

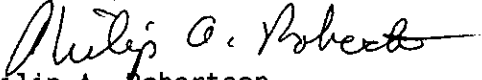
April 28, 1992

Mr. Todd Fink
Illinois Department of Conservation
Ferne Clyffe State Park
P. O. Box 67
Goreville, IL 62939

Dear Todd,

Enclosed please find a copy of a report that we did concerning our work on fire frequency in the Oak-Hickory forest type in Southern Illinois. Our major goal was to try to determine frequency of fire before recent settlement; however, because most of the trees were insufficiently old, we felt that further expenditure of money was unwarranted. We hope that this report suffices and that the money has been returned to your agency in proper fashion. If you have any questions, please do not hesitate to contact me.

Sincerely,



Philip A. Robertson
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SIU
618-453-3236

FIRE FREQUENCY IN OAK-HICKORY FORESTS OF SOUTHERN ILLINOIS

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INTRODUCTION

There is mounting evidence that *Acer saccharum* is increasing in density in oak-hickory forests of the interior midwest (Shotola et al., 1992; Boggess, 1964; Boggess and Bailey, 1964; Ebinger, 1968; Ebinger and Parker, 1969; Johnson and Bell, 1975; and Schmelz et al., 1975; Weaver and Ashby, 1971; Weaver and Robertson, 1981; Schlesinger, 1976, 1989). This increase may be the result of anthropogenic modifications in the natural disturbance regimes of these forests. Several types of natural disturbance occur including wind-throw, insect infestations, earthquakes and wildfire. Of these, the disturbance factor most modified by man is wildfire which has been very successfully suppressed during the past 5 or 6 decades. Severe, stand replacing fires are essentially non-existent today and as a result shade tolerant species such as *Acer saccharum* and *Asimina triloba* are becoming more abundant in mature mesic oak-hickory woods and the less shade tolerant dominant oaks and hickories are not reproducing. Lack of fire has also been credited with woody plant encroachment in drier *Quercus stellata* savannas in Missouri (Schroeder, 1982) and other barrens type communities in the midwest (McInteer, 1944; Guyette and McGinnes, 1982; Bacone et al., 1983; Nuzzo, 1986).

Little is known about the presettlement fire frequency or history of deciduous forests of the interior midwest. One study by Guyette and Cutter (1991) in Missouri reported that in *Quercus stellata* communities, fire frequency was greatest between 1700 and 1810 with an average fire free interval of about 4.2 years. Fire frequency decreased about 1882 when native American Indians began to exit the area. There was an increase in fire frequency when Euro-American settlers moved into the region. Because most of the forests are second or third growth, great difficulties if not impossibilities occur with regard to obtaining presettlement fire history. To attempt to obtain information about fire frequency in the Ozark and Shawnee Hills of southern Illinois, this study was initiated. The objective of this study was to determine presettlement and postsettlement fire frequency in Oak-Hickory communities from several sites in southern Illinois.

METHODS AND MATERIALS

Sites from which trees had been recently cut were located from U. S. Forest Service and Illinois Department of Conservation records. Each site was visited

and stumps were evaluated for the presence of fire scars and tallied accordingly. If an abnormality or discontinuity in the wood could not be identified as a fire scar it was not tallied. Fire scars were those discontinuities or abnormalities in the wood that showed a healing type of growth response over several cm of the stem surface for that annual ring. That is, the healing response was a thickened over-growth of new tissue that grew over the damaged area. Stumps with fire scars were aged as close to the center as possible and the age of the fire scar(s) determined. About 10% of the stumps were sectioned with a chain saw and the sections returned to the laboratory for a check on the ages determined in the field. The four sites studied include the Big Ranch timber sale and Trail of Tears State Forest in Union County, a private timber sale on the Maginal property in Alexander County and Simpson's Barrens in Pope County, Illinois.

