

Rapid Decline of Post Oaks in Texas

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If a post oak had a “mission statement,” it would be to grow, reproduce, and defend itself from a hostile environment, including pests and diseases. If successful, it would become a slow-growing, medium-size tree in the Southwestern and South Central United States.

Post oaks can flourish and do well where most other trees would not survive. In Texas, they grow best in the Cross Timbers, a prairie transition region where soils are dry with rocky outcrops and slopes. These soil types are well drained, sandy, coarse, deficient in nutrients, and low in organic material. Because they are drought resistant, post oaks can dominate sites that have little soil moisture. Understanding the ideal conditions for healthy post oaks helps explain why they have recently experienced widespread decline.

Post oaks are not susceptible to any major, virulent pathogens. Highly resistant to the oak wilt fungus *Ceratocystis fagacearum*, they rarely succumb to the disease. But there are several less lethal, common diseases and pests, such as blights, blisters, cankers, blotches, foliar spots, root rots, and defoliating insects, that can disfigure a tree and cause some dieback of branches, but rarely will kill it.

Examples of leaf diseases and insects include anthracnose caused by the fungus *Gloeosporium*, Actinopelte leaf spot caused by *Tubakia*, leaf rust, leaf skeletonizers, woolly aphids, gall insects, and wood borers. The most prevalent type of canker is caused by *Biscogniauxia (Hypoxylon) atropunctatum*,

the causal agent of Hypoxyylon canker (Fig. 1). Root rots, such as *Phytophthora sp.*, Ganoderma root rot, and Armillaria root rot, are also common. Post oaks are notoriously susceptible to various environmental



Figure 1. Exposed cankers of *Biscogniauxia atropunctatum* on a post oak after the tree dies and the bark sheds. Source: David N. Appel

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Figure 2. Mechanical damage, root disturbance, soil compaction, and other stress factors resulting from the urbanization of post oak woodlands. *Source: David N. Appel*

problems associated with urban development, such as root disturbances, compaction, slow drainage, and poor irrigation practices (Fig. 2).

Symptoms

In 2016, during the early spring to late summer, there were many inquiries as to why post oaks had “suddenly” died. The most frequent symptoms were

- Rapid appearance of chlorotic (yellow) and necrotic (brown and dead) leaves throughout the entire tree crown (Fig. 3)
- Leaves remaining attached to twigs, but the trees were dead or nearly so (Fig. 4)
- Groups of dead and dying trees (Fig. 5)

Although the trees appeared to have died suddenly, careful observation could have discovered initial symptoms a month or more before the trees collapsed. In an alternative scenario, the leaves dropped off, leaving a tree with sparse foliage and thin canopies. These trees can linger with various stages of twig and branch dieback, but remain alive

Environmental Factors

This rapid decline of post oaks is the result of varying extremes (drought and drowning) that

make the trees susceptible to attack by the cankers, root rots, soil moisture, and wood-boring insects described above. All of these problems were made worse by the historic drought in Texas in 2011 that crippled tree health to such an extent that trees are still suffering today. Extreme drought induces stress so that the trees must cope by expending storage carbohydrates (starches) to compensate for the strain.

During years of normal temperatures and rainfall, these storage carbohydrates accumulate in the roots as a result of photosynthesis. During stressful years, the tree responds and survives by mobilizing and depleting these stored reserves.

One response is through osmotic adjustment of



Figure 3. Initial symptoms of chlorotic (yellowing) and necrotic (brown) foliage on a post oak. Top: Symptoms distributed throughout the canopy. *Source: Sheila McBride* Bottom: Close-up of the foliar symptoms. *Source: David N. Appel*



Figure 4. A post oak in the final stages of rapid decline with necrotic leaves left on the tree. *Source: Sheila McBride*

cell contents. Osmotic adjustment, or changes in the levels of sugars in the sap, leads to regulation of tiny pores in the foliage called stomata, preventing water loss from the leaves. Leaves may drop from the tree prematurely to prevent water loss. These adaptations

allow trees to avoid wilting and continue metabolic functions with less water.

Another response during drought conditions is enhanced root growth with modifications such as increased suberization (waxy thickening of cell walls), which also helps the tree prevent water loss. These alterations come with a cost by exhausting the starches normally used by a post oak to achieve its “mission statement.” In other words, the result is a weakened, starch-depleted tree with poor growth, making it predisposed to diseases and pests that normally do them no harm. In similar types of oak decline worldwide, research verifies the same patterns and causes as those occurring with the Texas post oak mortality problem.

Control

The key to controlling rapid decline is to keep the trees healthy so they are not susceptible to diseases and pests that do not plague them during normal years. There are more options for trees in an urban setting than for those in rangelands and woodlands:

- Improve aeration and soil drainage
- Correct irrigation practices that may lead to overwatering
- Use mulches selectively to prevent continual watering around the base of the tree

(See <http://www.AgriLifebookstore.org/Hypoxylon-Canker-of-Oaks-p/eplp-030.htm> for more details about how to treat rapid decline in urban settings.)

These practices are not as practical in woodlands. A forest manager might suggest thinning an affected



Figure 5. A cluster of post oaks exhibiting symptoms of rapid decline. *Source: Sheila McBride*

stand of post oaks to reduce competition, making water and nutrients available to the remaining trees.

Such measures can be expensive, environmentally disruptive, and only taken when growing trees for profit.

Summary

During 2016, a dramatic increase in the incidence and severity of post oak mortality occurred throughout much of Texas—a scenario called “rapid decline of post oaks” because of the reported symptoms. Recent episodes of severe drought combined with fluctuating periods of extreme, unseasonal flooding created conditions for outbreaks

of diseases and pests that, under normal conditions, do not kill trees. Many of the problems strike aging post oaks that grow on marginal sites where the soils are not conducive to maximum growth and longevity.

The solutions to these problems lie in preventing repeated exposure to stressful growing conditions. Treatments such as specialized mulching and site alterations are practical only in urban environments; these situations are difficult to correct in post oak woodlands. Under stressful environmental and rapidly changing climatic conditions, increased mortality rates are inevitable in large populations of mature trees.

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