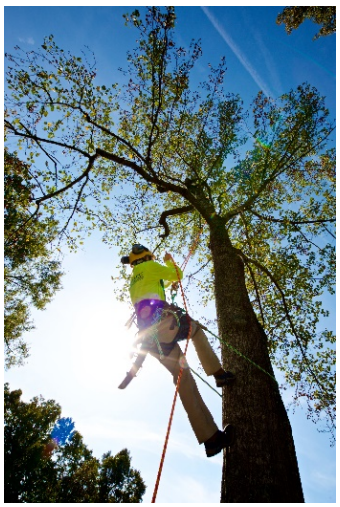
Bartlett Tree Research Laboratories

PLANT HEALTH CARE REPORT

Managing Trees over Time

Landscape trees and their site must be managed dynamically over time to meet the owner's expectations, optimize growth conditions, and maximize the tree's life span. A tree's growth and development from youth to maturity to eventual decline and death is strongly tied to its genetics and environmental growing conditions. Establishing a strong structure in its youth and delaying its transition from maturity to decline requires a proactive management plan based on the individual tree, species' traits, site conditions, and owner's goals.



Canopy inspection by a climbing arborist

Sampling soil for nutrient analysis

Understanding energy balance

Growth and all other life functions in trees are driven by energy derived from sunlight. Chlorophyll and other leaf pigments capture energy from sunlight and store it in the chemical bonds of carbohydrates. This energy is released as needed to support biological functions in a process called respiration. During respiration, high energy-yielding bonds in carbohydrate molecules are broken, releasing energy to fuel activities such as leaf development, wood growth, defense, and reproduction. Energy is also stored in reserve for periods of stress such as drought or defoliation by pests when current energy production cannot meet demand.

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Shifting energy in young, mature, and declining trees

Young trees have a high ratio of photosynthetic area (leaf surface) to biomass. With this high ratio, they can generate a surplus of energy, which is used to fuel rapid growth. Young trees can also respond to change and stress because of high levels of reserve energy. Even so, the highest loss rates of trees in a landscape are within the first 3 years of planting when the roots are establishing in the soil.

As trees mature, the ratio of photosynthetic area to biomass decreases. Most of the annual energy generated in the leaves is dedicated to maintaining existing tissues, defense, and reproduction. Less energy is available for growth, and energy reserves are minimal. Mature trees are not as capable of tolerating stress or change. When mature trees are exposed to stress from environmental factors, wounding, pest infestations or other causes, growth rate slows because energy reserves are shifted toward maintaining tissues and defense. With multiple stresses or chronic stress, energy production and reserves are further depleted and decline begins.

The declining tree has stunted growth, small leaves, premature fall coloration, abnormally heavy crops of seed, and branch dieback. These characteristics further inhibit energy production and create more demand on reserves. Declining trees may become infested by "secondary invaders" such as borers and canker and root disease pathogens. More energy reserves must then be used for defense. If the stress is not alleviated or the tree is unable to re-balance energy demands, it enters a mortality spiral and death ultimately results when the tree is depleted of energy.

Branch dieback on declining oak

Planning management for tree's life span and site

Tree management programs should be proactive, applying treatments preventively to maintain plant health rather than remedially once decline begins. Multiple considerations should inform the initial site plan, including owner expectations for the planting. For example, if selecting replacement trees for a city street, consider a few of these urban forestry points:

- Large-growing species in confined spaces will decline prematurely.
- Limited water and nutrient availability create energy deficits soon after planting.
- The average lifespan of an inner city tree growing curbside in a tree pit is 7 years.

- Tall species beneath utilities, which must be pruned often for clearance, will also decline prematurely.
- Reducing crown size and constant wounding will create energy deficits, which will predispose the plant to decline.
- Some tree species normally decline and die at an early age.

Matching species to sites

Fast-growing species, such as silver maple, poplar, and willow, have a shorter life span than slower-growing trees. Fast-growing trees allocate more energy to growth and less to defense, so they are poor compartmentalizers of wood decay and prone to life-threatening pest problems. If long-term tree survival is the goal, it is essential to match tree species to the site. Selection considerations should include available root space, crown space, soil type, hardiness (adaptability to temperature extremes), life span, and resistance or tolerance to pest problems.

Caring for trees

Inspecting trees for sound structure and health reveals defects and early symptoms of stress, which may be corrected before decline occurs. Tree inspections should be performed at least annually and after major storms. Inspections should be more frequent (such as monthly) in high use areas and for trees under stress.

Properly performed cultural practices—pruning, fertilization, integrated pest management and root system care—can maximize the life span of trees. However, improper management techniques are common stress factors of landscape trees, causing premature decline. A certified arborist should be consulted to develop a landscape plan and perform treatments aligned with meeting owner expectations and optimizing tree potential.

(L) Young jacaranda recommended for a soil conditioning treatment. (R) Surrounding soil was loosened and biochar and fertilizer incorporated using a compressed air tool.