

DAMAGE BY LIGHT SURFACE FIRES IN WESTERN YELLOW-PINE FORESTS

WALLOWA AND WHITMAN NATIONAL FORESTS

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Contributed

To determine the effect which light surface fires have upon commercial timber, a field study was recently made by the Forest Service in Oregon of typical yellow-pine stands in which surface fires had occurred, probably for centuries, at irregular but rather frequent intervals. The study was simple and rather rough in its methods, and does not exhaust the subject, but the observations were made with care, so that the results can be taken, so far as they go, as very representative of actual conditions over a large area.

The first part of this study had as its object to find out how many trees are killed and fire-scarred by an average "light" surface fire in western yellow-pine forests in eastern Oregon. The second part of this study aimed to find out how many yellow-pine butt logs, cut in logging operations in this region, are actually damaged by these light fires.

1. *Number of Trees Killed and Scarred by Surface Fires*

To get this information, there were selected several typical western yellow-pine stands in the Blue Mountains of eastern Oregon, which had recently been burned over by the surface fires, and which had been periodically run over by similar fires. Strips, one chain wide, were then run in all directions across these fresh burns and all the trees tallied by species in four classes:

(a) "Burned to death," trees that were killed by the heat of the surface fires about their bases. In this class were placed only trees which were known to be killed by the burning of the inflammable material about them. Trees which were killed by fire in their crowns were not included, because the strips were not run where the fire was of the nature of a crown fire.

(b) "Felled by fire," living trees which were burned off at the base by fire eating into basal fire scars.

(c) "Scarred by fire," trees which were so scarred by fire at their bases that the wood of the trunk was exposed. Under this heading were included trees which had been fire-scarred by previous fires, as well as those

scarred by the recent fire, since it was impossible to determine when the scars originated.

(d) "O. K.," trees which at the time of examination showed no bad effects from the fire.

In three separate burns in yellow-pine timber, 130 acres were tallied in this way, and the results are, therefore, representative of average conditions in this region. They show that a surface fire fells by eating out basal fire scars, on the average from one merchantable tree to each 4 acres to as high as two or three trees per acre; and that 42 per cent of all the merchantable yellow pines show fire scars at their bases. The summary of the tally on these yellow pines is shown in the following table, and, by way of comparison, the percentage of each form of injury received by other species is also given:

TABLE 1.—Percentage of each form of injury that trees of each diameter class receive from surface fires

Diameter breast high.	Burned to death.	Felled by fire.	Scarred by fire.	Apparently O. K.
WESTERN YELLOW PINE.				
12-18 inches.....	7.68	0.83	32.22	59.27
19-24 inches.....	4.96	5.22	39.69	50.13
25-30 inches.....	2.98	3.20	50.96	42.86
31-36 inches.....	5.83	2.92	53.35	37.90
Over 36 inches.....	6.31	3.16	60.00	30.53
All sizes.....	3.13	1.88	42.54	49.75
DOUGLAS FIR.				
All sizes.....	4.38	1.39	17.88	76.35
WESTERN LARCH.				
All sizes.....	.....	2.49	33.38	64.13
GRAND FIR.				
All sizes.....	13.06	.....	28.35	58.59

NOTE.—The figures for Douglas fir, western larch, and grand fir are in part compiled from data additional to that from which the yellow-pine figures are taken.

This table brings out the fact, which is so often observed, that the largest yellow pines are those which are most apt to be fire-scarred, probably because they are the oldest and have been subjected to the greatest number of these periodic surface fires. Yellow pine is apparently more susceptible of fire-scarring than the other species, which is in accordance

with its relatively thin bark and highly inflammable wood. Grand fir, while not susceptible of severe basal fire-scarring, is apt to be scorched to death because of its low crown.

In another small burn in a pure yellow-pine forest, where the fire had been merely a seemingly harmless ground fire, 6 out of the 297 yellow pines on the 23 acres were toppled over by being burned off at the base. Being the larger trees in the stand, they represented at least 6 per cent of the merchantable timber on the tract. Such damage by a very slight fire, which is not unusual, is, of course, possible only where the area has been repeatedly burned over so that a large percentage of the trees have scars which each succeeding fire enlarges.

Not alone are 1.8 per cent of the merchantable yellow pines gnawed off at the butt by each surface fire, and 42 per cent of the remainder scarred so that they are liable to be a prey of the next fire, but many of those which survive the fire are badly damaged for the use of the lumberman by having their butts "pitched" and by having a piece of the base actually consumed.

2. Damage to Butt Logs as a Result of Repeated Fires

The presence of "fat pitch" in the log depreciates its value for commercial purposes, since when much pitch is present the lumber will be as low grade at least as C Select.

In order to see just how much material was lost in a logging operation on account of fire scars, and what percentage of the butt logs were pitchy, a special record was kept of all the yellow-pine butt logs on a timber sale on the Whitman National Forest. The result of this study upon 900 butt logs shows the following interesting result:

TABLE 2.—Damage to butt logs

Description of logs.	Number of logs.	Per cent of total number of logs.	Average in scale per log.	Average deduction in scale per log.
			<i>Feet.</i>	<i>Feet.</i>
1. With small fire scars only.....	47	5	265	.....
2. With small pitchy areas only.....	258	29	369	.....
3. With bad pitchy areas.....	18	2	471	52
4. With bad fire scars and pitchy areas.	150	17	329	58
5. Defective, but not because of fire...	15	1	467	160
6. Free from defect.....	412	46	229	.....
Total.....	900	100	297	127

¹ Of the defective logs only.

The average diameter of the pitchy areas on the basal cross-sections of the 276 pitchy logs is a little less than 14 inches, but no deduction in the scale of these logs was necessary except in the case of 18 of them in which the pitching was greater—up to two feet in diameter sometimes.

The record of the butt logs for 1,184 trees (kept in two tests) shows that:

22.8 per cent of the butt logs show fire scars.

18.6 per cent are so defective because of fire damage that deduction in their scale is necessary.

46.1 board feet, or 14 per cent of their volume, is the average amount lost in each defective log.

25 per cent of the logs show in their basal cross-sections areas of "fat pitch," averaging 14.7 inches in diameter.

These figures may be taken as representative of conditions in the yellow-pine forests of eastern Oregon, which have been repeatedly subjected to surface fires. Striking as they are, they underestimate rather than overestimate the actual damage to the merchantable trees, for some of the most defective butts were left in the woods in high stumps and were not taken account of in this tally.

To express this loss in dollars and cents, in general terms for all fires, is quite impossible. Each fire, no matter how light it is, does damage to the commercial timber, often not in a conspicuous way, but nevertheless in a very real way. It may be said that each surface fire in this region kills outright a merchantable tree to each two or three acres, it leaves 42 per cent of the remaining merchantable trees fire-scarred so that they may fall victims to the next high wind or surface fire, and it "pitches" the butts of a large proportion of the best trees. These facts forcibly indicate that not only are surface fires immensely detrimental to the future welfare of a yellow-pine forest, but they also seriously depreciate its present commercial value.