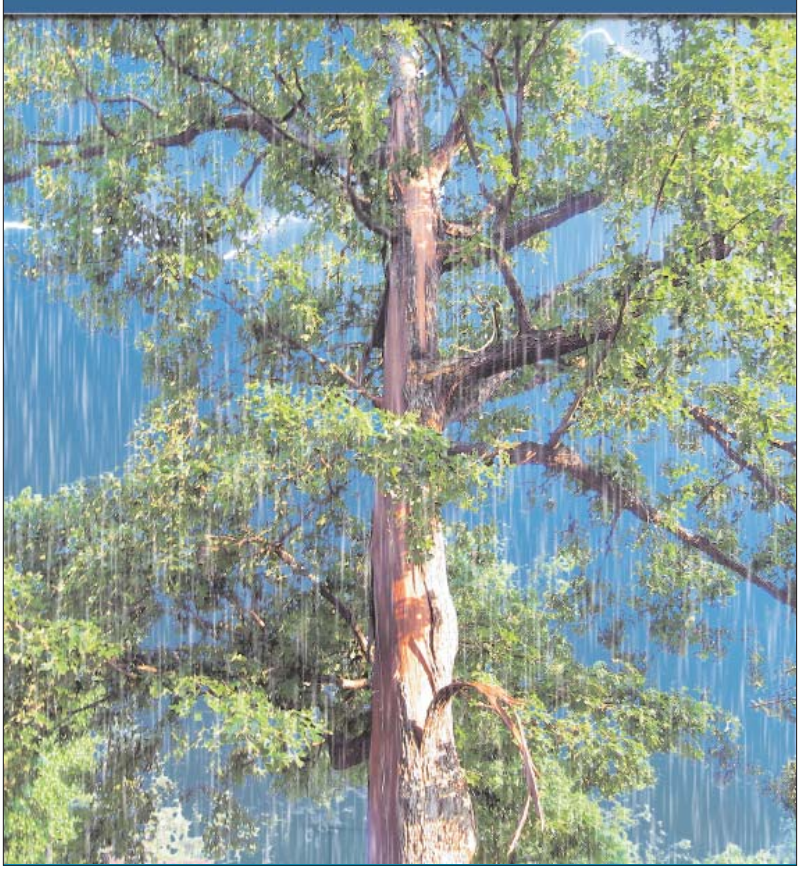
Battling Bolts from the Blue

By Guy Meilleur



Bark blown off post oak, Quercus stellata. Photos courtesy of Guy Meilleur unless otherwise noted.

The customary serenity and solitude of Andersonville National Cemetery was exploded at 8 a.m. on April 28, 2007, by the sound of chain saws and chippers.

Located at the infamous Civil War prison camp site near the Carter Presidential Museum in southeast Georgia, the Andersonville National Historic Site serves as a memorial to all American prisoners of war. The park provides an understanding of the overall prisoner of war story of the Civil War, interprets the role of prisoner of war camps in history, commemorates the sacrifice of Americans who lost their lives in such camps, and preserves the monuments located within the site. Park superintendent Fred Boyles understands that many trees at Andersonville are monuments in their own right.

Much of the 520 acres is covered with row after unbroken row of gravestones, and more will be added until the cemetery is full to the fences. The scattered trees stand sentinel, shading and softening the soldiers' final resting ground. Several are antebellum "witness trees," also veterans of the Civil War. Coordinated by urban forester Eric Gansauer and the Georgia Arborists Association, arborists with TCIA member companies Arborguard Tree Specialists and Downey Trees joined dozens of others to care for these veteran trees that watch over the graves of fallen veterans. This article is about one tree in particular that serves to remind us of something near and dear to arborists' hearts – the importance of tree preservation. Following is a report on that tree, No. 263:

Background

Lightning struck a post oak *Quercus stellata*, tree No. 263, located at the graveyard's edge in 2002. Two other large oaks to the north, No. 219 and No. 220, were not struck. A tree inventory flagged these trees for a more thorough inspection.

Assignment

I agreed to inspect three veteran oaks and offer opinions on their condition and prognoses. The use and purpose of this report was to inform decisions made by park staff regarding the management of these trees.

Observations

I noted four separate streaks of wood down the stem of tree No. 263, at approximately right angles to each other. The widest wound ran from the base up to the first primary fork on the northwest side and back down the other side. A small crack started at that fork, and there was active decay in a pocket above the crack, just below the fork. A large, fat skink was living under the detached bark.

