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Forest Fire Damage Appraisal Procedures and Tables For the Northeast

by

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by

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INTRODUCTION

Forest fire control in the Northeast is a bigger and more responsible job than most people realize. State, Federal, and other agencies currently spend some 6 millions of dollars in prevention efforts and in suppressing the 15 or 16 thousand fires that burn each year. There is good reason, therefore, to develop better and more uniform methods of damage appraisal so that the total fire bill--cost plus loss--can be determined with greater accuracy. It is only thus that the value of present and planned protection can be estimated.

Until 1951 there was no uniformity of procedure in appraising forest fire damages in the Northeast. Each State, and sometimes even districts within a State, had its own rules and scale of values. For example, the damage most frequently reported for young, satisfactorily stocked hardwood stands ranged among States from one to twenty dollars an acre (fig. 1). In some field units, a flat damage rate per acre was assessed regardless of stand conditions or fire severity. Obviously, such a wide divergence made comparisons among States, and damage statistics in general, rather meaningless. Recognizing the need for more uniformity in appraisal, the included set of provisional tables was accepted for trial by the Northeastern States beginning in 1951.

The procedures and tables presented are essentially the same as those prepared by the Southern States Forest Fire Control Chiefs' Forest Fire

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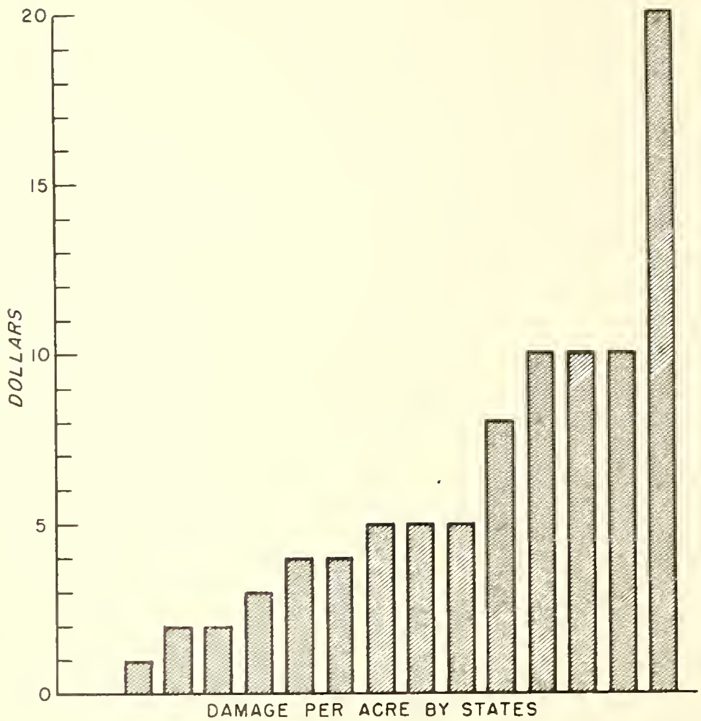


Figure 1.--Fire damage per acre to satisfactorily stocked young hardwood stands, reported by 14 Northeastern States, 1943-1949, varied widely.

Damage Committee in cooperation with the U. S. Forest Service and accepted throughout the South in 1949. The values in the present tables have been adjusted to correspond with the burning index scale on the type 5-W or -- meters. With this and some minor modifications, uniform methods of appraising fire damage are now used from Maine to Texas.

It is emphasized that the values in the tables were derived through the systematic use of averages--average timber stand losses and average stand values. As is the nature of averages, the figures will be reasonably accurate for large groups of fires but for a single fire may be quite unreliable.

BASIS OF FIRE DAMAGE APPRAISAL SYSTEM

Fire Damage Studies

The effects of wildfires on timber values have been studied intensively by the Southern and Southeastern Forest Experiment Stations. Their observations on some 78,000 trees on more than 340 burned areas form the basis for the present damage tables. The southern pines and principal Appalachian hardwood species are well represented in the data. From these and subsequent studies it was possible to determine the relation of tree size, species, and fire intensity to tree mortality and growth reduction. In addition, cooperative studies with the Division of Forest Pathology established the amount of butt decay that can be expected in burned stands.

Mortality is the main effect of fire on both conifers and hardwoods. Decay following wounding by fire can also cause appreciable loss in hardwoods. In fact, pitch streaks, unsound knots, or other defects caused by fire can lower the quality of mature timber in all species. On the other hand, growth reduction in both type groups is considered, on the average, to be so small that it can be ignored for damage appraisal purposes.

It is well known that under some conditions fires damage watershed, wildlife, soil, recreation, and other values. However, so little research has been done on these very complex phases of fire effects that as yet no direct monetary evaluation of them is possible. However, a flat rate of one dollar per acre has been added to all values in the tables to cover these effects.

Fire Damage Factors

In considering the factors to be used in appraising forest fire damage, a compromise between refinement and utility had to be made. Some degree of accuracy had to be sacrificed--not believed to be great on the basis of present information--to make an easily workable system. Accordingly, broad classes of forest types, tree size, and stand density, together with season of burning, and fire intensity as measured by burning index, were selected. These are variables that are significant in their effect on dollar damages; at the same time, they are easily determined in the field.

