PUBLIC DOCUMENTS OF MAINE:

1905

BEING THE

ANNUAL REPORTS

OF THE VARIOUS

DEPARTMENTS AND INSTITUTIONS

For the Year 1904.

VOLUME II.

AUGUSTA
KENNEBEC JOURNAL PRINT
1905

Lumbered spruce stand burned in 1903. Township 8, Range 5, Aroostook Co.

FIFTH REPORT

OF THE

FOREST COMMISSIONER

OF THE

STATE OF MAINE

1904

AUGUSTA
KENNEBEC JOURNAL PRINT
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STATE OF MAINE.

To His Excellency, John F. Hill, Governor of Maine:

I herewith submit my second report as Forest Commissioner for the year ending November 30, 1904, as required by the act for 1891, chapter 100, creating a Forest Commission.

EDGAR E. RING,
Forest Commissioner.

A situation where the right-of-way proved an effective fire-line. Near Bemis, Franklin Co.

REPORT OF THE FOREST COMMISSIONER.

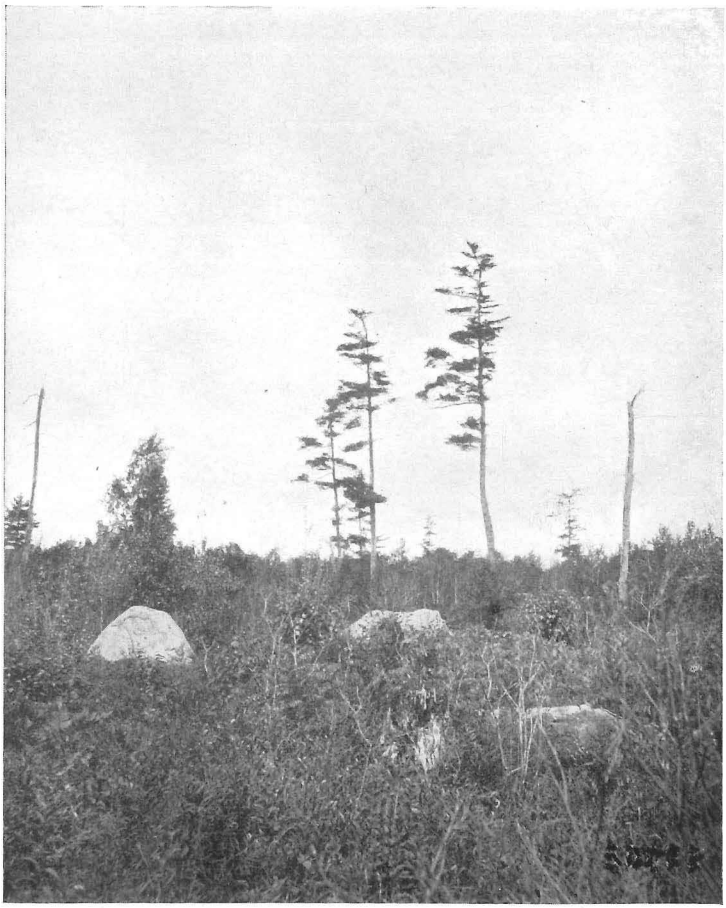
In carrying on the work of the Forestry Department for the past two years special attention has been given to the protection of the forests from fire. The results have been fairly satisfactory.

Considering the vast wooded area of the State and the many incipient fires which occurred during the exceedingly dry season of 1903, Maine has suffered less in proportion from forest fires than any other State. This is due to the system of warden service which was inaugurated by the Forestry Department under the law of 1903, which granted an appropriation of an emergency fund of $10,000 for 1903 and a like sum for 1904, for the prevention and extinguishment of forest fires. As will be seen by the tabulated report on the following pages 355 fires occurred in this State during 1903 and many smaller fires were put out of which no mention was made. With very few exceptions they were extinguished by the fire wardens with but little loss. A few fires which were not under control on June 3d, the memorable day of high and dry winds, when men were powerless to cope with the flames which swept over acres of timberland with the speed of a race horse, even the wardens being obliged to run for their own safety, swelled the total loss to the figures which staggered the public when the wind and fire had subsided and an account of the damage could be taken. But Maine was fortunate compared to some other states. The report of the loss by forest fires in the State of New York, for instance, shows that about 600,000 acres were burned at an estimated loss of $3,500,000. The cost to that state of fighting forest fires in 1903 was $175,000.

In connection with the loss and expense in this State I desire to say that in all cases of expense the land owners were willing

to pay as their proportional part, whatever the Forest Commissioner fixed as a just division of the cost. By so doing and carrying some accounts over to the next year we were enabled to continue the warden service throughout the season.

The old adage that one extreme follows another is shown by the extremely wet season of 1904. While some fires have occurred, particularly in Washington and Hancock Counties, where less rains have fallen and where the soil drys more quickly than in other sections of the state, the loss has been small and consequently the warden expense has been much less than 1903. Although some large bills of 1903 were carried over to 1904 and paid from the emergency fund of this year there will be returned to the State treasury, unexpended, about $2,000.



White pines which have escaped repeated fires. An illustration of the resistance of species to fire. Township XXII, Hancock Co.

FOREST FIRES OF 1903.

The forest fire record of 1903 will go down in history as one that has never been equalled and it is hoped never will be repeated. All of the states to which the trade is looking for a lumber and pulp supply for years to come, suffered great losses. It was a peculiar year, unusual conditions prevailing from the breaking of winter until the commencement of summer. The snow melted earlier than usual under the warm rays of the March and April sun, but the anticipated rains of spring failed.

Without the usual precipitation the ground quickly dried, creating a deplorable condition in the forests, such as the older woodsmen had never seen. The leaves of the preceding fall mixed with the underbrush, usually quickly covered by a green growth, produced in the spring of 1903 a condition equal to a tinder box, taking but the slightest spark to ignite. From April 8th to June 9th there was a fall of but 1.85 inches of rain. For the month of May only .73 of an inch fell and for twenty days following May 21st there was not a drop.

The Legislature, which had wisely provided an emergency fund of $10,000, for the prevention and extinguishment of forest fires, had scarcely adjourned before the great forest conflagration had started. The Forestry Department was carrying out the provisions of the amended law as rapidly as possible, but not all of the required wardens had been appointed and much remained to be done to complete the system and get it into practical working order. Thanks to the assistance of large operators and timber land owners, who in most instances were willing to cooperate with the State, sharing the expense and trouble, good men were found and appointed to the duties of fire wardens. It seemed almost incredible that the new system worked so well as it did with the short time allowed for acquainting the men with their duties, distributing the necessary blanks, etc.

Thousands of dollars worth of the best timber of the State was endangered by every new fire, but up to the day of the great gale the wardens with their men recruited from the crews of river drivers, mills and farms, kept the conflagration under control. The gale of June 3rd with the extreme dryness was more than any number of men could combat. From that date until June 9th when the drought was broken by a copious rain, occurred the greatest losses to the timberlands.

The type of fires with which the wardens had to deal can be divided into three classes, "surface," "ground" and "crown." In most cases the fire began on the surface among the debris of dead leaves and branches from the cuttings of previous seasons furnishing excellent material in which the fire could run. With the ground in such dry condition fire often worked down among the roots of the trees, burning for days and cropping out when it was considered practically extinguished. Among the conifers, with their inflammable foliage, surface fires frequently mounted to the tree tops and thus became crown fires. This type is the most dangerous and hardest to control, on account of the great surface offered to combustion, and also because of the powerful draft caused by the rising of the heated air, which fans the flames to uncontrolable fury.

FOREST FIRES IN INCORPORATED TOWNS IN 1903.

In the general supervision of the forests of the State it has been the aim of the Forestry Department to lend such assistance as comes within its power, to the incorporated towns. While the law relative to incorporated townships takes direct action and authority in the case of forest fires and places the responsibility and care of same upon the selectmen, there are many ways in which the State Forester can work in cooperation and harmony with the town officials, to the betterment and enforcement of all foresty laws.

Under the Revised Statutes of 1903 the sections of the forestry laws relating to towns reads as follows:

Sec. 52. The selectmen of towns shall be, ex-officio, forest fire wardens therein and shall divide said towns into three districts, bounded as far as may be by roads, streams of water, or lot lines, and assign to each of their number the charge and oversight of one district as district fire wardens therein. A description of each district and the name of the fire warden thereof shall be recorded with the town clerk. The services of such selectmen acting as said fire wardens, shall be paid for at the same rate as is paid for their other official services. It shall be the duty of the fire warden of the district in which a fire is discovered to take such measures as may be necessary for its control or extinction. For this purpose he shall have authority to call upon any persons in the territory in which he acts for assistance, and such persons shall receive such compensation not exceeding fifteen cents per hour as said selectmen may determine, the same to be paid by the town. But no town shall be holden to pay for extinguishing forest fires in any year an amount greater than two per cent upon its valuation for purposes of

taxation. If any person so ordered to assist, and not excused from said service by said forest fire warden on account of sickness, disability or some important business or engagement, shall neglect to comply with any such order he shall forfeit the sum of ten dollars, to be recovered in an action of debt in the name and to the use of the town, by the treasurer thereof.

Sec. 55. Whoever by himself, or by his servant, agent or guide, or as the servant, agent or guide of any other person, shall build a camp, cooking or other fire, or use an abandoned camp, in or adjacent to any woods in this state, shall before leaving such fire, totally extinguish the same, and upon failure to do so such person shall be punished by a fine of fifty dollars, provided that such fires built upon the sea beach in such situation that they cannot spread into forest wood or cultivated lands or meadows, shall not be construed as prohibited by this section. One half of any fine imposed and collected under this section shall be paid to the complainant.

Sec. 56. Selectmen shall erect in a conspicuous place at the side of every highway as they may deem proper, and at suitable distances alongside the rivers and lakes of the state frequented by camping parties, tourists, hunters and fishermen, in their respective towns, notices in large letters to be furnished by the forest commissioner, substantially in the following form: "Camp fires must be totally extinguished before breaking camp, under penalty of not to exceed one month's imprisonment or one hundred dollars fine, or both as provided by law..... Forest Commissioner." The forest commissioner shall furnish owners of wood lands situated within this state when called upon to do so, notices of similar tenor to be posted at the expense of said owners upon their respective lands.

Sec. 58. Municipal officers in towns, and county commissioners, the latter with respect to unorganized places, shall proceed immediately to a strict inquiry into the cause and origin of fires, within wood lands; and in all cases where such fires are found to have originated from the unlawful act of any person, to cause the offender to be prosecuted without delay.

Sec. 59. The selectmen of towns in which a forest fire of more than one acre in extent has occurred, and the county commissioners where a forest fire of more than two acres has occurred in any of the unincorporated places in any county,

Spruce, balsam fir and pine under a stand of birch, on land burned in 1862. Adjacent conifers seeded this area. Township 9, Range 5, Aroostook Co.

within a year, shall report to the forest commissioner the extent of area burned over, to the best of their information, together with the probable amount of property destroyed, specifying the value of timber as near as may be, and the amount of cord wood, logs, bark or other forest product, fencing, bridges and buildings that have been burned. They shall also report the cause of these fires if they can be ascertained, and the measures employed and found most effective in checking their progress. Blanks for the reports required in this act shall be furnished by said forest commissioner at the expense of the state.

Numerous inquiries come to the forestry department from town officials relative to the pay of the town fire wardens and the reimbursement of the town for money expended in fighting forest fires within the incorporated lines of the municipality. In some cases the bills are sent to the State forester with a request to settle same. To all such the reply is necessarily the same "we have no jurisdiction or funds to meet such bills." A careful reading of Sec. 52 clearly puts the cost of such forest fires, as may occur in all incorporated places, upon the town, to be paid from any funds the town may have for such purposes. In a few instances differences between the local fire companies and town officials, relative to the pay for fighting forest fires, have been referred to this department but that is a matter to be settled wholly between the firemen and the town. The State appropriation for the prevention and extinguishment of forest fires is for unincorporated townships and the Forest Commissioner has authority to give financial aid, in the way of fighting fires and patrolling, to only such places.

Cooperative assistance with the town officials, however, comes in the way of furnishing free to the towns, fire notices for posting and of such over 10,000 were sent to the selectmen early in the spring. I believe that in most cases these have been thoroughly posted throughout the towns and acting as a caution to careless people, prevent many fires. Blanks for the report of all forest fires are also furnished the selectmen and in this manner a tabulation is kept upon the losses to the wooded areas within the incorporated towns. In most cases I find that the town officials realize the importance of such statistics and are prompt in making their returns to this department.

In many of the reports interesting details and suggestions are made and to show the scope of the same we give a few as follows:

The selectmen of New Sweden say: "This year we had warnings read in the churches and at other public gatherings 'that whoever set fires during the dry season and at such times as it would be impossible to keep it under control would be liable for damages caused by such fires.' We think there are many careless men who never bother to read fire notices, and that they do not realize the position they are in, and that a warning read to them will set them thinking."

Mars Hill assessors say in connection with their report of the fire occurring in that town June 4, 1903: "We do not think that the law is regarded as it should be, we cannot trace these fires to the one who commits the crime. They say they 'do not know how it happened.' We took great pains to post fire notices all over the town last year and we renewed them last spring. Somebody ought to go to prison or pay a fine. We have not had any buildings burned in Mars Hill to our knowledge, but the inhabitants have lived in terror for two or three weeks. We have been surrounded by fire in the towns west and south and buildings and mills have been destroyed. Now these fires nearly all point to men who could not pay a fine and we think it should be punishable by imprisonment and plenty of it."

In Cutler the selectmen report this condition during the fire of June 5th: "We used water where we could get it; felled trees to save buildings, but the fire travelled so fast in the green woods that it was of no use in trying to stop it. Often the flames would jump two or three hundred feet."

The extreme dryness is illustrated in the fire which occurred in Argyle May 31st. In the report of same the selectmen say: "This fire started in the adjoining town of Edinburg. The people of that town together with some of our townsmen worked on it two days (it was only on a few acres then) and said they had it all out, but the third day came a tremendous gale and the fire got a fresh start and came into our town, Argyle, on the river lots, burning a saw mill, four dwellings, four barns, a blacksmith shop and some other buildings."

A corduroy road after the 1903 fire. Near Summit, Franklin Co.

The only positive knowledge of a fire having been caused by an incendiary comes in the report of a fire from North Berwick in which the selectmen say of the fire of May 17th: "It was set by an insane person who has since been confined in the Maine insane hospital."

The following tabulation by counties is carefully made from reports of fires occurring in 1903:

AROOSTOOK COUNTY.

Towns.	Days burning.	Cause.	Area burned in acres.	Area green timber.	Area previously burned.	Kinds of lumber burned.	How extinguished.	Amount of damage.	Measures most effective in fighting fires.
Ashland	3	Unknown	350	All	None	Spruce	Rain	$2,500	
Amity	3	Unknown	200	All	None	Mixed	Put out	300	Water, hoes.
Amity	2	Clearing land	200	All	None	Mixed	Put out	150	Water.
Amity	4	Clearing land	360	All	None	Spruce and hardwood	Put out	400	Water.
Bancroft	14	Unknown	1,000	All	None	Mixed	Rain	2,000	
Bancroft	5	Adjoining town	500	All	None	Mixed	Put out	1,000	
Blaine	3	Clearing land	50	All	None	Mixed	Burned out	Small	
Caribou	1	Clearing land	300	80 acres	220 acres	Mixed	Burned out	$1,500	Back fires.
Caribou	1	Clearing land	300	100 acres	200 acres	Mixed	Burned out	500	
Caribou	1	Clearing land	400	50 acres	350 acres	Mixed	Burned out	400	
Dyer Brook	2	Railroad	150	125 acres	25 acres	Spruce and hardwood	Put out	300	Water, trenching.
Dyer Brook	1	Railroad	15	All	None	Spruce	Put out	60	Water.
Dyer Brook	2	Railroad	100	30 acres	70 acres	Spruce and hardwood	Put out	100	Water and trenching.
Easton	14	Clearing land	40	30 acres	10 acres	Mixed	Burned out	Small	
Ft. Fairfield	6	Unknown	200	100 acres		Spruce	Put out		Engine & hose.
Grand Isle	4	Unknown	640	All	None	Spruce and cedar	Burned out	$1,000	
Haynesville	2	Unknown	2,000	All	None	Mixed	Burned out	2,000	
Linneus	3	Clearing land	200	All	None	Spruce, hemlock, hardwood	Put out	1,000	Water.
Linneus	2	Clearing land	50	All	None	Spruce and cedar	Put out	200	Water.
Limestone	8	Clearing land	400	200 acres	200 acres	Spruce	Burned out	800	
Limestone	10	Clearing land	1,000	500 acres	500 acres	Mixed	Put out	3,000	Water.
Limestone	6	Clearing land	100	All	None	Mixed	Put out	500	Water.
Ludlow	3	Clearing land	50	All	None	Hardwood	Burned out	50	
Ludlow	3	Clearing land	160	All	None	Mixed	Burned out	200	
Mars Hill	14	Clearing land	800	400 acres	400 acres	Spruce and hardwood	Rain	1,500	
Mars Hill	1	Clearing land	200	All	None	Spruce, hemlock, cedar	Put out	250	Water.
Mars Hill	1	Clearing land	200	All	None	Spruce, cedar, hardwood	Put out	250	Water.
Masardis	2	Clearing land	1,500	All	None	Spruce and fir	Burned out	2,000	

Masardis	1	Railroad	100	75 acres	25 acres	Mixed	Burned out	100	
Masardis	1	Clearing land	50	All	None	Mixed	Burned out	200	
Monticello	2	Clearing land	50	All	None	Spruce, fir, cedar	Put out	500	Water.
New Sweden	2	Set	25	All	None	Mixed	Burned out	50	
Orient	2	Unknown	1,100	1,000 acres	100 acres	Mixed	Rain	1,500	
Orient	1	Unknown	20	All	None	Spruce and hardwood	Put out	Small	Smothering with earth.
Perham	21	Clearing land	500	None	All	Mixed	Burned out	$400	
Perham	1	Unknown	700	All	None	Spruce, fir, cedar	Burned out	3,500	
Smyrna	4	Unknown	1,000	All	None	Mixed	Put out	4,000	Water, earth.
Sherman	1	Clearing land	600	All	None	Mixed	Put out	800	Water, back fires.
Weston	4	Unknown	200	100 acres	50 acres	Mixed	Put out	200	Water.
Garfield Pl	8	Clearing land	640	320 acres	320 acres	Mixed	Burned out	1,000	
Chapman Pl	17	Clearing land	2,500	2,000 acres	500 acres	Mixed	Burned out	4,000	
E Plantation	3	Fishermen	80	60 acres	20 acres	Spruce, cedar	Burned out	300	
Merrill Pl	5	Unknown	1,000	All	None	Spruce	Put out	5,000	Water.
Reed Pl	4	Clearing land	10	All	None	Mixed	Put out	100	Water.
St. Francis Pl	4	Clearing land	300	All	None	Mixed	Burned out	2,000	
		Total	20,280				Total loss	$45,610	

ANDROSCOGGIN COUNTY.

Greene	4	Railroad	30	All	None	Mixed	Put out	$300	Trenching.
Lisbon	1	Railroad	100	None	All		Put out	200	
Turner	5	Lightning	50	30 acres	None	Pine	Put out	500	Trenching.
Webster	3	Unknown	100	100 acres	None	Hemlock	Put out	250	
		Total	280				Total loss	$1,250	

CUMBERLAND COUNTY.

Brunswick	1	Railroad	50	All	25 acres	Pine	Put out	$50	Sand.
Brunswick	1	Unknown	3	All	None	Pine, fir	Put out		Sand, water.
Brunswick	1	Unknown	35	All	All	Pine	Put out	100	Sand, water.
Raymond	1	Unknown	25	All	None	Mixed	Put out	25	Water.
Raymond	5	Unknown	15	All	None	Pine	Put out	100	Beaten, hoes.
Scarboro	7	Unknown	100	50 acres	None	Mixed	Put out	300	
Sebago	1	Unknown	3	All	None	Spruce	Put out	20	Water.
Windham	1	Unknown	20	All	None	Pine, hardwood	Put out	125	Trenching, back fires.
		Total	251				Total loss	$720	

FRANKLIN COUNTY.

Towns.	Days burning.	Cause.	Area burned in acres.	Area in green timber.	Area previously burned.	Kind of lumber burned.	How extinguished.	Amount of damage.	Measures most effective in fighting fires.
Carthage	1	Unknown	38	All	None	Mixed	Put out	$165	Trenching, water.
Madrid	5	Railroad	2,000	All	None	Spruce, cedar, birch	Put out	2,000	Trenching.
Dallas Pl	8	Unknown	1,400	400 acres	600 acres	Spruce, cedar, birch	Put out	1,325	Water, earth.
Coplin Pl	3	Railroad	250	25 acres	225 acres	Bushes	Put out		Trenching.
		Total	3,688				Total loss	$3,490	

HANCOCK COUNTY.

Aurora	3	Blueberry burn	1,280	100 acres	All	Spruce, fir	Put out	$300	Trenching, back fires.
Castine	1	Smoker	2	All	None	Mixed	Put out	50	Trenching.
Castine	4	Unknown	60	50 acres	None	Spruce, fir	Put out	200	Water.
Dedham	10	Unknown	50	10 acres	7 acres	Spruce	Put out	50	Ditching.
Dedham	2	Burning grass	25				Put out	25	Ditching.
Eastbrook	2	Unknown	200	75 acres	125 acres	Mixed	Burned out	400	
Lamoine	3	Unknown	500	50 acres	None	Pine, Spruce, fir	Put out	1,000	Trenching, water.
Mariaville	8	Unknown	1,000	None	All	Mixed	Rain	500	Trenching, back fires.
Orland	5	Unknown	300	10 acres	290 acres	Mixed	Put out	20	Trenching, back fires.
Otis	7	Unknown	1,150	1,000 acres	150 acres	Mixed	Put out	1,000	Trenching, back fires.
Otis	4	Unknown	175	25 acres	150 acres	Soft wood	Put out	100	Trenching, back fires.
Otis	3	Unknown	175	50 acres	100 acres	Hard and soft wood	Put out	300	Trenching, back fires.

Sedgwick	7	Unknown	1	All	None	Hard wood	Rain	10	
Sullivan	4	Blueberry burn	150	50 acres	None	Spruce, fir, hard wood	Put out	200	
Trenton	4	Unknown	200		None		Put out	25	
Plantation No. 33	1	Unknown	30	All	All	Hardwood	Put out	200	
		Total	5,298				Total loss	$4,380	

KENNEBEC COUNTY.

Albion	1	Railroad	3	2 acres	None	Hemlock	Put out	$75	Earth.
Albion	7	Railroad	12	All	None	Mixed	Put out	600	Earth, water.
China	6	Unknown	1,000	All	None	Mixed	Put out	500	Trenching.
Pittston	4	Ice house fire	38	All	None	Pine	Put out	1,200	Trenching.
Monmouth	1	Railroad	21	2 acres	None	Poplar	Put out	180	Trenching.
Monmouth	2	Railroad	6	All	All	Brush	Put out	20	Trenching.
Winslow	2	Brush fire	25	3 acres	None	Hardwood	Put out	100	Water.
Winslow	1	Unknown	100	35 acres	None	Hardwood	Put out	300	Trenching.
Windsor	7	Brush fire	40	All	None	Mixed	Put out	1,000	Beaten.
Winthrop	1	Camp fire	4	All	None				
		Total	1,249				Total loss	$3,975	

KNOX COUNTY.

Camden	1	Unknown	3	2 acres	None	Hardwood	Put out	$100	Water.
Union	2	Unknown	4	1 acre	None	Mixed	Put out	100	Ditching, Water.
		Total	7				Total loss	$200	

LINCOLN COUNTY.

Boothbay	1	Burning rubbish	15	5 acres	None	Mixed	Put out	$50	Chemical engine
Bristol	3	Clearing land	20	All	None	Mixed	Put out	500	Ditching
Bristol	7	Unknown	2	1 acre	None	Mixed	Burned out	200	Ditching
Edgecomb	1	Clearing land	50	All	5 acres	Hardwood	Put out	250	
Edgecomb	1	Railroad	3	All	None	Spruce, pine	Put out	50	
Jefferson	4	Unknown	15	8 acres	None	Pine, hemlock	Put out	50	Water
New Castle	1	Railroad	12	All	6 acres	Maple, birch	Put out	150	
		Total	117				Total loss	$1,250	

OXFORD COUNTY.

Towns.	Days burning.	Cause.	Area burned in acres.	Area green timber.	Area previously burned.	Kinds of lumber burned.	How extinguished.	Amount of damage.	Measures most effective in fighting fire.
Bethel	1	Unknown	50				Put out		
Byron	2	Railroad	800	400 acres.	None	Spruce, hardwood	Put out	$1,000	Earth, water.
Brownfield	3	Railroad	175	All	25 acres	Pine, poplar	Put out	525	Ditching.
Denmark	1	Smokers	100	All	None	Mixed	Put out	300	Ditching.
Denmark	21	Unknown	200	All	None	Pine	Put out	1,000	Ditching.
Denmark	14	Unknown	1,000	All	All	Poplar, birch, pine	Put out	5,000	Ditching.
Fryeburg	4	Unknown	500	100 acres.	250 acres	Pine	Put out	1,600	Setting back fires.
Fryeburg	10	Railroad	100					400	
Grafton	6	Clearing land	75	All	None	Mixed	Put out	400	Ditching.
Grafton	14	Unknown	10	All	None	Spruce	Rain	250	Water.
Greenwood	2	Locomotive	5	All	None	Hardwood	Put out	10	Beating, hoes.
Greenwood	1	Unknown	10	All	None	Hardwood	Put out	20	Beating, hoes.
Hiram	2	Fishermen	20	All	None	Mixed	Put out	25	Trenching.
Lovell	12	Fishermen	175	All	None	Pine	Put out	1,000	Trenching, water.
Norway	1	Unknown	2	All	None	Pine, hardwood	Put out	25	Trenching, water.
Peru	21	Clearing land	600	200 acres.	None	Hardwood	Put out	200	
		Total	3,822				Total loss	$11,755	

PENOBSCOT COUNTY.

Argyle	4	Hunters	100	All	None	Soft wood	Put out	$300	Water.
Argyle	3	Hedgehog hunter	100	All	None	Hard and soft wood	Put out	300	Water, trenching.
Burlington	1	Unknown	5	Meadow	None	None	Put out		Water.
Bradford	9	Unknown	25	All	None	Mixed	Rain	100	Water, trenching.

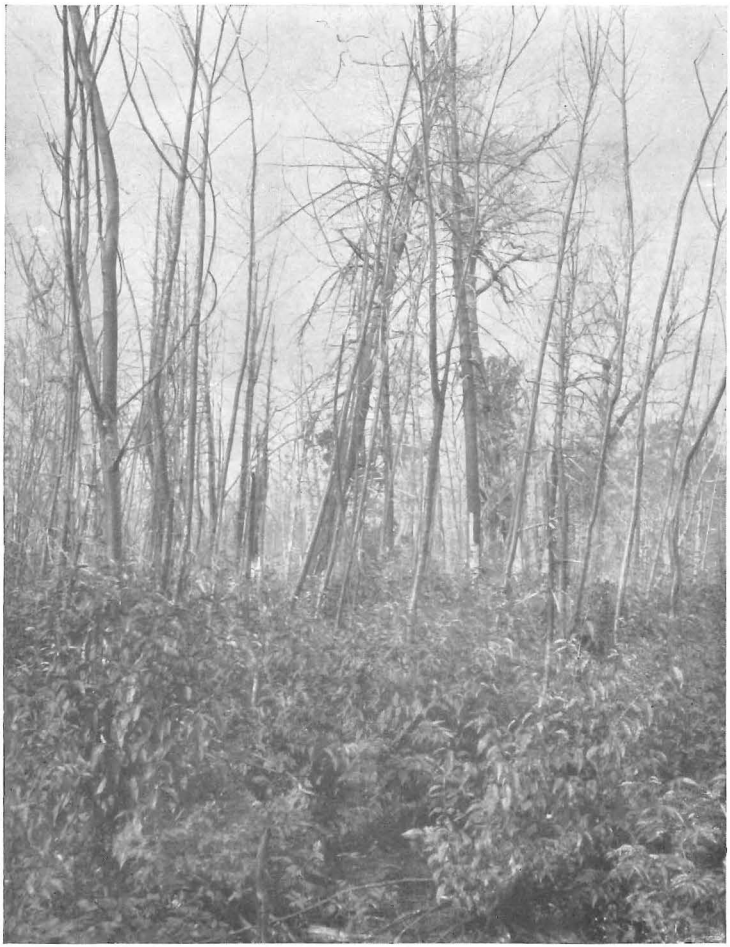
Bradley	3	Clearing land	20	All	None	Mixed	Put out	250	Trenching, back fires
Carroll	3	Burning camp	200	All	None	Spruce, hardwood	Put out	500	Water, clay
Clifton	1	Unknown	10	All	None	Soft wood	Put out	5	Trenching.
Clifton	3	Unknown	75	All	None	Hardwood	Put out	100	Trenching.
Clifton	2	Unknown	25	None	All	Bushes	Put out		Trenching.
Charleston	3	Smoking	6	None	None	Pasture	Put out	25	Trenching.
Edinburg	5	Campers	50	50 acres	None	Mixed	Put out	Small	Trenching, water.
Greenfield	6	Unknown	700	All	None	Mixed	Put out	3,000	Trenching, water.
Glenburn	5	Adjoining town	150	120 acres	All	Mixed	Put out	2,780	Trenching, water.
Greenfield	5	Unknown	125	75 acres	50 acres	Mixed	Put out	400	Trenching, water.
Greenbush	10	Railroad	400	100 acres	None	Pine, spruce, fir	Put out	500	Trenching, earth.
Greenbush	10	Unknown	300	All	None	Mixed	Put out	675	Trenching, earth.
Kenduskeag	8	Fishermen	100	All	50 acres	Mixed	Burned out	400	Setting back fires.
Lowell	4	Unknown	5	All	None	Spruce, white birch	Put out	75	Trenching.
Lowell	3	Unknown	75	50 acres	None	Mixed	Put out	150	Trenching.
Milford	2	Unknown	10	2 acres	None	Pine	Put out	50	Water.
Milford	14	Unknown	700	100 acres	600 acres	Mixed	Put out	1,000	Trenching.
Millinocket	28	Clearing land	200	All	100 acres	Mixed	Put out	2,000	Water, earth.
Mattamiscontis	6	Unknown	100	67 acres	33 acres	Mixed	Put out	300	Water.
Prentiss	3	Clearing land	75	50 acres	50 acres	Mixed	Put out	150	Water, cut down trees.
Prentiss	1	Unknown	3	All	None	Hardwood	Put out	20	Water, cut down trees.
Prentiss	2	Clearing land	10	All	None	Spruce, hardwood	Put out	50	Water, cut down trees.
Patten	4	Campers	60	All	None	Spruce, hardwood	Put out	1,000	Water.
Patten	2	Clearing land	30	All	None	Spruce, cedar	Put out	300	Water.
Veazie	2	Unknown	75	All	None	Mixed	Burned out	Small	
Stacyville Pl	14	Clearing land	3,000	All	None	Spruce, cedar, hardwood	Put out	30,000	Water.
Grand Falls Pl	8	Unknown	15	12 acres	3 acres	Spruce, hemlock, pine	Put out	50	Water.
		Total	6,749				Total loss	$44,480	

PISCATAQUIS COUNTY.

Towns.	Days burning.	Cause.	Area burned in acres.	Area green timber.	Area previously burned.	Kinds of lumber burned.	How extinguished.	Amount of damage.	Measures most effective in fighting fire.
Brownville	7	Railroad	20			Mixed			
Foxcroft	5	Fishermen	100				Put out	$250	Ditching. water.
Greenville	4	Clearing land	200			Mixed	Put out	1,000	Ditching, back fire.
Milo	1	Unknown	12	All	None	Soft wood	Burned out		
Monson	1	Fishermen	60		None	120 cords wood	Put out	250	Earth.
Monson	1	Unknown	1	All	None	Hardwood	Put out	20	Earth.
Monson	21	Clearing land	200	None	25 acres		Put out	400	Earth.
Shirley	4	Unknown	600	All	12 acres	Mixed	Put out	800	
Williamsburg	1	Railroad	3	1 acre	None	Mixed	Put out	10	Beaten out.
Barnard Pl.	1	Unknown	125		All		Burned out	15	
Kingsbury Pl	1	Unknown	10				Put out		Water.
		Total	1,331				Total loss	$2,745	

SAGADAHOC.

