2.40 francs to 3.20 francs to the towns per 1,000 francs of forest value; and in addition thereto he is taxed on the income in the amount of one per cent of the average two per cent of gross declared value of the forest, but neither the state nor the towns pay a tax on the income of their forests.

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## WURTEMBERG.

Wurtemberg lies west of Bavaria, and is the third German state in point of area, its population being a little over 2,000,000. Its greatest length from north to south is 140 miles, and its greatest breadth is 100 miles. One-third of the Black Forest (so called from the dark foliage of its pines), and which forms a sort of a triangle, lies within Wurtemberg, two-thirds being in Baden. The Black Forest has a total length of 93 miles, and its breadth varies from 13 to 46 miles.

### STATE FORESTS.

The Government forests occupy one-third of the entire forest area of the Kingdom and comprise 420,000 acres, namely:

Oak, 2 per cent; beech, 26 per cent; Scotch pine, 10 per cent; Norway spruce, 44 per cent; silver fir, 15 per cent; maple, ash, walnut, etc., 2 per cent.

The price of the forest land from which the timber is cut, varies according to local conditions and amounts, on the whole, to \$35 or \$40 per acre.

During the period 1893 to 1903, the Government bought annually about 250 acres of forest land for the purpose of the enlargement of its possessions; and, further, with a view to obtaining possession of solid boundaries of land.

The annual aggregate expense of administration of the forest amounts to \$1,183,574. Of this \$364,140 is paid to wood-cutters, \$147,560 is expended on roads, \$90,440 in forest culture, \$259,468 for pay of officials, \$148,468 for forest guards. The revenue was \$2,928,352, yielding a net revenue, after for 1895-1896 deducting all expenditures, of \$1,744,788, or \$3.63 per acre. The number of acres annually sown to forest is 296, and the number of acres planted to forest 6,177.

About one-fifth of the state forests is regenerated from self-sown seed, whilst the remaining four-fifths are regenerated by the planting of seedlings.

It is a principle to maintain (as far as the division of the age of the plantings permit) an equal annual cutting. At present the cutting is fixed at 1.94 cubic meters per acre. The cutting is contracted for with laborers living in the neighborhood of the woods. By good management there are at a given plot generally trees of about the same age. If the natural seed falling is intended to be used, the larger trees, either single or in crops, are cut out in a direction against the prevailing winds; the remaining trees are thinned and gradually cut out as the growing young trees may demand. If the natural seed falling is not taken into consideration, the wood crop is cut clean in narrow strips, also in a direction against the prevailing winds, and the cutting of the second and following strips is postponed until the young plantings can dispense with the side protection of the old woods. It is a principle that replanting follows immediately after the cuttings.

The Government officer, in forestry, has placed in his charge about 3300 acres of state forests, in addition to the management of, approximately, 2700 acres of communal forests. The State Forest officer, at the same time, is placed in charge of the forest policy of the state, under

the law of Feb. 19th, 1902; and in this capacity, prevents the mismanagement of protection forests.

The headquarters staff comprise, 1 President; 12 Technical Foresters (including the Commander of the Forest Guard); 2 Members, attending to the financial side, bud, gets, etc.; 1 Member, attending to buildings; 1 Member, attending to local matters. The salary of the President is \$2000. The salaries of the other members, known as "Councilors", vary between \$1350 and \$1810 per annum.

In regard to the rank in the forest service, as compared with other branches of the public service, it may be said that the forest officials rank in general equally with those state officials who are graduates of the university.

Workmen continuously employed in the forests are used only in a few large forest districts, notably, in certain parts of the Black Forest; otherwise, forestal labor is attended to by men usually employed in other vocations. Only in the case of workmen permanently employed, attention is paid to the proximity of home and Forest.

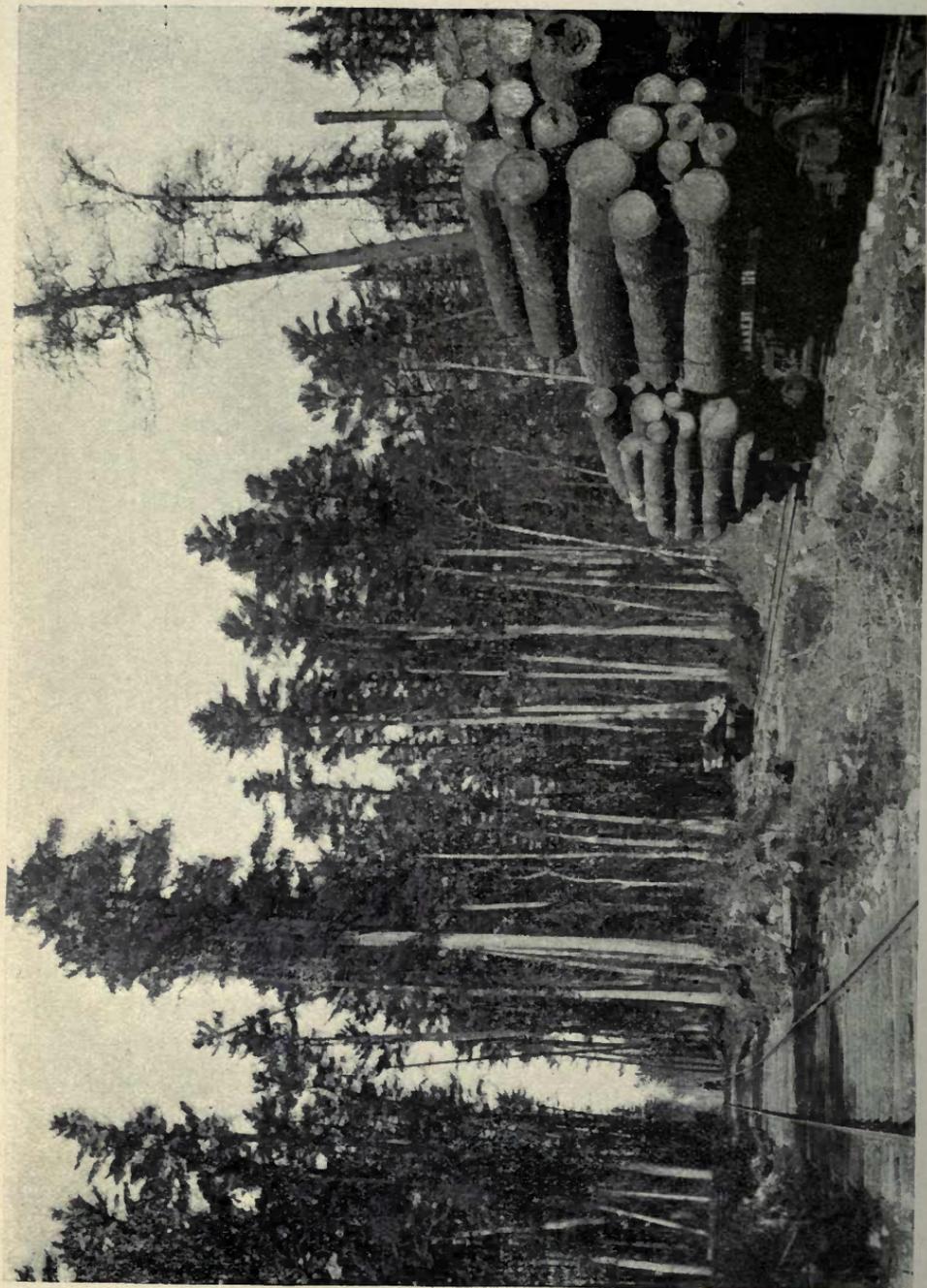
On 2500 acres of forest land, about 12 workmen may be employed during the entire year. The wages of the forest workmen are somewhat better than those of the common workmen, in order to retain the necessary amount of good labor for forestry.

During the years 1901 to 1905, there occurred altogether 124 forest fires. The damage caused by these forest fires was as follows: 2 forest fires, each \$300; 17 forest fires, each between \$25 and \$250; 105 forest fires, less than \$25 altogether.

The entire damage done by forest fires within the state forests of the Kingdom of Wurtemberg, and within the period of 1901-1905, amounts to \$2200.

The main causes of such forest fires are carelessness while smoking and lighting fires near forests. Forest fires are very rarely caused by sparks from locomotives.





Logging of White and Red (Norway) pine, in Township 53, Range 15, St. Louis County, Minnesota. Photographed April 19, 1906, for the annual report of the Forestry Commissioner of Minnesota.

## FORESTS OWNED BY CORPORATIONS.

These forests are about as extensive within the Kingdom of Wurtemberg as the Government forests proper. They are owned by municipalities, towns and such institutions as may follow out public purposes, and are subject, as such to Government control.

The arrangement of supervision and management at headquarters, in the case of Corporation Forests, is the following: 1 President; 12 Technical officers (the same men who form part of the State forest management); 4 members, having particular experience in the administration of communal matters.

Corporation forests must be managed, on the basis of forest working plans, in such a manner that a sustained annual yield is obtained under the local supervision of foresters who have obtained the training prescribed for for State forest service.

## PRIVATE FORESTS.

The forest area contained in private forests comprises 36 per cent of the forest area of the Kingdom or 537,000 acres. Approximately 200,000 acres, out of the total number of private forests, are placed under the management of trained foresters, whilst the management of the rest is merely limited by the law of Feb. 19., 1902, known as the law on Forest Policy.

According to this law, in the case of forests playing the the role of protection forests, and being essential as such for the benefit of the commonwealth in safeguarding the interests of the lowland no clear cutting and no very heavy thinning is allowed without the consent of the forest political authorities. These officials, at the same time, see to it that proper reforestation follows in the wake of heavy cuttings. If a private forest is maltreated, or if

damaging natural phenomena, or the spread of damaging insects, are apt to be caused by the mismanagement of a given private forest, then these same authorities take measures to prevent bad effects from resulting to the general welfare of the country.

Under the forest policy law, above mentioned, no forest must be converted into permanent farm land, unless the consent of the forest authorities is previously obtained. Permission is usually not denied, if the soil in question is better adapted to farming than to forestry, provided that climatical damage is not apt to result from the change; and, further, provided that adjoining forests are not endangered, notably, by windfall as a consequence of deforestation to the windward. As a rule, only small portions of forest are converted into farm land; and since a large number of abandoned farms have been reforested in the last ten years, there has been witnessed an increase of the forest area and not a reduction.

It may here be stated that in respect to net revenue Saxony and Wurtemberg stand at the head of forest administration and forest culture in general.

As further showing the situation in Wurtemberg I quote from the personal observations of Mr. Austin Cary, an American forester:

“The black forest is a region of high and rough land about a million acres in extent, partly in Baden and partly in Wurtemberg. It is well cut up with railroads and turnpikes; it has towns and villages scattered all through it, but much the greater portion of its area is covered with trees. The first forest of which I gained any knowledge was the property of the city of Freudenstadt, in Wurtemberg. I remember thinking as I rode up to the place by rail and found it a city of 6,000 inhabitants, that it wouldn't do for a man like myself, who wished to see nothing but woods from morning till night, to live in the

city. I would get off into the woods themselves and live. How great was my mistake! The forest was all about us. In five minutes' walk from the center of the city one could step into such fine woods as cannot be found in the whole state of Maine. Spruce and fir trees two to three feet through, and all the way up to 130 feet high, stood on the ground as thickly as they could stand. There were acres there that would cut more than 100,000 M. The previous summer I had cruised all through the spruce lands of the Kennebec, and here on single square miles was more timber than on whole townships on that river. And the best of it was this was no new or exceptional thing. The whole area of the forest was doing it. If it hadn't old timber it did have young, which is quite as essential to the result. They were growing that timber right along because they knew how to do it and because they were patient enough to wait for results."

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FREDERICK THE GREAT, THE FATHER OF GERMAN  
FORESTRY.

Frederick the Great promulgated laws in 1740 and 1754 for regulating the cutting of wood, which previously had been done as everyone pleased, without any regard to re-planting. In place of such improvident practice he established rotations of 70 years; that is, he provided that forests should have 70 years in which to mature before being cut, also prescribed methods of thinning so that the young and healthy growth of oak and beech would be better protected. Later instructions were issued in 1764, 1770, 1780, 1783. In addition to this he instituted communal forests under the care of wardens, forbade private owners from every wasteful cutting and placed under the care of the state a portion of the forests in Silisia which previously

had belonged to private parties. Frederick the Great ordered the division of the national forests into compartments or blocks, each of which was to acquire the age of 70 years before being cut. But inasmuch as it was found that 70 years were not sufficient for the proper growth of the trees, each of these main compartments were subdivided into two compartments, so that a period of growth running 140 years was established.

There had been, in more ancient times, laws relating to forests for certain parts of Prussia, the first dating 1547. These related to the right of using the forest and necessity of replanting, more than to general systematic care. One can therefore properly claim that Frederick the Great is the father of the German forests, as it was he who created the existing forestry laws and made them apply to private as well as to state forests.

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### THE WORKING PLAN.

The "Manual of Forestry" in five volumes, by Dr. William Schlich, principal professor of forestry at the Royal Indian Engineering College, Cooper's Hill, England, and formerly Inspector General of Forests to the Government of India, is the best work on the subject in the English language. Dr. Schlich has kindly given me permission to copy from his third volume an account of the "working plan" as used in forestry, and what follows on that subject is taken from that volume.

Forest working plans regulate, according to time and locality, the management of forests in such a manner that the objects of the industry are as fully as possible realized. The working plan for a protection forest, or a park-like forest, is altogether different from that of a forest which

is managed on economic principles. The latter is the kind with which we have here to do.

The working plan report is a document which gives necessary information and which describes the system of management in such detail as may be required in each case. For forests which are of great value, and which yield high returns, very detailed plans should be drawn up; for forests which give as yet only small returns, simple plans would be indicated.

## WORKING PLAN REPORT.

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1. Name and situation of forest; name of proprietor.
2. Boundaries.
3. Area.
4. Configuration of the ground.
5. Rock and general character of the soil.
6. Climate.
7. Legal position of forest, rights and privileges.
8. Surrounding population and its requirements.
9. Markets, lines of export.
10. Prices of the several classes of produce.
11. Cost of extraction and of transport to markets; supply of labor.
12. General description of forest growth.
13. Injuries to which the crop is exposed.
14. Rate of growth.
15. Yield tables, volume tables. form factors, reducing co-efficients, etc., used in the calculation of the volume and increment of the woods.
16. Organization and strength of the forest staff.

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WORKING PLAN FOR A PORTION OF THE STATE FORESTS OF  
THE HERRENWIES RANGE IN THE BLACK FOREST,  
GRAND DUCHY OF BADEN.

PERIOD 1884—1893.

WITH THE RESULTS OF THE ACTUAL WORKING.

GENERAL DESCRIPTION.

I. *Area and Boundaries.*

The areas are recorded as follows:

(a) Productive area . . . . .	1,747 acres
(b) Unproductive area . . . . .	nil. "
(c) Other areas, including fields, meadows, etc. . . . .	2 "

Total area . . . . . = 1,749 acres

Alterations in the above figures will probably become necessary when a fresh survey is made.

The outer boundaries are in order, but the internal boundaries require rectification.

## 2. *Locality.*

The forest here in question occupies on the whole the slopes lying between a hill range on the south and the river Schwarzenbach on the north. The highest point of the hill range, the Hoher Ochsenkopf, has an elevation of 3,465 feet above the sea, while the lowest part, near the Schwarzenbach, is only 2,000 feet above the sea, the mean elevation being placed at 2,600 feet.

The slopes, on which the forest is found, are mostly steep, level spots being only found on the summits of the hills, and toward the lower end, where granite and Bunter Sandstein meet.

The area is drained by the Schwarzenbach (a feeder of the Raumünzach) with its two feeders, the Gartenbach and Dobelbach. The first mentioned runs from west to east, and the two latter, more or less, from south-west toward north-east. It follows that the forest in the valley of the Schwarzenbach has generally a north aspect, and in the valleys of the Gartenbach and Dobelbach a northwest aspect on one side, and a southeast aspect on the other side of the streams. All the forest areas (except those situated at the highest elevations and which are of no importance) are protected by intervening ranges against the prevailing winds.

Up to a mean elevation of 2,500 feet, granite is the principal rock, which is sometimes (though rarely) pierced by porphyry. Above the afore-mentioned elevation the granite underlies upper Bunter Sandstein (Vogesen Sandstein), and the latter accordingly prevails in the larger part of the forest area.

The granite is generally rich in orthoclase and oligoclase, and therefore decomposes readily, and furnishes mostly a deep soil rich in mineral elements. The decomposition is facilitated, and the quality of the soil improved, by the remarkably numerous springs which appear between the granite and the Bunter Sandstein. Hard slow decomposing quartzite is of rare occurrence.

The Bunter Sandstein is characterized by rapidly and greatly changing mineral composition, consisting sometimes of readily decomposing rock yielding a deep clay soil, in other cases of hard quartz-gravel, frequently found on the surface in the numerous bolder-drifts. The Bunter Sandstein has numerous rents and fissures in all directions, so that it is rapidly drained, and the disintegration and decomposition are only rarely assisted by springs, which at the best are scanty and intermittent. It follows that the Bunter Sandstein soils, even when formed by the easily decomposed and minerally rich clay sandstone, never equal the best quality of the granite soil; moreover, they change frequently and very suddenly, and without any visible cause, into almost unproductive areas.

On the flat hill tops, layers of fine white sand (produced by the disintegration of the gravelly sandstone) frequently produces an impermeable stratum, preventing the water from percolating, thus causing bogs (or "Gründe") which often extend over considerable areas and are almost unproductive.

The quality of the soil, therefore, ranges between good and unproductive, in the following proportion:

Good and fairly good to medium	= 78 per cent.
Medium to indifferent	= 12 "
Indifferent to unproductive	= 10 "

The climate is rough, and is characterized by long winters with an abundant snowfall, and by rapid changes of temperature; at the same time it is throughout favorable for forest vegetation, especially for conifers.

### 3. *Species.*

The details will be found in the description of compartments. Generally speaking, the spruce and silver fir are the prevailing trees, the former being more abundant in the middle and upper parts, the latter at the lower elevations. The beech is associated with them locally and in varying proportions. Scotch pine is found in the granite region chiefly upon dry, steep, rocky slopes with a southerly aspect, and in the sandstone region, especially on dry ridges and the top of the mountains, as well as here and there in other localities. The three conifers attain a maximum height of 140 feet, with regular shaped and little tapering stems. Toward the upper limit of the area the height growth diminishes rapidly, dwindling down to 20 or even 15 feet on the high plateaux. Here the mountain pine and the birch are also found. Reproduction is generally good, except at the higher elevations. A marked difference is found between northern and southern slopes, the growth and reproduction being far more vigorous on the former than on the latter.

The silver fir is much exposed to cancer. Windfalls and snow breakage are fairly moderate, while the damage from insect attacks is very small. During the years 1874-83, the following proportion existed between the different classes of fellings:

Cuttings caused by insect attacks	=	1	per cent of total fellings.
"    "    snow breaks	=	12	"    "    "
"    "    windfalls	=	16	"    "    "
Cancer and other diseases and injury	=	19	"    "    "
Other cuttings	=	52	"    "    "
Total	=	100	"    "    "

### 4. *Method of Treatment and Rotation.*

The situation and the species necessitate the area being treated under the high forest system. The quality gradations, as indicated under 2, are so conspicuous locally that it is possible (as well as desirable in order to secure a proper idea of the condition of the forest), to group the growing stock according to its characteristics as produced by the quality of the locality, and according to the method of treatment thereby indicated. The actual basis of this grouping is the yield, and based upon it, the net income or financial result of the management. In this sense the forest may be divided into the following three groups:

*a. Areas Subjected to an Intensive Management.*—To this group belong all areas which, in virtue of their quality (as indicated mainly by the height growth of the trees on fully stocked areas) are capable of producing large timber; areas on which carefully conducted regeneration fellings will produce natural regeneration within a reasonable period of time, and where the cost of any artificial assistance in regeneration is commensurate with the anticipated returns. As lowest limit of this group a normal increment of 43 cubic feet per year and acre, calculated for a rotation of 120 years, has been fixed. The area thus included in the group amounts to 78 per cent of the whole. It is with this area, and the growing stock standing on it, that the management must more especially reckon, and from which the

largest possible sustained yield must be secured. With a suitable composition of the growing stock and a careful application of silvicultural principles, that object may be obtained under an average rotation of 120 years.

As regards the silvicultural treatment, and especially the regeneration of the woods, two different classes of forest or growing stock (corresponding with two qualities of locality) stand out prominently.

*First:* Forest of spruce with a strong admixture of silver fir (the latter occasionally predominating) more or less frequently interspersed with beech and more rarely with Scotch pine.

*Secondly:* Forest in which spruce predominates with a slight admixture of silver fir and here and there of Scotch pine, but devoid of beech.

The first class of forest occurs in the granite area and on those parts of the Bunter Sandstein (clay sandstone), which have deep, easily decomposed soils fit to be classed as good. The characteristic features of this class of forest are the occurrence of beech and deep soils, rarely covered with boulders or debris, lying mostly at the lower elevations; natural regeneration can here be successfully effected in a comparatively short period of time.

The second class of forest occupies the stony slopes of the Bunter Sandstein area, and in exceptional cases the quartzite parts of the granite area. Here the soil is generally covered with loose boulders and rock debris of varying size. These areas are nearly all found at the middle to upper elevations. The conditions described demand the maintenance of an uninterrupted canopy up to the age of maturity, and a careful execution of the regeneration cuttings spread over a prolonged period of time, or else weeds will spring up, which make regeneration very difficult, and at any rate expensive.

On the whole, however, careful management is sure to be successful in securing natural regeneration in all the areas pertaining to this group; for this purpose, as well as for the production of valuable timber, a rotation of 120 years on an average is considered of sufficient length. The length of the regeneration period differs considerably in the different parts, varying on the whole from 30 to 50 years.

*b. The second group* consists of woods growing on soils, which, even under the most careful management, cannot be expected to produce trees of first or even second quality. The trees here produced are of such limited height growth, that the production of valuable timber is out of the question. The woods are found in the upper, and here and there in the lower part of the Bunter Sandstein area, where the soil is covered with large masses of the debris of gravelly sandstone, which is not easily decomposed, and where the slightest interruption of the canopy overhead is followed by the appearance of a dense growth of bilberry and heather.

Nevertheless, these areas are capable of yielding timber of the inferior classes, as well as firewood, and the returns which may reasonably be expected from them, justify the application of a method of treatment which, while avoiding any interruption in the canopy and all expensive cultural operations, facilitates natural regeneration; in other words the treatment under the selection system by removing all trees which are deteriorating or incapable of increasing in value. It is difficult to fix any definite rotation, but it is estimated that the trees will take about 150 years to reach maturity.

The lowest quality limit for this group has been fixed at 7 cubic feet increment per acre and year, while the upper limit is, as already indicated, 43 cubic feet. The area comprised in this group amounts to 12 per cent of the total area.

*c. The third group* comprises the so-called "Grinden," that is to say the highest parts of the ridges, which are mostly level and have a tendency to bogginess. They are covered by a dense growth of bilberry and heather, and are incapable of producing more than a stunted tree growth, which yields only a scanty quantity of firewood, frequently not covering the price of preparing it; hence financial considerations are entirely out of the question, the areas being protected merely for the sake of preserving some cover on the hill tops. The group comprises all parts which produce an annual increment per acre of 7 cubic feet and under; they amount to 10 per cent of the total area.

In so far as the management aims at the production of valuable material, and at favorable financial results as regards outlay for artificial regeneration (where natural regeneration has failed), for improvement, tending, etc., only the areas in the first group can be considered. But in the treatment of those forests which pertain to the principal mountain region of the Black Forest, representing a certain drainage area, the task of forestry goes beyond mere financial considerations. It has in fact been recognized that it is necessary to keep areas of this class well wooded for the sake of a proper husbanding of the water supply in the streams. Accepting this further task, the forest administration has endeavored, during the last 50 years, to afforest the poorly stocked and frequently entirely bare areas at the higher elevations of the Bunter Sandstein region. In so far as the cultural operations were confined to the boulder drifts of the Bunter Sandstein, they were moderately successful, but the cultural attempts made in the "Grinden" prior to 1870 turned out failures. Since 1873 the cultural operations in the Grinden present a more hopeful aspect, owing to the experience gained by former failures, and it seems desirable to continue them in the future.

The working plan deals in detail only with the forest area subjected to intensive management, but the group worked under the selection system has also been adequately noticed in the general provisions.

The working plan lays special stress upon the execution of improvement fellings, more particularly the removal of cancerous silver firs. For this purpose the ordinary thinnings are utilized; but over and above these, cancerous trees must also be removed from the old woods, where otherwise no further thinnings would be required. In regeneration fellings the trees to fall first under the axe must be those attacked by cancer. Even then not nearly all cancerous trees can be removed during the next ten years. This fact teaches the management that in future a sharp attack must be made on all cancerous trees at the time of the first and second thinnings, even if a temporary interruption of the canopy should thereby be caused. On the rich deep soils of the granite area, which are almost exclusively concerned in these remarks, even an interruption of the canopy extending over a somewhat lengthy period would not be a misfortune, and preferable to the maintenance of a full canopy consisting to a considerable extent of cancerous trees. The existence of enormous quantities of such trees on the granite area was one of the reasons which led to the yield being fixed at its present rate.

##### 5. *Utilization.*

*a. Yield of Major Produce.*—The actual yield during the last 40 years has been as follows:

Compartment.	YIELD, IN SOLID CUBIC FEET.					Area in Acres.
	1844-53.	1854-63.	1864-73.	1874-83.	Total.	
1. Schwarzenbronn....	213,836	122,369	149,843	79,141	565,189	65
2. Schwarzenberg.....	811,518	158,778	200,733	158,955	829,984	211
3. Riesenkopf.....	12,502	47,288	206,242	65,617	331,649	76
4. Mehliskopf.....						34
5. Grünwinkel.....	19,742	124,629	57,423	202,252	404,046	202
6. Dobelbach.....	26,875	42,697	30,195	69,952	169,692	173
7. Hoher Ochsenkopf..						101
8. Kleingartenkopf....	34,256	2,331	1,443	1,024	39,059	76
9. Kleingarten.....	375,687	138,825	256,603	195,578	966,693	362
10. Grossgarten.....	62,544	46,688	26,417	59,118	194,767	175
11. Sachsenbronn.....	34,927	47,733	111,351	106,194	300,255	95
12. Gartenbach.....	86,311	83,345	494,665	156,412	820,733	172
	1,178,198	814,733	1,534,920	1,094,216	4,622,067	1,747
Average per year.....	117,820	81,473	153,492	109,422	115,552	.....
Average per year and acre.....	67.44	46.64	87.86	62.63	66.14	.....

From the appended statistical table it will be seen that the estimated increment of the next ten years amounts to 1,086,130 cubic feet.

The actual growing stock amounts to 9,488,731 cubic feet

The normal " " 7,892,160 "

The surplus of " " 1,596,571 "

The surplus of growing stock is due to a surplus of woods over 100 years old. With favorable prices for timber, the removal of this surplus in the shortest possible time would be advisable, so as to prevent loss of increment, and take unnecessary capital out of the forest, but as prices run low at present, it appears judicious to keep the greater part of it over for a while.

A consideration of the several compartments showed that the removal of the following material during the next ten years is advisable on silvicultural grounds:

Final cuttings . . . . . 1,146,000 cubic feet

Intermediate cuttings . . . . . 154,000 "

Total . . . . . 1,300,000 "

As this amount exceeds the expected increment by 213,870 cubic feet, equal to about one-seventh of the surplus of growing stocks, the yield has been fixed at 1,300,000 cubic feet, or annually:—

Final cuttings . . . . . 114,600 cubic feet

Intermediate cuttings . . . . . 15,400 "

Total . . . . . 130,000 "

If in the course of the 10 years prices should rise, there would be no objection to reduce the surplus of growing stock further by additional cuttings.

The disposal of the yield is effected as follows:

1) Free grant to the Roman Catholic Priest at Herrenwies, =	1,500 cubic feet.
"    "    "    School    "    =	1,000    "
(2) Sale by public auction and occasionally by private sale, =	127,500    "
Total annual disposals . . . . .	130,000    "

*b. Minor Produce.*—The principal items are forest pasture and the removal of litter, the utilization of which is permitted to the Herrenwies settlers, as a privilege.

According to government orders the privilege of forest pasture may be exercised only to such extent as the condition of the forest and the requirements of regeneration may permit. The district forest officer indicates from time to time the localities in which the privilege may be exercised. The privilege of removing litter free of charge is exercised under the same conditions. The exercise of these privileges is nowhere injurious, and may be continued during the next ten years.

The grass growing in blanks, on roads and in plantations has hitherto been sold for the benefit of the State, and, under suitable supervision, the practice may be continued.

The removal of building stones, the sale of plants, etc., is insignificant.

#### 6. Division into Compartments.

The contemplated new division into compartments must be postponed until the projected road system has been completed.

#### DESCRIPTION OF COMPARTMENTS.

Block and Compartment.		Area in Acres.	Description of Wood.
Name.	No.		
<i>I. Ochsenköpfe.</i>			
Schwarzenbronn . . . . .	1	65	<p>Spruce with silver fir, some beech, Scotch pine, larch.</p> <p>About .6 of area 30—50 years old, some trees older.</p> <p>About .4 of area 10—30 years old.</p> <p>Above the road fairly complete stocking; in youngest parts still suffering from frost; below road still some blanks caused by late cutting out of old trees; in the latter part still 120—150 years old spruce and silver fir in the final stage; these show a decreasing increment. Growth on the whole fairly good.</p>
Schwarzenberg . . . . .	2	211	<p><i>a</i> = 130 acres; 15—40 years old spruce and silver fir with some Scotch pine and beech; some lately planted, younger, a few up to 60 years old. About 25 acres planted. Where the shelter wood has been removed, stocking generally complete, in the rest still patchy with patches of bilberry intervening. Growth generally between good and fairly good; along Herrenwies meadows partly only fair, the spruce still suffering from frost. In the north-western part, below the road, on the Riesenkopf road, and in the south-east along Dobelbach, on about 37 acres 110—140 years old spruce and silver firs of decreasing increment are standing in the final stage.</p>

DESCRIPTION OF COMPARTMENTS—*Continued.*

Block and Compartment.		Area in Acres.	Description of Wood.
Name.	No.		
Riesenkopf.....	3	76	<p><i>b</i> = 81 acres (in three parts), spruce and silver fir with a few beech and Scotch pine, generally 50—75 years old, but some small groups only 30—50 years old; generally well stocked, here and there somewhat thin and patchy. Growth between good and fairly good. On 3 acres on the Dobelbach, 80—90 years old spruce, cover complete and growth good.</p> <p><i>a</i> = 47 acres; 100—130 years old spruce and silver fir, some older; on the whole cover fairly complete; toward compartment-Schwarzenberg somewhat thin, but on about 10 acres with a fair young crop of silver fir and spruce up to 15 years old. Growth fairly good, on the higher part inferior. About 6 acres along the road is a windfall area, now stocked with some silver fir and spruce growth.</p> <p><i>b</i> = 24 acres; 9—20 years old spruce (a few older), with some Scotch pine and larch, mostly well stocked, showing good to fairly good growth.</p> <p><i>c</i> = 5 acres; Grinde, in upper part heather covered, with 100 and more years old short and stunted Scotch pine, some spruce and mountain pine. On the whole poorly stocked. Part underplanted with 20—40 years old spruce, which show very poor growth.</p>
Mehliskopf.....	4	34	<p>50—90 years old (and more), mountain pine with some spruce, Scotch pine, birch and mountain ash; toward compartments 3 and 5 cover fairly complete, in the southern and south-western parts interrupted by larger and smaller areas of heather. Growth inferior.</p>
Grünwinkel.....	5	202	<p><i>a</i> = 186 acres; 110—150 years old, some older, spruce and silver fir, some beech with a few Scotch pine. In irregular final and seeding stage, in the southern part cover still fairly complete in strips. On 4 of the area stocked with up to 30 years old silver fir and spruce and a few beech. Growth of old trees still fairly good; on some stony ridges (about 7 acres) middling and inferior; young growth mostly only middling.</p> <p><i>b</i> = 16 acres on the highest part in the south and west, Grinde; heather-ground with 100 and more years old crippled Scotch pine, spruce, some mountain pine and birch; in some parts up to 60 years old advance growth thinly stocked. Here and there traces of plantings, 24 years old spruce.</p>
Dobelbach.....	6	178	<p><i>a</i> = 133 acres; 100—130 years old, some up to 200 years, spruce and silver fir, some Scotch pine; on the whole cover fairly complete; only in the western third along Grünwinkel through windfalls and dry wood cuttings somewhat thin and patchy; in the thin parts as yet little, up to 15 years old, advance growth in single trees. Growth good to fairly good. (Ilex found).</p> <p><i>b</i> = 27 acres (consisting of the upper south-eastern portion and a ridge running from it in a north-western direction to the centre of the compartment), 100—130 years old (some older), short-stemmed spruce with some Scotch pine and silver fir forming a thin, often very thin, wood; in parts younger up to 60 years old spruce, or an incomplete miserable under-</p>

## DESCRIPTION OF COMPARTMENTS—Continued.

Block and Compartment.		Area in Acres.	Description of Wood.
Name.	No.		
Hoher Ochsen.....	7	101	<p>growth of 25 years old spruce and Scotch pine (experimental planting). Growth middling to inferior.</p> <p><i>c</i> = 18 acres (uppermost part on the south) Grinde; heather land with 100 years and more old crippled Scotch pine, some spruce, birch thinly stocked; here and there remnants of 25 years old planted spruce and Scotch pine.</p> <p>70 and up to over 100 years old Scotch pine and mountain pine with spruce, some birch, sometimes forming a very thin wood of single trees, sometimes in smaller or larger groups; everywhere intersected by heather places and blanks. Growth inferior, even crippled.</p>
Kleingartenkopf.....	8	76	<p>100—120 years old, in some parts younger, some over 300 years old, spruce with Scotch pine, few silver fir, some mountain pine. In the western third and on the eastern point still fairly well stocked, some groups even well stocked; otherwise the wood is very thin and open. Growth middling to inferior; here and there an incomplete miserable undergrowth of 30—50 and more years old spruce and Scotch pine (planted).</p>
Kleingarten.....	9	362	<p><i>a</i> = 161 acres; spruce and silver fir, some beech. Mostly 50—80 years old, in strips and single trees up to 100 years old, others only 30—50 years old. In the eastern part are about 50 acres 80—100 years old. Everywhere spruce and silver fir standards up to 150 years old, mostly showing good growth. Almost throughout rather thinly stocked, here and there patchy, in consequence of late final cuttings and removal of cancerous silver firs. Growth mostly good, only toward the southern higher part decreasing.</p> <p><i>b</i> = 122 acres (in 3 places); spruce and silver fir with some beech, <math>\frac{15-40}{\text{average} = 50}</math> years old, some groups up to 50 years; mostly fully stocked. 120—150 years old (some older) mostly pruned spruce and silver firs in the final stage are standing almost everywhere over the above younger growth. The strip along Dobelbach is finally cleared. Growth good; of the old trees fairly good.</p> <p><i>c</i> = 79 acres (upper part toward the south), 120—300 years old pruned Scotch pine and spruce, few silver fir and birch, thinly stocked, often open; on the whole poorly undergrown with 20—50 years old spruce (mostly planted), a few silver fir; the latter in some places form, with up to 100 years old spruce, the picture of a selection forest. Soil much covered with heather. Growth middling to bad; rarely fairly good.</p> <p>On 6 acres near compartment Dobelbach on the main path, 100 and more years old spruce, with a few Scotch pine and silver fir, form a thin canopy and show middling growth.</p>
Grossgarten.....	10	175	<p><i>a</i> = 108 acres; spruce and silver fir 80—110 years old, some up to 150, some beech and a few Scotch pine. Partly fully stocked, but the greater part somewhat thin, in the lower part very thin; and here spruce and silver fir advance growth up to 50 years old in single trees and groups. Growth good to fairly good; in</p>

DESCRIPTION OF COMPARTMENTS—*Continued.*

Block and Compartment.		Area in Acres.	Description of Wood.
Name.	No.		
Sachsenbronn.....	11	95 (and 2 acres other areas.)	<p>the upper parts with stones (Halde), partly middling only.</p> <p><i>b</i> = 37 acres. (Ridge through middle of compartment and strip on south, southwest, and northwest.) 90—110, some up to 200 years old, spruce and Scotch pine, some silver firs, in the uppermost part some mountain pine in a thin, patchy, and often very thin wood; most of inferior growth; here and there traces of 30—40 years old spruce plantings.</p> <p><i>c</i> = 30 acres (adjoining compartment Kleingarten). A wood resembling a selection forest, of spruce and silver fir with beech, the trees 30—50 years old prevailing; little quite young. The 100—120 years old and older trees appear single and in groups. Growth good; above the cattle track inferior.</p> <p>100—120 years old (some up to 200 years), spruce and silver fir, also some beech, namely:</p> <p>On 42 acres, final stage, partly pruned, throughout with <math>\frac{10-30}{20}</math> years old (in the western part up to 40 years old), silver fir and spruce young growth; about 25 acres in the position of the seeding stage brought about by windfalls and dry wood cuttings; on 5 acres 80—100 years old, generally complete cover; in the thinner stocked parts is found up to 15 years old silver fir and spruce young growth; on 12 acres (southeastern corner, near compartment Gartenbach) generally canopy complete, here and there with a little advance growth.</p> <p>On 10 acres (in the west), 70—90 years old, some older spruce with silver fir, fairly complete canopy.</p> <p>On 7 acres (western point), 12—40 years old (in groups and single up to 60 years old), mostly irregular young growth of spruce with some silver fir, forming a fairly complete stocking.</p> <p>Growth of old trees good to fairly good, in the pruned portions partly less good; growth of young wood fairly good.</p>
Gartenbach .....	12	172	<p>110—140 years old spruce, silver fir, some older, some Scotch pine, the latter prevailing in places in the upper part, few beech; in the northern two-thirds in the final stage, partly in seeding stage. In these two-thirds about 85 acres are stocked with young growth of spruce and silver fir pretty completely, in the eastern part very fully; in the southern third still fairly complete cover, but on the western slope, already somewhat thin, as yet little young growth. Growth in northern two-thirds good, in the southern third good to fairly good; in the upper part, in the southeast, only middling.</p> <p>In the middle of the compartment are 3 windfalls and 1 beetle clearing, together 12 acres; of these, 7 acres fairly well stocked with up to 25 years old spruce and silver fir.</p>





ANNUAL REPORT OF  
SPECIAL WORKING PLAN.

