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The Harvard Forest Fire Study.

A study of forest fire experience with particular reference to the possibilities of forest fire insurance has been completed during the past year as a research project of Harvard University Forest, conducted by C. C. Averill and L. M. Frost. The following summary covers some of its interesting features; the complete report is a comprehensive document which cannot be covered in detail in this review.

The administration of commercial forests on a permanent yield basis, which is the ultimate objective of forest and conservation authorities who have been pointing out for many years the wastefulness of past and present forest exploitation methods, has been greatly handicapped by the forest fire hazard. Despite all reasonable precautions that can be taken, the hazard is still present and there is always the possibility that a disastrous forest fire may wipe out the entire investment in any forest project. Such uncertainties, it is felt by the sponsors of this study, constitute one of the primary hindrances to the administration of forest tracts on a sustained yield basis with resultant benefits to the owners and to the general public. Forest fire insurance, which would assure safety of investment in forest projects, has been available and quite widely applied in several European countries, but thus far is in the United States only in an experimental stage. The authors indicate that while there are a few insurance companies that write forest fire insurance, such business is not being actively solicited and the rates are considered prohibitory by timberland owners.

The Harvard Forest study shows definitely the forest fire losses in a representative area in relation to the total burnable values, and evaluates the various factors of hazard and fire protection for the purpose of establishing a method for estimating for any given tract the probable loss experience over a period of years. The present study has been necessarily limited to the State of Massachusetts and only certain forest tracts on which complete data are available have been intensively studied. The results are not offered as necessarily conclusive in their numerical values, but the study does present a method of treatment, which if applied over a large territory on a broad basis, should establish a definite method for evaluating forest fire losses that would be of very great benefit not only in respect to fire insurance on forest property, but in various other ways.

The authors point out that forest fire losses are currently reported in terms of acres burned or dollars of loss without reference to the total commercial value of the forest lands. Many forest fires destroy timber areas which have very low commercial value and while from the public viewpoint

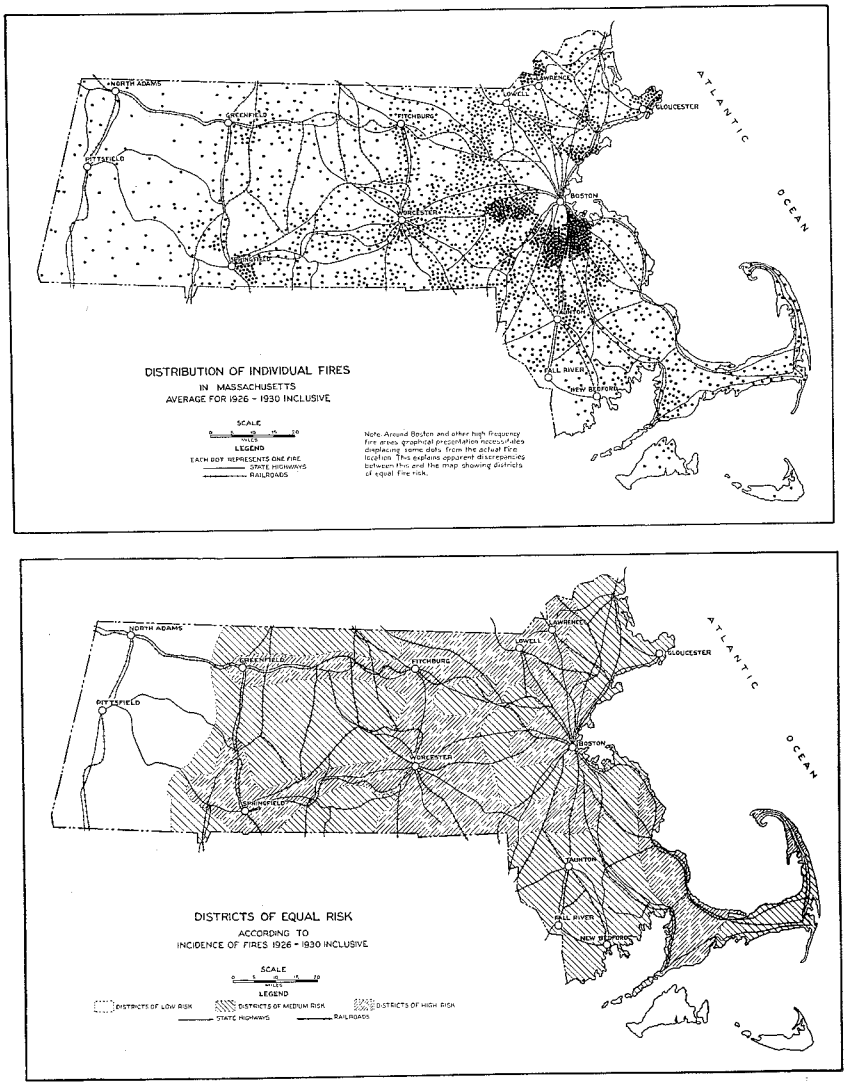
Blackington.