Topsham	2	Railroad	25	13 acres	None	Mixed	Put out	$200	
Topsham	1	Railroad	20	5 acres	None	Soft wood	Put out	50	Earth
Topsham	7	Railroad	250	All	None	Pine, hardwood	Put out	4,000	Earth
Topsham	1	Incendiary	2	None	None	Brush	Put out		
Topsham	1	Railroad	5	All	None	Hard and soft wood	Put out	200	
Topsham	1	Railroad	3	None	None		Put out	25	
Topsham	1	Smokers	25	All	None	Mixed	Put out	200	
Woolwich	2	Unknown	50	20 acres	10 acres	Mixed	Put out	1,000	Water.
West Bath	5	Unknown	40	All	5 acres	Mixed	Put out	100	Beating, water
		Total	420				Total loss	$5,775	



A stand of paper birch which came up after the 1884 fire, and was killed by the fire of 1903. Township 4, Range 9, Piscataquis Co.

SOMERSET COUNTY.

Fairfield	1	Campfire	30	3 acres	None	Hardwood	Put out	$200	Trenching.
Pittsfield	6	Unknown	600		None	Spruce and pine	Put out	1,000	Water.
Dennistown Pl	4	Unknown	75	None	All		Burned out		
Jackman Pl	3	Railroad	3	3 acres	None	Mixed	Put out	15	Water.
Lexington Pl	1	Mill	3		None		Put out	100	
Moose River Pl	6	Clearing land	15	All	None	Spruce, fir, birch	Put out	110	Water.
Mayfield Pl	4	Clearing land	80	15 acres	None	Mixed	Put out	75	Water.
Moose River Pl	1	Clearing land	30	28 acres	None	Mixed	Put out	50	Water.
		Total	836				Total loss	$1,550	

WASHINGTON COUNTY.

Alexander	1	Unknown	50	All	None	Hardwood	Rain	$10	Trenching, water.
Alexander	1	Unknown	100	60 acres	10 acres	Pine, cedar, birch	Rain	300	Trenching, water.
Alexander	3	Unknown	60	35 acres	None	Spruce, cedar	Rain	10	Trenching, water.
Beddington	20	Blueberry burn	1,000	200 acres	800 acres	Spruce, hemlock	Rain	300	Water.
Baileyville	2	Unknown	6,000	3,000 acres	3,000 acres	Mixed	Rain	10,000	Earth, water.
Baileyville	3	Unknown	300	All	None	Hardwood	Put out	900	Trenching.
Cooper	9	Unknown	1,000	600 acres	400 acres	Spruce, hemlock, hardwood	Rain	2,000	Water.
Charlotte	1	Unknown	30	10 acres	All	White birch	Burned out	50	
Cutler	3	Clearing land	4,000	3,000 acres	All	Spruce, fir, birch	Put out	18,000	Water.
Columbia Falls	1	Blueberry burn	4	2 acres	2 acres	Spruce	Put out	30	Trenching.
Columbia Falls	1	Blueberry burn	2	1 acre	None	Hardwood	Put out	10	Trenching.
Columbia Falls	1	Unknown	25	12 acres	13 acres	Mixed	Burned out	125	
Crawford	5	Unknown	30	All	None	Spruce	Put out	300	Trenching.
Crawford	4	Unknown	25	5 acres	8 acres	Mixed	Put out	50	Trenching.
Centerville	2	Unknown	8			Spruce and hemlock	Rain	10	Water.
Danforth	21	Clearing land	1,000	800 acres	200 acres	Mixed	Put out	2,000	Trenching, back fires.
Gorham	1	Clearing land	6	All	None	Mixed	Put out	150	
Meddybemps	1	Unknown	10	5 acres	All	Mixed	Burned out	25	
Marshfield	3	Unknown	200	188 acres	12 acres	Mixed	Rain	1,200	Trenching, back fires.
Machias	5	Unknown	200	125 acres	50 acres	Mixed	Put out	600	
Northfield	2	Hunters	75	All	All	Birch, beech, Maple	Burned out	200	
Northfield	5	Blueberry burn	100	40 acres	All	Birch	Put out	Small	Trenching, hoes.

WASHINGTON COUNTY—CONCLUDED.

Towns.	Days burning.	Cause.	Area burned in acres.	Area green timber.	Area previously burned.	Kinds of lumber burned.	How extinguished.	Amount of damage.	Measures most effective in fighting fire.
Princeton	9	Adjoining town	225	All	None	Spruce, pine	Put out	2,000	Water.
Waite	3	Unknown	2	None	All	Bushes	Put out		
Whiting	12	Unknown	3,400	2,800 acres.	600 acres	Mixed	Put out	8,450	Trenching.
Wesley	3	Unknown	400	100 acres.	300 acres	Pine, hardwood	Put out	75	Gravel.
Codyville Pl.	3	Unknown	200	None	75 acres		Burned out	125	
		Total	18,452				Total loss	$47,920	

WALDO COUNTY.

Burnham	20	Clearing land	1,200	200 acres.	600 acres	Mixed	Put out	2,500	Ditching.

YORK COUNTY.

Acton	1	Unknown	50	25 acres.	None	Pine	Put out	$500	Trenching.
Hollis	2	Unknown	1,000	All	All	Birch	Put out	1,000	Back fires.
Kennebunk	1	Brush fire	1,500	750 acres.	None	Mixed	Burned out	4,500	
Kennebunk	1	Railroad	50	8 acres.	42 acres	Pine	Put out	50	
Kennebunk	1	Railroad	40	7 acres.	33 acres	Pine	Put out	200	
Lebanon	3	Unknown	400	100 acres.	None	Pine	Put out	1,000	Sand, water.
Newfield	7	Unknown	200	100 acres.	100 acres	Mixed	Put out	400	Earth, back fires.
So. Berwick	3	Unknown	75	25 acres.	None	Pine	Put out	250	
No. Berwick	1	Incendiary	50	All	None	Pine	Put out	500	
Sanford	1	Unknown	10	None	All				Back fires.
		Total	3,375				Total loss	$8,400	

FIRES ON UNINCORPORATED TOWNSHIPS.

During the year 1903 fires occurred on the following unincorporated townships, according to the reports of the fire wardens:

AROOSTOOK COUNTY FIRES, 1903.

Township.	Date.	Acres.	Cause.	Damage.
Wallagrass Pl	May 17	6	Trapper	$40 00
Connor Pl	May 21	1,000	Clearing land	3,000 00
Connor Pl	June 3.	1,200	Clearing land	2,500 00
Caswell Pl	June 3.	400	From Connor Pl	600 00
Cyr Pl	June 3.	500	Clearing land	500 00
7 R. 5	June 2.	1,500	Fishermen	3,500 00
15 and 16 R. 6	May 30	3	Clearing land	15 00
15 and 16 R. 6	May 19	4	Camp fire	70 00
Merrill Pl	May 18	150	Clearing land	300 00
Portage Lake Pl	June 2	4	Clearing land	12 00
Portage Lake Pl	June 1	8	Fishermen	24 00
8 R. 4	May 25	½	Railroad	3 00
4 R. 5	May 29	15	Blueberry burn	40 00
3 R. 2	May 13	200	Clearing land	500 00
Garfield Pl	June 3.	700	Clearing land	2,100 00
Westfield Pl	June 3.	2	Clearing land	20 00
T. B R. 2	May 21	200	Clearing land	800 00
T. 7 R. 5	June 2.	100	Fishermen	1,000 00
T. 1 R. 5	June 3.	10	Unknown	30 00
Molunkus Pl	May 13	500	Clearing land	200 00
8 R. 4	June 1.	20	Unknown	15 00
8 R. 4	May 28	50	Railroad	150 00
8 R. 4	May 29	25		75 00
8 R. 4	May 31	2	Railroad	6 00
8 R. 4	June 8.	3,000	Unknown	15,000 00
8 R. 4	May 23	1	Unknown	5 00
Connor Pl	May 10	1,200	Unknown	2,500 00
Glenwood Pl	June 1.	2,500	Unknown	10,000 00
Reed Pl	June 3.	20	Clearing land	60 00
3 R. 3	June 1.	1,000	Fishermen	4,000 00
7 R. 4	June 4.	26,000	Railroad	78,000 00
Reed Pl	June 2.	750	Clearing land	500 00
2 R. 3	May 11	60	Fishermen	150 00
North Yarmouth	June 1.	25	Unknown	75 00
Macwahoc Pl	May 29.	30	Clearing land	100 00
Macwahoc Pl	May 8	6		18 00
17 R. 5	May 24	15		45 00
Hammond Pl	May 9	400	Clearing land	600 00
Caswell Pl	September 26.	2	Clearing land	6 00
Connor Pl	September 26.	3	Clearing land	9 00
Reed Pl	September 22.	20	Clearing land	40 00
9 R. 4	May 26	10	Railroad	15 00
13 R. 6	September 26.	10	Clearing land	30 00
14 R. 6	September 24.	9	Unknown	27 00
13 R. 6	September 23.	50	Sportsmen	200 00
7 R. 3	September 14.	75	Railroad	300 00
9 R. 7	October 2	2	Unknown	25 00
	Total acreage	41,787	Total damage	$127,205 00

FRANKLIN COUNTY FIRES, 1903.

Township.	Date.	Acres.	Cause.	Damage.
Redington	June 3	4,000	Adjoining township	$12,000 00
Dallas Pl	June 5	500	Unknown	500 00
Dallas Pl	June 2	1,400	Unknown	1,325 00
Lowelltown	May 16	600	Railroad	1,200 00
Dallas Pl	June 3	600	Unknown	1,500 00
Townships D and E	June 3	22,000	Unknown	66,000 00
3, R. 1, W. B. K. P	May 26	2,500	Railroad	7,500 00
2, R. 2, W. B. K. P	June 2	1,600	Sportsman	4,800 00
Jim Pond	May 9	100	Unknown	300 00
Jim Pond	May 3	100	Unknown	300 00
Coplin Pl	September 22.	150	Unknown	450 00
Rangeley Pl	May 26	1,500	Unknown	4,500 00
	Total acreage	35,050	Total damage	$100,375 00

HANCOCK COUNTY FIRES, 1903.

Nos. 22 and 16	June 3	6,000		$15,000 00
Township 27	May 17	100	Unknown	300 00
No. 8, S. D	May 26	500	Railroad	2,500 00
No. 10	May 16	2	Unknown	6 00
No. 32	June 9		Adjoining township	
No. 7	May 1	1,000	Unknown	2,000 00
No. 33	May 16	250	Unknown	200 00
No. 32	May 4	1,000	Unknown	1,000 00
No. 21	April 30	160	River drivers	80 00
No. 33	May 10	10	Unknown	50 00
No. 22	May 24	7,000	Unknown	20,000 00
No. 22	April 27	3,000	Blueberry burn	10,000 00
	Total acreage	19,022	Total damage	$51,136 00

OXFORD COUNTY FIRES, 1903.

4, R. 2, W. B. K. P	June 3	80	Campers	$400 00

PISCATAQUIS COUNTY FIRES, 1903.

Nos. 4 and 6, R. 10	June 3	2,560	Unknown	$12,800 00
No. 6, R. 9	June 3	12,000	Unknown	60,000 00
No. 4, R. 9	June 3	20,000	Unknown	100,000 00
No. 5, R. 9	June 3	21,000	Unknown	105,000 00
No. 3, R. 9	June 3	9,600	Unknown	48,000 00
Squaw Mt. Township	May 13	80	Unknown	400 00
Squaw Mt. Township	June 1	10	Railroad	75 00
No. 1, R. 10	June 3	1,000	Camp fire	5,000 00
Elliottsville Pl	April 8	30	Railroad	150 00
Elliottsville Pl	April 26	200	Railroad	1,000 00
Elliottsville Pl	May 26	10	Railroad	50 00
Elliottsville Pl	June 1	5	Railroad	25 00
A, R. 10	June 3	3,000	Unknown	12,000 00
A, R. 11	June 3	1,500	Unknown	6,000 00
East Middlesex	June 3	5		30 00
Little Squaw Mt	September 23.	3	Fishermen	9 00
Township 3, R. 14	September 17.	5	Unknown	20 00
	Total	71,008	Total damage	$350,559 00

PENOBSCOT COUNTY FIRES, 1903.

Township.	Date.	Acres.	Cause.	Damage.
No. 6, R. 8	June 3	1,280	Unknown	$5,500 00
No. 5, R. 8	June 3	5,120	Unknown	25,600 00
No. 4, R. 8	June 3	9,600	Unknown	48,000 00
No. 3, R. 8	June 3	640	Unknown	3,200 00
No. 2, R. 8	June 3	2,500	Unknown	7,500 00
Stacyville Pl	June 1	1,000	Clearing land	5,000 00
Grand Falls Pl	May 31	2,500	Unknown	7,500 00
Webster Pl	May 2	50	Unknown	150 00
Webster Pl	May 11	20	Clearing land	25 00
No. 1, R. 7	June 3	300	Unknown	1,500 00
No. 2, R. 6	June 3	1,000	Unknown	3,000 00
No. 5, R. 1	September 23.	3	Campers	12 00
No. 1, R. 7	September 25.	40	Unknown	250 00
No. 3, I. P	September 25.	200	Unknown	400 00
	Total	24,253	Total damage	$107,637 00

SOMERSET COUNTY FIRES, 1903.

Lexington Pl	June 10	2	Clearing land	
Mayfield Pl	May 18	100	Clearing land	$300 00
Jackman Pl	May 31	3	Railroad	15 00
Rockwood Strip	June 1	200	Clearing land	600 00
Long Pond	May	1	Railroad	3 00
Dennistown	May 12	60	Unknown	25 00
Dennistown	June 3	12	Unknown	25 00
Attean	June 5	50	Railroad	200 00
Taunton & Raynham	June 1	800	Clearing land	2,400 00
Taunton & Raynham	May 11	1,500	Unknown	3,000 00
Holeb	September 22.	½	Unknown	3 00
Jackman Pl	September 20.	12	Unknown	75 00
Carrying Place	September 23.	4	Campers	50 00
Carrying Place	September 12.	⅛	Campers	10 00
Misery Gore	September 17.	2	Railroad	10 00
Dennistown	September 12.	100	Unknown	400 00
Attean	September 12.	2	Railroad crew	10 00
Stony Brook	October 1	60	Unknown	180 00
Spencer Town	September 14.	30	Unknown	90 00
Long Pond	September 29.	2	Unknown	20 00
	Total acreage	2,941		$7,416 00

WASHINGTON COUNTY FIRES, 1903.

No. 19	May 11	300	Unknown	$900 00
No. 19	May 18	5	Unknown	15 00
Kossuth	June 3	30	Unknown	90 00
Kossuth	May 12	250	Clearing land	750 00
Dyer 1 R. 2	May 16	40	Unknown	40 00
No. 18	June 4		Fishermen	150 00
No. 1	May 9	15	Fishermen	45 00
Codyville	May 10	200	Unknown	160 00
No. 25	April 30	50	Unknown	100 00
No. 24	June 1	3,000	Fishermen	8,000 00
No. 30	May 9	1,800	Unknown	5,400 00
No. 18	May 28	400	Unknown	1,200 00
No. 5	May 23	1	Campers	10 00
	Total acreage	6,091	Total damage	$16,860 00

SUMMARY OF FIRES OF 1903.

A more careful estimate and from later figures on the damage and loss to the wooded area of the State by the fires of 1903 reduces somewhat the estimate given in our bulletin which was published shortly after the fires which occurred in April, May and June of that year. According to returns made by fire wardens and selectmen the following table of area burned over and total damage is compiled:

Counties.	Acreage.	Damage.
Aroostook	62,067	$172,815
Androscoggin	280	1,250
Cumberland	251	720
Franklin	38,738	103,865
Hancock	24,320	55,516
Kennebec	1,249	3,975
Knox	7	200
Lincoln	117	1,250
Oxford	3,902	12,155
Piscataquis	74,203	358,959
Penobscot	31,002	152,117
Somerset	3,777	8,966
Sagadahoc	420	5,775
Washington	24,543	64,780
Waldo	1,200	2,500
York	3,375	8,400
	269,451	$953,243

FOREST FIRES OF 1904.

It is a vast different story we have to tell of the forest fires of 1904. The conditions were altogether different from 1903. There was the usual amount of spring rain which, after the snow was off, kept the ground wet until a green growth had started in the forests, practically assuring safety to the woods. Frequent rains during the summer coupled with the excellent conditions of the spring resulted in getting through the season with practically few fires and a small loss, on either the incorporated or unincorporated townships. Washington and Hancock counties suffered the most, less rain being reported in that section. The following tabulation shows the area burned:

AROOSTOOK COUNTY FIRES IN 1904.

Township.	Date.	Acres.	Cause.	Damage.
St. Francis	May 8	15	Unknown	$50 00
Hammond	June 16	30	Clearing land	50 00
2 R. 2	June 24	100	Unknown	400 00
D R. 2	July 9	100	Unknown	300 00
15 R. 7	July 13	2	Campers	10 00
	Total	247	Total damage	$810 00

FRANKLIN COUNTY FIRES IN 1904.

Langtown	June 21	1	Railroad	$3 00
Letter E	July 20	5	Unknown	5 00
Rangeley	July 22	2	Unknown	8 00
Lowell	August 3	100	Unknown	100 00
	Total	108	Total damage	$116 00

HANCOCK COUNTY FIRES IN 1904.

No. 10	May 5	1,200	Unknown	$3,600 00
No. 33	June 20	2	Unknown	10 00
No. 22	August 5	100	Luncheon fire	50 00
	Total	1,302	Total damage	$3,660 00

PENOBSCOT COUNTY FIRES IN 1904.

1 R. 7	June 19	5½	Campers	$30 00
Grand Falls	August 5	3	Campers	5 00
Seboeis	April 21	10	Drivers	10 00
	Total	18½	Total damage	$45 00

PISCATAQUIS COUNTY FIRES IN 1904.

Township.	Date.	Acres.	Cause.	Damage.
Elliottsville	May 5	3	Railroad crew	$5 00

SOMERSET COUNTY FIRES IN 1904.

Lexington	May 7	100	Porcupine hunter	$75 00
5 R. 7	June 16	3,000	Lightning	3,000 00
Sandwich Aca	June 20	10	Railroad	25 00
Lower Enchanted	August 28	60	Unknown	150 00
	Total	3,170	Total damage	$3,250 00

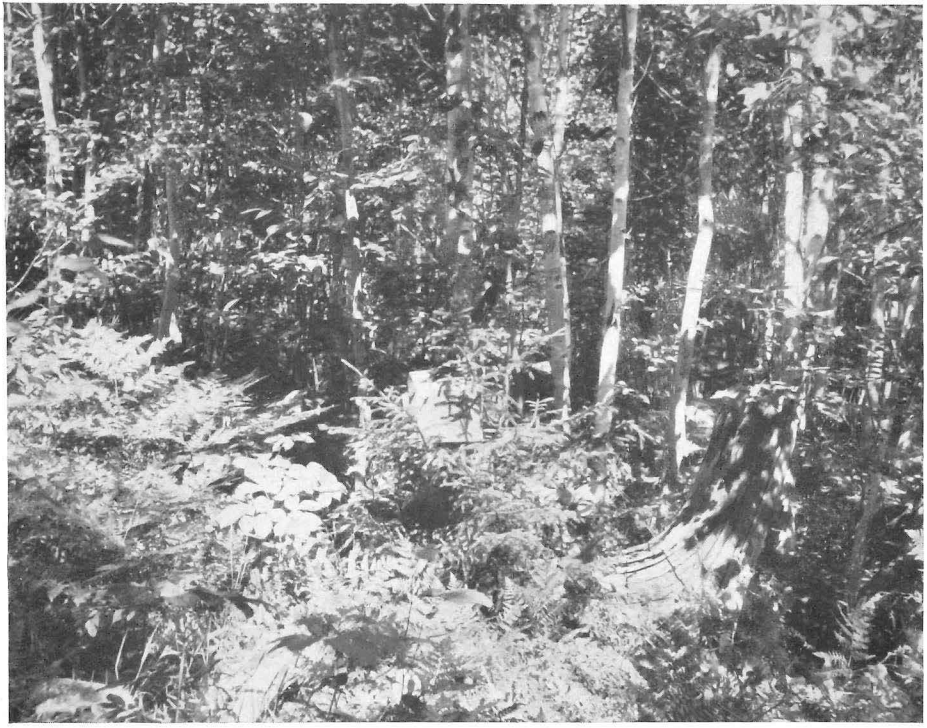
WASHINGTON COUNTY FIRES IN 1904.

No. 43	June 4	160	Unknown	$30 00
No. 37	June 17	200	Unknown	250 00
No. 24 and 30	June 19	1,300	Campers	4,000 00
No. 30	June 19	150	Campers	200 00
No. 25	June 19	100	Unknown	50 00
No. 35	June 16	250	Fishermen	200 00
No. 14	July 10	1	Unknown	4 00
No. 14	July 10	2	Unknown	5 00
No. 27	August 4	1	Unknown	10 00
No 31	August 4	3	Unknown	10 00
No. 26	August 4	3	Unknown	10 00
	Total	2,110	Total damage	$4,769 00

SUMMARY OF FIRES OF 1904.

Following is a summary of the fires of 1904:

Counties.	Acreage.	Damage.
Aroostook	247	$810
Franklin	108	116
Hancock	1,302	3,660
Penobscot	18	45
Piscataquis	3	5
Somerset	3,170	3,250
Washington	2,110	4,769
	6,958	$12,655



A situation where trees burned in 1884 were not blown down. Scarcely any growth followed this fire. Burned again in 1903. Township 4, Range 8, Penobscot Co.

FIRE WARDENS' VIEW OF THE LAW.

Early in the summer circular letters were sent out to the various forest fire wardens asking for information as to the working of the law in the particular locality in which each were located. Various reports were received, from which have been selected the following from the several sections and counties covered. While I do not agree in all instances to the suggestions made I am giving the reports as made by the wardens, to show how the law is received and looked upon by the men whose duty it is to carry out the instructions as mapped out by the Forest Commissioner.

PISCATAQUIS .COUNTY.

W. M. SHAW, July 8, 1904:

As per your request of June 16, I wish to state that I served as fire warden in this section for the year 1903, and personally superintended extinguishing one fire of about 40 acres on the East shore of Moosehead lake, and on the line of the C. P. Railway. I discovered this fire myself about 9. 30 A. M. on the third day of May, 1903. I got a crew of about 18 men onto the fire within a short time, and as the fire was very near the Lake we used water to extiguish the same, but as we got farther away from the Lake so that it was slow getting water, we were obliged to use grub hoes and shovels in order to stop this fire from running.

It was a very hot day and the wind blew hard from the south, so that we could not work in front of the fire, and were obliged to go a short distance ahead and set back fires in order to stop its running before the wind. We did not get the fire under control until long after dark that night, and did not get the fire put out for several days as it burnt more or less in the ground and hung in the old stubs.

This fire was running in a growth of hard wood where the spruce had been cut out, and I believe if it had been in a spruce growth that it would have burnt very much more territory as it was very dry and windy at that time.

This fire started either from the section men burning ties along the right of way, or from a C. P. locomotive; but as there was a train went over the road about one hour before the fire was discovered, I believe it caught from the locomotive.

I wish to say in regard to the big fire that burnt near Askwith, and that was looked after by fire warden Louis Oakes and Martin Munster, that the fire was in black growth and could not be stopped until it got to Brassua Pond, but I believe they did excellent work in keeping this fire in the one narrow path which it made. Many places there they were unable to get water, but kept it from spreading by digging a trench and throwing the dirt in on the fire.

I believe the money that was appropriated and used in fighting fires during the summer of 1903 saved the land owners of the State many hundred thousand dollars, as you had many good wardens appointed, and they had authority to summon help wherever they could find it, and seemed to have more interest in extinguishing fires than I have ever known to be shown before. It was a particularly dry spring and there were many fires started along the railroads through the State, and some started by river driving crews. This fire was also started along the right of way of the C. P. Railway, and without doubt it was set either by their locomotive or section men in burning ties in that extremely dry time.

After these fires were extinguished our Company as well as other land owners, kept men patrolling the C. P. R. right of way, and following all trains where they crossed our lands, and by so doing I believe that we saved many more fires that would have done a great deal of damage had they not been put out by the man patrolling before they got under way."

Greenville, July 8, 1904.

AROOSTOOK COUNTY.

D. L. CUMMINGS, JUNE 25, 1904:

"Regarding forest fires in my section in 1903, there were none to any extent. Several started but I had men watching for men travelling along the road, who would be likely to set fire, or be careless with matches when smoking. I employed one man about two weeks to patrol the highway road through the town of 17, R 5, and I employed four or five men at two different times toput out fires that farmers set while clearing land, and I know from experience that the proper way to handle the fire warden work is to put men on whom you can trust and let them patrol the sections that are exposed to fire, and those places are any turnpike road running through the forest, tote or lumber roads where people go fishing. Fifty dollars paid to a trusty man for patrolling a section not only prevents fires from being set but they are there to put out a fire should one get started. Thousands of dollars worth of timber land is destroyed by fires and spent in fighting forest fires, when nine times out of ten a few dollars paid to the right man, would have saved the money spent in fighting and the timberland also. At one time in May 1903 when we had a few days of very dry weather and high winds I put two men on about three miles stretch, gave them a team, had them take two water pails each, and shovels and ride back and forward over the stretch. There was one fire started, where some natives boiled their kettle to have a lunch, a short distance from the highway. Had those two men on patrol not seen the fire in time, with the three days it had to run before we had rain, it would have swept the whole of T, 17 R. 5.

Now regarding who sets forest fires I feel justified in saying, for no man in the State has a better chance to find out those things than I, I am speaking of Aroostook County in this case, but without a doubt it is the same all over the State, ninety per cent of the forest fires are started by farmers and fishermen, citizens of the State. Many fires start from burning brush by the farmers and citizens going fishing, as a rule, are very careless about putting out their fires. Of course some forest fires start where we can't place the blame on any one. I have never known a fire to start from any lunch fire left by non-resident sportsmen, either with or without a guide. They are more care-

ful with their fires and it may be due to some extent that they are obliged to be careful, but that I don't believe, and I consider the best protection the forests of Maine have today is the sporting camp owners and guides. That is no mistake and people begin to see it. I am not talking because I am in the sporting business myself, but it is a fact and has been proven by the fact that you hardly ever hear of a forest fire starting around a sporting camp."

OXFORD AND FRANKLIN COUNTIES.

SILAS F. PEASLEE, JULY 11, 1904:

"I have your letter of inquiry of June 16th and replying will say that in year 1903 I, as fire warden, employed no men constantly, but only those reported in my account last season on the fires on T. 2 R. 2, and T. 3 R. 1 in Franklin County, and T. 4 R. 2 in Oxford County.

The method employed by me in extinguishing forest fires was to have a few axemen along the edge of the fire as near to the fire as they could work, clear a trail of brush and small bushes so that men could conveniently pass along, then have other men follow with hoes and remove the surface leaves and combustible material from a narrow strip, then have other men follow up with pails and hoes, wetting the ground down and beating the fire back, until a fire line was established sufficiently to check the flames, and later after the force of the fire was spent follow in upon the burnt territory and put out the fire in the punky trees, logs, stumps, turf, etc.

As to the working of the law will say that it gives system to a plan for keeping men upon the alert to give warning if any fire occurs, and to get men at once for the extinguishing of same, as well as a system for patrolling at extremely dry and dangerous periods without which system much was heretofore neglected that is now well looked out for."

FROM THE RANGELEY REGION.

F. A. DOLLOFF, JUNE 20, 1904:

"In reply to your request to Fire Wardens who served last year, I submit to you the following:

On April 28th a fire started near the foot of the logan south of Bemis, also one started at Brimstone, so called, which is about half way between Summit and Houghton.

The fire south of Bemis started about noon time and spread very rapidly, but was gotten under control April 29th. Although it would spring up from time to time in places, but was held in check so it did not cover a very large territory, and was practically all out by May 10th.

The Brimstone fire also caught about noon and spread very rapidly but was gotten in control so we held it and it did not spread materially after the 29th until the wind blow of May 24th when it got away and went to within about one mile of Houghton when it was gotten in control again and held until after the rains.

On May 9th fire started at Valley Dam, which spread very rapidly and went over the side of the mountain back of the Berlin Mills Co. camps, but was held and in fairly good control until May 10th when a rise of wind caused it to break away and go to the Four Ponds.

On May 14th fire was well under control and held until the big wind blow of May 24th which caused it to break out again and the ground practically all burned over again and was fully as hot a fire as when it burned the first time.

May 10th at about noon time a fire started about ¾ mile north of Summit, this fire spread back onto the side of the mountain quite a bit, but was gotten in control and held only breaking out in a few places until a heavy wind on May 24th when it broke away and reached the summit, and on May 25th it had reached to the back side of the cuttings of the Berlin Mills Co. on the west side of the track, all of these fires as soon as the old cuttings were burned over, did not run much as it would not burn in the green timber where there was not any fallen rubbish to feed on.

On May 26th fire broke out north of Bemis and was held in control from the 27th to the 29th when it broke away and on June 1st Bemis burned out.

On Wednesday June 3d the wind blew a gale and every fire broke out new and the ground was practically all burned over again making in some instances three times that the same ground was burnt over, and in most of cases as hot as the first

burning, although of course the blaze did not reach as high in the air as the first time.

On May 24th fire was reported in the Blanchard and Twitchell old works in No. 6 Township, this fire eventually crossed the mountain and met the fire north of Houghton. On June 7th we had fires all in good control and let a part of the men go. On June 8th it rained most all day.

As regards the mode of fighting the fires, various ways were employed, such as covering with dirt, (where dirt could be got) and trenching where it could be done, and by water, which was found to be the most successful of any method, although water was hard to get in a good many places, more could be done by getting it than in any other way.

We also had a steam pump rigged up in our derrick car, which we supplied from the tank of a locomotive, and was able to do some very good work with this rig, which proved it to be a very good arrangement.

In regard to the force used in fighting the fires, all the men available were put on, men were run from Rumford by special train, the men employed in the cutting up mill at Bemis were put on, and Cummings' mill crew from his dowel mill, and all the men available around Bemis, and McGregor's men from the work at Oquossoc, in fact all were put in service. The force would run from 50 to 300 men a day as the case required.

We had an engine and car ready to move men from place to place at a moments notice, so that if any fire should break away or a new one start, we were able to place a crew of men there in a very short time, all men were placed in crews, and a code of signals arranged so that one crew or more could be called without disturbing the other crews, which made it practically so we could call any number of men, or the whole lot at will by the locomotive whistle.

We also had our regular track men on service at all times, and track was patrolled after each train. After 9 o'clock in the forenoon there was practically nothing done only to look out for and fight fire. We in most cases calculated to get the men onto the fire line at daylight to fight fire, and by this method it proved that we could put out fire from the time men could see to get around in the woods up to about 10 or 11 o'clock when after that we could only hold it to say nothing of putting out.

In regard to the working of the law, etc. We have not had any experience in that line, as we got men for what we could, more or less, which was the only way out of it, for men getting two dollars or two and a half per day would not work for anything else, so that our pay run from $1.35 to $2.50 and in some instances as high as $3.00 per day of 10 hours, everything being kept to its lowest possible mark.

We also had a set of boarding cars which we moved from place to place as required, and this food bill alone was very large.

The dinners were taken in most of cases by the train to opposite of where the men were at work and sent in to the different gangs, so no time was lost in the men going after it.

I do not see anything provided by law, as regards to food for men in extreme cases, or in places where if there is no food it is impossible to get men to stay and work as they are not able to get it themselves. Which in our case last year it would have been impossible to put up any fight against the fire had we not attended to this matter and saw that the men were fed in order to get their work."

FRANKLIN COUNTY.

C. S. SKINNER, JULY 17th, 1904:

"Yours of June 16th has just reached me. My way of fighting fire is in all dry spells to keep a close watch all the time, and also have our men do the same, and if we see any smoke arising in any section under our charge to at once get onto the ground just as soon as possible, with just what help at the time seems necessary. Then we try to use the best methods to at once extinguish it that we have at hand, often we can not get water handy and in that case we use shovels and hoes digging trenches around the fire and throwing fresh dirt on it as I find that fresh dirt is firstrate to smother and put out a fire with. I always aim to have plenty of pails on hand and where it is possible to get water to do so, and get right at it in good lively shape before it gets under too much headway, for you know it is often quite an easy matter to put out a small fire, when I left for thirty minutes it is in some cases almost impossible to get it under control before it has done lots of damage. We often have used

green brush to whip out a running blaze and hold it in check until we could get water or dirt on it. Of course there are cases where back fires can be started and do good and keep from spreading further but those chances in my opinion are not very plenty, and when done it needs the best of judgment in managing the fire. It is very important to have good lively help that you can get some life in, in fighting fire and those that won't get discouraged. In one or two cases the women have taken hold and done excellent work as they are always interested to do the very best they can, but of course it is not often they can help. I think you are doing lots of good in the State in getting up the interest that you have to put out these forest fires before they do too much damage, as our Company think the fires are the greatest risk that we run."

SOMERSET COUNTY.

