MINNESOTA TREE LINE
Agricultural Extension Service
University of Minnesota

DUTCH ELM DISEASE -

Community Experiences

No. 5 — Ward C. Stienstra

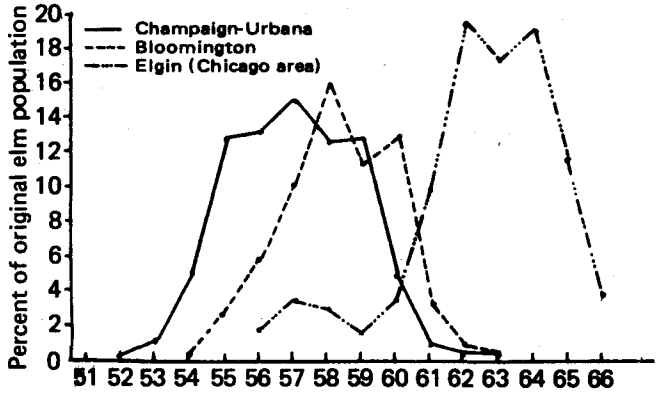
The causal organism of Dutch elm disease, *Ceratocystis ulmi,* was introduced into the United States from Europe in logs with not only the fungus but also the European bark beetle, *Scolytus multistriatus.* This bark beetle was reported to be present in Massachusetts as early as 1909 and the native bark beetle, *Hylungopinus rufipes,* probably was present also. It appears that the fungus and the beetles were present in logs destined for veneer factories in New York, Ohio, and Indiana, and the bark beetles escaped from the logs along the route of travel and caused the infection in at least 13 areas of seven states. In 1930 a few diseased elm trees were found in Ohio, and the fungus was identified by Dr. Curtis May. Dutch elm disease was reported around the port of New York in 1933. The disease spread until it has been reported from southeastern Canada to Georgia, Alabama, Mississippi, and Texas; west to Colorado and California; and north to Idaho and Oregon. It is now present in 41 states and is the most destructive shade tree disease in North America.

It is interesting to note that Dutch elm disease was first observed in 1919 at Tilburg, the Netherlands; in Belgium; and in France at several locations (Chalons-sur-Marne, Versailles, Vichy, and Bergerac). After 18 years, the disease was widely spread among elms bordering the roads in the Netherlands and in burl elms which were imported to the United States of America. The disease was first found in England in 1927 and moved to the Scottish border by 1937. The Dutch investigators performed much creditable research on Dutch elm disease. For many years, even in the 1930's, they had a systematic cleanup underway not to eradicate but to delay the spread of the disease and permit economic utilization of the elm. This effort gave the disease its name, Dutch elm disease. In midwestern North America, the fungal organism developed an aggressive form (more virulent) which is more devastating than the original. This aggressive or virulent form has destroyed 90 to 95 percent of the elms in many midwestern cities and is now in Minnesota. Similar disasters can occur in Minnesota cities in the next few years. The cost of dead tree removal in communities must be paid sooner or later. The experience of many cities in other states is that it makes good sense to spend money now, thus reducing the rate of tree loss. It is interesting to note further that the aggressive form from North America was reintroduced from Canada to England in 1969 with a cargo of infected logs.

The plague of Dutch elm disease is here. Just as before, when we did not heed the warnings that Dutch elm disease was coming and must be dealt with, even today many people and communities don't understand and/or appreciate the scope of the problem. Dutch elm disease is caused by a fungus. It is spread from tree to tree by common root systems, i.e., root grafts, and by beetles which feed on branches and reproduce under elm bark. These two means of spreading the disease soon kill 90 to 95 percent of the elm trees in any community.

