DETECTIVE DENDRO
THE DIAGNOSTIC SLEUTH

By Guy Meilleur

The Case of the Eloquent Elephant

The best places to learn about managing older trees, Codit and I decided, were in older countries, where older trees have been managed for a long time. At ISA's conference in Italy, the keynote speaker emphasized that "there are significant and important gaps in what we know about [. . .] tree biomechanics in particular."

A French researcher also noted, "Only by taking into account the ecological context, the substrate, and the immediate and distant infrastructure can arborists make informed decisions about tree mechanical stability."

An Italian arborist presented his doctoral research on replacing soil around the flare of a veteran tree with permeable aggregate. When the old soil was removed with a supersonic air excavation tool, fine roots were also blown off. New roots naturally regenerate from traces remaining where old roots were shed, as new branches originate from dormant buds connected by traces to the heart of the parent branch. Could light wounding be beneficial? An explosive growth of new roots in response to the treatment confirmed this hypothesis.

An incredible elephant of a *Quercus robur* in need of care.

"Amazing results!" Codit exclaimed. "It's great to see our practices confirmed by research. I can't wait to try that again on an old tree."

Full of new energy and ideas, we flew to Sweden for a course on valuing and managing veteran trees. One of our instructors was Vaughn Verdier, an ecologist and caretaker of England's royal forests. His focus was on the wildlife value in tiny creatures that live in and on gnarly old oaks. The course also covered historical methods of managing pollards in pastures, and other "working trees." These lessons advanced our understanding of tree inspection, and appreciation of tree benefits.

"That course was awesome," Codit remarked after we said our goodbyes and packed the car. "But will it apply to our daily work?"

"We may soon find out," I replied. "There are tales told of an elephant of a *Quercus robur*, with the greatest girth in all of Europe. We'll be inspecting it this afternoon, with Verdier and some local arborists. We're told it's suffering from powdery mildew and other conditions."

After a drive through rolling countryside, Codit parked the car and grabbed our diagnostic kit. The sign posted at the head of the trail told the tale of pilgrims taking shelter under the tree centuries ago.

Our senses delighted with the rose (*Rosa* sp.) and blueberry (*Vaccinium* sp.) shrubs growing along the path, but our hearts sank as the tree came into view. Much of its crown was dead. Many of the twigs had buds on them, indicating that they died recently. The leaves were pale and small. We joined our colleagues and circled the 14.11-meter trunk (circumference at breast height). A black band of compacted bark just below the branches remained where an iron strap had been removed. Just below those dark marks, a steel cable circling the trunk was held fast by 13 eyebolts.

I tried to scrape off the compacted bark with my pocket knife, but it was as hard as the iron that compressed it. Two robust columns of living tissue connected the living crown to the earth, but the rest of the trunk appeared to be shriveled. A dead section of the trunk on

A more intimate look at the problems facing this pachyderm-sized oak. From the compressed bark, where an iron strap used to sit, to an enormous cavity full of vitality, there's a lot to unpack.

the north side had started falling, but was secured by the same type of cable and fasteners. A nearby oak, 30 feet (10 m) away, displayed high vitality. Two Norwegian naturalists were certain this young *Quercus robur* was connected by root grafts and extracting vitality from the giant.

Some of the wood surrounding the open cavity was bulging with vitality. When probed with a diagnostic knife, the dead burl was as hard as if it were petrified.

The group's grim faces turned to Verdier for guidance, and hope.

"First, look to the soil!" the veteran tree man exclaimed. "We must check for fungal relationships, such as mycorrhizae, connecting the tree to the earth. Only if these are healthy can the tree be restored."

I nodded, eyeing the dense turfgrass, nettle, and other weeds growing thickly between the rocks that were piled against the massive buttress roots centuries ago, when the surrounding area was cleared for pasture. Thick, ungrazed grass grew everywhere under the branches of the once-magnificent tree, signaling that the soil was dominated by bacteria, so the fungal connections were weak.

"Our team previously checked for oak roots near the dripline, and found very few," said a young entomologist. "The foliage tested positive for powdery mildew, which we have treated with a mineral spray. All that is left to do for this tree is apply a layer of woodchip mulch."

I walked up to the flare, dropped to my knees, and pulled out a moist, four-inch (10 cm) thick section of sod with surprisingly little effort. Smelling my fingers, my nose recoiled at the putrid stench of the rotting thatch.