JOHN HOLDEN, JULY 7, 1904:

"Refering to yours of the 16 ult. I took precaution to inform each man in this settlement to be very careful of fires, but with all a fire was started and ran onto Blue Ridge and I engaged about 40 men and with the assistance of other wardens the fire was controlled in the following manner:

In the fields with teams we plowed around the field two or three times thus checking the fire from running in the moss and grass and could keep it within those bounds by carrying and hauling water.

In the woods we dug up the fresh earth with mattocks and beating the fire back with brush and carrying water and working night and day.

As to preventing fires I take great pains to impress every person with the fact that every acre of forest land that is burned is a loss to every person resident of the State and to protect the forest is to protect their own wealth which is true to a certain extent and to post notices at all camping grounds and along tote roads and where they can be seen from the water if passing in a boat or canoe, I believe that those notices have a great deal to do to prevent forest fires; and to follow camping parties during dry weather. It seems to me that this is one of the best laws ever made and without it this last year much more

A dense growth of firewood on a 1903 burn. Vicinity of Summit, Franklin Co.

forest would have been burned over. I shall ever encourage an appropriation of this kind."

SOMERSET COUNTY.

GEORGE C. JONES, JUNE 23, 1904:

"Yours of June 16th at hand. In reply I will say, that I had no fires of importance in 1903, only two small ones which I put out myself. I think it a good idea to go to all the crews in the woods cutting poplar etc, and explain the law to them and request them to be very careful in regard to fires. I followed this method last year and found it worked well, for instance one boss would not let his men smoke outside of the camp while it was so dry last spring.

I think the law is all right and works well. I also think the wardens should patrol their different sections more, as it is easier to extinguish a small fire than a large one. In adding one more town to my territory it gives me a very large section to patrol. It takes me four days to cover it properly. But we have been very fortunate so far, as it has rained about all the time."

FROM HANCOCK COUNTY.

FRED S. BUNKER, JUNE 5, 1904:

"In regard to how the forest fires were handled in 1903. I had good success in trenching and back firing on some parts of the fire. Some parts were extinguished with water where it could be obtained handy. In my experience with forest fires I find about all can be done is to trench and a part of the time to 'back fire;' average number of men 10."

PENOBSCOT COUNTY.

Mr. John Graham, of South Springfield, who has had years of experience in the Maine forests, writes: "The Forest fire law is working well and if it had been enacted thirty years ago it would have saved the State and land owners many thousands of dollars."

FOREST FIRE WARDENS.

The following is a complete list of the Forest Fire Wardens, for unincorporated townships, who have been appointed to date.

AROOSTOOK WATERS.

Hazen Husen, (P. O. Presque Isle,) Townships Nos. 10 R. 3; 10 R. 4; 11 R. 3; 11 R. 4.

William Sewall, (P. O. Island Falls,) Township No. 4 R. 3.

James Crandall, (P. O. Burleigh,) Merrill Plantation, Townships Nos. 7 R. 3; 7 R. 4.

D. H. Moore and J. J Niles, (P. O. Houlton,) Townships Nos. 7 R. 5; 7 R. 6; 8 R. 4; 8 R. 5; 9 R. 3; C. D. Hammond Plantation; East one-half 8 R. 3.

Miles D. Arbo, (P. O. Oxbow,) Townships Nos. 9 R. 11; 10 R. 11; 9 R. 12; 10 R. 12.

Elmer E. Gilpatrick, (P. O. Davidson,) Townships Nos. 1 R. 6; 2 R. 6.

John Brown, (P. O. Eagle Lake,) Townships Nos. 15 R. 5; 15 R. 6; 16 R. 6.

C. A. Trafton, (P. O. Ashland,) Townships No. 10 R. 6; Garfield Plantation; Sheridan Plantation.

E. R. Tozier, (P. O. Portage Lake,) Townships Nos. 14 R. 6; 13 R. 7; 14 R. 7; 12 R. 7; 13 R. 5; Portage Lake Plantation; Nashville Plantation; 13 R. 8; 14 R. 9; 15 R. 9; 15 R. 8.

Romuld Labbe, (P. O. Wallagrass,) Wallagrass Plantation; Townships Nos. 15 R. 8; 16 R. 8; 16 R. 9.

John Tall, (P. O. Stockholm,) Stockholm Plantation.

George W. Junkins, (P. O. Ox Bow,) Ox Bow Plantation; Townships Nos. 10 R. 7; 11 R. 7; 9 R. 7.

H. H. Jewell, (P. O. Caribou,) Connor Plantation; Caswell Plantation; Cyr Plantation; Hamlin Plantation.

Charles Peterson, (P. O. Ashland,) Townships Nos. 11 R. 8; 11 R. 9; 11 R. 10; 12 R. 8; 12 R. 9.

D. L. Cummings, (P. O. Houlton,) Township No. 16 R. 5.

Benjamin Straight, (P. O. Milford,) Upper St. John waters in Maine.

Charles H. Shannon, (P. O. Macwahoc,) North Yarmouth Academy Grant.

Aleck Currier, (P. O. Ox Bow,) Ox Bow Plantation; Townships Nos. 7 R. 8; 8 R. 8; 9 R. 8; 10 R. 8.

William Atkins, (P. O. Ox Bow,) Townships Nos. 8 R. 9; 9 R. 9; 10 R. 9.

Cyrus Chase, (P. O. Westfield,) East ½ No. 10 R. 3.

Wm. N. Carpenter, (P. O. Houlton,) Hammond Plantation; No. 7 R. 3.

George F. Swasey,(P. O. Howe Brook,) Nos. 7 R. 3; 7 R. 4; West ½ 8 R. 3.

George Moore, (P. O. St. Croix, Me.,) Nos. 9 R. 4; 9 R. 5.

George L. Byron, (P. O. Linneus,) Nos. 4 R. 3; A R. 2.

Allen Quimby, (P. O. Stockholm,) Stockholm Plantation

F. G. Quincy, (P. O. St. Francis,) Nos. 18 R. 10; 19 R. 11; 17 R. 8.

J. B. Bartlett, (P. O. Ashland,) Aroostook Waters.

Claude L. Sawyer, (P. O. Old Town,) St. John Waters in Maine.

Harry E. Hasey, (P. O. Levant,) St. John waters in Maine.

Osgood F. Smith, (P. O. Portage Lake,) Nos. 14 R. 6; 13 R. 7; 14 R. 7; 12 R. 7; 13 R. 5; 15 R. 6; 16 R. 6; Portage Lake Plantation; Nashville Plantation.

Fred D. Cummings, (P. O. Houlton,) No. 16 R. 5.

PENOBSCOT WATERS.

D. E. Huff, (P. O. Danforth,) Township No. 8 R. 3 N. B. P. P.

George H. Huston, (P. O. Bangor,) Aroostook and Penobscot Counties.

Charles Berry, (P. O. Katahdin Iron Works,) Townships B R. 10; B R. 11.

C. H. Randall, (P. O. Katahdin Iron Works,) Townships A R. 11; A R. 12.

John Coughlin, (P. O. Katahdin Iron Works,) Townships A R. 10; 1 R. 11.

S. C. Cummings, (P. O. Haynesville,) Townships Nos. 3 R. 2; 3 R. 3; 3 R. 4; 2 R. 3; 2 R. 4.

Harry Bowers, (P. O. Burlington,) Townships Nos. 3 B. P. P.; 3 R. 1 N. B. P. P.

J. M. True, (P. O. Lee,) Township No. 3.

George S. Ranney, (P. O. Winn,) Webster Plantaton; Drew Plantation.

J. E. Smart, Jr., (P. O. Seboeis,) Seboeis Plantation; Townships Nos. 2 R. 8; 3 and 4, R. 9, N. W. P.

G. G. Robinson, (P. O. Kingsbury,) Kingsbury Plantation.

Joseph Lobley, (P. O. Mattawamkeag,) Hopkins Academy Grant, Townships Nos. A R. 7; 1 R. 7; 1 R. 6; 2 R. 8; I P. No. 3.

W. J. Curran, (P. O. Patten,) Townships Nos. 6 R. 8; 6 R. 9; 5 R. 9; 5 R. 8; 7 R. 9.

Fred Stinson, (P. O. Moro,) Townships Nos. 7 R. 5; 7 R. 6; 8 R. 5; West one-half 7 R. 4.

C. C. Garland, (P. O. Debsconeag,) Townships Nos. 2 R. 9; 2 R. 10; 2 R. 11; R. 10.

Selden McPheters, (P. O. Norcross,) Townships Nos. 1 R. 8; 1 R. 9; 1 R. 10.

M. M. Tracy, (P. O. Stacyville,) Stacyville Plantation; Townships Nos. 3 R. 7; 2 R. 6; 2 R. 7; 4 R. 7; 3 R. 8; 4 R. 8.

A. S. Garland, (P. O. Monson,) Elliottsville Plantation; Townships Nos. 7 R. 9; 8 R. 10; 7 R. 10, N. W. P.

Earle S. Page, (P. O. Burlington,) Township No 3.

Charles N. Thompson, (P. O. Kingman,) Webster; Upper Molunkus; Macwahoc Plantation.

Fleetwood Pride, (P. O. St. Croix,) Townships 7 R. 4; 8 R. 4; 7 R. 3; 8 R. 3.

A. L. Green, (P. O. Katahdin Iron Works,) Katahdin Iron Works; B R. 10; B R. 11.

John H. Rice, (P. O. Bangor,) A R. 10; A R. 11; 1 R. 10; 1 R. 11.

H. W. Lord, (P. O. Montague,) 1 N. D.

George Butterfield, (P. O. Onawa,) Elliottsville Plantation.

J. P. Mallett, (P. O. East Winn,) Township No. 3.

W. L. Hobbs, (P. O. Milo,) Seboeis Plantation.

Harry F Ross, (P. O. Bangor,) Nos. 2 R. 8; 2 R. 9; 3 R. 8; 3 R. 9; 4 R. 8; 4 R. 9; W. E. L. S.

Frank Keegan, (P. O. Wytopitlock,) Glenwood Plantation; Reed Plantation; North Yarmouth; 2 R. 4.

Wm. Heughen, (P. O. Onawa,) Elliottsville Plantation; Bowerbank.

Joshua F. Smith, (P. O. Chesuncook,) Nos. 6 R. 13; 6 R. 14.

J. P. Mallett, (P. O. East Winn,) Township No. 3.

KENNEBEC WATERS.

Matthew Kennedy, (P. O. West Forks,) Township No. 1 R. 5.

George Jones, (P. O. Caratunk,) East Moxie, West Moxie and Moxie Gore; Square Town.

William Lockyer, (P. O. Eustis,) Jim Pond Town; Chain of Ponds; No. 4 R. 5; Kibby.

Sullivan Newton, (P. O. Jackman,) Attean; Dennistown; Sandy Bay; Townships Nos. 4 R. 6; 5 R. 6.

John Covel, (P. O. Holeb,) Holeb; Forcythe and Township No. 6 R. 7, B. K. P. W. K. R.

C. S. Skinner, (P. O. Lowelltown,) Skinnertown; Lowelltown; Townships Nos. 1 R. 7; 2 R. 7;

J. Cooke, Jr., (P. O. Kineo,) Big W; Little W.

M. P. Colbath, (P. O. North West Carry,) Big W; Little W; Seboomook; Soldier Town.

William M. Shaw, (P. O. Greenville,) Piscataquis County.

John H. Green, (P. O. Lexington,) Lexington Plantation; Highland Plantation.

Thomas Gerard, (P. O. Jackman,) Townships Nos. 4 R. 6; 5 R. 6.

W. H. Galusha, (P. O. Greenville,) Little and Big Squaw; Gore A. R. 2; Lily Bay; Sugar Island; Deer Island.

A. J. Kennedy, (P. O. Greenville Jct.,) Spencer Bay; Blake; East Middlesex; Day's Academy Grant.

Frank Smart, (P. O. Greenville,) Day's Academy Grant.

Silas Nelson, (P. O. Moosehead,) Taunton & Raynham; Misery Gore.

Charles Meservey, (P. O. Roach River,) Townships Nos. 1 R. 12; A R. 12; 1 R. 13; A R. 13.

Will P. Forsyth, (P. O. The Forks,) West Forks Plantation; Townships Nos. 2 R. 5; 2 R. 6, B. K. P. W. K. R.

George L. Smith, (P. O. Augusta,) Townships Nos. 2 R. 5; 3 R. 5; 4 R. 5; 2 R. 6, B. K. P. W. K. R.

Frank Savage, (P. O. Stratton,) Bigelow Plantation; Coplin Plantation; Dead River Plantation.

J. K. Viles, (P. O. North New Portland,) West Eustis, No. 3 R. 5.

Harry Pierce, (P. O. Eustis,) King; Bartlett; Pratt; 4 R. 5, B. K. P. W. K. R.

John Holden, (P. O. Rockwood,) Blue Ridge; Tomhegan; Rockwood Strip; Middlesex; Farm Island; Taunton & Raynham.

Martin Munster, (P. O. Askwith,) Misery Gore; Taunton & Raynham; Brassua.

E. Gilbert, (P. O. Askwith,) Misery; 10,000 acre tract; Misery Gore; Taunton & Raynham Strip; Brassua; Sandwich Academy.

Michael Redmond, (P. O. Jackman,) East half Moose River.

John Prince, (P. O. Jackman,) Long Pond Town.

Fred Henderson, (P. O. Jackman,) Thorndike and Holden towns; Attean and No. 4 Township.

B. W. Adams, (P. O. Mayfield,) Mayfield Plantation.

Henry J. Lane, (P. O. Caratunk,) Carry Town; Pierce Pond Township.

H. P. McKenney, (P. O. Jackman,) Township No. 3 R. 6; B. K. P. W. K. R.

M. S. Tyler, (P. O. Blanchard,) Bald Mt. Township.

Frank J. Durgin, Oliver Adams, Henry Hudson, (P. O. The Forks,) Nos. 1 R. 6; Bow Town; Johnson Mountain; Enchanted.

Henry Heughey, (P. O. Jackman,) Thorndike; Alder Brook; Soldier Town; Moose River Plantation; Long Pond Town.

Colin McRichie, (P. O. Holeb,) Holeb, Forcythe; Gorham Grant; No. 6 R. 7, B. K. P.

Adolph Foster, (P. O. Roach River,) A R. 11; A R. 12; No. 1 R. 11; 1 R. 12.

H. E. Harlow, (P. O. Dead River,) Carry Town; Nos 3 R. 4; 2 R. 2, B. K. P. W. K. R.; Black Brook.

J. C. Viles, (P. O. Skowhegan,) Carry Town; Nos. 3 R. 4; 2 R. 2, B. K. P. W. K. R.; Black Brook.

Elmer Tufts, (P. O. Kingfield,) Crocker Town; Jerusalem.

W. S. Heath, (P. O. Salem,) Mt. Abram.

Albert Edgerley, (P. O. Greenville,) A. R. 13; A R. 14; 1 R. 13, W. E. L. S.

Sylvere Gaudet, (P. O. Rockwood,) Taunton & Raynham; Blue Ridge; Tomhegan; Rockwood Strip; Middlesex; Farm Island.

Webster Moore, (P. O. Jackman,) Jackman Plantation; Moose River Plantation.

Charles Ray, (P. O. North East Carry,) East and West Burbank.

Walter Taylor, (P. O. Stratton,) Bigelow Plantation; Coplin Plantation; Dead River Plantation.

F. M. Wyman, (P. O. Mayfield,) Mayfield Plantation.

Marshall R. Hastings, (P. O. Hastings,) Batchelder Grant.

M. J. Marr, (P. O. Moosehead,) Nos. 1 R. 6; 1 R. 7.

J. S. Williams, (P. O. Jackman,) Sandy Bay Township.

Frank P. McFarland, (P. O. Askwith,) Sandwich Academy Grant.

WASHINGTON COUNTY.

James Christie, (P. O. Lambert Lake,) Lambert Lake Plantation; Forest; Dyer; Township No. 11 R. 3, N. B. P. P.

George Andrews, (P. O. Topsfield,) Codyville Plantation; Kossuth; Dyer.

Willis B. Hoar, (P. O. Grand Lake Stream,) Grand Lake Stream Plantation; Townships Nos. 6 N. D.; 6 R. 1, N. B. P. P.; 43 and No. 5.

Waldo Mercier, (P. O. Princeton,) Indian Township; Townships Nos. 7; 1 R. 1; 21; 26 and 27.

John Graham, (P. O. South Springfield,) No. 5 R. 1; No. 4 N. D.; No. 4 R. 1; Kossuth.

Victor M. Smith, (P. O. Northfield,) Townships Nos. 18 and 19.

L. F. Leighton, (P. O. Epping,) Townships Nos. 18; 19; 25 M. D.

L. C. Bridgham, (P. O. Beddington,) Townships Nos. 36; 37; 29; 30; 31; 24.

Fred Albee, (P. O. Machias,) Gilmore Driscoll and A. B. Hayward, (P. O. Wesley,) Townships Nos. 24; 31; 30; 36; 29; 37.

John O. Tuell, (P. O. East Machias,) West one half No. 14 Plantation.

Frank Gray, (P. O. Wesley,) Nos. 30; 31; 36; 37.

Thomas S. Smith, (P. O. East Machias,) East one-half No. 14 Plantation.

John R. Sullivan, (P. O. Whitneyville,) Townships Nos. 42 and 43.

HANCOCK COUNTY.

G. L. Joy, (P. O. North Hancock,) Township No. 8.

Fred S. Bunker, (P. O. Franklin,) Townships Nos. 7, 9 and 10.

Henry French, (P. O. Eastbrook,) Township No. 16; South one half No. 22.

Nahum Jordan, (P. O. Aurora,) Township No. 21; North one-half No. 22; South one-half No. 28.

John Baker, (P. O. Riceville,) Townships Nos. 39; 40; South one half No. 2; North one half No. 34.

John R. Shuman, (P. O. Great Pond,) Number 33 Plantation.

OXFORD & FRANKLIN.

Silas F. Peaslee, (P. O. Upton,) Magalloway Plantation; Lincoln Plantation; Townships Nos. 5 R. 3; 5 R. 4; 5 R. 5.

Samuel Eastwood, (P. O. Redington,) Redington Township.

Rufus O. Dyer, (P. O. Coplin,) Lang Plantation.

J. W. Bucknam, (P. O. Wilson's Mills,) Lincoln Plantation; Townships Nos. 5 R. 3; 5 R. 4; 5 R. 5.

Frank Dolliff, (P. O. Oquossoc,) Letter D.

Freeland D. Abbott, (P. O. Houghton,) Letter E.

General view showing the margin of the burn of 1903. Near Four Ponds, Franklin Co.

Charles H. Adams, (P. O. Rangeley,) Dallas Plantation.

Cyrus A. Campbell, (P. O. Rangeley,) East one half Dallas Plantation.

Phineus Richardson, (P. O. Kennebago Lake,) Township No. 3 R. 4.

Benj. Dewitt, (P. O. Skinner,) Kibby; No. 5 R. 6; Merrill Gore.

David M. Harris, (P. O. Stratton,) Coplin Plantation

Henry W. Dunn, (P. O. Andover,) North and West Andover surplus.

Stillman N. Littlehale, (P. O. Bethel,) Riley Township.

Temple E. Spaulding, (P. O. Oquossoc,) T. 4 R. 3, Oxford County; T. 2 R. 1; 3 R. 1; 3 R. 3, Franklin County.

George E. Allen, (P. O. Middle Dam,) Letter C, Oxford County.

GOOD RULES TO FOLLOW TO PREVENT FIRE.

Do not build a campfire until all the dry leaves and inflammable material has been raked away to a safe distance.

Do not go away and leave your campfire burning. Extinguish it completely before you move on.

Do not leave a smudge burning while you are absent.

Do not throw down a lighted match or stub of a cigar. When you light your cigar or pipe extinguish the match before throwing it on the ground.

Do not burn a bee-tree, or use fire to smoke out game until every possible precaution is taken to prevent the flames from spreading; and,

Do not go away and leave the tree on fire.

Do not leave your fire on the bank of a stream, when engaged in river driving, without giving orders that it must be completely quenched with water.

Do not burn a clearing during a very dry period.

Do not refuse to give the necessary evidence to a fire warden when a neighbor violates the law by burning his clearing out of season; or, at least,

Do not try to shield your neighbor from the consequences of his crime.

Do not refuse to go to a fire when ordered out by the fire warden, unless compelled to do so by urgent necessity.

THE WOODLOT.

In the ever changing importance of the products and income to be derived from the farm, nothing has come faster to the front than the realization that the farmer's woodlot is valuable. Not many years ago the timber on a farm was reckoned of little value except for fire wood. The weaving of miles of iron rails like a net work over the State, traversing almost every portion, and the introduction of large pulp and paper plants, has wrought a great change and larger things can be looked for. It is this onward march of the industrial progress in wooded areas that is making every stick of timber valuable.

The proper amount of attention given the woodlot at the right season, and such a time can be selected for this as to least interfere with the cultivation of cleared land, will yield as much as many other crops. A man with a growth of spruce, poplar, pine or white birch upon his farm is pretty sure of a good market for the same. In former years little account was made of any growth except pine, but the introduction of the pulp mill has changed all this and now spruce leads in value with poplar not far in the van. White birch for hundreds of manufactured articles is becoming valuable.

Some may not take as rosy a view of the possession of a good woodlot or small tract of timber, giving as a reason that the distance from the pulp market hinders a ready sale of their wood or timber. So far as the pulp trade goes this may be a fact, but the time may come when the pulp mill will be much nearer you than you expect, if not by the actual building of a mill in your locality, then by the introduction of a railroad, steam or electric, which will carry the wood or timber to the mill. Then this fact must be taken into consideration that the enormous demand for spruce for pulp and lumber will turn the market to what are perhaps now unthought of places, for its supply of lumber for the bulding trades. The country saw-

mill will thus increase in value, affording an outlet for every thousand of timber you may have upon your farm. The advent of the modern portable mill makes almost every wood lot a good mill site.

If you have given this little thought, look into the matter, make a survey of that back woodlot which has had but little of your attention. Cut out the trees of lesser value, giving the better qualities more room to grow. Thin out the thick stands and in a few years it will be a surprise to you to see the improvement in growth and consequently increased value of the same. Many illustrations of the value of small lots could be given but I will give only one which comes to mind. Some 22 years ago a man in Franklin County had an offer of a woodlot containing 24½ acres at $8.00 per acre. He made the purchase and not a few of his neighbors and friends thought he must be considerably cheated in his bargain but time has proved that he was wiser than his neighbors and the lot turned out better than he had dreamed. The first winter after purchasing he took off from the piece white birch to the value of $400, thus getting more than his purchase money back. He has since cut twice over the same piece taking off more white birch to the value of $300. In addition to the white birch he has taken off 240 cords of poplar; 225 cords of fire wood; cut 300 cedar posts; sold $240 worth pine; $40 worth of fir; $30 worth of brown ash and still has the lot left which he values at more than $500.

It is hard to make rules that will apply to all lots, but the following general rules for the care and protection of the woodlot can be carried out to advantage. Cut out all the timber that blows down. Cut any trees that seem to be diseased or dying. Take out the crooked, knotty and scrubby trees. Cut the oldest trees that seem to do the least growing. Cut early in the winter before deep snow interferes with the work of picking up and hauling. Never cut the edges of a woodlot, but leave a thick growth to act as a wind break.

It is well known that most hard woods send up sprouts from the stump, especially if the trees are cut before the sap begins to run in the spring. Many farmers take advantage of this fact, and cut their woodlands clear, and then wait fifteen to thirty years for a second crop of sprouts. It is common to hear

this practice vigorously condemned, but as a matter of fact, it is one of the established systems of forestry used in Europe as well as in this country. For the production of firewood it has many advantages; and if the cutting is done carefully, the growth will frequently amount to not less than 1 cord per acre per annum. Thus, New England farmers calculate that about twenty-five years are required for cleared sprout land to produce 25 cords of wood per acre. This system has been in practice since the early settlement of the country, and in many places old hard wood stumps may be seen from which repeated crops of sprouts have been cut.

Tree planting is followed with great success in many parts of the United States and while little of it has been done in Maine the time is approaching when Legislation along this line will be asked. We should have a law for the encouragement of tree cultivation on the farm. The time is near at hand when the farm must produce its timber for posts, poles and other uses. This necessity should be recognized by liberal and wise legislation. All farm land, set to useful trees should be exempt from taxation, at least for a number of years, and prizes, intelligently devised should be offered by the State and County in agricultural counties to stimulate farmers to embark in enterprises of this character. Many states are taking up such legislation and it recommends itself to the consideration of thoughtful citizens and legislators. Nothing on the farm adds more to its value than a woodlot or a little forest of useful timber.

The matter of protection against fire should also claim the attention of the farmer. In farming sections, where the holdings are small and interspersed with fields and roads, the fires can be successfully prevented by careful watching. Hitherto the majority of owners of both large and small tracts have relied chiefly on careful watching and, in case of a fire, on extinguishing it before much damage is done. Further precautions are, however, now coming into use, such as clearing wood roads, burning fire lines, piling and burning tops after cutting, etc. Some of these measures are practical only on small woodlands, but those who have tried them speak enthusiastically of their success.

Plans are being made for the coming year to give the woodlot special attention, making a study of the existing conditions from a practical standpoint, taking up the subject in a manner that cannot but help in the management and care of the smaller tracts of timber or wood. The result of such study will be published in the form of a bulletin and issued from this office the coming summer or fall. Prof. Spring, instructor in Forestry at the University of Maine, will also during the coming winter, visit various parts of the State giving practical talks along this line, before the granges and agricultural societies of the towns.

THE FORESTRY COURSE IN THE UNIVERSITY OF MAINE.

The Legislature of 1903-4 appropriated for public instruction in forestry the sum of $2500 per year for the years 1903 and 1904. The larger portion of this sum has been used in establishing and maintaining a chair of forestry at the University of Maine, and the balance for investigation and research along the line of public instruction. As professor of this department we were fortunate in securing the services of Samuel N. Spring, M. F., Forest Assistant of the United States Bureau of Forestry. Prof. Spring came highly recommended and in his work for the State has shown himself to be a thoroughly competent and practical man. An outline of the work at the University of Maine and the course of study follows:

The department of Forestry in the University of Maine offers a four years' undergraduate course which may serve not only as a basis of practical work in forestry but also as a liberal education. First, it gives an opportunity for all students in the University to acquire a general knowledge of forestry since all of the courses which are offered are open to election by those who desire them. Second, it may be taken as a major course by any student who wishes to specialize in forestry and make that his profession. Third, it gives the students of Agriculture special training in the management of the farmer's woodlot.

The courses offered in the department are as follows:—

1. General Forestry.—The importance and scope of the subject; direct and indirect influence of the forest; relation of the forest to the State; relation of forestry to other sciences; and of the individual branches of forestry to each other; forestry in the United States. (Three hours a week, one term.)

2. Forest Botany.—A study of the morphology and functions of the organs of trees; the development of the tissues of

woody plants; a systematic account of the trees of the United States, with special reference to those of commercial value. (Two hours a week throughout one year.)

3. Forest Botany, Field and laboratory work.—Excursions to identify and classify the trees and principal shrubs about Orono. Microscopic work in the study of structure and development of the organs of trees; etc. (Four hours a week throughout one year.)

4. Silviculture.—A study of the facts which concern forest growth in the relation of the tree to external influences; characteristics of the forest, and of the forest regions of the United States; systems of reproducing forests naturally; thinnings and improvement cuttings. (Two hours a week throughout one year.)

5. Silviculture, Field Work.—Special studies and practical work in the forest. (Eight hours a week, first half of fall term and last half of spring term.)

6. Forest Measurements.—The determination of the contents of felled and standing timber and of the whole forest on a tract; methods of measurement in use in the United States; calculation of the rate of growth; construction of volume and yield tables. (Two hours a week, one term.)

7. Field Work in Forest Measurement.—Practice in taking measurements in the forest, and office work in computing the results. (Four hours a week, one term.)

8. Lumbering.—Lectures on the methods of lumbering in the different parts of the United States. (One hour a week, one term.) In connection with this course the student is required to spend two weeks in a lumber camp and present a written report on the operations of lumbering in that locality.

9. Forest Management.—Financial and economic considerations; the normal forest; principles and preparation of working plans. (One hour a week, one term.)

10. Thesis Work.—Special investigation in forest management by the student and the presentation of a thesis. (Ten hours a week, one term.)

THE MAJOR COURSE IN FORESTRY.

A complete course in forestry includes the study of many allied sciences that are essential and fundamental to the study of the subjects of forestry. These auxiliary courses are taken for the most part in the first and second years, thus preparing the student for the advanced courses of the third and fourth years. The following scheme shows the arrangement of a major course in forestry:—

FIRST YEAR.

Fall Term.	Spring Term.
General Biology, Laboratory Biology,	General Botany, Laboratory Botany,
Public Speaking,	Public Speaking,
English Composition,	English Composition,
Drawing,	General Forestry,
Modern Language,	Modern Language,
Algebra,	Trigonometry, Analytic Geometry,
Military Drill.	Military Drill.

SECOND YEAR.

General Botany,	Plant Physiology, Laboratory Plant Physiology,
General Chemistry, Laboratory Chemistry,	Plane Surveying Field Work, Surveying,
English Composition,	General Chemistry, Laboratory Chemistry,
Forest Botany, Laboratory Forest Botany,	English Composition,
Modern Language,	Forest Botany, Laboratory Forest Botany,
Physics.	Modern Language.

THIRD AND FOURTH YEARS.

Silviculture, Silviculture, Field Work,
Forest Measurements, Field Work, Forest Measurements,
Lumbering.
Forest Management,
Thesis.

(The balance of the work in these two years is elected from other departments of the University under the advice of the Professor of Forestry and includes such subjects as Geology, Mineralogy, Soils, Entomology, Economics, Modern Language, History, etc.)

History of the work done in Forestry at the University of Maine during the college year, 1903-4, the first year after the Chair of Forestry was established, forty students elected

Former wasteful method of lumbering. A burned white pine stump, eight feet tall and four feet in diameter breasthigh. Township 4, Range 9, Piscataquis Co.

courses in this subject. Of this number four students took the major course in forestry with the intention of making it their profession.

At the beginning of the second year six more students were enrolled in the forestry course, making a total of ten students who are expecting to receive the degree of Bachelor of Science in Forestry at the completion of their university course.

During the first year the students had practical work during the fall in improving the college woodlot and in the spring of 1904 work was begun on a forest nursery on the college grounds. In the fall of 1904 some special experiments in handling second-growth woodland were begun and sample plots were surveyed on which different methods of treatment will be used. The results of these experiments will be of value to the owners of woodland in the State.

CONCLUSIONS AND RECOMMENDATIONS.

There is no question but the forest fire problem is paramount to all others in the protection of our forests and it has been the special aim of this department to get all the information possible on this subject. The State of Maine should be second to no other State in the protection of its valuable woodlands. The United States Bureau of Forestry has expended much money along this line under the able direction of its chief forester, Gifford Pinchot, who has kindly given us valuable assistance in the prosecution of the study of the forest fire problem in this State. Early in the summer of 1904 a force of trained experts were sent to Maine and under the direction of Prof. Spring made a study of the fire question as it exists in this State to-day. Several townships located in different sections of the State, calculated to best illustrate all the conditions, were chosen for study and investigation which continued for several months. The result of this study appears in the ably prepared report contained in the following pages. The suggestions he makes are very valuable and I recommend them to the careful consideration of the citizens of the State.

It is gratifying to know that public interest in the protection of our forests from fire has reached a point where the State is willing to lend its assistance to their protection. The forest fire law of 1903 carrying with it an emergency fund for use in that direction has saved to the State taxable property enough to repay it many times over. It is safe to assert the money loss to the State by forest fires is much greater by land becoming useless and untaxable than need ever be expended by the State in preventing these fires. All thinking men having at heart the welfare of our State will concede that Maine's prosperity depends almost wholly upon its income from its forests. It is not an agricultural State but the soil is particularly adapted to

the growth of all the different woods peculiar to this latitude, spruce predominating.

Practically all the industries of Maine are dependent upon its forests which are the least protected against damage of any other form of property which the owner possesses. The man who pays taxes on timberland should be entitled to a reasonable protection to his property and this should apply to the owners of wood lots as well as townships. Reports made to this department of forest fires in incorporated towns show that in many instances the selectmen through niggardliness or incapacity have not complied with that part of the law relating to forest fires in incorporated places, and I believe the law should be so amended that in case of damage to the owners of woodland, caused by such negligence they should be recompensed by the town. The farm wood lot is entitled to as much or more protection than the larger tracts.

The growing of timber should be encouraged in every way possible and laws should be enacted to encourage the planting of trees and under certain conditions small tracts of wood land should be exempt from taxation.

Under the new law one hundred and forty one wardens have been appointed, a list of which appears elsewhere. With few exceptions they are men well qualified for the position. They are woodsmen and are interested in their work. Early in the season they posted 8000 fire notices on the unincorporated townships and during extremely dry weather have done some patrol duty.