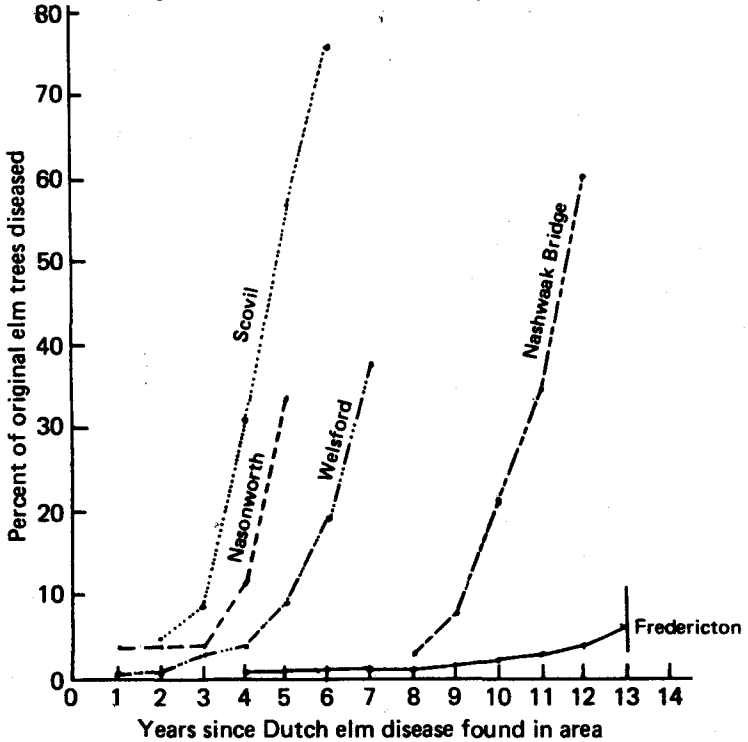
Cities Without Disease Control Programs

First are examples of the municipalities without disease control programs. In the greater Chicago area are examples of cities similar in landscape and design to many Minnesota communities and certainly to the Twin Cities Metro area. Elgin, Illinois (northwestern Chicago) annual losses are shown in figure 1. In 1966, 94 percent of the original parkway elm population was dead. In a short period of 9 years, 94 out of 100 trees were dead. The trees were a hazard, not only in terms of Dutch elm disease, but also a public nuisance, and eventually had to be removed. The cities of Aurora, Joliet, Waukegan, and Zion lost 91.1 percent, 92.1 percent, 80.8 percent, and 93.8 percent of their parkway elms in the same period. This same picture of rapid demise of elm was observed in other Illinois cities such as Champaign-Urbana and Bloomington (figure 1).



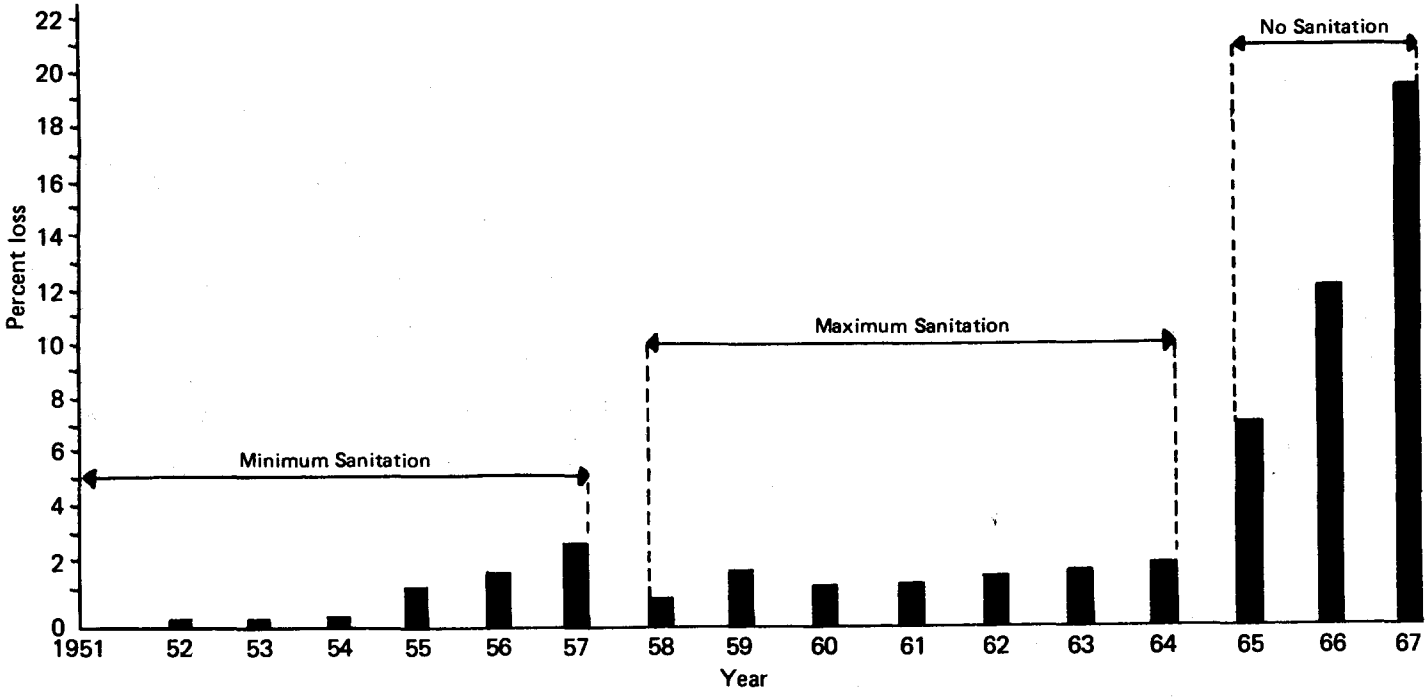
Annual DED infections

Dutch elm disease moved into new areas constantly. In 1957 it was discovered 95 kilometers north of Fredericton, Canada; 1 year later, it was only 16 kilometers from the city's boundaries. In 1957, the city acted to examine, record, and map all elm trees at least 12 centimeters Diameter at Breast Height (DBH). However, no disease was found in the city until 1961 when a diseased tree was confirmed. It was removed and destroyed under local legislation and tree commission powers. Since the