Forest type.--Only three type groups are recognized in our damage tables: pine, pine-hardwoods, and hardwoods. This may seem an over-simplification because there are five generalized types in the Northeast, namely, White-Red Pine, Spruce-Fir, Oak-Hickory, Maple-Beech-Birch, and Loblolly-Shortleaf Pine. However, no other course was possible because of the dearth of applicable information regarding fire damage in the White-Red Pine and Spruce-Fir types. Except for these two, we believe the northeastern types are adequately represented in the basic damage data.

The question has been raised whether damage figures obtained from studies on southern and mid-Atlantic conifers can be applied to northern conifers. There can be no positive answer until additional research has been carried on. However, there is some evidence that the difference between the two groups is not as great as might be supposed.

The best information on this point was obtained from a comparison of our mortality figures with those obtained from a survey by the Northeastern Forest Experiment Station. Mortality in young conifer stands on more than 150,000 acres following the 1947 fires in southwest Maine differed by less than one percent from the figures on which our tables are based when the burning index was reckoned at 100. What the difference would be at other levels of fire intensity is not known, but it should not be great. Another fact revealed by the Maine survey, as will be seen from the following tabulation, is that there was little difference in seedling and sapling mortality among the pure coniferous and mixed types or in pole timber among all types, but obviously fewer small hardwoods were fire-killed.

Type	Mortality: Seedlings and saplings (Percent)	Mortality: Poles (Percent)
White pine, spruce-fir, pitch pine, and hemlock	79	58
White pine-hardwood, and spruce-fir-hardwood	78	52
Hardwood-white pine, and hardwood-spruce-fir	76	53
Hardwood	66	56

This higher mortality rate, plus the increased susceptibility of surviving hardwoods to decay, clearly indicates the necessity for distinguishing between hardwood and coniferous types, but the data do not indicate that otherwise much refinement is warranted. They are not conclusive but are supporting evidence in favor of our original plan to use only the three type groups, pine, hardwood, and pine-hardwood. Northern coniferous types, which may not be adequately covered by this scheme, should be listed as either pine or pine-hardwood for damage appraisal purposes.

Tree size.--For all species so far as is known, the larger the tree diameter the greater the resistance to fire. This relationship in pines is graphed in figure 2. The correlation in hardwoods is also strong.

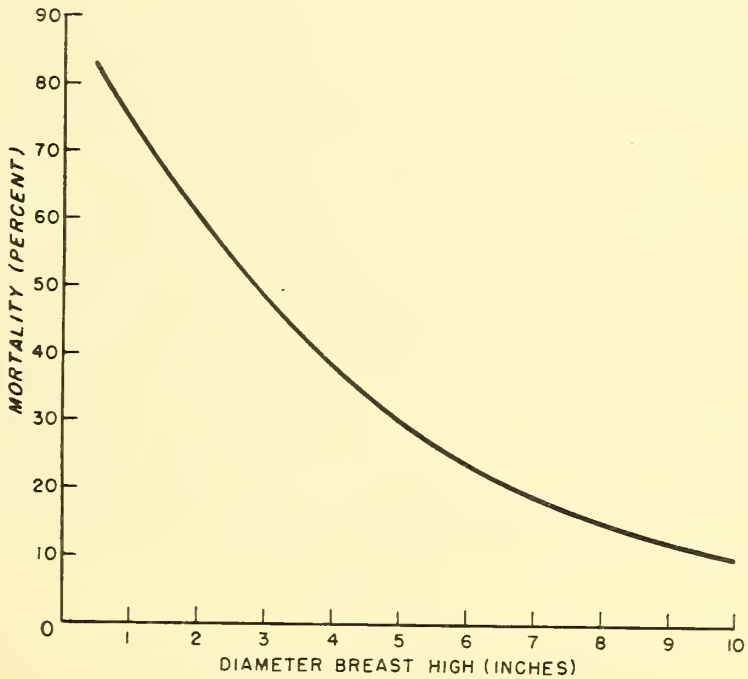


Figure 2.--Mortality by diameter classes in young pine stands (burning index 65).