The fire warden law of 1903 is not perfect and needs amendments but it is a move in the right direction and should be sustained. We need a system that shall include as its basis the patrol of the forests for the detection of incipient fires and the punishment of persons who cause them.

The following amendment to our present fire law has been compiled by the United States Bureau of Forestry and this department and I recommend its passage at the coming session of the legislature.

Section 1. The Forest commissioner shall create in the State such a number of forest fire districts according to the river systems or other convenient boundaries as he may deem necessary for the effective forest fire protection of the State.

Section 2. For the supervision of such fire districts and the fire wardens therein (already provided for by law) one Head Fire Warden shall be appointed for each district by the Forest Commissioner, to hold office at the pleasure of said Forest Commissioner.

Section 3. The duties of the Head Fire Wardens shall be to patrol and supervise their respective districts from April 15, to June 15, or such part of this period as the Forest Commissioner shall deem necessary, watching for fires; to keep a record of all persons entering and camping therein; to post fire warnings and give personal warning; to investigate and gather evidence concerning the causes of any fires that occur and the work done by the fire warden and his assistants in extinguishing them. He shall perform such other duties as the Forest Commissioner shall designate. He shall make a report from time to time as directed by the Forest Commissioner. Fire wardens in the respective districts shall report to the Head Fire Warden whenever a fire occurs.

Section 4. The Head Fire Warden shall receive pay not to exceed $2.50 per day, and expenses for travel and subsistence not to exceed $2.00 per day for the period of actual patrol and duty.

Section 5. If the period of April 15 and June 15 in any year is an extraordinarily dry one, the Forest Commissioner may order any Head Fire Warden to hire such other persons and for such time as is deemed necessary to patrol for the discovery and extinguishing of forest fires in his district during the emergency period. These men shall be paid at the rate of $1.50 per day and subsistence for the time during which they are employed for such patrol.

Section 6. In case the season becomes fire-dangerous during any part of the year other than the period of April 15 to June 15, the Forest Commissioner may order any Head Fire Warden to patrol his fire district, and, if necessary, employ assistants for that purpose as provided in section 5 of this act, his compensation to be the same as for the regular period of patrol, April 15 to June 15.

Section 7. The expenses incurred under this act shall be paid from the regular State appropriation for forest fire protection.

Section 8. All Head Fire Wardens of the State shall have the same power toward the apprehension and arrest of those violating State forest laws that are now possessed by sheriffs, and shall be allowed the same fees as sheriffs, for like services, and they shall have the same rights as sheriffs to require aid in executing the duties of their office.

A feature of this report to which I wish to call attention is the very interesting paper on blueberry culture, by Prof. W. M. Munson, of the University of Maine.

EDGAR E. RING,
Forest Commissioner.

THE CONTROL AND PREVENTION OF FOREST FIRES IN MAINE.

S. N. SPRING, M. F.

INTRODUCTION.

The protection of the forests of Maine from fires is of the greatest importance to the people of the entire State, and particularly to landowners and lumbermen. This has been very forcibly brought home by the repeated forest fires of the last century, and especially by the very destructive ones which occurred in 1903. The character of the forest growth on these lands burned over, as well as local history, testify to the great extent of country that has been laid bare, and much interest is centered in the future of the burned land and in what measures can be taken to lessen the danger. A detailed investigation into the nature and the control of forest fires in this State is therefore both timely and of great value.

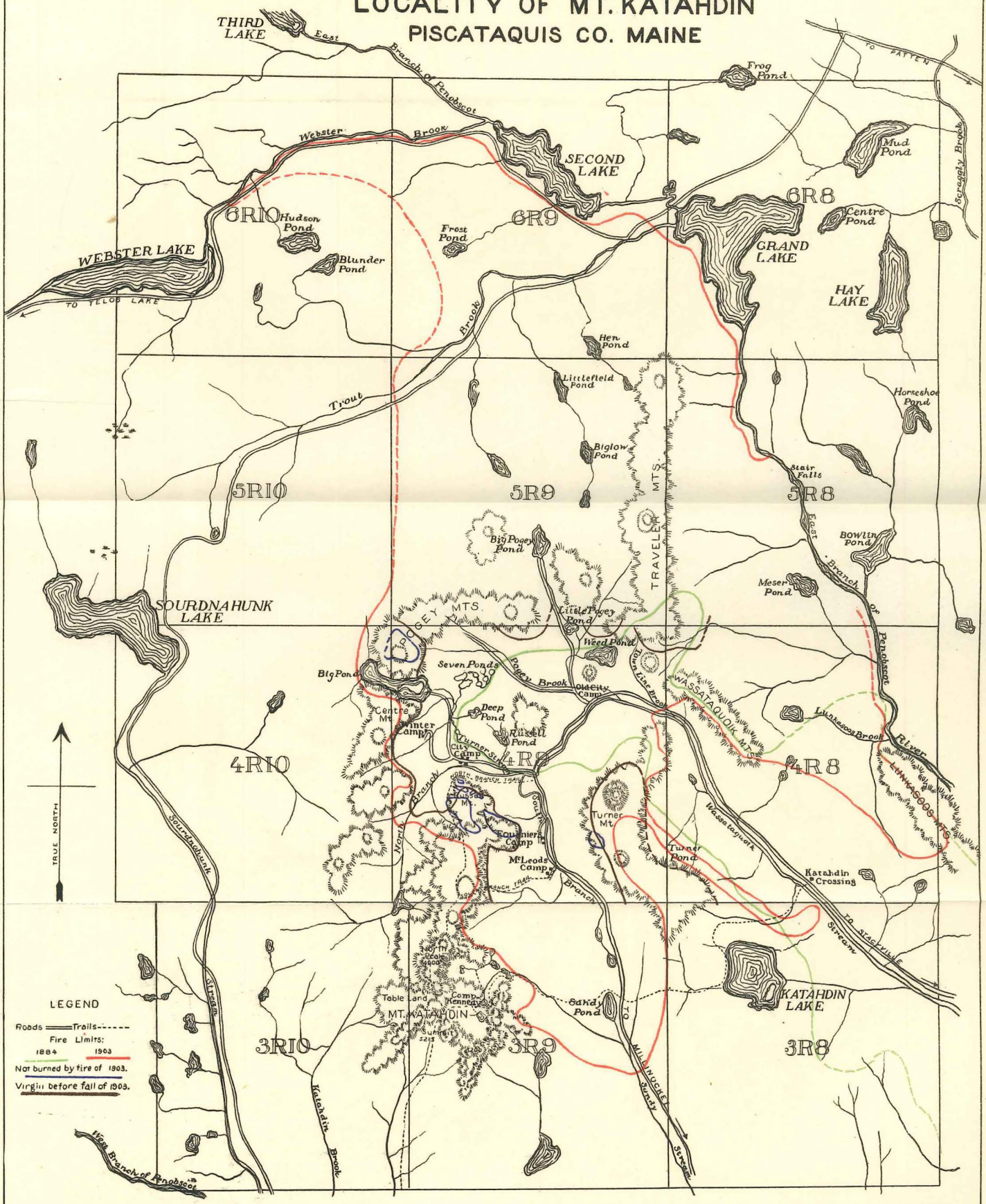
The present study was undertaken at the request of the forest commissioner of the State of Maine, Hon. E. E. Ring, and has been carried out by the State and the Bureau of Forestry in co-operation. The subject has been considered from two standpoints:

1. The nature and effects of forest fires as seen from a detailed study of three areas burned in 1903.

2. The control and prevention of forest fires.

The places selected for this investigation were the vicinity of Mount Katahdin in Piscataquis county, Township XXII in Hancock county, and Township D in the Rangeley Lake region, Franklin county. A forestry party of four men investigated these regions, taking sample plots to ascertain the composition of the forest types, the character of the reproduction, and the

LOCALITY OF MT. KATAHDIN
PISCATAQUIS CO. MAINE



BUREAU OF FORESTRY - U. S. DEPT. OF AGRICULTURE.

No 113.

growth upon old burns. The history of each tract was obtained and a careful examination was made of its present condition and of the nature and effects of the fire. In addition to this work on burned land, information concerning control and prevention of forest fires was sought by extensive observation of conditions in the State and by interviews with fire wardens, railroad officials, and prominent landowners and lumbermen.

The purpose of the report based upon this study is to present all the information obtainable which bears on the solution of this difficult problem of prevention and control.

SCOPE OF THE INVESTIGATION.

1. In general, after a forest fire the land is at once occupied by a hardwood growth, but it tends to revert eventually to the type of forest which existed prior to the fire.

2. Repeated fires on a tract of forest land delay the return of valuable species, and may so alter the normal conditions that forest growth of any kind will be wholly excluded.

3. The direct losses of merchantable timber, equipment, etc., though very great, are far less important than the destruction of the young, non-merchantable stand of trees and seedlings, and the impoverishment of the forest soil.

4. A fire patrol by the individual owner or through the co-operation of several owners of timberland has been found to be a sure and effective method of fire protection.

5. Any State fire-warden system which does not provide for a patrol during dangerous seasons is efficient only in controlling and extinguishing forest fires after they are discovered. The fire-warden service of Maine has had good control over those fires which have not gained great headway before they were known to exist.

6. The disastrous fires of 1903 have awakened a strong sentiment in favor of fire protection, but this alone will accomplish little unless it leads to greater efforts in co-operating with the State service and in assisting in the enforcement of the law.

REPRESENTATIVE FOREST FIRES OF 1903.

The Region of Mount Katahdin, Piscataquis Co., Maine.

THE TRACT IN GENERAL.

The area examined is situated between the east branch of the Penobscot river on the east, the Katahdin range and the Wassataquoik stream on the south, Sourdnahunk stream—a tributary of the west branch of the Penobscot—on the west, and Webster brook on the north. This tract covers an area of about 200,000 acres, and occupies most of Townships 4, 5, and 6, Range 10; and Townships 3, 4, 5, and 6, Range 9, Piscataquis county; and Townships 4 and 5, Range 8, Penobscot county.

Topography and Drainage.

The topography of this region is very rugged. Katahdin, the highest mountain in the State, and its various ridges and foothills, together with a number of smaller ridges, notably Turner Mt., Traveller Mt., the Wassataquoik range, Sourdnahunk, etc., cover most of the southern part of the tract. The ground is very rocky, and it is almost impossible to build a road through the region. This makes the country very inaccessible, and partly accounts for the fact that it contains no inhabitants excepting those connected with the lumbering operations.

The tract is divided into four distinct watersheds: (1) Wassataquoik stream, with its tributaries, draining most of Township 4, Range 9 and Township 4, Range 8; (2) Trout brook and Webster brook, with their tributaries, draining the northern portion; (3) Sandy stream and its tributaries, flowing southward into Millinocket lake, and draining the extreme southern portion; (4) Sourdnahunk stream, draining the west portion. The first two systems drain into the east branch, while the latter two flow into the west branch of the Penobscot river.

Windfall on spruce land burned in 1903. Township 4, Range 9, Piscataquis Co.

Township 4, Range 9.

A detailed study was made of Township 4, Range 9, as typical of the entire burned territory. It is centrally situated and presents almost all the conditions found on the larger tract. The location of the camp at which the party stayed, very near the center of the township, afforded a good opportunity for gaining an intimate knowledge of this territory. Since most of the township has been burned twice—once in 1884 and again in 1903,—it was possible to study not only the immediate effects of a fire but also the ultimate natural reclamation of a burned area.

The details of the topography of this township are shown on the map accompanying this report. The soil is generally a fresh to moist sand or gravel, with a very small admixture of clay. In the lower, flatter parts it is a muck. In still other parts certain of the numerous small ponds have been filled, partly or completely, and form "quaking bogs" of greater or smaller extent. Most of the ground is covered with scattered stones and boulders of gray granite, from a few inches to 25 feet or more in diameter.

The township is quite inaccessible. The main road, or at least the one most travelled over, runs from Stacyville on the Bangor and Aroostook Railroad, and is about 30 miles long and very rough. It takes a team of two horses, drawing even a moderately light load, 12 to 15 hours to cover the distance. A second road, used only in the winter time, extends from the Bell dam to Millinocket lake, following the general course of Sandy stream. The rest are logging roads.

PAST CONDITIONS OF THE TRACT.

Conditions Prior to the Fire of 1884.

On a huge boulder a short distance below the Bell dam, there is painted in large letters the following legend: "Tracy and Love began lumbering operations on the Wassataquoik in 1882." Although the area was lumbered for white pine from 75 to 100 years ago, this marks the beginning of close cutting. Only two years later, in 1884, a fire swept this region which devastated over 20,000 acres. There can be little doubt that the "slash" left after lumbering had much to do with the spreading of this fire.

Virgin Forest Types.

Before the virgin conditions were destroyed the forest had four more or less distinct forests types. A few small patches of virgin timber are still left, and an examination of these, together with a study of the standing burned timber, forms the basis for the description of these types.

Cedar swamp.—This type occurs on low, swampy bottomlands, with mucky soil. It is characterized by the occurrence of a considerable proportion of white cedar, or arborvitæ, associated with red spruce, balsam fir, red maple, and black ash, and is found on limited areas immediately about streams or swamps. The higher portions of the lowlands were formerly white pine knolls, but the white pine was cut a long time ago, and has failed to reproduce itself to any great extent. The spruce in the cedar swamp is usually smaller and of a poorer quality than that growing on higher land.

No table of stand showing the original representation of the various species can be given for this type, as no area was found in virgin condition.

Spruce flat.—This type covered most of the area of Township 4, Range 9. It occupied the better drained level land and valleys, slightly above the cedar swamps. The most important trees are the spruce, which is here found in mixture with balsam fir, and several broad-leaved species, yellow birch, beech, and occasionally red maple. White pine was formerly abundant on this type, and it was not uncommon to find a tree 3 to 4 feet in diameter breast high, and reaching a height of 150 feet. Both because of its wide extent, and because of the predominance of conifers in it, the forest of the spruce flat is the most important in this region.

Spruce and hardwood land.—This type is a transition between spruce flat and spruce slope. It occurs on well-drained land upon the lower slopes of mountains and hills. The characteristic trees in the order of their abundance are spruce, balsam fir, beech, yellow birch, sugar maple, and paper birch, with an occasional hemlock and white pine. It is a very important type in Maine, but in this region is of only small extent.

Spruce slope.—The spruce slope occupies land above the type just described, and extends to the roughest parts of the moun-

tains. It is an almost pure coniferous forest, in which spruce and balsam fir predominate. On the higher parts of the mountains the soil is shallow and the spruce in this poorer situation does not attain so good a development as on the lower slopes. In certain places the vegetable soil is more than a foot deep. Seedlings of spruce and balsam fir are small and suppressed. Four and one-fourth acres measured gave an average of 673 trees per acre, between 2 and 34 inches in diameter breast high (4½ feet from the ground). Ninety-five per cent of the trees are conifers, spruce forming 51 per cent and balsam fir 39 per cent of the whole stand.

Alpine type.—Besides the types described, a fifth, which may be called the alpine type, is found on the Katahdin ridge, at an elevation above 4,000 feet. It is characterized by stunted, scrubby trees—spruce, balsam fir, and a dwarfed form of the paper birch—together with a general arctic flora. It is of no commercial importance.

With the advent of the lumberman the virgin forest conditions were greatly changed. At first the white pine was taken out, and the stumps, often 6 feet high, still testify to the careless method of lumbering employed in those days. Later, when white pine became scarce, the lumbermen returned and began to remove the spruce. The swamps were covered with a network of "corduroy," and the trees on the steepest slopes were made available by a system of "slides," and so, in a very few years, the largest spruce began to disappear. The ground, in consequence, was covered with piles of slash, which in time of drought became very inflammable.

An Old Fire on this Tract.

As has already been said, lumbering began on Township 4, Range 9, between 75 and 100 years ago, and it is remarkable from what difficult and almost inaccessible places the trees were removed. High stumps and long tops furnished the fuel for the first fire, the results of which are still apparent.

On the main road from the new City camp in Township 4, Range 9, to Stacyville is an oasis in the great burn of 1903. This green spot occurs very near the point where the east town line crosses the road. It has an area of about 25 acres and it escaped destruction by the fires of 1884 and 1903, first because

there were a great many broad-leaved trees mixed with the conifers, and, second because, in general, the land was low. The evidence that this area was burned a long time ago is shown (1) by the occurrence of charred stumps and logs here and there, which are manifestly much older than those left after the fires of 1884 and 1903; (2) by the presence of a great many *popple and paper birch about 70 years old, forming an even-aged stand such as is typical of burned areas; (3) by the fact that the conifers in mixture show the characteristics of a stand which has come up under broad-leaved trees. They are even-aged, have more rapid growth than those coming up in virgin woods, but not such a rapid growth as the young trees on lumbered land.

Great attention was paid to this area, because it indicates in general the kind of forest that may be expected on the burn of 1903 after an equal interval of time.

It is probable that the fire indicated by this growth occurred in 1837, the year of a very extensive fire in this region, which burned over a number of townships to the east. Just how much of this region was burned by that early fire it is impossible to say, since the two more recent fires, especially that of 1884, have obliterated the limits of the succeeding stand, but that it covered a large area is shown by small patches like those already described, found scattered along the road almost as far as Dacey dam.

This isolated patch of green timber is situated on land which slopes gently to the Wassataquoik stream. The soil is a fresh to moist gravelly sand from 3 to 18 inches deep, underlaid by coarser gravel; a little clay is found mixed with the soil in the deeper places. The vegetable soil consists of about an inch of leaves and needles, which rapidly decay and mix with the mineral soil. The ground cover consists of smilax, eaglebrake, bunchberry and ferns. The underbrush is composed of a scattered growth of striped maple, spotted maple, witch-hobble, shadbush, etc. The replacement of the conifers is very good, the saplings in many cases overtopping the hardwood trees. Of the 1,323 young trees between one-half foot and 25 feet in height

*A term common throughout Maine and New Hampshire for two trees,—the largetoothed poplar (Populus grandidentata) and the aspen (Populus tremuloides).

found on a sample acre of young growth, 97 per cent were conifers. Of the 918 trees more than 2 inches in diameter breast high on an average of two typical acres, 36 per cent were conifers, 39 paper birch, 4 per cent yellow birch, 7 per cent popple, and 11 per cent red maple.

The Fire of 1884.

As already mentioned, lumbering for spruce in this region was begun in 1882, and was followed by the fire of 1884.

The fire was started on June 29, at Norway Falls, about a mile below old City camp in Township 4, Range 9, by some fishermen who allowed a fire that they made for driving away mosquitoes to spread beyond control. It was a dry season and the slash left by the lumbermen the winter before, together with many trees which had been thrown by a violent storm on November 12, 1883, known in local history as the "Maine cyclone," made good fuel. June 29 was calm and the fire spread in all directions, but on the next day a very strong west wind came which for several days drove the fire before it. During that time it burned up to the southeast end of Traveller mountain, but did not burn the west end, and to the tops of Lunkasoos and the Wassataquoik range, but was unable to descend the ridges. Then continuing north of Lunkasoos, in the valley formed by that mountan and the Wassataquoik ridge, it reached, but did not cross the east branch of the Penobscot river.

No attempt was made to control the fire, and it was checked only when rain came on July 3. How long it smouldered after that date is unknown. After July 3 no more direct damage was done.

The estimated damage done by the fire was about $100,000. The following is a rough estimate of the area burned: Township 4, Range 9, 6,000 acres; Township 4, Range 8, 12,000 acres; Township 3, Range 8, 3,000 acres; Township 3, Range 7, 300 acres; Township 4, Range 7, 1,000 acres; total, 22,000 acres.

The interesting points of the 1884 fire may be summarized as follows:

Conditions existing before the fire.—Two seasons' lumbering left enough litter and slash in the woods to endanger the remaining forest. In addition, windfalls increased the danger.

Cause.—Carelessness in starting a small fire.

Main Barriers to the Fire.—The tops of ridges, the hardwood growth which came after still older burns, and, in several places, streams.

Nature of the Burn.—The fire was not a quick top fire, like that of 1903, but burned the litter and the vegetable soil until nothing but the bare mineral soil and rocks were left.

Conditions Prevailing Between 1884 and 1903.

The general appearance of the country soon after the 1884 fire must have been very similar to that which prevails now. The charred, black ground little by little became covered with vegetation, and the popple and paper birch came in almost immediately. The usual struggle between the species for the occupancy of the soil began. In 1903, 19 years after the previous fire, the ground was wholly reclaimed.

A description of this young growth shows the conditions on land burned in 1884 but skipped by the 1903 fire. The soil is rather coarse, but has more or less clayey loam near the top. Most of the vegetable soil was burned by the fire of 1884. Since then a layer of rapidly decaying leaves and moss, 1 to 1½ inches deep, has been formed. The ground is covered rather thickly with a growth of bunchberry, eaglebrake, several kinds of club moss, and ferns, asters, sarsaparilla, etc. The underbrush consists of a dense growth of striped maple, fire cherry, mountain holly, mountain ash, witch-hobble, willow and alder, the last two species often forming thickets. There are many seedlings of spruce, balsam fir, and white cedar but these species are not growing as rapidly as the red maple sprouts, the yellow birch, or the popple. The most abundant species are popple, paper birch, and red maple, in the order named.

Fire of 1903.

Origin.—Lumbering did not stop in 1884. On the portions of the tract unburned before, it accumulated slash for the next fire, which came in June, 1903. The spring of 1903 was one of the driest seasons known recently in the State. From April 9 to June 9, a period of about 9 weeks, there was only 1.23 inches of rain. The largest precipitation in one day during that period fell on April 25, amounting to .46 of an inch. Forest fires during this dry time were occurring in all parts of the State. On

Spruce, balsam fir, and pine under a stand of birch, on land burned in 1862. Adjacent conifers seeded this area. Township 9, Range 5, Aroostook Co.

Tuesday, June 2, came the fire which detsroyed most of the forest in the Katahdin region.

Local opinion ascribes the origin to a gang of men who were constructing a telephone line near Webster lake, in Township 6, Range 9, but conclusive evidence is wanting. On the next day, Wednesday, June 3, a very strong northwesterly wind drove the fire at a very rapid rate in the direction of Township 4. Had the wind been from the southeast, the flames would have been driven on to Webster and Telos lakes, where the fire would probably have stopped, or at least been put under control. But Trout brook, the nearest stream of any size, is far south of the place where the fire started, and by the time the stream was reached the fire had assumed uncontrollable proportions. There were no other natural barriers to the progress of the fire for a number of miles, and no attempt was made to fight it at the start.

Progress of the fire.—There are three conditions which favor the spread of a forest fire. These are, (1) plenty of fuel, (2) wind, (3) absence of natural barriers. Given these conditions, a fire will travel almost indefinitely. The main barriers to the progress of a fire are bodies of water of sufficient size, wide roads, high ridges and steep mountains, and hardwood forests.

In Townships 4 and 5, Range 9, the above conditions were especially favorable, and account for the continued and rapid progress of the fire. The waste from lumbering operations furnished abundant fuel; a strong gale of wind was blowing; and there were no barriers in the northern portion. The mountain ranges were parallel to the direction of the fire, which followed a broad, ampitheatre-like valley; the bodies of water were small; and the hardwood growth was mostly in the extreme southern part of the tract.

The rate of progress of the fire was very rapid, so rapid, in fact, that the ground was merely scorched, and in many places the vegetable soil was left intact, except on the very surface. On the other hand, the fire was so hot that scarcely anything survived. Many of the trees were entirely consumed; in other places trees were barely scorched, parts of the crowns being left green. Between these two extremes all gradations exist. Thus there are spots on which about half of the trees were burned completely, while the others are still standing, charred and blackened or half consumed.

One peculiar feature of the progress of the fire was probably due to the nature of the topography of this locality. A study of the accompanying map of the region will show that a narrow valley known as the Pogey Notch, runs north from the large, amphitheatre-like valley of Township 4, Range 9. In the southern part of the ampitheatre, and also having a general north-and-south direction, is the narrow valley of the south branch of Wassataquoik stream. Furthermore, these two narrow valleys—the Pogey Notch and the South Branch Notch—lie in a general north-and-south line, so that the whole forms a kind of flue, with narrow ends and a broad central portion. The direction of the wind on June 3, when the fire was at its worst, was through this flue, and this probably accounts for the destructiveness of the fire in the large valley and on the slopes of the two narrow valleys. Thus, the slope of Turner Mt., forming part of the east wall of the flue, was swept almost entirely clean.

Another interesting feature of the fire was the distance to which the burning material was carried by the wind. An eye-witness testifies that he saw a fire several miles southeast of the main one. There was no other possible origin for this smaller blaze excepting a brand carried there by the wind.

Areas skipped by the fire.—As a result of the great speed at which the fire traveled many patches of woods were entirely skipped, exhibiting the forest conditions which prevailed before the fire. They vary in size from a few square rods to over 1,000 acres. They are irregular in shape, and distribution. As a general rule, more patches were skipped on hillsides than in the valleys.

Course taken by the fire and extent of area burned.—The fire started about a mile east of Webster lake, in Township 6, Range 10, and traveled eastward before a light wind, growing wider as it advanced. It crossed into Township 6, Range 9, where it went as far as the south shore of Second lake. Growing still wider, it turned southward, crossed into Township 6, Range 8, where it ran to the southwestern shore of Grand lake, and thence along the east branch almost as far south as Lunkasoos brook in Township 4, Range 8. Its eastern course was not further ascertained, since it does not concern the special region examined.

Steep rocky slope burned by the 1903 fire. Near Valley Dam, Township D, Franklin Co.

At the same time the fire crossed the southern boundary of Township 6, Range 9, and burned all of Township 5, Range 9, excepting a narrow strip along the west edge of the township. The eastern part of the fire spread farther eastward, up the slopes of the Traveller mountains. Then descending on the east side of the range, it lost much of its intensity, and was finally checked by the young hardwood growth which occurs there.

The part of the fire which reached the southern portion of Township 5, Range 9, was apparently traveling eastward along the north slope of Pogey range, and it appeared to the persons in the old City camp on the Wassataquoik, in Township 4, Range 9, that it would pass north of this tract, but when the fire reached the Pogey notch it was swept into the great basin which constitutes most of the township, and traveled southward with great rapidity. At this stage of the fire the wind increased in velocity and the flue-like effect of Pogey notch and the South Branch valley, was manifested.

The fire burned along the southern base of Pogey mountain to Big pond, but did not burn the ridge of the mountain which is green as is also the top of Centre mountain to the west. The wind drove the fire up the North Branch valley, burning the slash up the slope of Russell, and it penetrated the virgin timber in streaks. In the South Branch valley it burned the northwest corner of Turner mountain, and the lumbered land on the southeast part of Russell mountain. It was finally stopped by the virgin timber on the east side of Mount Katahdin.

The fire also followed the Wassataquoik valley, and burned all of the north and the eastern slopes of Turner mountain. Turning southeastward, it burned over the area already burned by the 1884 fire, and finally stopped near the place where the main road crosses the east line of Township 4, Range 9.

It is not known when the fire of 1903 stopped. It is certain, however, that the blaze lost much of its intensity by Friday, June 5. It probably was not entirely extinguished until after heavy rains came on Tuesday, June 9. The greater portion of the tract was burned in a very short time.

The area burned over by the 1903 fire may be summarized as follows:

Southeast half of Township 6, Range 10,	3	square	miles
Southern three-quarters of Township 6, Range 9,	19	"	"
Southwest corner of Townhsip 6, Range 8,	2	"	"
Western half of Township 5, Range 8,	8	"	"
Northwestern quarter of Township 4, Range 8,	15	"	"
Northeast corner of Township 3, Range 8,	1	"	"
Most of Township 4, Range 9,	32	"	"
Practically all of Township 5, Range 9,	36	"	"
Northeast half of Township 3, Range 9,	15	"	"
Northeast corner of Township 4, Range 10,	1	"	"
Total,	132	"	"
	or 84,480 acres.		

Margin of the fire.—The same causes that stopped the 1884 fire also checked the 1903 burn. These were ridges, hardwood stands, and virgin forests.

Ridges in Township 4, Range 9, acted as barriers to the fire in several ways. They deflected the course of the wind, and therefore of the fire, and caused local currents of air to be set up. In very few instances did the fire *descend* a ridge.

The hardwood growth proved an effectual barrier to the fire in several instances, especially on the southeastern slope of Turner mountain. Hardwoods tend to produce this effect because the crowns of the trees are not inflammable, because there is more moisture and denser shade than in a coniferous stand, and because there is little slash on the ground.

The virgin forest, especially that on the upper slope of Centre mountain, and in the North Branch valley proved a natural hindrance to the fire. Conditions here are similar to those found in a hardwood stand in that there is no fuel from waste left by lumbering, the shade is dense and there is a moist, moss-covered soil.

A study of the accompanying map will show how these natural barriers stopped both the 1884 and the 1903 fires. The boundaries of these two burns are, therefore, very close to each other. On the Wassataquoik range, for example, the margin of the two fires is almost identical. In many places the margin of the new fire is *inside* of the line of the old fire. This is due to the fact

Virgin spruce slope burned in 1903. Township 4, Range 9, Piscataquis Co.

that the green popple and birch which have come up since 1884 acted as a barrier to the 1903 fire. In the same way the 1884 fire was doubtless checked in several places by the hardwoods which had come in after the 1837 burn.

Miscellaneous Observations.

Resistance of various species of trees towards fire.—White pine is by far the most resistant tree of all. Its thick bark, its great height, and its clear length, when grown in the woods, combine to make it proof against fire.

Hemlock, when old, has a very thick bark which protects it quite effectively.

Spruce, when old, has a rather tough, flaky bark, which will protect the tree from a fire which is not too intense. When the tree is young the bark is comparatively thin, and the tree does not resist fire well.

Balsam fir has a smooth, rather thin bark, which makes the tree decidedly tender, especially when young.

White cedar grows in moist places, and often escapes a forest fire, but it is probably less resistant than any of the other conifers found in this region.

Yellow birch is the most resistant hardwood observed on this tract. The tree has a thick bark, which although flaky and apparently inflammable, seems to protect the tree with a good deal of effectiveness. Occasionally a yellow birch is found green in a spot where most of the other trees have been killed. A young yellow birch is quite tender.

Sugar maple also has a thick bark, and the larger trees are resistant to fire.

Paper birch, when old, has a very inflammable bark, but it may be burned without seriously affecting the life of the tree.

Red maple, white ash, and black ash are comparatively tender, and will not survive a bad burn. The trees often grow in moist places and may escape injury by fire for this reason.

Popple has very thin bark when it is young, and is therefore sensitive to fire. It is seldom that a young popple survives even a comparatively light burn.

Beech is probably the least resistant of all hardwoods. Its bark is so thin that even a slight excess of heat will scald or burn it. Its crown may help to stop a fire, but the tree itself will die.

Present Condition of the Forest.

On most of the burn of 1903 all former growth was entirely killed. The cleanest sweep was made in those places where the 1903 fire burned land which had hardly recovered from the severe burn of 1884. In many such places the ground is now entirely bare.

In the exceptional cases in which the destruction was not complete, the four types of forest were affected in different ways by the fire of 1903. Those in which lumbering had taken place between 1884 and 1903, or that had been burned in 1884, show still other modifications after the recent burn. Hence a multiplicity of conditions exist at present.

The main types of forest growth in those few places where fire has injured but not destroyed the trees are specified below. Of the original spruce flat and cedar swamp types there is practically no virgin timber.

Virgin spruce slope.—In the forest of this type the reproduction, underbrush, and ground cover were entirely destroyed. Owing to their size, and hence their thick bark, the grown trees remain alive, but are badly scorched.

Virgin spruce and hardwood land.—As has already been said, there is very little of this kind of forest in the region. The fire of 1903 did not burn it.

Spruce slope and spruce flat modified by lumbering.—Forest of this character was for the most part totally destroyed. A few small patches escaped but are badly scorched on their margins. These represent areas skipped by the swiftly driven crown fire. No reason can be given for their remarkable escape. After the crown fire had passed, the dense young reproduction which had come up after lumbering acted as a blanket, preserving the interior from the slow surface fire. This is due to the fact that the small saplings had green branches from the top to the bottom. If the lower branches had been dead they would have furnished additional fuel for the fire, but instead they made a protecting screen and preserved moisture on the ground.

Spruce and hardwood land modified by lumbering.—In most cases the fire did not extend over this type. The trees injured are those which were standing near the margin. The conifers were more often killed than the broad-leaved trees. The thick underbrush common in a forest of this character, as well as the

Lumbered spruce flat burned in 1903. Trees subsequently thrown by the wind. Vicinity of Summit, Franklin Co.

crowns of the hardwood trees, were effectual in checking the progress of the fire.

Cedar swamp modified by lumbering.—This type, occurring as it does in moist situations, did not burn readily. In places where the swamp was of small extent, however, and it was surrounded by fire, the heat scorched or killed many trees. The reproduction, the underbrush, and the ground cover in the interior of the forest have rarely been killed.