discovery (1961) of Dutch elm disease in Fredericton and implementation of the strict sanitation program, a total of 5.3 percent (74) of the elm trees have been lost. In Fredericton, called the City of Stately Elms, more than three times the number of diseased trees were removed because of decadence, street widening, fires, and other non-disease causes, while four nearby communities lost 33.3 percent, 37.4 percent, 59.7 percent, and 75.5 percent through 1974 from disease (figure 2). Communities with no sanitation lost an average of 12 percent per year. The losses have continued in the Fredericton control area and are gradually increasing, yet the relative loss is low. The Fredericton tree commission believes control measures will leave a residual healthy elm population within the city after most elms on the outskirts are dead and the vector Elm Bark Beetle (EBB) population is reduced. This should encourage other communities to practice sanitation, even those with a wild elm population around their boundaries, and particularly those with few natural occurring elm trees on the outside of the control area.

Dutch elm disease was found in two locations in central New York in 1946—12 miles north of Syracuse and ½ mile east. Five years later, the first diseased tree was found in Syracuse. From 1951 to 1957, every elm was tested for Dutch elm disease by examining samples from the suspect tree in petri plate culture. The presence of other vascular diseases in elms was insignificant and, further, several strains of the Dutch elm disease fungus were noted to be present. The disease potential was made known to the city administration but little was done until 1958, when a state law was amended to allow public removal of diseased trees on private land. During this period, losses increased rapidly because sanitation by the city was only partial and the public did not heed the city's warnings. The city removed and destroyed trees under its control while private beetle-infested elm wood was not destroyed. In fact, people collected and hoarded it for later use. As a result, the city's sanitation program was ineffective. The percent of dying elms removed increased from 67 percent in 1956, to 78 percent in 1957, to 95 percent in 1959 through 1964. Even during this period some people did not heed the city's warnings or believe that a potential disaster could occur. As a result, the effect of sanitation in some city areas was nullified. The overall city-wide losses from 1958 to 1964 saw an increase from 6.34 percent total **accumulative loss** to 17.99 percent. The loss varied from 0.94 percent to 2.02 percent **per year** for an average of 1.66 percent. These losses reflect all losses including those from drought, insect defoliation, and other adverse factors. The sanitation program consisted of detection, removal, and destruction. No extensive use of DDT by the city or private individuals was attempted. While the city did use some DDT for defoliating insect control, no bark beetle control was expected from these applications. In 1964 the city chose not to continue the sanitation program and the annual diseased tree loss increased to 6.14 percent in 1965, 10.19 percent in 1966, and 15.7 percent in 1967. The 7-year sanitation program was lost and without continued sanitation tree losses again accelerated logarithmically (doubling and tripling per year) (figure 3).



Communities With Disease Control Programs

Dutch elm disease was found in the greater Chicago area in 1954. After 3 years many cities organized disease control programs based on recommended procedures. Some, as stated before, chose not to combat the disease. In general, control programs rely on sanitation procedures aimed at reducing the insect vector population; spraying elms with insecticide to prevent insect transmission; and when required, root graft barriers to prevent root transmission. The practices are indirect, demanding, and expensive, but when followed aggressively result in acceptable disease losses. A mature tree population can be retained by communities if control practices are followed and elms lost to Dutch elm disease are replaced. Since 1957 the number of cities applying insecticide to healthy elms has been decreasing until now about 16 cities use methoxychlor in the late winter or early spring.

The percentage of parkway elms killed by Dutch elm disease in 18 cities follows. Nine of the communities discontinued spraying but all retained strict sanitation procedures. The **accumulative loss** rate ranges from 10 percent to 46.8 percent for the 14-year period of 1957-1971. The goal was a loss rate of less than 2 percent **per year;** most achieved that overall rate with higher losses in some years. It is suggested that the high loss rates reflect failures in adjacent communities. After many years it is clear that disease control practices followed conscientiously enable cities to maintain the valuable elm population. The program requires expertise, persistance, and authority.

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