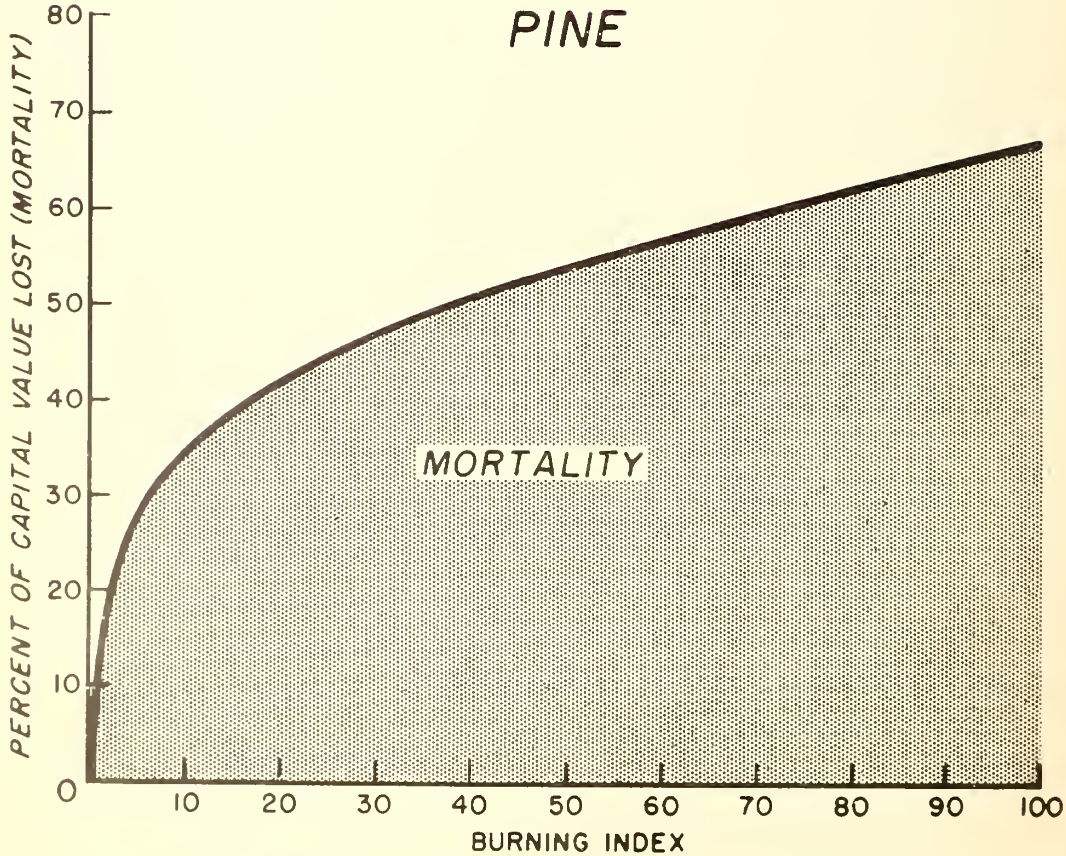
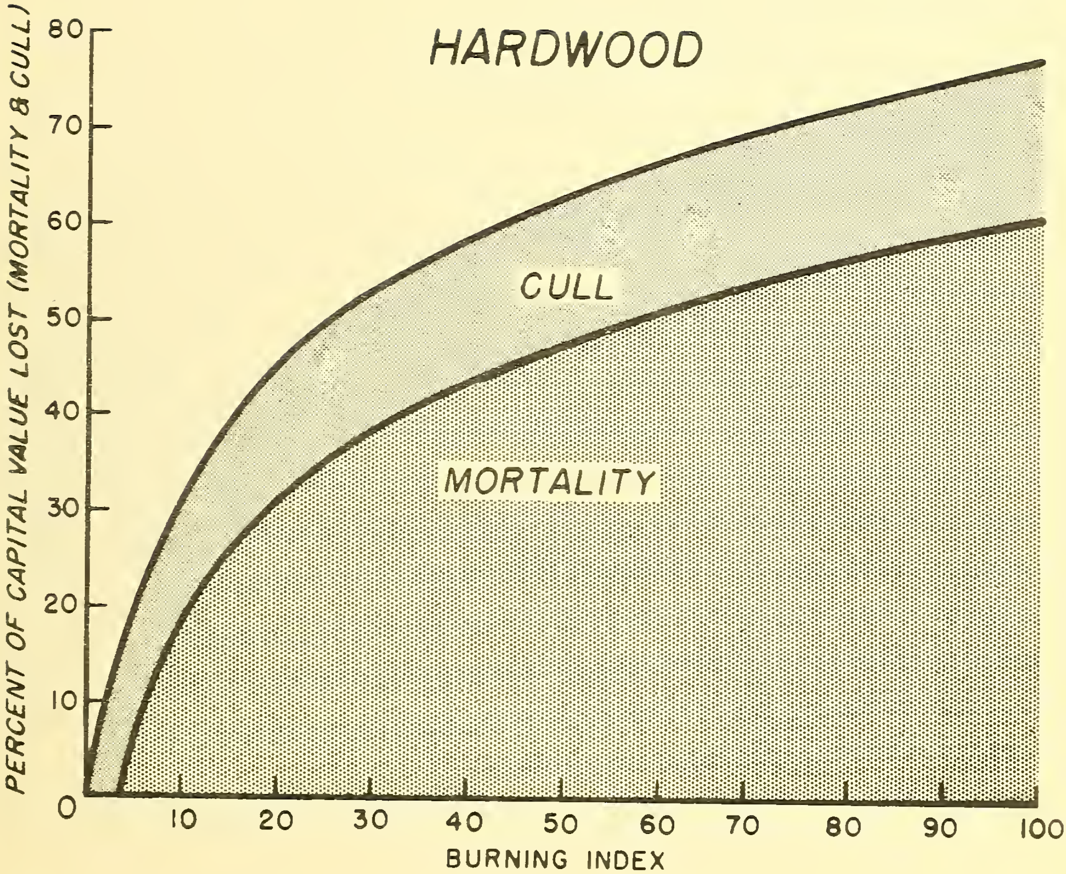


Figure 3.--Fire damage in young pine and



hardwood stands is correlated with burning index.