Even where the forest growth was entirely killed and nothing but dead standing or fallen timber was left, the various types which existed prior to the fire are still quite distinguishable, while on lumbered land the dense growth of reproduction prior to the fire of 1903 is shown by the very large number of dead seedlings which still stand on the spots not too severely burned.

Loss Due to the Fire of 1903.

The damage done may be classified as direct and indirect.

DIRECT DAMAGE.

1. *Damage done to merchantable timber.*—This is the damage of which account is first taken by every lumberman, and next to it the property damage is considered.

Seldom are trees completely consumed by fire. Much more often the timber is scorched and killed by a rapid top fire, or the roots are so badly burned by a ground fire that the trees are soon thrown by the wind.

The direct loss will then depend on the amount of killed timber which can be removed. This differs according to the locality, depending on the difficulties of lumbering and the use to which the lumber may be put. Often small, isolated bodies of dead standing timber are not worth the cost of lumbering, owing to their position in a place where fallen trees and debris make an operation costly.

The degree to which the tract was lumbered prior to the fire lessens or increases the loss. If there was only a small amount of merchantable timber on the land it will not be a paying operation to remove it after the fire. Where pulpwood can be utilized, much small burned timber can be lumbered, and the amount of direct damage lessened. In the region under consideration this was possible.

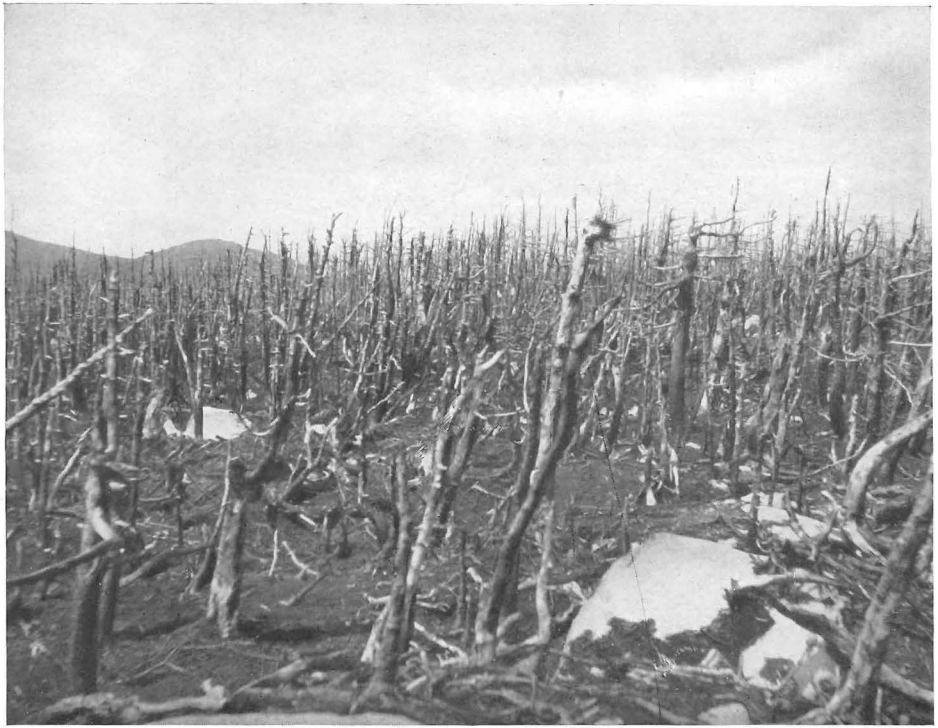
2. *Damage to property.*—This includes the damage to and the loss of camps in use, supplies, logging roads, bridges, and dams. It is impossible to make an accurate estimate of these losses in the Katahdin region, for those most familiar with the cost of equipment are not able to figure out exactly what the total amount was. Some individual cases of loss are of interest. One "jobber" lost his camp and the supplies that were in it, amounting to $5,000 in value. One large depot camp with its stores was entirely destroyed. The damage to one dam in the region may be estimated at nearly $1,000. Many other evidences of loss are apparent, and varying accounts are given by those interested.

INDIRECT DAMAGE.

1. *Loss of future stand.*—The seedlings, saplings, and small trees are the basis for the future stand. The loss may be shown in two ways: by a comparison of the number of years that it takes to establish a valuable merchantable growth on burned land with the time that the remaining trees of an unburned lumbered area of the same forest type would have had to grow before a cut equal in quantity to the original cut could be made, or by the number of years actually lost through the destruction of those trees not quite merchantable at the time of the fire. The second way, discussed below, shows the loss more strikingly.

By ascertaining the age and corresponding diameters of felled trees on this tract, this loss in time has been calculated. The method of cutting previous to the fire of 1903 was to take the tree down to 7 inches in diameter at the top end. This diameter at the top was found to correspond to that of 9.6 inches breast-high. All trees less than 9.6 inches in diameter were left by the lumberman, and were afterward burned by the fire. It was ascertained that it took a virgin spruce in this region 200 years to attain a diameter of 9.6 inches breast high. This period, 200 years, represents the maximum number of years lost by the forest on account of the fire, since the tree 9.6 inches in diameter is the largest tree which was left by the lumberman and subsequently killed. The minimum number of years of growth lost is represented by the age of the youngest seedling on the tract.

2. *Change of character of the forests.*—Probably the greatest indirect damage done by the fire was to change the character of



Spruce forest lumbered in 1895, burned in 1903. Township 4, Range 9, Piscataquis Co.

the forest from a valuable stand of conifers to a less valuable growth of paper birch and popple.

Paper birch is valuable for spools, and popple is used for the finer grades of pulp, but it is impossible to drive the former and difficult to drive the latter any great distance. A stand consisting of these two species is therefore valueless if situated a long distance from the market.

When a fire destroys a coniferous stand, as a general rule, birch and popple will replace the original forest. These hardwoods protect the seedlings of the conifers which eventually appear. In course of time many of the birch and popple will be crowded out, the conifers will gradually re-establish themselves, and the area will tend to revert to a coniferous forest. The first stages of this process are exhibited on areas burned in 1884.

Three and one-half acres on typical areas of land burned in 1884 showed 739 trees per acre. Of these 3 per cent were conifers, 55 per cent popple, 24 per cent birch, 14 per cent red maple, and the remainder other hardwood species.

3. *Deterioration of the soil.*—Another kind of indirect damage caused by the fire is the deterioration of the soil. The Katahdin region is mountainous. It is very rocky and there are many ledges. It must have taken many centuries to cover these bare rocks and ledges with soil of sufficient depth to grow even such shallow-rooted trees as spruce. The fire has burned the trees and the ground cover, and the bare, shallow soil was left to be blown away by the violent winds which occur at high altitudes, and to be washed away by rains. As a result, a great many places which sustained forest growth prior to the fire are now entirely bare, and it will be long before a new soil and a new forest growth will appear on them.

4. *Denudation of watersheds.*—The fire of 1903 in the Katahdin region bared the headwaters of many streams. This will cause freshets which will interfere with the operations of lumbering. A sudden flow of water tends to lodge the logs high upon the bank and makes driving more difficult, while an even flow can be handled successfully by the splash dams.

5. *Winds.*—The winds will have freer access to the remaining forest, and many trees will be thrown down. Already many windfalls have occurred.

6. *Drifting of snow.*—Logging operations will suffer through the difficulty of toting, owing to the drifting of snow on the roads, no longer protected from the wind by the forest.

7. *Logging operations.*—The work of lumbering will also be rendered more difficult, and therefore more expensive, because the ground is littered with the fallen stubs and trees left by the fire. Certain parts of the upper slopes and ridges, which could formerly be lumbered with only a very small margin of profit, because of the difficulty of getting the timber down, will not pay for the operation after the fire, owing to the increased cost.

8. *Insects.*—Insects are sure to attack the dead and dying trees left after a fire. Not only do they thus sometimes make valueless merchantable timber left on the burn, but they are apt to multiply and become the source of serious damage elsewhere.

9. *Future fires.*—If the fire of 1903 had entirely consumed the trees, there would then be little danger from another fire in the near future. Instead, the trees were only partly burned, and the fallen timber will furnish much fuel for new fires.

On the territory examined the moisture conditions are good, favoring a rapid decay of the wood. If this region is protected from fire for the next few years, the fallen trees will become moist and decay partially so that they will not burn readily, excepting in a very dry season. These logs when in an advanced stage of decay make excellent seedbeds, especially for spruce and balsam fir. It is, therefore, of the utmost importance that fire be kept out of this tract in the immediate future.

Probable Future of the Tract.

Present occupation of the soil.—When an area has been burned clear and is ready for occupation by another growth, a struggle at once begins among the different species of plants for the possession of the soil. Even a slight advantage will enable a plant to win in this struggle. In general the species that are naturally best adapted to a certain locality will tend eventually to reassert themselves, but since conditions may be altered greatly by a fire, a long period may elapse before a forest like the original returns.

Plants, the seeds of which are enclosed in hard, shell-like coverings, not readily injured by a fire, have an advantage over plants having delicate seed. This is the reason why, for exam-

A situation where trees burned in 1884 were not blown down. Scarcely any growth followed this fire. Burned again in 1903. Township 4, Range 8, Penobscot Co.

ple, cherry will spring up directly after a fire, from seed already in the ground.

Again, certain plants are able to establish themselves at once on burned land because of some special facility of conveyance which the seed has. For example, the light and downy seed of the fire-weed is freely carried by the wind while blueberry is soon distributed over a burned area by birds.

A typical virgin spruce slope stays naked longer after a fire than a spruce flat. Many acres of burned spruce slope on Township 4, Range 9, have remained black and entirely naked on 90 per cent of their surface, while the lower land has been covered by vegetation on more than 60 per cent of its area. This is due to the fact that the lower land has a deeper soil and greater moisture than the slopes.

Areas burned in 1884 and then again in 1903 have recovered sooner than those burned by the latter fire alone. This is accounted for, first, by the fact that plants from which sprouts and suckers come were more plentiful on the land burned in 1884, and that their roots were not killed by the fire of 1903. For example, popple came up much more readily on this land than on that burned only once, because there was a great deal of popple growing there before the fire, and many suckers were sent up at once from the roots. Trees which have this power of forming adventitious shoots have an advantage in the struggle over those which reproduce by seed alone. Secondly, in most cases the young green hardwoods which had come up after the 1884 fire furnished a blanket which, to a certain extent, lessened the fierceness of the fire, and thus caused the escape of many of the trees and other plants.

Prospects of a merchantable stand.—The most important question concerning the discussion of the possible future of this region is what the prospects are for a new merchantable stand.

The fires of 1837 and 1884 were of small extent in comparison with the large 1903 burn. No part of the country covered by the two earlier fires was so far removed from coniferous seed trees as to be inaccessible to seed soon after the fire. The fire of 1903 was so extensive, however, that many places are two or three miles away, or more, from a coniferous seed tree. It is very doubtful whether the seed from the trees on the margin can

be carried to the middle of the burn. Hence, the return of a coniferous stand to the burned land will be very gradual. The land nearest the seed trees already shows a great many small seedlings, and a belt of reproduction will soon be established along the margin of the burn and about areas skipped by the fire. The places farther away will have to rely on seed furnished by the trees of the zone first reproduced. This will take a great many years, and meanwhile the less valuable hardwood species will get possession and make the re-establishment of conifers more difficult. Although there are always a few seed trees on a burn which escape destruction it will still probably take from 25 to 50 years before seed is distributed over all parts of the tract burned in 1903. It will then take from 75 to 150 years more for a merchantable stand to mature. Altogether it will probably be from 100 to 200 years before the trees will be large enough to be cut.

TOWNSHIP XXII, HANCOCK COUNTY, MAINE.

TOPOGRAPHY, DRAINAGE AND SOIL.

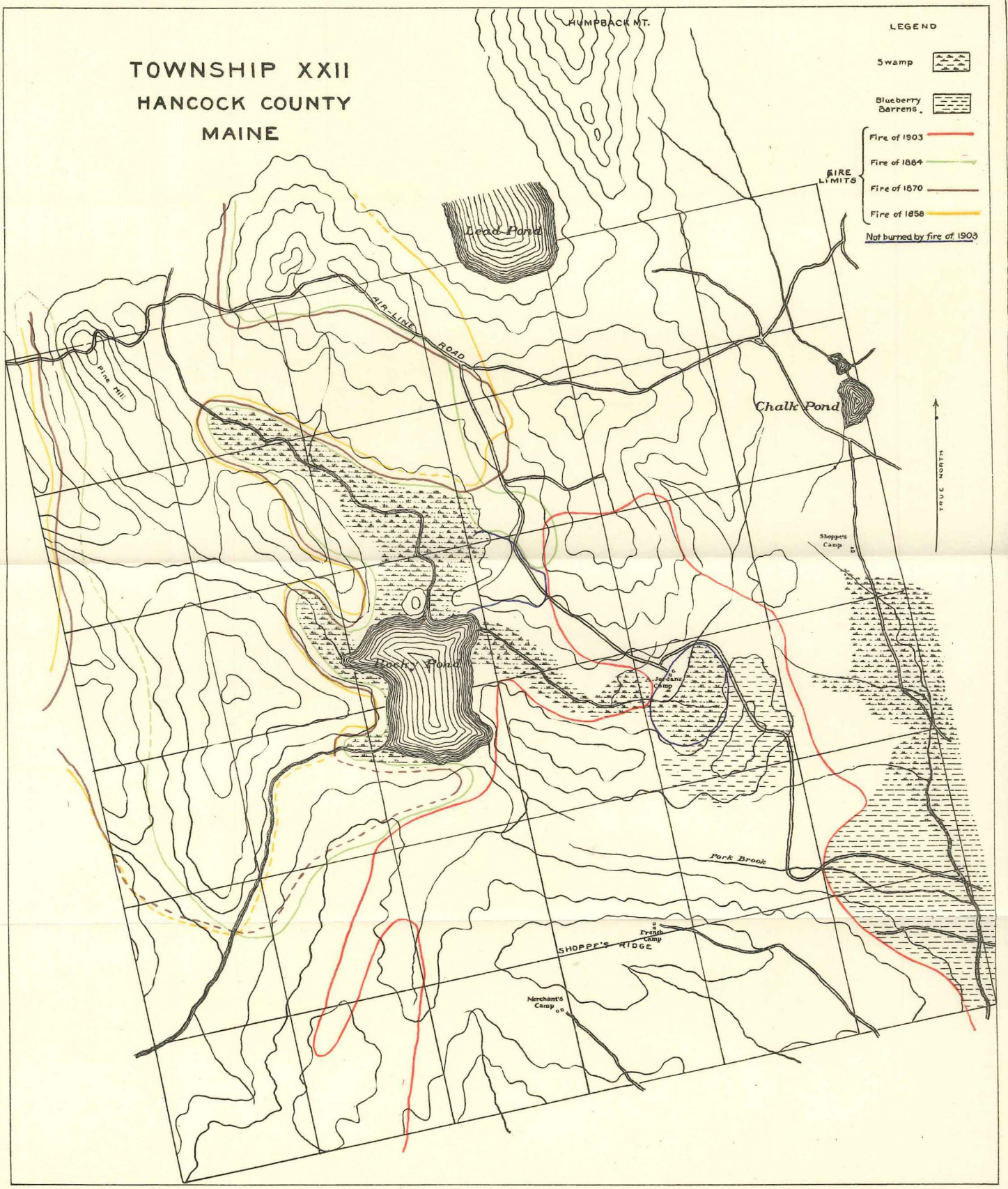
Township XXII is an unorganized town situated in the southeastern part of Hancock county. The town line on the east is part of the boundary between Hancock and Washington counties.

The topography of the township varies from flat and boggy country, chiefly in the southeastern part and in the vicinity of Rocky Pond, to rough, rolling, and hilly country in the northern part. Humpback, or Lead Mountain, the highest point in the vicinity, rises near the north line, and its foot-hills influence the direction of drainage on XXII.

There are two main water systems on the township: waters flowing in a general southwestern direction, and those flowing southeastward. To the former belong Rocky Pond with its inlet and outlet, and all the tributary streams. These waters flow into Union River. To the latter system belongs the various brooks which form Indian Stream, flowing into the west branch of the Narraguagus River.

Spruce forest lumbered in 1895, burned in 1903. Township 4, Range 9, Piscataquis Co

TOWNSHIP XXII
HANCOCK COUNTY
MAINE



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№ 112.

The most important body of water on the township is Rocky Pond, situated just west of the center of the town, and having an area of one to one and a half square miles. There are two small ponds in the northeastern part of the township, Chalk Pond and a smaller, unnamed pond, which are remarkable for the accumulation on their bottom of "infusorial earth," locally known as "silica."

The soil varies from almost pure clay to a coarse-grained, gravelly sand. Irregularly-shaped boulders of coarse-grained gray granite which decay into small cubical blocks, cover the region. Boulders of other rock, as slaty shale, diabase, etc., also occur, but in rather small quantities. In places loamy sand appears, but the general character of the soil is a sand underlaid by a coarse gravel.

ROADS.

The old "Air-line Road" from Bangor to Calais crosses the northern part of this township, and near the northeast corner of XXII this road is intersected by the Cherryfield Road, which connects the township with the seacoast. Besides these two main roads, which roughly bound XXII on the north and the east, a number of tote roads and lumber roads form a network in the interior of the township. Two of these logging roads deserve mention here: one is the "Center-line Road," as it is called on the map, which starts near the center line of the town, runs southeastward for a distance of about 3 miles, and then joins an older road which finally reaches the Cherryfield Road in the northwestern corner of the township of Deblois. The second road lies just outside of XXII, and leads from Spectacle Pond in Township XXI, northwestward, finally joining the Air-line Road.

Although there are many roads in the township, certain parts of it are very difficult of access, owing to the swampy character of the country in the vicinity of Rocky Pond.

INHABITANTS.

There are at least six lumber camps in the township, five of which were in operation in the fall of 1903, and will probably be used again during the next lumber season. The average camp is of rather small capacity, accommodating between one and two

dozen men. Five out of the six camps are located in the eastern half of the town.

Besides these lumber camps, there are but two inhabited houses on the township. They are located on the Air-line Road about two miles east of the northwest corner.

HISTORY OF THE TRACT.

Virgin Forest Conditions and Present Types.

The part of Maine in which Township XXII is situated has been settled and occupied since early colonial times. As a result almost no part of the original forest stand is now left, and any description of the virgin forest must be based on local history and fragmentary evidence.

From the general topography of the region it appears that four distinct forest types once occurred in it.

1. Pine land on which white and red pine predominated. This land is made up of sandy hills and occupies most of the western half of the township as far as the outlet of Rocky Pond, about a square mile in the vicinity of Chalk Pond, and about two square miles in the southeast corner of the township.

2. Hardwood ridges, which supported a growth of hardwoods, with hemlock in mixture. These occurred in the north and south central portion of the town, and also in its southwest corner.

3. Spruce flat, in which the predominating species were spruce and balsam fir.

4. Spruce bog or cedar swamp, which had a forest growth, the principal species of which were black spruce, white cedar and balsam fir.

The last two types were found in the eastern part of the township. None of the types were pure. The pine lands, no doubt, had a small percentage of hardwoods, the spruce flat had some hemlock, and the cedar swamp had white pine growing on the hummocks which so frequently occur in swamps.

Repeated fires and lumbering operations have considerably altered these types. As the number of fires and distinct lumbering operations is very great, the type variations produced by them are numerous. In general, four types of growth may now be recognized, with some subdivisions to show the effect of lum-

Lumbered spruce flat burned in 1903. Township XXII, Hancock Co.

bering or fires, or both—spruce bog, spruce flat, hardwood ridge and blueberry barrens.

Spruce bog, not recently lumbered.—This type occurs on the low, moist, imperfectly-drained lands, especially in the eastern part of the town. The soil is a fairly deep clay or clayey sand. The vegetable soil consists of well-decayed vegetable mould, 6 to 10 inches deep. The ground is completely covered with a dense growth of moss, and a more scattered growth of weeds. The growth of underbrush, consisting of a few bushes of sheep-laurel and mountain holly is scant. The young conifers, mostly spruce and balsam fir, occur in two stories: the upper one, about 10 feet high, is rather uniform in age; the lower story is uneven-aged and apt to be suppressed. A few small larches are scattered over the area. A sample half-acre was found to have 828 trees, two or more inches in diameter breast-high. Of these, 51½ per cent were spruce, mostly black spruce, 31 per cent balsam fir, 4 per cent white pine, 12½ per cent red maple, and the rest a slight admixture of paper birch and larch.

Spruce bog, recently lumbered.—This modified type occurs in the same situation as the preceding type, and does not differ very much from it. The younger trees are growing slowly, as they have not yet been affected by the increased light due to the recent lumbering. The greatest difference between this type and the unlumbered type is the difference in the number of trees per acre. The percentage of the various species is almost the same in both cases.

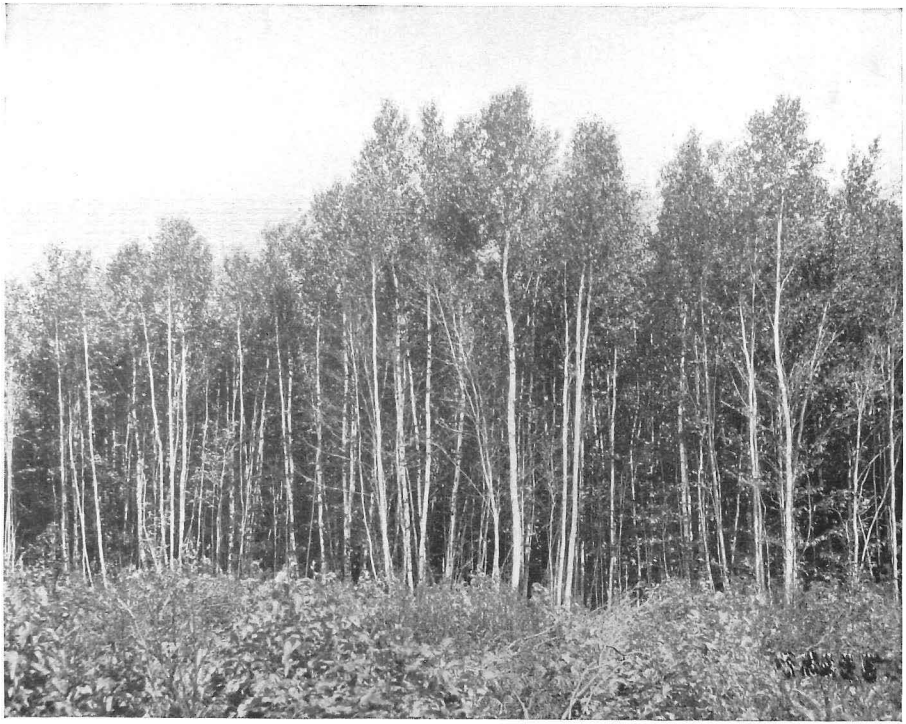
Spruce flat, lumbered, unburned.—This type occurs on rather well-drained flat land, just north of the spruce bog on this township. The soil is a fresh, deep, clayey sand. The vegetable soil, about 12 inches deep, consists of decayed logs, leaves, and needles. The ground is covered with moss and lichens, and in some places there is a dense growth of eaglebrake and other weeds. The underbrush consists of a well-scattered but sparse growth of striped maple, mountain holly, and witch-hobble. The young trees are mostly spruce, balsam fir, and white pine, of all sizes, and are making good growth. There were 3,240 trees per acre, 10 feet or less in height, on an average sample plot. About 43 per cent of these were spruce and 57 per cent balsam fir. The count of a representative half-acre indicated that there

are 672 trees per acre, 2 or more inches in diameter breat-high. Forty-five per cent are spruce, 39 per cent balsam, 7 per cent white pine, and the remainder mostly hardwoods. From these figures it is seen that lumbering at first benefits balsam fir more than spruce.

Lumbered spruce flat, burned by the fire of 1903.—The stand described above, when burned, presents certain new conditions. The fire of 1903 scorched the top of the vegetable soil, and caused the surface of the granite rock to break into small fragments. The old ground cover was completely burned. A new growth of eaglebrake and blueberries has appeared in scattered patches, but the underbrush is now represented only by a few scattered seedlings of fire cherry. All of the young trees and most of the older ones were completely killed.

Pure hardwood ridge.—This type is confined to rather small areas but its character is very well defined. It occurs on the top of several ridges which traverse the town approximately north and south. Two ridges, one about a quarter of a mile east of the center line of the township and the other on the west town line, offer the best examples. The soil is fresh and well-drained, and varies from a clayey sand to a fine gravel. The vegetable soil, consisting of decayed leaves and twigs, is mixed with the mineral soil to a depth from 2 to 4 inches. The ground cover is a leaf litter about an inch deep. There is almost no weed growth. The underbrush consists of witch-hobble and striped maple. Practically no conifers are found on this type, except a few suppressed seedlings of spruce, balsam fir, and white pine, 1 to 3 feet high. The species of trees, in order of their abundance, are: beech, yellow birch, paper birch, sugar maple, and red maple.

Hemlock bench—The usual ground for hemlock in this locality is the hardwood ridge, but occasionally hemlock benches are found, which differ from the ridge in being more level and in having a smaller percentage of hardwoods. This type occurs in the northern part of the township. The reproduction on the hemlock bench is fairly good, spruce and hemlock seedlings being most plentiful. A count of a typical half-acre indicated 452 trees more than 2 inches in diameter breast-high, per acre. The species of trees in the order of their abundance are: hem-



A stand of paper birch on land burned in 1858. Township XXII, Hancock Co.

lock, spruce, balsam fir, yellow birch, red maple, white cedar, beech, and black ash. The conifers constitute about 84 per cent of the trees on this type.

Between these two extremes of the pure hardwood ridge on which hardwoods are 100 per cent of the growth and the hemlock bench with only 15½ per cent hardwoods, there are all gradations. Sometimes the hardwoods predominate and sometimes the conifers.

Bluebrry barrens.—Roughly speaking, there are about 2,600 acres covered by blueberry barrens on Township XXII. This region affords unusually good opportunities for studying the formation of these barrens.

It is well known that after a fire a growth of paper birch, popple and other hardwoods is sure to come up almost immediately. Under these, if there are no further fires seedling conifers will start sooner or later, according to the distance from seed trees, but the more often and the more intensely a given tract is burned, the harder it will be for a new forest to establish itself. The continual destruction of the sprouts that form the new stand will eventually weaken and then kill the roots from which they spring, and the destruction of the vegetable soil will take away the proper seedbed. As a result, the more often an area is burned, the more scrubby the subsequent forest growth. Finally a time comes when the trees are unable to compete with certain hardy plants which can thrive under these new conditions, and the region becomes a barren. The most common of these hardy plants, are blueberry, sweet fern, fireweed, eagle-brake, and fire cherry, all of which a typical barren has in great profusion. The situation determines however to a certain extent, the kinds of plants which will come in after a fire. On swampy land, swamp-loving species will succeed, but on high ground a fire may so impoverish the soil that altogether new species may come in. Hence, there are several types of barren. As the dry ridges or hillsides burn more readily than the low-lying bogs, most of the barren land is of an upland type. Originally the uplands were covered with a stand of pine, and hence the statement is generally true that pine land forms the best blueberry barrens.

Township XXII shows in an almost uninterrupted series the steps taken in the formation of a barren, from the stage when the

area is still a green stand of good forest, to the time when there is not a tree left on it. It may be of interest to describe these steps as actually observed.

1. The first stage is the virgin forest with a dense stand of tall, straight, clear trees, and a ground cover of thick moss and scattered plants.

2. The land is then lumbered, light is let into the stand, and the character of the ground cover, underbrush, and especially of the reproduction, is greatly changed.

3. The lumbered land is then burned, the original stand destroyed, and the ground cover is greatly altered. Conditions now resemble those described when the burned spruce flat was considered. To show the exact nature of the ground cover, underbrush, and reproduction on a recently burned area, a sample plot was taken, which shows the following plants, here arranged in the order of their abundance:

Eaglebrake, *Petris aquillna,* L.; Bristly sarsaparilla, *Aralia hispida,* Vent; Fire cherry, *Prunus pennsylvanica,* L. f.; Bush honeysuckle, *Diervilla diervilla,* (L) MacM.; Fireweed, *Epilobium angustifolium,* L.; Raspberry, *Rubus strigosus,* Michx; Paper birch, *Betula papyrifera,* Marsh; Sweet fern, *Comptonia peregrina,* (L) Coulter; Wild sarsaparilla, *Aralia nudicaulis* L.; Bunchberry or dwarf cornel, *Cornus canadensis* L.; Red maple, *Acer rubrum,* L.; Other plants, *Compositae.*

4. The burned area is eventually covered with a stand of birch, popple, red maple, etc., under which conifers come up. These are the general conditions which prevail on the land burned in 1884. The vegetable soil is here one to two inches of partly-decayed leaves and twigs. The ground is covered with a growth of bunchberry, blueberry, and sweet fern, under which is a dense growth of wintergreen. There is almost no underbrush, excepting a few fire cherry shoots. The reproduction consists of a scattered growth of spruce and balsam fir, from one to ten feet high. On a representative half-acre there were 762 trees, all of which were between 2 and 4 inches in diameter breast-height. About 76 per cent of these were paper birch, 13½ per cent beech, and 8½ per cent red maple.

5. The land, now grown up with small hardwood trees, is burned again and again, until after a while the "barren" aspect is assumed. There may still be a few red maple, paper birch,

and fire cherry sprouts on the ground, but the trees are very scrubby and there is no doubt that one or two more fires will reduce this area to a typical barren.

6. Finally the true barren without trees of any kind is developed. The ground is thickly covered with a growth of blueberry bushes, sweet fern, brake, bunchberry, goldenrod, fireweed, and sheep laurel.

The blueberry barren has here been treated as a type of growth, and described as such. Its relation to the future of the forest will be treated under the consideration of the blueberry industry.

History of the Lumbering Operations.

This township is situated near the coast, and formerly had white pine, well suited for ship masts. This region was lumbered from the earliest colonial times, when Maine was still a part of the Massachusetts Bay Colony, but no systematic lumbering was done on Township XXII until about 1835. White pine was the species cut almost exclusively, only the very largest spruce was then considered merchantable. Red pine was used for shipbuilding. Lumbering, as a rule, was done by contract calling for a definite number of trees per thousand board feet, e. g., 4 trees to the thousand. As a result, only the best timber was cut. A lumbering operation working under such a contract covered a large extent of territory.

As the larger trees began to disappear, the smallest merchantable diameter limit began to decrease. Also, as new uses for the wood appeared, new sizes and species, formerly considered unmerchantable, came into use. For example, in 1882, a tannery was built near the northeast corner of the township, and hemlock, not considered valuable previously, began to be extensively lumbered. All the soft wood cut in this region has been for lumber purposes. Since there was no demand for pulpwood, there was no use for the smaller-sized trees until 1902, when a stave mill was established at Cherryfield, and since then trees of all sizes are taken, down to 4 inches at the small end.

The reproduction of young conifers on these closely-lumbered lands is excellent. In some places the seedlings grow so close together as to form almost impenetrable thickets. It is evident that this close lumbering of the tract has not in itself been a

menace to the future stand of timber, since natural regeneration is so good in this portion of Maine, the only great hindrance to a valuable forest in the future is fire.

Earliest Known Fires.

The earliest known fire in the vicinity of Township XXII of which a record has been found occurred about 1840, probably soon after the first lumbering operations. It started in the northwestern part of Beddington and burned southeastward, doing much damage to the standing timber. This fire opened up the forest; later ones reduced the region to the present blueberry barren. Very little is now known of the history and the extent of this early fire.

Several fires occurred in the next 20 years, between 1840 and 1860, but none of them were of great extent. Their importance consisted in the gradual inroad which they made on the forests.

Later Fires.

Recently hardly a year has passed without a fire in Township XXII. Most of them have been comparatively small, burning, as a rule, 10 to 15 acres of land, but four of these fires were of such extent, and have done so much damage, that special attention will be given to them. They are the fires of 1858, 1870, 1884, and 1903.

Fire of 1858.—This fire started in June in the vicinity of Pine hill. No efforts were made to stop it, hence it burned for about three weeks, shifting its direction with the change in the wind. It burned as far south as Rocky pond and its outlet, and eastward to a point about half a mile east of the center line. Just exactly how large this burn was is not known; the inhabitants do not remember the area covered. The growth which came up after that fire, and which would have served as an indication of the extent of the burn, has been repeatedly burned by later fires. It is estimated that 10,000 acres of land were included in its course.

Places burned in 1858, but not touched by later fires, now show a very dense growth of trees from 2 to 13 inches in diameter breast high. A typical half-acre of this land has 1,414 trees per acre. The land, before it was burned, undoubtedly was covered with a hard wood forest. The present growth is 83 per

cent of paper birch, 7 per cent beech, and the remaining 10 per cent red maple, hard maple, yellow birch and popple.