COMPARTMENTS.	DESCRIPTION OF CUTTINGS, CULTIVATION, ETC.	CUTTINGS.		Cultivation. Acres.	Draining Ditches. Feet.	Road Construction. Feet.
		Final. Cubic feet.	Intermediate Cubic feet.			
1. Schwarzenbronn ..	Final cutting in regenerated part.....	34,000	.....	.....	.....	.....
	Filling up blanks with spruce.....	.....	.....	8	.....	.....
	Thinning and cutting of cancerous silver firs....	.....	10,000	.....	.....	.....
	Total.....	34,000	10,000	8	.....	.....
2. Schwarzenberg....	<i>a</i> Thinning of shelterwood and partial final cutting .....	35,000	.....	.....	.....	.....
	Filling up blanks with spruce and Scotch pine.	.....	.....	10	.....	.....
	<i>a</i> and <i>b</i> Thinning and removal of cancerous trees .....	.....	53,000	.....	.....	.....
	Total.....	35,000	53,000	10	.....	.....
3. Riesenkopf.....	<i>a</i> Seeding cutting, and partly final cutting....	53,000	.....	.....	.....	.....
	<i>b</i> and <i>c</i> Rest.	.....	.....	.....	.....	.....
	Total.....	53,000	.....	.....	.....	.....
4. Mehliskopf.....	Rest.	.....	.....	.....	.....	.....
5. Grünwinkel.....	<i>a</i> Thinning of shelterwood, seeding cutting in the fully stocked parts by the removal of cancerous and large trees .....	318,000	.....	.....	.....	.....
	<i>b</i> Rest	.....	.....	.....	.....	.....
	Total.....	318,000	.....	.....	.....	.....
6. Dobelbach.....	<i>a</i> Thinning and removal of cancerous trees.....	19,000	19,000	.....	.....	.....
	<i>b</i> and <i>c</i> Rest.	.....	.....	.....	.....	.....
	Construction of an export road to meet the main road.....	.....	.....	.....	.....	4,900
	Total.....	19,000	19,000	.....	.....	4,900
7. Hoher Ochsenkopf	Rest.	.....	.....	.....	.....	.....
8. Kleingartenkopf..	Rest.	.....	.....	.....	.....	.....

SPECIAL WORKING PLAN—Continued.

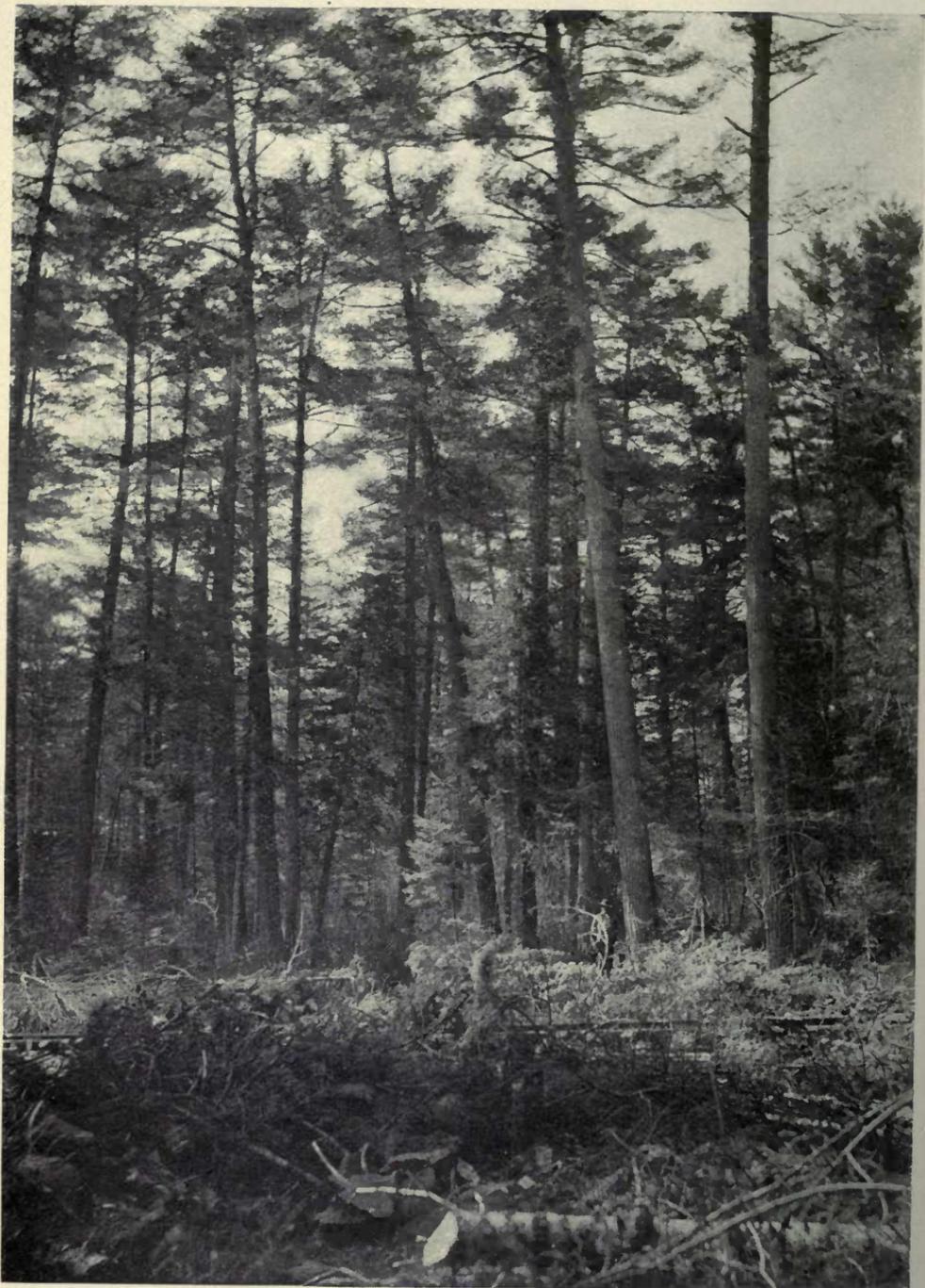
COMPARTMENTS.	DESCRIPTION OF CUTTINGS, CULTIVATION, ETC.	CUTTINGS.		Cultivation. Acres.	Draining Ditches. Feet.	Road Construction. Feet.
		Final. Cubic feet.	Intermediate Cubic feet.			
9. Kleingarten.....	a Cutting of all old standards and cancerous trees.....	45,000	3,000			
	Thinning.....					
	b Thinning of shelterwood and partially final cutting.....	198,000				
	Filling up blanks with spruce.....			12		
	c Cutting out of old defective trees where young growth exists... Construction of an export road to meet the main road.....	14,000				
	Total.....	257,000	3,000	12		9,500
10. Grossgarten.....	a Thinning and removal of cancerous trees.....	47,000	47,000			
	b Rest.....					
	c Removal of standards and cancerous trees... Thinning.....	25,000	15,000			
	Construction of an export road.....					5,000
	Total.....	72,000	62,000			5,000
11. Sachsenbronn....	In the regeneration area: thinning of shelterwood and partially final clearing; in the rest seeding cutting.....	163,000				
	Filling up blanks with spruce.....			3		
	Construction of an export road.....					3,500
	Total.....	163,000		3		3,500
12. Gartenbach.....	Continuation of regeneration cuttings and removal of cancerous trees.....	195,000				
	Thinning in fully stocked parts.....		7,000			
	Filling up blanks with spruce and Scotch pine.....			8		
	Construction of an export road.....					3,000
	Total.....	195,000	7,000	8		3,000

## SUMMARY OF THE PROVISIONS OF THE

COMPARTMENT.	PROVISIONS OF WORKING PLAN.					
	Cuttings.			Cultiva- tion. Acres.	Drain- ing. Feet.	Road Con- struction.
	Final. Cubic Feet.	Inter- mediate. Cubic Feet.	Total Cubic Feet.			
1. Schwarzenbronn.....	34,000	10,000	44,000	3	.....	.....
2. Schwarzenberg.....	95,000	53,000	88,000	10	.....	.....
3. Riesenkopf.....	53,000	.....	53,000	.....	.....	.....
4. Mehlskopf.....	.....	.....	.....	.....	.....	.....
5. Grünwinkel.....	318,000	.....	318,000	.....	.....	.....
6. Dobelbach.....	19,000	19,000	38,000	.....	.....	4,900
7. Hoher Ochsenkopf...	.....	.....	.....	.....	.....	.....
8. Kleingartenkopf.....	.....	.....	.....	.....	.....	.....
9. Kleingarten.....	257,000	3,000	260,000	12	.....	9,500
10. Grossgarten.....	72,000	62,000	134,000	.....	.....	5,000
11. Sachsenbronn.....	163,000	.....	163,000	3	.....	3,500
12. Gartenbach.....	195,000	7,000	202,000	8	.....	3,000
Total.....	1,146,000	154,000	1,300,000	36	.....	25,900

NOTE.—The excess was due to heavy windfalls; it will not derange future





Some of the majestic primeval white pine forest still remaining in St. Louis County, Minnesota. Photographed April 19, 1906, for the annual report of the Forestry Commissioner of Minnesota.

## WORKING PLAN AND OF THE EXECUTION.

RESULTS OF ACTUAL WORK DONE.					COMPARISON OF PROPOSED AND EXECUTED CUTTINGS.		Remarks.	
Cuttings.			Culti- vation. Acres.	Drain- ing. Feet.	Road Con- struc- tion. Feet.	Cut too much. Cubic Feet.		Cut too little. Cubic Feet.
Final. Cubic Feet.	Inter- mediate. Cubic Feet.	Total. Cubic Feet.						
33,084	12,549	45,583	4.4	.....	.....	1,583	.....	
54,517	75,000	129,517	5.0	.....	.....	41,517	.....	Excess due to windfalls and snow-break.
132,900	.....	132,900	.1	.....	.....	79,900	.....	Excess due to windfalls and snow-break.
.....	.....	.....	.....	.....	.....	.....	.....	.....
177,169	.....	177,169	.1	.....	.....	.....	140,831	Held back, on account of ex- tra fellings in other compts.
86,606	68,301	154,907	.....	.....	5,003	116,907	.....	Excess due to windfalls.
.....	.....	.....	.....	.....	.....	.....	.....	.....
842,444	21,635	364,079	8.4	.....	9,679	104,079	.....	Excess: wind- falls and con- struction of road.
95,852	.....	95,852	.....	.....	5,299	.....	38,148	Thinning held over.
111,049	.....	111,049	.9	.....	3,691	.....	51,951	Held back on account of ex- cess in other compartments
197,660	.....	197,660	.....	.....	2,953	.....	4,340	.....
1,231,231	177,485	1,408,716	18.9	.....	26,625	108,716	.....	.....

arrangements, as there is yet a considerable excess of growing stock in the forest.

## SAMPLE PAGE OF THE DETAILED CONTROL BOOK.

1. *Schwarzenbronn.*

Year.	Description of Cuttings, Cultivation, etc.	CUTTING.		Cultivation. Acres.	Draining Ditches. Feet.	Road Construction. Feet.
		Final Cubic feet.	Inter- mediate Cubic feet.			
<i>Provision of Working Plan.</i>						
	Final cutting in regenerated part..	34,000	.....	.....	.....	.....
	Filling up blanks with spruce .....	.....	.....	3	.....	.....
	Thinning and cutting of cancerous silver firs.....	.....	10,000	.....	.....	.....
	Total.....	34,000	10,000	3	.....	.....
<i>Execution.</i>						
1884	Final cutting.....	14,297	.....	.....	.....	.....
1884	Dry and windfall wood.....	813	.....	.....	.....	.....
1885	Windfalls.....	665	.....	.....	.....	.....
1886	Final cutting, thinning.....	6,166	832	.....	.....	.....
1886	Windfalls.....	547	.....	.....	.....	.....
1887	Windfalls.....	1,363	.....	.....	.....	.....
1888	Final cutting, thinning.....	7,759	11,717	.....	.....	.....
1888	Planting.....	.....	.....	1.7	.....	.....
1888	Windfalls.....	82	.....	.....	.....	.....
1889	Dry wood, windfalls.....	649	.....	.....	.....	.....
1889	Planting.....	.....	.....	2.2	.....	.....
1890	Windfalls.....	693	.....	.....	.....	.....
1890	Planting.....	.....	.....	.1	.....	.....
1891	Planting.....	.....	.....	.2	.....	.....
1892	Planting.....	.....	.....	.1	.....	.....
1893	Planting.....	.....	.....	.1	.....	.....
	Total.....	33,084	12,549	4.4	.....	.....

SOME NOTICES OF THE PRESS DURING THE PAST  
TEN YEARS.

The principle on which the present work in Minnesota is based is that *prevention* of fires is the chief remedy. \* \* This report is one of the most valuable documents of its kind which has been published. \* \* It will be widely called for, and gives an object lesson to other parts of the country.—*Boston Herald* (1896).

The annual report of the Chief Fire Warden of Minnesota, Mr. C. C. Andrews, is a document of value to all interested in forestry. As Mr. Andrews says, when people understand the benefits to be derived from a rational management of our forest lands, then, and not till then, will there be a public sentiment that will make the Fire Warden Law as effective as it should be. The attempt which Minnesota is making to prevent forest and prairie fires is indeed a commendable one.—*Outlook* (N. Y.)

Very notable contribution to the literature of forestry.—*American Lumberman*.

Since the establishment of the office the state has been singularly free from destructive fires.—*Minneapolis Lumberman*.

Apart from the importance of the subject, the masterly way with which it is handled makes this report of 137 pages a gem of its kind. This compilation of data represents an immense amount of painstaking labor, on which an active mind and a strong hand has done first-class service.—*St. Louis Lumberman*.

The Fifth Annual Report of the Chief Fire Warden of Minnesota is not exactly a magazine, but it has illustrated pages, it deals with nature, and it is full of information about forests in this and other countries. Don't fail to get this report. It is exceedingly valuable. Here is a chance for the schools to become intelligent concerning our Minnesota forests and concerning forestry generally.—*School Education*.

A most interesting document. \* \* This movement is full of hope for the future of American forests.—*Chicago Standard*.

The public mind needs to be educated on the subject, and a report like this will have an excellent effect.—*Minneapolis Journal*.

State document of great value.—*Farm, Stock and Home*.

Gives evidence of able and energetic work on his part.—*Popular Science Monthly*.

This document gives a great deal of valuable information. \* \* The letters sent by the fire wardens and others throughout Minnesota to their Chief in reply to his circular of inquiries are remarkably intelligent and interesting.—*American Architect and Building News* (Boston).

We should like very much to see it duplicated in Wisconsin.—*Eau Claire Leader*.

Exhibits the fact that the Chief Fire Warden is in close touch with the fire wardens in each town in the state.—*Roseau Times*.

The Minnesota law is one of the best and most progressive in force in any of the states.—*Gifford Pinchot, Chief of the U. S. Division of Forestry*.

RESOLVED, As a fundamental proposition of rational forestry, we commend the well-organized effort of the State of Minnesota to suppress forest fires, being aware that no advance can be made in forest management without such protection.—*Resolution adopted by the American Forestry Association*.

Under the vigorous administration of the present Chief Fire Warden much has been done to promote the growth of a correct public sentiment and not a little has been accomplished in the actual prevention and suppression of fires.

Warning notices in great numbers have been posted and the intelligent cooperation of a large force of assistant wardens has been secured. During the drought in the early summer of the present year over 300 fire wardens were in correspondence with their chief, reporting precautions taken, and otherwise showing their interest and activity. The system is doubtless capable of improvement, but in its inception and reasonably successful working a great step has been taken, and by so much Minnesota is well in advance of Michigan and Wisconsin.—*Prof. V. M. Spalding of the University of Michigan, in "Science" for December 28, 1900*.

Minnesota is taking a foremost place among the commonwealths that are giving attention to forestry. The annual reports of General C. C. Andrews, really forestry reports, are of great interest and value.—*Democrat Chronicle, Rochester, N. Y. (1901)*.

Preventing fires by careful watching and prompt punishment for law breaking hunters and campers, and also by quick action in stopping incipient fires are the chief means resorted to to protect the forests from conflagration. This sort of work Chief Fire Warden Andrews is doing in Minnesota to as great an extent as is possible with the means at his disposal to do with.—*Farm, Stock and Home, Minneapolis (1906)*.

While it is never safe to speak too glowingly of a service that has been performed while there is yet danger of failure, it has undoubtedly been proven that the work of the department of the chief fire warden of Minnesota has been efficient during the years since it was created. Backed by the law against carelessness with fire in the woods, the fire warden and his deputies have certainly assisted in making it possible to say that since the great Hinckley fire in 1894 the forests of this state have been comparatively free from fires. Possibly natural conditions have contributed largely to this, but it is nevertheless true that Minnesota's forest regulations are, in this respect, very satisfactory. They can be made more so if the next Legislature will provide more liberally for the work. Preserving present forests from fires is as valuable a work as the encouragement of conservative lumbering, or the replanting of forests.—*Mississippi Valley Lumberman (1906)*.

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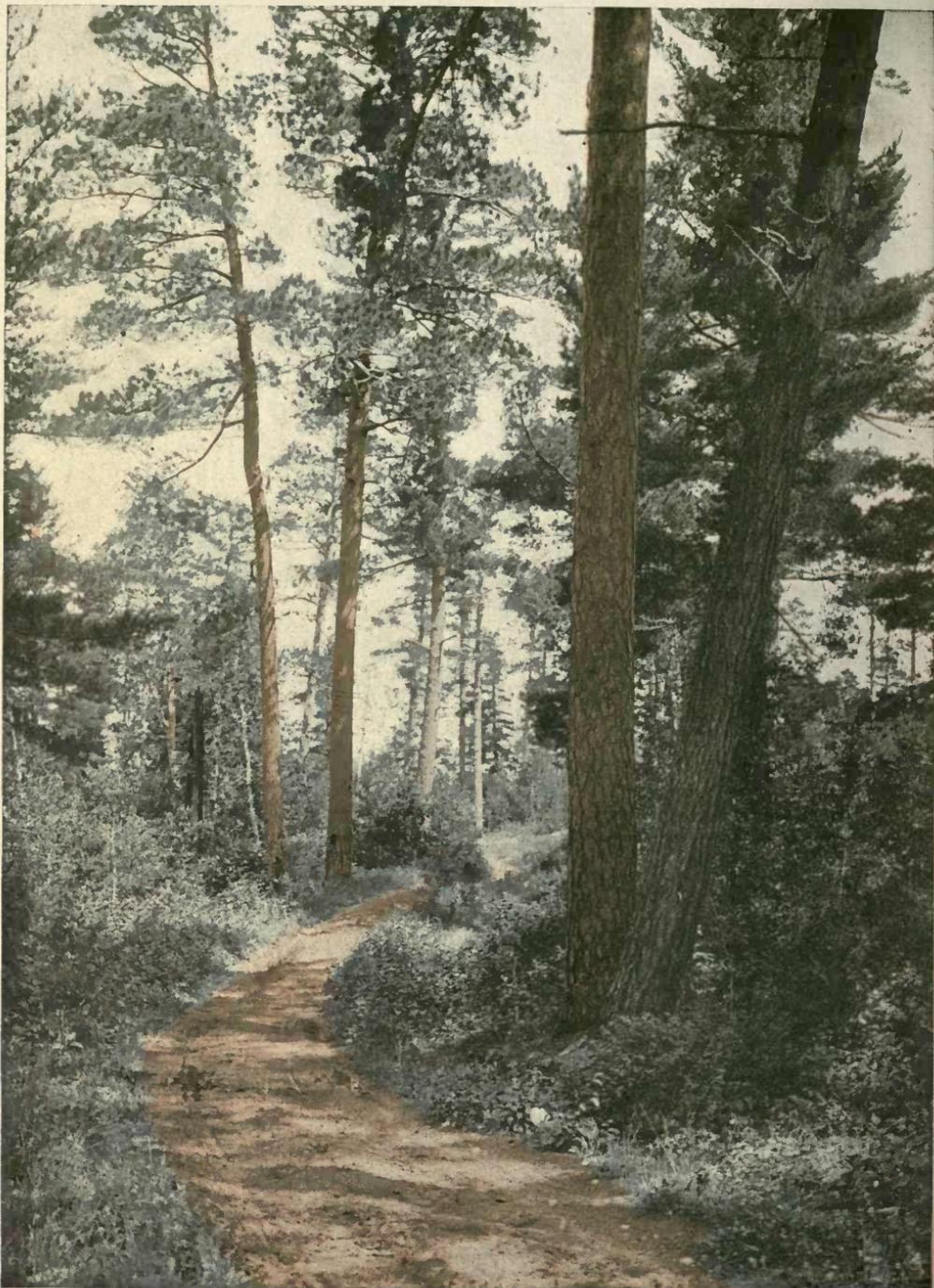
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In Itasca Park. Photographed 1907 for the Annual Report of the Forestry Commissioner of Minnesota. Itasca Park includes the head-waters of the Mississippi river. It is a forest reserve and has recently come under charge of the Forestry Board. No sound standing timber, however, is to be cut in its limits. It is a health and recreation resort for the public.

FORESTRY

*Walker Mulford*

3

THIRTEENTH ANNUAL REPORT

OF THE

FORESTRY COMMISSIONER

[FORMERLY CHIEF FIRE WARDEN]

OF

MINNESOTA

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AS REQUIRED BY CHAPTER 22 OF THE REVISED LAWS OF MINNESOTA, 1905.

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FOR THE YEAR 1907.

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ST. PAUL, MINN.,  
PRINTED BY THE PIONEER PRESS COMPANY,  
1908

STATE OF MINNESOTA  
OFFICE OF FORESTRY COMMISSIONER, }  
ST. PAUL, JUNE 1, 1908.

*Hon. S. G. Iverson, State Auditor:*

SIR: As required by Section 3 of Chapter 22, Revised Laws of Minnesota, 1905, I have the honor to submit, herewith, my annual report for the year 1907.

Very respectfully,

C. C. ANDREWS,

*Forestry Commissioner.*

THIRTEENTH ANNUAL REPORT  
OF THE  
FORESTRY COMMISSIONER  
OF MINNESOTA.

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The year 1907 was not an exceptional one in having continued dry weather for several weeks in different parts of Northern Minnesota in May-June and in October and November. The damage reported from forest fires was, however, only \$16,145. Eight were reported to have been caused by railroad locomotives, eight by hunters, three from clearing land and 29 from causes unknown; but probably the greater part of these last were from burning brush and clearing land.

The principal damage was from prairie fires, which were considerable in Clay, Polk and Wilkin counties. The number of acres reported burned over, usually reported in round numbers, and possibly exaggerated in some instances, were 172,760, damage \$23,942. As many as 17 of these fires were reported as caused by railroad locomotives; 11 were caused from burning brush and meadow. One of the worst of these fires was in Wilkin county, caused by a well-to-do farmer attempting to burn a fire break around his haystacks after having plowed a few furrows. I obtained evidence which

should be sufficient to convict him of carelessness in causing the fire, but refrained from instituting criminal prosecution, because it appeared that he was liable to suffer considerably in payment of damage in civil actions at law.

#### THIRTEEN YEARS' EXPERIENCE.

We have now had 13 years' experience with the law for the prevention of forest and prairie fires. Town supervisors, mayors of cities and presidents of village councils are constituted fire wardens under this law; they are every year instructed in their duties under the law, and cautioned to use their efforts for the prevention and control of fires; they are paid for investigating and reporting fires; they are liable to a penalty for failing to report forest and prairie fires in their districts; in unorganized territory wardens are appointed by the Forestry Commissioner, where there is a suitable person whose services can be obtained; and it can be safely assumed that about all the fires that are at all important have been reported. The returns show that the damage done by forest fires during these past 13 years has averaged only \$29,819 annually, and that the damage from prairie fires during the same period has averaged only \$16,397 annually.

When we consider the great area of country—20,000,000 acres and upwards—where such fires are liable to prevail, the great activity in the settlement of the country and in the various industries, the damage from fires has been exceedingly small. In neighboring states during the period mentioned forest fires have occurred doing damage in at least one instance to the amount of a million dollars. I believe the administration of this law in Minnesota has saved more than a million dollars worth of property.

There is, however, room for improvement. No one

can tell when a season like that preceding the Hinckley calamity, September 1, 1894, may occur, and too much care cannot be observed in regard to fires in dangerous localities in seasons of drought. A small fire, if left to smoulder and burn, might in a very dry period, with a terrific gale of wind, cause a great calamity. The only safe way in case of such fire is, if a warden in whose district it occurs cannot entirely extinguish it, to summon assistance and make such a break around it that it cannot spread. It must not be neglected. The law is explicit in making it the duty of a warden to "go to the place of danger," to CONTROL fires and to PREVENT fires.

Wardens have other public duties, but none of their duties is more respectable than that of saving their districts from a catastrophe that is liable from forest and prairie fires. If such catastrophe should occur through their neglect, it would be a lasting discredit to their memory; on the other hand, where their vigilance results in the preservation of life and property in their communities, they deserve public gratitude.

## SUMMARY OF FOREST FIRES, 1907.

COUNTY AND TOWN.	Date.	Acres.	Damage.	Cause.
Aitkin County—				
Beaver.....	Oct. 21. ....	25	\$300	Hunters
Farm Island.....	Oct. 22. ....	70	Slight	School Children
Beltrami County—				
Battle.....	June 8. ....	30	Slight	Camper
Port Hope.....	Oct. 29. ....	200	100	Hunters
Summit.....	June 5. ....	200	50	Unknown
Summit.....	June 8. ....	120	500	Unknown
Carlton County—				
Wrenshall.....	June 10. ....	30	150	Unknown
Cass County—				
Bungo.....	Oct. 22. ....	640	Slight	Unknown
Moose Lake.....	Oct. 31. ....	700	2,500	Campers
Chisago County—				
Branch.....	April 21. ....	.....	25	Unknown
Sunrise.....	April 22. ....	500	300	Clearing Land
Clearwater County—				
Bear Creek.....	June 7. ....	120	375	Unknown
Cook County—				
Grand Marais.....	June 19. ....	160	50	Unknown
Grand Marais.....	June 28. ....	100	None	Lightning
Lutsen.....	June 10-19. ....	200	1,500	Unknown
Maple Hill.....	June 22. ....	5	None	Unknown
Crow Wing County—				
Ideal.....	April 21. ....	40	50	Unknown
Pelican.....	April 21. ....	30	10	Burning Meadow
Pelican.....	July 20. ....	40	200	Travellers
Watertown.....	May 20. ....	100	50	Unknown
Houston County—				
Hoka.....	April 19. ....	100	750	Unknown
Hubbard County—				
Farris.....	June 8. ....	200	500	R. R. Locomotive
Itasca County—				
Lake Jessie.....	June 17. ....	200	100	Smoker
Lake Jessie.....	June 29. ....	500	None	Unknown
Marcel.....	June 1. ....	300	None	Unknown
Wirt.....	Nov. 12. ....	30	200	Hunters
Twp. 54, R. 26.....	Oct. 23. ....	320	500	Unknown
Koochiching County—				
Pine Top.....	June 21. ....	10	Slight	Unknown
Twp. 153, R. 27.....	July 12. ....	110	600	Unknown
Mille Lacs County—				
Princeton.....	Aug. 12. ....	2	20	R. R. Locomotive

## SUMMARY OF FOREST FIRES, 1907—Continued.

COUNTY AND TOWN.	Date.	Acres.	Damage.	Cause.
Morrison County—				
Cushing.....	May 12 .....	80	\$50	Unknown
Green Prairie.....	April 23.....	150	275	Hunters
Lakin.....	July —.....	200	Slight	Clearing Land
Pike Creek.....	Oct. 22. ....	15	Slight	Unknown
Rail Prairie.....	May 5 .....	800	225	Unknown
Rosing.....	May 23.....	125	300	Unknown
Olmstead County—				
New Haven.....	May 12 .....	80	150	Clearing Land
Ottertail County—				
Eastern.....	Oct. 21.....	350	50	Unknown
Maine.....	Oct. 24.....	300	200	Hunters
Parker's Prairie....	Oct. 24.....	500	300	Unknown
Parker's Prairie....	Oct. 28.....	10	None	R. R. Locomotive
Woodside.....	Oct. 18.....	5	350	Unknown
Pine County—				
Norman.....	May 9 .....	60	600	Unknown
St. Louis County—				
Angora.....	June 14 .....	1,100	500	Unknown
Duluth.....	June 1.....	200	2,000	Campers
Fern.....	June 6.....	40	500	Burning Brush
Kugler.....	June 7.....	100	50	Unknown
Mesaba.....	June 8.....	500	300	Burning Right-of-Way
White.....	June 14.....	220	100	Unknown
Twp. 55, R. 18.....	June 7.....	18	Slight	R. R. Locomotive
Todd County—				
Bruce.....	Oct. 16.....	80	Slight	Unknown
Wadena County—				
Aldrich.....	April 1.....	25	Slight	R. R. Locomotive
Leaf River.....	Oct. 16.....	200	300	R. R. Locomotive
Leaf River.....	Oct. 19.....	75	75	R. R. Locomotive
Rockwood.....	Oct. 19.....	320	100	R. R. Locomotive

Total acres burned over, 10,385.

Damage, \$16,145.

Classification of causes:

Burning brush or meadow, 3.

Clearing land, 3.

Hunters, 8.

Railroad locomotives, 8.

Other causes, 3.

Unknown, 29.

## SUMMARY OF PRAIRIE FIRES, 1907.

COUNTY AND TOWN.	Date.	Acres.	Damage.	Cause.
<b>Anoka County—</b>				
Columbus.....	May 3.....	500	None	Unknown
Fridley.....	Oct. 22.....	80	\$350	R. R. Locomotive
Grow.....	Jan. 24, 1908..	350	475	R. R. Locomotive
<b>Clay County—</b>				
Cromwell.....	April 28.....	40	140	Burning Straw
Eglon.....	May 1.....	100	150	Burning Grass
Elkton.....	June 4.....	600	60	Unknown
Elkton.....	Nov. 19.....	200	300	R. R. Locomotive
Flowing.....	May 18.....	3,000	1,500	R. R. Locomotive
Flowing.....	Oct. 8.....	600	700	R. R. Locomotive
Flowing.....	Oct. 22.....	1,800	4,435	R. R. Locomotive
Kragnes.....	May 17.....	40	300	Burning Grass
Moland.....	Oct. 29.....	160	1,404	R. R. Locomotive
Oakport.....	May 18.....	320	780	R. R. Locomotive
Spring Prairie.....	May 18.....	10,000	1,000	R. R. Locomotive
Spring Prairie.....	Oct. 22.....	3,000	5,000	R. R. Locomotive
<b>Kittson County—</b>				
Hill.....	Oct. 23.....	160	200	Unknown
Norway.....	Nov. 16.....	1,000	None	From Town of Pelan
Pelan.....	Nov. 12.....	500	50	Hunters
<b>Lac qui Parle County—</b>				
Mehurin.....	Oct. 21.....	250	1,000	From South Dakota
<b>Lincoln County—</b>				
Drammen.....	Oct. 23.....	1,000	150	Burning Straw
<b>Marshall County—</b>				
Bloomer.....	May 21.....	130	200	Clearing Land
Comstock.....	Oct. 21.....	1,200	300	Unknown
Comstock.....	Nov. 17.....	200	None	Unknown
Moose River.....	April 28.....	830	None	Hunters
<b>Polk County—</b>				
Belgium.....	Nov. 15.....	1,000	.....	From Town of Euclid
Belgium.....	Nov. 17.....	300	180	From Town of Brandt
Brandt.....	Nov. 17.....	3,000	175	Burning Fire Break
Brislet.....	Nov. 19.....	30	173	R. R. Locomotive
Euclid.....	Nov. 15.....	1,000	None	R. R. Locomotive
Gentilly.....	May 23.....	1,280	400	Burning Grass
Helgeland.....	May 14.....	11,000	200	Unknown
Helgeland.....	Oct. 22.....	1,000	None	From Tn. of Comstock
Helgeland.....	Oct. 27.....	600	250	From Town of Brandt
Helgeland.....	Nov. 17.....	6,000	300	From Tn. of Comstock
Parnell.....	Nov. 12.....	700	200	Unknown
Tilden.....	May 12.....	200	10	Burning Meadow
Tilden.....	Oct. 26.....	6,000	200	R. R. Locomotive
<b>Red Lake County—</b>				
Bray.....	Oct. 22.....	400	200	From Tn. of Numedal
Bray.....	Nov. 20.....	6,000	25	Hunters
Numedal.....	May 24.....	2,000	None	Burning Meadow
Numedal.....	Nov. 20.....	3,000	125	Fm. Tn. of Goose Lake

## SUMMARY OF PRAIRIE FIRES, 1907—Continued.

COUNTY AND TOWN.	Date.	Acres.	Damage.	Cause.
Yellow Medicine Co.—				
Florida .....	March 28.....	60	\$55	Clearing Land
Florida .....	Oct. 28. ....	550	1,500	R. R. Locomotive
Fortier.....	April 21.....	20	120	Unknown
Roseau County—				
Soler .....	Oct. 19.....	1,000	75	Burning Meadow
Swift County—				
Maryland .....	Oct. 11.....	640	225	R. R. Locomotive
Maryland .....	Oct. 17.....	640	820	R. R. Locomotive
Wilkin County—				
Akron.....	Oct. 23.....	150	None	Burning stubble
Atherton... ..	Oct. 19.....	640	480	Burning Fire Break
Campbell.....	Oct. 22.....	800	2,000	R. R. Locomotive
Manston .....	Oct. 19.....	6,000	5,000	From Tn. of Atherton
Manston .....	Oct. 23.....	1,600	500	From Tn. of Mitchell
Meadows.....	Oct. 23.....	3,000	75	From Town of Nilsen
Nilsen.....	Oct. 23.....	4,000	1,000	Burning Fire Break

Total acres burned over, 172,760.

Damage, \$23,942.

Classification of causes:

Burning brush or meadow, 11.

Clearing land, 2.

Hunters, 2.

Railroad locomotives, 17.

Other causes, 12.

Unknown, 8.

## FIRE REPORTS.

The following is a copy of the fire report blank furnished to fire wardens from the office of the Forestry Commissioner, with prepaid return envelope:

STATE OF MINNESOTA.  
FIRE WARDEN'S REPORT OF FIRE.

To the Forestry Commissioner, St. Paul, Minn.:

A [state whether forest, prairie or field fire].....  
fire occurred in the [state what part of town].....  
part of the town of.....being Township No.....  
Range.....in the County of.....on the  
.....day of.....[state about what time of  
day]..... It burnt over.....acres of [state  
kind of land, whether field, prairie, brush, meadow, heavy or light  
timber]..... destroyed.....  
.....and did damage to the amount of  
\$..... Said fire originated on Section No.....  
being land occupied by.....[if vacant,  
so state].....and was caused by [explain  
how it originated. It is the chairman's duty "**to inquire into the  
cause**" of the fire. He should report the **facts and circumstances  
showing who caused the fire**].....

The fire was extinguished in.....hours after it started. There  
were.....persons called to help extinguish it. [If  
none were called, so state.] The number of persons assisting in  
extinguishing the fire was..... The fire was  
extinguished in the following manner .....

The weather was [state whether dry and windy and how long it had  
been dry].....

[Give the **name of any Fire Warden** who was present and assisted  
in controlling or extinguishing the fire, and the name and address  
of any **witness** as to who set the fire and state **what he will  
swear to**.