Open grasslands and cut over lands under fifteen years of age have the highest combustibility rating on the proposed grading schedule for forest fire risk. Fires of this character involve small damage while confined to open grassland, but are a dangerous menace to adjoining stands of valuable timber.

such fires are most undesirable in destroying forest cover, interfering with future productiveness of the land, destroying water shed protection, etc., nevertheless in relation to the commercial value of the timber the loss has been relatively small.

In the present study six typical forest areas embracing a total of approximately eight thousand acres were selected for detailed study. These tracts had been under the same ownership and consecutive management for fifteen years or more. All the fires which had occurred on these properties during a fifteen-year period were carefully analyzed and detailed estimates made of the total value of the standing timber in each year. It was found that the average loss per year per one hundred dollars of value of standing timber was 5.4 cents. The average fire loss per acre per year was 1.8 cents. The properties studied varied in physical characteristics, in degree of fire hazard and in the extent of the fire protection available. In each case an analysis was made of the character of the hazard and after careful consideration of the factors contributing to the fire risk a proposed grading schedule was devised, which is designed for determining the relative probability of fire loss on forest properties in general. This schedule gives an interesting analysis of the various elements in the forest fire problem and is reproduced herewith.

This grading schedule for forest fire risks takes into account the differences in combustibility of different types of forest cover and the various elements of fire hazard and fire protection. The numerical figures used, of course, are based on judgment and would be subject to change as a result of further experience, but the method would seem applicable under a wide



Harvard University Press.

variety of conditions. It should be noted that there are other factors which cannot be definitely provided for in such a schedule. The attitude of the permanent population towards the local forest area is a matter of primary importance. In a territory where the livelihood of a large proportion of the inhabitants comes from logging or wood-using industries a better experience may be expected than in an area where the wood lands play no part in the livelihood of the inhabitants. General weather conditions, though not mentioned specifically in the schedule, are, of course, of primary importance and

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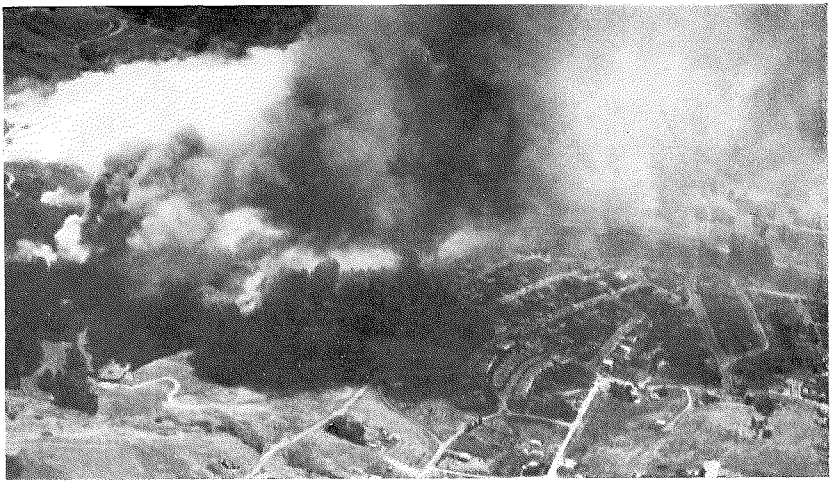
Softwood stands under thirty years of age rank next to open grasslands on the combustibility rating schedule.

it is understood that in any national application of such a schedule the results would have to be weighted for weather conditions and other territorial influences. The variation in the experience of the forest fire risks, in accordance with the character of population, weather conditions, etc., is shown for the State of Massachusetts by the accompanying illustrations reproduced from the original report.

The conclusion of the authors is that "the present study disproves for this region at least the conviction generally held by foresters and underwriters that timberlands in the aggregate are subject to unusually high loss costs and to such high fire risks that insurance is impossible."

A Grading Schedule for Forest Fire Risk.

