LIVE OAK (*Quercus virginiana*)
Oak Wilt; *Ceratocystis fagacearum*

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INCIDENCE OF TRENCH BREAKOUTS FOLLOWING APPLICATIONS OF TRENCH INSERT BARRIERS TO CONTROL ROOT TRANSMISSION OF *CERATOCYSTIS FAGACEARUM* IN TEXAS LIVE OAKS, 1998: Fourth-year field evaluations of four trench insert materials, including water-permeable Typar® polypropylene spunbonded fabric, Biobarrier ® or Typar® with trifluralin-impregnated nodules, and water-impermeable polyethylene Geomembrane liners of two thicknesses (20 and 30 mil), were conducted to further test the effectiveness of these physical and/or chemical barriers to root transmission for long-term control of oak wilt. Research plots were selected in a mature natural stand of live oaks growing within a residential development site on a predominantly rocky, sandy clay-loam soil type near Austin, Texas. Soil depth to bedrock ranged from 1-1.5 m at the test site. Test trees were selected approximately 23-30 m beyond the expanding edge of a large oak wilt infection center. A roughly linear trench was cut with a chain trencher approximately 2 km long and 1.5 m deep immediately adjacent to the test trees and between the infection center and the test plots. The plots, established 27 Jul 93, consisted of 18 plots of 12-18 trees along the trench. Six treatments were applied to separate plots on 13 Dec 93 in a completely randomized design along the full length of the trench with 3 replications (plots) per treatment. The treatments included one of the four trench inserts, no insert (trench alone), or no trench for the untreated controls. Three trees per plot, located approximately halfway between the trench and the infection center, were inoculated to provide additional pressure on barrier treatments. Inoculated trees were cut with an axe into the sapwood on one side of the tree on 5 May 94. The wound was filled with a 1-2 ml aliquot of a mixed mycelial-conidial inoculum suspension prepared from colonies of *Ceratocystis fagacearum* growing for one week on 0.5% Neopeptone-glucose broth. All other treatments were challenged by natural inoculum (untreated controls) through root transmission from the adjacent expanding infection center. Healthy controls that received no treatment were selected outside of the trench for disease severity comparison. The incidence of oak wilt breakouts from barriers was documented by recording numbers of disease breakouts and infected trees per 183 m of barrier contained within each of 3 trench segments, along with the mean distance of symptomatic trees from the trench (if present) outside of the barrier. Crown symptom ratings, percent branch mortality, and percent defoliation were recorded 14 May 98 as indications of disease severity and disease progress, 4.5 yr after the trench treatments were applied and four-years following inoculations. Disease severity ratings of infected live oaks in breakout areas were compared using confidence intervals (mean ± SEM).

The occurrence of diseased trees outside of containment trenches (breakouts) occurred in several treatment plots four years following installation of barriers to root transmission. Trench breakouts were observed only for the thinner water-impermeable Geomembrane 20 insert, among the trench inserts tested, and in plots with trenches lacking inserts. The advancing front of the infection center moved unimpeded into plots lacking trenches. Infected trees in breakout areas exhibited significantly lower crown ratings and significantly higher branch mortality and defoliation than healthy controls. Most trench breakouts due to root transmission occur within a year after trench installation in current suppression programs. These results suggest that breakouts in plots with trenches alone after four years resulted from root grafting between trees on opposite sites of the trench as a result of abundant adventitious roots forming at the ends of severed roots in response to root pruning by trenching. The water-impermeable inserts tend to divert adventitious root growth under the trench to facilitate grafting. The Typar, Biobarrier, and Geomembrane 30 inserts increased the effectiveness of trenches by extending the protection provided by trenches three years beyond the time that trenches are normally expected to prevent root transmission. The additional cost of trench inserts above trenching costs is justified only in high-hazard sites (e.g. urban areas) where high-value landscape trees require additional protection.

	Disease Incidence			Disease Severity[5]		
Barrier treatments[1]	Trench breakouts[2]	No. infected live oaks[3]	Distance (m)[4]	Crown Symptom Rating[6]	Branch Mortality (%)	Defoliation (%)
Typar	0	0				
Biobarrier	0	0				
Geomembrane 20 mil . . .	3	12	12.8	1.7 ± 0.3	60.0 ± 14.4	85.4 ± 6.4
Geomembrane 30 mil . . .	0	0				
Trench alone	2	5	2.4	2.0 ± 0.4	55.0 ± 20.0	82.0 ± 13.3
No Trench Control	1	6		1.7 ± 0.4	74.6 ± 16.3	90.8 ± 5.8
Healthy Control	0	0		4.0 ± 0.0	0.2 ± 0.1	2.1 ± 1.0

[1] Trench inserts were mounted with aluminum pins to the wall of the trench on the side closest to the infection center and were supported by backfilling the trench with soil removed during construction of the trench.
[2] Number of oak wilt breakouts from containment trenches per 183 m of barrier contained within three trench plots per treatment.
[3] Total number of oak wilt-infected live oaks associated with trench breakouts for each treatment.
[4] Mean distance of symptomatic live oaks (within trench-breakout areas) from trench barriers or beyond containment trenches.
[5] Disease severity ratings of infected live oaks in breakout areas were compared using confidence intervals (mean ± SEM).
[6] Crown symptom rating scale: 1 = crown dead, totally defoliated, or with only necrotic leaves attached, 2 = thinning crown with leaves having diagnostic oak wilt symptoms, including veinal chlorosis or veinal necrosis, 3 = crowns containing foliage with chlorosis or reduced leaf size, but lacking diagnostic symptoms of oak wilt, and 4 = full. healthy crown with no apparent foliar symptoms.