RESULTS

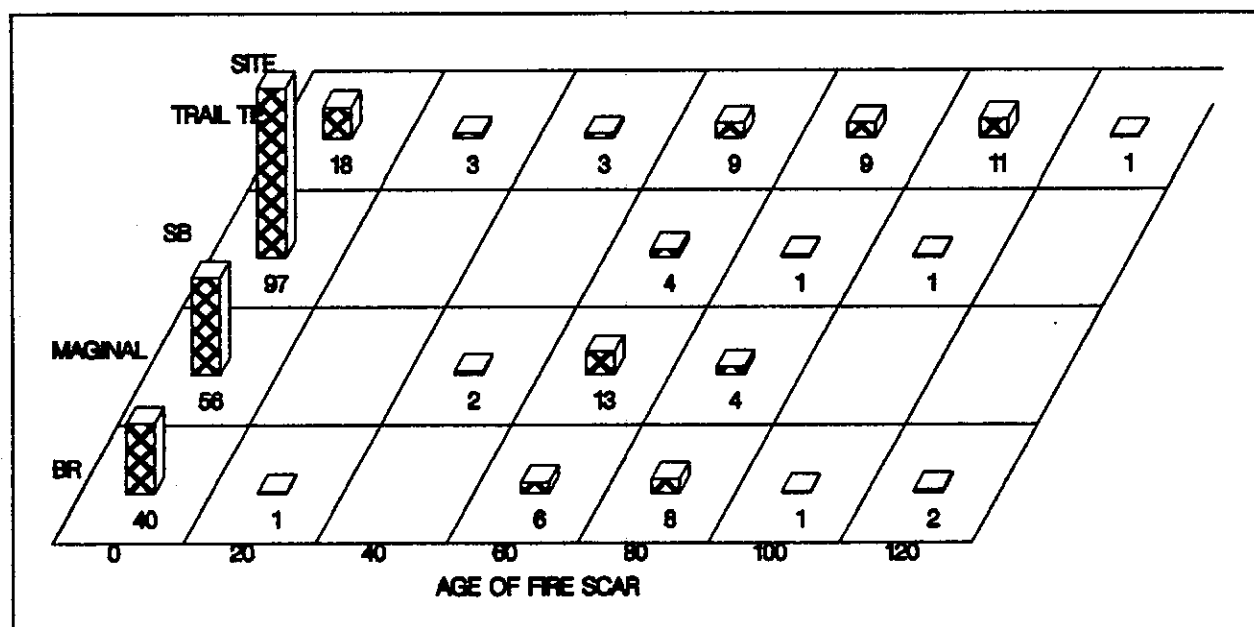


Figure 1. Frequency of fire scars from stumps evaluated on four sites in southern Illinois. Stumps without scars were coded as zero and occur in the first frequency class.

A total of 299 tree stumps were examined on the four sites. Fifty eight, 75, 112 and 54 stumps were from the Big Ranch, Maginal, Simpson's Barrens and Trail of Tears sites, respectively. No stump was older than about 150 years and those that were older than approximately 125 years were primarily hickories. Precise and accurate determine of tree age was virtually impossible as most tree centers were rotten or decayed. Figure 1 shows the frequency of fire scars by site. Those trees having no fire scar were given a fire scar age of zero. The greatest frequency of fire occurred about 60 to 80 years ago with only sporadic occurrences in the last 5 decades. A few of the older trees showed multiple fire scars. The lack of fire scars in the older age classes, in part, reflects that deteriorated condition of the heart wood of those

trees. In addition, if a fire occurred at the time a given stump was very young survival would be unlikely and consequently no fire scar would be present.

Table 1. Average age of stump and fire scar from four Oak-Hickory dominated sites in southern Illinois. First number is tree age and second is age of fire scar.

SITE	MEAN	STD	RANGE
ALL STANDS	94.5	24.9	55-150
	67.1	25.1	6-130
BIG RANCH	99.9	29.5	58-150
	77.6	23.7	17-130
MAGINAL	85.0	25.9	
	62.8	9.9	
SIMPSON'S BARRENS	79.0	22.1	55-118
	72.8	13.4	59-93
TRAIL OF TEARS	102.4	15.8	62-127
	71.4	26.6	6-117

Within some sites it became apparent that fire scars of different ages were present depending upon the location within that site. All sites but Simpson's Barrens, which was quite small, had two different areas surveyed. In two of the three sites where more than one area was surveyed, the average age of the fire scars differed (Table 1). The two areas at Big Ranch differed by about 12 years and at Trail of Tears by about 27 years. There was little difference between the two areas surveyed at the Maginal site.

Table 2. Average age and standard deviation of fire scars from sites and subsites surveyed in southern Illinois.

SITE	MEAN	STD DEVIATION	N
BIG RANCH 1	68.5	6.0	4
BIG RANCH 2	80.2	26.3	14
MAGINAL 1	63.1	7.1	15
MAGINAL 2	61.8	18.8	4
SIMPSON'S BARRENS	72.8	13.4	6
TRAIL OF TEARS 1	53.3	27.6	16
TRAIL OF TEARS 2	85.1	15.6	21

DISCUSSION

Because the trees were insufficiently old to permit an assessment of presettlement fire frequencies in the region, the project was abandoned. Based on a limited data set, it is evident that the fire frequency has diminished considerably in the last 60 years, due largely to fire suppression efforts by local, state and federal agencies. The higher fire frequencies from the early 1900's to about 1930 may result from intentional burning by local inhabitants. Haines *et al.*, (1973) report that in Missouri, fires were most frequent in March and April and then in late October and early November. Many of the fires were intentionally set, perhaps a carryover from earlier traditional practices. Miller (1920) that during the early 1900's much of the forest land of southern Illinois was burned annually under the pretext of increasing grass production for livestock, to improve passage through the forest for coon and possum hunting, to protect private property from fire and to improve the general health of the community. This ritual of annual burning likely did not encompass all areas every year but affected different areas with varying frequencies. This would explain why some areas show more fire scars than other areas. The fact that not all trees in an area show fire scars probably results from lack of an annual burn over the entire landscape and because any given fire varies in intensity and does not affect all trees equally. Miller's paper was basically a plea to implement some sort of fire control effort on this region as he believed and showed pictures to support the idea that annual burning was degrading these forests. Since annual burning is not characteristic of presettlement fire frequencies, one has to wonder what the presettlement natural fire frequency of these forests was. Presettlement fire frequency likely ranged between the annual burning of the early 1900's and the current situation where fires are virtually eliminated by suppression activities.

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