



The Plant Doctor's LANDSCAPE TIPS

By Dr. David L. Roberts, *The Plant Doctor LLC a.k.a. The Tree Doctor*

DED AMERICAN ELMS: AN UPDATE

INTRODUCTION

Dutch Elm Disease (DED), caused by the fungus *Ophiostoma ulmi* (previously known as *Ceratocystis ulmi*), is an introduced, invasive, lethal disease of native elm species, especially American elm (*Ulmus americana*) (Photos 1A-1D). All North American elms are susceptible but some species such as slippery elm (*Ulmus rubra*, red elm) are slightly less susceptible than American elm. The popular 'Camperdown' elm (*Ulmus glabra* "camperdown") is very susceptible (Photo 2). There are several strains of the fungus (example: *O. novoulmi*, etc.) The fungus/disease was introduced into North America on elm logs in the early part of the 20th century and

was subsequently identified by scientists here in the early 1930s. Ironically, the U.S. had restrictions against the importation of elm lumber; however, there were no restrictions against the importation of elm logs for the purpose of veneer. DED receives its name from Dutch scientists who first identified the disease on Dutch elms in the Netherlands in 1921.

DED CYCLE

There is both a disease cycle and a tree cycle. The fungus is transmitted "overland" from infected trees to healthy trees by the elm bark beetle (*Scolytus* sp.), which tends to feed on two-year-old twigs. The insect produces distinctive galleries

(Photo 3) in the wood where larvae hatch from eggs and feed in a fan-shaped pattern, picking up propagules (spores) of the DED fungus. Once a tree branch is infected by beetle injury and transfer of the fungus, the fungus moves downward, usually in a rather narrow vascular pattern

Continued on page 18



Photo 1A



Photo 1B



Photo 1C



Photo 1D

Photo 1A-1D: The Buckley Elm was once considered the grandest elm in North America; it was the "Champion." Around 2000, the tree became infected by the DED fungus (1A)-note thinning in the top center of the tree. Photo 1B is slightly staged but nevertheless shows the grand size of the trunk. Looking up from beneath the Buckley Elm shows the grandeur of one of nature's cathedrals. All that's left of the Buckley Elm as of 2011 (Photo 1D).



Photo 2

Photo 2: This unusually large 'Camperdown' elm resides in Boyne City, Michigan and has, thus far, escaped the deadly DED fungus.



Photo 3

Photo 3: When elm bark beetle larvae tunnel after hatching from eggs, they create very distinctive galleries in the cambium tissues, where they pick up the DED fungus. These characteristic galleries can not only identify the insect as likely the elm bark beetle but can also be used to identify American elms (after they have died)!



The Plant Doctor's LANDSCAPE TIPS

DED AMERICAN ELMS: AN UPDATE

Continued from page 17

until it reaches trunk/root region, where it spreads and moves outward and upward, killing the tree. Verification of DED infections includes rather obvious vascular discoloration (streaking) beneath the bark (Photo 4). DED is a vascular wilt disease, analogous to Oak Wilt and Verticillium Wilt.



Photo 4: Vascular staining by the DED fungus is sometimes called streaking. Note dark striations in the vascular area directly beneath the bark. Healthy elm trees would exhibit an almost white coloration throughout the vascular region (see also Photo 10C).

People often believe that due to lethality of DED, that American elms are practically extinct. Nothing could be farther from the truth. First, there are many large elms that have “escaped” the disease (see below). Second, in Michigan, as is repeated in many areas of North America, millions of elms germinate every year and grow into trees . . . and millions of elms die every year. Elm seedlings often attain heights of 20-40-60 feet over a decade or two before being killed by “reinfection” by the DED fungus. Hence, this is a continual tree cycle of life and death. From an evolutionary standpoint, there is little impetus for American elms to develop resistance to DED because elm trees usually reach seed bearing age before dying.

PROMINENT ELMS (THE ESCAPES)

Another misconception that I encounter fairly often is that any large elms still in

existence must be resistant to DED. False!!! Although, it is important to consider the possibility of resistance development, in general, all elms native to North America are susceptible. Due to the rather haphazard nature of DED fungal spread by elm bark beetles and subsequent infection of healthy trees, many elms have escaped infection . . . sometimes for very long periods of time. Every year I receive phone calls from individuals who believe they possess the largest elm in existence – they often say, “It’s Huge!!!” My follow up usually discloses a nice elm that typically range in size from 1.5 to 2.5 feet trunk diameter. Large but not large compared to many older elms still living.