P. O..... Signature.....  
Date..... Name of Organized Township.....

## CIRCULARS OF INSTRUCTIONS.

The following are among the instructions sent out each spring from the office of the Forestry Commissioner:

## DUTIES OF FIRE WARDENS.

Circular No. 31. } STATE OF MINNESOTA,  
OFFICE OF FORESTRY COMMISSIONER.  
St. Paul, Minn., April 11, 1908.

**By Section 1782, Revised Laws, Minnesota, 1905, Supervisors of Towns, Mayors of Cities, Presidents of Village Councils are Fire Wardens. They shall go to the place of danger to Prevent Fires and to Control Fires. They shall in emergencies Compel Assistance.**

No one can tell when a season like that preceding the Hinckley calamity, September 1, 1894, may occur, and too much care cannot be observed in regard to fires in dangerous localities in seasons of drought. A small fire, if left to smoulder and burn, might in a very dry period, with a sudden and terrific gale of wind, cause a great calamity. The only safe way in case of such fire is, if a warden in whose district it occurs cannot entirely extinguish the fire, to summon assistance and make such a break around it that it cannot spread. The law is explicit in making it the duty of a warden to "go to the place of danger" to CONTROL fires and to PREVENT fires. They shall promptly INVESTIGATE and REPORT fires and make COMPLAINT before a magistrate for violation of the law.

Wardens have other public duties, but none of their duties is more respectable than that of saving their districts from a catastrophe that is liable from forest and prairie fires. If such catastrophe should occur through their neglect it would be a lasting discredit to their memory. On the other hand, where their vigilance results in the preservation of life and property in their communities, they deserve public gratitude.

The only safety is to insist that people shall **be careful about fire. Wardens must be watchful, energetic, strict.**

C. C. ANDREWS,  
Forestry Commissioner.

## DUTIES OF RAILROAD COMPANIES AND THEIR EMPLOYEES IN THE PREVENTION AND EXTINGUISHMENT OF FOREST AND PRAIRIE FIRES.

Circular No. 30 } STATE OF MINNESOTA,  
OFFICE OF FORESTRY COMMISSIONER,  
St. Paul, Minn., April 9, 1908.

The following section (2037) of the Revised Laws of Minnesota, 1905, relating to the duties of railroad companies and their employes in preventing and extinguishing forest and prairie fires, is herewith quoted for the information and guidance of all parties concerned:

“Every company operating a railroad shall use upon each locomotive engine a good and **efficient spark arrester**, and shall keep the ground for fifty feet on each side of the center of the main track **clear of combustible materials**, except ties and other material necessary for the maintenance and operation of the road, from April 15 to December 1. No company shall permit any of its employes to leave a deposit of fire, live coals or ashes in the immediate vicinity of woodland or lands liable to be overrun by fire, and every **engineer, conductor or trainman discovering fire adjacent to the track shall report the same promptly** at the first telegraph station reached by him. In seasons of drought, every such company shall **give its employes particular instructions** for the prevention and extinguishment of fires, and shall cause warning placards furnished by the Forestry Commissioner to be **conspicuously posted at every station** in the vicinity of forests and grass lands, and, **when a fire occurs near the line of its road**, shall concentrate such help and adopt such measures as shall be available for its extinguishment. Any company violating any provision of this section shall forfeit to the state not more than one hundred dollars for each offence, and any railroad **employee** violating the same shall be **guilty of a misdemeanor**, and shall be punished by a fine of not less than five dollars nor more than fifty dollars.”

The placards should be posted, one on the **front** part of the outside, and one in the principal waiting room of the principal

station building. To post them on small out-buildings or telegraph poles, as is sometimes done, is **not a compliance with the law.**

Frequently when a station building is newly painted and a placard is removed it is not again put up, which shows gross neglect of duty. Conductors and trainmen are often neglectful in noticing and reporting fires that occur along the line of their road. The public looks to railroad companies and their employes for the exercise of more than ordinary care. Let us see if improvement in this matter of forest and prairie fires cannot be made without having to resort to harsh measures.

C. C. ANDREWS,  
Forestry Commissioner.

## FIRE WARDEN ACCOUNTS.

Circular No. 28 } STATE OF MINNESOTA,  
OFFICE OF FORESTRY COMMISSIONER,  
St. Paul, Minn., Jan. 2, 1907.

### TO FIRE WARDENS:

Accounts for patrolling will not be approved unless the warden reported to the Forestry Commissioner the facts showing the need of such service and received permission to patrol.

The law requires that forest and prairie fires be promptly investigated and reported. Unless that be done, an account for fighting the fire will not be approved.

Wardens sometimes include in their accounts the service of other persons. In all such cases a receipt from such person for the amount of his service, as a sub-voucher, must be attached to the warden's voucher. It is better, however, that each person who is to be paid any amount should make a separate account. Wardens frequently overlook signing the receipt for their pay in advance.

It sometimes appears that a warden has neglected to post the warning notices until late in the season. Such notices ought to be posted very soon after they are received, and unless this is done pay for the posting will not be allowed.

Very respectfully,  
C. C. ANDREWS,  
Forestry Commissioner.

FORM OF CRIMINAL COMPLAINT, JUSTICE'S COURT, UNDER FIRE WARDEN LAW.

Circular No. 24 } STATE OF MINNESOTA, OFFICE OF FORESTRY COMMISSIONER, St. Paul, Minn., March 16, 1906.

The following form, with explanations, may assist fire wardens and justices of the peace in criminal prosecutions:

STATE OF MINNESOTA, } ss.

County of..... being first duly sworn, makes complaint and says that ..... did, on the..... day of..... A. D. 190.., at the town of..... in said County and State, kindle a fire near to forest (or prairie, if such was the fact) land and left it unquenched (if the kindling the fire was by some one acting under his direction, allege "caused to be kindled a fire") contrary to the form of the statute in such case made and provided, and against the peace and dignity of the State of Minnesota; and prays that the said ..... may be arrested and dealt with according to law.

Subscribed and sworn to before me this....day of....A. D. 190.. } .....

Justice of the Peace.

STATE OF MINNESOTA, OFFICE OF ATTORNEY GENERAL, St. Paul, March 16, 1906. } Approved: C. S. JELLEY, Asst. Att'y General.

NOTE.—The above form of complaint is under Section 1787, Revised Laws of Minnesota, 1905. The evidence must show that the defendant set the fire or caused it to be set. The testimony of a credible witness that he saw the defendant set the fire is the best kind of evidence; but it is sufficient to convict if circumstances are proved which show beyond a reasonable doubt that the fire was set by him.

It is best to avoid any allegations in a complaint that are unnecessary; such, for example, as that the fire was set on a particular section of land. It is unnecessary to allege or prove intent to

do injury. If a person sets a fire in dry weather without the means for its control, it is no excuse for him that the wind rose unexpectedly. Everyone may expect the wind to rise or change at any time. These are things the prudent man will look out for. Fire wardens should investigate fires without a day's delay, and if there is evidence to convict they should promptly make complaint before a justice of the peace or other court of competent jurisdiction.

Section 4997, Revised Laws of Minnesota, 1905, is as follows:

“Every person who shall negligently or carelessly set on fire, or cause to be set on fire, any woods, prairie or other combustible material, whether on his own land or not, by means whereof the property of another shall be endangered, or who shall negligently suffer any fire upon his own lands to extend beyond the limits thereof, shall be guilty of a misdemeanor.” The facts may sometimes make it advisable to have a complaint made under this clause.

A rigorous, rather than mild, enforcement of the law against forest fires is the truest kindness.

Respectfully,

C. C. ANDREWS,

Forestry Commissioner.

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#### RED LAKE COUNTRY.

In the early part of July I made a trip to the Red Lake country, and mainly to see the pine forest on the east side of Red Lake, comprising about 36 square miles, and which appears on the map as a wedge-shaped peninsula, 12 miles in length, between Lower and Upper Red Lakes. The level portion of the land is covered principally with hardwood timber of different varieties and of large growth, which shows the fertility of the soil; most of the pine, both white and Norway, is on a ridge which runs along the center. There is considerable undergrowth of large-leaved trees amidst the pine. While many of the pines are about a hundred feet high and have reached their growth, there are some which would yet earn good interest by their growth fifty years longer. The symmetrical

and stately forms of the trees, clear of limbs to a height of 60 feet, the fresh, reddish color of the Norway and the dark, handsome slate color of the white pine, and standing so close that an acre would seem in many places to contain about 200 trees, one at first sight of this forest can only exclaim upon its beauty. There are probably 200,000,000 feet of pine in this particular forest, of the value of \$10 per thousand at the present prices, and which belongs exclusively to the Red Lake Indian band, now numbering 1,300 persons. In other parts of their reserve are probably 50,000,000 feet more. The present area of the Red Lake Indian reserve is 340,000 acres, the most of which is fairly good agricultural land.

I think that most of our people would be surprised at the progress being made in civilization by the Red Lake Indians. They have two large and well-equipped school buildings and schools, the principal one being at the village of Red Lake and the other at Ponemah on the peninsula above mentioned, and situated on a cleared and cultivated plateau on the north shore of Lower Red Lake. This band of Chippewas is under the charge of an agent in the Civil Service and whose title is Superintendent of Schools.

I went from Bemedji to Red Lake on one logging railroad and returned most of the way on another logging railroad, both passing through fine bodies of forest. The high price of forest products in recent years has led to the construction of hundreds of miles of logging railroads in Northern Minnesota, which will always remain in use for transportation and which are contributing much to the development of the country.

It is not uncommon now for lumbermen to cut as many as 14 kinds of marketable timber in the same forest. On

this trip I saw, for the first time, a train load of basswood logs standing on the railroad tracks.

#### VISIT TO LAKE COUNTY.

Early in August I visited Lake County; went forty-four miles by railroad from Knife River in a northeasterly direction, through mostly cut-over country, and was impressed by some of the advantages there for settlers. Lake County contains 1,300,000 acres of land, much of which is good for agriculture, though comparatively little is under cultivation. Much of the land that I saw will produce, among other crops, wheat, oats, potatoes and good hay. There are numerous streams of soft water which contain trout. The surface is undulating, and the more valuable timber having been removed it will require much labor to subdue the soil. It struck me that large owners of land might well afford to give each settler twenty acres of land with the privilege of buying sixty more under certain conditions for cultivation. Lumber companies, however, are absorbed in their own affairs and cannot go into the immigration business; but commercial or immigration clubs of the various cities interested might be able to carry such a scheme into effect. I talked with Jacob Schaf, a German farmer who has been cultivating a farm about seven miles north of Beaver Bay for twenty-six years. He has wheat four feet high and is enthusiastic about the agricultural advantages of the country. The occupation of agricultural lands by a good class of settlers would lessen the dangers of forest fires.

The law of Minnesota requires railroad companies to keep their right of way clear of combustible material a distance of fifty feet from the center of the track on each side. It makes a country look very much better where this is attended to and where the adjoining standing

timber looks fresh and thrifty and is free from the scars of fire. It also adds greatly to the value of railroad property where this regulation is carefully adhered to.

I saw a very handsome and large body of white pine yet remaining in the vicinity of Gooseberry River, and was told that it had lately been sold at \$13 per 1,000 feet standing.

#### TRIPS INTO PINE COUNTY.

It was thirteen years the 1st of last September since the forest fire in which 418 persons perished in the vicinity of Hinckley. In the latter part of August I visited the country swept over by that fire to examine especially any pine that has grown since the fire. Three miles east of Hinckley I saw a tract of several hundred acres of close standing jack pine, about ten feet high, intermixed with some Norway pine and with poplar, which has grown since 1894. The tract borders the Grindstone River and is a little too rocky for field crops. It is the kind of land that should be kept for forest. I was informed of several other bodies of young pine forest that has grown since the Hinckley fire.

Most of the land in that region is suitable for agriculture, and I saw quite a number of well-cultivated and prosperous-looking farms and with buildings that would be a credit to any farming community.

Owing to the quality of the soil, some of the pine which I have mentioned will be large enough to cut in twenty-five years, and it shows how important it is to keep out fires.

As the removal of the old pine stumps has much to do with the successful opening of farms on cut-over land, I made a particular inquiry about the business of producing turpentine from such stumps. There is a plant for this manufacture, under a Russian invention, a dozen miles or

so east of Hinckley. Only Norway pine stumps are used, and they must be old enough to have had the sap wood, which is the part nearest the bark, decayed. The company pays \$4 for 3,000 pounds, reckoned a cord, of stump and roots; and the product from such quantity is 40 bushels of charcoal, 25 gallons of turpentine, 20 gallons of tar and some citric acid.

#### UPPER ST. CROIX VALLEY.

About the middle of September I made a more extended trip in Pine County and visited the upper St. Croix valley of Minnesota, about 70 miles above Taylor's Falls, being that part about east from Hinckley, and was impressed by the large size of the river so far up. The country was originally pine forest which was cut many years ago, and most of the land was burned over in the dry season of 1894. It is now grown up to what might be called brush forest, of which the greater part is poplar; but there are occasional bunches of valuable hardwood trees, including ash, that escaped fire. I was noticing particularly the regrowth of pine, and I would say that not more than a twentieth part of the area that I saw in a drive of about 25 miles in Pine County is well stocked with pine. The pine that I saw was almost wholly jack pine. The country is generally level or moderately undulating, but with depressions along the river courses. Lakes are not common, but streams are frequent and are said to contain trout. The land is generally free from rocks and appears to be considerably in demand for farming purposes.

#### OUTPUT FROM MINNESOTA FORESTS 1907-1908.

There is no system of statistics showing the amount of timber that is cut in the Minnesota forests in any one year or season. It has been the general understanding

that during the recent prosperous years the cut of pine timber has amounted to about one billion and a half each year. On account of the unexpected business depression beginning in the latter part of 1907, it was assumed that the output for the winter of 1907-8 would be only about half the usual amount.

With a view to ascertaining as far as practicable the output for that season, I in December last, sent out printed blanks to about 300 firms and individuals supposed to be engaged in cutting timber of various kinds in Northern Minnesota, calling for a statement of the number of feet and kinds of timber being cut for the market, on what subdivisions, the number of logging camps, number of men employed and average wages. Replies were received quite generally and promptly and in a frank and cordial spirit. I received in all 260 returns and communications, showing that the aggregate output of various kinds of timber and wood from the Minnesota forests this past winter was as follows:

Pine, 800,000,000 feet; mixed timber, including ash, balsam, basswood, birch, cedar, poplar, pine, spruce and tamarac, 79,000,000 feet. Included in this last list should be noted Balm of Gilead, a species of poplar not before reported as being cut for timber. Number of poles, 213,028; number of ties, 3,565,750; number of posts, 1,754,500; number cords of pulp wood, 151,890; number cords of wood, 77,580; number of feet of mining timber, 500,000; number logging camps, 529; number of men employed, 19,575; average wages, \$26 a month and board.

These returns are probably 25 per cent below the actual output. In respect to cordwood, pulpwood, posts, ties and poles, I believe they are much more than 25 per cent below the actual output. Naturally I could not get

the address of all the camps, and as before stated the figures do not include what was cut by farmers and settlers for their own use. This is the first attempt that I know of being made to collect statistics of this kind, and another trial at some future season ought to result in more accurate returns. These figures, however, show how important the forests are as an industrial resource, employing as they do many thousand men in the winter season, when there would be no other occupation for them. The original value of the forest products, even in a season like the past, amounts to many million dollars.

### Plan of Reforestation.

The pine forests of Minnesota have been logged sixty years and most of the timber has been shipped out of the State. In a few more years the original pine will be gone. Already thirty thousand car loads of forest products are brought into Minnesota annually from the Pacific coast.

The population of the United States since its first settlement has increased at the average rate of 18 per cent every ten years, and in eighty years will reach the amazing number of 320,000,000! Forest products will be in much greater demand then than now. If we neglect suitable measures of reforestation our posterity will be ashamed of us.

Forestry is not an expenditure. It is a savings bank investment. The great thing in forestry is that it utilizes third and fourth rate—sandy, hilly and rocky—land that is unfit for agriculture. The yield tables of Germany show that an acre of such land planted as part of a forest, with pine, on forestry principles—seedling trees two or three years old, planted at an average distance apart of four or five feet, it being necessary to have forest crowded when young to promote height growth—will in eighty

years produce 18,000 feet board measure. The surviving trees—for the greater number would have died out—would be from 12 to 15 inches in diameter breast high. They would continue, if left standing, to grow many years after they had reached the age of eighty years, but not at a rate to earn good interest.

If the State this year planted 37,500 acres of forestry land in the same way, and continued to do as much every year for eighty years, it would then have a normal forest of 3,000,000 acres—not in one body but in scattered localities—of the value of probably \$200,000,000, yielding a net revenue of 3 per cent per annum. From the 37,500 acres planted this year there could then be cut 675,000,000 feet board measure of logs and the same amount every year thereafter perpetually. Under forestry management a larger percentage of the cut-over area would become reforested by natural seeding than is the case under present methods of logging (now only about 5 per cent of cut-over land becomes well stocked with pine from natural seeding), the blank spaces would be promptly replanted and a sustained yield secured.

If the State had 37,500 acres of third or fourth rate land to plant with forest we would find that on an average 5 per cent of it was already well stocked with pine or some other valuable timber, and that another 5 per cent of the area was rock or water, which we would call blank spaces; deducting this 10 per cent from 37,500 would leave 33,750 acres to be actually planted. In other words, for every 1,000 acres of third or fourth rate land only 900 acres on an average would have to be planted.

In planting about 200 acres substantially in the way above mentioned the State has found that two men can plant one acre a day, the whole cost, exclusive of land, being about \$6.00 per acre. To plant 37,500 acres each

spring would require 2,500 employes thirty days. Although some thousands of men will for a few years be coming out of the logging camps every spring, some of whom could be employed in planting, and although the planting would be done in half a dozen or more counties, still it is not likely the State could for a number of years plant 37,500 acres annually. The State should not undertake to do any more than it can do economically and well. It should, however, engage in the work with energy.

Prussia plants and sows 45,000 acres of state forest annually. The other German states in the aggregate plant more.

I believe the State will be able to purchase forestry land at an average price of not exceeding \$2.50 per acre, but as the State has some school land that is only fit for forestry, but which according to the constitution must be offered for sale at not less than \$5.00 per acre, authority should be granted for paying \$5.00 per acre when necessary.

The ordinary revenue is not sufficient to permit the legislature to appropriate money enough to carry into effect a plan of reforestation as extensive as the above. To accomplish this there should be an additional tax of three-tenths of one mill on all taxable property in the State, being only thirty cents on each thousand dollars. This would raise about \$300,000 annually and be sufficient to carry the plan into effect. That the plan may be permanent it should be authorized by a constitutional amendment such as herewith proposed. That it may not seem extravagant let me mention that for forestry Pennsylvania appropriates annually \$400,000 and New York \$550,000.

If the next legislature were to submit the amendment it could not be voted on until the general election in 1911,

and if adopted no money would be available under it sooner than 1913.

Few states have the natural resources to undertake such a system of reforestation. Minnesota's natural advantages admit of her doing it. If she has the public spirit to undertake it she would at once be in the front rank, if not the leader, of all the American States in reforestation.





Original white pine forest in township 50, range 18, on the Fond du Lac Indian Reservation, Minnesota. Photographed 1907 for the Annual Report of the Forestry Commissioner of Minnesota.

## Proposed Constitutional Amendment.

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To secure a sustained yield of timber for the use of the people of this State the proper officers shall annually levy and collect a tax of three-tenths of one mill on each dollar of the taxable property within this State, the proceeds of which shall be used for the purchase of land for the State adapted for forest at not over \$5.00 per acre, and for the production and maintenance thereon of forest according to forestry principles. Unexpended balances shall not lapse but constitute a fund for forestry purposes. The timber produced thereon shall be sold at a fair valuation and the revenue therefrom be paid into the State treasury, except that one quarter of the net revenue shall be paid to the towns in which the land is situated, in aid of public schools and roads. Should any tract acquired be found better adapted for any other purpose than the production of timber, it may be sold or leased and the proceeds used for acquiring or developing forestry land. Until otherwise directed by the legislature, which may supplement these provisions with necessary enactments, the State Forestry Board shall draw and disburse the money hereby provided and purchase, manage and control the lands and forests. No money shall be paid for any tract until the attorney general shall certify to the validity of the title. It shall be competent for two successive regular legislatures, by a two-thirds vote of each house, to alter or repeal any of these provisions.

LETTERS FROM VARIOUS CITIZENS OF MINNESOTA APPROVING  
THE FOREGOING PLAN OF REFORESTATION, IN THE  
ORDER OF THEIR DATE.

(From Mr. J. M. Underwood, experienced nurseryman and  
formerly President of the State Horticultural Society.)

LAKE CITY, MINN., Jan. 22, 1908.

Gen. C. C. Andrews,  
St. Paul, Minn.

Dear Sir:

I have just read over the plan you recommend for reforestation. You certainly have put the subject in a logical and conclusive manner, and I heartily endorse the proposed constitutional amendment. There is nothing of greater importance to our State and country than of promoting moisture in our climate and retaining it, and in no way can it be done except by reforesting our cut-over forests and adding to them. Commending you for your efficient service in this work, I am,

Very truly yours,

J. M. UNDERWOOD.

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(From Hon. S. G. Comstock, ex-Member of Congress.)

MOORHEAD, MINN., Jan. 22, 1908.

Hon. C. C. Andrews,  
Forestry Commissioner,  
St. Paul, Minn.

Dear General:

I have read with much interest your plan of reforestation. The need for some energetic action in that line is apparent to all familiar with the facts. I have heard no plan so feasible and practical as the one you outline. In my judgment the State will do well to adopt and put in early execution your recommendations.

Very sincerely yours,

S. G. COMSTOCK.

(From Mr. J. H. Beek, Secretary St. Paul Jobbers' and Manufacturers' Association.)

ST. PAUL, MINN., Jan. 22, 1908.

Gen. C. C. Andrews,  
Forestry Commissioner,  
State Capitol, City.

Dear Sir:

I have very carefully thought over your plan of reforestation as outlined in your letter of January 14th, and I am heartily in favor of it. Unless the State of Minnesota enters upon some comprehensive plan of reforestation and pursues it continuously the time is not far distant when the people will realize how costly has been the indifference and shortsightedness of our lawmakers.

Yours truly,

J. H. BEEK.

(From General C. McC. Reeve.)

MINNEAPOLIS, MINN., Jan. 22, 1908.

General C. C. Andrews,  
St. Paul, Minn.

My Dear General:

I have examined carefully your plan of reforestation and I certainly approve most heartily of it. To my mind no one question is deserving of more prompt and intelligent action on the part of the proper authorities than the question of providing an adequate timber supply for future generations.

Yours very truly,

C. McC. REEVE.

(From Mr. Daniel R. Noyes.)

ST. PAUL, MINN., Jan. 23, 1908.

Hon. C. C. Andrews,  
Forestry Commissioner,  
St. Paul, Minn.

Dear Sir:

Your favor of Jan. 20 received. I am heartily in favor of the plan proposed to "secure a sustained yield of timber" in this State. The matter of "reforestation" is one of great importance to Minnesota, and some practical plan of reforestation is of the utmost importance to our State, and cannot be entered upon too soon.

Yours truly,

DANIEL R. NOYES.

(From Ex-Lieut. Governor A. E. Rice.)

WILLMAR, MINN., Jan. 23, 1908.

Hon. C. C. Andrews,  
St. Paul, Minn.

My Dear General:

The necessity of reforestation under such a plan as you propose, or something similar, ought to be given serious consideration by every thinking person who has at heart the needs of the State and the welfare of its future generations.

Sincerely yours,

A. E. RICE.

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(From Mr. Robert A. Kirk.)

ST. PAUL, MINN., Jan. 24, 1908.

Gen. C. C. Andrews,  
St. Paul, Minn.

Dear Sir:

I have your valued favor of the 21st, enclosing statement of your plan of reforestation.

I am sure that most thoughtful men are disposed to regard this subject as one of the most important subjects before our people. Already valuable time has been lost in getting to work on it, and it is to be hoped that our next legislature will take favorable action on it. I do not attempt to recommend any particular plan for this purpose. I have not given the matter careful attention, and am not qualified to express an opinion of the value of any plan under consideration.

I feel deeply, however, that this work should be undertaken at the earliest day possible, and that it should be put into operation as soon as the large body of intelligent men who have been giving this subject careful consideration can unitedly work together in carrying out this object.

It is a great work and deserves the most thoughtful consideration of all public spirited citizens.

Yours truly,

R. A. KIRK.

(From Hon. W. P. Allen, former Senator from Cloquet District,  
and for many years Vice Pres. C. N. Nelson Lumber Company.)

Gen. C. C. Andrews,  
Forestry Commissioner,  
St. Paul, Minn.

Dear Sir:

I have carefully read your circular offering a plan of reforestation, to be submitted to the people of Minnesota through a constitutional amendment.

With the general purpose of the proposed plan I am, as you know, heartily in sympathy, and I do not know of any one in the State better fitted by temperament and experience to work out the details than yourself. The adoption of some permanent system of scientific forestry by the State of Minnesota is, in my opinion, the only way to avert a disastrous famine in forest products in the near future, and, what is worse, a steady decrease in rainfall and the consequent lessening of agricultural production. No dependence can be put on private initiative and enterprise, even when encouraged by tax exemption or other subsidy.

It is a work to be undertaken by the whole State, since its ultimate benefits accrue to the treeless portions of the State even more than to the regions included in the forested limits.

Very truly yours,

W. P. ALLEN.

(From Mr. James J. Hill, Great Northern Railroad Company.)

ST. PAUL, MINN., Jan 25, 1908.

Mr. C. C. Andrews,  
Forestry Commissioner,  
St. Paul, Minnesota.

Dear Sir:

Acknowledging receipt of your favor of the 24th instant, I beg to say that I have read your plan for reforestation of cut-over pine lands in this State, and find it well worthy of the best efforts of all the people in the State. Our forest, once a rich heritage, is rapidly disappearing. Except for the areas on the Pacific coast, the forests of the whole country will in twenty years be practically exhausted, and then we will be compelled to begin in earnest what you recommend now.

Yours truly,

JAS. J. HILL.

(From Hon. Wm. B. Dean, Ex-Senator from Ramsey County.)  
 REDLANDS, CALIF., Jan. 26, 1908.

My Dear General Andrews:

Yours of the 20th instant, forwarded from St. Paul, is at hand.

I know of nothing relating to the material interests of Minnesota that should command the hearty support of our people more than the subject of reforestation.

The plan proposed in the amendment to the Constitution seems practical and common sense. If it should ever be put into operation, future generations will bless the wise men who devised it. I hope you will be successful in your efforts.

Yours truly,

WM. B. DEAN.

(From Mr. Thos. Owens, Gen. Sup't. Duluth & Iron Range R. R.)  
 TWO HARBORS, MINN., Jan. 27th, 1908.

Mr. C. C. Andrews,

Forestry Commissioner,

St. Paul, Minn.

Dear Sir:

I am in receipt of your letter of the 24th inst., with your plan of reforestation; and I assure you that I heartily concur in same. In fact, I am a strong believer in the fact that we should plant trees for the coming generation.

Yours truly,

THOS. OWENS.

(From President Northrop, State University.)

MINNEAPOLIS, MINN., Jan. 28, 1908.

Hon. C. C. Andrews,

St. Paul, Minn.

Dear Sir:

I have read with interest the plan of reforestation recommended by the Forestry Commissioner of Minnesota, and while I cannot go into a minute examination of the plan, I may say unhesitatingly that the plan seems to me to be feasible and desirable. It is of the utmost importance that the land in Minnesota that is not adapted to agriculture should be restored to forests, if possible; and I have faith in your knowledge of the subject and your wisdom that justifies me in approving your plan.

Very truly yours

CYRUS NORTHROP.

(From Mr. Geo. Rupley of Duluth.)

DULUTH, MINN., Jan. 20th, 1908.

Hon. C. C. Andrews,  
St. Paul, Minn.

Dear Sir:

I have your favor of the 28th instant enclosing copy of proposed constitutional amendment.

I certainly approve of the plan of State forestry outlined therein and trust there will be no unnecessary delay in its adoption.

Very truly yours,

GEORGE RUPLEY.

(From Mr. J. W. Cooper, of Griggs, Cooper & Co., St. Paul.)

ST. PAUL, MINN., Jan. 30, 1908.

Mr. C. C. Andrews,  
Forestry Commissioner,  
State Capitol, City.

Dear Sir:

I have read with a good deal of interest the printed communication sent me in your favor of Jan. 28th. I have long thought that the State could well afford to spend sufficient means to eventually cover lands that are unfit for agriculture with timber of various kinds. I believe there is no question of more importance than the question of reforestation, and I regret so few people give the matter any thought. If it was possible to place before the people of Minnesota what reforestation means to future generations, I have no doubt a large majority of the people would favor liberal use of public moneys for such a scheme. I assure you it will be my pleasure to do anything in my power to assist you in the matter.

Yours very truly,

J. W. COOPER.

(From Mr. T. G. Walther of St. Paul.)

ST. PAUL, MINN., Jan. 29, 1908.

Gen. C. C. Andrews,  
St. Paul, Minn.

Dear Sir:

The subject of the restoration of our pine forests is very interesting to me.

I fully believe that the United States ought to take hold of this



(From Mr. Joseph McKibbin of St. Paul.)

ST. PAUL, MINN., Feb. 1st, 1908.

Gen. C. C. Andrews,  
Forestry Commissioner,  
St. Paul, Minn.

My Dear Sir:

I have read your plan of reforestation with great interest, and while lacking the information to discuss it fully in all its details, the plan as a whole has my hearty endorsement.

Forestry is one of our greatest economic problems. It should especially command the attention of our more thoughtful citizens and legislators. When we are so resolved, we can extricate ourselves in a comparatively short time from most of our economic difficulties—but no amount of penitence and energetic reform can grow a pine forest in much less than a hundred years.

Individuals will not engage to any extent in enterprises from which they must wait a century for returns. Reforestation is peculiarly the work of the State and the nation, and a vigorous and broadspread start should at once be made in Minnesota.

Very truly yours,

JOSEPH MCKIBBIN.

(From Professor Thomas Shaw, of St. Anthony Park, Minn.

WILLISTON, N. D., Feb. 1st, 1908.

Gen. C. C. Andrews,  
St. Paul, Minn.

Dear Sir:

Your letter of the 28th ult. and the circular inclosed have reached me here. I take the first spare moment to reply. I have read what you say in the circular headed "Plan of Reforestation Recommended by the Forestry Commissioner of Minnesota," and am in hearty accord with the same. Minnesota will not be true to herself nor to her future citizens unless steps are taken at the earliest possible moment looking to reforestation under government supervision.

I am also in hearty accord with the proposition to ask for a Constitutional amendment on the general lines suggested by the Commissioner, but have not yet been able to give that study to this phase of the question which its importance demands

Truly yours,

THOMAS SHAW.

(From Hon. Daniel W. Lawler.)

ST. PAUL, MINN., Feb. 3, 1908.

Gen. C. C. Andrews,  
Forestry Commissioner,  
St. Paul, Minn.

Dear General:

I have carefully studied your plan of reforestation and your draft of the proposed Constitutional amendment to put it into effect.

I believe that your plan is feasible and that the commencement of the work should be no longer delayed. During the past several years I have carefully read in the newspapers the accounts of your efforts for the preservation and renewal of our forests, and I believe that the people of the State are under great obligations to you for the intelligent and efficient work which you have done.

Respectfully,

D. W. LAWLER.

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(From J. W. Strong, President Emeritus, Carlton College, of  
of Northfield, Minn.)

LOS ANGELES, CALIF., Feb. 4, 1908.

Hon. C. C. Andrews,  
Forestry Commissioner,  
St. Paul, Minn.

My Dear Sir:

For many years I have been deeply interested in your earnest efforts to preserve the forests of Minnesota from needless waste—a waste far greater than most of our citizens appreciate. The importance of reforestation cannot be overestimated. The adoption of the Constitutional amendment suggested would, in time, accomplish what President Roosevelt so wisely calls “an imperative business necessity.” I sincerely hope your plan may be carried out at the earliest possible date.

With personal regards,

Very cordially yours

JAS. W. STRONG.

(From Mr. L. W. Ayer, Experienced Woodsman and Timber Estimator.)

BELLE PRAIRIE, MINN., Feb. 3, 1908.

Gen. C. C. Andrews,  
Forestry Commissioner,  
St. Paul, Minnesota.

Dear Sir:

Your favor of the 1st inst., enclosing "Plan of Reforestation," is before me. That this "Plan," or something equivalent thereto, is absolutely necessary to prevent the destruction of our entire timber resources in the near future, is evident to any one fully conversant with the facts; and I am glad to give it my unqualified endorsement.

Born and raised in the timber region of Minnesota and having followed the occupation of surveyor, cruiser and timber estimator for thirty-five years or more, my opportunities for observation have been perhaps as great as those of any person in the State.

Truly yours,

L. W. AYER.

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(From Ex-Governor Lucius F. Hubbard.)

ST. PAUL, MINN., Feb. 6, 1908.

General C. C. Andrews,  
St. Paul, Minn.

My Dear Sir:

The proposition that Minnesota should adopt a definite policy for the protection and perpetuation of her forest products, such as would be provided by the Constitutional amendment you have suggested, is one of the important questions that ought to be pressed upon the attention of the people of the State.

This is one of the vital questions of the moment, and much farther postponement of its serious consideration and practical action thereon, would be a neglect of duty that would be severely judged by generations to follow us. I believe that our people are now educated upon this subject to a point where a decided opinion in favor of substantial State aid for the reforestation of our denuded timber tracts would be secured if an opportunity was given for its expression.

Very truly yours,

L. F. HUBBARD.

(From Mr. Frank J. Waterous.)

Gen. C. C. Andrews, ST. PAUL, MINN., Feb. 13, 1908.  
Forestry Commissioner,  
St. Paul, Minn.

My Dear Sir:

The proposed Constitutional amendment as recommended by you appears to me to be thoroughly practical and feasible, and I am satisfied that if the people of our State understood the situation that the amendment would carry by an overwhelming majority.

Is there not some way that a campaign of education can be inaugurated calling the people's attention to the importance of this matter?

Yours sincerely,

FRANK J. WATEROUS.

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(From Hon. J. R. Morley, Chairman House Committee on Forestry, Legislature, 1905.)

Gen. C. C. Andrews, OWATONNA, MINN., March 3, 1908.  
St. Paul, Minn.

Dear Sir:

I have read with much interest the Constitutional amendment proposed by you for presentation to the next Legislature. And I can assure you that I am very much pleased to see these steps taken toward reforesting the cut-over lands not fit for agriculture.

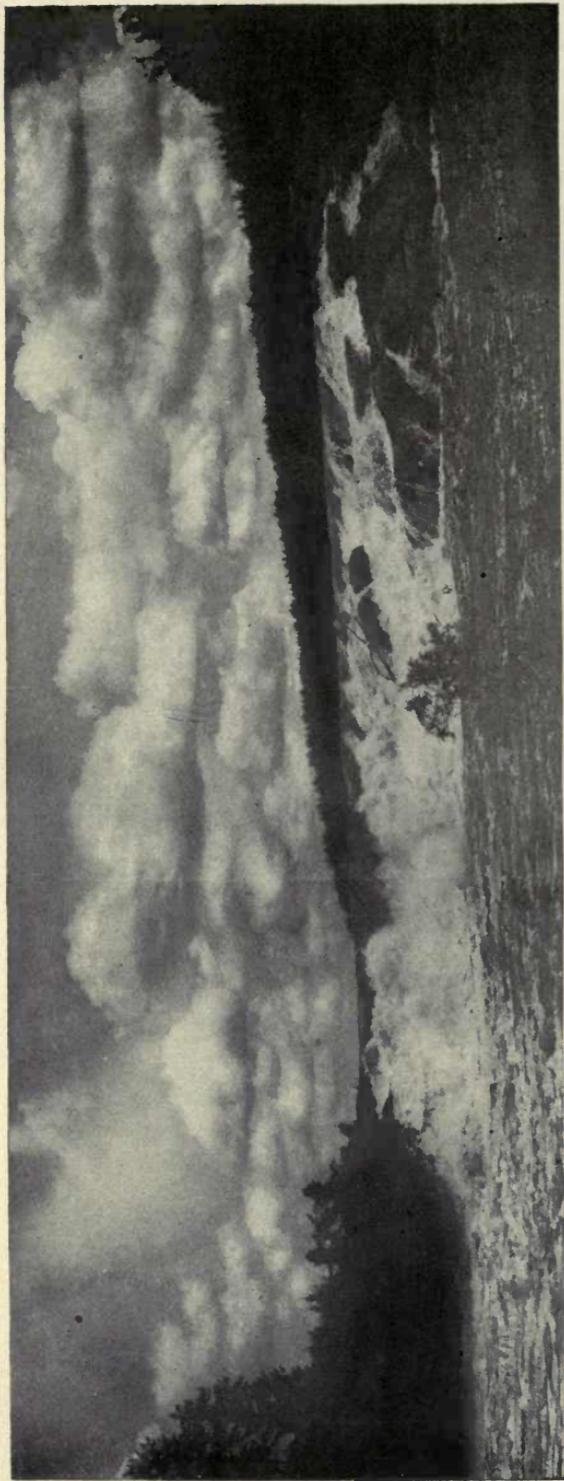
And I think the State should take the necessary steps at once to reforest these cut-over lands. It is common knowledge that our forests are fast becoming depleted and the average citizen is indifferent about it. But if the State does not interest itself in the matter of reforestation it will never be done.