Fire of 1870.—This fire was first observed on September 15 in the vicinity of Pine hill. An attempt was made to fight it—the first ever made on Township XXII. A high wind prevailed, the woods were dry, and all efforts to check it were of little use. Not much is known of the extent of the burn. Its effects were noted in two places, and from these isolated spots and with the information gathered from the older inhabitants in this vicinity, the general boundaries of the fire were marked on the accompanying map. It will be seen from this map that the fire of 1870 covered much ground already burned in 1858.

Fire of 1884.—It is not known exactly where this fire started, or what course it took. The effects of the fire, and the growth which has come up since then, were found in several places on the township. From these and the information furnished by some of the inhabitants of this region, a fairly accurate outline of the burn was obtained. It covered a large extent of territory, but as much of the country over which it swept had already been burned by one or both of the two preceding fires, there was not much damage to merchantable timber. Since this fire much of the land has been covered by a dense growth of paper birch, popple, and red maple, as already described.

Fires of 1903.—There were two distinct fires in the spring of 1903, one occurring toward the end of April, the other in the beginning of June. There is some reason to believe that the June fire was a re-awakening of the April fire, which in that case lay dormant for over a month. Both fires occurred on Township XXII, the June fire, however, spreading to Township XVI. From 12,000 to 13,000 acres of land were covered by these two fires, entailing heavy losses, both direct and indirect.

The April fire.—The first fire was discovered on April 27, on the tract known as the "Prentiss block," located about a mile east of Rocky pond, near the east-and-west center line of the township. The cause of the fire is unknown, but certain circumstances give rise to a conjecture concerning it. The Prentiss block is on a low ridge from which the timber was removed a long time ago. It was subsequently burned several times, until it was converted into a blueberry barren. This part of Maine

has a large blueberry industry. To improve the crop of blueberries, fires on the barrens are started at regular intervals. Since the April fire started on a barren and at the time of the year when land is burned for blueberries, it is not improbable that blueberry pickers are responsible for this fire.

The spring of 1903 was unusually dry, and the fire spread rapidly. It seems to have had no definite course at first, but to have spread in all directions, burning farthest to the southwest, where it ran to the shore of Rocky pond. Southward it burned to a point about a quarter of a mile north of Pork brook. To the east it extended to a point about one mile west of the township line. On the north the boundary of the fire is very uneven and ragged. This portion of the township is hilly, the lower slopes being covered with a dense stand of growing conifers, which covered the land opened up by heavy lumbering. To the north the stand of hardwood growth checked the fire, and changed it from a top to a ground fire. It was there brought under control by the fire-fighters. As a top fire it burned everything in its path, but as a ground fire it merely killed all reproduction and scorched the lower parts of the older trees.

Roughly estimated, the April fire burned about 2,000 acres. The damage to merchantable timber, however, was comparatively slight, since lumbering had been frequent, and very little timber of value was left standing. On the other hand, the indirect damage due to the loss of a future stand is large, because the region burned had excellent spruce, pine, and hemlock reproduction.

When the fire was discovered it had already gained considerable headway. The fire warden of the north half of the township was at that time employed in driving logs from Spectacle pond into the Union river. Taking with him his crew of about 30 men, he reached the line of the fire to the southeast of Rocky pond. Previous to this, another crew of about 30 men, mostly river drivers working on the Narraguagus river, had arrived, and were attacking the fire from the north.

The methods employed in fighting were ditching or trenching ahead of the fire line and using water directly to put out the small blazes started by sparks. While it was a crown fire, little was accomplished, but when it dropped to the ground, the methods employed became fairly effectual.

The cost of fighting the fire was about $360, as 60 men were engaged for three days at an average cost of $2 per day for each man.

The loss of camps and supplies amounted to $500. No estimate can be made of the loss due to the destruction of corduroy roads, etc.

The June fire.—From the time when the April fire was supposed to have been extinguished until the June fire was discovered, the proprietors of this tract employed a man to patrol the township. No fire was discovered during the dry month of May, but on the afternoon of June 1 the patrolman discovered smoke rising from the most southeasterly point of the shore of Rocky pond. Knowing that the fire would not be likely to do much damage at night, he went to Deblois for help, and also sent word to the fire warden in Aurora. By two o'clock of the next afternoon, June 2, more than 100 men were at work on the fire line.

Little is known of the origin of this second fire. The prevailing opinion here among the inhabitants is that the fire of April, not having been completely put out, smouldered in the vegetable soil throughout the month of May, finally breaking out anew. The charge of incendiarism is also made.

During the twenty-four hours subsequent to the discovery of the fire, it gained considerable headway, and, driven by a southwest wind, was swept back over the land burned by the earlier fire. On the night of June 2, however, the wind changed its course to almost the opposite direction, blowing from the north and northwest with greatly increased velocity which carried the fire back at great speed. This wind lasted throughout the morning and afternoon of June 3. Early in the morning the fire passed completely beyond control, and swept down upon what was then considered to be the best stand of timber in the country. It was located upon a long ridge extending in a general east-and-west direction, and locally known as Shoppe's ridge. The ridge was covered on its northern slope with a fine growth of hemlock, and on the southern slope, which is long and very gentle, by a good stand of second growth pine and spruce. This was nearly all killed, the fire widening out as it progressed.

Where it crossed the township line between XXII and XVI, the burn was almost 3 miles wide.

The area covered by the June fire is estimated at about 12,000 acres, more than half of which is in Township XXII. It extends from the blueberry barrens in the southeastern part of XXII, westward to the hard wood ridge east of Spectacle pond. The hard woods on this ridge seem to have been a very effectual check to the fire, so that the burn changed its character from a top to a surface fire. To the east the barrens of the township of Deblois stopped its progress in that direction, and on the south, the west branch of the Narraguagus river, together with Colson brook, formed the boundary line.

The fire probably smouldered or burned weakly in places on the barren until June 13, when a heavy downpour of rain came, lasting two days and completely extinguished it.

No efforts were spared in fighting the fire. More than 100 men were employed. All known methods of fire fighting were tried, but with little result. While it was a crown fire the ordinary methods of stopping it with water or dirt, and ditching or trenching, were of absolutely no use. Back firing was tried, but the high wind made this very dangerous, soon carrying the smaller fire beyond control.

It was only when the fire finally reached the blueberry barrens on the south and east that an effective method of controlling it was found. Several furrows were ploughed across the path of the flames, and men were stationed to guard this fire line. This was an expensive method, and was used only sparingly.

The fire was fought for about 10 days with an average force of about 100 men. The cost of fighting this fire is estimated to have been $2,200.

The loss due to the destruction of merchantable timber was very great. The 1903 fires differed from those of 1884 and 1870 in that they swept over much land previously unburned. As will be seen from the accompanying map, the fires of 1858, 1870, and 1884 all covered approximately the same tract, but the 1903 fires occurred on a new area. It is difficult to make even an approximate estimate of the total loss. Most of the land burned in 1903 had been lumbered about 40 years before, and had, therefore, a very good stand of second growth conifers, the trees in

places being 12 to 20 inches in diameter on the stump. The stand was completely killed, and although some of the dead trees were taken out the season after the fire, the loss was still very great.

There was also a great indirect loss due to the destruction of the future stand and the deterioration of forest conditions.

There are several noteworthy features of the 1903 fire:

1. The April fire was controlled with comparatively little effort, after only three days of fighting. This tends to show the possibility of thoroughly controlling fires set at this time of the year to improve the regulated blueberry lands in this county.

2. After the April fire was under control, no care was taken to see that it was thoroughly extinguished.

3. The progress of the June fire was remarkable, burning first over land swept by the April fire, and then completely reversing its course and doing great damage.

It is a notable fact that the three fires of 1858, 1870 and 1884 all had approximately the same boundaries. The explanation of this is the effectiveness of the same natural barriers.

The Blueberry Industry and its Relation to the Forest.

The blueberry region of Washington and Hancock counties extends in general from Township XXXVI down to the coast, and from the west branch of the Narraguagus river, eastward to the Machias river. A considerable amount of wooded land occurs throughout this region, but blueberry barrens are the characteristic feature of the land. 75 or 100 years ago this whole country was covered by a dense forest composed for the most part of old white pine over spruce, though on some of the ridges hard wood and hemlock formed a considerable part of the growth. On the sandy plains, constituting what is known as the "true barrens," the growth was almost pure pine, Norway pine on the poorer soil and white pine on the better.

Fire followed the lumbering of the pine, and blueberry barrens resulted. This class of land increased gradually until about 1860, and much more rapidly thereafter.

The productive power of the barrens is maintained by burning the land periodically. The right time for burning is immediately after the disappearance of the snow, while the tops of the blueberry bushes are dry and the soil wet enough so that the fire

will not injure the roots. Burning after May 10 is said to be injurious to the barrens. There are great differences in the care exercised; some persons start the fire on their land at the proper time and tend it carefully, while others, who have too large an area to manage in this way, simply travel across the barrens trailing a lighted torch consisting of a gas pipe provided with a loose wick and filled with kerosene oil. These frequently pay no attention to the thoroughness of burning or the direction that the fire may take.

An owner of blueberry lands plans to burn one-third of his land each year, gather berries from one-third, and allow one-third of it to rest. Under this system a piece of land is burned over every three years. The season following the burning the bushes sprout out and grow a few inches. The second year a full crop of berries is gathered, but the bushes do not attain a sufficient growth to make enough fuel for a fire that will completely clear the ground. The desired growth is attained during the third season, when only a small and comparatively valueless crop of berries is borne. The following spring the land is burned, and the rotation begins anew. Newly burned forest land bears a better crop than the old barrens, because the soil is richer and there is a large amount of ashes on it. Different portions of the barrens vary in their capacity to produce a crop of berries.

It is sometimes said that blueberry land will "run out" in course of time, that is, that the soil will naturally fail to produce a new crop. The evidence is against this. Certain tracts of land have been carefully burned and picked for from 30 to 50 years without showing a decrease in the crop. Lands that are burned at the wrong time of the year, however, so that the roots of the bushes are severely injured, require a period of from 10 to 15 years to regain their productive capacity.

Thirty-five to forty years ago a lobster-canning factory at Jonesport began to can blueberries, and a few years later a factory for blueberries was started at Cherryfield. In 1885 several more factories were started in this region, and the burning of the land became systematic and general. The fires ran farther and farther into the timber every year; thus all the pine land was burned, and much spruce land with it. About 1899 other blue-

berry canning companies were organized, and secured closely cut timber land, converting it into blueberry land. The fires penetrated still farther into forest land, and the timber line has been pushed back about six miles within five years.

Except for small private holdings of 25 to 50 acres, almost all the land is controlled by the canning companies. These companies let contracts for the picking of the berries. A picker can gather berries on land belonging to the canners and get about 3 cents per quart from the contractor of the company, the prices varying with the season. Or he can gather berries from his own land, if he has any, and secure 6 to 8 cents a quart at the factory. If he has no land of his own, the incentive of a higher price for outside berries may lead him to go on to a distant burn somewhere in the forest, on another man's land, and steal berries which bring him 6 to 8 cents per quart, as before. The same incentive leads him to set fire to these blueberry barrens in the forest. The distance to which the berries must be hauled, however, prevents a great number of such cases.

The increasing size and value of the blueberry industry make it a good source of income to many people in this region. In a very productive year during the six weeks in which the season is at its best a man with a large family to assist him has been known to earn as much as $600 to $800. From four to eight dollars a day can be made by a rapid picker.

The berry pickers consider the forest of no value, as compared with the blueberry industry, and have no regard for it. There can be no doubt that a great many forest fires in the past have been due directly or indirectly to blueberry pickers. The burning of the barrens is done by the contractors, some of whom have no regard for the safety of the forest, and there is a constant encroachment on forest land. On the other hand, the system of burning has been well regulated by many of the companies, and is done with great care in order to secure good-sized crops. These men appreciate the value of properly handling the present blueberry lands.

It is probable that good blueberry land is financially much more productive than the same amount of forest such as is found in this region. Economically considered, the blueberry barrens are justified. But the first requirement should be the complete

and careful use of the large amount of land now in barrens. This area will have to be increased as the growing industry demands it, but this does not justify the ruthless extension of the barrens into valuable forest land year by year for the sake of a little better crop, while areas already barren are carelessly or only partially worked.

PRESENT CONDITIONS.

Condition of the Timber.

There now remains between four and five square miles of lumbered and unburned timber on Township XXII. This is mostly in the northeast quarter, except for one and a half square miles in the extreme southwest corner. The value of the timber differs greatly, according as the land has been lumbered more or less recently.

The Burned Land.

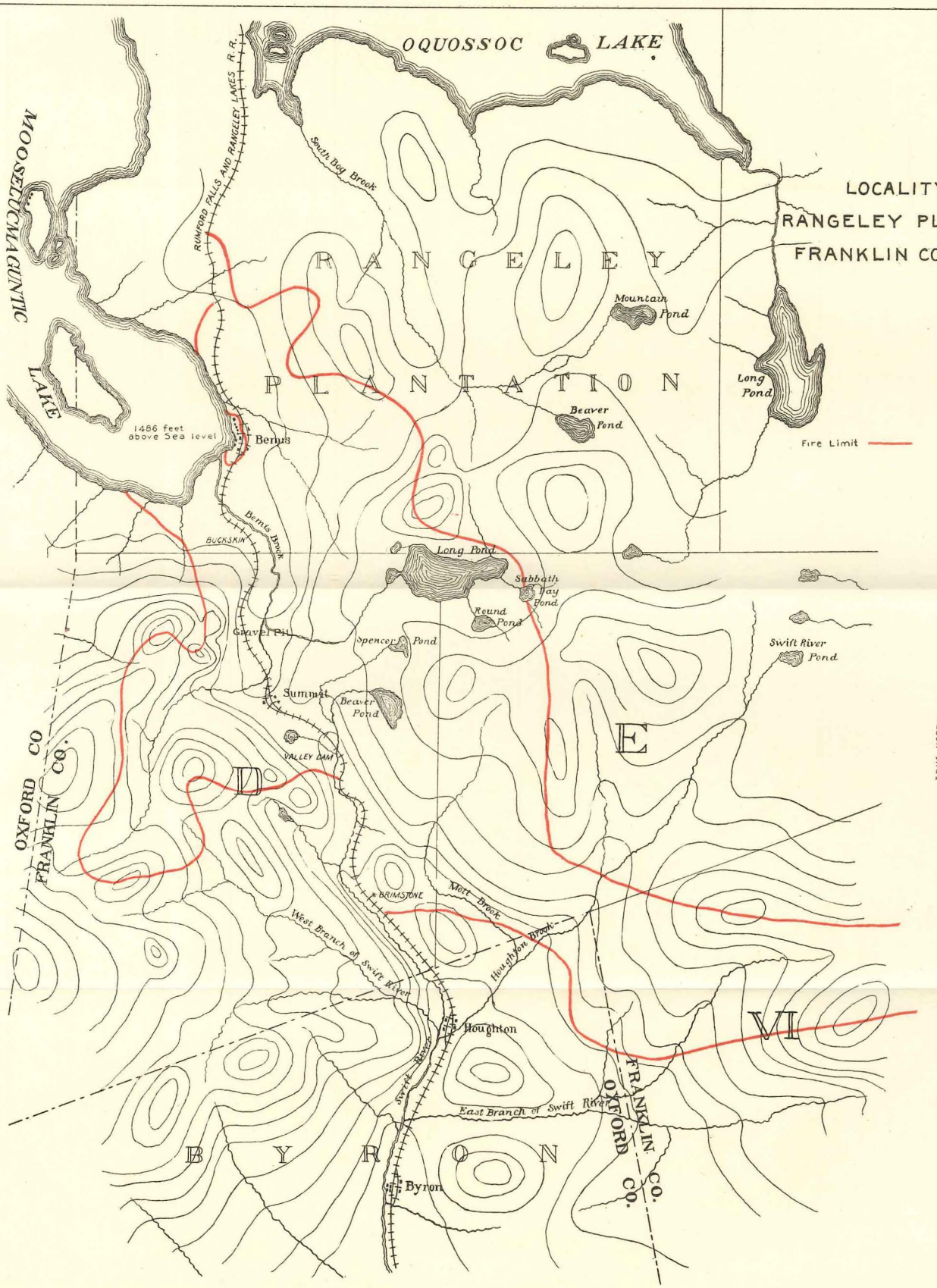
There are between four and five square miles of true blueberry barrens on which no timber of any kind grows, and probably will not grow for many years to come. These barrens occur almost entirely in the eastern half of the township.

Between 8 and 9 square miles of the township consist of land repeatedly burned over, approaching, more or less closely, the character of typical barrens. After a long time this land will be reforested with more or less valuable trees if further fires do not occur.

From three to four square miles of the township are covered with a growth of birch, popple, and other trees that have come up since the fires of 1858, 1870, or 1884. In many cases there is a dense reproduction of conifers under these trees, and a valuable stand of merchantable timber is sure to come in time.

Between 10 and 11 square miles are covered by the 1903 burn. What will happen to this land will depend entirely on whether fires continue to burn it over. If the fires are not kept out the land, and indeed all the land in the township, will be converted into a barren. If they are kept out, the usual change of species will come, and a merchantable forest may be expected in from 75 to 150 years.

Young conifers on lumbered spruce flat. (Six-foot pole in foreground.) Township XXII, Hancock Co.



LOCALITY OF
RANGELEY PLANTATION
FRANKLIN CO., MAINE

BUREAU OF FORESTRY - U.S. DEPT. OF AGRICULTURE.

No 111

Good reproduction, together with the rapid growth characteristic of this region, is sure to bring this about. Owing to the demand for timber of small dimensions, these stands will be cut closely at intervals. It is doubtful, however, whether any cutting of new timber can be done in less than 75 years on land just burned. On that which has been repeatedly burned, a merchantable stand cannot be expected for a much longer time and it will probably be of an inferior character at first.

LOCAL SENTIMENT AS TO FOREST FIRES.

The lumbermen and the older inhabitants in this region are much opposed to the continual burning of land and the rapid disappearance of the forest. The greater portion of the people, however, are interested in the blueberry industry, and their sentiment is decidedly in favor of converting the land to barrens. The woodland belongs to a very few people; the blueberry land, on the other hand, is by many considered public property. The majority of the people favor the blueberry industry and not the forest industry.

REGION OF THE RANGELEY LAKES, FRANKLIN COUNTY, MAINE.

THE TRACT IN GENERAL.

The area studied consists of the southwestern part of the Rangeley plantation, the western part of Township E, the northwestern portion of Township VI, and all of Township D. It includes a total of about 30,000 acres.

The Rumford Falls and Rangeley Lakes Railroad runs through the middle of this tract, connecting at Rumford Falls with the Portland and Rumford Falls Railroad. A telegraph and a long distance telephone line extend along the right of way of these railroads. This establishes direct communication with the large cities of the southwestern part of the State.

There are numerous logging roads and trails on the area, but few are of any importance. Many parts of this country are quite inaccessible.

Topography and Drainage.

The topography of the burned area is in the main hilly to mountainous. The most prominent features of the region are two parallel ranges of hills, from one to three miles apart, running in a general north and south direction. To the north the hills are comparatively low and their slopes are gentle, but to the south they become mountains, being two to three thousand feet high. The slopes are often precipitous. Both ranges are broken up by a number of narrow valleys running at right angles to the main ridges. Examples of these smaller valleys may be seen along the upper part of Bemis stream and the outlet of the Four ponds.

The surrounding country is drained by the Androscoggin river and its tributaries. The northern portion of the area which was studied, including the southwestern part of Rangeley plantation, the north half of Township D as far as Summit, and the northwestern part of Township E, is drained by Bemis stream and its tributaries. The rest of the area is drained by the Swift River and its tributaries, flowing into the Androscoggin River a short distance north of Rumford Falls.

Rock and Soil.

The rock of this region consists mainly of outcrops and scattered boulders of various sizes. The boulders, as a rule, are composed of very fine-grained gray granite, crossed by many veins of a coarser-grained granite, light in color. The outcrops consist of very much folded layers of schistose granite.

There are many glacial deposits of sand and gravel. In the main the soil is decidedly sandy, but it varies from a coarse gravelly sand to a fine-grained loamy clay. The mineral soil is for the most part covered by a layer of "duff" or humus, from two inches to a foot and a half in thickness. In this layer of "duff" a forest fire can travel for weeks without being discovered and at the very first strong wind be fanned into a blaze. It also favors fire by making the mineral soil inaccessible to the fire fighters, who must often use the latter where water is scarce.

Virgin Types of Forest.

There are two well-defined forest types in the region, namely, spruce land, and mixed spruce and hardwood land. The former may be sub-divided into spruce flat and spruce slope. The mixed

Dense growth of cherry which has come up since the fire of 1903. Near Summit, Franklin Co.

spruce and hardwood land grades on the one hand into pure spruce land, and on the other into pure hardwood land. There is very little pure hardwood land and it will not therefore be considered as a separate type in this region.

Spruce flat.—Spruce flat is found about two miles north of Bemis, where it reaches from South Bog Brook to Lake Moose-lucmaguntic, near the head of Bemis Stream; and it also occurs about three miles east of Bemis, where it extends towards Four Ponds.

The best example of this type is the area north of Bemis. It is a very uniform stand of spruce and balsam fir mixed with pine. It is not unlikely that this stand is the result of a burn 150 to 200 years ago. Evidence to support this supposition is, (1) the comparative rarity of very old trees and the uniformity in the size of the trees; (2) the presence of scattered paper birch, which almost always follows a burn; (3) the fact that while large white pine stubs, 3 to 4 feet in diameter breast-high, are present on the area, there are very few large white pines growing, showing that something must have happened to destroy the large white pines. (4) The general appearance of the stand, which seems to indicate that all the trees came up together, or at least within a very short time. The above evidence is not, however, wholly conclusive proof of an old fire.

The spruce flat type occurs on low, comparatively flat ground. The mineral soil varies from clay to coarse sand, with loam near the top. It is well drained and rather deep. The vegetable soil consists of decayed leaves, needles, and twigs, about 6 inches in depth. The ground is covered with a heavy carpet of moss and a litter of needles. There is almost no weed growth, excepting a few scattered patches of bunchberry and woodsorrel, and the reproduction of the conifers is very poor. There are many spruce and balsam fir seedlings, 2 to 6 inches high, but very few seedlings above this size, and these are mostly suppressed.

A sample half-acre had 1,050 trees per acre which were more than 2 inches in diameter breast-high. Of these 70 per cent were spruce, 17 per cent white pine, 7 per cent balsam fir, about 5 per cent paper birch, and about .5 of one per cent each yellow birch and white cedar.

Spruce slope.—The spruce slope type is found in small isolated areas on the tops of hills and on very steep slopes. Small patches of this type may be found scattered almost anywhere on the spruce-hardwood land. Two large areas come within the burned region. One is found in the vicinity of Four Ponds, stretching from there to Summit, and extending for about a mile along the railroad. The second area occurs on a gradual slope to the southeast of Bemis Stream. This area is a very pure spruce stand, while the one near Four Ponds has a mixture of hardwoods.

This type occurs on fresh, medium-deep, rich loam underlaid by clayey sand. The vegetable soil is composed of decayed moss and needles, and is about a foot in depth. The ground is covered with a carpet of moss, with here and there a clump of ferns. A few scattered bushes of spotted maple and of mountain holly also occur.

The reproduction of spruce is fairly good, but most of the larger seedlings are suppressed. Balsam fir seedlings occur mostly in the more open places.

On a standard half-acre there were 506 trees per acre over 2 inches in diameter breast-high; 77 per cent of these were spruce, 18 per cent balsam fir, 3½ per cent yellow birch, and 1½ per cent paper birch.

Spruce and hardwood land.—The spruce and hardwood land is the predominating type of this region. It occurs everywhere, —on the slopes, on the flats, and in the valleys. It is the most important stand commercially. The relative abundance of the spruce and hardwood varies with the nature of the slope, the drainage, etc., and no definite rule in regard to this may be laid down. In general, however, it may be said that for a given slope the higher one goes the more spruce is found in the mixture. On the lower slopes and in the bottoms of the valleys the type grades into the pure hardwood land, which occurs here in narrow strips or small patches. The mineral soil on this type is a loam, from 2 to 6 inches deep, moist and well drained. The vegetable soil is composed of well-decayed leaves and twigs, from 3 to 6 inches deep. The ground is covered with a litter of fallen leaves and a more or less scattered growth of woodsorrel, club moss, and ferns. The bushes consist of a dense growth of

General view of blueberry barrens on Prentiss block. Locality where a fire started in April, 1903. Township XXII, Hancock Co.

witch-hobble, and a rather scattered growth of spotted maple and striped maple. The spruce seedlings are from ½ to 8 feet tall, and there are from 2,000 to 3,000 of them to the acre. Only 12 per cent of the seedlings are over 2½ feet in height. The number of balsam fir seedlings is about 1,000 to the acre. They range from ½ to 4 feet in height, but only 20 per cent of these are over 1½ feet high.

There are 334 trees per acre over 2 inches in diameter breast-high; on a representative half acre 14 per cent were spruce, 47 per cent balsam fir, 33½ per cent yellow birch, 2½ per cent paper birch, 1½ per cent sugar maple, and 1 per cent beech.

HISTORY OF THE TRACT.

Past Lumbering Operations.

The lumber industry in this vicinity has followed the same general course as the other regions. There was here, as throughout the entire north woods, the white pine period, when nothing but pine and a few of the very largest spruce trees were considered merchantable. Then came the period when the supply of white pine was exhausted, and the large spruce was lumbered. Finally came the present period of pulp wood. All conifers, regardless of size or species, with the possible exception of white pine, are cut for pulp. Twenty or twenty-five miles from Bemis are located two of the largest paper mills in the country, the Berlin Paper Mills, at Berlin, N. H., and the International Paper Company's mill at Rumford Falls, Me. In connection with the latter there is also the Continental Paper Bag Co.—the largest paper-bag company in the country,—and a plant which manufactures the paper for the United States postal cards. Besides these mills there is a plant situated at Bemis, belonging to the International Paper Co., and engaged in sawing pulp-wood logs into sections 18 inches long, which are then loaded on cars and sent to Rumford Falls.

A large amount of capital is invested in these mills. Although they are not dependent for their supply of wood upon this territory exclusively, there can be no doubt that this country contributes a considerable proportion of the raw material which they use, and a shortage of supply here would cause much capital invested in mills and machinery to lie idle. Therefore, in order

to be able to draw a continuous supply of wood, it is of the utmost importance that fires be kept out of this region.

The railroad has made it possible for the manufacture of hardwood to begin. This will play a very important part in changing the character of the north woods. When the hardwoods as well as the softwoods are cut, the area is stripped naked, and a hardwood stand is almost sure to come up and to keep out, at least for a time, the slower-growing conifers. This kind of lumbering has much the same effect as a fire, because it changes the character of the stand. Taking out the hardwoods will also have an influence on the progress of a forest fire, as a hardwood stand is one of the best barriers to the spread of a fire.

In this region the hardwood industry is, thus far, represented by a single mill, situated about ¼ mile above Bemis. Although it cuts a large quantity of paper birch for spools, its main product is dowels. A "dowel" is a slender, cylindrical piece of wood, of any length and a quarter of an inch to several inches in diameter. It is used for many purposes, especially in turnery, and for furniture, pail-handles, etc. All species of hardwoods are used, including the birches, maples, and ash. The edgings and slabs left as a waste by-product in the mill are sent to the cities of southern Maine to be sold for firewood. During the coal strike of 1902 this wood found a ready market and commanded a high price. Until a quantity large enough to be shipped has been accumulated, the wood is stacked along the railroad track, and, in dry seasons, is a source of danger to the surrounding country.

A comparison between the conditions which exist on lumbered areas with those found on unlumbered land shows the following facts: that the spruce and hardwood land lumbered 30 to 35 years ago has a smaller number of trees per acre and a greater percentage of small spruce and of large yellow birch than the virgin land. The per cent of balsam fir is about the same in both cases. The pure spruce land lumbered 30 to 35 years ago exhibits similar conditions.

In recent lumbering the spruce and hardwood land has been cut almost clean in some places,—for example, on Township D, —while in other places it has been hardly touched. The amount of timber taken out from any given stand depended, in general, on the amount of spruce which grew there. The young coni-

Young conifers in an opening on lumbered land. (Six-foot pole on the right.) Township XXII, Hancock Co.

fers have responded to the new light conditions by making more rapid growth, but in some cases a dense growth of striped and spotted maple has come up and is interfering with the proper development of the seedlings.

Previous Important Fires.

This country does not show any very extensive old burns. The dry season of 1837, which was responsible for the widespread fires in the southeastern part of the State, here caused only one small fire several miles east of Houghton. The fires of 1884, which proved so disastrous in the Katahdin country and in Hancock county, are here represented by a burned strip of land about six miles long and a mile wide in the eastern part of Townships VI and E.

A fire which burned about 300 acres in the vicinity of Four Ponds occurred in 1898. The character of the subsequent growth was entirely obliterated by the more recent burn.

The fire of 1903 was the first extensive one to occur in this region.

HISTORY OF THE BURN OF 1903.

Since most of the lumbered area was burned by the 1903 fire it is difficult to say just what conditions prevailed here, but there is no reason to suppose that they were materially different from those that existed in the two regions which have been already described.

Cause, number, and extent of the fires.—The fire of 1903 will long be remembered in this region as one of the worst that has ever occurred in this part of the State. The dry season of the spring of 1903 made the woods very inflammable, and the railroad passing through the country was a constant source of danger. About the middle of April the railroad company employed a number of men to patrol the right of way and to put out any incipient fires which might start from the sparks of locomotives. Crews, each consisting of two men, were stationed two miles apart, and were instructed to follow each train. But in spite of all precautions fires did start.

There can be no doubt that the immediate cause of the fire was the railroad. The company authorities themselves do not deny this. Still, it is held that other causes may be ascribed for some

of the later fires which occurred. No direct charges have been brought against anybody, but it has been intimated, both by a railroad official and by a well-known lumberman, that certain unscrupulous persons took advantage of the panic and the general demoralization which prevailed during the dangerous time of intermittent fires and deliberately started forest fires from motives of revenge or other personal feelings. In evidence of this they cite the following instance: One day near the middle of May a fire was discovered at least two miles to the leeward of the main fire, which was then burning along the track. It is contended that fire could not have been carried such a distance against the wind, and that the second must therefore have been set by some one. In some cases also the water barrels which are kept along the right of way for extinguishing fires were found with shot holes in them. Conclusive evidence, however, to support the above statements has not been shown.

No definite date can be set for the start of the fire. Small, insignificant blazes along a railroad track are liable to occur in almost any time of drought, and there can be no doubt that a number of these small fires occurred throughout the dry month of April. Towards the latter part of that month conditions became more dangerous. It is hard to say how many of these blazes became so large as to deserve the name of forest fires, because after a time the entire country was black with smoke, and no individual fires could be distinguished. It is impossible to give a separate history of the beginning, the progress, and the control of each of these fires. Fires would start, progress for a time, and then apparently be brought under control, or broken up into several different parts, so that it is difficult to say whether a given fire had a distinct origin or was merely a part of another fire. However, seven fires, every one of which had a distinct origin, are quite definitely known.

1. The first fire of any significance started on April 28, near the railroad track, about half a mile below Bemis, at a place known as Buckskin. It traveled in a general southerly direction, but it is not known how far it went, or when it was finally put out. It is claimed that the fire was under control by May 10. During the twelve days of its activity it burned a considerable area in the region of lower Bemis Stream.

2. The second fire started at a place locally known as Brimstone, about midway between Summit and Houghton. It started on April 28,—the same date on which the Buckskin fire was discovered,—and it also burned in a general southerly direction. It is supposed to have been controlled on May 2 or 3, having burned, meanwhile, an area 2 or 3 miles long and 1½ to 2 miles wide.

3. One of the most destructive fires of the season occurred in the vicinity of Valley dam, and was discovered towards the evening of May 9. It was put under control on May 14, but during the five days of its activity it burned over an area of 6,500 to 7,500 acres. When the fire started the wind was northwest, and the flames were driven southeastward. Before long the wind shifted more to the west and drove the fire eastward, causing it to burn the region in the vicinity of Beaver Pond. On May 10 the wind, still shifting, drove the fire more northward, and the beautiful country in the vicinity of Four Ponds, a favorite fishing ground of the summer resort guests, was burned clear. Within a day or two the wind had shifted completely around, blowing from the northeast and causing the fire to travel over part of the country which it had already burned, finally sweeping it on to Summit. There, by back firing and a determined effort on the part of the fire fighters, the fire was brought under control.

4. On May 10, the day after the Valley dam fire started, the fire occurred which burned the northwest part of Township VI. Very little is known about this fire. It originated at a considerable distance from the railroad track. The wind on this day was southeast, driving the fire northward and northwestward. The conditions gave rise to the story of incendiarism. It is not at all improbable that the fire was started by some fishermen, as this region is known to be good fishing ground. The fire appears to have traveled in a long tongue, which passed very near to the strip burned by the Valley dam fire. It joined the latter at some point to the north, and its further history is unknown.

