Dutch Elm Disease in Texas

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The vascular pathogen *Ophiostoma novo-ulmi*, causal agent of Dutch elm disease (DED), has been known to occur in Texas for several decades. Outbreaks seem to occur periodically in certain areas, including Lufkin, Waco, and the Ft. Worth/Dallas regions in Texas. Most recently a large, relatively destructive outbreak has been active in the Flower Mound area near Ft. Worth. Records in the Texas Plant Disease Diagnostic Laboratory (TPDDL) in College Station show that there were two confirmed cases during 2005 in that region. One of the confirmations was in an American elm (*Ulmus americana*), and the other in a cedar elm (*Ulmus crassifolia*). There was another confirmation in an American elm this past summer (2008). This current outbreak has gotten the attention of homeowners, urban foresters and arborists, resulting in a great deal of discussion about how the situation should be handled.

Like oak wilt, Dutch elm disease is one of the more notorious tree diseases to appear in North America. The devastation caused by DED was due to the extreme susceptibility of the native American elm and the widespread urban plantings of that species throughout the midwestern U.S.A. In spite of what is found on poorly documented internet websites, all native elm species in North America are not uniformly susceptible to *O. novoulmi*. As can be seen in the excellent reference "Diseases of Trees and Shrubs," written by Wayne Sinclair with Howard Lyon and Warren Johnson (Cornell University Press), there is actually a great deal of variability in susceptibilities of native North American elms. Cedar elm is listed in that text as being intermediate in susceptibility, and it is highly likely that many other native elms in Texas carry some resistance to *O. novo-ulmi*. The predominance of cedar elm in the Texas woodlands is undoubtedly one of the reasons why the impact of DED in Texas has been minimal. Nonetheless, the DED pathogen can be extremely damaging when introduced into a stand dominated by the highly susceptible American elm (*Ulmus americana*), as is happening in Flower Mound. It is likely that the DED pathogen is more widespread throughout Texas and has simply avoided detection.

Diagnosis of DED can be accomplished in the field with a fair degree of accuracy. Within weeks of infection, individual limbs and branches rapidly wilt and die **(Figure 1)**. In American elms, the wilting rapidly spreads from a few infected branches throughout the tree in a matter of weeks **(Figure 2)**. Branch tips form dead, necrotic "shepherd's crooks" due to the wilting of the younger tissues. A key diagnostic criterion is discolored vascular streaking just beneath the bark of infected twigs, branches and limbs **(Figure 3)**. This is a recognizable, reliable symptom. Since *O. novo-ulmi* is a vascular parasite, it spreads from tree to tree through root grafts and can be relied upon to cause patches or rows of diseased trees,

depending on the tree stand structure. Laboratory isolation of the pathogen is also a routine, reliable process. Unlike the oak wilt pathogen (*Ceratocystis fagacearum*), *O. novo-ulmi* emerges on laboratory media consistently from infected twigs and branches. *C. fagacearum*, however, is far more difficult to isolate even from symptomatic tissues.

A different disease has been diagnosed in Texas on cedar elm, called native elm wilt. This disease is caused by the fungus *Dothierella* spp. and without laboratory confirmation may be confused with Dutch elm disease. Bacterial leaf scorch (BLS), caused by *Xylella fastidiosa*, also occurs on elms in Texas and might be mistaken for Dutch elm disease, although BLS would not kill a tree nearly as quickly (if at all). The TPDDL is equipped for, and experienced in, isolating *O. novo-ulmi*. New forms and instructions for sample submission can be found at the recently improved clinic website **http://plantclinic.tamu.edu/**.

In spite of the extreme virulence of the pathogen, DED has proven to be a controllable tree disease. The key to control relies on a combination of practices. They include regular survey and detection, removal of trees to eliminate inoculum production, applications of insecticides, elimination of root grafts, and intravascular injection of high value trees at high risk of infection. Therapeutic injections are also effective for trees in the early stages of colonization, but should not be attempted if more than 5 – 10% of the crown is symptomatic. Remedial pruning may be useful, particularly when used with a practice called “bark tracing.” The extent of colonization can be estimated by peeling bark and following the trace of discolored sapwood from the infected limb down toward the trunk. Again, bark tracing and pruning of diseased limbs is only effective in the early stages of infection and will not work in trees in the advanced stages of colonization. An excellent source of DED control recommendations may be found at the U.S. Forest Service website **http://www.na.fs.fed.us/spfo/pubs/howtos/ht_ded/ht_ded.htm**.