	Points +	Points −
Combustibility. (Average 50 points.)		
1. Swamps which are wet the year round		10
2. Open and poorly stocked stands of softwoods fifty years old and up	10	
3. Hardwood stands above brush size. Open softwood stands thirty to fifty years old	50	
4. Softwood stands under thirty years of age	80	
5. Cut-over lands under fifteen years of age. Open grasslands or grasslands on which plantations have recently been established	100	
Exposure Hazard. (Average 100 points.)		
1. Centers of population:		
Within a radius of 25 miles of cities of 150,000 or more	15	
Within a radius of 15 miles of cities of 20,000 to 150,000	10	
Within a radius of 2 miles of cities of 1000 to 20,000	5	



International.

Near-by centers of population, railroads, highways and other occupancy in or near a wooded area increase the forest fire hazard, according to the grading schedule.

		+	—
2.	Railroads (coal-burning)		
	Adjacent or within 1/10 mile of property	25–100	
	One-tenth to one-half mile from property	10–50	
	One-half to one mile from property	0–20	
3.	Highways		
	State highways and paved town roads:		
	Adjacent to property	15–45	
	Not adjacent but within ½ mile	5–15	
	One-half to 2 miles from property	2–6	
	Graveled road adjacent to or within 1/10 mile of property	5–15	
	Dirt road within ½ mile of property		5
4.	Occupancy		
	Fishable stream on or within ¼ mile of property	15–45	
	Hunting permissible	5	
	Camp sites on or adjacent to property	4–12	
	Logging operations going on at present on or adjacent to property	5	
	Construction work going on at present on or adjacent to property	3–9	
	Dwellings adjacent to or within ½ mile of property	5–15	
	Resident who is responsible for fire suppression on property during fire seasons		10
	Rubbish piles or dump within ½ mile of property	0–20	
	Any other use not listed that may increase the fire risk	0–20	

The range of points for any one exposure hazard is to allow for variation in the marginal inflammability adjacent to the exposure.

Protection. (Average credit 50 points.)

1.	State protection	
	All parts of property visible from a fire tower	10
	Within a radius of 15 miles of state equipment	5
2.	Town protection	
	Power pump, pump cans, and other hand tools	35
	Pump cans and hand tools only	20
	Patrol during dry seasons	5

	+	—
3. Private protection		
Power pump, pump cans, and other hand tools		50
Pump cans and hand tools only		25
Patrol during dry seasons		10
Power pumps usable only on the following percentage of property due to lack of water:		
75 to 90 per cent	5	
50 to 75 per cent	15	
25 to 50 per cent	20	
Less than 25 per cent	25	
Property posted		3
All adjacent property posted		5

Average points for entire schedule, 150 plus, 50 credit, total 100. Grading may vary from zero for no hazard to 300 points for extremely high hazard. This schedule is intended for application in areas of uniform weather conditions; it would be subject to appropriate weighting for variation in weather conditions.

Spontaneous Heating and Ignition.

By Harold H. Brown and Norman J. Thompson,
N.F.P.A. Committee on Spontaneous Heating and Ignition.

The annual fire losses due to spontaneous ignition are estimated at between $45,000,000 and $50,000,000. There are almost no data available upon which to base an estimate of losses which are due to spontaneous heating where ignition has not resulted, but spontaneous heating which results in the rotting or aging of many agricultural and industrial products without leading to fire undoubtedly represents an enormous economic loss.

The existence of spontaneous ignition or combustion was recognized in very early times and was referred to in literature by early Greek and Latin writers. For such an old and widely recognized natural phenomenon it is surprising that sufficient thought and study have not been given to determine the fundamental processes taking place in the heating and ignition of various materials. A number of theories have been advanced, most of them based upon some experimental evidence, but no one of them sufficient to explain all conditions which have been noted. One of the early theories was based upon the fact that friction developed heat. This could hardly explain the heating of materials which had been long in storage and had not been moved. Another theory was that of the accumulation of vital heat, it being supposed that the warmth created by living tissues such as those of freshly cut grass, would continue to accumulate if held in a confined space and would finally raise the temperature to the point of ignition.

It has been found that a considerable amount of heat is developed in the rapid absorption of gases by finely divided and porous materials. Finely divided carbon, iron and many other substances will absorb oxygen very

The authors, chairman and member of the N.F.P.A. Committee on Spontaneous Heating and Ignition, have prepared the article at the direction of the committee and in order to acquaint N.F.P.A. members and others interested with the program of the committee.