The Buckley Elm: Once considered the largest elm in North America by The Champion Tree Project (Photos 1A, 1B, 1C & 1D), this large elm resided in a farmer’s corn field near Buckley, Michigan (just south of Traverse City). The farmer claimed he could not cut the tree down because he didn’t have a chain saw large enough. Caretakers of the tree mistakenly believed the tree was resistant to DED. In 2000, the tree exhibited symptoms of DED, confirmed by lab analysis. I was called in to try to save the tree after it became infected. The lesson learned is that once an American elm becomes infected, it cannot be saved (see further details in the Management section below).

The Elms of the Grosse Pointes: There are an unusual number of mature elms in the Grosse Pointe cities in Michigan (Photo 5), largely due to dedicated DED management strategies, especially sanitation. A humongous elm still survives at the Lochmoor Country Club. Another nearby elm was purported to have been planted in 1700 (Photos 6A & 6B).

The Roberts Elm: While in high school in the late 1960’s, I pursued science fair projects as part of my college prep curriculum. The focus of one such project was grafting: grafting tomatoes on



Photo 5: Some of the Grosse Pointe cities of SE Michigan still possess significant populations of elms as evidenced by this photo taken several years ago by the author. One can still visualize how many streets in urban America appeared in the mid-1900s.



Photo 6A & 6B: This is a very large, old elm still surviving in the Grosse Pointes (6A, note author standing next to the tree). Note the graceful, vase-like structure for which American Elms are known. It carries this plaque from the Elm Research Institute (6B).

potato, pepper on tomato, etc. Denise was a classmate of mine, and her father was a Plant Pathologist who worked at the nearby U.S.D.A. Forestry Research Station near Delaware, Ohio. A focus of Dr. Carl Seliskar's work was finding resistance to the deadly DED. One avenue he pursued was grafting an American elm scion (shoot) onto a Siberian elm or Chinese elm root stock (Chinese and Siberian elms are largely resistant to DED, suggesting the likely source of DED-Asia). It was hoped that the DED-resistant root stock would confer resistance to the American elm shoot (top=scion). As part of my grafting project, Dr. Seliskar helped me graft an American elm shoot onto a Siberian elm root stock. The grafted tree measured less than 12 inches tall and approximated the diameter of a pencil. Upon completion of the project, I transplanted the tree into the family farm's front yard and forgot about it. While in graduate school in the late 1970s, Dr. Seliskar contacted me and asked what happened to the tree. I related that the tree was in my parent's front yard and that it was now over 15 feet tall. He and other scientists visited the tree and practically interrogated me on what I did to help the tree survive. Apparently, all of the 100's of trees the scientists had grafted, failed (broke). Hence, mine was the only survivor, and the tree reached some prominence in the local news . . . and perhaps in some scientific circles. Over the next 30 years, the tree grew to approximately 60 feet in height and measured over 30" at the graft union (Photo 7A). Unfortunately, in 2000, about the same period the Buckley elm contracted DED, my elm tree also contracted DED (Photo 7B).

DED MANAGEMENT

There are a multitude of options available to us for DED management. Following are brief descriptions of some of those options. Obviously, an integrated approach using most available tools at our disposal is advised.

Sanitation: A highly effective and practical procedure for DED control is sanitation – removing diseased elms at the first sign of infection. Leaving dead elms standing



Photo 7A



Photo 7B

Photo 7A & 7B: The “Roberts Elm” resulted from a grafting experiment I did in high school. An American elm scion was grafted onto a DED-resistance Siberian elm root stock. The theory was that the resistant root stock would confer resistance to the American elm top. Of the 100's (1000's?) of grafts performed by USDA scientists, mine was the only one to survive . . . at least for 30 years until it contracted DED in 2000. Photo 7A shows my father (in his mid-80's) standing proud next to the tree his son grafted; the graft union reached over 30 inches diameter. Also note the Siberian shoot emerging from the root stock (left). Photo 7B shows the tree in the throes of death from DED. Predictably, the Siberian elm produced a shoot from the root stock that still survives as a tree to this day.