There is ongoing excavation for grave sites in the southern half of this tree's root-zone. The foliage was pale and yellowish. There was erosion and compacted soil to the north, and significant damage to buttress roots all around.

Tree No. 219, another post oak, had a large wound where its main stem was torn off, leaving three horizontal limbs. The trunk sounded hollow, but there was little dead wood in the crown.

Tree No. 220 is a southern red oak, *Quercus falcata*. It had a dead top, and two recently broken limbs to the west. These were removed during the aerial inspection.

Andersonville – Wound at main fork of landmark post oak. No callus growth in five years, decay advancing, root damage increasing, high target rating: fatal damage from lightning strike. Courtesy Chip Hildreth, ArborCarolina

Ten-inch lightning wound on mature white oak, Quercus alba, closed after four seasons of tree care.

Testing & analysis

I used a hammer to test the trunk of tree No. 263 for resonance at 4½ feet above the ground. Fifty-two inches of bark circumference sounded hollow. The bark came off easily because it was dead. One hundred and five inches of the circumference sounded alive. Unidentified wood-boring insects were active underneath the loose bark – but not in the exposed areas where the wood was dry. The wound above the primary fork was more than 20 inches wide. A probe went 6 inches through mushy tissue at the fork.

The trunks of trees No. 219 and No. 220 were solid on the outside, and had significant woundwood around their old wounds.

Discussion

With one-third of the bark blown off the trunk, and a 20-inch-wide wound above the first fork, this lightning damage seemed terminal. This fork seemed at risk to fail in a moderate summer storm, but it could be cabled to buy some years. However, it is only a matter of time before cracking and decay render the lower trunk unstable. Poor root health and more excavation for graves mean this time will come fairly soon, despite the wood's resistance to

decay. The skink's plump belly is evidence of insect activity in the damaged areas.

Tree No. 219 and No. 220 were structurally intact and removed from areas the public is likely to visit.

Conclusions

Tree No. 263 posed a high risk in the near to medium term. The long-term risk can only be abated by removal. Trees No. 219 and No. 220 posed a low risk until their roots are excavated.

Superintendent Boyles made the tough decision to remove tree No. 263. He also made a much easier decision – to apply for funding to protect the remaining landmark trees from future lightning strikes.

Lightning protection systems

According to government data, the region receives on average more than 10 lightning strikes per square mile. A lightning protection system will effectively and affordably protect a tree 98 percent of the time. The average time for installation is two hours for a two-person crew.

The climber ascends the tree to its highest point while the other worker excavates a trench at least 8 inches deep and 10 feet from the trunk. An air tool can save time and spare roots during this process. Once the climber ties in, the fasteners and one end of the copper cable (conductor) are tied on and hoisted. The conductor is fastened

Thick-barked, fast-growing Pinus taeda, *loblolly pine, with extendable fastener going in.*

to a terminal at the top of the tree, then pulled taut, not tight as the climber descends and clamps it to standoffs to prevent contact with the tree. These standoffs can be up to 6 feet apart, depending on the tree's form. A straight line is preferred for maximum effectiveness, leaving the stem between buttress roots toward the path chosen for the ground terminal.

The ground rod is copper-coated and typically 8 feet long. It must be driven a foot below the surface to protect people and animals above it. Tree roots are not so lucky – observations indicate a 15 inch "kill zone" near the ground. Driving the

Thin-barked Liriodendron tulipifera, *tulip poplar, with standard standoff attachments holding ¼-inch conductor, as per ANSI A300 (Part 4).*

rod into the ground can be done with a hammer in sandy soil, but a post driver or air hammer is needed for harder subsoils.

To test the system's effectiveness, use a ground resistance tester and a continuity meter. A reading of under 50 ohms is preferred. Additional ground rods can be installed 10 feet apart to provide adequate grounding. One way to be sure that your system works is to attach strike monitoring fuses and check them after storms.

Aftercare

As noted in the ANSI A-300 Part 4, the client must be notified that the system should be checked regularly. Fast-growing trees present a special challenge, because the system must be attached to new standoffs to avoid contact between the conductor and the tree. When it gets close, the old standoffs must be cut off and replaced, and the conductor clamped to the new standoff. This presents two problems. First, the bits of metal left in the tree can potentially cause arcing, as they draw the electricity from the lightning strike to the tree. It is unclear how much potential there is for this to happen. Second, installing new fasteners means making new wounds, which is never a good thing.