For the purpose of improving accuracy of the tables, it would have been desirable to introduce more than two diameter classes as variables in the hardwood type group. But, owing to the difficulty of classifying typically uneven-aged hardwood stands by diameter, only two classes--under 12 inches and over 12 inches d.b.h.--were recognized.

In the pine and pine-hardwood type groups, four diameter classes were included, representing roughly, reproduction, sapling, pulpwood and sawtimber stages of stand development.

Stand density.--Stand density, that is, relative number of trees on a unit of area, is used in this system of appraisal as one measure of the worth of the stand. By and large, stand values are directly proportional to the number of stems per acre. Volume would be a better index, but because it is difficult to measure without a good deal of experience, stand density has been used. There should be little difficulty in classifying stands into the two broad classes, satisfactory or unsatisfactory stocking.

Stand origin.--For several reasons origin has been included as one of the variables in appraising damage in pine stands. On the average, planted stands, both satisfactorily and unsatisfactorily stocked, yield more than natural stands in similar categories. Also, because of the probable increase in planting in the future, as indicated by long-range forestry programs, it was thought desirable to emphasize potential losses from fire by means of a separate table. Such information may have additional value in convincing owners that plantations deserve a high degree of protection.

Fire intensity.--Fire damage and fire intensity are obviously correlated; the hotter the fire the greater the damage. Burning index is a fairly reliable gage of intensity and is therefore used in the appraisal tables.

The relation between fire intensity and damage is plotted in figure 3. Losses are expressed as a percentage of present worth, or capital value of the stand.

Season of year.--In addition to the factors already discussed, some element or elements associated with season of the year have a significant effect on fire losses. Generally speaking, fires do more damage in late spring, summer, and early fall than in winter. The reasons for the seasonal differences are not clearly defined, but two factors probably account for most of the increased summer damage. One is the general absence of hardened bud scales and corky bark on twigs during the growing season, and the other is higher vegetation temperatures during the summertime.

Unprotected plant tissue is easily damaged by extremes of either heat or cold. And when vegetation is hot because of exposure in bright summer sunshine, only a small heat contribution from a fire will raise the temperature of tissues to or beyond the lethal temperature, which is roughly 140°.

Ideally speaking, it would be best if the temperature of the individual day could be included as a factor in damage appraisals. However, the fire danger stations are not measuring temperature. Consequently, it has been assumed for present damage appraisal purposes that severe damage is probable during the season when daily mean air temperatures remain at or above 50°, a condition favoring plant growth, and maximum daily air temperatures average at least 60°. As the temperature of exposed vegetation frequently will exceed that of the surrounding air by about 20°, this means that the temperature of plant tissue frequently will exceed 80° during this period. On an average, the trends of the daily mean and the daily maximum temperatures are coincidental, so a single transition date can be chosen in spring and fall to denote the change of season.

Accordingly, the year has been divided into two seasons, summer and winter. An analysis of 20 years of Weather Bureau records for the Northeast establishes the following transition dates for the several states and some subdivisions. Either the individual median dates (May 1 and October 23 or 24 in Rhode Island, for example) or average dates, as stated on page 19, can be used.

As a practical means of taking this average differential between seasons into account, damage figures for summer fires are greater than for winter by an amount equivalent to one danger class.

State	District	Daily maximum temp. of 60° or more		Mean daily temp. of 50° or more	
		From	To	From	To
Virginia	Coastal	3/10	11/24	3/14	11/21
	Piedmont	3/20	11/8	3/30	11/5
	Mountain	3/29	11/4	4/3	10/30
Kentucky	Eastern	3/17	11/11	3/22	11/7
	Central	3/19	11/8	3/21	11/7
	Western	3/15	11/12	3/17	11/11
West Virginia	Southern	3/20	11/8	4/1	11/2
	Northwestern	3/30	11/5	4/4	10/29
	Northeastern	4/1	11/1	4/16	10/25
Maryland	-	4/2	11/3	4/5	11/2
Delaware	-	4/1	11/4	4/4	11/4
New Jersey	-	4/17	10/30	4/17	10/31
Pennsylvania	Eastern	4/15	10/25	4/23	10/23
	Western	4/17	10/24	4/29	10/20
Connecticut	-	4/27	10/25	4/27	10/26
Rhode Island	-	5/2	10/20	4/30	10/27
New York	Western	5/3	10/15	5/2	10/20
	North Central	5/2	10/11	5/2	10/10
	South Central	4/28	10/20	4/30	10/15
	Eastern	4/30	10/18	4/29	10/19
Massachusetts	-	4/30	10/20	4/29	10/23
New Hampshire	-	5/1	10/11	5/5	10/7
Vermont	-	5/2	10/8	5/9	10/7
Maine	-	5/12	10/6	5/13	10/7