Photo 8

Photo 8: Sanitation is an important DED management procedure, involving the prompt removal of infected elms once they have become infected. These dead elms remained in place for many years and served as sources of infection for elms in this community. Where was this photo taken? The affluent Bloomfield Hills!

in place almost guarantees a source of infection for other elms in the community (Photo 8). It is likely that nearby weedy, diseased elms led to the infection and death of the Buckley elm (Photo 9).

Continued on page 20



Photo 9

Photo 9: Failure to promptly remove diseased elms in a rigorous sanitation program can lead to enhanced spread of DED. Nearby infected, volunteer (weedy) elms undoubtedly led to the demise of the Buckley Elm (See also Photos 1A-1D).



The Plant Doctor's LANDSCAPE TIPS

DED AMERICAN ELMS: AN UPDATE

Continued from page 19

Tracing: Once an elm is infected, if caught at the first sign of “flagging” (wilting) (Photo 10A & 10B), if from overland transmission, the infection can be “traced” (Photo 10C) down the tree to the point where there is no further visible evidence of vascular discoloration (streaking). Making a chainsaw cut through the vascular system several feet below any visible streaking can

sometimes stop the infection.

Trunk Injections: Once elms are infected, they cannot generally be saved with chemical treatments (although some of us are experimenting with high rates of fungicides). Prophylactic treatments with Arbotect (Thiabendazole) has proven to be fairly effective, at least providing an added measure of insurance for tree survival

(prior to infection). Injections need to be done every 2-3 years. Some arborists have also reported good success with propiconazole treatments, although propiconazole is not reported to translocate into next year's tissues as readily as Arbotect does.

Foliar Sprays: In decades gone by, toxic insecticides such as DDT and later methoxychlor were applied to elm trees in blanket sprays to kill elm bark beetles. Over the years, the risk vs. benefit considerations have demonstrated that such toxic applications are not justified.

Root Graft Disruption: An important procedure to stop DED transmission through root grafts to nearby trees is root graft disruption. Such a procedure, if done correctly, is also highly effective, even for a similar disease such as Oak Wilt.

Resistance: A potentially highly effective measure for DED management is genetic resistance. A number of varieties/selections/cultivars available on the market are purported to exhibit resistance to DED. Some of these are listed in Table 1. To increase diversity and incorporate “native” (some would not be considered absolutely “native”) trees into our landscapes, we might consider utilizing more elm trees. It would be wise to carefully research the variety or cultivar to be given consideration for purchase and installation. Some varieties do not exhibit the fast growth, structure (vase-like) and size of the traditional American elm. And some are more or less susceptible to elm leaf beetle damage, etc. In the mid 1980's, I was given two small Liberty elm seedlings, one of the first elms purported to be resistant to DED; I planted them in my yard. Both have reached a good, mature size. One became infected by the DED fungus; however, it is still living but exhibits stunting on some branches.



Photo 10A



Photo 10C



Photo 10B


Photos 10A, 10B & 10C: For “Tracing” to be effective in stopping DED, the technique must be implemented at the first signs of flagging (wilt). This large elm on the MSU campus (10A) is well beyond the possibility of salvation from tracing. A “Lift” is being employed at this country club in SE Michigan to trace DED from very early signs of flagging (10B). Tracing is accomplished by cutting “windows” in the limbs and trunk (10C), essentially following the infection (staining) down the tree by looking for vascular discoloration (see also Photo 4). If the infection is caught before reaching the root collar region by making a chainsaw cut through the vascular system, trees can sometimes be saved.

Table 1: Elms Reported to be Resistant to Dutch Elm Disease

Liberty
Accolade (Morton)
Commendation (Morton)
Danada Charm
Emerald Sunshine
Frontier
Homestead
Jefferson
New Harmony
Patriot

Pioneer
Prairie Expedition
Princeton
Propsector
Regal
Triumph
Valley Forge
Vanguard
Chinese
Siberian

OTHER ELM ISSUES

American elms and nonnative elms can contract a variety of other problems. Some of these issues include Elm Black Spot (a rather harmless fungal leaf spot), Elm Leaf Beetle, and Elm Yellows (aka Phloem Necrosis), caused by a phytoplasma (Photo 11). 

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Photo 11: Not all elm deaths in Michigan result from DED. This tree exhibits the classic signs of “Elm Yellows” – a disease caused by a phytoplasma (bacteria-like microbe). Elm Yellows, aka Phloem Necrosis, is just as deadly as DED.