5. Also on May 10 another fire was discovered at a place a short distance north of Summit, called the Gravel Pit. A large force of men was sent to fight this fire, and it was held in check, but not entirely extinguished. On May 24 a very strong gale

came from the south, the fire escaped from the fighters, burned the vicinity of Summit for the second time, and on May 25 it spread to the southwestward and burned most of Township D. This fire burned over the largest area of all the fires.

6. On May 26 a small fire was discovered near the town of Byron. It was quite insignificant, but deserves to be mentioned because it is the southermost point near the railroad track where a fire occurred in 1903.

7. The last, and financially the most destructive, fire of the season started on May 28, very near the place where, exactly a month before, the Buckskin fire broke out. Driven by a southerly wind it traveled northward, burning along the southeastern shore of Lake Mooselucmaguntic, but for some unaccountable reason skipping Bemis. After two or three days the wind changed to the northwest and drove it over the part of the area previously burned. Bemis for a time was safe, but on June 1 the wind again shifted, this time to the northeast, and drove the fire directly toward Bemis. A sawmill and a number of camps and lodges in this vicinity were totally destroyed. Camp Bemis, one of the oldest summer resorts in this region, was saved only after great effort. The hardwood mill situated about a quarter of a mile north of Bemis escaped untouched.

This fire was the last one of the series. During the middle of May the line of the fire extended for 10 or 11 miles, and the strip burning had a width varying from 20 rods to more than a mile.

The fires kept on burning in spite of all efforts. On June 3 a strong gale fanned the flames, hitherto partially controlled, into a top fire which burned the vicinity of Summit for the third time. A day of rain on June 8 checked the fires, but they were not totally extinguished until the heavy rains of June 13.

Fighting the Fires.

Instrumentalities for Fighting the Fires.—The railroad line on the tract examined has a right of way of 4 rods,—66 feet. Of this strip about 10 feet are taken up by the surface of the embankment or cut, over which the ties and rails are laid. This leaves a strip of about 25 feet on either side of the road-bed. In places, where the ridges of the embankment slope gradually, the width of these strips is still further reduced, until, in some places,

it is no more than 10 feet. The railroad company is obliged by law to keep these strips clear of inflammable material, and on the whole this requirement is complied with.

Water occurs at short intervals along the road. In most cases it is in the form of natural springs or streams. Where these sources of water are lacking, and where wood, ties, etc., are kept near the track, water barrels are located. About 85 per cent of these barrels have been found to be sound and containing water.

Special apparatus for fighting forest fires, such as are used on the Adirondack Division of the New York Central Railroad, were not used here.* Spades, buckets, picks, etc., are kept in the section houses at the railroad stations. Since the fires of 1903, the assistant roadmaster in charge of this part of the line has obtained some hose of extra strength. This, when attached to a locomotive, can be made to sustain a pressure of 80 to 90 pounds, and to throw a half-inch stream of water for a distance of about 100 yards. This jet of water, when trained on a tree, is strong enough to tear off the bark. Its efficiency was tested in the spring of 1904, when a fire was discovered near South Rangeley. The burning stumps and trees were simply shattered by playing the stream upon them, and the fire was extinguished after it had burned only three acres.

The number of men employed by the railroad company to fight fires in 1903 varied from 20 to over 400. At first only the regular railroad employees were called out. But as the fire spread all available men found in the region were pressed into service. Men were taken off from the drives and called out from the various mills. Finally, carloads of men were sent out from Rumford Falls to the scene of the fires. Several nationalities were represented, principally Americans, French Canadians and Italians. The Italians proved the best workers.

The right of way of the railroad proved a very efficient fire line. It is not uncommon to find that a fire had burned for a mile or more on one side of the track while the opposite side is still green. This is especially the case where the burn was a ground or surface fire. The railroad embankment being of mineral soil, often having absolutely nothing inflammable on it,

*See "Bulletin Forest Fires of 1903" by William F. Fox, Forest, Fish and Game Commission, of the State of New York.

can be depended upon to stop even a very intense surface fire. The right of way, as already mentioned, is 4 rods wide, but this width of fire line, however, proved no check for top fires driven across the track by a strong wind. There were no other artificial fire lines. When the forest fires assumed dangerous proportions, however, the owners of summer resorts in the vicinity of South Rangeley and Oquossoc, having become anxious lest the fires should reach them, clamored for protecton. The railroad company, accordingly sent a crew of men to clear a fire line fully four miles north of the area burning. Work was begun along a stream, where a strip about 50 feet wide was entirely cleared of underbrush, ground cover, and vegetable soil. The trees, however, were left standing. As the fire never reached this line it is not known how effective it would have been. It deserves to be mentioned, however, to show what trouble and expense the people in this vicinity were willing to incur when the danger of the fire was fully appreciated. The railroad company paid for this work.

Methods of fighting the fire.—All the men employed to fight the fires were divided into crews, the number in each varying according to the size of the fire and the experience of the men. It was found that a crew of about a dozen men was, proportionately, the most efficient, but crews of as many as 40 or 50 men were used in some cases.

A code of signals was arranged by means of which any number of men from any crew, or any number of crews, could be called back whenever it was desired. Usually the crew were called out at three o'clock in the morning and work was continued until one or two o'clock in the afternoon, when the wind became so strong that it was considered impossible to fight the fires. Often work would be resumed in the evening after the wind had died down and the fire changed back to a ground fire.

In addition to the actual fire fighters there were patrol men and scouts. The former traveled in pairs, the crews being a quarter of a mile apart from one another. The duty of the scouts was to cruise the woods, to observe the progress of the fires that were known, and to look for news ones. These scouts, as well as the foremen of the various crews, were required to send in reports every day, and sometimes more often, directly to

the roadmaster. Several telephone instruments were carried from point to point on the line, so that communication might be established between the roadmaster and the crews.

Several methods of fighting the fires were used. Trenching was resorted to in some cases where the fire was distinctly a surface or ground fire, and when valuable property was to be saved. In those cases the trenches were deep enough to uncover the mineral soil. Where the vegetable soil or "duff" is often a foot or more in depth, trenching is an expensive method. The most effective method was the use of water and shovels. Dirt was used to choke the fire wherever it was available, and water was not always at hand. In a few extreme cases every bucket or pailful of water represented a cost of 35 cents, and economy had to be exercised. Back firing was resorted to in only two cases, and then because no other methods were available. The back fire set near Summit, to save the railroad station and section house, is especially interesting. The fire was coming from the north, driven by a strong wind. The region immediately north of Summit was divided into small blocks, by a series of trenches. In order to prevent too large a fire the blocks were burned over one at a time, with precaution to keep the fire from spreading.

Nature of the Burn.

To understand the patchy character of the burn, the ragged nature of the fire margin, and the apparently peculiar course of the fire, several facts must be borne in mind.

In the first place, there was not in this case merely one fire with a single origin spreading over the area, as did the Katahdin fire, but there were, as already described, at least seven distinct fires. The burns merged into one another in some places, and were quite distinct in others. This in itself would cause the area burned to appear quite patchy. The best example of this is found along the railroad track just north of Brimstone. The fire that originated there and the one that started at Valley dam about two weeks later did not merge near the track, and hence there is a green strip of woods of varying width between these two burns.

In the second place, account must be taken of the long time during which the fire burned, six to seven weeks. During that period the winds varied greatly in intensity and direction, at one

time fanning the flames and burning a patch of timber, while at another time, when gentle, allowing the fire to travel in the vegetable soil, doing hardly any damage to the large trees, which remained green.

Fighting the fire no doubt produced some influence on the appearance of the burn; thus, the back firing at Summit changed the direction of the fire.

More than anything else, the factor that produced the greatest influence on the direction of the fire in its progress, and consequently on the burned area, was the lumbering operations. Here the fact is brought out, as in no other place studied, that a fire will travel along the lines of lumbering. It is remarkable what a sharp line the fire margin has where it reaches a virgin stand. In not a single case on the entire area in this region did the fire penetrate into a virgin stand for more than 10 rods. In several places it was observed that the fire traveled just far enough into the virgin woods to consume the logs and slash left there in the process of lumbering the adjacent area. Where two strips of lumbered land came to an angle in an unlumbered stand, causing the uncut area to have the shape of a V, it sometimes happened that the fire cut across the narrower part of the V. However, in general, it would be safe to say that fully 95 per cent of the area burned was lumbered land. For this the slash was undoubtedly responsible. Where lumbering was most heavy the fire was most intense. On Township D where the trees had been cut to a very small diameter limit the fire burned the land quite clean.

The topography of the region is still another factor which influenced the character of the burn. Here, as in the Katahdin region, there are a number of main valleys with smaller tributary ones. The general direction of the wind was much modified by this topography, and the influence of ridges on the progress of a fire is well illustrated. The margin of the fire shows what a natural barrier the ridges made, and the map further emphasizes this fact.

A growth of paper birch 6-10 feet high on land burned about ten years ago. Township XXII, Hancock Co.

DIRECT DAMAGE.

Estimated Loss Due to the Fire.

Cost of fighting the fire.—The fire was fought for about six weeks. The number of men employed varied from 20 to about 400, averaging about 100 men a day during the entire period.

The wages paid the fire fighters ranged from $1.50 to $3 per day. This difference in pay is due to the fact that the men taken off drives and from mills received their regular wages. The average pay per man may be put at about $2 per day. The food furnished the men may be estimated at 50 cents for each man per day. This makes a total cost of $2.50 per man.

Assuming that the fire was fought for 40 days, with an average force of 100 men, at the rates given above, the total cost of fighting the fire was $10,000. This estimate corresponds closely to the amount expended. The railroad company bore nearly all the expense of fire fighting in this region.

Damage to property.—The heaviest damage to property was the burning of a mill sawing pulp wood, situated near Bemis. It was completely destroyed by the fire, but the loss was covered by insurance. Several sporting camps and lodges at Bemis were burned. Four lumber camps were also destroyed. The railroad officials say that their loss was quite insignificant, a few bridges being burned which had to be propped up after the fire and entirely replaced in 1904. The ties and rails were damaged to a slight extent.

Damage to mechantable timber.—A good idea of the amount of country burned by the 1903 fire may be obtained by looking at the map and following the limits of the fire. It will be seen that the fire burned over most of Townships D and E, about a half of Township VI, a quarter of Rangeley plantation, and several hundred acres in Byron. The area thus described covers about 27,000 acres. At first it would appear that this represents an enormous amount of damage through loss of timber; but, as has been pointed out, it was largely a lumbered area that was burned, and since most of the cutting was done for pulp wood, and therefore to a small diameter limit, the loss due to destruction of merchantable timber is quite insignificant. It is true that on the Rangeley plantation the diameter limit in cutting was larger, namely, 14 inches on the stump, and hence the loss was

greater, but the area burned on the plantation is a small per cent of that burned in the entire region. Another consideration is that the timber burned was not an entire loss. Most of it was saved by cutting it the season following the fire. The wood was badly checked, but that did not impair its value as pulp wood. It is not an underestimate to place the average loss per acre at 50 to 60 cents for merchantable burned timber not removed. This would give a total loss of about $15,000.

The total direct loss due to the fire of 1903 is as follows:

Cost of fighting the fire	$10,000
Damage to property	95,000
Loss of merchantable burned timber not subsequently lumbered	15,000
Total	$120,000

INDIRECT DAMAGE.

There is no way of estimating this damage in the Rangeley region. The lumbered land was closely burned and gives no opportunity for knowing the former condition of seedling growth. The loss of the seedlings and young trees which are a basis for a new stand is comparable with that in the Katahdin region.

Other indirect damages done by the fire may be mentioned.

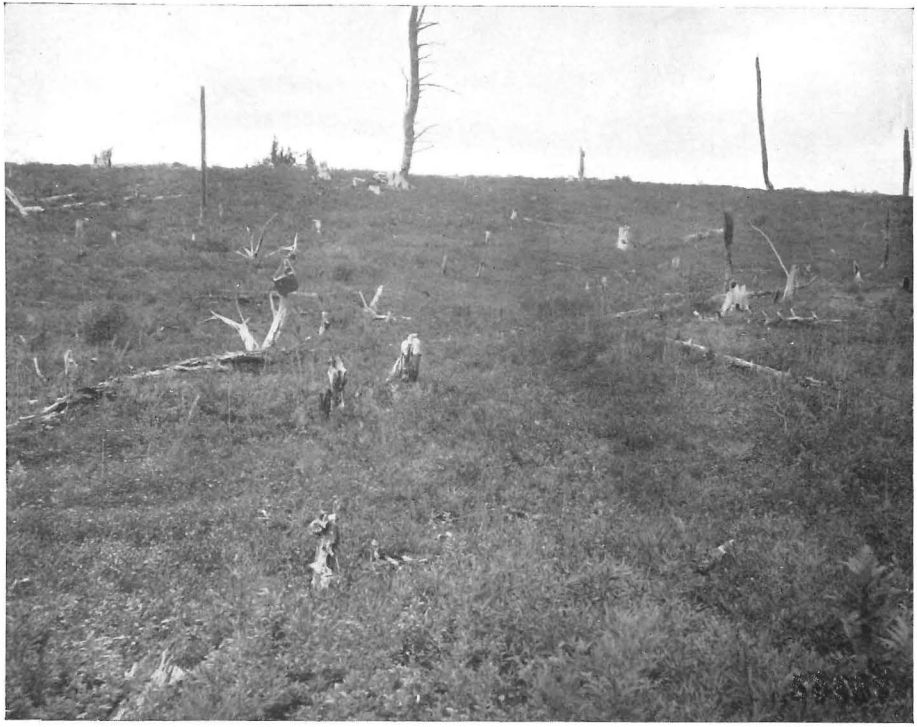
1. The increased difficulty of lumbering the land.

2. The increased danger from fires since there is now so much fallen debris on the ground.

3. The washing away of the soil on steep slopes that were laid bare by the fire.

4. A temporary loss to the beautiful character of the country.

The Rangeley lake region has long been known as one of the most famous summer resorts of the "north woods." The fishing in this part of Maine is probably unsurpassed. Many summer resorts and "camps" representing considerable capital are situated here, of which there are at least twelve that accommodate from 50 to 300 guests each, and the number of smaller places is undoubtedly much greater. Eight of the camps have a total advertised capacity of 1,025 guests. The rates in these large places vary from $2 to $4 per day. During the months of



Typical blueberry barrens. Township XXII, Hancock Co.

July and August most of the camps are full, and many people come as early as June, while others do not come before September. The number of people employed in twelve large camps during the summer is between 400 and 500, while it is certain that the total number of visitors and people employed in the whole Rangeley lake region is many times greater.

In view of the importance of the industry, not only locally, but to the State, it is interesting to notice the effect of the forest fires on the number of summer visitors.

As has already been mentioned, ,this is primarily a region for fishing. A severe and extensive fire may ruin certain streams temporarily or permanently. This is not the case at Bemis, so far as can be ascertained. Rumor of an extensive fire in a summer resort region will reduce the number of visitors. In the Rangeley lake region this affected business during the season of 1903, but not in 1904. When the primary object of visiting a region is to secure a pleasant outing and a summer home, a serious fire not only causes the loss of an immense amount of property, such as hotels, camps, etc., but it renders the region for a long time valueless for this primary object. Owing to the fact that this fire occurred where it did, no great indirect loss to the summer resorts has resulted, but had it occurred in the upper Rangeley lake region, the effect would have been very seriously felt.

MISCELLANEOUS STUDIES.

Damage Done by Insects.

No trees killed or injured by the 1903 fire were discovered which were affected by insects to a greater depth than one inch. Their value, therefore, as pulp wood had not been impaired at the end of the second season after the fire in this region. One of the most injurious of these insects in spruce is the destructive spruce wood miner (*Tetropium cinnamopterum,* Kirby). For a description of this insect and its work, reference may be made to bulletin 56 of the West Virginia Experiment Station, "Report on Investigations to Determine the Cause of Unhealthy Conditions of the Spruce and Pine, from 1880-1893;" also bulletin 28 (new series), U. S. Dept. of Agriculture, Division of Entomology, "Insect Enemies of the Spruce in the Northeast," by Dr. A. D. Hopkns.

LOCAL SENTIMENT AS TO FOREST FIRES.

The chief industries in this region are pulp wood lumbering and the summer resort business. Both of these industries are damaged by forest fires, and the sentiment of everybody in this region is decidedly against fires. There is hardly anybody who would profit by fires. There are very few people on the tract, and those that are there are all employed either by the railroad company, in the mills, or in the summer resorts. The temptation of setting fires for the purpose of finding employment in fighting them, therefore, does not exist here.

On the other hand, there are here, as elsewhere, people who, although their sentiment against fires is strong, show no desire to take active measures to prevent or fight them.

PRESENT CONDITION AND PROBABLE FUTURE OF THE TRACT.

A typical burned area at present exhibits the following conditions:

The vegetable soil is all burned off, and the loose, sandy mineral soil is exposed. There is no ground cover. The underbrush consists of a dense growth of fire cherry, 3 to 5 feet high, and a more scattered growth of raspberry bushes. All the trees and seedlings have been killed. Paper birch, and more rarely popple, appear in some places.

With two paper companies cutting all conifers down to about 4 inches in diameter at the top end, with a mill which can use every kind of hard wood, and with a railroad passing through the middle of the area, likely to set another forest fire in the next very dry season, the promise of a future forest composed of valuable spruce is very dubious.

CONTROL AND PREVENTION OF FOREST FIRES.

FACTORS AFFECTING FOREST FIRES.

Natural Barriers to Forest Fires.

1. Wide streams are natural fire lines which are effective in stopping ground or surface fires. A strong crown fire, however, driven by the wind, will cross a stream of great width.

2. Wide roads clear of waste material form a barrier for slow fires because fuel is lacking on this line.

3. One of the best barriers is a line of ponds and swamps at which a fire loses its intensity and dies out or may be held in check if the natural fire line is not wide enough to stop it.

4. A large expanse of thick, wet moss under a stand of timber assists in checking a fire.

5. A change in the character or direction of the wind alters the condition of the fire. If the wind shifts to a direction opposite to the one in which it first came, the fire will be driven back over the part already burned and may die for lack of fuel. If the wind dies down the fire will drop from a crown to a surface or ground fire, and it will then be possible to check it.

6. Ridges influence a fire in its direction and intensity. They act as a windbreak and protect land on the leeward.

Fires ascend a ridge readily, but usually stop at the top. They descend slowly. Where the ridges are parallel to the course of the fire it usually burns around the nearest end and continues on both sides.

The relative steepness and aspect of a slope modify the action of a fire. A north slope will not burn so readily as a south slope under the same given conditions. A very precipitous slope acts as a wall at which a fire tends to stop or burn out on the rocky ledges.

In a hilly or mountainous region the counter currents of air which are caused by the character of the topography affect the fire in much the same way as a change of wind-direction does. In the Katahdin region this is illustrated in the narrow valley

on the north branch of the Wassataquoik. Here the fire was checked in part by the virgin timber on the slopes and partly by the strong current of air rushing down the narrow valley toward the intense heat of the fire.

7. Fires have a different degree of intensity according to the time of day, being lowest at night and in the early morning. The lack of wind at night and the greater moisture are the factors most influential in checking the fire. A crown fire will change to a ground fire toward evening if the wind goes down. It may then die out if some other natural barrier exists, but usually burns slowly in the vegetable soil. The next day it will be fanned into a top fire if the wind rises. Calm, cloudy days, when the air contains considerable moisture, have much the same effect as the conditions existing during the night.

8. The character of the forest growth is one of the greatest natural factors in influencing a fire. The effect of hard wood trees, of mixed hard wood and conifers, and of timber in a virgin condition have been fully described in the report on the Katahdin fire.

Fighting the Fire.

Immediate steps must be taken to control a fire as soon as it is discovered. Delay may mean the beginning of a great disastrous fire.

Organization is the first point. The fighters must be separated into small crews with a foreman experienced in superintending work. Personal judgment on the part of the leader (usually the fire warden) must be exercised in choosing the place where work is to begin. This depends on the topography of the land, the character of the fire, the direction of the wind, and the situation of the fire with regard to valuable timber. Work can seldom be carried on near the front of a fire driven by the wind, but must be commenced on the sides, especially, if possible, to check it from spreading into valuable growth.

Small fires may be attacked at many points, large ones at those points where effort will be of some avail and possibly save a good stand of timber.

Shovels, hoes, axes and buckets are the essentials in an equipment for the usual methods of fighting fire. Different persons advocate different methods of fighting. Trenching in one way

or another is the most common. Complete trenching down to mineral soil takes considerable time and it is often better temporarily to dig holes along the lines where the stand is to be made against the fire, and spread the dirt between the holes. It is essential in connection with this to have guards to watch the line of fire after it reaches this artificial barrier, and afterwards to hoe back the vegetable soil along this line until the mineral soil is exposed. This entirely prevents the possibility of the fire working along in the vegetable soil and breaking out again. Water, where available, is used in wetting down a line of defence, and is considered by some to be the most effective means of control. This method requires the same determined watching and final grubbing down to mineral soil as in the former case, if complete success is to be attained. Very long bucket brigades are an expensive method of controlling a fire, but are sometimes necessary where other means cannot well be used.

Back firing is a method attended by great risk, especially where a gale is blowing. Under these conditions it is difficult to keep it under control and prevent the sparks from starting other fires to the windward in yet unburned territory. Its use should be limited to extreme necessity, and then great care must be employed. A back fire set at the wrong time or in the wrong place may be carried beyond control by the wind and prove as disastrous as the fire which it was intended to check. The place to start a back fire is on the windward side of a well cleared space, the bank of a stream, or the edge of a bare road. It must burn against the wind and not be allowed to cross the line from which it was started. The kind of back firing used at Summit in the Rangeley region, as already described, is especially valuable in protecting houses, camps, and mills in case of a bad fire.

The methods of fighting fires are well known to the people of the State, and have been discussed in other reports. The keynote in the whole question of fighting fires is handling the available men to the best advantage. Systematic, indefatigable efforts, well directed, will lessen the loss from fires very greatly. The person in charge should know the region perfectly, be quick to think and act, and not wear his men out by placing them injudiciously where the fire is fiercest and control impossible.

Scouts should be sent out to keep him in touch with the progress of the fire and the fighting in all parts of the region.

The time to fight the fire is not when it is largest and driven by the wind, but during the hours when it drops from a crown to a surface fire. Work should begin early in the morning and the men be allowed to rest during the hours when the wind is high. Three hundred men may accomplish far less when the fire is at its height than fifty men during the hours when it is lowest. It is the natural thing to go and fight a fire when it is largest, and after it becomes low, or is fairly well checked, to consider it of no importance. This simply means a repetition of large expense and hard work the next day, when it is again fanned into a dangerous blaze. The important point, therefore, is the control and the complete extinguishing of the fire when it is small.

Protection by Private Owners.

By individual owners.—The value of protection from forest fires is appreciated by many people in the State, but instances of vigorous action on the part of individual owners are not so frequent. Many owners consider freedom from fire a matter of luck and any protection as futile. One lumber company whose mill is situated in a township which it owns has completely protected itself against fire for a great many years. The township is situated in a region where fires have repeatedly occurred. All the rest of the region is badly burned. A view of the whole township is commanded from the top of the mill. The principle followed by this company has been to keep watch daily during the dangerous period of the year for any sign of fire in the township, and when the slightest trace of smoke was seen men were sent to investigate. Continued vigilance and fighting the fires when they were small have saved this tract. Where conditions similar to this exist protection is possible by the same prompt action.

Another source of protection is the man usually stationed in camp during the summer, to guard the property and supplies of the lumber companies. Some of the firms issue special orders to their men to look out for forest fires and extinguish them. A further step in advance would be to have these men patrol the tract so far as necessary, and keep watch of all parties entering it for fishing or other purposes.

Near view of a steep slope burned in 1933. The soil has been almost totally washed away. Near Valley Dam, Township D, Franklin Co.

Lumbermen have also shown their interest in protection by the ready transfer of their men from the drive and other work in order that they might fight fires.

An indirect form of protection from fire has been suggested by a landowner. He recommends strongly the leasing of camp sites to responsible parties for the construction of sporting camps. This tends to remove the danger from many camp fires being carelessly left, since it affords a stopping place for the sportsmen. The responsibility and protection of the region will rest to a certain degree on the owner of the camp.

The increasing use of the telephone for communication at the time of the drive is a valuable accessory for fire protection as well. The expense of one suitable for the woods is not great. In a region presenting average difficulties of construction the approximate cost for material and labor of a line recently established was from 30 to 40 dollars per mile.

By railroad companies.—Among the principal causes of forest fires are railway locomotives. The railroad companies become a factor in forest protection through the efforts which they make to control this source of danger.

The right of way of railroads running through forest land is required by law to be kept free of inflammable material each year. All locomotives are required to be provided with approved and efficient arrangements for preventing the escape of fire and sparks. The clearing of the right of way is quite well performed. Proper precautions are used by the section men in regard to the safest time for burning this waste material. On some of the newer branches of railroads, stumps remain, and occasionally charred logs. The right of way of the older lines is grassed over and in good condition. It is annually cleared and the grass burned.

The following blank forms and statements furnished by officials of some of the chief railroad lines show the measures taken in regard to forest fires.

BANGOR AND AROOSTOOK RAILROAD COMPANY.

"Fire-Prevention Rules."

"Rule No. 10. Make regular inspections of front ends of locomotives and replace defective nettings. Inspect ash pans frequently for defects allowing escape of coals. Track walkers must report any locomotive dropping fire."

Form E. 41. 6-12-'02.

DEPARTMENT OF MOTIVE POWER AND EQUIPMENT.

Station.....Date.....

Mr. O. Stewart, Supt. M. P. and E., Hartwell, Me.:

DEAR SIR: I have examined netting, etc., in front end of the following engines, and hereby certify that condition of same is as shown in this statement:

Engines.	Date Examined.	Condition.
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....

Signed.....

Occupation.....

Note:—This report to be forwarded to Supt. M. P. and E. every Monday morning.

C. E. 43. 5-04-500

BANGOR AND AROOSTOOK RAILROAD COMPANY.

Report of fire which occurred on Section No.....

Date.....190.., about.....o'clock,.....M., on the.....side of the track near.....between..... .....and.....stations, in the town of.....

A spruce forest killed by a rapid crown fire. The railroad was not an effective fire-line here. On the left are heaps of debris collected by the section men to clear the right-of-way. Near Bemis, Franklin Co.

1. Name and post office address of the owner of property damaged or destroyed. If property damaged or destroyed covers several owners give name and post office address of each.
2. By whom and at what hour was fire discovered?
3. About how far from the outside rail of the main track, nearest to the fire, did it start?
4. Do you know or think it was caused by sparks from a locomotive; and if so, from what train, stating train and engine number.
5. What was the direction of the wind and was it blowing hard when fire was discovered, and was it in the right direction to communicate fire from a passing locomotive?
6. What was the last train which passed previous to the discovery of the fire? If a regular train, give the train and engine number; if an extra train, state whether passenger or freight, as well as engine number, and in which direction it was running.
7. How long did the fire burn after it was discovered?
8. Give description of each owner's property damaged or destroyed, such as number of acres of land burned over; whether wood, pasture or mowing land; and if woodland or orchard, the kind of trees and about the number of years' growth; also, whether any fences or other property was damaged or destroyed.
9. What is your estimate in dollars of the extent of damage to each owner caused by this fire?

10. If you think the fire did not catch from locomotive sparks, but was caused by fire communicated in some other manner, or if you think it originated from sources entirely outside the control of the railroad, so state and give your reasons.

11. Do you know any persons, either employees or others, who know any facts in regard to the origin of the fire? If so, give their names and post office addresses.

12. If you know any facts in regard to the fire not called for in the above questions, state them.

.....

.....Section Foreman.

Correct,.....Roadmaster.

Section foremen must fill out this report for each fire which occurs on the line of their sections, whether upon the company's premises or near them, being particular to answer all questions; sending the report promptly to the roadmaster of the division. In cases where one fire damages or destroys property owned by more than one person, be particular to so state, giving post office address, description of property damaged, and estimated loss of each owner.

MAINE CENTRAL RAILROAD COMPANY.

Form M. P. 85.

Maine Central R. R. Co. Motive Power Dept.

.....190 .

Supt. Motive Power:

I have this day examined Eng. No.....

Extension Arch .....

Nettings .....

Smokestack .....

Cones .....

Sparkerpot .....
Brick Arch .....
Grates .....
Ashpan .....
Dampers .....
..... Foreman.
..... Engineer.

Note repairs on the back of this blank.

PORTLAND & RUMFORD FALLS RAILWAY.

Superintendent's Office.

"The netting used in the locomotives is perforated sheet steel 10-½" x 5-16". There are three locomotives fitted with 1-½" x ¼". All of the locomotives now, however, are being fitted with 1-½" x ¼". The locomotives are also being equipped with the Robinson Exhaust Nozzle, which it is thought will almost entirely eliminate the throwing of live cinders.

"During the time that forest fires are liable to occur, the locomotives are carefully inspected and looked after by the master mechanic personally."

Superintendent.

CANADIAN PACIFIC RAILWAY COMPANY.

Superintendent's Office.

"During the forest fires of 1903 every section was patrolled by the section men after the passing of each train, and each section was supplied with an extra number of water pails, and barrels kept filled with water ready for use were placed along the track at convenient places.

"The size of the nettings in the engines was two and one-half mesh to the inch, No. 12 gauge wire, which is standard for extension smoke boxes.

"The netting of engines was also examined at the end of every trip."

Superintendent.

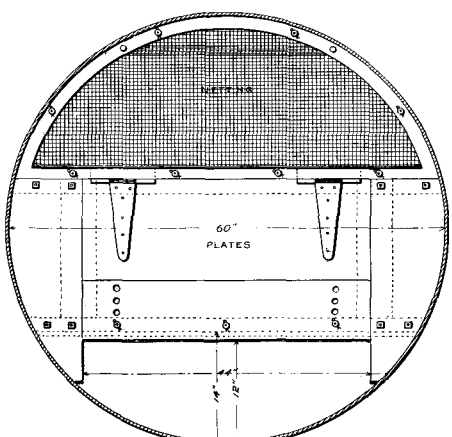
The railroads, it has been noted, took the necessary precautions in regard to the netting, etc., in all their engines and the

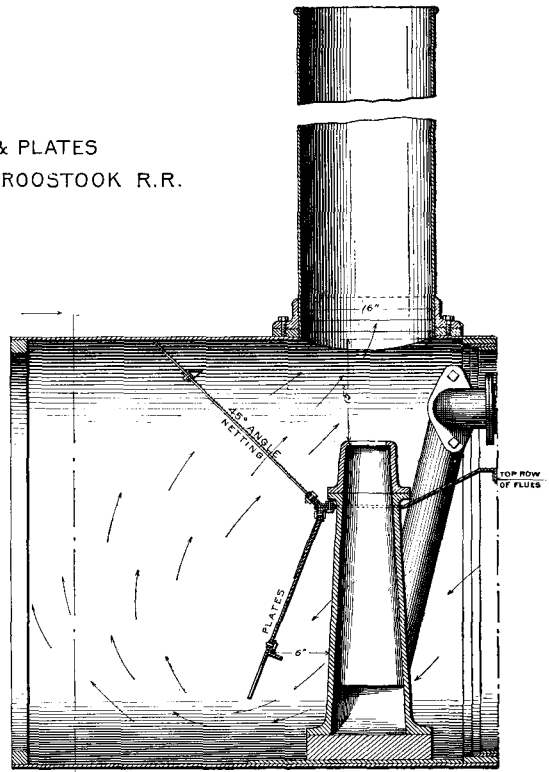
regular inspection of each locomotive. The standard mesh for this netting in the extension smoke boxes is No. 12 wire, 2½ by 2½, that is, 2½ wires and spaces to the inch, or, more clearly, 5 wires and 5 spaces each way, in 2 inches of netting. The openings formed by the netting are a trifle over ¼ inch square. No cinders larger than this can escape, and by referring to the accompanying drawing the principle of the extension smoke box will be noted. This arrangement causes the smoke and cinders to pass from the flues in a downward direction under the solid series of plates, curve upward to the forward part of the smoke box, then still upward to the netting and on to the smoke stack (see drawing of extension smoke box). The size of mesh in the netting is as small as can be used without interfering with the draught of the engine. In ordinary seasons the sparks escaping from the netting will not be a source of danger to the forest, but in a dry period many small fires are undoubtedly started along the right of way. During the dry season of 1903 special orders were sent out by the railroad officials of all the roads to the section men and to the inspectors of engines. It was the duty of the section men to put out any fires which were started on the right of way. In case of a fire of considerable size, nearby section crews were summoned and gravel train laborers were used. Considerable money was expended by the railroads in fighting the fires. Many small blazes were extinguished in this way by the section men and others.