Such a system of reforestation as you propose would put Minnesota in the front rank in this particular enterprise, as she has been in everything she undertakes. Let the people become once interested in this matter and realize the benefit that will accrue to posterity, and your measure will become instantly popular. No time should be wasted, and I hope you will use every effort to get this matter before the people, to the end that public sentiment may crystallize and results may be got at the hands of the next legislature.

Yours truly,

J. R. MORLEY.





Natural Resources. Curtain Falls, outlet of Crooked Lake into Lake La Croix, northern boundary of Minnesota (Township 66, Range 12).  
Photographed July, 1905

(From Mr. James E. McGee, of Hibbing, St. Louis County,  
Timber Cruiser and Surveyor for Thirty Years.)

HIBBING, MINN., April 13, 1908.

Mr. C. C. Andrews,  
Forestry Commissioner,  
St. Paul, Minn.

My Dear Sir:

In answer to your letter of February 1st, 1908, will say that your plan of reforestation meets my approval; and also your proposed Constitutional amendment meets my approval. I have had thirty years' experience as timber cruiser, surveyor and logging superintendent in the forests of Northern Wisconsin and Minnesota.

Yours truly,

JAS. E. McGEE.

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#### TAX EXEMPTION TO PROMOTE FORESTRY.

It is the opinion of some people that it would be good policy to encourage the production of timber by private parties by reducing the tax on land so used. In Minnesota it would require an amendment to the Constitution to authorize a lower rate of tax for forest than for other land. If any such measure were adopted there would have to be conditions that on land receiving the benefit of low tax, forest should be maintained according to forestry principles. It would not do to leave the land in a wild state to take its chances for natural forest growth, because in such a condition it might be very many years before the whole of it would become well stocked with valuable timber. There would have to be conditions that all of the land not well stocked naturally should be planted with valuable trees at proper distance apart—say not more than about five feet apart when two or three years old; also that the assessor should in person annually visit the land and report in detail as to the manner in which forest was maintained. Besides, the State forestry authority

would have to keep informed as to the way in which forest was maintained on private land receiving the benefit of tax exemption or reduction.

I believe the opinion which favors any such encouragement of private parties in forest production goes no further than to recommend that the land be taxed simply for its value as land, and that no tax be levied upon the timber until it is cut, and that the tax shall then be collected according to a fair value of the timber.

I do not believe that public opinion would favor treating large tracts of private land nor land of large corporations in this way; but only about 40, possibly 80, acres owned by any one individual.

If it should be found expedient, I would not object to the submission of an additional amendment to the Constitution of a clause in substance like the following, to form a part of and follow the amendment I have recommended for a tax levy of three-tenths of one mill on every dollar of taxable property, namely:

To encourage the production of timber by private parties, the Legislature may provide that not exceeding 80 acres of land belonging to any separate owner and used for the production of timber in a manner which the Legislature shall prescribe, shall be taxed only for its value as land; the timber to be exempt from tax until cut.

#### DISSEMINATE INFORMATION.

The law makes it one of the duties of the Forestry Commissioner to "disseminate information concerning forestry." He is frequently called upon to give talks on forestry. As it may interest the reader to see a sample of these talks, the following report of an address made by him before the Men's Club of the Park Avenue Congregational Church, Minneapolis, the evening of January 28, 1908, is here given:

The Hinckley forest fire, in which 418 persons perished, occurred September 1st, 1894. There was at that time a law against setting forest fires, but there was no one particularly required to have it enforced. If the present law had been in force the Hinckley fire would not have occurred. The law of 1895 made town supervisors fire wardens. It provided for a chief, since changed to Forestry Commissioner, whose duty was to instruct the local wardens and keep them on the alert, provide them with blanks on which to report fires and warning notices to post against setting fires. He was also required to investigate the forests, the means of regrowth and to make an annual report containing information on forestry. Thus he was and is more than a mere police officer. The State pays the wardens for their actual services and collects half from the counties in which the service was rendered. The appropriation is extremely inadequate, being only \$5,000 for an ordinary season and \$5,000 for a season of unusual drought. Nevertheless, according to the reports of wardens, the average damage done by forest fires the past twelve years was only \$30,000 a year.

Many people think that a forest is a dense wilderness. As a forest should only occupy third and fourth rate land that is unsuited for cultivation, it naturally must be in detached bodies. Take, for example, the so-called Black Forest, lying partly in Baden and partly in Wurtemberg. That forest extends over country 90 miles in length, with an average breadth of 30 miles, yet within it are cultivated farms, villages and even cities, and a population of 1,000,000, it abounds with fine roads and is practically a fine park.

A year or two ago I stood on a hill in my native town, Hillsboro, N. H., from which I could see most of the sur-

face, and it seemed to me that two-thirds of it was forest, and yet it has four villages and a larger population than average towns.

According to forestry a tree has reached its fiscal age and ought to be cut when it ceases to earn good interest by its growth. On third and fourth rate—hilly, rocky and sandy land, which only should be used for forest, the pine will on an average reach its fiscal age in 80 years.

The original pine of Minnesota will last only about ten years longer. The State should begin reforestation on an extensive scale and the friends of forestry would accomplish a good work if they would secure the election to the Legislature of **even one** able man who would **make forestry a specialty**.

#### EDITORIAL ASSOCIATION.

Address of Gen. C. C. Andrews, Forestry Commissioner of Minnesota, at the annual meeting of the State Editorial Association in the reception room of the Mayor of Minneapolis, February 20, 1908:

After something over twelve years' experience in the forestry service of the State I have ventured to recommend a plan of reforestation. I bring it before you, because I believe that, as educators of public opinion, you can, if you try, secure its adoption. It is that a constitutional amendment be adopted providing for an annual tax of three-tenths of a mill on each dollar of taxable property, the proceeds to be used by the Forestry Board in the purchase of forestry land at not exceeding \$5.00 per acre, and maintaining forest thereon according to forestry principles. This tax would be only thirty cents on a thousand dollars. The revenue from the forest to be paid into the State treasury, except that one-quarter part of the net revenue to go to the town in which the forest is situated in aid of schools and roads.

Third and fourth rate land can be bought for \$1.50 per acre, but as the State holds some land only fit for forest the minimum price of which is \$5.00 per acre, there should be authority to pay that when necessary.

The German yield tables show that an acre of third or fourth rate land planted as part of a forest with pine on forestry principles—two or three year old seedlings five feet apart—will in eighty years produce 18,000 feet of timber, board measure. I say eighty years, because on an average pine does its fastest growing in that period. It grows after that, but not at a rate to earn good interest on the capital it represents. Forestry always looks to getting good revenue.

Experience shows that the State can plant forest at about \$6.00 per acre, exclusive of cost of land. If the State had 37,500 acres of third or fourth rate land to plant with forest we would find that 5 per cent of it was already well stocked with pine or some other valuable timber, and that another 5 per cent of the area was rock or water, which we would call blank spaces; deducting this 10 per cent from 37,500 would leave 33,750 acres to be actually planted.

The three-tenths of a mill levy will yield about \$300,000 annually, but if adopted it will be five years before any money will be available. In the course of ten years the State would be able to annually acquire and plant 37,500 acres, not in one body but in scattered localities. Then in eighty years the state would own three million acres of normal forest from which 675,000,000 feet board measure of timber could annually be cut perpetually. It would be worth \$200,000,000, yielding a net revenue of 3 per cent; giving steady employment to 50,000 workmen, besides those in mills and shops, and affording other benefits,

such as improvement of climate and soil, water supply in streams, beauty of scenery and covert for game.

No one feels poorer for that splendid fleet that has gone to the Pacific, and no one will feel poorer for the adoption of this plan of reforestation.

#### PROGRESS OF UNITED STATES GOVERNMENT FORESTRY.

The progress of forestry under the government of the United States in recent years has been remarkable.

Twenty years ago the appropriation made by Congress for the U. S. Bureau of Forestry in Washington—and which was then occupied simply in the diffusion of forestry information—was only \$10,000 a year. The appropriation made for forestry at the last session of Congress, 1907, was \$2,400,000!

Twenty years ago there was not an acre of United States forestry reserve (now called national forest). Today there are 167,000,000 acres of national forest!

If the United States government employed scientifically trained foresters for the management of its forests in the same proportion as they are employed by Prussia for the management of its state forests, and assuming that only half of the United States' national forests are productive (it is supposed that a portion are too mountainous to be productive), then even for that half it would require eight thousand scientifically educated foresters for their management!

At present there are not one hundred scientifically trained foresters available for such service.

What a vast field is open for scientifically educated young American foresters! And what a useful influence will the needed body of scientific men for the management of the forests have on the general welfare of the country.

The country that gave the world the sewing machine, the electric telegraph, the ocean cable and the telephone is not going to be very slow in scientific forestry after it gets once started; and I confidently predict that in thirty years from now the United States will be in the front rank of countries, if not indeed the leader, for splendid forestry achievement.

REPORT BY A COMMITTEE OF THE NATIONAL ACADEMY OF  
SCIENCE ON A PLAN OF FOREST ADMINISTRATION.

It will be valuable here to place on record the first steps taken by the government of the United States in creating a forestry system.

The Act of Congress of March 3, 1891, section 24, authorized the President to set apart any part of the public lands, wholly or in part covered with timber or undergrowth, whether of commercial value or not, as public reservations, and by public proclamation declare the establishment and limits thereof. By the year 1896 sixteen forest reservations had been established under this law, aggregating an area of 17,500,000 acres, but no plan had been devised for their administration.

February 15, 1896, the Secretary of the Interior, Hon. Hoke Smith, addressed a communication to Professor Wolcott Gibbs, of Newport, Rhode Island, President of the National Academy of Sciences, requesting that an "investigation and report" be made by the National Academy "upon the inauguration of a rational forest policy for the forested lands of the United States." Congress, June 11, 1896, appropriated \$25,000 for such investigation and report, and Professor Gibbs appointed a commission consisting of Professor Charles S. Sargent, director of the Arnold Arboretum at Harvard University; Gen. Henry L. Abbott, United States Engineer Corps;

Professor William H. Brewer, of Yale University; Mr. Arnold Hague, of the United States Geological Survey; Mr. Alexander Agassiz, and Mr. Gifford Pinchot, forester, to perform the duty. The members of this commission began their work July 2, 1896, "visited most or all of the forest reservations and other public forests of the United States, devoting three months of hard travel and careful study, without compensation, to the work assigned them." Their report, dated May 1, 1897, was drawn up by the chairman, Professor Charles S. Sargent, and signed by all the members, and contains much valuable information and various recommendations; and is accompanied by several carefully drawn bills which, or portions of which, have been enacted by Congress. The appointment and labors of such a commission, of course, gave a great impulse to American forestry. The commission recommended the establishment of a permanent forest bureau, composed of trained officers, to administer, maintain and improve the reserved forested lands; that topographical surveys, under the supervision of the Director of the Geological Survey, be made of the reservations to determine what portions of them should be permanently reserved on account of their forest covering, and what portions should be reopened to entry and sale; that regulations should be issued for the protection, growth and improvement of the forests on the reservations, for the sale of timber, firewood and fencing to actual settlers and to owners of mines; for allowing the public to enter and cross the reservations, etc., etc.; that all public lands of the United States more valuable for the production of timber than for agriculture or mining shall be withdrawn from sale, settlement and other disposition, and held for the growth and sale of timber.

The following are a few extracts from this noteworthy report:

#### NEGLECT OF REPRODUCTIVE MEASURES.

“But a well regulated water supply is not the only thing dependent on the preservation of forests. In civilized nations the demand for lumber and other forest products is continuous, and requires systematic and intelligent forest reproduction. Numerous districts in our country have now no more timber than is needed for early use, and if forest reproduction is not encouraged local timber scarcity in the not distant future seems inevitable. The enormous waste from forest fires, incendiary and accidental, which prevail in nearly every part of the United States, the extravagant modes of lumbering, especially in the West, permitting valuable logs to rot in the brush on account of slight defects, and the universal neglect of all reproductive measures, threaten the prosperity of the country and should receive early attention from the Government.”

#### FOREST FIRES.

“No human agency can stop a Western forest fire when it has obtained real headway, and the only hope of averting the enormous losses which the country suffers every year from this cause is in PREVENTING FIRES FROM STARTING IN THE FORESTS OR IN EXTINGUISHING THEM PROMPTLY. They will always occur, but the experience gained in the Yellowstone National Park since it has been patrolled by detachments of the United States army and in Canada shows conclusively that with the aid of disciplined forest rangers intelligently directed the number of forest fires in any district can be greatly reduced, and that it is frequently possible to extinguish small fires if they are energetically attacked when first discovered.”

## FOREST RESERVES FOR THE PEOPLE.

“A study of the forest reserves in their relations to the general development and welfare of the country shows that the segregations of these great bodies of reserved lands can not be withdrawn from all occupation and use, and that they must be made to perform their part in the economy of the nation. According to a strict interpretation of the ruling of the Department of the Interior, no one has a right to enter a forest reserve, to cut a single tree from its forests, or to examine its rocks in search of valuable minerals. Forty million acres of land are thus theoretically shut out from all human occupation or enjoyment. Such a condition of things should not continue, for unless the reserved lands of the public domain are made to contribute to the welfare and prosperity of the country they should be thrown open to settlement and the whole system of reserved forests abandoned. Land more valuable for its mineral deposit or for the production of agricultural crops than for its timber should be taken from the reservations and sold to miners and farmers, the mature timber should be cut and sold, settlers within or adjacent to the boundaries, unable to procure it in other ways, should be authorized to take such material from reserved forests as is necessary for their needs, and prospectors should be allowed to search them for minerals.

“But it must not be forgotten that the public domain of which these reserves form a part belongs to the people of the whole country and not to those of any one section. It is right, therefore, that the forest reserves should be managed for the benefit of the people of the whole country and not for any particular class or section. Steep and elevated mountain slopes should not be cleared of their forests for the sole benefit of the prospector or the miner, because this, by its influence on water flow, might

mean permanent injury to persons living hundreds of miles away. A few foreign sheep owners should not be allowed to exterminate great forests at the expense of the whole country; and prospectors and miners should not be permitted to burn, wilfully or carelessly, forests in which all classes of the community are equally interested.

“Our examination of the Western forests shows that the existing methods and forces at the disposal of the Interior Department are entirely inadequate to protect the forests of the public domain. Civil employes, often selected for political reasons and retained in office by political favor, insufficiently paid and without security in their tenure of office, have proved unable to cope with the difficulties of forest protection, and the reserves are practically unguarded.”

#### FOREST ADMINISTRATION.

“It has been shown that the preservation and judicious management of the forests on those portions of the public domain which are unsuited for agriculture are of great importance for the flow of rivers needed for the irrigation of arid districts, and to furnish forest products for settlers on adjacent arable lands and for mining operations. The cheapness of forest products in the United States, and the length of time required to produce crops of timber in the West, will make the investment of the capital of individuals in silvicultural operations, for the present at least, a doubtful enterprise in those States and Territories where the public domain is now principally situated; and silviculture in western North America will only be really successful under sustained government control and administration; for, dealing with crops which often do not reach maturity until the end of one or two centuries, it can only be made profitable by carrying out, without interruption

and under thoroughly trained officers, plans which must often be followed during the lives of several generations of men. This stability and continuity of management can only be secured by a permanent government administration composed of officers of the highest character, entirely devoted to duty."

"Ultimate self-support of a government forest administration is possible in the United States, and it may be expected to yield a permanent income if the national forests are managed with the intelligence, thrift and honesty which characterize the forest administration in Germany, France and other European countries. At first, however, the cost of administration will exceed the receipts, as is almost invariably the case in important economic reforms, but outlays may be expected to diminish in proportion as the administration is faithful, intelligent and honest."

"The fundamental principle of any government system of forest management should be the retention of the fee of forest lands, and the sale of forest products from them at reasonable prices, under regulations looking to the perpetual reproduction of the forest. While it is not desirable, perhaps, that the Government in the immediate future should enter into competition with the private owners of forest lands, it is evident that ultimately the sale of forest supplies from the government timber lands should not only cover all expenses of government forest management, but produce a steadily increasing income.

"Upon officers charged with the administration of the government forests will devolve the care of immensely valuable public property, its improvement under the best established scientific methods, police responsibility of exceptional delicacy, surveys, the construction of roads and engineering works for the protection of mountain slopes,

and the control of numerous agents, widely separated and not easily trained to habits of discipline. Many of these duties are essentially military in character and should be regulated for the present on military principles. Wise forest management calls for technical knowledge which must be based on a liberal scientific education. The forest officers must be men of the highest personal character, who can be trusted to avoid participation in any private business connected, however remotely, with forest products. To secure the service of men qualified to meet these several requirements will call for liberal remuneration and permanent tenure of office."

#### PAY OF FORESTRY OFFICIALS.

"The following are the rates of annual compensation suggested for forest officers, with an increase of 10 per cent for each period of five years' service: For the director, \$4,500; for the assistant director, \$4,000; for an inspector, \$3,500; for a head forester \$2,500; for a forester, \$2,000.

For the subordinate grades a monthly pay of \$45 for rangers and of \$35 for assistant rangers is proposed, with a gradual increase for length of service. Rations in kind, or a commutation, should also be furnished.

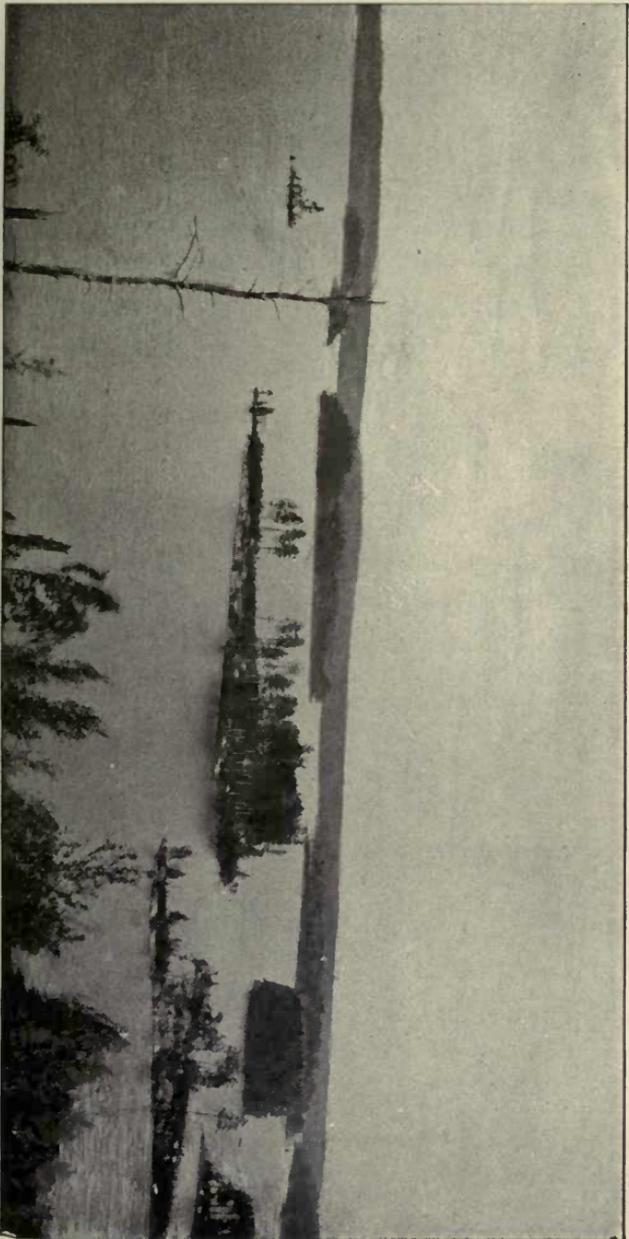
All officers of the service, on reaching the age of 64 years, should be entitled to receive 50 per cent of their pay at the time of their retirement, and a like inducement to faithful service should be extended to rangers after a service of thirty years.

"This organization will require for salaries, including those of rangers, for each of the first five years, an annual appropriation of \$250,000. While the number of officers proposed is much smaller in proportion to the area of the territory to be protected, now about 40,000,000 acres, than has been found necessary in other countries, it is

believed to be sufficient for the immediate wants of the service. It is probable, however, that it will have to be enlarged in the future, when increase of population in the Western States and Territories and a greater demand for forest supplies than now exists will make the protection of the reserved forest lands more difficult and will justify more elaborate methods of forest management than now appear necessary, or when now unreserved forest lands of the public domain are controlled by the officers of the forest bureau.

“When it is remembered that several million dollars’ worth of timber are taken every year from the public domain without the Government being able to obtain any payment for it, it would appear a wise and economical policy to spend annually a few hundred thousand dollars on an organization which would prevent such unnecessary drains on the wealth of the nation. It must be remembered also that an efficient forest administration would be able to prevent many forest fires on the public domain, and that it is not an unusual occurrence for a single fire to destroy material in a few days worth more in actual money than this forest administration would cost in years, while the loss to the country in impaired water flow through forest fires, which might be easily prevented, is incalculable. The expenditure, therefore, of \$250,000 a year in furnishing means for protecting the forests on the public domain would appear to be justified by every consideration of common sense and economy.

“The example, moreover, of wisely directed national forests may be expected to be a substantial benefit to the private interests of the citizens of the United States, both as object lessons and in the opportunity they would offer for the special training of foresters. Such examples would gradually change the wasteful methods now practiced by indi-



Burnside Lake in St. Louis County. Popular resort for trout fishing. A part of the State's Burnside Forest, being land granted to Minnesota by Congress in 1904, for forestry purposes, borders on this lake. Alexander Winchell, Geologist of Michigan, pronounced this lake more beautiful than the Thousand Islands of the St. Lawrence River.



vidual owners of forest property, and in this way increase national wealth and prosperity. Your committee fully realizes that the organization of such an administrative bureau of civil officers would be a radical departure from the recognized customs of the United States. The nature and extent of the interests at stake, however, and the difficulty, delicacy and permanency of the duties demand an exceptionally stable service. The experience of all other countries shows that this service can be successfully performed only by highly trained and conscientious officers."

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### MINNESOTA NATIONAL FOREST.

The following is the Act of Congress approved May 23, 1908, changing the boundary and somewhat reducing the area of the Minnesota National Forest:

*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,* That there is hereby created in the State of Minnesota a national forest consisting of lands and territory described as follows, to-wit:

Beginning at a point where the north line of section thirty-one in township one hundred and forty-eight north, range twenty-eight west, fifth principal meridian, intersects the low water mark of the lake formed by the waters of Third River; thence easterly along the north line of sections thirty-one, thirty-two, thirty-three, thirty-four, thirty-five, and thirty-six in township one hundred and forty-eight north, ranges twenty-eight and twenty-seven west, continuing easterly along the north line of section thirty-one in township one hundred and forty-eight north, range twenty-six west, to a point where said line intersects the low water mark of Bow String Lake on the west shore; thence southerly along the west side of said lake at low water mark to a point where it crosses the section line between sections sixteen and seventeen in township one hundred and forty-seven north, range twenty-six west; thence southerly along the section line on the east side of sections seventeen, twenty, twenty-nine, and thirty-two in township one hundred and forty-seven north, range twenty-six west, and continuing southerly along the east side of sections five, eight, seventeen, twenty, twenty-nine, and thirty-two, township one hundred and forty-six north, range twenty-six west, continuing southerly along the east line of sections five, eight, seventeen, twenty, and twenty-nine, township one hundred and forty-five north, range twenty-six west, to a point at the low water mark on the right bank of the Mississippi River on the section line between sections twenty-eight and twenty-nine in said township; thence southeasterly along the right bank of the Mississippi River at low

water mark to its confluence with Leech Lake River in section twelve in township one hundred and forty-four north, range twenty-six west; thence southwesterly along the right bank of Leech Lake River along the low water mark to Mud Lake; thence along the line of low water mark of Mud Lake on its northern and western shores to the point where Leech Lake River empties into the same on fractional section thirty-two, township one hundred and forty-four north, range twenty-six west; thence up said river along the low water mark on the right bank thereof to a point in fractional section twenty-nine where the line intersects the low water mark of Leech Lake; thence in a northwesterly and southwesterly direction following the contours of said lake at low water mark to the point at low water mark on the shore of said lake on the northeast boundary of the ceded Leech Lake Indian Reservation on section line between sections five and eight, township one hundred and forty-three north, range twenty-nine west; thence in a southwesterly direction following the contours of said lake at low water mark to the point on said lake at the southwestern extremity of Ottetail Point; thence southwesterly in a direct line to the southern extremity of section twenty-five in township one hundred and forty-three north, range thirty-one west; thence in a westerly direction along the contour of said lake to the southwestern extremity of section twenty-six in said township; thence in a northerly and westerly direction along the contour of said lake at low water mark to a point where the center line through section two, running in a north and south direction in township one hundred and forty-three north, range thirty-one west, intersects the low water mark of Leech Lake; thence northerly through the middle of said section two to the shore of a small lake at low water mark; thence along the east shore of said lake at low water line to a point where the section line between sections thirty-five and thirty-six, township one hundred and forty-four north, range thirty-one west, intersects low water mark of said lake on north shore; thence northerly on section line between sections thirty-five, thirty-six, twenty-five, and twenty-six, to the low water mark at the shore of a small lake; thence northerly along the east side of said lake to a point where the section line between sections twenty-five and twenty-six intersects the low water mark of said lake in said township; thence northerly along the east line of sections twenty-six, twenty-three, and fourteen, to a point on the east line of section fourteen, twenty chains north of the southeast corner of section fourteen; thence west twenty chains; thence north twenty chains; thence west twenty chains; thence northerly along the east side of a small lake to a point where the center line running in a north and south direction through section fourteen intersects the north side of said lake at low water mark; thence northerly along the center line of said section through section eleven to the quarter corner between sections two and eleven of said township; thence westerly to a point twenty chains west of the northwest corner of section eleven; thence north forty chains; thence west twenty chains; thence north to a point where the center line running in a north and south direction in section three intersects the township line between townships one hundred and forty-four and one hundred and forty-five north, range thirty-one west; thence westerly to the quarter quarter corner on the township line in the southeast quarter of section thirty-four in township one hundred and forty-five north range thirty-one west; thence north twenty chains; thence west forty chains; thence north twenty chains; thence west twenty chains to the quarter corner

between sections thirty-three and thirty-four in said township and range; thence northerly along the east line of sections thirty-three, twenty-eight, twenty-one and sixteen in said township to a point where it intersects the right-of-way of the Great Northern Railway as at present located; thence easterly along said right-of-way to a point where it intersects the shore of Cass Lake at low water mark in section fifteen, township one hundred and forty-five north, range thirty-one west; thence northerly along the west shore of Cass Lake and the south, west and north shore of Allen's Bay and the northwest shore of Cass Lake to a point along the contour of said lake at low water mark at the head of the Mississippi River, approximately in section twenty-one, township one hundred and forty-six north, range thirty west; thence easterly along the right bank of said river to a point where the range line between ranges twenty-nine and thirty west intersects said river; thence northerly along the range line to the northwest corner of section nineteen in township one hundred and forty-seven north, range twenty-nine west; thence easterly along the north line of sections nineteen, twenty, twenty-one, twenty-two, twenty-three and twenty-four in said township and along the north side of sections nineteen and twenty in township one hundred and forty-seven north, range twenty-eight west, to a point where said line intersects the left bank of Third River at low water mark; thence northerly along the right bank of Third River to the contour line at low water mark of the lake formed by the waters of Third River; thence southeasterly and northerly along the contour line of said lake to the point of beginning; and it is the intent of this Act to include in said national forest and make a part thereof all that certain territory and land which has heretofore been selected by the Forester of the Department of Agriculture as the ten sections situated in townships one hundred and forty-four, one hundred and forty-five, and one hundred and forty-six north, ranges thirty and thirty-one west of the fifth principal meridian in Minnesota and designated as being the ten sections referred to and authorized to be selected by section two of the Act approved June twenty-seventh, nineteen hundred and two, being chapter eleven hundred and fifty-seven, United States Statutes at Large, volume thirty-two, entitled, "An Act to amend an Act entitled, 'An Act for the relief and civilization of the Chippewa Indians in the State of Minnesota,'" approved January fourteenth, eighteen hundred and eighty-nine; and also all the islands in Cass Lake in the State of Minnesota.

And in addition to the lands and territory above described, the lands described by section two of said Act of June twenty-seventh, nineteen hundred and two, as follows: "One hundred and sixty acres at the extremity of Sugar Point, on Leech Lake, and the peninsula known as Pine Point, on which the new Leech Lake Agency is now located" shall be included in and are hereby made a part of said national forest: *Provided*, That this Act shall not in any manner abridge the right of citizens to the use of the west and northwesterly shores of Cass Lake.

SEC. 2. The Secretary of the Interior is hereby authorized to proceed with the sale of the merchantable pine timber upon the above-described land outside of said ten sections and said islands and points, in conformity with the provisions of said Act above entitled, and reserving ten per centum of such timber from sale, said ten per centum to be designated by the Forester of the United States Department of Agriculture; and as to the timber upon said ten sections and said

islands and points, the said Forester is authorized, under such rules and regulations as he may prescribe from time to time, to sell and dispose of so much of the standing timber thereon as he may deem wise and advisable in the conduct of a National Forest: *Provided*, That a commission of three persons shall at once be appointed, consisting of one person to be designated by the President, one by the Secretary of the Interior, and one by a general council of the Indians of the Winnibigoshish, Cass Lake, Chippewas of the Mississippi Reservation, and Leech Lake Reservation, to be held under the direction of the agent at Leech Lake Indian Agency; and said commissioners shall proceed forthwith to appraise the value of the five per centum of timber heretofore reserved from sale by the provisions of said Act entitled "An Act to amend an Act entitled 'An Act for the relief and civilization of the Chippewa Indians in the State of Minnesota,' " approved January fourteenth, eighteen hundred and eighty-nine, and the ten per centum hereafter reserved under the provisions of this Act, and the timber upon said ten sections and upon the unappropriated lands on said islands and points, and shall ascertain the acreage of actual land included under the provisions of this Act and to the estimated value of said five per centum of timber reserved under the said Act entitled "An Act to amend an Act entitled 'An Act for the relief and civilization of the Chippewa Indians in the State of Minnesota,' " approved January fourteenth, eighteen hundred and eighty-nine, and the ten per centum reserved under this Act and the estimated value of timber upon said ten sections and upon the unappropriated lands on said islands and points, to the sum of the values of the timber so estimated shall add an amount equal to one dollar and twenty-five cents for each and every acre of land not otherwise appropriated which they find covered by the provisions of this Act, and shall certify the same to the Secretary of the Interior. The Indians designated in this section, acting through a representative who shall serve without compensation, to be named by them at the time of their appointment of the commissioner herein, shall have sixty days in which to appeal to the President of the United States from the findings of said commissioners, as certified to the Secretary of the Interior. At the end of said sixty days, if no appeal has been taken or if an appeal has been taken, then, upon the determination thereof by the President, the Secretary of the Interior shall certify the amount found by said commissioners, or if modified by the President, the amount determined by him, to the Secretary of the Treasury, who shall thereupon place such amount to the credit of all the Chippewa Indians in the State of Minnesota as a part of the permanent fund of said "All of the Chippewa Indians in the State of Minnesota" provided for in an Act of Congress entitled "An Act for the relief and civilization of the Chippewa Indians in the State of Minnesota," approved January fourteenth, eighteen hundred and eighty-nine, and the Acts supplementary thereto, and the amounts so certified to the Secretary of the Treasury shall draw interest at the rate of five per centum per annum, pursuant to the terms of said Acts.

SEC. 3. That any Indian having an allotment within the limits of the National Forest created by this Act is hereby authorized to relinquish such allotment and permitted to take another allotment in lieu thereof outside such National Forest, under the direction of the Secretary of the Interior; and the allotments of any deceased Indians located within the boundaries of said National Forest shall not hereafter be disposed of under section seven of the Act of June

twenty-seventh, nineteen hundred and two (volume thirty-second Statutes at Large, page two hundred and forty-five); but the heirs of said deceased Indians shall have the right, with the consent of the Secretary of the Interior and under such rules as he may prescribe, to relinquish to the United States the lands covered by such allotments and to select surveyed, unappropriated, unreserved land within the limits of any of the ceded Indian lands in the State of Minnesota and outside of the National Forest hereby created in lieu of the land covered by such allotments; and the lands so relinquished by the Indians or their heirs shall thereupon become part of the said National Forest. And the Secretary of the Interior is hereby authorized on request of the Forester of the Department of Agriculture to purchase such relinquishments from said Indians or their heirs and to pay for the same from any moneys received, after the appraisal of timber herein provided for, on account of the sale of timber from the National Forest hereby created, or from the sale of any other products or the use of any lands or resources thereof.

SEC. 4. That all land in any of said reservations, the Winnibigoshish Indian Reservation, Cass Lake Indian Reservation, Chippewas of the Mississippi Reservation, or Leech Lake Indian Reservation, not included in the National Forest hereby created as above described, heretofore classified or designated as agricultural lands, is hereby declared to be open to homestead settlement; and any of said land which has been classified as timber land shall be open to homestead settlement as soon and as fast as the timber is removed therefrom, in conformity with the homestead law, except that none of said lands shall be disposed of except on payment of one dollar and twenty-five cents per acre.

SEC. 5. That all moneys received from the sale of timber from any of the lands set aside by this Act for a National Forest, prior to the appraisal herein provided for, including all moneys received for timber under sales made by the Secretary of the Interior as authorized by existing laws and section two of this Act, shall be placed to the credit of the Chippewa Indians in the State of Minnesota, as provided for in an Act of Congress entitled "An Act for the relief and civilization of the Chippewa Indians in the State of Minnesota," approved January fourteenth, eighteen hundred and eighty-nine; and the Acts supplementary thereto, and shall draw interest at the rate of five per centum per annum, pursuant to the terms of said Acts; and after said appraisal the National Forest hereby created, as above described, shall be subject to all general laws and regulations from time to time governing national forests, so far as said laws and regulations may be applicable thereto.

SEC. 6. That the commissioners provided for herein shall receive a compensation of ten dollars per day each for each and every day actually spent upon the work herein provided for, which shall be paid out of any money in the Treasury of the United States not otherwise appropriated, and no commissioner shall be paid for more than ten days' service.

SEC. 7. None of the Indian graves now upon any of the islands or points referred to in this Act shall be disturbed, and the Indians shall continue to have the right to bury their dead at such places as they have heretofore used for that purpose, under the rules and regulations to be prescribed by the Forest Service.

SEC. 8. That nothing in this Act contained shall in any manner bind the United States to purchase any of the land in said reservations excluded from the

reserve created by this Act, or to dispose of said land, except as provided by the Act of January fourteenth, eighteen hundred and eighty-nine, entitled "An Act for the relief and civilization of the Chippewa Indians in the State of Minnesota," and an Act of June twenty-seventh, nineteen hundred and two, entitled "An Act to amend an Act for the relief and civilization of the Chippewa Indians in the State of Minnesota," or the provisions of this Act; or to guarantee to find purchasers for said lands or any portion thereof, it being the intention of this Act that the United States shall act as trustee for said Indians to dispose of the said lands and the timber thereon, and to dispose of the proceeds thereof, as provided in said Acts, only when received from the sale of the timber and the lands, as therein provided.

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LETTER FROM MR. GIFFORD PINCHOT, U. S. FORESTER, IN  
REGARD TO THE FOREGOING ACT OF CONGRESS.

The following letter from Mr. Pinchot, explains the effect of the foregoing Act of Congress :

WASHINGTON, April 22, 1908.

HON. MOSES E. CLAPP,  
United States Senate.

My dear Senator:

The joint letter from you and Senator Nelson of April 10 is received. The boundary as embodied in your bill (S. 4186), as it was amended and passed the Senate on April 15, is satisfactory to this service because the advantages to the Minnesota National Forest carried by your bill are worth more to it than the land it loses. Apparently the bill eliminates 69,380.88 acres. This, however, is offset by the following additions:

The Ten Sections,	-	-	-	6,400	acres
Sugar Point,	-	-	-	160	"
Pine Point,	-	-	-	7,000	"
Cooper and other islands in Cass Lake,				1,119.20	"

In all, - - - 14,679.20 acres

In addition to this, the Indian allotments within the boundary established by your bill approximate 50,000 acres, which under the terms of the bill may be relinquished to the Government for other allotments or for a money consideration. It is possible, therefore, that 64,679.20 acres may be added to the forest, as against 69,380.88 eliminated from it, leaving the forest positively reduced in area by 4,701.68.