BASIS OF FIRE DAMAGE VALUES

Average Yields

The yield of forests is a composite of many products. In the Northeast, an evaluation of yield would include bean poles, pulpwood, fuel wood, acid wood, mine props, stave bolts, shingle and shuttle blocks, basket splints, tanbark, poles, piling, sawlogs, and a variety of other products. However, production varies from place to place and from time to time. Mine props, for example, are only cut in areas reasonably close to the mines, and tanbark some years is hardly merchantable, though there have been years when entire stands were cut exclusively for bark. For our damage appraisal tables it was therefore necessary to use average region-wide yields of products which could be reckoned in stable units and for which there is a universal and continuing demand. Experience has shown these to be pulpwood for conifers (the earliest merchantable product) and sawlogs for hardwoods. If the demand for immature hardwood pulpwood expands, the average yield of hardwood stands will also need to be computed in terms of pulpwood.

The average yield of northeastern forests in terms of these stable units, and the accompanying stumpage prices in the following tabulation are thought to be reasonable averages for satisfactorily stocked stands:

Type	Origin	Age	Yield/acre	Unit value	Value/acre
Pine and pine-hardwood	Natural	20 yrs.	10 cds.	$2.00	$20.00
	Planted	20 yrs.	15 cds.	2.00	30.00
Hardwood	Natural	80 yrs.	5,700 b.f.	7.50	42.75

Unsatisfactorily stocked stands are expected to yield only one-third of these amounts.

Unit prices are assumed to be the net price after marketing costs have been deducted.

Average Costs

The per-annum cost of producing stumpage varies widely as does the number of items entering into the cost. These are usually considered to be management expense, protection costs, taxes, administration, and interest on investment.

Management expense.--Although some forest owners spend considerable amounts on silvicultural measures (thinning, pruning, eliminating undesirables, etc.), these practices are not widespread. Average management costs on a region-wide basis are considered to be negligible and are ignored in our calculations. The same is true of administrative expenses.

Protection costs.--Almost all forest land in the region is protected by either State or Federal services. In addition, it is rather common practice for timber landowners to plow and maintain firebreaks, eliminate hazards, contribute time in suppressing fires, and so on, thus supplementing the protection furnished by public agencies. Allowance for protection in our figures includes the average amount spent by State and Federal agencies plus the estimated average value of contributions by the landowners.

Taxes.--All forest landowners who periodically harvest products pay taxes in some form or other, although the amount and method of payment differ. Some pay on the basis of assessed valuation, others on the basis of the worth of products cut or sold. Because there is no good way of calculating an average, what appears to be a reasonable figure (10 cents per acre per year) is used.

In summary the recognized per-annum costs per acre are:

Type	Taxes (Cents)	Protection (Cents)	Total (Cents)
Pine	10	12	22
Pine-hardwood	10	10	20
Hardwood	10	6	16

Interest Rate

A rate of 3 percent is uniformly used to discount average yields and capitalize average costs.

Stand Values

The value of immature timber stands is fixed primarily by its expected future yield and its current age. Average expected yields have been set up, and the following average ages for immature stands, determined for the most part from U. S. Forest Survey data, are used in these calculations:

Type	Size class (Inches)	Average age (Years)
Pine and pine-hardwood	0-2.0	5
	2.1-4.0	12
	4.1-10.0	20
Hardwood	0-12.0	25
	12.1+	80

The dollar-and-cents value of immature stands then can be calculated by substituting the preceding values in the following equation:

$$V = \frac{Y + E}{1.0\,p^{n}} - E$$

V = Value of immature stand

Y = Ultimate sale value

E = $\frac{\text{Annual expense}}{\text{Interest rate}}$

p = Interest rate

n = Number of years to reach maturity

For example, the computations for hardwoods in the 0 to 12-inch size class are:

$$V = \frac{42.75 + (\frac{.16}{.03})}{1.03^{55}} - (\frac{.16}{.03}) = \$4.13$$

Damage Computations

The amount of damage under each category in the tables is computed from the following equation:

Damage = \$1.00 + (stand value x expected loss)

For example, in the hardwood type, 0-12.0 inches size class, satisfactory stocking, burning index 65, winter season, the computations are:

Damage = \$1.00 + (4.13 x 0.68) = \$3.81,

or when rounded off as in our tables, \$4.00.

HOW TO APPRAISE FIRE DAMAGE

The usual procedure in determining damage by this system is to (1) classify the timber stand burned by type, density, origin, and tree size in the field and then (2) compute the loss in the office--average tabulated damage per acre times acres burned.

Ordinarily, the tabulated figures, which include average total damage to timber stands below sawlog size and damages from degrade in satisfactorily stocked sawlog stands, plus a \$1.00 allowance in all categories for intangible losses to soil, water, forage, and resources other than timber, are all that are needed to compute the loss from wildfires. The exceptions are those fires that kill sawlog trees (not merely wound or defoliate) and destroy or damage cut pulpwood, logs, fuel wood, fences, buildings, and other forest products or tangible improvements. A separate appraisal must be made to determine these added damages. The average value of these supplemental losses is not included in the tables because of the wide variation between fires; damages to improvements have been appraised as high as \$20,000 on a 20-acre fire, whereas the usual figure is zero.

