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Observations on the Effect of Logging on the Spread of Oak Wilt in the Brayton Memorial Forest, Iowa[1]

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The oak wilt disease, caused by *Endoconidiophora fagacerum* Bretz, has been present in the Brayton Memorial Forest, near Hopkinton, Delaware County, Iowa, for many years. The actual date of original infection is unknown.

Prior to 1951, the forest was left unmanaged and no disease control was attempted. During that year, a 100 percent inventory was made of the trees killed by this disease on a 38.6-acre tract within the forest (Brinkman 1952).

In 1952, the 38.6 acres were divided into three compartments to be logged on cutting cycles of ten-, five- and one-year durations. By June, 1956, five markings for cut and four cuttings had been made on the one-year cutting cycle plot. The sixth marking was due in this plot as well as the first in the five-year one in 1956.

When it was learned that the management of this 38.6-acre tract would be changed, another 100 percent inventory for oak-wilt-killed trees was made in the late spring of 1956. This paper presents the results of this inventory.

At the time of the 1951 survey, a majority of the wilting trees were black, northern red, and jack oaks. The dead red oaks were observed to lose their bark rapidly and stand for seven to eight years before falling. The black and jack oaks retained their bark and fell within five to six years. The white oaks were relatively free from oak wilt.

The 1951 tally on the 38.6-acre tract showed that an average of 5.89 trees per acre had been killed during the previous eight years, or 0.739 trees per acre per year. Because only standing trees were tallied, this figure was considered to be conservative.

The 1956 inventory over the same 38.6 acres tallied only standing trees which retained all or part of their bark. This was done in an attempt to avoid a double tally on any of the wilted trees. A control

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plot of 10.6 acres was established in a different part of the forest. Trees wilting at the time of the inventory were mapped but not included in the average figures because the number was not yet complete for the 1956 season. Partially dead white oaks showing no symptoms of wilting were not recorded. Single trees in the control plot, dead so long that the trunks were badly decayed or no bark remained on them, were included only when they were closely associated with more recently wilted trees that could be definitely diagnosed at "oak-wilt-killed" trees. Isolated trees that still contained evidence of mat and pad formation were included.

A total of 137 trees was tallied on the 38.6 acres in the recent inventory as being killed by oak wilt. This number included the 20 wilted trees recorded as cut and the 13 cut trees in the "harvest" class in 1955 which were assumed to be oak wilted (Table 1). This was an average oak wilt kill of 0.710 tree per acre per year. For the same period of time the average on the control plot was 0.811 tree per acre per year. In 1951 the average for the 38.6 acres was 0.736 tree per acre per year. This was 0.026 tree per acre per year higher than the 1956 figure.

Table 1

Data for the Annual Cutting Cycle Compartment of 13.87 Acres

No. of mark	Date marked	Date cut	Total No. trees marked	No. of wilted trees marked	No. oak-wilted trees removed/ acre
1	Jan. 1952	Oct. 1952	38	—	—
2	Sept. 1952	Oct. 1952	43	1	0.071
3	Fall 1953	Sp. 1954	38	4	0.288
4	Fall 1954	Sp. 1955	43	13[3]	0.937
5	Fall 1955	Fall 1955	24	15	1.081

[3]These trees were classed as "harvest" and therefore assumed to be oak wilt infected.

All tallied trees were classified as having been dead two or more years ago, one year ago or still in stages of wilting. This was determined by the degree of deterioration of bark and trunk and the advancement of the rhizomorphs of the shoestring root rot (*Armillaria mellea*). The locations of these trees were plotted on a map to show their interrelationships to each other and to previous logging activity as evidenced by scars left from skidding trails.

Individual compartments compared on a five-year basis indicated the average trees killed per acre per year to be nearly equal for the annual plot and the control plot. The other two cutting-cycle plots combined gave a slightly lower average. When the first four of these years were separated from the five-year average, the combined ten- and five-year plots gave approximately the same loss as the annual and control plots (Table 2). When the figures for the 1955 kill were treated separately, a doubling in oak wilt incidence was indi-

cated. This was true for all plots except the five-year one. No evident reason for the variation found between the plots can be advanced from the information available.

Although the amount of data available for this study has been insufficient for drawing definite conclusions, there is an indication that logging operations have little effect on the spread of oak wilt. After the 1955 season, loggers in northeastern Iowa suggested that their operations were increasing oak wilt damage. The correlation between spring logging wounds and natural long distance spread of oak wilt (Norris 1955) seemed possible. The above data, showing the same oak wilt increase in the ten-year plot where no logging was done, in the control plot located in a different part of the forest and in the annual cutting plot where logging was present, indicated no correlation between oak wilt spread and logging operations.

Table 2

Oak-Wilt-Killed Trees Per Acre Per Year on the 38.6-Acre Tract and 10.6-Acre Control Plot

	1951 Tally	1956 Tally				
Item		1 yr. cc plot	5 yr. cc plot	10 yr. cc plot	Combined 5 & 10 yr.	Control plot
Total five-year average	—	0.853	1.125	0.298	0.687	0.804
Total four-year average	—	0.688	1.230	0.237	0.707	0.604
1955 loss	—	1.514	0.703	0.542	0.607	1.604
Average total tally.	0.736			0.710		0.811

The authors suggest that in the future management plans of this upland oak forest, an oak wilt disease study be incorporated. Only in this way can reliable relationships between logging practices and oak wilt incidence be established.

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