It seems to me that the essential things in the bill are that the National Forest is created immediately instead of awaiting the cutting of the merchantable timber, as was necessary under the existing law; the Ten Sections, the islands in Cass Lake, Pine Point and Sugar Point are included within the forest, with the merchantable timber thereon uncut; the Indians are paid such amounts as are due them for their lands and for the timber left standing; the percentage of seed trees reserved is increased from five to ten per cent; the forest is consolidated by making possible the relinquishment or purchase of Indian allotments; and the logging on all Indian allotments not relinquished shall be done in such a manner as not to endanger the rest of the forest. I am very glad that Section 7 was added to protect the Indian graves.

I am hoping that some solution of the State swamp land question will be found which will remove the last difficulty in the way of the successful administration of this National Forest.

Very sincerely yours,

GIFFORD PINCHOT,

Forester.

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## THE STATE'S POWER TO REGULATE CUTTING OF TREES ON PRIVATE LAND.

Although the question in its application to forestry has not been agitated in Minnesota, it is nevertheless a well established principle of law that the State has the constitutional power—known as its “police” power—to regulate the use of private property so as to promote the public welfare. Under this power the State can prohibit the cutting of small trees by a private owner, where such cutting would injuriously affect the maintenance of natural water supply, or otherwise be prejudicial to the public welfare. This principle of law has lately received fresh support by an opinion of the Supreme Judicial Court of Maine, rendered at the request of the Senate of Maine, and as it will prove instructive to all interested in forestry, I quote it in full.

The request, dated March 27, 1907, of the Senate of Maine for the opinion was as follows:

ORDERED, The Justices of the Supreme Judicial Court are hereby requested to give to the senate, according to the provisions of the constitution in this behalf, their opinion on the following questions, to-wit:

In order to promote the common welfare of the people of Maine by preventing or diminishing injurious droughts and freshets, and by protecting, preserving and maintaining the natural water supply of the springs, streams, ponds and lakes and of the lands, and by preventing or diminishing injurious erosion of the land and the filling up of the rivers, ponds, and lakes, and as an efficient means necessary to this end, has the legislature power under the constitution.

1. By public general law to regulate or restrict the cutting or destruction of small trees growing on wild or uncultivated land by the owner thereof without compensation therefor to such owner;

2. To prohibit, restrict or regulate the wanton, wasteful or unnecessary cutting or destruction of small trees growing on any wild or uncultivated land by the owner thereof, without compensation therefor to such owner, in case such small trees are of equal or greater actual value standing and remaining for their future growth than for immediate cutting, and such trees are not intended or sought to be cut for the purpose of clearing and improving such land for use or occupation in agriculture, mining, quarrying, manufacturing or business or for pleasure purposes or for a building site; or

3. In such manner to regulate or restrict the cutting or destruction of trees growing on wild or uncultivated lands by the owners thereof as to preserve or enhance the value of such lands and trees thereon and protect and promote the interests of such owners and the common welfare of the people;

4. Is such regulation of the control, management or use of private property a taking thereof for public uses for which compensation must be made?

#### OPINION OF THE COURT.

*To the President of the Senate:*

The undersigned justices, in obedience to the requirement of the constitution, severally give the following as their advisory opinion upon the questions of law submitted to the justices of the Supreme Judicial Court by the senate order of March 27, 1907:

We find that the legislature has by the constitution "full power to make and establish all reasonable laws and regulations for the defense and benefit of the people of this state, not repugnant to this constitution nor that of the United States." Constitution of Maine, Article IV, Part III, Section 1. It is for the legislature to determine from time to time the occasion and what laws and regulations are necessary or expedient for the defense and benefit of the people; and however inconvenienced, restricted or even damaged particular persons and corporations may be, such general laws and regulations are to be held valid unless there can be pointed out some provision in the state or United States Constitution which clearly prohibits them. Those we understand to be universally accepted principles of constitutional law.

As to the proposed laws and regulations named in the senate order, the only provision of the United States Constitution having any possible application to

such legislation by a state would seem to be that in XIV amendment. As to that provision, we think it sufficient to quote the language of the United States Supreme Court in *Barbier versus Connolly*, 113 United States 27, where, speaking of the XIV amendment, the Court said: "But neither the amendment, broad and comprehensive as it is, nor any other amendment was designed to interfere with the power of a state, sometimes termed its 'police power,' to prescribe regulations to promote the health, peace, morals, education and good order of its people, and to legislate so as to increase the industries of the state, develop its resources and add to its wealth and prosperity." It may be added that the proposed laws and regulations would not discriminate between persons or corporations but only between things and situations, with a classification not merely arbitrary but based on real differences in the nature, situation and condition of things.

We think the only provisions in the state constitution that could be reasonably invoked against the proposed laws and regulations are the guaranteed right of "acquiring, possessing and defending property," and the provision that "private property shall not be taken for public uses without just compensation." Dec. of Rights, Section 1 and 21). If, however, the proposed legislation would not conflict with the latter provision, it evidently would not with the former; hence, only the latter one need be considered.

The question of what constitutes a "taking" of private property in the constitutional sense of the term has been much considered and variously decided. In the earlier cases and in the older states the provision has been construed strictly. In some states, in later cases, it has been construed more widely to include legislation formerly not considered within the provision. Still more recently, however, the tendency seems to go back to the principles enunciated in the earlier cases. In Massachusetts, one of the earliest states to adopt the constitutional provision, and in Maine, adopting the same provision in succession, the courts have uniformly considered that it was to be construed strictly as against the police power of the legislature.

*Commonwealth versus Tewkesbury*, 11 Met. 55, decided in 1846, was a case where the legislature prohibited the owners from removing "any stones, gravel or sand" from their beaches in Chelsea as necessary for the protection of Boston harbor. The court held that the statute did not operate to "take" property within the meaning of the constitution, but was "a just and legitimate exercise of the power of legislature to regulate and restrain such particular use of property as would be inconsistent with or injurious to the rights of the public." *Commonwealth versus Alger*, 7 Cush. 53, decided in 1851, was a case where the defendant was prohibited by statute from erecting and maintaining a wharf on his own land (flats) beyond certain fixed lines. The court held that the defendant's title to the land (flats) was a fee simple, and that but for statute he would have had full right to erect and maintain wharves upon any part where they would not obstruct navigation. It was not claimed that the proposed wharf would obstruct navigation, but rather admitted that it would not. The court further held, however, that the statute was within the legislative power and not forbidden by any clause in the constitution. The question was considered at length in an opinion by Chief Justice Shaw, and the principle stated as follows:

"We think it a settled principle, growing out of the nature of well ordered civil society, that every holder of property, however absolute and unqualified

may be his title, holds it under the implied liability that his use of it shall be so regulated that it shall not be injurious to the equal enjoyment of others having an equal right to the enjoyment of their property, nor injurious to the rights of the community. All property in this commonwealth, as well as that in the interior as that bordering on tide waters, is derived directly or indirectly from the government and held subject to those general regulations which are necessary for the common good and general welfare. Rights of property, like all other social and conventional rights, are subject to such reasonable limitations in their enjoyment as shall prevent them from being injurious, and to such reasonable restraints and regulations established by law as the legislature, under the governing and controlling power vested in them by the constitution, may think necessary and expedient. This is very different from right of eminent domain," etc.

In the case of *Wadleigh versus Gilman*, 12 Maine 403, decided in 1835, only 15 years after the adoption of our constitution, there was upon the plaintiff's land a wooden building. A city ordinance was passed by legislative authority prohibiting the erection of wooden buildings within certain limits, which included the plaintiff's building. After the passage of the ordinance the plaintiff moved his building to another place within the same inhabited limits. The defendant, as city marshal, acting under the ordinance, entered upon the plaintiff's land, took the building down. The court held the ordinance valid and the defendant protected, and declared as follows: P. 405: "Police regulations may forbid such a use and such modifications of private property as would prove injurious to the citizens generally. This is one of the benefits which men derive from associating in communities. It may sometimes occasion inconvenience to an individual, but he has compensation in participating in the general advantage. Laws of this character are unquestionably within the scope of the legislative power without impairing any constitutional provision. It does not appropriate private property to public uses, but merely regulates its enjoyment."

In *Cushman versus Smith*, 34 Maine 247, decided 15 years later, in an elaborate opinion by Chief Justice Shepley, the court said of the constitutional provision in question (page 258): "The design appears to have been simply to declare that private property shall not be changed to public property, nor transferred from the owners to others for public use without just compensation." In *Jordan versus Woodward*, 40 Maine 317, it was said by the court at page 324: "Strictly speaking, private property can only be said to have been taken for public uses when it has been so appropriated that the public have certain and well defined rights to that use secured, as the right to use the public highway, the turnpike, the ferry, the railroad and the like." The same doctrine was recognized in *Preston versus Drew*, 33 Maine 558; *State versus Gurney*, 37 Maine 156; *Boston & Maine Railroad Company versus County Commissioners*, 79 Maine 386; and as late as 1905 in *State versus Robb*, 100 Maine 180.

There are two reasons of great weight for applying this strict construction of the constitutional provision to property in land: First, such property is not the result of productive labor, but is derived solely from the state itself, the original owner; second, the amount of land being incapable of increase, if the owners of large tracts can waste them at will without state restriction, the state and its people may be helplessly impoverished and one great purpose of government defeated.

Regarding the question submitted, in the light of the doctrine above stated (being that of Maine and Massachusetts at least) we do not think the proposed legislation would operate to "take" private property within the inhibition of the constitution. While it might restrict the owner of wild and uncultivated lands in his use of them, might delay his taking some of the product, might delay his anticipated profits, and even thereby might cause him some loss of profit, it would nevertheless leave him his lands, their product and increase, untouched, and without diminution of title, estate or quantity. He would still have large measure of control and large opportunity to realize values. He might suffer delay, but not deprivation. While the use might be restricted, it would not be appropriated or "taken."

The foregoing considerations lead us to the opinion at present that the proposed legislation for the purposes and with the limitations named in the senate order, would be within the legislative power and would not operate as a taking of private property for which compensation must be made.

Respectfully submitted,

LUCILIUS A. EMERY,  
WM. P. WHITEHOUSE,  
S. C. STROUT,  
HENRY C. PEABODY,  
ALBERT M. SPEAR,  
LESLIE C. CORNISH.

March 10, 1908.

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## FORESTRY IN BULGARIA.

Bulgaria, bordering the west coast of the Black Sea and the south bank of the Danube, was in antiquity a part of Thrace. That, in the drama of "The Gladiator," was the native land of Spartacus. Now a slave and gladiator, he had, he says, in boyhood looked from the "cloud-piercing Hoemus" upon a fertile country sloping to the mighty Danube, where "peace was tinkling on the shepherd's bell and singing with the reapers."

Bulgaria, with a population now of over four million, was for five centuries a province of Turkey, but gained its political independence thirty years ago. It has made rapid progress in recent years, and naturally forestry is one of the things that has received favorable attention from its enlightened government.

The total area of the forest in Bulgaria comprises 7,512,000 acres, being 30 per cent of the whole area of the country. Of these, 2,231,000 acres belong to the State, 3,866,000 acres to parishes, 132,000 acres to schools

and 1,283,500 acres to private individuals. Scotch pine and other conifers, including fir (*picea pectinata*) and spruce, are the prevailing kinds of trees.

#### ADMINISTRATION.

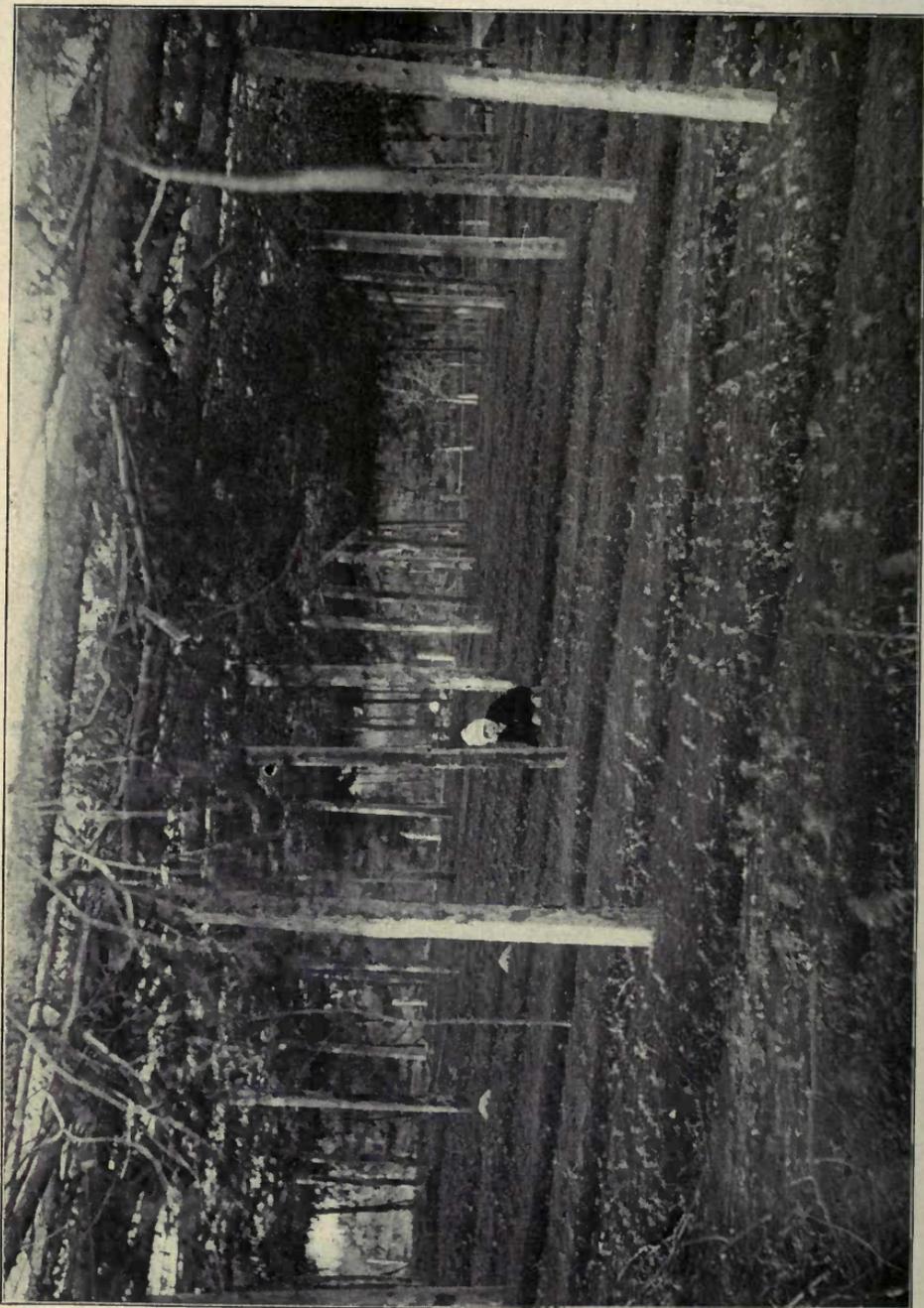
The administration of the forests is by a bureau in the Ministry of Commerce and Agriculture, and consists of a chief, an inspector general of forests and two assistant chiefs. The budget for forests and forestry for the year 1905 was \$150,000. There are six district inspectors, who have received scientific forestry training, 40 foresters who have received forestry training. There is a district inspector for each 1,250,000 acres and a forester for every 190,000 acres. There is a keeper to patrol the forest to every 3,500 acres. There are also many other employes. For the parish forests there is a forester for every 125,000 acres.

These facts are taken from an unusually able and fine volume entitled "Bulgaria of To-day," issued in 1907 by the Bulgarian Ministry of Commerce and Agriculture, and a copy of which was kindly sent to the Commissioner of Forestry of Minnesota by the British Diplomatic Agent and Consul General at Sofia, Sir G. W. Buchanan. The following are the concluding words of the chapter on forests in said volume:

"The improvement of our forests demands enormous sacrifices, but on the other hand a time will come when the revenue from the forests will play an important part in the State budget. The Bulgarian Government, fully aware of its duties and its interests, concentrates its efforts to this end; to make our forests, by the simplest means, in the near future a source of riches, which are so sorely needed by the young State for the completion of its organization."

It is an interesting fact that Bulgaria, in territorial extent, is only half as large as Minnesota.





Showing a part of nursery containing Norway spruce seedlings, from seed sown and covered with brush screens, made under direction of the Minnesota State Forestry Board on the Pillsbury Reserve in Cass County. Evergreen seedlings must be protected from the sun for a few weeks after they come up.

## Forestry In Other European Countries.

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Of the sketches of forestry in sixteen European states which have appeared in my recent annual reports those of eleven countries—Alsace-Lorraine, Baden, France, Hesse, Italy, Norway, Prussia, Saxony, Sax-Meiningen, Switzerland and Wurtemberg, as printed in this report have been wholly revised or contain additional information kindly furnished by their respective forestry directors.

### ALSACE-LORRAINE.

#### STATE FORESTS.

Aggregate extent 343,545 acres, also the state possesses together with several towns and villages 40,630 acres of undivided forests, situated in the valleys of the Rhine and Mosel rivers and on the Vosges Mountains. The prevailing kinds of trees are beech, oak, pine (*pinus sylvestris*), fir (*abies pectinata*) and spruce (*picea excelsa*). The average estimated value per acre is about \$100. Annual aggregate expense \$1,480,000; annual aggregate revenue, \$2,333,000; average net profit per acre, \$2.40. The number of acres annually sown with seeds, 1,025; planted with seedlings, 2,915 acres. On 265 acres the surface of the ground is roughly opened with spade, plow, harrow or hoe with a view to facilitate the germination of self-sown seeds. On about 50 per cent of the entire area, reforestation is effected by self sown seed from standing trees; on about 35 per cent of the entire area planting trees; and on about 15 per cent planting seeds is resorted to.

There is a continuity of forest produce. The annual yield or cutting of the forest is not allowed to exceed the annual production. A decrease of the growing stock, by over-cutting the forest, would be considered a criminal offense on the side of the forest administration. The general increase of the productiveness of the forest, however, permits of a gradually, but slightly, increased annual output. The forests consist of more or less averaged sections termed "compartments." Every compartment yields periodically (say in the 40th, 50th, 60th, 70th, 80th and 90th year of tree life) a certain "intermediate yield," composed of immature trees, removed by way of thinning. When the remaining trees reach financial maturity, they are removed either by a clean sweep or gradually, the removal proceeding hand in hand with the development of the second growth started underneath the mature trees (fir and beech).

The cutting of forests, with a view of using the soil for agriculture or pasture thereafter, is strictly prohibited since 1803, unless, under certain stated conditions, permission to the contrary effect is granted by the civil government. Any forest ground cleared from tree growth must be planted up within three years after such clearing, if in the opinion of the forest administration regeneration from self-sown seeds cannot be depended upon. The owner of unproductive lands, when proposing to plant such lands to forest, receives certain contributions out of the treasury of the state. Plantations made on the tops and on the steep slopes of mountains, also plantations made on dunes and on unproductive prairies densely clothed with ligneous weeds, are free from taxes for 30 years. The amount of damage annually caused by forest fires is very little; no data available. The principal cause of such fires, when they do occur, is the careless use of matches and cigars thrown away burning. Very few such fires are annually caused by rail-

road locomotives; no data available. It may be estimated that in Alsace-Lorraine, as in Prussia, 10 per cent of all forest fires are caused by sparks from locomotives.

The forest service is entirely co-ordinate and equal to the other branches of the public service. The average salary per annum of the "Land Forst Meister" (forest councillor) is \$2,200; of the "Oberforstmeister" \$1,800 of the Forstrat \$1,500 the "Oberforster" (district manager) \$830; and the allowance for office and traveling expenses of each officer is \$500. 27 "Oberforster" have the use of unfurnished house, 37 an equal compensation.

#### PRIVATE FORESTS.

The aggregate extent of private forests is 766,635 acres, of which 544,670 acres are managed on forestry principles, being owned by towns, villages or public institutions. The forests owned by private individuals proper, aggregating 221,965 acres, are managed at the will of the owner except as above stated. The average value per acre is uncertain; it depends on growing stock, accessibility, quality of soil, etc. However the average value of the private forests may be roughly estimated at \$275 per acre. The average annual rate of net income is between one and one-half and four per cent. The total forest product of Alsace-Lorraine is well sustained. The municipal forests yield 70 cubic feet per acre per annum. This quantity is equivalent to about 140 feet of lumber, board measure, and one-half a cord of fuel. The population of Alsace-Lorraine is 1,641,000. The area of the entire territory is 3,628,000 acres of which 1,110,180 acres are under forest. The annual yield of raw material is 61.1½ cubic feet per acre. Of this amount 45 per cent consists of timber, and 55 per cent of fuel, corresponding with about 170 feet timber, board measure, and four-tenths cord of fuel. The cost of cut-

ting timber and fuel, inclusive of sawing into logs, piling along wood roads, etc., amounts to 1.5 cents per cubic foot. At this price the workmen earn 52 cents per day. The value of timber, without bark, dragged to forest roads, is 11 cents per cubic foot, on an average. The value of fuel, piled up along roads, is 5.4 cents per cubic foot, or about \$3.42 per cord. (The stumpage of timber is worth about \$12 per 1,000 feet, board measure.) In the state forests about \$100,000 are spent annually for road improvement and forest railroads. In the private forests the exclusive right of hunting is periodically leased to the highest bidder, under certain restrictions. Likewise in about half of the state forests the "Oberforster" manages the right of hunting by order of the government. In the state forests these leases yield annually 10 cents per acre. In the season of 1903, for instance, there were killed, in the administered districts of the state forests aggregating 188,440 acres, 242 head of red deer, 679 head of roe deer, 298 head of wild boar, 1890 hares and 10 capercaillies, tetrao urogallus (mountain cock), besides a number of minor animals.

A forester of scientific education (Oberforster) has, on an average, under his charge 13,933 acres of forests, managed on forestry principles and being owned by the state, by towns, villages or public institutions.

In the state forests there are steadily employed for every 1,000 acres of forest, 35 experienced forest laborers. Their pay is generally and on an average not higher than that of ordinary laborers 50-55 cents per day.

With respect to the proportion which exists in coniferous forest between reforestation by natural seeding and reforestation by planting, positive data cannot be furnished, except that reforestation of the fir (*abies pectinata*) is principally natural seeding.

## AUSTRIA.

## STATE FORESTS.

The entire forest area of Austria is, in round numbers, 24,000,000 acres, of which the state administers 2,573,940 acres of actual forest, and of which 800,000 acres belong to religious, educational or charitable endowments. Under the Department of Forestry there are eight territorial offices, and under these eight territorial offices there are 186 local offices. The largest area under the supervision of a single territorial officer is 628,225 acres; the smallest area under the supervision of a territorial officer is 191,498 acres, whilst the average is 452,762 acres.

Including unproductive soil a local range comprises in one case as much as 120,726 acres. If only the productive forest area is drawn into calculation, the maximum size of a local range is 58,993 acres, whilst the minimum is only 1,030 acres. The average size of the forest area under the management of a single local officer is 13,880 acres.

There are two distinct groups of forests administered by the state authorities—one in the east, comprising lands in Galizia and Bukowina, and one in the west, comprising the Alps. Besides, there are some smaller forests lying in the southern and the northern sections of the empire.

Twenty-six per cent of the state and fund forests are lying in the plains and at the foot hills.

Forty-nine per cent of them are lying in the mountains, at medium elevations, growing under conditions favorable to tree growth.

Twenty-five per cent of them are lying in the highest mountain region, extending up to the limit of tree growth.

The species covering most ground is the European spruce (*Picea excelsa*), occupying 49 per cent of the entire forest area. Beech is next, occupying 20 per cent. Then follows the fir, occupying 19 per cent, and the larch, occupying 5 per cent. A small area only is in possession

of the pines (only 3 per cent). The balance of 4 per cent is occupied by alder, linden, maple, oaks, elms, aspens, willows, etc. It appears from these figures that the Austrian state and fund forests consist of coniferous woods to the amount of three-quarters and of hard woods to the amount of one-quarter.

In the Alps spruce reaches up to an elevation of 2,000 meters (or 6,562 feet), and in the Karpath mountains to an elevation of 1,500 meters (or 4,921.5 feet). It forms, especially on the high mountain ranges, pure forests in many cases. However, it is often found mixed with other conifers and with hardwoods. In the very highest mountains it shows a poor growth, short boles and bad form, the diameter decreasing rapidly from the root to the top. The branches are running down to the ground and are covered with lichens. Spruce thrives best on slightly sloping ground protected from high winds, where the underlying ground is a sandy loam formed from slate. Here the tree shows long, straight and clean boles. However, spruce is found thriving in almost all situations.

Silver fir (*Abies pectinata*) is mostly found mingled with beech, horn-beam and spruce. It does not run as high up in the mountains as the spruce will do. However, it is found in the Karpath mountains at an elevation of over 1,500 meters (or 4,921.5 feet). Pure forests of fir are found only in a few places (Vienna forest, Karpath mountains and Krain).

Larch (*Larix Europæa*) is scarcely ever found forming pure forests. Its favorite ground is an eastern and northern slope where spruce is the predominating species. Under these conditions it rises as high up as 2,200 meters (or 7,218.2 feet). Larch is thriving splendidly on calcareous and sandy loam, especially on well shaded slopes. Larch avoids wet, sunny, and such localities which are exposed to rough winds.

Scotch pine (*Pinus sylvestris*) is found in the Alps and

in some dry and poor localities elsewhere. It is running up to an altitude as high as 1,200 meters (or 3,937.7 feet, in southern Tyrol even as high as 1,700 meters (or 5,577.7 feet), here attaining the size of a dwarf only. In the sandy plains of Galizia, Scotch pine shows a good growth and furnishes fine timber.

The black pine (*Pinus Austriaca*) is very scarce on the whole. On the south slopes of the Vienna mountains it forms small forests. It is fond of the sunny side and of calcareous ground.

It is impossible to ascertain the value per acre of the state and fund forests. This value depends on the locality, on the means of transportation, on the condition of the lumber market, etc. Even an average figure giving an idea of the value of the said forests cannot be given. If the annual net yield per acre is taken as a basis for the valuation of our forests at a rate of 3 per cent, then the average value of the state and fund forests per acre will amount to \$8.91. It is likely to range between \$3.50 and \$20 per acre, according to the possible yield.

During the twenty years between 1874 and 1893 there was expended annually on an average:

I. For forestry proper, namely, forest utilization, transport of forest products, charcoal burning, maintenance of forestry buildings, silviculture, etc.	\$732,578.17
II. For agriculture, namely, expenses for administration and for maintaining buildings. . . . .	9,675.45
III. For other branches, namely, for technological industries, for shooting grounds, fishing, timber yards, etc. . . . .	87,193.67
IV. For administration, including the salaries for all local officers, rangers, guards, etc., their traveling expenses, the expense of keeping up buildings used by these officers, etc. . . . .	418,499.05
V. For public expenses (taxes and charity expenses).	259,867.44
VI. Money refunded . . . . .	756.13

VII. Extraordinary expenses (purchase of real estate, new buildings, new surveys, demarkation of boundary lines, forest working plans, prescriptive rights, etc.) .....	143,845.88
VIII. Administration at headquarters (expenses at the territorial offices and at the ministry of agriculture) .....	151,340.20

Grand total expense.....\$1,803,755.89

During the same period—namely, during the twenty years between 1874 and 1893—the mean annual gross receipts amounted to:

I. From forestry (sale of fuel and timber, of charcoal, of minor forest produce, etc.) .....	\$1,727,805.73
II. From agriculture (rentals from land leased, etc.) .....	161,592.16
III. Technological industries (rents of buildings and establishments, rents from shooting and fishing licenses, rents from yards, etc.) .....	291,747.02
IV. Money refunded.....	6,524.15
V. Extraordinary revenue .....	19,492.24
Total receipts.....	\$2,207,161.30

To the latter figures there must be added the value of the prescriptive rights under which the inhabitants of certain villages have the privilege of taking timber, fuel, grass, etc., from the forest without refunding any money for such taking, estimated at..

	290,336.40
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Therefore grand total gross receipts.....\$2,497,497.70

Deducting from this amount the expenses previously mentioned, there remains a net revenue of..... \$693,741.81

Thus the entire state and fund forests of the Austrian empire have netted on an average, during the above named period of twenty years, 26.8 cents per acre per year.

During the five years lying between 1887 and 1893 there were planted up annually on an average 15,614 acres, by means of planting seeds or planting seedlings, at an expense of \$28,586.01 for labor only. To these planting ex-

penses there must be added the annual expenses incurred for the following items, namely:

I. For raising, transplanting and nursing plants in nurseries proper.....	\$17,894.78
II. For preparatory work, as drainage, subsoiling, making mounds to plant upon, etc .....	1,694.96
III. For cleaning and attending to the young forest previous to the age of, say, 20 years.....	6,406.72
IV. Spades, picks, mattocks and other tools.....	834.02

Adding these items to the above named figure of \$28,586.01, the grand total expense for replanting amounts to \$55,416.49, or to \$3.55 per acre.

Of the entire forest area of 2,590,182 acres, six-tenths of one per cent are planted up annually. Of these, 40.5 per cent were planted with seeds and 59.5 per cent were planted with seedling plants. For planting seeds there were used annually 23,669 kilograms of coniferous seeds; further, 561 hectoliters of acorns and 10,543 hectoliters of walnuts. The number of seedlings planted annually averages 17,604,196, planted out on 9,294 acres.

Regeneration is effected partly from self-sown seed under the cover of mother trees, partly from coppice shoots, partly by planting and sowing after clear cuttings as indicated above. Besides, where natural regeneration fails, planting seeds or seedlings takes place. The number of acres either wholly or partly cut over annually is 18,212. Of these, 55 per cent, or 10,108 acres, are planted up artificially by means of sowing and planting, whereas 45 per cent, or 8,104 acres, are regenerated from self-sown seed or from coppice shoots.

The difference between the area planted up annually, namely, 15,614 acres, with the area replanted annually after a clear cutting just mentioned, namely, 10,108 acres, amounts to 5,506 acres, and may be explained partly from the fact that on a considerable fraction of the 8,104 acres just mentioned artificial help is needed when natural

regeneration fails, partly from afforestation of areas not occupied by forest crops heretofore.

The total amount of the annual harvest, or annual cut, on the whole area under the state forest management is pretty constant, whilst it is more or less subject to changes in the different territories or forest ranges, according to market conditions. Owing to the system of roads and railroads in the forest of Galizia and of the Bukowina being extended annually, the annual utilization of forest produce in the state and fund forests is expected to increase in the future. The annual cut depends on figures prescribed by forest-working plans. It is never allowed to surpass the yield capacity of the forest.

Aside from charcoal burning, forest products are sold before manufacturing takes place. The trees to be cut are felled, freed from branches, and cut up into logs, and, if so desired, split up and freed from bark at the expense of the owner of the forest. "Timber" consists of: (1) Timber fit for building purposes which is not cut up into logs; (2) saw logs, the length of which depends more on the conditions of the logs than the inspection rules; (3) "work wood," which means timbers fit for carriage work, for turnery, etc.; (4) split timber, used especially for cooperage purposes. "Fuel" consists of wood for burning and for charcoal making. The former is cut up into pieces one meter (or 3.281 feet) long, the bark not being removed. According to the diameter of the log from which the fuel is taken, it is sold either split or unsplit. It is piled up according to quality, in distinct and separate piles. Fuel for charcoal burning is cut into pieces two or three meters long.

Relative to the reforestation of ground allotted to forestry, the main rules are found in paragraphs 2, 3 and 4 of the imperial "Patent," dated Dec. 3, 1852, which run as follows: Paragraph 2: "Without special permission,

no forest ground must be devoted to other purposes than timber production. If forest ground is used for other purposes than timber production, the owner shall be fined 30 cents to \$1.50 per acre. After such unlawful use the ground must be replanted within a time prescribed by the local authorities. If reforestation does not take place within the time thus prescribed a second punishment shall take place."

Paragraph 3: "Areas cleared from forests are to be planted up with timber species within five years after the clear cutting in the case of forests owned by the state or by the communities. Wherever there are clearings left from olden times they must be planted up within a period equal to the time fixed for the rotation of crops or fixed as the age of maturity of trees. In the case of private forests, a longer space may be allowed according to circumstances. Whosoever neglects this prescription shall be punished in the same way as if he had used forest ground for other purposes than for timber production." Paragraph 4: "No forest must be devastated; i. e., it must not be treated in such a way as might endanger or render impossible the continuation of timber production. If there is such danger, the fine to be imposed upon the owner of the land shall be the same as if forest ground was used for other purposes than timber production, or as if afforestation was omitted after a clear cutting. Aside from the fine, afforestation shall be made by force, if necessary, the owner bearing the expenses."

If the treatment was such as to render timber production impossible for the future, a fine up to \$3 per acre shall be imposed upon the owner. Under these rules or laws the local authorities have planted up during the years 1891 to 1895:

In state and fund forests, 231 acres; in communal forests, 28,269 acres; in private forests, 126,949 acres.

Preventives against forest devastation were taken:

In state and fund forests, on 1,393 acres; in communal forests, on 328,487 acres; in private forests, on 1,003,342 acres.

The statistics for the years 1891 to 1895 show that there occurred 3,007 forest fires, running over an area of 19,310 acres, and causing a loss of \$163,904. On the yearly average, 601 forest fires have run over an area of 3,862 acres, involving \$32,781 damage.

These fires were caused: By carelessness, in 1,210 cases; intentionally, in 181 cases; by sparks from locomotives, in 118 cases; by lightning, in 26 cases; by unknown agents, in 1,472 cases.

The officers of the state forest administration have a general rank equal to all technical branches of government administration. The forest officers in Austria are divided into two groups, one of which is attending to the administration of the Austrian state and fund forests, while the other is charged with the control and enforcement of all laws and rules enacted with reference to forestry. The latter forest officers are joined to the local political administration.

All government officers are allotted to different grades or ranks, the rank depending on their merit and their age, and being combined with a certain title and with a definite income peculiar to that rank. Forest officers are found in the following ranks: Tenth rank, forest assistants engaged in the administration of state and fund forests, drawing a salary of \$364 to \$405 per annum, to which there must be added an additional pay varying from \$64 to \$162, according to the time which the officer has spent in government service; ninth rank, head foresters entrusted with the local administration, drawing a salary of \$445 to \$526, with an additional pay varying from \$81 to \$202; eighth rank, a forest master, or inspecting officer, draws a salary of \$567 up to \$729 and an ad-

dition from \$97 to \$243; seventh rank, a forest counselor draws a salary of from \$810 to \$972 and an additional pay of from \$142 to \$283; sixth rank, a superior forest counselor draws a salary of from \$1,134 to \$1,458, in addition to a pay of from \$162 to \$324, depending on time of service. The traveling expenses, daily allowances on journeys, etc., differ according to the rank of the officer. Many of the local officers are living in government buildings, paying a rent equal to one-half of the additional pay above mentioned.

#### PRIVATE FORESTS.

At the close of 1895 the entire forest area of Austria was 23,993,442 acres. Deducting from this figure the area of the state and fund forests, aggregating 3,782,369 acres (out of which 862,236 were unproductive area), there remain 20,211,072 acres, which are composed of communal forests to the extent of 3,456,782 acres, and private forests to the extent of 16,754,290 acres.

There are treated according to forestry principles proper: In the case of communal forests, 14.5 per cent, equal to 500,818 acres; in the case of private forests, 38.4 per cent, equal to 6,434,070 acres. In these forests all work is done according to working plans, periodically made by officers of a training equal to that of the government forestry officers. In 85.6 per cent of the communal forests (2,955,964 acres) and in 61.6 per cent of the private forests (10,320,220 acres) no working plans exist. The work is done without reference to scientific forestry, more or less at haphazard after empirical rules.

The price of private forests depends on the quality of the soil, the age of the forest, and on the locality, viz., on the market conditions and on the industrial development of the section in which the forest is situated. Thus it is impossible to give even an approximately correct figure representing the value of private forests. Forest land

has been sold actually at prices ranging between \$5 and \$340.

The annual net revenue drawn from forestry varies just as much as the value of the forest itself. It is impossible to give any exact figure showing the annual net revenue from private or communal forests. A net revenue of equal to two or three per cent of the capital invested in forestry may represent a fair average.

The annual production of timber and fuel in the Austrian forests has somewhat declined of late. Savings are made everywhere to make good former over-cutting. Besides, the regulations of the forest laws are now being enforced, and under these enforced laws the utilization of forest produce had to be diminished. In the year 1890 the total harvest of timber and fuel from 24,173,333 acres of forest aggregated 29,341,590 cubic meters, or 1,035,758,127 cubic feet. In the year 1895, on the other hand, there were cut from 23,993,442 acres only 27,523,241 cubic meters, or 971,570,407.3 cubic feet.

It may be stated that the smaller figures, representing the area of the forest in 1895, are explained by the fact that the political authorities, whenever they think it fit, after consulting the foresters in charge, approve of a change of forest land into agricultural or pasture land. Besides, the diminished area is partly explained by mistakes made formerly in the survey of the forests.

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## DUCHY OF BADEN.