Classifying the Timber Stand--Field

As a general rule no plots will be measured and no tallies made when classifying the timber stand. The warden or fire boss, while suppressing the fire, particularly while mopping up or stepping across and around the fire to determine the area, should be able to determine the stand condition with little difficulty or extra work.

To illustrate how a timber stand is classified, assume that an 18-acre fire burned on March 15, 1951, at the intersection of Heywood and Shoal Roads, Limestone Township. The town warden estimated the situation thus: natural stand, about 50 percent pine and 50 percent hardwoods, predominantly pulpwood size, growing space pretty well occupied and no large openings or brushy areas, no saw timber killed and no cut forest products or physical improvements damaged. So he reported this information on the Supplemental Fire Damage Report in this manner (his entries shown on the sample form on the following page):

Location-- intersection Heywood and Shoal roads, Limestone Township
Name-Number-- Limestone #46
Date of fire-- March 15, 1951
Type (page 17)-- Pine-hardwood
Origin (page 17)-- Natural
Size class (page 18) and density (page 18)--4.1-10.0 inches, satisfactory
Area burned -- 18 acres

Ordinarily that concludes the warden's part in appraising fire damages.

Supplemental appraisals to determine the worth of saw timber killed and cut products or improvements destroyed must be designed to fit individual jobs. For instance, if a great deal of saw timber was killed over a 3,000-acre area, a 10- or 20-percent cruise might be made to determine the volume killed. But if the same kill occurred on only 10 acres, probably a 100-percent tally would be made. Hence, no attempt is made to outline the procedures to be followed. Stumpage and improvement values used, of course, should be the average price currently paid in free sales for similar commodities in the community.

SUPPLEMENTAL FIRE DAMAGE REPORT

Location Int. Heywood and Shoals Rds., Limestone Township

Name-number Limestone #46 Date of fire March 15, 1951

PINE TYPE [ ] PINE-HARDWOOD TYPE [X]

Planted [ ]	Natural [X]		Area Burned	Fire Intensity	Damage per Acre	Total Damage
Size class	Density					
Inches DBH	Stems per acre Less than	Stems per acre More than	Acres	B.I. or class	Dollars	Dollars
0-2.0	300 [ ]	300 [ ]				
2.1-4.0	200 [ ]	200 [ ]				
4.1-10.0	120 [ ]	120 [X]	18.0	65	7	126
10.1 plus	15 Classify young growth	15 [ ]				

HARDWOOD TYPE

0-12.0	200 [ ]	200 [ ]				
12.1 plus	15 Classify young growth	15 [ ]				
Total area burned			18.0			

1. Damage to young growth and intangibles, sub-total from above 126
2. Damage or value of sawlog trees killed
3. Damage to forest products
4. Damage to improvements

Total damage--sub-total, items 1-4 126

Computations--Office

In addition to the stand classification, a measure of fire intensity is essential in appraising fire damage. Where fire danger is measured, as in most districts, and the burning index recorded in the district office, the dispatcher or other designated person need only enter the index in the Fire Intensity column on the Supplemental Fire Damage Report. If danger measurements are lacking, intensity must be estimated while suppressing the fire and the estimate recorded as part of the field data. With the stand classified, fire intensity recorded, and knowing the season of the year, the district officer can easily find the average damage per acre under the proper category in the tables and record this figure on the form. Total damage, of course, is merely the product of acres and damage per acre.

In the preceding illustration, with a burning index of 65, the office entries on the Supplemental Fire Damage Report are those that are circled.

STANDARDS AND DEFINITIONS

For appraisal purposes, the area burned may be considered as a single unit if it is fairly uniform; if it is not uniform, it may be divided into any number of smaller units in terms of the following definitions and standards:

1. Forest type

   a. Pine--75 to 100 percent conifers, regardless of species
   b. Hardwoods--75 to 100 percent hardwoods, regardless of species
   c. Pine-hardwood--Any mixture other than the above

   If few or no trees are evident (open land), the area should be classified as one of the three types according to the timber type surrounding the area.

2. Stand origin (method of establishment)

   a. Natural--established by natural seeding or sprouting
   b. Planted--established by direct seeding or planting

3. Size class

Classified according to the diameter breast high (4-1/2 feet above ground) of the predominating group of trees per unit of area, whether they be seedling, sapling, pole, or sawlog trees.

Description	Size class (d.b.h.)
Pine and pine-hardwood types	
Seedlings to bean poles	0 - 2.0"
Bean poles to pulpwood	2.1" - 4.0"
Pulpwood or cordwood	4.1" - 10.0"
Saw timber	10.1" plus
Hardwood type	
Seedlings, bean poles, and cordwood	0 - 12.0"
Saw timber	12.1" plus

Where two or more size classes are intermingled, only one will be used. It will be the largest size class with satisfactory density, or if no size class has satisfactory density, the size class showing the greatest injury.

4. Stand density

Pine and pine-hardwood types: classified according to the number of conifers per acre, other species disregarded.