Although some of these management techniques sound familiar to those involved with oak wilt control, they are based on very different principles due to significant differences between the two pathogens. Unlike oak wilt, where fungal mats are required for insect transmission, every infected elm tree is a source of inoculum for spread by the insect vectors. Elm bark beetles breed in dead and dying elms, where the pathogen forms copious spores in the galleries. As the new populations of beetles emerge from the contaminated galleries, they disperse to feed in twig crotches on healthy elms. This is another significant difference between oak wilt and DED – the elm bark beetles make their own wounds, whereas nitidulids require a fresh wound made by some other agent. During feeding by elm bark beetles, *O. novo-ulmi* is inoculated into a new tree to complete the disease cycle. For this reason, one of the best ways to control DED is to detect diseased trees in the earliest stages of infection and destroy them before they can serve as inoculum sources for beetle transmission. These surveys must be made regularly and thoroughly. Insecticide sprays are also effective in suppressing an epidemic, but trees must be treated with excellent coverage. Successful DED control requires a well-organized, long term commitment in a community where the resources are available for sustained management. If there is even a temporary cessation of control practices where there is available healthy host type, then resumption of an epidemic is likely.

Beyond practical considerations, the recent outbreak of DED in Flower Mound raises some interesting questions about the pathogen. *O. novo-ulmi* has been transported repeatedly over the globe during the past 75 years and has undergone some significant genetic changes. These changes have resulted in new subspecies of the pathogen that have increased in virulence and have developed a greater capacity to decimate elm populations. The genetic status of the pathogen in Texas, however, has not been studied. Current range maps of the newer strains in North America do not extend into Texas. Although these considerations may appear to be merely of academic interest, this dangerous pathogen may yet have the ability to cause extensive damage in our elm populations and it needs to be closely monitored.

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Figure 1. Wilting and necrosis of an individual limb on an American elm infected with the Dutch elm disease pathogen. *Photo by D.N. Appel*

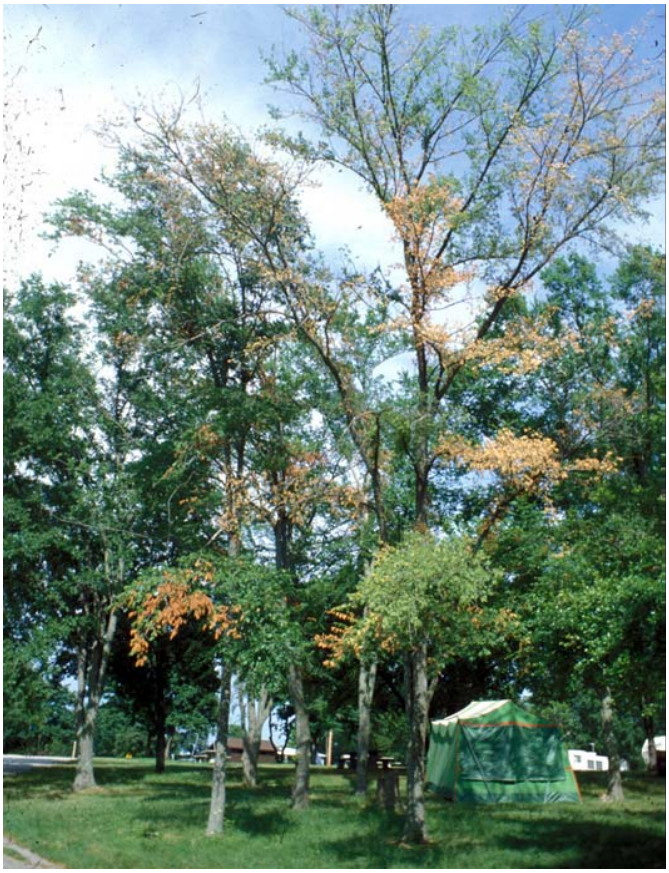

Figure 2. Groups of elms in advanced stages of colonization by the Dutch elm disease pathogen. *Photo by D.N. Appel*

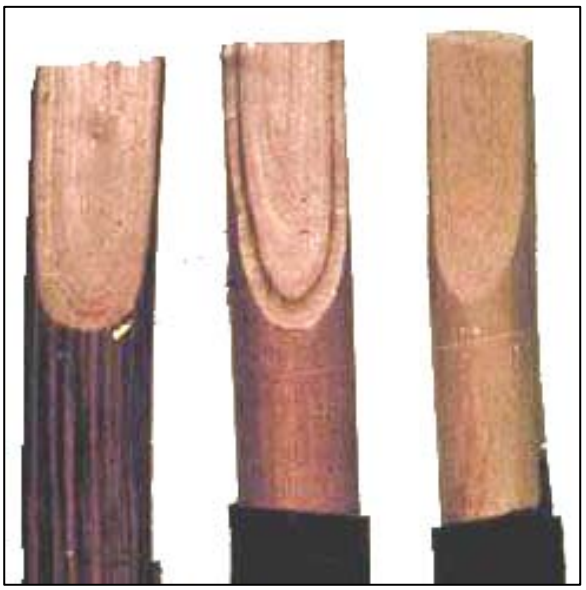

Figure 3 (above)**.** Limb on far left exhibiting internal streaking caused by a current year's infection with the Dutch elm disease pathogen. Limb in middle infected previous year. The limb on the far right is uninfected. *Photo courtesy of the American Phytopathological Society.*