### STATE FORESTS.

The aggregate extent of the state forests of Baden is 248,000 acres, located in the Black Forest, the upper val-





German working men at dinner in a German forest. The German forests give steady employment to over a million laborers.



Road in a German forest. There must be an economical way of getting out forest products, and good roads are essential in such a country.

ley of the Rhine and in the Odenwald. The prevailing kind of trees is the spruce. Reforesting is effected by seed from standing trees; also by planting trees; in some rare cases by artificial sowing, the latter in the case of Scotch pine. There is a gradual increase of crop. The usual method of cutting the crop consists in cutting the mature trees and covers at periods, as a rule, from thirty to forty years, with longer or shorter intervals. Cutting in blocks clean (pines and Scotch firs) in exposed stormy situations is less frequent. According to paragraph 29 of the forest law of Baden of the year 1833, no part of any forest is allowed to be kept uncultivated.

The forest service ranks equally with other branches of the public service, and is comprised in Class D of the tariff of salaries. Seven members of the Administration of Forests and Domains (which forms a part of the Treasury Department) are the highest forest officers. They bear the title of Councillors of the Forest Board, and have a salary not exceeding \$1,380, and \$147 for expenses.

Besides the state forest there are community and corporation forests, covering a total surface of 555,069 acres, which are managed on the same principles as the state forests.

#### PRIVATE FORESTS.

About one-third of all private forests is managed on forestry principles. The total forest product of the country increases gradually.

## BAVARIA.

## STATE FORESTS.

Bavaria, whose attractive capital, Munich, is frequented by so many Americans, has 6,000,000 inhabitants. Its state forests comprise 2,150,000 acres, and are mostly managed as "selection" forests. Large forests are to be found in all parts of the kingdom; but as a general rule the mountainous districts in the south (Alps), the north (Spessart) and northeast (Bohemian forest) are covered with the densest forest. Of the whole area of the country 33 per cent is covered with forest. The prevailing kind of trees, or 77 per cent, are coniferous. The remainder comprise various kinds of deciduous trees—those losing their foliage in winter. Among the conifers, red and white pine are most frequent. Among the deciduous trees the beech occupies the greatest space. The oak is also cultivated quite extensively for tanning purposes. The average estimated value of the forest land is \$50 per acre. The annual aggregate expense of administering the forests (1891) including salaries of officials, wages of workingmen, local taxation, new purchases, etc., amounts to \$4,965,204. The total revenue from the forests the same year amounted to \$8,187,349. Number of acres sown or planted to forests in 1892 was 14,800, more than three-fourths of which area was planted with coniferous trees. In the case of the red pine and the white pine, reforestation is mainly done in the natural way. In the case of the fir (*pinus sylvestris*) it is always effected artificially; in the case of the beech, always in a natural way (seed from standing trees); in the case of the oak, generally by artificial sowing. There is a continuity of forest products and a steady increase of the revenue which the state derives from its forests. This is due, first to an increase of prices, secondly to an increase of the yearly

crop. The latter must chiefly be regarded as a result of the present condition of the forests, which are being and have been steadily improved; also of the economy which was practiced in former times. Where reforestation is effected by seeding from the standing trees, the crop is generally cut in lengthy strips, usually not exceeding about thirty yards in width. As a general rule the administration of the state forests makes it a principle to avoid cutting in large blocks clean. In regard to compulsory tree planting, it may be said that every forest area, the trees of which have been cut, no matter whether state or private property, must be reforested in a short time, unless evidence can be furnished that the land would be better adapted to agricultural purposes.

The damage caused by forest fires is quite insignificant, being in 1890 only \$974, in 1894 only \$1,686. The principal cause of such fires is the carelessness of the workmen employed in the forests and of individuals and parties making excursions, particularly on Sundays. There are no data at hand as to the number of such fires caused by railroad locomotives, and although some fires are no doubt so caused, the number is certainly very small.

The administration of the Bavarian state forests constitutes one of the departments of the ministry of finance. It is directly subordinate and responsible to the latter, no other authorities intervening. The highest forest official who may be regarded as being at the head of the forest administration, responsible, of course, as stated, to the minister of finance, bears the title "Ministerialrath,"—ministerial or cabinet councilor. The chief director of the Bavarian administration of state forests is "Ministerialrath" Ganghofer. His starting salary is 7,740 marks. After a sixteen years' service the salary advances to 8,820 marks. Next in rank are the so-called "Oberforstrathe," with a starting salary of 6,660 marks, which, after a sixteen years' service, is increased to 7,740 marks.

## PRIVATE FORESTS.

The aggregate extent of private forests was 3,149,400 acres in 1892. In addition to the state and private forests there are about 800,000 acres of forests belonging to separate towns and villages. The forests which are owned by great landholders are managed on forestry principles. These forests, however, only comprise a very limited area, somewhat less than 400,000 acres. Most of the private forests are the property of small landholders. The average value per acre of private forests is somewhat less than that of the state forests. The net income rate varies widely. The data at hand are too few and too unreliable to admit of arriving at any conclusion with regard to the average. Opinions vary as to whether the total forest product of the country increases or decreases. In general the extent of the private forests seems to be somewhat decreasing. This would, of course, also appear to entail a decrease of the total forest product. Forest lands are only allowed to be changed into agricultural lands when proof can be furnished that the agricultural crop may be expected to exceed in value the forest crop. Between 1886 and 1891 7,000 to 8,000 acres of private forests were newly planted or sown.

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DENMARK.

## STATE FORESTS.

The experience of a country which had adopted important forestry regulations almost at the very beginning of the last century and which has successfully, through tree planting, resisted the invasion of desolating sand drifts from the sea shore must prove of much value. It was, therefore, with a high degree of satisfaction that I lately received from the Department of Agriculture of

Denmark, answers kindly furnished in the English language to some questions that I had submitted. I have put the information in its present form.

The aggregate extent of the state forests of Denmark is 142,140 acres, besides 2,962 acres for public parks. Of these, 67,700 acres are old forests, 74,440 acres are new plantations, especially on heathy tracts. The planting of forests had already commenced one hundred years ago, but has quite particularly increased since 1850. Forty-five per cent of the state forests are situated on the Danish islands; 54 per cent on the peninsula of Jutland, of which latter only 10.6 per cent are old forests, the rest are new heath plantations not yet thoroughly planted up. Beech comprises 37.7 per cent, oak 3.3, ash, maple, birch, elm and alder 4.8 per cent, and conifers 54.2 per cent. Conifers did not exist in Denmark 150 years ago, so that the extensive area of conifers in the state forests at present has been produced artificially. For the planting up of heaths the mountain pine (*pinus montana*) and the spruce (*picea excelsa*) are particularly utilized. The annual aggregate expense of administration averaged \$40,000 per year for the period 1893-97. Annual aggregate revenue averaged per year for the period 1893-97: revenue \$258,416, expenses \$195,370. The smallness of the net revenue arises partly from the fact that about half of the state forests are still so young as to yield only a small revenue, partly from extensive new areas being cultivated every year. The area annually sown or planted to forest averaged 2,285 acres per year for the period 1897-1900. Regeneration from self-sown seed is only used in the case of the beech (*fagus silvatica*) and of the silver fir (*abies pectinata*). In all other cases, forests are regenerated by means of planting plants or sowing seeds.

There is a sustained yield. Every tenth year a working plan is prepared for cuttings and cultivations of the next decennium. In working out these plans it is taken

into consideration, as far as may be, that there should be such areas and stocks of wood in store for the future as are available for the decennium. Within such a decennial period the yield of the cuttings varies according to circumstances; as a rule, however, there is but little differing one from the other. The extent of the state forests being on the increase, the proceeds will naturally increase. The forests are divided into parts of 10—100 acres in size, according to the nature of the soil or the species and age of the stock of wood. Within each decennial period a certain number of such divisions are destined for cutting, and the latter is commonly to be finished and the areas restocked with plants at the end of the period.

Private persons are prohibited by the law of September 27, 1805, from cutting away those remnants of the old forests of the country still existing in the said year. In cases of offence, means are placed in the hands of the government to force the owners to restock the cleared area under control of the state officer in charge. Consequently but very few forest areas have disappeared in the course of the nineteenth century. The many new plantations in Jutland which have risen by means of government subventions disbursed through the "Hedeselskabet," are subject to the same prohibition of clearing. Finally, under the guidance of a board of administration not appertaining to the state forestry service, the government has caused the waste sandy downs on the west coast of Jutland to be planted in order to subdue the sand drift in those parts, which had in former times caused great devastation. At the close of 1899 about 27,000 acres of sand downs had been planted with a good result. Damages by forest fires occur every year, but they have hitherto been rather insignificant. On account of the dense population of the country the casual forest fires are quickly quenched. The principal cause of such fires is care-

lessness of various kinds. It is notorious that several forest fires have been caused by sparks from locomotives, but no number can be stated.

The administration of the state forests is under the Department of Agriculture; its yearly budget is voted under the general budget of finances and its officers are appointed by the king. The state forestry is managed by three forest masters, twenty-three superior foresters, sixty-nine foresters and 306 keepers. The superior foresters have the use of a house free of charge, together with a lot of arable land (30-100 acres) upon which they pay the ordinary taxes, besides a salary of \$950-\$1,250. The salary of the forest masters is \$1,450, to which is added an allowance for traveling and other lawful expenses. The three forest masters give in an annual report on the operations of the local ranges under their supervision. Three reports are prepared in the department and printed in a condensed form as a supplement to the public accounts. Every tenth year is issued a review of the state forestry in the past decennium. The "Tidskrift Skovvasen" (forestry periodical), published in Copenhagen by Mr. C. V. Prytz, professor of forestry in the Royal Agricultural and Forestry Academy, and "Hedeselskabets Tidskrift" (periodical of the society for the cultivation of heaths), published by "Det danske Hedeselskab" at Aarhus, are the periodicals. The revision of the decennial working plans for state forestry, which is simultaneous with the preparation of the working plan for the next ten years, is undertaken by a "Skovtaxator" (appraiser of forests), classed directly under the department, and four assistant clerks. A second "Skovtaxator" with one clerk is constantly occupied in the experimental line, in examinations of the growth of trees and the economy of divers modes of forest husbanding, altogether in support of practical forestry.

## PRIVATE FORESTS.

The aggregate extent of private forests is 505,900 acres, of which, by the statistics of 1896, beech (*fagus silvatica*) comprises 44 per cent; oak, ash, maple, birch and alder comprise 18 per cent, and spruce (*picea excelsa*), pine (*pinus sylvestris* and *montana*), silver fir (*abies pectinata*), larch (*larix Europea*), etc., 38 per cent. Three-fourths to four-fifths of these forests are managed on forestry principles. The extent of private forests by the official statistics was, in 1888, 414,837 acres, and, in 1896, 454,874 acres. By the law of September 27, 1805, before mentioned, and which is still in force, private persons are prohibited from cutting their parts of the old forests of the country standing at that time, aggregating at that date an area of about 280,000 acres. This area comprises (besides the old forest area of the state, about 100,000 acres) the remnants of the original forests of the country still existing. Since 1850 very considerable areas have been planted with forests, both by the state and by private persons, especially in the heathy tracts of the peninsula of Jutland. In these tracts an area of 108,500 acres has, since 1868, been planted by private persons, however under the guidance and control of the "Hedeslskab" (society for the cultivation of heaths), which is aided by the state (for the year 1900 to the extent of \$73,000); and of the above area 54,600 acres were thoroughly cultivated at the close of 1898.

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FRANCE.

The total extent of the forests of France (exclusive of the colonies) is about 23,600,000 acres, which represents about 17 per cent of the surface of the entire territory.

These forests are divided in: Forests of the state, 2,800,000 acres; forests of the municipalietis and of the

public institutions, 4,800,000 acres; forests of individuals, 16,000,000 acres. The forests of the state and those of the municipalities and of the public institutions are managed and supervised by the Administration of Forests. France only extends over 9 degrees in latitude, but, as it has very high chains of mountains, the result is that it possesses all the climates of Europe, from the hottest to the coldest, and that a great variety exists in the species of trees that compose the forests.

The principal varieties of these species are: In the warm region, comprising the borders of the Mediterranean sea and of the Gulf of Gascony, the cork oak (*quercus suber*), the evergreen oak (*quercus ilex*), the cluster pine (*pinus pinaster*) and the Aleppo pine (*pinus halepensis*).

In the temperate region, comprising the plains, the rolling grounds and the lower parts of the mountains, the common European oak (*quercus robur*), the European white oak (*quercus pedunculata*), the beech (*fagus silvatica*), the hornbeam (*carpinus betulus*), the common European ash (*fraxinus excelsior*).

In the cold region, comprising the middle and upper parts of the mountains, up to the extreme limit of vegetation, the silver fir (*abies pectinata*), the Norway spruce fir (*abies excelsa*), the beech (*fagus silvatica*), the Scotch pine (*pinus sylvestris*), the mountain pine (*pinus montana*), the larch (*larix Europea*).

#### STATE FORESTS.

The total area of the forests of the state, 2,800,000 acres, is composed of 2,200,000 acres of productive forests and of 600,000 acres of protective forests, situated in the mountains or on the dunes of the ocean; of lands recently purchased by the state on the banks of torrents and whereon timber is now being planted.

The forests yield annually to the state:

Timber (cubic feet).....	38,100,000
Fire wood (cubic feet).....	64,200,000
<b>Total.....</b>	<b>102,300,000</b>

This represents nearly an annual production of  $46\frac{1}{2}$  cubic feet of wood per acre of productive forest. The state forests produce in addition thereto oak bark, which is used in the tanning of leather; cork, rosin and several other small products; also hunting rights are leased.

The gross annual income in money is \$6,000,000, or \$2.72 per acre of producing forest. In some forests this average is largely exceeded and it attains as high as \$8 per acre.

The expenses are as follows, viz:

Personnel.....	\$1,240,000
Forest instruction.....	36,000
Sundry works.....	336,000
Reforestation of mountains.....	651,000
Taxes paid to departments and municipalities.....	405,000
Sundry expenses.....	57,000
<b>Total.....</b>	<b>\$2,725,000</b>

But of all these expenses a large share is applied either in administering the forests of the municipalities or in executing works of real public utility in the "protection forests," or in reforestation mountain lands (to prevent slides and the like). If we make these several deductions we find that the expenses incurred in the producing forests do not exceed \$1,500,000 or 70 cents per acre. The net annual income of these forests is therefore \$2.72 less 70 cents, equal to \$2.02 per acre.

The state forests are carried on either as high forest or as coppice, and are managed under regulations approved by the President of the Republic. Cuttings are made yearly. In forests rich in wood there is cut every year an amount equal to the increment or growth; in forests poor in wood

they cut less than the increment in order to gradually increase the forest. The endeavor is made also to increase the production of the timber wood by reducing that of the fire wood. The "high tree forests" are cut down at periods ranging from 120 to 150 years.

The work is directed in a way that will insure natural reforestation from the seeds that fall from the standing trees. Not only the trees that have attained the age determined by the rules are cut down, but also the dead ones and those which are dying, and those that prevent the growth of neighboring trees. In temperate climate the annual cutting of high trees is on a limited area; a large number of trees are cut down simultaneously. In very cold climates and where winds are to be feared, only a few trees are taken away at a time on the same point, and cutting is then done on a larger area.

The low forest, coppice and second growth are cut in rotations, ranging from 25 to 35 years. The reserved trees, which are very numerous, are cut on an average every 100 years, but some selected trees are allowed to attain and even pass 200 years.

The labor performed in the forests consists in the construction and maintenance of forest roads, water saw-mills, houses for watchmen, replanting. Fortunately, owing to the system of culture now in use, artificial reforestation has but little importance in forests, properly speaking, but sowing and planting in the small open spaces, or on the points where a few more valuable species are to be introduced, or where the soil of the forest is better adapted to some varieties, there sowing and planting are more frequent. The average cost of such work is \$10.00 per acre.

The State and Communal forests are organized and managed so as to obtain regeneration by means of natural seeding. A sufficient number of trees are left standing that they may entirely cover the ground with their seed.

It may happen that those trees are thrown down by a hurricane or destroyed by fire. In that case recourse must necessarily be taken to planting, but that case does not often occur. In the private forests the same method is generally applied as in the State and Communal forests. However, as these forests are felled at a very early age, the proprietors must restore them by planting. This only occurs in the regions of plains where pine forests are grown on barren ground with a view of yielding the largest possible revenue.

A forester, with scientific knowledge, *i. e.*, a ranger or assistant conservator (*Garde general ou Inspecteur adjoint*—these two officers fulfilling the same functions) has on an average to administer an area of 19,000 acres of State forests, Communal forest or forests belonging to a public establishment. They generally have at their command three chief guards and ten or twelve forest guards.

Properly speaking, there are no workmen who devote themselves especially to forest work. Most of them only come into the forests in the bad season; in summer time they work in the fields. The number of workmen employed for 1,000 acres can therefore not be given exactly. It varies according to the regions and the longer or shorter time that the workmen devote to the forest work. Many forests being surrounded with villages, many woodcutters repair to their homes every evening. However, when the forests are very large and require work too far situated from the villages, the workmen, in order to avoid too great a loss of time in the morning and evening, construct huts in which they spend the night and cook their meals. The charcoal-burners, obliged to watch day and night over the kilns, always live in the forests.

Very considerable reforestation is made on mountain lands, where the State plants trees to regulate the action of the waters and stop the ravages of torrents. For that purpose \$700,000 are expended every year, the

largest part of which is used in the purchase of land, and the other part in dams to regulate the streams, and in plantations to settle and retain the soil. The State purchases yearly, on an average, 16,000 acres. The average cost of reforestation is \$20 per acre, and \$18 must be added thereto for work in improving the streams, building roads, etc. Planting is preferred to sowing on calcareous or chalky soil.

The administration of the forests forms part of the Department of Agriculture. It has charge not only of the direction and care of the forests of the state and of those belonging to municipal corporations and public institutions, but also the overseeing of the fishing in the rivers and creeks. At its head is a director, residing in Paris, who has under him: A central service composed of 2 conservators, 3 administering general inspectors, 12 inspectors, 7 assistant inspectors and 19 clerks.

An exterior service composed of:

First—Personnel, superior or of administration—32 conservators, 200 inspectors, 210 assistant inspectors, 232 general wardens.

Second—Personnel, inferior or of surveillance—3,650 foremen and wardens, paid by the state; 3,700 foremen and wardens, paid by the municipal corporations and public institutions.

The annual salaries paid are as follows:

SUPERIOR OFFICIALS.

Director .....	\$3,000
Administrators .....	\$1,800 to 2,600
Conservators .....	1,600 to 2,400
Inspectors .....	800 to 1,200
Assistant Inspectors .....	600 to 800
General Wardens.....	300 to 520

Exclusive of some additional allowances for traveling expenses.

## INFERIOR OFFICIALS.

Foremen and wardens paid by the state an average of ..	\$160.00
Foremen and wardens paid by the municipal corporations and public institutions .....	116.00

The foremen and wardens receive in addition thereto allowances of firewood, tillable land, pasture grounds, etc.

Those in the employment of the state have free rent in houses built in the forest, or in lieu thereof they receive as compensation a cash equivalent.

The superior officials are entitled to a retreat pension at the age of 60 years, and the inferior officials at the age of 55 years.

France has three forestry schools. One school of higher instruction at Nancy; one school of secondary instruction, and one school of primary instruction. The two latter schools are established in the department of Loiret, on the possessions of the administration at Barres.

FORESTS OF MUNICIPAL CORPORATIONS AND OF PUBLIC  
INSTITUTIONS.

The forests of municipal corporations and of public institutions comprise 4,800,000 acres. They are supervised by the Forest Service on the same conditions and according to the same principles as the state forests. They contain about 200,000 acres of forests for protection, and their producing area is thereby reduced to 4,600,000 acres. They produce annually, timber, 45,000,000 cubic feet; fire wood, 125,000,000 cubic feet, and together, 170,000,000 cubic feet. This represents nearly an annual production in wood of 37 cubic feet per acre of productive forest. The annual cash value of the product, including the bark, cork and rosin, is \$6,500,000, or \$1.41 gross income per acre. The net income is about \$1.14 per acre. The forests belonging to the municipalities and public institutions are under regulations approved by the president of the republic. These regulations and those of the state

forests have been established with a view of insuring a continuous annual production and even of increasing that production in the forests where it is not yet sufficient.

#### PRIVATE FORESTS.

Private individuals are at liberty to manage their forests as they please. But they are prohibited from cutting and taking trees from forests which are necessary to maintain and regulate water flow, to protect lands against the encroachments of the sea and sands, to defend the territory, or which are necessary for the public health. The destruction of private forests has become rarer and rarer and the proprietors acknowledge now that on soils of poor quality the income from forests is greater than that from arable land. As a result the area of private forests, instead of decreasing, increases from year to year by reason of the timbering of lands on which agriculture pays but small profits.

The income from private forests in quantity and in money is not exactly known. It is, however, known that on the same area they pay less than the state forests. Private individuals in their anxiety to get returns are inclined to cut down the wood when it is too young, and in the forests where coppice wood is raised they do not leave a sufficient reserve, and oftentimes leave none at all. One can notice, however, that the principles of silviculture are spreading more and more in the culture of private forests. The large forests are subjected to the same mode of management and are treated like the state or municipal forests. On the whole the annual production is regular and tends to become better in both quantity and quality.

#### FOREST FIRES.

In the temperate and in the cold regions of France (that is, in the larger portion of the territory) the fires are but few and cause slight damage. The long periods of

drought are not frequent, the numerous roads that run through the forests make very good lines of defense, and the villages that surround the massive wooded areas furnish at the first alarm devoted laborers. The railroad companies, being held responsible for damage by fire caused by flying sparks from their locomotives, take particular care, and in exposed places cut the grass and brush along their roadbeds.

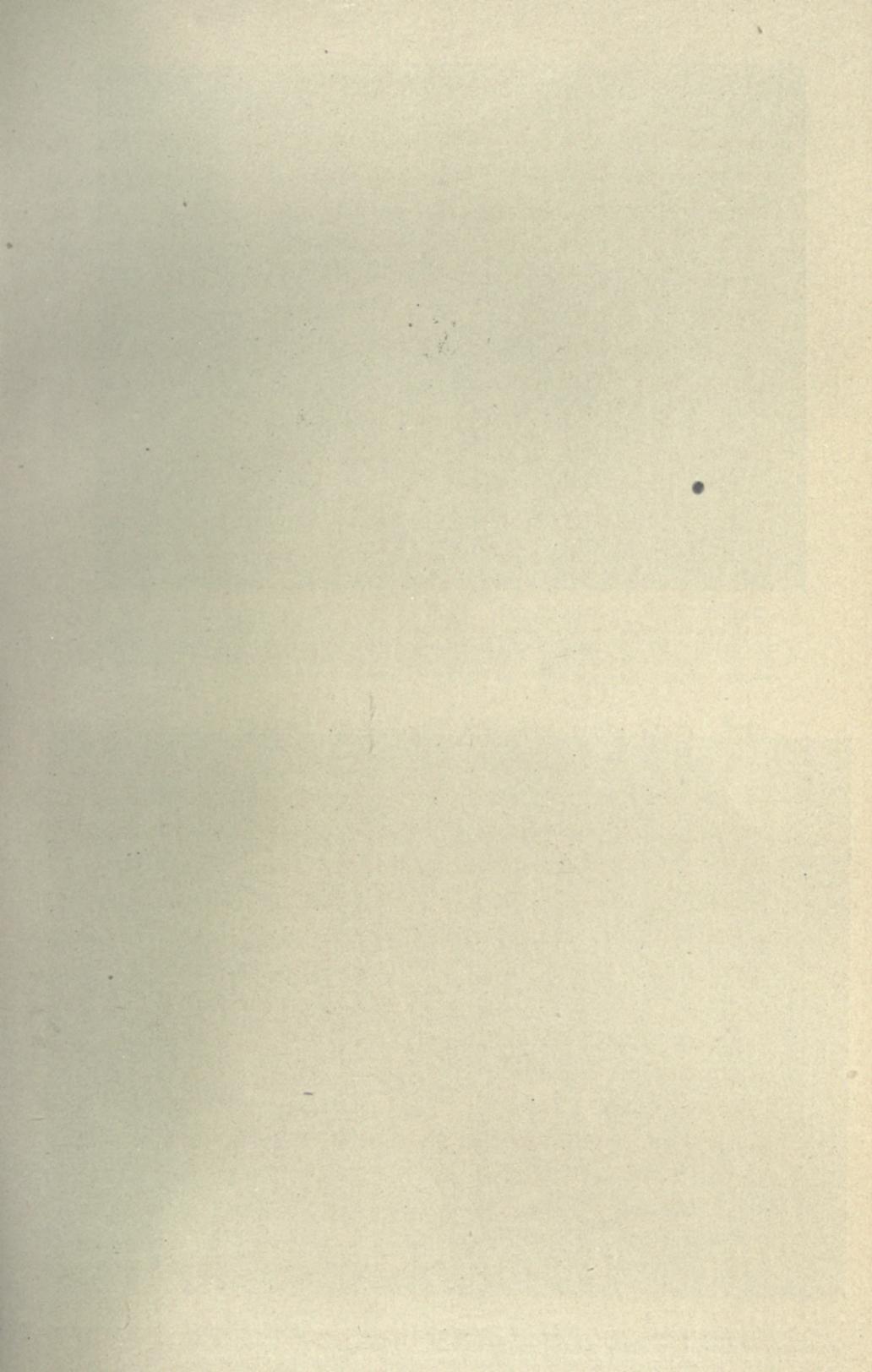
The forestry code forbids, under penalty of \$4 to \$20, carrying or lighting matches in or within a distance of 200 metres from the forests.

In the forest camps of the state, municipal corporations or public institutions, it is forbidden to the workers to light fire outside of the buildings or shops, the location whereof is indicated by the forest service.

In the warm region the dangers from fires are greater. As a preventative against them more roads are built, trenches 20 to 50 metres wide and kept free from grass and brush are made around the forest, along railroad lines, on the dividing lines between forests belonging to several owners, and also from distance to distance in the large and dense forests belonging to the same proprietor. The use of fire in forest camps and in agricultural camps situated within 200 meters from the forests is forbidden during the months of June, July, August and September. A special watch is organized, and telegraphic lines penetrating the center of the forests admit of alarm of fire at its start and call for help. If the working force appears to be insufficient the military authority furnishes the deficiency and sends on the spot soldiers who act according to the directions of the forest service.

#### COLONIES.

France, fully convinced that the preservation of forests is in all lands of the highest importance, has organized a forest service in its possessions outside of Europe—in Al-





Open country like what is often seen in the forest regions of Minnesota. This sketch is taken on the road bordering Turtle Lake near Buena Vista, Beltrami County. In many instances nature unaided does not completely stock a forest, but leaves frequent blank spaces. It requires forestry science to utilize all the surface with valuable trees.



What forestry science does. This is a German forest of spruce planted and managed according to forestry science; trees about 80 and 100 years old. Observe how closely the trees stand. Where forestry is applied, all the land devoted to forest becomes so well stocked with trees.

geria, Tunis, Madagascar, Indo-China, Reunion. In Algeria the organization is exactly similar to that of France, and calls for an annual expenditure for salaries and works of \$600,000.

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## GRAND DUCHY OF HESSE.

The forests of the Grand Duchy of Hesse (population 1,119,893 in 1900); situated in the valleys of the rivers Rhine and Main (on diluvial and alluvial sand), in the Taunus (on slate, Devon), in the Vogelsberg mountains on basalt and red sandstone), and in the Odenwald mountains (on granite and red sandstone) comprise 612,020 acres or 31 per cent. of the entire area of the State.

Of this area 177,880 acres are Crown and State forests, managed for and in the interest of the State; 234,955 acres are communal forests, owned by municipalities or public institutions; 135,285 acres are private forests of the 1st class, entailed forests in possession of families, and 63,900 acres are private forests of the 2nd class (ordinary private forest), owned by individuals.

The broad-leaved trees, beech, oak, ash, alder, birch, maple, horn-beam, etc., are covering about 60 per cent of the area under forest, the remaining 40 per cent consist of conifers, pine, spruce, fir, larch, etc.

The average estimated value of the Crown and State forest land is \$150 per acre, but there are great differences according to quality of soil, age and condition of growing stock, transportation facilities and density of population.

The annual aggregate expense of administration and protection, for wood-cutting, cultivation, construction and repairing of forest roads, etc., amounted in 1903 to \$534,153, and the aggregate net revenue for the same year to \$364,191. The average rate of net income is about 2½ per cent.

For regeneration by means of planting and sowing, 3½ million seedlings and 50,000 kilograms of seed of broad-leaved species, 11½ million seedlings and 2,500 kilograms of seed of coniferous species were used at an expense of \$65,167. Full reforestation—over the entire surface of the ground—is carried out upon about 700 acres; filling up of blanks in natural or artificial regeneration upon about 2,000 acres per annum. Regeneration by seed dropping from the mother trees is only applied in the case of the beech; in all other cases sowing or planting is resorted to.

Scotch pine seedlings are mostly planted when one year old four feet apart on strips of ground about 12 inches broad and well prepared to a depth of 12 inches. Sowing on similar strips of ground occurs in exceptional cases.

Spruce, fir, white pine and larch are planted when 3 to 4 years of age.

Oak is invariably planted by seed, by setting the acorns from 3 to 4 inches apart, in 3 close rows on strips of ground thoroughly loosened by the hoe. All other broad-leaved species are planted at an age of from 2 to 5 years.

Areas to be replanted after clearing off the mature trees are not allowed to exceed the size of 7 to 8 acres, because larger clearings are considered to be suffering

more heavily from drying, from weeds and from increase of injurious insects.

Experiments of cultivating and acclimating foreign species of trees, for instance Douglas fir, red oak, Japanese and Siberian larch, etc., etc., have been so far not discouraging. Common acacia, Canadian poplar and white pine are well naturalized. The culture of Douglas fir is increasing from year to year.

The needed plants are raised in forest nurseries, kept under the care of the local forest rangers. Should the stock not be sufficient, the supply is to be furnished by responsible private nurseries.

The comparatively large areas covered by oak-coppice forest, for obtaining the formerly high priced tanning bark, is decreasing from year to year. The introduction of substitutes for tanning bark has reduced the price of oak-bark to that degree that the working up of it by the present high wages is hardly advisable.

In the southern part of the Odenwald mountains, on the warm, dry and steep slopes of the Neckar valley, where the oak-coppice forest is to be found to a large extent—a section of the country of comparatively poor soil for agriculture—rye and buckwheat are raised for a few years after coppicing the oak. For that purpose the bark and the salable wood being removed and the twigs scattered about, the tract is burned over and the seed grain hoed into the ground. As soon as the sprouts of the oak-stumps have attained the length of a few feet, agricultural use of the ground is given up.

On account of the decline of the price for oak-bark, blanks in oak-coppice forests are no longer filled by oak plants, but in the main by Scotch pine plants. In this way the change of the oak-coppice forest into pine forest

is frequently effected, excluding of course, after pine plants have been brought in, any further agricultural use of the forest ground.

Another combination of field crop—potatoes—with forest trees during one or two years following the cutting of mature trees is in some parts of the country customary, less for the object of raising a paying crop of potatoes than for the benefit of the pine seedlings, planted in rows, alternating with rows of potatoes, for which it secures a soil of a high and beneficial porosity. To neutralize the exhaustion of the soil by the potatoes, the elements taken from the soil by that crop are resupplied by artificial manuring.

Reforestation is effected on about 40 per cent of the area by seed from standing trees (beech), on about 10 per cent by coppicing and on about 50 per cent artificially and chiefly planting. The annual yield is strictly sustained and is not allowed to exceed the annual growth. It is made up of material obtained from thinnings (about 40 per cent) and of mature trees (about 60 per cent). The average yield per acre and per annum is 88.6 cubic feet, 75 per cent of which is used as fuel. The average value of cordwood, piled up along forest roads, was in 1903, \$6 per cord, the average value of logs, cut and hauled to forest roads, \$9.40 per 1,000 feet board measure.

The average proceeds for minor forest products, such as grass, grass seed, litter, stones, etc., etc., are of some significance, while those derived from hunting leases are quite considerable.

The laborers, inhabitants of the neighboring villages, employed in wood-cutting, in culture-work, in building

and repairing forest roads, etc., are earning on the average about 75 cents a day.

The average sum of wages paid annually per 1,000 acres of forest amounts to about \$200. By the rate of wages of 75 cents per day, the stated amount represents the working time of one man for 267 days—nearly for one year. Since actually the chief work is performed between fall and spring, a comparatively large force has to be employed during the stated business season, while for the rest of the year the work is rather scarce.

The management of the Crown, State and Communal forests, is performed by the government Oberforster, under supervision of the ministry of finances, section for administration of forest and cameral estates. This section is formed by eight members, to-wit, one Ministerialrat (a forest officer) as chairman, six Oberforstrat and one lawyer.

As stated above, there are 234,955 acres of communal forests owned by municipalities or public institutions and being of the same value as the State forests. They are managed and supervised by the State forest officers; the sale of forest products however lies in the hands of the legal representatives of the proprietors. As an equivalent for managing their forests, the owners have to pay yearly a fixed amount per acre into the State treasury.

The private forests of 1st class (135,285 acres) entailed forests in possession of families and managed on forestry principles by technically and scientifically educated officers, paid by the proprietors, represent a similar value per acre as the State forests.

The remaining 63,900 acres of forests—ordinary private forests—mostly forest lots of small extent, are in the hands of individuals and to a certain extent used at the will of the owners. The condition of that class of

forest is usually a poor one, the value considerably lower than that of the other classes of forest, in consequence of abuse by removal of every particle of litter and impoverishment of soil.

In cases when the owner of private forests of the 2nd class is willing to sell his forest lots, and municipalities are not purchasers, the State is mostly a ready buyer.

The damage caused by forest fires is not of very great account. During the years 1903 and 1904 from the total area of forests 143 fires were reported, causing a loss of \$3,000. Of these fires, 20 with a loss of \$1,175, were caused by railroad locomotive sparks.

Carelessness of smokers visiting the forests for recreation is the principal cause of most of the forest fires and the greatest number of fires occur during the months of April and May, the time of the beginning of vegetation, a season bringing numerous visitors to the forests.

The comparatively small losses caused by visitors has to be placed to the account of the high esthetical worth of the forest, offered to mankind by its majestic beauty, by its pure and refreshing enjoyment.

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## ITALY.

### STATE FORESTS.

The aggregate area of the state forests is 128,960 acres, principally situated in Tuscany—provinces of Florence, Arezzo, Grosseto, Pisa and Leghorn; and Venice—provinces of Belluno, Treviso and Udine. These lands are regarded as inalienable. The prevailing kinds of trees are oak, beech, pine, larch and fir. The total annual expense of administration averages

about \$80,000. The annual sale of the raw material from the state forests averages \$150,000. The number of acres annually reforested with trees is 150. The method of reforesting varies according to the different species of trees and the local conditions; but seeding, whether artificially or naturally, is used only for the oak and the beech. For other kinds, such as the fir, pine, larch and chestnut, reforesting is done by planting. Generally good care is taken to maintain a sustained yield. In regard to cutting, the practice is to cut only those trees which have reached fiscal maturity and those that are dead or about to die.

Only a very small number of forest fires are caused by railway locomotives. The forest service has much importance in the protection of mountainous land and in the control of water. The annual salary of the chief inspector of the forests of the first class is 6,000 lire; that of the chief inspector of forests of the second class, 5,000 lire; that of inspector of forests of first class, 4,000 lire. The Minister of Agriculture generally publishes a detailed report on the administration of the forests every five or six years.

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## NORWAY.

### STATE FORESTS.

The extent of the public and semi-public forests, according to the latest returns, cover an area of 546,932 hektars of coniferous trees and 369,967 hektars of foliferous trees (almost exclusively birch), making together 916,899 hektars, estimated at a total value of Kr. 34,720,837, no consideration having been taken to rights of use (usufruct) connected with the forests. The average value of the woodland makes thus about Kr. 37,86 pr. hektar.

The total expenditure in connection with the management and administration of the forests for the financial year 1904-1905 amounted to Kr. 644,700,53, while the revenue yielded by the forests during the same period was Kr. 1,109,147,85.

Of the above expenditure, however, about Kr. 190,000 were paid as grants to private forestry, purchase of woods and other objects, which do not concern the direct management of the public forests.

During the year 1904, 1,529,245 trees were planted out (chiefly pine, *pinus sylvestris*, and spruce, *abies excelsa*,) with which has been covered an area of about 3,058 hektars and 41,30 kilograms of seed have been sown over an area of 21 hektars at a total cost of Kr. 28,883,61.

During the same year ditches have been dug in bogs and sour (seepy) ground and brooks cleared in a length of 91,142 running meters.

The regeneration is effected chiefly by natural seeding from the remaining trees and the mode of felling the trees is mainly on the basis of the selective cutting system.