To address these problems, an extendable fastener known as the Arborbolt was developed by Ben Fuest in England. Ninety percent of the trees there with lightning protection installed are redwoods, *Sequoiadendron giganteum*. This species' relatively fast growth and large mature size mean the fasteners would need replacing several times over the trees' life spans. Its thick bark calls for a long shank like the Arborbolt's on the standoff to reach the wood, as called for in the standard. Pre-drilling is required, which decreases the risk of cracking the wood but increases the time needed. On many trees these advantages may not be worth the added cost, but for redwoods and some other species the Arborbolt was designed with their needs in mind. There is no U.S. distributor at present.

Tree #263 at Andersonville did not recover from lightning wounds. It will be felled by the friendly fire of chain saws.

Selling points

No matter how it's fastened, a lightning protection system adds a lot of value to a specimen tree. Selling is as easy as comparing its cost to the value of the tree and the expense of removal and replacement. The target rating for the risk of a lightning strike to most residential trees is very high, considering that roots contact wires that contact all the electronic equipment in the modern home. Signature golf course trees are leading candidates. Not only do they define the fairways and create doglegs, golfers seeking to finish one more hole before the rain hits may seek shelter under a tree, only to be killed by a lightning strike that is drawn to that same tree.

Tall trees that are in the open and on high ground are most susceptible. Trees in other recreational areas are prime candidate sales, as well as those near commercial buildings and parking lots. Some lists have been made ranking species susceptibility, based on water content and oil content and other characteristics, but these lists have not been proven reliable.

More land is being developed around large trees, and more trees near targets everywhere are growing taller, and our climate is heating up, so the lightning protection market is growing rapidly. Adding a system can fit in well with the tree care services a company offers, and put off the day that a veteran tree must be laid to rest.

Guy Meilleur is the owner of Better Tree Care Associates in Apex, N.C.

ANSI A300 Part 4 - Lightning Protection

Adhering to the American National Standards for tree care helps make you an expert in the eyes of clients and authorities, such as your local municipality. ANSI standards are recognized as the final authority in the United States civil court system. Order each part to be certain your work meets industry standards and to use as a guide for writing work specifications.

Product code: A300P4
Price: $20 (Members: $15)

For this and other safety and education products, call 1-800-733-2622 or shop online at www.tcia.org

Lightning-Struck Tree Assessment and Mitigation

When lightning strikes a tree, the owner will often assign an arborist to help determine the appropriate response. Depending on the tree and the arborist, what they hear will range from, "It's going to die, so we should remove it," to "It looks okay for now, let's wait and see." Neither of these answers adequately addresses the owner's or the tree's needs. Both neglect useful tree care techniques for assessing and mitigating lightning damage:

- Bark inspection. Tap the bark with a mallet to determine whether it is detached from the wood. Measure the detached areas. Probe any cracks in the xylem with a thin instrument to determine the depth. If the damage to the lower trunk is not extensive, inspect the crown.
- Consider the species' relative tolerance to lightning strikes, based on its compartmentalization qualities, grain pattern, and genetic vigor.
- Consider the individual specimen's vitality, and its location relative to people and property. Assess the risk.
- Present treatment options to the owner, providing a prognosis of recovery if the treatments move forward. If the client is an insurance company, the arborist is often asked to make a recommendation because the tree work is part of a claim. If the owner decides the risk is acceptable, these steps can be taken:
- Reattach the bark if it is still moist inside. Thin bark may move enough if it is wrapped tightly for a few weeks. Thicker bark may be reattached with fasteners such as staples.
- If the bark cannot be reattached, it should be trimmed – "traced" – back to the point where it is attached to the xylem, so there will be no hollow area as callus tissue grows over the wound. This applies to all the bark, from the top of the tree down to the buttress roots.
- The exposed wood should be treated to repel insects. Reapply as needed
- The soil around the roots, especially those that carried the current, should be aerated as needed and inoculated with beneficial microorganisms such as mycorrhizal fungi. Any mineral element that is lacking should also be applied
- Mulch the root system 2- to 4 inches deep with organic material, and irrigate as needed.