The experience of 1903 points strongly toward the necessity of a better protection along railroad lines. The step taken by the Rumford Falls and Rangeley Lakes Railroad in purchasing a fire hose, to be used by an engine in putting out fires along the right of way wherever this appliance can be used is of the utmost importance.

One distinct factor in the disastrous fires of the past which originated on or near the right of way of a railroad was the existence of great quantities of lumber slash close to the line of the right of way. Where the conservative lumbering of a tract near a railroad is contemplated it is well worth while for the owner to consider what means can be taken to protect the valuable growing timber that is to be left. The ordinary idea is to remove every merchantable stick and have no care for the future

ARRANGEMENT OF NETTING & PLATES
IN SMOKE-BOX USED BY BANGOR & AROOSTOOK R.R.





of the land. Another step may be perfectly feasible, namely, to leave a strip of uncut forest ten rods wide beside the right of way. This will act as a shield to stop chance sparks. The absence of tops and branches on the ground in this belt with the moist condition of the soil under the deep shade will stop a surface fire if it has escaped from the right of way. This means the reservation of 19 acres to one mile of railroad. It is an insurance belt, so to speak. It is not a loss but an investment. The larger trees of this strip may be lumbered later after the slash on the lumbered land has partially decayed. It will be necessary, however, at that time to dispose of the slash on the strip. This belt of timber should always be kept as thick as is financially allowable, or this plan will be of no value.

COOPERATION OF OWNERS.

Protection by the landowner has entered upon a stage of rapid development shown by a few distinct cases. One of these is a plan proposed and successfully carried out by the owners on the St. John River system in Maine. It was outlined as follows:

"In the spring of 1903, the landowners on the waters of St. John and Allagash united in employing four men to do patrol duty on those waters. These men were put on the work the first of May and continued on said work till October 1. One man was located at St. Pamphile, P. Q., near the boundary and covered the region around Big Black River; this region is infested with Canadian settlers near the boundary who make a business of making sugar on the American side each spring, and need close attention. The other men patrolled the St. John River and its tributaries in canoes, following the drives down the river and the sportsmen and driving crews up. They put out all camp fires which were left burning. These men were appointed fire wardens by the Forest Commissioner, and so they had authority to call for help in case of a fire getting beyond their control. This is the first time anything of the kind has been tried and it has proved very satisfactory, inasmuch as no fires of any extent occurred during the season. The expense of the four men was about $160 per month, borne entirely by the landowners, who paid in proportion to their interests in the several townships covered by the patrol.

"During the season of 1904 the same arrangement has been carried out, five men having been employed on the work, with the same good results. In this section the greatest danger from fires seems to be in the early part of the season before the leaves get started and when the logs are being driven. The driving crews are strung out considerably and in consequence many fires are kindled along the rivers and oftentimes left burning. Then, too, many of the men employed on the drives are Canadians living in the Province of Quebec. They come down the St. John on the drives and then return by the St. John and Big Black rivers into Canada. On their return they are more or less intoxicated and, of course, not any too careful, hence the danger and the necessary protection."

Several very important points are revealed in the successful operation of this scheme. (1) The effectiveness of a cooperation by owners in protecting the forests. (2) The very small annual expense that is incurred. (3) Patrolling is the surest method of protection.

Another cooperative plan of protection was carried out by the owners of land along the Ashland branch of the Bangor and Aroostook Railroad, soon after that portion was finished. This was a simple plan of patrol along the right of way. The expenses of the patrolman were met proportionally by the several owners. It was entirely effective during the time in which it was operated.

Another plan was proposed for the owners in one section of the State of which the following statement was furnished by the one who originated it:

"The State made an appropriation in 1903, to be placed in the hands of the Forest Commissioner, for the purpose of guarding forest property, in order to prevent fires as much as possible. The wild-land owners realized that this fund was very insignificant in times of extreme drought. Many of them employed men at their own individual expense to patrol their property, but each realized that he was as likely to suffer from fires spreading from other lands, that were unguarded, as from fires originating within his own lines; consequently, the plan was conceived of raising a much larger fund by each of the land owners contributing pro rata according to his acreage, say 3 cents an acre, for the

A hillside laid bare by the fire. Near Valley Dam, Township D, Franklin Co.

purpose of creating an additional fund to supplement that in the hands of the Forest Commissioner. It was proposed that the wild-land owners have an executive committee, of perhaps three, who were to act in concert with the Forest Commissioner, or rather as a Board of Advisors, to direct how this money should be expended. It was further understood that the fund appropriated by the State should be used first, and only such portion of the contributed fund as seemed necessary to supplement the work of the Forest Commissioner. The Forest Commissioner consented to attend to the work, and numerous wild-land owners signified their willingness to enter upon this agreement. It was found, however, that numerous owners, particularly women and minors, refused to join in this scheme, the minors, of course, being unable to, and their guardians unwilling to assume the responsibility. There was still one other class, those who from utter indifference and selfishness refused to contribute. Finally, it was found that the scheme could not be carried through unless cooperation was secured through the personal efforts of some one or two individuals who were willing to give the time and expense to make a thorough canvass. As a result, no one being willing to attend to this work, the whole scheme finally fell through.

"It was further understood, as a part of the scheme, had it prevailed, that at the end of the season, whatever portion of the unexpended fund remained in the hands of the Forest Commissioner, he was to distribute it pro rata according to the contributions."

STATE FIRE-WARDEN SERVICE.

The section of the forestry act as amended, creating a warden service, is as follows:

"Section 4. It shall be the duty of the Forest Commissioner to take measures for the prevention, control, and extinguishment of forest fires in all plantations and unorganized townships, and, to this end, he shall appoint such number of forest-fire wardens to patrol the forests as may be necessary to carry out the provisions of this act, assigning to each warden the territory over and within which he shall have jurisdiction. Fire wardens, so appointed, shall hold office during the pleasure of said commissioner, be sworn to the faithful discharge of their duties by any

officer authorized to administer oaths, and a certificate thereof shall be returned to the office of said commissioner. Said wardens shall perform such duties, at such time, and under such rules and regulations, as the commissioner may prescribe, and they shall receive as compensation two dollars for each day of actual service. Whenever a fire occurs on, or is likely to do damage to, forest lands within the jurisdiction of any such fire warden he shall take immediate action to control and extinguish the same, and for this purpose forest-fire wardens are hereby authorized to summon to their assistance citizens of any county in which said fire may be, and every person so summoned and assisting shall be paid fifteen cents for each hour of service rendered by him. Immediately after the extinguishment of a fire the warden in charge shall make return, under oath, to the commissioner, of the expense thereof, including the names of the persons so summoned and assisting, with their post office addresses, and the hours of labor actually performed by each. All expense incurred under the provisions of this section shall be paid from the funds appropriated to and for the use of the forest commission."

To provide for the last clause of the section an appropriation of $10,000 for 1903 and a like sum for 1904 was made in the general appropriation bill, to be known as an emergency fund for the extinguishment and prevention of forest fires.

The great benefit derived from the present fire-warden system is admitted by every one. The measure was adopted at a very opportune time. The losses due to the serious fires of the dry season of 1903 were much less than they would have been if no fire wardens had been ready to meet this extremity. During the less dangerous season of 1904 the wardens have held the fires in fairly good control whenever they occurred.

The class of men acting as fire wardens in this State is good. The Forest Commissioner assisted by the landowners and lumbermen of the State has appointed trustworthy and reliable wardens. A very careful inquiry has disclosed the fact that almost all have been alert and active in their duties. The men have usually shown good judgment in the time, method, and point of fighting fires.

Since there are no intermediate officers between the Forest Commissioner and the fire wardens in the various sections of the

State the success of this system depends greatly on the character and efficiency of the individual wardens, hence the importance of the quality of men that are appointed.

For the prompt and effective extinguishing of forest fires *as soon as they are discovered* the warden service is the best measure of protection ever adopted by the State. Its permanent value is evident. A further centralization of authority will increase its effectiveness.

The most essential point in making the warden service of the greatest value is earnest cooperation with it by private owners and companies. Note has already been made of the fact that the patrolmen employed by the owners of the St. John River system are appointed fire wardens. This cooperation should be extended wherever it is possible. Railroad employees should cooperate fully with the fire warden in case of fires near the right of way.

The ideal system for protection from forest fires is not only the prompt control of the fires, but the prevention by means of a patrol.

PUBLIC SENTIMENT.

For over a century there have been years when very serious fires have occurred in the State of Maine. To some of these reference is still made, while others are forgotten. Such years placed side by side appear formidable—1795; 1825, 6 and 7; 1837; 1858; 1870; 1884; 1886; 1903. Between these years many smaller fires also occurred in the different parts of the State. The large losses have roused public sentiment. The increasing value of timber, the growing interest of the people in making a continued advancement in all practical lines of improvement in the State, and the realization that a definite forest policy must be formulated, have caused a great step forward to be taken in the control and prevention of forest fires.

The general public, however, do not fully appreciate the loss due to these fires. The estimates that are made are usually low. They are made immediately after the fire when the loss in equipment, supplies, bridges, dams, etc., is not yet fully known. This can only be ascertained when the lumbering of the burned land is undertaken. The actual area covered by the fire is also, to a great extent, unknown at the first. Furthermore, the owner does not wish the public to know that he has received a great

financial loss and in his report places the estimate at a very conservative figure. No attempt is made to calculate the loss indirectly incurred, such as the destruction of the smaller trees which will become the future merchantable stand. This is a direct loss of capital which has been increasing for over a century.

The lumbermen frequently accept the forest fire as an inevitable occurrence. Many argue that the best policy is to cut everything possible on a lot with no regard to the future, because if any merchantable timber is left it will be burned. This argument is weak. Wherever the burned timber can be removed during the first or second season following the fire there is practically no loss of this merchantable timber which was left by former conservative lumbering. The only factor of loss is the slightly increased cost of lumbering on a burned tract. This applies to regions where pulpwood is cut and where there is a decided tendency to cut the land close. In other regions the cutting to such a low diameter limit is not carried out.

The inhabitants of the various portions of Maine differ greatly in their attitude toward fire. Some are alive to the question, others are apathetic. In comparison with the sentiment ten or twenty years ago, a marked improvement is shown. In general, there is a willingness to fight fires except in the case of some few indifferent or lazy people. There is a strong tendency exhibited for those interested solely in personal holdings to be indifferent to a fire in adjoining townships. The rough and careless element also still exists which has as little regard for protection from fire as it has for other laws.

The sentiment against carelessness in building and extinguishing fires amounts to very little. Until a sentiment is established which will cause the people to assist in securing evidence and convicting those guilty of careless actions, the same reckless waste of valuable forest property must continue in some localities. This was brought out by inquiries with regard to the origin of forest fires. The answers indicate that the sentiment is strong against setting or carelessly leaving fires, but has not yet reached the point where the inhabitants of any given region are willing to push the matter further, and procure evidence to assist in enforcing the law.

RECOMMENDATIONS.

1. *To Lumbermen and Landowners in Maine.*

Burned forest land.—After a fire, lumber operations should be concentrated at once upon the burned area, and every stick of dead timber which is merchantable, even at a very small profit, should be removed. This will decrease the direct loss due to the fire and the subsequent damage by insects, and lessen the amount of inflammable material that will furnish fuel for a new fire.

Every precaution should be used after a fire to prevent another one during the operation of logging and driving the timber. If fire is kept out for a few years the danger will be greatly lessened, but repeated fires will prevent the reclaiming of the land by a valuable second growth.

When lumbering the dead timber injury to any young living conifers should be avoided, and they should not be used for corduroy, skids, or other purposes. The reseeding of the tract to valuable species depends both upon seed trees on the margin of the burn and especially upon those within the burn which have escaped the fire.

Unburned forest land.—Orders should be issued to camp tenders to patrol the tract of timber in which the lumber company is interested, in order to prevent forest fires.

Whenever it is possible, a number of owners of land in one locality or on one watershed should cooperate in establishing a patrol each season, whether the season is especially dangerous or not. A small sum annually expended for patrol will be a good investment if the losses from one great fire only are thus prevented.

The telephone system should be introduced or extended in order to establish quick communication between important points in case of a fire. The fire warden and the fire fighters can thus be summoned much more quickly.

2. *To the Railroad Companies.*

Extra section men should be appointed during the months when forest fires are liable to occur, whose sole duty should be to patrol the right of way on each section after the passing of trains.

Fire hose should also be provided to be used on a special engine in case of an emergency such as the season of 1903.

3. *To the State.*

The payment of those fighting a fire should be as prompt as possible, in order to encourage persons to respond quickly and cheerfully when summoned to put out a forest fire. In order to obtain this result, the fire warden should be allowed to advance the money whenever possible and to pay the fire fighters immediately after their work is done.

The following law is recommended for the State of Maine:

* * * * * * * * * *

The final compilation of this law will be found under the recommendations and conclusions of the Forest Commissioner on page 55.

Piles of edgings close to the track, awaiting shipment. A source of danger to the forest.

Near Bemis, Franklin Co.

BLUEBERRY CULTURE—A HORTICULTURAL SOLUTION OF THE PROBLEM OF DEFORESTED LANDS.

W. M. MUNSON.

In many of the northern and eastern states,—particularly in New England, New York, New Jersey, Michigan, and the mountain districts of Pennsylvania and West Virginia,—there are many thousands of acres, worthless for agricultural purposes, which after the pine is removed send up an abundant growth of blueberry bushes, alders, poplars, birches, spiræs and sweet fern. These lands are, for the most part, considered as public property and are recklessly burned over by irresponsible parties to promote the growth of blueberries and to destroy the birches and other plants which would soon shade the ground. In regions which are accessible, especially in the vicinity of pulp mills, some of these lands may become naturally re-forested and return a profit to their owners, but in a great many instances such a result can never be expected. In some parts of Maine, particularly in Washington county, the management of such lands has been systematized, and the canning of blueberries has become an important industrial operation.

WHAT ARE BLUEBERRIES?

The blueberries, of which there are several kinds, belong to the natural order Ericaceæ, or the Heath family, and to the genus Vaccinium. The members of this group, though native to this country and supplying in large quantities fruit which is surpassed in quality by but few of the generally cultivated species, have received comparatively little attention from an economic point of view.

There is much confusion in the vernacular names applied to members of the genus Vaccinium. The term "Bilberry" and "Whortleberry," usually mentioned as "common names" by American writers, are seldom or never heard among the common

people in this country, while "Huckleberry" is often used indiscriminately for plants of this genus and for the Gaylussacias. In the central states the term Huckleberry is usually applied to *Vaccinium corymbosum,* while Blueberry is given to the low growing species, like *Canadense* and *Pennsylvanicum.* In New England, Huckleberry is reserved for species of Gaylussacia, while Blueberry is applied to the lower growing species as above, and High-bush Blueberry to *corymbosum.* There is no satisfactory explanation of the word huckleberry, which in English works occurs only in those of recent date.*

HISTORICAL NOTES.

The vacciniums have been strangely overlooked alike by horticulturalists and by historians. Pliny, Vergil, and Theophrastus make brief reference to them; Dodoens, (1) in 1578, and Gerard (2) and Parkinson in the early part of the seventeenth century give brief discussions of several forms. Parkinson says: (3) "There are divers sorts of these low shrubs which must all go under the name of Whorts or Whortleberries, although there is much difference between them." He then describes *nine different sorts,* the first two being referred to as "Bilberries."

In America the fruit must have been used extensively by the Indians in colonial times, though there are few records of such use. Parkinson refers to Champlain who in 1615 found the Indians near Lake Huron gathering blueberries for their winter store. Kalm speaks of the Indians drying the fruit by the sunshine or by the fireside for winter use. Roger Williams mentions "attitaash" (whortleberries) of which there are divers sorts; sweet like currants—sautaash are these currants dried by

* The Latin writers of the middle ages generally referred to plants of the genus Vaccinium as Myrtillus, and the fruit was known as myrtleberry. It is not improbable that the term Whortleberry is a corruption from myrtleberry (Cf. Prior, Prop. Names, Brit. Plts. 121) and that the American colonists further changed the name to "Hurtleberry." The transition from hurtleberry to huckleberry was easyby dropping the first r, i, e, hutleberry. Others derive the name Whortleberry from the Anglo-Saxon *heort-berg*, hart-berry, or as we would say, deer-berry. The question is discussed by Sturtevant in the Transactions of the Massachusetts Horticultural Society, 1890, p. 18.

1. Lyte's Dodoens, 670. (1578).
2. Herballe, ed. 2, 1418. (1578).
3. Theatrum Botanicum, 1459. (1640).

The blueberry barrens.

the natives and so preserved all the year; which they beat to powder and mingle it with their parched meal, and make a delicate dish which they call sautauthig, which is as sweet to them as plum or spiced cake to the English." (1)

Until very recently no attempt has ever been made at improvement by cultivation.

USES OF THE FRUIT.

As before noted, the records concerning the uses and distribution of the vacciniums are meagre. Enough is known, however, to indicate that from the earliest times various species have been recognized as of value for food or ornament. Pliny (2) mentions the use of vaccinia to dye the garments of bond-slaves to a purple color.

Dodoens, in 1578, says: (3) "With the juice of them (especially of the black kinde) is made a certayne medicine called of the apothecaries *Rob,* the which is good to be holden in the mouth against great drieth and thirst in heat agues.....Fen or Marrische (marsh) whortes doe also quenche thirste, and are good against all evil inflamation or heat of the blood."

Gerard also, in 1633, writes: (3) "The juice of the black whortleberries is boyled till it becomes thicke and is prepared or kept by adding honey or sugar unto it: The apothecaries call it *Rob,* which is preferred in all things before the raw berries themselves.....They be goode for a hot stomacke, they quench thirste, and allay the heat of burning agues.....The people of Cheshire do eat the blacke whortles in creame and milke as in these south parts we eate strawberries.....The red whortle is not of such a pleasant taste as the blacke, and therefore not so much used to be eaten; but they make the fairest carnation color in the world."

Parkinson, in 1640, quotes Gerard concerning the medicinal value of the "bilberries," and says further: (4) "With the juice of the berries painters do color paper or cards, doe make a kind of purple blew colour, putting thereto some allome and

1. Roger Williams' key, 231; cited by Tuckerman, foot note in Josselyn's N. E Rarities, 92.
2. Lib. 16 cop. 18, cited by Gerarde, Herballe, ed. 2, 1419.
3. Lyte's Dodoens, 670.
4. Herballe, ed. 2, 1419.
5. Theatrum Botanicum, 1459.

Galles, whereby they can make it lighter or sadder as they please. And some poor folks, as Tragus sheweth, doe take a potfull of the juice strained whereunto an ounce of allome, four spoonfulls of good wine vinegar, and a quarter of an ounce of the waste of the copper forgings, being put together, and boyled all together, they put their cloth, woll, thred, or yarne therein, letting it lye for a good while, which being taken out and hung up to dry and afterwards washed with cold water will leave the like Turkey blew color, and if they would have it sadder they put thereto in the boyling an ounce of broken Galles."

The berries of *V. ovalifolium* are used largely by the natives of the northwest in making a dainty which they call *le brou.* The berries are gathered before they are quite ripe, pressed into a cake, dried and laid up for winter use. "For use a quantity is put into a vessel of cold water and stirred rapidly until it appears somewhat like soapsuds. It is pleasant to the taste, with a slightly bitter flavor." (1) Funston, in a recent report on the flora of Alaska, says concerning this species: (2) "A shrub four feet in height forms a large part of the undergrowth near the coast (Yakutat bay, Alaska). The dark purple berries, rather larger than peas, are collected in great quantities by the Indians who use them fresh and preserve them for winter, drying the fresh berries by artificial heat. In September, immediately after the close of the fishing season, nearly all the women and children devote themselves to collecting and drying blueberries for winter."

Of all the American species used for food, the most important are, perhaps, *corymbosum, Pennsylvanicum, Canadense,* and *vacillans.* The first of these, the high-bush blueberry, or swamp blueberry, or "huckleberry" of the middle West, is of firm texture, good size and excellent flavor. The shrub is easily transplanted, grows rapidly on any good soil and, more than any other species, shows a marked tendency to vary in the size, shape and quality of its fruit. It is the natural starting point in attempts to add the blueberry to the list of cultivated fruits. During the past few years it has received considerable attention as a garden fruit, especially in New England. (3)

1. R. Brown, Jr., Bot. Soc., Edinburg 9:384.
2. Contrib. U. S. Nat'l Herb. 8: No. 6, cited by Gard. and For. 9:70, 1896.
3. The Blueberry in Maine, Rep. Me. Exp. Sta., 1898, 170; The Horticultural Status of the Genus Vaccinium. Bul. 76 Me. Exp. Sta., 1901.

The other species named grow mostly on uplands—*Pennsylvanicum* especially, on dry sandy "barrens"—and form the bulk of the blueberry crop as seen in the cities or at the canning factories.

Of the ornamental species none are more strikingly beautiful late in the autumn than the common high bush blueberry—*V. corymbosum.* When well grown it is a stout, thick, spreading bush eight to ten feet high. The plant is beautiful when in flower; the fruit is attractive and of the best quality; and the bright scarlet and crimson effects in late autumn, rivalling the sumach in brilliancy, are unsurpassed. As an ornamental plant the species deserves a place in every garden.

SPECIES MOST COMMON IN MAINE.

The blueberries most commonly found in Maine are *Vaccinium Pennsylvanicum, V. Canadense* and *V. Corymbosum,* generally known as "low sweet," "sour top" or "velvet leaf," and "high-bush," respectively. In addition to these *V. vacillans* is occasionally found, and a black-fruited form (*V. nigrum,* Britton) is quite abundant. White-fruited forms of both *Pennsylvanicum* and *Canadense* are sometimes met.

DWARF OR LOW-BUSH BLUEBERRY.

1. *Vaccinium Pennsylvanicum,* Lam.

A low branching shrub, 6 inches to 2 feet high with green, warty but glabrous branches. Leaves oblong, or oblong-lanceolate, green and glabrous on both sides or slightly pubescent on the veins beneath, sharply serrulate, acute at both ends, ¾ to 1½ inches long, ¼ to ½ inch wide; flowers few in the clusters, longer than the very short pedicels; corolla oblong-campanulate, slightly restricted at the throat, white or pinkish; berry blue with more or less bloom, very sweet, ripening in July. Found mostly on dry, rocky or sandy soil.

This species, commonly known as "early sweet" or "low sweet," furnishes the greater part of the blueberries of our market. The fruit is usually large, sweet, bluish-black and covered with bloom. It varies greatly, however, in size, form

and color. The plant is of low habit and, on newly burned areas, is very prolific. Old plants bear but few flowers or fruits in a cluster, as already intimated, but plants one or two years from the "burn," usually send up a prominent spike. The berries can thus be stripped off by the handful and gathered very rapidly.

VELVET LEAF OR "SOUR TOP."

2. *Vaccinium Canadense,* Richards.

A low pubescent, branching shrub, 6 inches to 2 feet high. Leaves oblong, oblong-lanceolate, or narrowly elliptic, pubescent, at least beneath, entire, 1 to 1½ inches long, ⅓ to ½ inch wide; flowers few; corolla oblong-campanulate, greenish white; berry blue, with bloom (rarely white), moist places, May and June. Fruit ripe July and August.

This species, usually more vigorous in habit than the preceding, grows more commonly in rather moist, rocky, not swampy, localities. The fruit is larger and more acid than the other low forms (hence the popular name "sour top"), and matures from one to three weeks later. It is not so popular in the general market as is the first mentioned species, but it is very prolific and its lateness in ripening is a point in its favor.

HIGH-BUSH BLUEBERRY.

3. *Vaccinium corymbosum, L.*

Tall (5-10 feet), with minutely warty, greenish-brown branches; leaves ovate, oval or oblong, short petioled; flowers, appearing with the leaves, equal to or longer than the pedicels; corolla cylindrical or slightly constricted at the throat, white or pinkish; berry blue with a bloom. Exceedingly variable. Swamps and moist woods, often extending to dry hillsides.

This species is very variable, not only in the habit of growth, but in its blooming characters and fruit. Not infrequently individual plants bear large quantities of fruit measuring ⅜ to ⅝ inch in diameter; while a black fruited variety, (*var. atrococcum,* Gray), has small, polished, black fruits, equally as good as the other in flavor. The fact of variability renders this species one of the most promising for cultivation. It flourishes

alike in the sunlight and in partial shade; on the dry upland and in the swamp. It is also worthy of note that plants of similar quality, both as to habit and size of fruit, are usually found associated in groups—a fact which indicates that these characteristics are probably transmitted by seed.

4. *Vaccinium vacillans,* Solander.

A low, stiff, branching shrub with glabrous, warty, yellowish-green branches; leaves obovate or oval, entire or minutely serrulate, pale, glabrous on both sides or often glaucus beneath; flowers bell-shaped or cylindrical, somewhat constricted at the throat, pink. Dry places, especially in sandy soil. May-June. Fruit ripe, July, August.

This species, often associated with *V. Pennsylvanicum,* is of excellent quality and ripens somewhat later than the other. As with *V. Pennsylvanicum,* the flowers are often racemose on long naked branches.

LOW BLACK BLUEBERRY.

5. *Vaccinium nigrum,* Britton.

"Similar to *Vaccinium Pennsylvanicum* and often growing with it; 6 to 12 inches high, the twigs glabrous. Leaves oblong, oblanceolate or obovate, acute at apex, narrowed or rounded at the base finely serrulate, very nearly sessile, ½ to 1 inch long, ¼ to ½ inch wide, glabrous on both sides, green above, pale and glaucus beneath; flowers few in the clusters, longer than their pedicels; corolla globoseovoid, very little constricted at the throat, white or cream color; berry black, without bloom, about ¼ inch in diameter. Blooms earlier than *V. Pennsylvanicum* May. Fruit ripens in July." Britton and Brown. Flora of North U. S. II, 579.

This type is not infrequently met in the vicinity of Cherryfield is classed with the ordinary "early sweet." It is usually found in areas varying in extent from a few square feet to several rods. Scattering bushes are also found mingled with *V. Pennsylvanicum.*

The Blueberry Industry.

The land devoted to the blueberry industry in Maine lies mostly in Washington county, where there are about 150,000 acres known as the "blueberry barrens." This land lies chiefly in the townships of Cherryfield, Columbia, Deblois, Beddington, Harrington, Jonesboro, and Numbers 18 and 19. Recently a canning factory has been established at Vanceboro for the utilization of the fruit in the northern part of the county. Much of this land was burned over by the Indians before the colonial period, and since the timber was removed from the remainder, it too, has repeatedly been burned to keep down the growth of birches, alders, etc., and to facilitate the harvesting of the fruit.

About 40,000 acres of the barrens belong to Mr. William Freeman of Cherryfield, who may properly be regarded as the pioneer in the blueberry industry of America. After long and bitter litigation he proved beyond question his right to charge royalty for all fruit gathered on his lands and established a systematic method of treatment which is applicable, under most conditions, everywhere. The method is somewhat as follows:

The land is divided into several tracts, each of which is leased to some responsible party who assumes the whole care of burning, keeping off trespassers, harvesting and marketing the fruit. The owner receives, as rental, one-half cent per quart for all the fruit gathered.

The pickers receive from one and a half to three cents per quart; those who lease the land and haul the fruit to the canning factory, or to the station for shipment, one-half to one cent per quart,—the rate being determined, in accordance with the market values, by the firm which handles the product. The fruit is all canned or shipped by one firm which keeps a record of the amount as it is brought in, and pays the royalty to the owner.

Every year a certain section of each "lease" is burned over. This burning must be done very early in the spring, before the soil becomes dry; otherwise the fire goes too deep, the humus is burned from the ground, and most of the bushes are killed. Many hundred acres on what should be the best part of the "barrens" have thus been ruined. The method most commonly

used in burning a given area, is for the operator to pass around the section to be burned, dragging after him an ordinary torch or mill-lamp.

He then retraces his steps and follows over the burned areas, setting new fires in the portions which have escaped and back-firing if there is danger of spreading unduly over areas which it is desireable to leave unburned. A device occasionally used consists of a piece of one-half inch gas-pipe, bent at the end at an angle of about 60 degrees. The end opposite the bent portion is closed with a cap or plug. In the other end, after filling the pipe with kerosene, is placed a plug of cotton waste or tow. This device is by many regarded as superior to the lamp or torch, as it is more easily handled. Each section of the lease is usually burned over every third year.

By far the largest portion of the fruit is taken to the factories for canning. Early in the season, however, before the factories are opened, a considerable amount is shipped to the larger cities for use while fresh. This fruit is usually shipped in quart boxes, shown in the figure. The blueberries have an advantage over other small fruits in that, with the exception of currants and gooseberries, they will stand rough handling better, and will keep longer than the others.

All of the early fruit is picked by hand, and only the ripe berries are gathered. Later in the season, particularly on "old burns," i. e. on areas which will have to be burned over the next year, the fruit is gathered with a "blueberry rake." This is an implement somewhat similar to the cranberry rake in use on Cape Cod, and may be likened to a dust pan, the bottom of which is composed of stiff parallel wire rods. The fruit may be gathered much more quickly and more cheaply by means of the rake. The bushes are, however, seriously injured by the treatment. In no case should the rake be used in gathering the high-bush blueberries. As the berries are gathered they are passed through a fanning mill before being sent to the canning factory; and again, at the factory, they are submitted to a much stronger winnowing. This is usually the only preparation necessary.

Wm. Freeman of Cherryfield, as already noted, may properly be regarded as the father of the blueberry industry in America.

His account of the beginnings of the industry is given herewith. The canning of blueberries on a commercial scale was begun in Maine as early as 1866 when A. L. Stewart of Cherryfield packed some of the fruit procured from the neighboring wild lands for the Portland Packing Company. J. W. Jones, a pioneer in the corn packing industry, was engaged in the canning of blueberries in 1870, as were also William Underwood and Company, Jonesport, Maine.

Before canning the fruit was deemed practicable, "the plains" were considered common property and people came for fifty and even one hundred miles for a week's outing and to gather blueberries for their own use, and to sell to the merchants of neighboring cities and villages. The timber on the plains was fast being destroyed by fires which were set by the blueberry pickers and, in 1870, Mr. Freeman, who owned some forty thousand acres of the wild land, decided to charge a small royalty for the fruit picked on his lands. Most of the packers paid the small amount demanded without question, but the Underwood Company refused and after repeated attempts to get them to recognize his right of property, a suit for trespass was instituted by the owner. The trespass continuing, other suits were brought and the case was finally carried to the supreme court before it was decided. The final decision was a complete victory for Mr. Freeman—a judgment of $1,700 being granted and the right of owners of public lands to sell "stumpage" for blueberry or other fruits being established once for all. Mr. Freeman's action not only benefited other owners of wild lands, as well as himself, but it resulted in the perfect system of management already detailed.

The financial importance of the blueberry industry is very difficult even to estimate at the present time. In Maine the canning of blueberries is largely in the hands of a few leading packers. The largest of these factories has a daily capacity of 700 bushels and the average annual output is 8,300 cases of two dozen cans each; representing 6,250 bushels of fresh fruit. The average price per case for the canned fruit is $1.90. In other words, the value of the annual product of this one factory is not far from $15,000.

There were in 1900 seven factories in Maine which engaged in canning blueberries. These were as follows: J. and E. A.

A blueberry canning factory.

Wyman, Cherryfield; Burnham and Morrill, Harrington; L. A. and A. R. Logie, Columbia Falls; J. A. Coffin, Columbia Falls; A. L. Stewart and Son, Cherryfield; Lawrence Bros., Jonesboro; L. A. and A. R. Logie, Vanceboro.

The value of these factories is about $50,000. Those at Jonesboro and Vanceboro were erected in 1900.

The number of hands employed in the various factories would aggregate about a hundred, but including the pickers, there are from one thousand to two thousand men, women and children employed in the blueberry packing industry during the canning season. About $30,000 are distributed among the pickers each year.

The total canned product of the "blueberry barrens" in 1899 was about 50,000 cases and the price per case was $2.20, making the value of the blueberry crop in this one section considerably more than $100,000. Some seasons the value of the crop will be more than this, some seasons less.

In other sections of Maine, in Northern Michigan, and in other regions where the blueberry is abundant and the timber has been removed, a similar industry might with profit be established. In response to the question of over production, it may be said that the demand for canned blueberries is increasing with the supply, and the difficulty is to meet the demand rather than to keep up prices.

While it is doubtful if timber should be deliberately removed with the view of producing blueberries in Maine, it is certain that there are large areas on which the timber has been removed, which are worthless for agricultural purposes, and which are already stocked with blueberry plants, that may be made to yield good returns to their owners in the manner above outlined. This is specially true of the hilly region in Franklin and Oxford counties where pickers come for many miles and camp in the blueberry fields. Too much cannot be said, however, about the necessity for systematic management and care in burning over these tracts. Every year hundreds of acres of valuable timber are destroyed as a result of carelessness or criminal negligence on the part of those who set fires on blueberry lands. As a rule, this loss is unnecessary and inexcusable.

INDEX.