The staff of the office for woods and forests consists of 1 Skogdirektor (director of forests), 4 Skoginspektorer (inspectors of forests), 26 Skogforvaltere (managers of forests), 1 Skogtaxator (valuer of forests), 4 Skogassistenter (forest assistants), 13 Skogplantere (forest planters) and 418 Skogvogtere (forest keepers). With exception of the forest keepers the whole of the staff is made up of men more or less thoroughly trained for this special line. On each of the "Skogforvalters" to whom the management of the public forests is entrusted, falls on an average 31,415 hektar. The distribution of the area is, however, very uneven.

There are no permanent laborers in connection with the forest and woods office of the State. Provided the

trees from the public forests are not sold standing on the root, the felling and the conveyance (transport) of the wood is contracted for, while the planting and sowing, as well as the work in the nurseries, are carried out at daily wages, which as a rule are not higher than the earnings of ordinary day laborers (viz., about Kr. 3,00 a day). Where the forests are situated far away from inhabited places, cabins have been erected for the use of the laborers, and cottages for the staff.

The state has four great and several smaller nurseries, and for the drying of tree seeds two large and four smaller establishments which supply the necessary seed for public use and are also able to set apart a great portion for private consumption, especially of spruce seed.

In accordance with Section 3 of the Act of Storthing of July 20, 1893, rules and regulations for the protection of the forests have up to now been adopted in 77 districts, and in accordance with Section 8 of said Act ordinary forest regulations in 37 districts, together 114 districts.

The majority of these regulations aim at prohibiting the cutting of trees under certain dimensions, still with the modification that cutting of trees not holding the proper measure is allowed in most cases where they have been selected by the overseer, who is paid by the district in question. The said Act of the Storthing is not considered to allow binding regulations for replanting and sowing of destroyed forests to be included in the above regulations.

In accordance with the Act of Storthing of July 14, 1893, with supplementary Act of July 27, 1896, regulations for the prevention and extinguishment of forest fire have hitherto been adopted in 164 districts. The regulations provide for compulsory attendance of able bodied men in case of forest fire. It has been found that these

regulations have greatly contributed to limit the spreading of forest fires.

The State has a High School and two elementary schools which give instructions in forestry. Such instruction is also given by several agricultural schools.

#### PRIVATE FORESTS.

A society has been formed called "Det norske Skogselskab" (the Norwegian forest society) comprising the whole country with branches in 15 Amter (counties). The society has 18 nurseries and supports about 50 private nurseries. Two establishments for the drying of seeds are in operation. During the year 1904 the forest societies planted out about six million plants and sowed 415 kil. seed by which an area of about 1800 hektar of bare ground is considered to have been cultivated. During the same year ditches have been dug in bogs or in sour (seepy) ground and brooks cleared in a total length of about 259,000 meters or 259 kilometers.

"The Norwegian Forest Society" publishes a journal for forestry, of which 5,400 copies have been printed and is published monthly. In addition thereto a review "Forstligt Tidsskrift" is published by two graduates in forestry for their own account, and which is published in quarterly issues.

In order to assist private people in the management of their forests, 11 Amtskogmestere (district inspectors of forests) have been appointed, whose salary and traveling expenses are defrayed one-half by the State, whereas the other half is paid by the county in question.

## PRUSSIA.

## STATE FORESTS.

The extent of the state forests of Prussia is 6,955,227 acres. Included in this, however, are 715,637 acres not designed for tree culture. In addition, the extent of forests belonging to municipalities is 2,563,812 acres; belonging to churches, 207,752 acres; belonging to corporations, 555,900 acres; private forests, 10,828,730 acres; making an aggregate extent of 21,111,421 acres in the whole kingdom.

The prevailing kinds of trees in the state forests are Scotch pine, larch, beech, red pine, fir and oak. The value of the land varies so much, rising from a small amount to \$700 per acre, that it is impossible to give an average estimated value. The annual aggregate expense of administration (state forests) is as follows: The office expenses and maintenance, including expense for education in forestry, etc., averaged in the years 1893 to 1897, per annum, \$8,500,000. The annual aggregate revenue in the years 1893 to 1897 amounted to \$17,200,000, being at the net rate of \$1.50 per acre of actual forest. The number of acres sown or planted with forest annually during the years 1893 to 1895 was 44,830.

The area of evergreen forests annually reforested from self-sown seeds is extremely small in comparison with the sections which are replanted either by seeds or seedlings. In the case of Scotch pine (*Pinus sylvestris*) artificial regeneration by seeds or seedlings forms the rule. An exception is made only within a small territory where the June bug (*Melolontha vulgaris*) has appeared, during the last years, doing considerable damage in the eastern part of Prussia (Heath Forests, Johannisburger Heide). The natural regeneration of the Scotch pine has been adopted within this territory as a means of preventing the atta

of the June bug. When the June-bug-danger has passed by, we shall return without a doubt, to artificial regeneration of Pine. The natural regeneration of conifers prevails, however, preferably within the mountain forests, where regeneration of the Silver Fir (*Abies pectinata*) is concerned.

The foresting of the beech is mostly effected from standing trees, though artificial sowing and planting are also done. The oak is either reforested by seed from standing trees, or artificially through sowing or by planting. In regard to the continuity of forest products, the forestry department endeavors to obtain the highest possible continuous net income. The usual method of cutting is in blocks clean.

Under the head of compulsory tree planting the following laws are referred to: The Forest Protection Law of July 6th, 1875, the law of August 4th, 1876, concerning the administration of forests owned by municipalities and public institutions in the provinces of Prussia, Brandenburg, Pomerania, Posen, Silesia and Saxony.

The average annual damage caused by forest fires in the years 1892 to 1896 was as follows: Totally or mostly destroyed, 2,992 acres; only slightly damaged, 117 acres; only the surface destroyed, 522 acres. The average annual number of forest fires in the years 1892 to 1896 was 36, the causes of which were as follows: 12 unknown, 2 railroads, 5 incendiary, 16 caused by carelessness, 1 lightning. During the years 1892 to 1896 the annual average number of forest fires caused by railroad locomotives was 2.

The officers in the forest service are equal in rank to the other high grade officers in the government service. The foresters have clerical rank. The salary of "Oberforster" (district manager) ranges according to length of

service from 2,700 to 5,700 marks. Unfavorably situated officers receive an additional amount, the maximum of which is 600 marks annually. In addition there is usually free residence and fuel. The salary of the "Oberforstmeister" (chief inspector) is from 4,200 to 7,200 marks, according to length of service, which is calculated from the time of qualification for the office of "Forstrath" (councillor). The "Oberforstmeister" and "Forstrath" are each allowed an amount not exceeding 2,900 marks for traveling expenses.

The average size of State Forests placed in charge of a scientifically trained forester amounts to 9750 acres. Within the entire State Forests, during the year 1904, there were employed 156,772 workmen (and workwomen) working on 10,479,589 workdays. In other words, there have been employed, per 1,000 acres of State Forests, 22 workmen (and workwomen) engaged on 145 workdays.

The workmen obtain a sufficient wage scale. In order to attach the workmen and their interests to the forest, a number of small farms are being leased to them at a cheap price. Within the entire State Forest Administration of Prussia, there are kept, altogether, 631 houses for forest workmen, containing 1323 dwellings.

#### PRIVATE FORESTS.

The extent of private forests in Prussia, as above stated, is 10,828,780 acres. About one-half of these forests are managed on forestry principles, and their average value is somewhat less per acre than that of the state forest. On the larger estates the area devoted to forests gradually increases, while on the smaller estates the forest area probably decreases.

Some of the forests of Prussia are attractive resorts for travelers, and especially pedestrians, who enjoy the ex-

cellent roads. Of the celebrated Thuringian chain, which is 70 miles in length by from 8 to 25 miles in breadth, a writer says: "The successive hills melt into each other in gentle undulations, forming a continuous and easily traced comb, and only the northwest slopes are precipitous, and seamed with winding gorges. This mountain range incloses many charming and romantic valleys and glens; the most prominent feature of its picturesque scenery is formed by the fine forests, chiefly of pines and firs, which clothe most of the hills."

Prussia comprises nearly two-thirds of the entire extent of the German Empire, yet its area lacks considerable of being twice that of Minnesota. Thirty-one per cent of its soil is predominantly sandy, and on the whole probably is not as good as that of Minnesota; yet it sustains a population twenty-five times as large as that of Minnesota. This fact might well find a lodgment in the minds of our statesmen, that whereas Prussia annually derives a net revenue of \$1.50 an acre from her 6,000,000 acres of state forest, our state, from about an equal area of land in its borders, adapted to forest, derives no regular net revenue at all.

### FORESTRY IN RUSSIA.

At my request the American ambassador at St. Petersburg, Mr. Riddle, has kindly furnished me information on forestry in Russia. It is probably not generally known in this country that scientific forestry was introduced in Russia as early as 1820; and that a school for scientific instruction in forestry is maintained at St. Petersburg attended by 565 students. For the support of this school the Russian government expends annually \$93,250.50, and the students \$17,643.50. Besides, there are in the empire 32 lower grade schools for forestry instruction with 580 students. The state forests comprise the enormous

area of 634,143,918 acres, the merchantable timber on which is sold under sealed bids. The expense of administration averages about \$5,570,773 annually. The revenue in 1904 amounted to \$24,650,278. Selection cutting is mostly practiced. In 1905, 21,241 acres were artificially planted and 126,052 acres started for replanting. The forests at present are under the charge of 1237 scientifically trained foresters.

The following are the questions I submitted and the answers that were furnished:

Question 1.—Area of the productive state forests of Russia, character of surface and soil and prevailing kind of trees? Area:—

Siberia.....	102,600,000 acres.
Caucasus.....	19,353,918 “
Russia in Europe.....	461,700,000 “
Finland.....	50,490,000 “

Soil:—Generally sandy-clay.

Species:—Pine, fir, oak and birch.

Question 2.—Average number of feet of timber annually cut therefrom; average age of pine when cut and diameter breast high at such age?

No accurate reply can be made to the first part of this question, as the acreage of all the forest land in the empire (especially in Russia in Asia) is unknown; there is likewise no information relative to the mass of trees cut each year on private forest estates, the acreage of which in Russia in Europe amounts to 108,000,000 acres. In view of this only the amount of timber obtained from state forests can be given. The Report for 1905 shows that out of 286,427,665 acres of state forests in Russia in Europe 4,802,412 cubic fathoms (7 feet) of timber were cut from 229,532,232 acres; about 22 per cent. of this amount was received from the forests of Northern Russia, namely,

the provinces of Archangel, Vologda, Perm Olonets and Viatka, covering an area of 247,702,139 acres, which in 1905 yielded 1,062,304 cubic fathoms of timber. Furthermore, in the Caucasus, 13,418,327 acres of state forests, with good forest land covering 8,454,607 acres, yielded 132,463 cubic fathoms of timber, and in Russia in Asia 361,945,497 acres of forests belonging to the state, of which 129,169,881 acres are good forest land, yielded 607,595 cubic fathoms of timber. Thus all the State forests in the empire, covering 661,792,491 acres, yielded in 1905 5,542,470 cubic fathoms of timber.

With regard to the average age of pine when cut, this can only be approximately defined, according to the manner in which the forests are cleared, namely: whether the whole forest is cut down or whether only chosen trees are cut.

Generally in Russia in Europe the age of the trees felled is: for pine, from 80, 100, 120 and 150 years; for oak, 60, 80, 100, 120 and 150 years; for fir, 60, 80 and 100 years. For private forest landowners the forestry laws are applied, and the age for oak is 40 years; while that of other leaf trees is fixed at 30 years. The forests mortgaged in the Nobility Land Bank enforce in European Russia, in the North, the age of 100 years; in Central Russia, 80 years; in Southern Russia, 70 years; for oak 120 to 80 years, when bad growth, 40 years; for birch, poplar and alder, from 30, 40 to 50 years. In the state forests the age for cutting is fixed: for oak, from 80 to 120 years, and for other species, from 40 to 60 years.

With regard to the diameter of trees cut, an average cannot be properly given, as it varies so greatly, in view of the age, degree of intensity of the growth, local requirements, etc. In properly managed estates, the trees cut have dimensions from  $1\frac{3}{4}$  to  $17\frac{1}{2}$  and  $26\frac{1}{4}$  inches. In

Northern Russia the diameter of coniferous trees, the pine and fir tree, sent to the market at Archangel and obtained from the provinces of Archangel and Vologda, varies from 14 inches to  $15\frac{3}{4}$  inches breast high, while trees of 21 inches and even  $26\frac{1}{4}$  inches in diameter are found. The average diameter of oak trees is also difficult to establish, but it may be fixed at  $15\frac{3}{4}$  to 21 inches, while gigantic oaks are found having from  $43\frac{3}{4}$  to  $52\frac{1}{2}$  inches in diameter breast high.

Question 3.—Explain briefly the way in which the state sells its standing timber?

Notwithstanding the growing importance which the exploitation of forests has taken in Russia it rarely occurs that the proprietors manage their own estates; the forests are generally divided into small lots and sold to the highest bidder. The sale of forests belonging to the Domains and the Imperial Cabinet are generally advertised for sale, six months in advance. The bidders present their offers in sealed envelopes which are opened on a day fixed for this purpose in their presence. They may make bids for a number of lots or for the whole forest, depositing from 10 to 20 per cent of the contract value as guarantee for the proper execution of the contract.

The party who has made the highest bid receives the permit to cut the trees, and, if he deposits the entire value of the contract, he receives the permit to carry away the timber. The trees are cut down for the most part in Russia from October 28th to March 28th. Hand labor is abundant in the north of Russia, where forestry constitutes the main resource of existence of the population, as well as in the central and western provinces, where the peasants have no other winter labor. Labor is paid by tree or beam or rafter, or by the fathom for wood to be used as fuel. The average day costs from 45 to 50 copeks

(22½ to 25 cents) per laborer in the basin of the Vistula, while it becomes less, being 20 cents per day in the eastern provinces, and runs up as high as 35 and 45 cents per day in unpopulated districts. Generally the laborers form themselves into an "Artel" or association having a "starosta" or "senior" at the head, which directs the work and acts as intermediary between the agents and laborers.

Question 4.—What is the annual expense of administering the state forests, and does such expense include forestry instruction and the purchase of additional lands?

The expense of administering the State forests including expenses of forestry instruction amounted in 1904, and is about an average, to \$5,570,773.

Question 5.—Amount of annual revenue?

The revenues from the State forests in 1904 amounted to \$24,650,278.

Question 6.—Is clear cutting or selection cutting mostly practiced?

In state forests selection cutting is mostly practiced.

Question 7.—About what proportion of cut over land becomes reforested by natural seeding and what by artificial planting or sowing?

The report of state forests for 1905 shows that the state, when it sells its forests to private parties for exploitation, receives from the purchaser a pecuniary guarantee for the proper and full exploitation of the contract. And these sums when not returned to the contractors on account of improper fulfilment of their contract, form a fund used in reforesting or planting forests. Thus in 1905 from the sums thus obtained and from credits obtained for that purpose: (a) 21,241 acres were artificially planted; (b) 7,290 acres of planting were finished; (c) 126,052 acres were started for replanting; (d) 105,799 acres were worked at, and (e) 38,383 acres already planted received supple-

mentary work. In forest lands belonging to private owners in Russia in Europe out of 39,906 acres 32 per cent were replanted and 68 per cent sown.

Question 8.—How many acres are annually planted?

The answer to this question was included in No. 7.

Question 9.—What is generally the age of the plants; how many feet apart are they planted; how many men, women or children does it take to plant an acre per day and at what expense?

The age of the plants which are transferred from the nursery devoted specially to the cultivation of various kinds of trees, is as follows: the pine, generally from one to two years of age; the fir, 2 to 3 years old; the oak, from 2 to 3 years old; other leaf trees from 1 to 2 years old.

The method of planting pine and fir trees in Russia is in squares, the trees being planted in rows, the rows and trees being 42 inches apart. The forests are also planted in rows 56 inches apart, the trees therein being 28 inches apart. In the first instance 9600 young trees are planted on 2.7 acres, and in the second instance 2.7 acres contain 10,800 trees. Oak and other leaf trees are planted in rows 56 inches apart, the trees being 28 inches apart.

The cost of this work depends upon many conditions: the quality of the soil, the degree of readiness of the soil, the distance of the nurseries from the ground to be planted, therefore it is preferable to give several instances which characterize the amount of labor required. These instances have been chosen from reforestation effected in the province of Voronege (Central Russia).

1.—The planting of pine trees in sandy and sub-sandy prepared soil, 1 to 2 year trees in rows 56 inches apart and 28 inches distance between trees, placing one or two trees in each hole, transported over a distance of from  $\frac{2}{3}$

to  $5\frac{1}{3}$  miles; including the digging of the holes, the force employed per deciatine (2.7 acres) was: for laborers with horses 0.35 to 0.40; for laborers without horses from 3.5 to 3.6, and for women from 2.5 to 2.9.

2.—The planting of pine, same soil as above, in furrows ploughed out 42 inches apart, digging up the young trees and transporting them over a distance of from  $\frac{1}{3}$  to 2 miles; digging holes with spades in furrows and planting the trees, the force expended per deciatine (2.7 acres) was: for laborers with horses 0.65 to 0.90 and for common laborers without horses 2.9 to 5.9 and women from 8.6 to 15.2.

3.—Planting 1 to 2 year old oak trees at the rate of 1200 per deciatine (2.7 acres) in firm soil (black clay), one or two trees in each hole dug out by spade, each hole being 6 vershoks ( $10\frac{1}{2}$  inches) deep, the force expended was: men with horses from 0.12, men without horses from 1.3 to 4.5 and women from 12.5 to 13.8.

4.—The planting of 1 to 2 year old oak, 400 to the deciatine (2.7 acres), cost force per deciatine: laborers with horses 2.9, without horses 8.8 to 12.0 and women 5.8 to 6.2.

The planting of trees in the black soil steppes of Southern Russia, at the rate of 10,800 trees from 1 to 3 years old per deciatine (2.7 acres), requires about 1 man with a horse, 10 men without horses and 12 women.

With regard to the cost of the above named work, it varies greatly according to the price of labor in the different localities. In the province of Voronege the cost of labor is from 50 to 75 cents per day for a man with a horse; 20 cents for men without horses and from 15 to 20 cents for women.

Question 10.—Annual amount of damage by forest fires? Means taken for preventing and extinguishment of forest fires?

In 1904 the amount of damages in the forests by fire and other reasons, was as follows:

Loss caused by fire .....	\$84,930.50
Loss caused by insects .....	24,068.50
Loss caused by floods.....	1,039.50
Loss caused by snow storms .....	10,098.50
Loss caused by wind .....	33,147.00
Loss caused by other reasons .....	6,566.00
	Total loss.....\$159,852.00

The means taken for preventing and extinguishment of forest fires is not stated.

Question 11.—Number of persons annually employed in the state forests and average number of days in a year; and about what number of them reside in or near the forests?

In reply to the first portion of this question it is necessary to state that nearly all the lumber obtained from the state forests is used either for the requirement of the peasant population or is sold by auction, so that both the peasants and contractors work the forests with their own laborers; on this account the Forestry Department does not employ laborers for the state forests, and when it does employ laborers it is for timber required for its own use (valued of about 2½ million dollars per annum), as well as for reforesting purposes.

The second portion of the question is so indefinite that it is difficult to give a reply. If this question is made in order to ascertain the relation between the forest area and population in various parts of the empire we then refer to the information on this subject contained in the copy of the "Forests of Russia," edited for the Universal Paris Exhibition in 1900. (This book has been forwarded.)

Questions 12 and 13.—On an average how many acres are under the supervision of a scientifically educated for-

ester? What is his pay and allowance? After how many years service does he receive a pension and at what rate? Also: What is the title, rank and pay of the highest class of forest officials?

If the first portion of this question refers to the average number of state foresters employed in Russia, the reply is included in the Forestry Report for 1905, namely: 1237 foresters, of which 996 in Russia in Europe, 87 in the Caucasus and 154 in Russia in Asia. The area of the forests under their control would be as follows: In the north of Russia in Europe, the average area of forestry would vary from 2,970,000 acres in the province of Archangel to 245,592 acres in the province of Viatka, while in the Caucasus the area is, for instance, 147,420 acres, and in Russia in Asia 2,430,000 acres.

Foresters are divided into two categories (I. Class and II. Class). Forest Inspectors into "Seniors" and "Juniors". The duties of the latter are to inspect and control from 2 to 4 foresters in their district. At present the majority of crown foresters have acquired the highest forestry instruction, and the average number, lower instruction. Inspectors have assistants which have obtained the highest degrees in forestry. In 1905 there were 253 assistants and 1386 forest "conductors" or guides.

The pay of local foresters serving the crown varies according to the condition of their duties and may be expressed as given below:

Senior forest inspectors .....	\$1250.00
Junior forest inspectors .....	1075.00
Foresters I class .....	from \$725 to 875.00
Foresters II class .....	from 600 to 750.00
Assistant foresters .....	from 275 to 400.00
Forest guides .....	from 200 to 350.00

These amounts include from \$75.00 to \$250.00 for expenses of displacement.

With regard to pensions it must be said that they have to serve 35 years, but a portion of the pension is granted to persons who have served less time, according to categories: up to 15 years, from 15 to 25 years and from 25 to 35 years.

The amount of pension they receive is worked out as follows:  $\frac{1}{4}$  of their pay when they have served 15 years;  $\frac{1}{3}$  when they have served from 15 to 25 years,  $\frac{1}{2}$  for 25 to 35 years service, and  $\frac{2}{3}$  of their annual pay for 35 or more years service.

The rates of pensions for 35 years or more service, are fixed as follows:

Senior forest inspectors.....	\$600.00
Junior forest inspectors .....	500.00
Foresters of I class .....	400.00
Foresters of II class.....	350.00
Assistant foresters.....	200.00
Forest guides .....	125.00

It must be remarked that according to the laws in force foresters (as well as inspectors) and their assistants have the special privilege of receiving land, the proportion being from 81 to 121 $\frac{1}{2}$  acres for foresters and inspectors and 40 $\frac{1}{2}$  acres for forest assistants. Besides, many foresters, inspectors and their assistants receive dwellings in houses belonging to the Government and purposely built for them; those who do not receive free dwellings are made a special allowance therefor. Fuel is granted to all in proper quantities.

Question 14.—When was forestry first introduced into the management of state forests?

In 1820.

Question 15. — What are the colleges or schools for scientific forestry instruction and aggregate number of students attending; also, number of forestry schools of lower grade and number of students attending?

There is, so far, only one college for scientific forestry instruction, which is known as the "Institut du Corps Forestier" in St. Petersburg, which had last year 515 students on January 1st, this number was increased during the year by 169 more; 64 students graduated and 55 left for various reasons, thus on January 1, 1907, there were 565 students as follows: 181 in the I class, 154 in the II class, 127 in the III class and 103 in the IV class. The whole course lasts four years. The maintenance of this college costs annually \$110,894, of which sum the government pays \$93,250.50 and the students \$17,643.50.

Besides, there are 32 lower grade schools in both Russia in Europe and Russia in Asia, with 580 students. At the beginning of the present year 1162 students presented themselves but only 255 were accepted. The maintenance of these schools costs the government \$78,827.00.

## DUCHY OF SAX-MEININGEN.

The area of state forests is 106,530 acres; of communal forests, 84,460 acres; of private forests, 71,850 acres; miscellaneous, 1,480 acres; in the aggregate, 264,310 acres, being equal to 42.4 per cent of the total area of the state. The state forests comprise 24 units of administration, in charge of 24 superior forest officers. The highest functionary in forestry matters is the president of the forestry bureau. The bureau is composed of five forest councillors, two of whom act as forest inspectors at the same time, each one supervising 12 of the above

named 24 forest officers. The annual yield of the state forests is 5,779,669 cubic feet of lumber and fire-wood cut in ripe forests, and 1,288,904 cubic feet of fire-wood and pulp-wood obtained from thinnings. These figures correspond with an annual yield of about 155 feet board measure of lumber plus 0.40 cords of fire-wood per acre per annum. The state forest officers at the same time control the management of the communal and private forests within the state. All grades of forest officers have certain police duties concerning forests, fish and game preservation.

The regeneration of cutover Silver Fir (*Abies pectinata*) forests is obtained principally from self-sown seed. The Silver Fir is planted only where the species is absent at the present moment, and where the admixture of the species with other kinds already at hand appears to be desirable.

The reforestation of Norway Spruce (*Picea excelsa*) is obtained usually by the planting of seedlings. Still, wherever advance growth, starting from self-sown seed, is found to be at hand in suitable groups and bunches, there such advance growth might be used to good advantage as a means of partial regeneration.

The regeneration of Scotch Pine (*Pinus sylvestris*) is effected partly by the planting of seed and partly by the planting of seedlings.

All State Forests and Communal Forests—the latter being the property of towns, villages, cities, corporations or of funds of an educational or religious character—are administered by and are placed in charge of forest officials possessing a thorough, scientific and technical education in forestry.

The number of the forest workmen continuously employed in the forest changes from time to time. On the

1st of October, 1905, there were employed, altogether, 844 workmen. These workmen are domiciled, usually, in the nearby villages.

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## SAXONY.

### STATE FOREST.

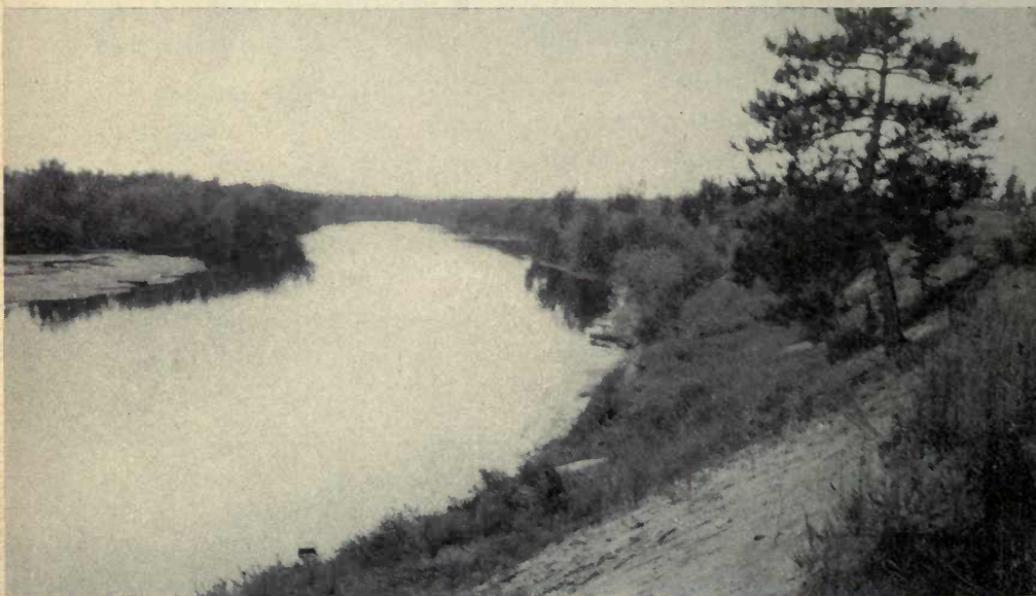
The aggregate area of the state forest is 442,000 acres. The forests are scattered over the Erz mountains themselves and over their outskirts. They are further situated in a few smaller and separate mountain ranges and in the plains. The altitude at which the state forests are found ranges from 100 to 1,200 meters, or from 328.1 feet to 3,637.2 feet, above sea level. The first group of forests, in the Erz mountains, is pretty compact and comprises 235,000 acres. The second group, in the outskirts of the Erz mountains and in some smaller distinct mountain ranges, comprises 113,000 acres; and the third group, in the plains, comprises 94,000 acres. The soil consists of decomposed granite, granulite, gneis; mica-slate, clay-slate, grauwacke, porphyry, sandstone and some basalt. In the plains there is diluvium and alluvium. Only a very small portion of the forest area might be deemed fit for agricultural use.

The principal tree species are spruce, *picea excelsa* (Link); Scotch pine, *pinus sylvestris* (L.); silver fir, *abies pectinata* (D. C.); larch, *larix europæa* (D. C.); rotbuche, *fagus silvatica* (L.); oaks, *quercus pedunculata* (Ehrh.), and *qu. sessiliflora* (Sm.); hornbeam, *carpinus betulus* (L.); ash, *fraxinus* (L.); several maples, namely: *acer pseudoplatanus* (L.), *a. platanooides* (L.); further, several species of elm, *ulmus*; of birch, *betula*; and of linden, *tilia*. The prevailing species is spruce.





Using the "Krempe" to work a log down to a road in a German forest.



Upper St. Croix River at point due east from Hinckley, Minnesota, looking down the river. Photographed 1907.

The value of the state forests, including timber and soil, aggregates 1903, \$86,306,000. Hence the value per acre is \$195. The annual expenses for administration for the year 1903 were \$1,270,800. In the year 1903 the annual gross revenue amounted to \$3,338,500; the annual net revenue to \$2,067,700.

The entire area planted annually varies according to circumstances. On the average it will reach 6,500 acres. Of these 6,500 acres 500 acres are planted up with seeds and 6,000 acres are planted up with plants. The question whether plants or seeds shall be employed for restocking cleared ground depends on the condition of the soil. As a general rule, seeds are planted only on such areas which do not produce grass and weeds to a large extent and which at the same time are of sufficient fertility and well protected against late frost. The sowing or planting of seeds must be done not later than in the second year after the final removal of the former tree crop. Strips about three feet wide or places about six feet square are cultivated with a spade before the seed is thrown on them. Only in rare cases the entire area to be planted with seeds is ploughed and harrowed and the seeds spread over it broadcast. The plants used for planting up a clearing are as a rule two years old or older. The age of the plants selected depends on the condition of the area to be planted aside from depending on the species itself. Spruce, Scotch pine, fir and larch, as a general rule, are used two to five years old; beech, oak, ash and maple, as a general rule, are used three to six years old. The plants are raised in nurseries. Only in rare cases they are taken from areas previously planted with seed in the open forest. The number of plants used per acre ranges between 1500 and 2500, according to the species, the size of the plants used and the condition of the area to be planted.

Regeneration from self-sown seed is only used in the case of the beech (*Fagus silvatica*) and of the silver fir (*Abies pectinata*). In all other cases forests are regenerated by means of planting plants or sowing seeds.

There is no law or rule in Saxony for compulsory reforestation after clearings.

There is not much damage done by forest fires. It averages \$300 per year. Forest fires of a larger extent have happened very rarely. As a rule, forest fires are caused by the careless use of matches by tobacco and some cigar smokers. Fires are caused by sparks from locomotives; on the average perhaps ten per year.

The yield or annual cut is fixed by working plans prepared for periods of ten years and renewed after the lapse of such periods. Within these periods the annual yield is almost constant. At the end of a period, however, a new working plan might provide for either a higher or lesser yield. It is an iron-clad rule that on the whole the cut shall not exceed the increment of the forest.

Trees are cut as low down as possible above the surface of the soil; the instrument used is the saw. The stump and the root are dug out afterwards wherever such work is remunerative, viz., where the wood obtained can be sold at a paying rate. In Saxony regular forest management began with the beginning of the nineteenth century in a systematic way; hence there is no objection to clearing an entire area of given size, say of two or three acres, at once, removing from it every tree standing on it. In exceptional cases, pieces of forest not entirely mature may be sacrificed with a view of saving others from the dangers threatening from storms.

The average age of maturity in Saxony for conifers (spruce) is eighty to ninety years. However, there are cases in which this rule is not adhered to. The size of trees when fit for the axe depends entirely on the species,

on the condition of the locality, the means of transportation, etc. Previous to the final cutting, and beginning with the twenty-fifth year of a piece of forest, and ending at the sixtieth year of the forest, thinnings take place at intervals of about ten years with a view to allow increased light and increased space to the most promising specimens of the growing stock. Specimens growing less vigorously, dying or dead, are removed at the same time wherever it pays.

There is no difference in the rank of the forest officer compared to that of any other state officers employed in the technical branches of the government. The state forestry service is divided into a lower and higher branch. The professional training for the first one is a merely practical training, whilst the latter necessitates scientific preparation of a high class. The requirements with reference to this scientific preparation are as follows: Graduating from a state gymnasium; twelve months' study at a university; three years study at the forest academy at Tharandt, at which two examinations must be passed; three years of practical professional training under a forest officer and at the bureau of forest working plans at Dresden; examination by the state authorities. After this preparation, as soon as there is a vacancy, appointment as government officer might follow, to begin with as assistant of an Oberförster (Superior Forester); then as superior forester, and so on up to the higher ranks of chief of a forest territory or chief of the bureau of forest working plans. The latter officers have the title of "Superior Forest Master." The highest technical authority controlling the local and territorial officers is called "State Forest Master." There are 109 local ranges in Saxony allotted to 17 territorial districts. The former are in charge of a superior forester (Oberförster), the latter in charge of a superior forest master. The central bureau

of the entire state forestry service is under the Secretary of Finances.

The salary of a superior forest officer averages \$1,075 (from \$900 to \$1,250), to which must be added an allowance of \$600 for traveling expenses, horse keeping and the use of a house free of rental. The salary of the Superior forest master averages \$1,524, ranging from \$1,500 to \$1,800, to which must be added a traveling allowance of \$1,200 and the use of a house free of charge.

In the case of physical disability the forest officers draw a pension depending on the duration of their state service and on the salary received so far. This pension is at least 30 per cent of the salary. In no case does it amount to over 80 per cent. The latter figure is paid after 40 years or more of state forestry service. At the age of sixty-five years the state forestry officer is entitled to a pension in case he desires to retire, even if his constitution would enable him to continue in the service.

An annual report of the Saxony forest administration is published in the "Tharandter forstliches Jahrbuch." This periodical is a distinguished periodical on forestry.

As further information, it may be stated that the administration of a forest range, by the superior forester under the supervision of the superior forest master, is outlined by "the working plan" which is prepared by the bureau of forest working plans at Dresden, containing prescriptions for a period of ten years. The superior forest officer co-operates in the preparation of this working plan, which has to be submitted to the secretary of finances. The preparation of a working plan is based on a thorough knowledge and a thorough scrutinizing of the conditions of the forest range, which often takes several months. The forest working plan contains a statement showing the areas of the different compartments or units of the forest range; it contains a description of these com-

partments and maps of the same; all sections of the forests are examined with reference to their increment. All these investigations made, the forests or sections of forests to be cut during the next decade of years are selected and pointed out specifically. Further, there is stated specifically what compartments or sub-compartments are to be thinned out, what areas are to be planted up, and by what means regeneration is to be effected in each single case. Deviations from the prescriptions of a forest working plan must not be made unless authorized by the secretary of finances. Every working plan is controlled by the state forest master in the range itself. Besides, in the midst of the ten years period, or after the lapse of five years, such a control by the highest forest officer of the state takes place, so as to find out whether and in how far the prescriptions of the working plan have been followed and whether deviations might be advisable.

The sale of the forest produce (timber, fuel, bark, stones, etc.) is done by the superior forest officer with the help of a local state cashier, who is holding an office absolutely independent from the forestry service and is directly subordinate to the secretary of finances. This arrangement makes embezzlements practically impossible. The sale of timber and fuel takes place, after they are cut and piled up, by means of public auction. The cutting and piling of timber and fuel is done by common hands working under a contract. Any planting, on the other hand, is done by day workers, under the supervision of the local rangers, so as to warrant careful work.

#### PRIVATE FORESTS.

According to a statement made for the year 1900, the total area of the private and communal forests in Saxony is 520,000 acres. All forests owned by municipalities and villages and other corporations, and a considerable frac-

tion of the larger private forests, are managed according to true forestry principles. The administrations of municipal, town and village forests, also the administrations of the private forests, are not controlled by the state, but the bureau of forest working plans at Dresden prepares the working plans for the larger of these forests.

It is impossible to give any data as to the average value per acre of communal and private forests. Neither are data available as to their average annual yield. Generally speaking, the yield of private and communal forests is considered to be lower than from state forests. Wherever there are working plans the cut is steady and even during the period over which the working plan extends. Where there are no working plans the cut depends entirely on the pleasure of the owner.

Small holdings of forests, especially those of the peasantry, are deteriorating. Parts of such forests are changed into fields or meadows; other sections are purchased by the state, communities or wealthy private individuals.

## GRAND DUCHY OF SAXE-WEIMAR.

The area of state forests is 110,910 acres, of private forests 120,510 acres; in the aggregate 231,420 acres, being equal to 25.6 per cent of the total area of the state. The state forests comprise 37 units of administration, in charge of 37 superior forest officers, trained at the forest academy of Eisenach.

The control of the local forest administration is effected through six forest inspectors, the highest authority in forestry matters being represented by a forestry bureau, attached to the office of the secretary of finances. Forest working plans are prepared and their execution controlled by the "Commission of Forest Working Plans," at Eisenach, the director of the forest academy being at the

same time chief of that commission. The annual yield of the state is 5,864,177 cubic feet of lumber and fire-wood, corresponding with about 125 feet board measure timber plus 0.31 cords fire-wood per acre per annum.

The main duties of the superior forest officers consist of: Care of the property; maintenance of boundary lines; preventing the acquisition of prescriptive rights to pasture, litter wood, etc., by outsiders, and preventing forest offenses; maintenance of the growing stock of timber; forest utilization and forest regeneration, as prescribed by the working plans; sale of forest produce and control of the book-keeping.

