

Despite slow growth, young trees may appear healthy, because they are not yet competing with neighboring trees for water and nutrients. As root systems compete for soil space, however, competitive stresses exceed the resistance of dominant shortleaf pines.

Stressed roots become susceptible to several soil-inhabiting organisms. On littleleaf-prone sites, the most important is *Phytophthora cinnamomi*. While not ordinarily aggressive on vigorously growing shortleaf pine roots, this fungus is able to infect the feeder roots of stressed trees. The death of these vital root tips further stresses the tree because the root area available for nutrient and water absorption is reduced. Crown symptoms develop as the uptake of nutrients slows and becomes critically low. Once the decline is visible, death of the affected trees usually occurs within 6 years. Loblolly pine may persist for longer periods after crown symptoms appear.

Symptoms

Unlike some other root diseases, littleleaf does not occur in infection centers. Rather, diseased trees in various stages of decline are scattered randomly throughout the stand. These subsequently coalesce where conditions permit disease and symptom development on more trees. The name "littleleaf" describes the reduced needle length of affected shortleaf pines. Needles on affected trees usually also turn yellowish. Twig growth slows and only current year needles are retained, giving the crown a tufted appearance. These symptoms usually do not appear until the trees are from 20 to 30 years old. Concurrent with crown symptom development, diameter growth of the main stem slows dramatically. The entire visible decline process, which may take from 2 to 6 years in shortleaf pine, culminates in death. Symptom development is similar in loblolly pine, but the symptoms may appear later and the progression to death may take longer.

During the entire decline cycle, littleleaf-affected trees are susceptible to the southern pine beetle, which attacks and kills them, and then spreads to adjacent trees which may be healthy, killing them as well. The results are losses far in excess of those caused by littleleaf disease alone.