Hardwood type: classified according to the number of hardwoods other than weed species (sassafras, sourwood, fire cherry, gray birch, alder, etc.) per acre.

Satisfactory stocking: characterized by uniform tree spacing, few openings and no large openings, little or no grass, ferns, and weeds growing under the tree crowns, and the following number or more trees per acre. The average spacing of trees in a satisfactorily stocked stand is also tabulated because sometimes it is easier to judge spacing than to estimate the number of trees.

Size class (d.b.h.)	Trees per acre (Minimum number)	Spacing (Maximum feet)
	Pine and pine-hardwood types	
0 - 2.0"	300	12 x 12
2.1" - 4.0"	200	15 x 15
4.1" - 10.0"	120	20 x 20
10.1" plus	15	50 x 50
	Hardwood type	
0 - 12.0"	200	15 x 15
12.1" plus	15	50 x 50

Unsatisfactory stocking: all stands not conforming to the above, including "open land."

5. Season of the year: Either the following average dates or the individual median dates, shown on page 10, may be used.

   a. New England and New York

      Summer: May 1 through October 15
      Winter: October 16 through April 30

   b. Other states

      Summer: April 1 through October 30
      Winter: November 1 through March 31

6. Fire intensity

County or district index for the day as integrated by the type 5-W or 5-0 meters, or, lacking danger measurements, an estimate as follows:

Light--burning indexes 0-11, mortality among seedlings and saplings one-third or less

Moderate--burning indexes 12-35, mortality one-third to one-half

Severe--burning indexes 40-100, mortality over one-half

FIRE DAMAGE TABLES

Table 1: Pine-hardwood type, natural stands, fire danger measured.

Table 2: Pine-hardwood type, natural stands, fire danger estimated.

Table 3: Pine type, natural stands, fire danger measured.

Table 4: Pine type, planted stands, fire danger measured.

Table 5: Pine type, planted and natural stands, fire danger estimated.

Table 6: Hardwood type, natural stands, fire danger measured.

Table 7: Hardwood type, natural stands, fire danger estimated.

Table 1.--Forest fire damage per acre, pine-hardwood type, natural stands

SATISFACTORY DENSITY

Dollar damage per acre	Summer				Winter			
	Size class DBH (Inches)				Size class DBH (Inches)			
	0-2.0	2.1-4.0	4.1-10.0	10.1+	0-2.0	2.1-4.0	4.1-10.0	10.1+
	Burning Index				Burning Index			
1							1	1
2						1	2	2-3
3		1	1	1-3		2-4	3-4	4-15
4		2	2	4-9	1	5-10	5-10	16-45
5		3	3-4	10-75	2	11-16	11-20	50-100
6		4-5	5-10	80-100	3	17-20	25-50	
7	1	6	11-20		4-6	25-30	55-100	
8	2	7-8	25-40		7-9	35-40		
9	3	9-10	45-75		10-16	45-50		
10	4-10	11-13	80-100		17-40	55-65		
11	11-100	14-17			45-100	70-80		
12		20-25				85-95		
13		30				100		
14		35-45						
15		50-100						

UNSATISFACTORY DENSITY

Dollar damage per acre	Summer 0-2.0	Summer 2.1-4.0	Summer 4.1-10.0	Summer 10.1+	Winter 0-2.0	Winter 2.1-4.0	Winter 4.1-10.0	Winter 10.1+
1						1-2	1-2	
2	1-3	1-4	1-4		1-15	3-20	3-20	
3	4-100	5-12	5-35		16-100	25-60	25-100	
4		13-25	40-100			65-100		
5		40-100						

Table 2.--Forest fire damage per acre, pine-hardwood type, natural stands

SATISFACTORY DENSITY

Estimated fire intensity	Summer				Winter			
	Size class DBH (Inches)				Size class DBH (Inches)			
	0-2.0	2.1-4.0	4.1-10.0	10.1+	0-2.0	2.1-4.0	4.1-10.0	10.1+
	Dollar damage per acre				Dollar damage per acre			
Light	10	6	6	4	7	4	4	3
Moderate	11	12	7	5	10	6	5	4
Severe	11	15	9	5	11	10	7	5

UNSATISFACTORY DENSITY

Estimated fire intensity	Summer 0-2.0	Summer 2.1-4.0	Summer 4.1-10.0	Summer 10.1+	Winter 0-2.0	Winter 2.1-4.0	Winter 4.1-10.0	Winter 10.1+
Light	3	3	3		2	2	2	
Moderate	3	4	3		3	2	2	
Severe	3	5	4		3	4	3	

Table 3.--Forest fire damage per acre, pine type, natural stands

SATISFACTORY DENSITY

Dollar damage per acre	Summer				Winter			
	Size Class DBH (Inches)				Size Class DBH (Inches)			
	0-2.0	2.1-4.0	4.1-10.0	10.1+	0-2.0	2.1-4.0	4.1-10.0	10.1+
	Burning Index				Burning Index			
1							1	1
2						1-2	2-4	2-3
3		1-2	1-2	1-3	1	3-10	5-13	4-15
4		3-4	3-8	4-9	2	11-20	14-35	16-40
5		4-6	9-25	10-75	3-5	25-35	40-100	45-100
6	1	7-9	30-80	80-100	6-10	40-50		
7	2-4	10-13	85-100		11-20	55-65		
8	5-12	14-17			25-55	70-80		
9	13-35	20			60-100	85-95		
10	40-100	25-30				100		
11		35-40						
12		45-50						
13		55-60						
14		65-75						
15		80-100						

