



Fire damage effects on red oak timber product value

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In this study, researchers sought to determine how timber value was affected by fire damage to the boles of saw-log size trees. The lowest logs of fire-injured red oaks were harvested and milled into dimensional lumber. Value losses due to fire injuries were tracked through the lumber grading and valuation processes.

The economic loss due to fire-caused injuries (i.e., fire scars) was measured in terms of volume and value in the butt logs (only) of 88 red oak (*Quercus velutina*, *Q. rubra*, and *Q. coccinea*) trees harvested from prescribed fire units in southern Missouri. Fire scar dimensions and tree sizes (diameter at breast height (DBH)) were measured prior to tree harvest. Trees with varying diameter, external fire damage,



Fire-scarred tree pre- and post-harvest. The dotted circle on the base of the log depicts (to scale) the log's small end diameter. The solid square shows the portion of the round log that is utilized when manufacturing rectangular dimensional lumber. Though this tree appeared heavily defected while standing, its butt log value loss was 8.0%, and its volume loss was 2.8%, with much of the fire-injury defect removed during the milling process. For the whole tree, value loss was 4.4% if upper logs are considered. Photos: Joe Marschall

MANAGEMENT IMPLICATIONS

- For red oak sawlogs, most value loss is due to lumber grade changes, not volume loss.
- Expect minimal value loss for red oak sawlogs with fire damage less than 20 inches tall.
- Regardless of fire-scar size, red oak sawlogs harvested within 5 years of injury will have little or no value loss.

and fire-scar residence time (time between fire damage occurrence and tree harvest) were selected. DBH ranged from 9.5 – 24.8 inches; fire-scar heights ranged from 6 to 154 inches; and fire-scar residence time was a maximum of 14, minimum 2 years. The number of logs above the butt

log (upper logs) were tallied and the small end diameter measured. Lumber grade changes and volume losses due to fire-related injuries were tracked on individual boards (n=1298, 7754 board feet). Lumber values were assigned using rough, green lumber values reported by the Hardwood Market Report (April, 2011).

Overall, value and volume losses were low. Volume loss per fire-scarred log averaged 3.9%, with the value loss average per butt log at 10.3%. The average value loss decreased to 7.1% if estimated values for the upper logs were considered. A large amount of fire-caused defect was removed incidentally during the milling process (see figure). Statistical models were developed that predict log value loss from tree size, fire scar size, and fire-scar residence time. A reference table (next page) was developed to estimate value loss per butt log from tree size (DBH) and fire-scar height and depth. Depending on fire-scar height, annual value loss is estimated to range from 0.5% to 1.3%. For example, a fire scar 40 inches in height is expected to lead to about 10.5% value loss to the butt log if the tree is harvested 14 years after the fire damage occurred.

Trees that were mid-sized (i.e., pole size) when injured were most likely to experience higher value loss, while trees that were small or large in diameter at

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time of injury typically experienced little or no value loss. If fire damage is less than 20 inches in height and/or less than 20 percent basal circumference is injured, then little value loss occurred over 14 years. If these thresholds were exceeded, then value loss was likely. Regardless of fire-scar size, value loss was very low if trees were harvested within five years after fire damage.

fellings and lopping of excessive fuels near crop trees) in a shelterwood harvest accompanied by prescribed fire can minimize damage to residual trees, indicating that fire-scar heights, and timber quality losses can be effectively minimized.

which are at least 8 inches DBH at time of fire damage and a log grade typical for dimensional lumber utilization (i.e., 'sawlogs') as opposed to higher value products such as veneer or staves, and with fire-scar residence times not greater than 14 years.

The findings from the study summarized here are applicable only for red oak trees

Study authors note that [Brose and Van Lear \(1999\)](#) found that implementing relatively simple practices (i.e., directional

FOR FURTHER READING

[P. Brose, D. Van Lear, 1999. Effects of seasonal prescribed fires on residual overstory trees in oak-dominated shelterwood stands. South. J. App. For., 23 \(2\), pp. 88–93.](#)

		DBH (inches)													
		10	11	12	13	14	15	16	17	18	19	20	21	22	23
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	10	2	2	2	1	1	1	1	1	1	1	1	1	1	1
	30	5	4	4	3	3	3	2	2	2	2	2	2	2	1
	50	8	7	6	5	5	4	4	3	3	3	3	2	2	2
	70	11	10	8	7	6	6	5	4	4	4	3	3	3	3
	90	15	12	10	9	8	7	6	6	5	5	4	4	4	3
	110	18	15	13	11	10	8	7	7	6	5	5	5	4	4
	130	21	17	15	13	11	10	9	8	7	6	6	5	5	5
	150	24	20	17	15	13	11	10	9	8	7	7	6	6	5
	170	27	23	19	17	14	13	11	10	9	8	7	7	6	6
	190	30	25	21	18	16	14	13	11	10	9	8	8	7	6
Fire-scar height X	210	33	28	24	20	18	16	14	12	11	10	9	8	8	7
	230	36	30	26	22	19	17	15	13	12	11	10	9	8	8
fire-scar depth (inches)	250	40	33	28	24	21	18	16	15	13	12	11	10	9	8
	270	43	36	30	26	23	20	18	16	14	13	12	11	10	9
	290	46	38	32	28	24	21	19	17	15	14	12	11	10	10
	310	49	41	35	30	26	23	20	18	16	15	13	12	11	10
	330	52	43	37	32	28	24	21	19	17	15	14	13	12	11
	350	55	46	39	34	29	26	23	20	18	16	15	14	12	11
	370	58	49	41	35	31	27	24	21	19	17	16	14	13	12
	390	61	51	43	37	32	28	25	22	20	18	16	15	14	13
	410	64	54	46	39	34	30	26	24	21	19	17	16	14	13
	430	68	56	48	41	36	31	28	25	22	20	18	17	15	14
	450	71	59	50	43	37	33	29	26	23	21	19	17	16	15
	470	74	62	52	45	39	34	30	27	24	22	20	18	16	15
	490	77	64	54	47	41	36	31	28	25	23	21	19	17	16

Percent value loss on standing timber per butt log, based on fire-scar measurements and tree diameter.