## SWEDEN.

### STATE FORESTS.

The aggregate extent of the state forests of Sweden in 1895 was 18,080,753 acres. The area of state forests is annually increasing by extensive purchases of private forest. The prevailing kinds of trees are spruce (fir), pine and birch. The estimated value of the state forests is \$4 per acre. The figures in this statement are for the year 1895, in which the aggregate expense of forest administration was \$185,397, and the aggregate revenue was \$1,126,636. The number of acres sown or planted to forest was 10,875. The number of acres damaged by fire was 1,200, and the amount of damage was about \$10,000. Neglected camp fires and carelessness when burning fields for cultivation are the principal causes. Only three fires were caused by railroad locomotives. The state forests are divided into 9 districts and 74 ranges ("revir"). The chief of a district is an officer entitled "Öfverjägästare," with annual salary of \$1,707 and rank corresponding to

the rank of major in the army; the chief of a range ("revir") is an officer entitled "Jägmästare," with a salary of \$1,200 and rank corresponding to that of captain in the army. Before any one can be appointed as "Jägmästare" he must have passed successfully the examinations required after a year's attendance at one of the forest schools, the examinations required during a two years' course at the College of Forestry at Stockholm, and must have practiced forestry a year on a range. Foresters or guards receive a salary of \$160. The state provides dwellings in the vicinity of the forests for officers and foresters. At the head of the forest administration is a director general, with salary of \$2,400, and having rank corresponding to that of a major general in the army; and a chief of bureau, with salary of \$1,867 and rank corresponding to that of a lieutenant colonel in the army.

There is a continuity of forest product based upon certain plans of cultivation. Reforesting is effected partly by sowing, partly by planting, but principally by seeds from standing trees, assisted by planting. The usual method of harvesting the forest crop is, in the southern part of the country, by cutting in blocks clean; in other parts of the country by cutting trees only down to a certain size fixed by law. The total forest product of the country is sustained, and it is increasing.

#### PRIVATE FORESTS.

The aggregate extent of private forests is 58,715,135 acres and their average value per acre is estimated at about \$5. About twenty-five per cent of private forests is managed on forestry principles. A royal committee is preparing a project of forest laws to promote re-growth of private forests.

## FORESTS OF THE UDDEHOLM COMPANY, SWEDEN.\*

The forests of the Uddeholm Stock Company are situated in nine parishes in the province of Vermland and in two parishes of the province of Dalarne. Karlstad, on Lake Wenern, about fifty (English) miles distant, and Gothenberg, about one hundred and eighty miles distant, are the nearest export harbors. Lake Wenern is connected with the Baltic and also the North Sea by the Gotha and Trollhatte (canals). The company owns fifty-six miles of railroad—Nordmark-Klarelfven—with thirteen stations, which transports all sorts of goods, especially iron and lumber, to and between the works. The company owns 400,000 acres of land in Vermland and 25,000 acres in Dalarne. About 60,000 acres have been acquired within the last ten years. Of the entire area, not exceeding 60,000 acres consist of naked tracts, fields, meadow, also unproductive surface of moss, lake and rocky elevations; while at least about 375,000 acres consist of natural forest-bearing land. Hereof perhaps 15,000 to 18,000 acres are pasture land. Pine comprises 70 per cent of the forest, and spruce 30 per cent of all trees large enough for the saw. The birch is the prevailing species within the pasture, but among the birch conifers are generally found.

The Uddeholm Company's lands lie on both sides of the Klar river along its middle course. The parish of Råmen, in Vermland, and the boundary of Dalarne terminate the extent of the property on the east and the two judicial districts of Fryksdal on the west. About 375,000 acres lie in one body. Only a very little public forest and some belonging to farmers are included therein here and there. The rocky elevations consist of primary rocks, principally granite and gneiss, with interspersed

\*Information furnished in Swedish by Dr. Fredrik Loven, chief forest master, through Mr. Gust. Jansson, manager of the Munkfors Iron Works.

hills of hyperite. West of the Klar river red iron gneiss is almost the prevailing rock, but east of the same river granite prevails, in large part solid, not crystalline, but there are large tracts of primary granite poor in feldspar. On granite, pine prevails to the extent of 75 to 80 per cent, while on gneiss spruce occupies at least 40 per cent of the surface. On the 'hyperite' hills spruce of large growth prevails. The soil in the forest is composed partly of the disintegrated rock such as above mentioned and partly of deposits of older or later water courses. Much of the soil is gravelly; much also is sandy. The Klar river within the region of the Uddeholm forest is 400 feet above the sea, and on the east and west sides rise very steep hills which at a distance, generally of a thousand yards, attain a height of from 1,000 to 1,500 feet above the sea; thereafter they take a plateau form, but are very often broken by water courses or bogs. The whole region is thereby in a large degree of that cut or broken character which one can readily obtain an illustration of by ascending one of the principal heights. The highest and only actually barren-topped mountain in the company's forest is Harfjellet, 2,200 feet above the sea. Another, Tönnet mountain, 1,700 feet above the sea, is called a 'fjell' (barren-topped or snow-covered mountain), but it is not actually that, for it is partly forest-covered.

Agriculture takes a subordinate place; the land most suitable for cultivation is generally along the banks of the larger streams. About 700 persons occupy small farms as tenants and are obliged to produce certain quantities of charcoal, in general 6,600 bushels each, and in all 4,620,000 bushels. They are also obliged to transport the coal to the works. Besides, there are several hundred forest laborers with smaller premises on which one or two cows and several smaller animals are fed. About

14,000 persons live and gain their livelihood on the company's property.

About 3,000 acres (2,700 to 3,000 'tunnland'; one tunnland being equal to 1.22 acres) are consumed or cut over annually; though it is not easy to say just how much, because clean cutting and selection cutting (cutting only the larger trees) are both practiced. On an average every tunnland (1.22 acres) ought at the end of every rotation period—120 years for pine and 90 years for spruce—yield from 4,000 to 4,500 cubic feet of lumber.

The forest is handled by means of cutting trees that hinder the growth of others or which are themselves defective ('hjelp och rensningsgallringar'), and thinning to admit light ('ljushuggningar'), consisting of two to three careful timber cuttings with an interval of 15 to 20 years, which end either by leaving seed trees or in clean cutting. The best stands of pine are finally cut at the age of from 130 to 140 years, and the middling at the age of 120 years, and the poorer at the age of 100 years. The spruce stands in which thinning is much practiced are nevertheless very sensitive to damage from excess of light, wherefore timber cutting must be undertaken with great care and skill, otherwise drought occurs. Spruce is cut at the age of 70 to 100 years, according to its quality. During the past ten years there has been cut yearly 12,000,000 cubic feet of lumber of various sorts, namely, of saw and building timber, 2,000,000 cubic feet; spruce for paper pulp, 850,000 cubic feet; telephone and telegraph poles, 125,000 cubic feet; firewood, 2,275,000 cubic feet; wood for charcoal, 6,600,000 cubic feet; miscellaneous, 150,000 cubic feet. Besides, there was each year brought to the works and consumed stub-wood to the amount of 1,500,000 cubic feet.

Certainly not more than 15, or at the highest 20, per cent of the cut-over area becomes restocked by natural

seeding. The cuttings are not so large but what the by-standing trees can in an essential degree contribute to renewal, and, besides, very often 15 to 20 seed trees are left on each 1.22 acre tract. The difficulties which forest culture meets with in this locality are very stony land, spring and summer drought, spring frost, sometimes, as during the previous year, excessive rain, mossy or swampy land and land heavily pastured by cows and sheep. On the other hand, the forest area is not much troubled with heath, strong growth of grass, insects, etc. In regard to sowing, the twigs are burned immediately after the frost is out of the ground, and while the ground is damp. Generally the following year the cleared area is sown with pine and spruce seed. On pine land spruce seed is mixed to about 50 per cent. On land which is suitable for both, 60 to 70 per cent of spruce seed is used. On pure spruce land 15 to 20 per cent of pine seed is mixed in. On cleared land, to prevent injury from drought, long, narrow seed strips—made by hatchets—are used about a yard apart, not large squares; but when heath or grass growth is to be feared then planting is to be preferred. For hacking of these seed strips are selected places which are suitable for the growth of the seeds and protection of the plants, such as the north side of shading objects,—for example, stumps, windfalls, fixed rocks, etc. The seed is laid on the south corner of the seed strip so that seed and plant will be better shaded. When sown on rocky land it has to be raked and covered by hand. On even ground the seed strips should be made in a direction from east to west, and the seeds not deep, harrowed down along the south border of the strips. On the other hand, on steep descents the seed strips should be laid horizontally, so that the seed, in case of heavy rain, shall not be washed down the hill. During the latest ten years there have been yearly about 2,400 acres

sown with from 800 to 900 kilograms of conifer tree seed.

The planting of forest trees takes place on the company's land on a small scale and only where strong growth of grass hinders the growth of young forests. That is usual on good spruce land. There are planted four-year-old transplants from four to five feet apart, so that the number of plants on a tunnland (1.22 acres) varies between 2,250 and 3,500. The average number of trees standing on an acre at the time of cutting is very different, depending on previous cuttings. To more fully answer this question as to old forest on gravelly land which has not been subjected to other cuttings than the thinning of too crowded trees and cuttings of defective trees, the number of trees on two tracts, each of two and a half acres extent, have been counted with the following result: First tract, average pine land, pure stand of pine; average age, 135 years; average height, 85 feet; diameter measured 5 feet from ground. There were found 8 trees with diameter of 5 inches, 13 of 6 inches, 20 of 7 inches, 27 of 8 inches, 34 of 9 inches, 42 of 10 inches, 44 of 11 inches, 44 of 12 inches, 53 of 13 inches, 40 of 14 inches, 30 of 15 inches, 16 of 16 inches, 11 of 17 inches, 3 of 18 inches, 2 of 19 inches; total, 385 trees, containing 9,178 cubic feet. Second tract, good pine land; young spruce successively grown up; pine of average age of 130 years and average height 85 feet; there were found 3 pines and 37 spruces 5 inches in diameter, 44 pines and 58 spruces 6 inches, 61 pines and 37 spruces 7 inches, 77 pines and 28 spruces 8 inches, 76 pines and 11 spruces 9 inches, 82 pines and 7 spruces 10 inches, 83 pines and 6 spruces 11 inches, 73 pines and 3 spruces 12 inches, 53 pines and 1 spruce 13 inches, 30 pines 14 inches, 14 pines 15 inches, 9 pines 16 inches, 5 pines 17 inches, 1 pine 19 inches, 2 pines 20 inches (in diameter); total, 613 pines and 188 spruces, in all 12,013 cubic feet.

Thus were found about 300 trees left per "tunnland" of about 5,300 cubic feet, which, according to an average age of 133 years, shows a yearly average growth of 40 cubic feet per "tunnland" (1.22 acres). If, on the other hand, timber cutting is done once or twice before the final cutting, as is usual, the number of trees at the last is much less. To prevent forest fires, during very dry weather, strict watch is kept by 30 forest guards and by extra ones, and in addition all of the company's dependents are obliged, when a forest fire breaks out, to send notice to the forest guard or forest manager and assist in extinguishing it. Generally the precautions are effective in preventing such fires. No forest fire worthy of mention has occurred in twenty years.

The company's land has been used for forest more than 100 years. It cannot be said what the net revenue is per acre, as the greater part of the product is used at the works in form of coal or fuel. The average yearly growth per "tunnland" ought to be 40 cubic feet, of which one fourth, or 10 cubic feet, should be saw timber of the net value of 1.50 kronor; 10 cubic feet of building timber, worth 1 kronor; 20 cubic feet of wood, worth 0.70 kronor, or, for the 40 cubic feet, 3.20 kronor (equal to \$0.85).

The income from game is not large. There are shot annually 12 elks, many hares and game birds.

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## SWITZERLAND.

The Swiss Confederation is composed of twenty-two cantons, which are separate and sovereign states; and while each canton has legislative authority over forests, the Confederation also exercises legislative authority over them in certain regards. In conformity with the prescriptions of the federal law of October 11, 1904, all forests of Switzerland are placed under the supervision of the Confederation.

The Confederation itself is not actually the owner of any forests, but some of the separate states are owners. The forest domains are part of the national wealth, and comprise 96,497 acres. There are also in the cantons the forests of the municipalities and of the corporations, comprising 1,414,677 acres. Besides there are private forests comprising 604,014 acres. The total area of forests is therefore 2,115,188 acres, or about 20 per cent of the total area of Switzerland.

Forests are found everywhere in the high mountains. Forests are found standing at 200 meters above the sea level (in the canton of Tenin) and reach as high as 2,100 meters in the high mountains. In Grisons (Engadine) they even reach 2,300 meters in altitude.

The more common varieties of trees are among the resinous kinds, the Norway Spruce (*Picea excelsa*) the Silver Fir (*Abies pectinata*) the Larch, the Scotch and Mountain pines, the Cimbrian pine; among the deciduous kinds, the beech and the chestnut trees; this last kind grows especially in the canton of Tessin.

The value of forest land varies greatly and depends on the location, the nature of the soil, thickness of the settlements, the increase of these settlements and on the trade in timber and other products of the forest. The value of per hectare ( $2\frac{1}{2}$  acres) may range accordingly from 300 francs to 6,000 francs.

In regard to expenses of administration, a distinction must be made between the expenses incurred by the Confederation and those incurred by the cantons. In 1904 the expenses incurred by the Confederation for forest administration amounted to \$112,600.

The following were the net receipts from State Forests in 1903 as to a few cantons:

Berne, 787,000 francs or 60 francs per hectare of forest.

Soleure, 31,500 francs or 38.33 francs per hectare of forest.

St. Gall, 58,000 francs or 59.62 francs per hectare of forest.

Schaffhouse, 113,100 francs or 45.33 francs per hectare of forest.

Argovie, 151,600 francs or 49.73 francs per hectare of forest.

Thurgovie, 83,000 francs or 65.90 francs per hectare of forest.

Neuchatel, 58,000 francs or 30.26 francs per hectare of forest.

The net receipts from towns of their forests in 1903 were:

Winterthur, 99,100 francs or 91.07 francs per hectare forest.

Schaffhouse, 35,000 francs or 77.05 francs per hectare of forest.

St. Gall, 104,800 francs or 144.36 francs per hectare of forest.

Coire, 49,200 francs or 43.65 francs per hectare of forest.

On an average about 593 acres of forest have been created annually during the past thirty years, at the expense of the Confederation, the cantons and the owners of the grounds.

In order to regenerate the forests, both planting and natural seeding are practiced, as may be most effective.

In the lowest countries, where clean cutting is practiced, planting is resorted to. Where real dangers exist from avalanches, land-sliding, etc., which do not permit complete denudation, and where gardening is required, natural modes of regeneration are generally used, and sowing is seldom done.

Reforestation by the Confederation in high mountain regions costs on an average 400 francs per hectare for 6,000 to 7,000 plants set in their places.

The federal and cantonal legislatures prescribe a sustained production for the forests of the state, of the towns and of the municipal corporations. If, through winds,

snow-slidings or otherwise, too much timber has been destroyed, less cutting is done in the following years, in order that as rapidly as possible the forest may regain the number of trees fixed by the management. The forests are operated in various ways, according to localities and according to the size of timber that is to be grown, as high-forest, coppice with standards and coppice.

In accordance with the terms of the federal law, the forest area cannot be reduced. The cleared land must consequently be reforested, except in cases where an equal area of land is converted into forest. Furthermore, the cantons as well as the Confederation have the right to compel the creation of protective forests wherever they are needed for public utility.

Forest fires seldom occur. Of those which do occur the principal causes are carelessness in lighting fires in the immediate vicinity of the forests and lack of care in the woods. It is rare that a forest fire is occasioned by locomotives.

The administration charged to execute the federal forest law is the Federal Inspectorate of Forests, forming a part of the Swiss federal department of the interior. Nearly all the cantons have for their territories a forest administration. In the small states one single technical official is at the head of the service, but in the larger cantons the administration is under the direction of one or more chief forest inspectors or chiefs of the service and of several district foresters or forest inspectors. An inferior personnel instructed in courses lasting two months is attached to this technical personnel and is organized to execute the work of forest economy.

A few cities or towns with extended and important forests have also a self forest administration, at the head of which is a person of technical forest training. Among

them are Zurich, Berne, Lausanne, St. Gall, Winterthur, Fribourg, Coire, Soleure, Schaffhouse

The Chief Federal Inspector of Forests has an annual salary of 8,000 francs and fees of eight francs per day, and eight francs per night, when he has to be absent, for his service; he gets his traveling expenses reimbursed, his first assistant has a salary of 6,400 francs and is similarly indemnified for his inspection trips.

The three inspectors of the canton of Berne receive each 5,300 francs per annum. They receive extra pay, six francs per day and four francs per night, for all inspections made outside of their city, and their traveling expenses are reimbursed.

The high forester or chief inspector of the canton of St. Gall who has a salary of 5,000 francs, receives twelve francs per day and five francs per night, besides his traveling expenses, when out inspecting.

The Federal Inspectorate of Forests publishes every year a report on its management. The majority of the cantonal inspectors do likewise.

In the matter of taxes, the cantons are sovereign in their own limits. Taxation therefore differs according to the cantonal territory to which it applies. In all these states a tax on the forest is imposed, and in most states that tax is combined with the tax on income. But for one and the same forest only one of these two modes of taxation is generally applied. A few examples will show: In the canton of St. Gall the state has paid to the towns in which it has forests a tax of 1.20 francs per hectare. In Argovie the state pays to the towns where its forests are situated a tax of 2.40 to 3.20 francs per 1,000 francs of forest value. On the other hand, the towns only pay to the state a tax of 40 centimes per 1,000 francs of forest





**Food for Forest Fires.** Sample of country on the White Earth-Chippewa Indian Reservation, where the United States Government lumbered for the Indians a few years ago, in a splendid forest of Norway pine. Shows a lack of forestry methods. Photographed for the annual report of the Forestry Commissioner of Minnesota.



Spruce and fir forest near Freudenstadt, Wurttemberg, Germany: age about 130 years. Shows how closely land becomes stocked with trees under scientific forestry management. Also shows undergrowth about six inches high. Minnesota's natural resources are so great that if she would now begin to spend annually \$300,000 in forestry, she would in eighty years have 3,000,000 acres of as good forest on land not suited for agriculture, and of the value of \$200,000,000 and upwards.

value. The private forest proprietor pays to the state 40 centimes and from 2.40 francs to 3.20 francs to the towns per 1,000 francs of forest value; and in addition thereto he is taxed on the income in the amount of one per cent of the average two per cent of gross declared value of the forest, but neither the state nor the towns pay a tax on the income of their forests.

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## WURTEMBERG.

Wurtemberg lies west of Bavaria, and is the third German state in point of area, its population being a little over 2,000,000. Its greatest length from north to south is 140 miles, and its greatest breadth is 100 miles. One-third of the Black Forest (so called from the dark foliage of its pines), and which forms a sort of a triangle, lies within Wurtemberg, two-thirds being in Baden. The Black Forest has a total length of 93 miles, and its breadth varies from 13 to 46 miles.

### STATE FORESTS.

The Government forests occupy one-third of the entire forest area of the Kingdom and comprise 420,000 acres, namely:

Oak, 2 per cent; beech, 26 per cent; Scotch pine, 10 per cent; Norway spruce, 44 per cent; silver fir, 15 per cent; maple, ash, walnut, etc., 2 per cent.

The price of the forest land from which the timber is cut, varies according to local conditions and amounts, on the whole, to \$35 or \$40 per acre.

During the period 1893 to 1903, the Government bought annually about 250 acres of forest land for the purpose of the enlargement of its possessions; and, further, with a view to obtaining possession of solid boundaries of land.

The annual aggregate expense of administration of the forest amounts to \$1,183,574. Of this \$364,140 is paid to wood-cutters, \$147,560 is expended on roads, \$90,440 in forest culture, \$259,468 for pay of officials, \$148,468 for forest guards. The revenue was \$2,928,352, yielding a net revenue, after for 1895-1896 deducting all expenditures, of \$1,744,788, or \$3.63 per acre. The number of acres annually sown to forest is 296, and the number of acres planted to forest 6,177.

About one-fifth of the state forests is regenerated from self-sown seed, whilst the remaining four-fifths are regenerated by the planting of seedlings.

It is a principle to maintain (as far as the division of the age of the plantings permit) an equal annual cutting. At present the cutting is fixed at 1.94 cubic meters per acre. The cutting is contracted for with laborers living in the neighborhood of the woods. By good management there are at a given plot generally trees of about the same age. If the natural seed falling is intended to be used, the larger trees, either single or in crops, are cut out in a direction against the prevailing winds; the remaining trees are thinned and gradually cut out as the growing young trees may demand. If the natural seed falling is not taken into consideration, the wood crop is cut clean in narrow strips, also in a direction against the prevailing winds, and the cutting of the second and following strips is postponed until the young plantings can dispense with the side protection of the old woods. It is a principle that replanting follows immediately after the cuttings.

The Government officer, in forestry, has placed in his charge about 3300 acres of state forests, in addition to the management of, approximately, 2700 acres of communal forests. The State Forest officer, at the same time, is placed in charge of the forest policy of the state, under

the law of Feb. 19th, 1902; and in this capacity, prevents the mismanagement of protection forests.

The headquarters staff comprise, 1 President; 12 Technical Foresters (including the Commander of the Forest Guard); 2 Members, attending to the financial side, budgets, etc.; 1 Member, attending to buildings; 1 Member, attending to local matters. The salary of the President is \$2000. The salaries of the other members, known as "Councilors", vary between \$1350 and \$1810 per annum.

In regard to the rank in the forest service, as compared with other branches of the public service, it may be said that the forest officials rank in general equally with those state officials who are graduates of the university.

Workmen continuously employed in the forests are used only in a few large forest districts, notably, in certain parts of the Black Forest; otherwise, forestal labor is attended to by men usually employed in other vocations. Only in the case of workmen permanently employed, attention is paid to the proximity of home and Forest.

On 2500 acres of forest land, about 12 workmen may be employed during the entire year. The wages of the forest workmen are somewhat better than those of the common workmen, in order to retain the necessary amount of good labor for forestry.

During the years 1901 to 1905, there occurred altogether 124 forest fires. The damage caused by these forest fires was as follows: 2 forest fires, each \$300; 17 forest fires, each between \$25 and \$250; 105 forest fires, less than \$25 altogether.

The entire damage done by forest fires within the state forests of the Kingdom of Wurtemberg, and within the period of 1901-1905, amounts to \$2200.

The main causes of such forest fires are carelessness while smoking and lighting fires near forests. Forest fires are very rarely caused by sparks from locomotives

## FORESTS OWNED BY CORPORATIONS.

These forests are about as extensive within the Kingdom of Wurtemberg as the Government forests proper. They are owned by municipalities, towns and such institutions as may follow out public purposes, and are subject as such to Government control.

The arrangement of supervision and management at headquarters, in the case of Corporation Forests, is the following: 1 President; 12 Technical officers (the same men who form part of the State forest management); 4 members, having particular experience in the administration of communal matters.

Corporation forests must be managed, on the basis of forest working plans, in such a manner that a sustained annual yield is obtained under the local supervision of foresters who have obtained the training prescribed for for State forest service.

## PRIVATE FORESTS.

The forest area contained in private forests comprises 36 per cent of the forest area of the Kingdom or 537,000 acres. Approximately 200,000 acres, out of the total number of private forests, are placed under the management of trained foresters, whilst the management of the rest is merely limited by the law of Feb. 19., 1902, known as the law on Forest Policy.

According to this law, in the case of forests playing the the role of protection forests, and being essential as such for the benefit of the commonwealth in safeguarding the interests of the lowland no clear cutting and no very heavy thinning is allowed without the consent of the forest political authorities. These officials, at the same time, see to it that proper reforestation follows in the wake of heavy cuttings. If a private forest is maltreated, or if

damaging natural phenomena, or the spread of damaging insects, are apt to be caused by the mismanagement of a given private forest, then these same authorities take measures to prevent bad effects from resulting to the general welfare of the country.

Under the forest policy law above mentioned, no forest must be converted into permanent farm land, unless the consent of the forest authorities is previously obtained. Permission is usually not denied if the soil in question is better adapted to farming than to forestry, provided that climatical damage is not apt to result from the change; and further, provided that adjoining forests are not endangered, notably by windfall as a consequence of deforestation to the windward. As a rule, only small portions of forest are converted into farm land; and since a large number of abandoned farms have been reforested in the last ten years, there has been witnessed an increase of the forest area and not a reduction.

It may here be stated that in respect to net revenue Saxony and Wurtemberg stand at the head of forest administration and forest culture in general

As further showing the situation in Wurtemberg, I quote from the personal observations of Mr. Austin Cary, an American forester:

“The Black Forest is a region of high and rough land about a million acres in extent, partly in Baden and partly in Wurtemberg. It is well cut up with railroads and turnpikes; it has towns and villages scattered all through it, but much the greater portion of its area is covered with trees. The first forest of which I gained any knowledge was the property of the city of Freudenstadt, in Wurtemberg. I remember thinking as I rode up to the place by rail and found it a city of 6,000 inhabitants, that it wouldn't do for a man like myself, who wished to see nothing but woods from morning till night, to live in the

city. I would get off into the woods themselves and live. How great was my mistake! The forest was all about us. In five minutes' walk from the center of the city one could step into such fine woods as cannot be found in the whole state of Maine. Spruce and fir trees two to three feet through, and all the way up to 130 feet high, stood on the ground as thickly as they could stand. There were acres there that would cut more than 100,000 M. The previous summer I had cruised all through the spruce lands of the Kennebec, and here on single square miles was more timber than on whole townships on that river. And the best of it was this was no new or exceptional thing. The whole area of the forest was doing it. If it hadn't old timber it did have young, which is quite as essential to the result. They were growing that timber right along because they knew how to do it and because they were patient enough to wait for results."

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#### FREDERICK THE GREAT, THE FATHER OF GERMAN FORESTRY.

Frederick the Great promulgated laws in 1740 and 1754 for regulating the cutting of wood, which previously had been done as everyone pleased, without any regard to re-planting. In place of such improvident practice he established rotations of 70 years; that is, he provided that forests should have 70 years in which to mature before being cut, also prescribed methods of thinning so that the young and healthy growth of oak and beech would be better protected. Later instructions were issued in 1764, 1770, 1780, 1783. In addition to this he instituted communal forests under the care of wardens, forbade private owners from every wasteful cutting and placed under the care of the state a portion of the forests in Silesia which previously

had belonged to private parties. Frederick the Great ordered the division of the national forests into compartments or blocks, each of which was to acquire the age of 70 years before being cut. But inasmuch as it was found that 70 years were not sufficient for the proper growth of the trees, each of these main compartments were subdivided into two compartments, so that a period of growth running 140 years was established.

There had been, in more ancient times, laws relating to forests for certain parts of Prussia, the first dating 1547. These related to the right of using the forest and necessity of replanting, more than to general systematic care. One can therefore properly claim that Frederick the Great is the father of the German forests, as it was he who created the existing forestry laws and made them apply to private as well as to state forests.

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## SOME NOTICES OF THE PRESS DURING THE PAST TWELVE YEARS.

The principle on which the present work in Minnesota is based is that *prevention* of fires is the chief remedy. \* \* This report is one of the most valuable documents of its kind which has been published. \* \* It will be widely called for, and gives an object lesson to other parts of the country.—*Boston Herald* (1896).

The annual report of the Chief Fire Warden of Minnesota, Mr. C. C. Andrews, is a document of value to all interested in forestry. As Mr. Andrews says, when people understand the benefits to be derived from a rational management of our forest lands, then, and not till then, will there be a public sentiment that will make the Fire Warden Law as effective as it should be. The attempt which Minnesota is making to prevent forest and prairie fires is indeed a commendable one.—*Outlook* (N. Y.)

Very notable contribution to the literature of forestry.—*American Lumberman*.

Since the establishment of the office the state has been singularly free from destructive fires.—*Minneapolis Lumberman*.

Apart from the importance of the subject, the masterly way with which it is handled makes this report of 137 pages a gem of its kind. This compilation of data represents an immense amount of painstaking labor, on which an active mind and a strong hand has done first-class service.—*St. Louis Lumberman*.

The Fifth Annual Report of the Chief Fire Warden of Minnesota is not exactly a magazine, but it has illustrated pages, it deals with nature, and it is full of information about forests in this and other countries. Don't fail to get this report. It is exceedingly valuable. Here is a chance for the schools to become intelligent concerning our Minnesota forests and concerning forestry generally.—*School Education*.

A most interesting document. \* \* This movement is full of hope for the future of American forests.—*Chicago Standard*.

The public mind needs to be educated on the subject, and a report like this will have an excellent effect.—*Minneapolis Journal*.

State document of great value.—*Farm, Stock and Home*.

Gives evidence of able and energetic work on his part.—*Popular Science Monthly*.

This document gives a great deal of valuable information. \* \* The letters sent by the fire wardens and others throughout Minnesota to their Chief in reply to his circular of inquiries are remarkably intelligent and interesting.—*American Architect and Building News* (Boston).

We should like very much to see it duplicated in Wisconsin.—*Eau Claire Leader*.

Exhibits the fact that the Chief Fire Warden is in close touch with the fire wardens in each town in the state.—*Roseau Times*.

The Minnesota law is one of the best and most progressive in force in any of the states.—*Gifford Pinchot, Chief of the U. S. Division of Forestry*.

RESOLVED, As a fundamental proposition of rational forestry, we commend the well-organized effort of the State of Minnesota to suppress forest fires, being aware that no advance can be made in forest management without such protection.—*Resolution adopted by the American Forestry Association*.

Under the vigorous administration of the present Chief Fire Warden much has been done to promote the growth of a correct public sentiment and not a little has been accomplished in the actual prevention and suppression of fires.

Warning notices in great numbers have been posted and the intelligent co-operation of a large force of assistant wardens has been secured. During the drought in the early summer of the present year over 300 fire wardens were in correspondence with their chief, reporting precautions taken, and otherwise showing their interest and activity. The system is doubtless capable of improvement, but in its inception and reasonably successful working a great step has been taken, and by so much Minnesota is well in advance of Michigan and Wisconsin.—*Prof. V. M. Spalding of the University of Michigan, in "Science" for December 28, 1900*.

Minnesota is taking a foremost place among the commonwealths that are giving attention to forestry. The annual reports of General C. C. Andrews, really forestry reports, are of great interest and value.—*Democrat Chronicle, Rochester, N. Y. (1901)*.

Preventing fires by careful watching and prompt punishment for law breaking hunters and campers, and also by quick action in stopping incipient fires are the chief means resorted to to protect the forests from conflagration. This sort of work Chief Fire Warden Andrews is doing in Minnesota to as great an extent as possible with the means at his disposal to do with.—*Farm, Stock and Home, Minneapolis (1906)*.

While it is never safe to speak too glowingly of a service that has been performed while there is yet danger of failure, it has undoubtedly been proven that the work of the department of the chief fire warden of Minnesota has been efficient during the years since it was created.—*Mississippi Valley Lumberman (1906)*.

[From Gen. Henry L. Abbot, Colonel of Engineers, U. S. Army, retired, one of the commission appointed by the National Academy of Sciences to consider and report a forest policy for the United States and upon whose report the forest reserves were established.]

CAMBRIDGE, MASS., June 29, 1901.

Mr. C. C. Andrews, Chief Fire Warden, St. Paul, Minn. Dear Sir: Please accept my thanks for the copy of your annual report for the year 1900, which has come safely to hand. I need not say how much those who appreciate the value of our forests admire the good work you are doing for their proper treatment.

Yours truly,

HENRY L. ABBOT.

For the twelfth time, Minnesota's Prophet of Forestry, Gen. C. C. Andrews, presents to the government and people of the State his annual report. For nearly thirteen years Gen. Andrews has given to the forestry interests of the State the most painstaking and conscientious study; to the protection of its forests against fire, in his capacity as chief fire warden, the most vigilant watch-care. \* \* \*

But his service as fire warden, important as it has been, has not paralleled in magnitude that which he has sought to render in the capacity of a public teacher of the principles of forestry. By the conditions of the act creating his office, it was made a part of his duty to "disseminate information concerning forestry." That part of his commission he has interpreted in the terms of the enthusiast—more and more so as the mistakes and wastefulness of the State's policy toward its lumbering interests became clear to him, and he perceived the necessity of providing—in Minnesota, the traditional "home of the pine" and the storehouse of a forest wealth once deemed "inexhaustible"—against a treeless future. He has been indefatigable in traveling over the State as the herald and exponent of a rational forestry. In lectures before schools, colleges and societies; in frequent contributions to the newspapers; in conversations with individuals and in labors before legislative committees, he has presented such an array of facts and figures as should, as the result of his work, have made Minnesota foremost among all the States in its provisions for maintaining its forests and averting an impending lumber famine. His annual reports have been masterly in their presentation of the forestry situation here as compared with that in Europe and in other States of our Union, and in their arguments, verbal and pictorial, for the substitution in Minnesota of a wealth-producing for a wealth-destroying system.—*Pioneer Press*, St. Paul, Minn., Aug. 6, 1907.

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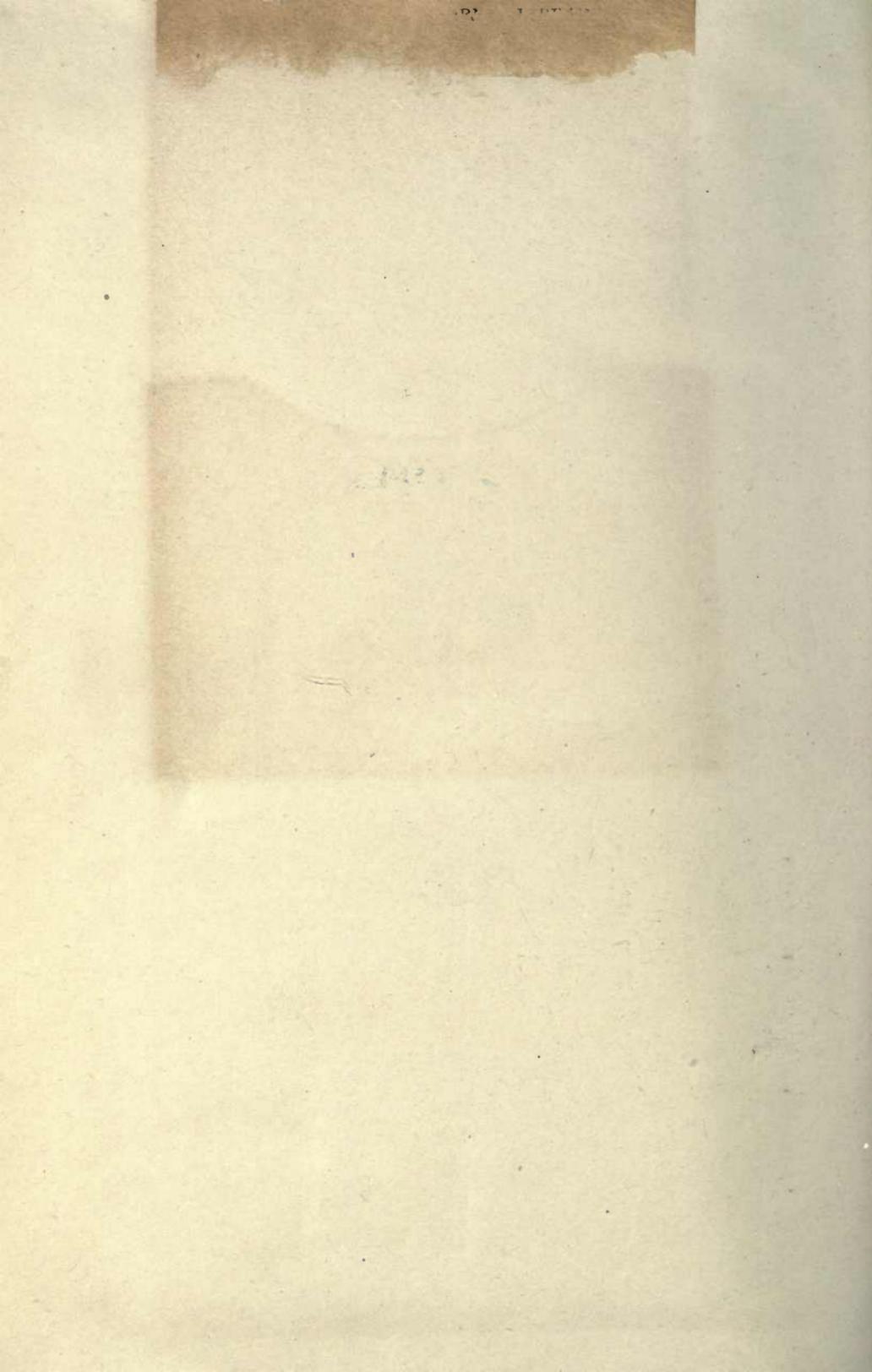
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