UNSATISFACTORY DENSITY

Dollar damage per acre	Summer 0-2.0	Summer 2.1-4.0	Summer 4.1-10.0	Summer 10.1+	Winter 0-2.0	Winter 2.1-4.0	Winter 4.1-10.0	Winter 10.1+
1		1			1-2	1-6	1-5	
2	1-50	2-9	1-25		3-100	7-50	6-100	
3	55-100	10-25	30-100			55-100		
4		30-65						
5		70-100						

Table 4.--Forest fire damage per acre, pine type, planted stands

SATISFACTORY DENSITY

Dollar damage per acre	Summer				Winter			
	Size class DBH (Inches)				Size class DBH (Inches)			
	0-2.0	2.1-4.0	4.1-10.0	10.1+	0-2.0	2.1-4.0	4.1-10.0	10.1+
	Burning Index				Burning Index			
1							1	1
2						1	2	2-3
3			1	1-3		2-4	3-4	4-15
4		1	2	4-9		5-9	5-11	16-40
5		2-3	3-5	10-75		10-16	12-25	45-100
6		4	6-10	80-100	1	17-20	30-50	
7		5-6	11-20		2	25-30	55-95	
8		7	25-45		3	35	100	
9		8-9	50-95		4-5	40-45		
10	1	10-11	100		6-8	50-55		
11	2	12-13			9-12	60-65		
12	3-4	14-15			13-25	70-75		
13	5-9	16-17			30-50	80-85		
14	10-20	20			55-100	90-100		
15	25-70	25						
16	75-100	30						
17		35						
18		40						
19		45						
20		50-55						
21		60-70						
22		75-85						
23		90-100						

UNSATISFACTORY DENSITY

Dollar damage per acre	Summer 0-2.0	Summer 2.1-4.0	Summer 4.1-10.0	Summer 10.1+	Winter 0-2.0	Winter 2.1-4.0	Winter 4.1-10.0	Winter 10.1+
1						1	1-2	
2		1-4	1-5		1-4	2-17	3-20	
3	1-6	5-10	6-35		5-20	20-45	25-100	
4	7-100	11-17	40-100		25-100	50-85		
5		20-35				90-100		
6		40-55						
7		60-100						

Table 5.--Forest fire damage per acre, pine type

NATURAL STANDS

SATISFACTORY DENSITY

Estimated fire intensity	Summer				Winter			
	Size class DBH (Inches)				Size class DBH (Inches)			
	0-2.0	2.1-4.0	4.1-10.0	10.1+	0-2.0	2.1-4.0	4.1-10.0	10.0+
	Dollar damage per acre				Dollar damage per acre			
Light	8	5	4	4	5	3	3	3
Moderate	9	9	5	5	7	4	4	4
Severe	10	14	6	5	9	7	5	5
UNSATISFACTORY DENSITY								
Light	2	2	2		2	1	1	
Moderate	2	3	2		2	2	2	
Severe	3	4	3		2	3	2	

PLANTED STANDS

SATISFACTORY DENSITY

Estimated fire intensity	Summer 0-2.0	Summer 2.1-4.0	Summer 4.1-10.0	Summer 10.1+	Winter 0-2.0	Winter 2.1-4.0	Winter 4.1-10.0	Winter 10.0+
Light	13	7	5	4	9	4	4	3
Moderate	14	14	7	5	12	6	5	4
Severe	15	21	9	5	14	11	7	5
UNSATISFACTORY DENSITY								
Light	3	3	2		3	2	2	
Moderate	4	5	3		3	3	2	
Severe	4	7	4		4	4	3	

Table 6.--Forest fire damage per acre, hardwood type, natural stands

SATISFACTORY DENSITY

Dollar damage per acre	Summer		Winter	
	Size class DBH (Inches)		Size class DBH (Inches)	
	0-12.0	12.1 plus	0-12.0	12.1 plus
	Burning Index		Burning Index	
1		1	1-2	1-14
2	1-2	2-30	3-8	15-80
3	3-11	35-100	9-40	85-100
4	12-65		45-100	
5	70-100			

UNSATISFACTORY DENSITY

1	1-100		1-100	

Table 7.--Forest fire damage per acre, hardwood type, natural stands

SATISFACTORY DENSITY

Estimated fire intensity	Summer		Winter	
	Size class DBH (Inches)		Size class DBH (Inches)	
	0-12.0	12.1 plus	0-12.0	12.1 plus
	Dollar damage per acre		Dollar damage per acre	
Light	3	2	2	1
Moderate	4	2	3	2
Severe	4	3	4	2

UNSATISFACTORY DENSITY

Light	1		1	
Moderate	1		1	
Severe	1		1	

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