I felt the dry soil under the sod, and stroked the sparse, brittle layer of tree roots. Between the rocks piled around the flare, ropy roots of hazel, nettle, and other weeds grew deep. Gripping their root collars, I loosened their hold on the earth with a slow but steady pull, shook off the soil, and piled them on the rocks. Weeds repeatedly cut back the development of vigorous roots up to eight inches (20 cm) long.

"These weeds have re-sprouted vigorously after being cut back," I said. "Fencing out the cows when this park was built may have lessened soil compaction, but it also caused significant problems. When this area was grazed, the tree roots could exchange gases through the turf. Also, these other weeds would not be so competitive."

I dug the bare soil of the footpath around the tree, but found no roots near the surface. Oak roots were visible, but not numerous, starting at four inches deep or so. The soil on the path was compacted, as was exposed soil farther from the stem.

I crawled into the north end of the open cavity to look for more clues as the group gradually gathered around the lunch table to review the discouraging data.

"Several questions remain," Vaughn Verdier began:

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- "How did the tree continue growing where it was strangled by the strap, and how can we mitigate the strangulation?
- What should be done with the nearby oak?
- How can access to this champion oak be maintained while improving the soil?
- What should be done with the dead trunk section that has failed? and
- How can we regenerate roots, and revitalize the tree?"

I walked out of the south end of the cavity, pulled a wild onion out of the ground, and began peeling away the outer layers. "Your lesson that old trees grow downward, regenerating an inner crown as the outer crown dies back, has been a valuable contribution to our understanding," I gratefully acknowledged. "Another lesson is learned from the onion: the sweetest part can be found on the inside."

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WHAT'S THE SOLUTION?

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We dug into lunch, and the questions about the old tree.

"I can apply what I learned in Italy to the last question," Codit began. "Walking into the site, what struck me most was the contrast between the lush green foliage of the weeds, and the pale yellow foliage of the oak. Starting at the flare, roll away the loose rocks and pull the weeds out by the roots. On the exposed oak roots, apply a 5 cm layer of healthy soil harvested from the younger oak nearby. Then install permeable aggregate above the root collar, to restore the original grade at the flare. Chop down the weeds that can't be pulled out, and remove all of the debris. Leave flowers and herbs that are identified as symbiotic, or beneficial for pollinators."

The naturalists added, "We can see that the competition from the other weeds is severe, and the giant is losing the battle for water and nutrients. Allelopathic turfgrass is winning the chemical battle for a favorable rooting environment. Dead leaves and topsoil collected from the young oak should be chopped up and spread where weeds once grew. Cardboard and mulch can be used to smother the grass that is not pulled out. If the diagnostic team agrees that the young oak is competing with the champion, then it can be cut down.

"However," Vaughn interjected, "it is not clear that this competition exists. Could the young tree be providing not competition but carbohydrates to the older tree? Evidence of competition is lacking. The tree could be severely reduced, with cuts up to six inches (15 cm). This pruning might lessen root growth, and the potential for competition. Over time, it may provide habitat for creatures escaping from the older tree. The young oak's leaves and twigs can be chopped, and spread over the old oak's root-zone. The larger branches can be laid outside the giant's dripline, to further insulate and nourish its roots. Should the crown become unstable, this line of logs could be enhanced with branches to limit access, and risk."

New roots originate at the edges of the cavity.

Codit continued, "Like leaves, dead branches and trunk sections recycle nutrients back to the tree. Aerate the soil on the path four inches deep with 1–1.5 cm holes. Uncable the broken dead stem section, split it along the grain, and trim it to make sections lay flat enough to be used as planks, or discs of wood, for walking. Lay these planks over the current path as a natural boardwalk. Where oak roots are exposed after rocks are pulled out, transplant native roses and berry bushes that are found near the younger oak."

"All good so far," I agreed. "Let me try to tackle the last question. The strap prevented the flow of nutrients by compacting the bark and conductive tissues. The compacted bark alone continues that compression and dysfunction. Tracing the compacted bark will mitigate the damage. The English standards advise us to remove dead bark when it gets in the way of closure, so use a clean sharp chisel to scrape off the dead bark without disturbing living, often white, tissue. The German standard advises us to encourage the process of regeneration and enhance vitality by modifying the soil. When in doubt, read the directions.

"Part 8 of the U.S. ANSI A300 standard expects us to inspect "Conditions in the crown that may reflect root conditions" and "Stem tissue connecting the crown and the roots." This giant oak's vertical trunk sections (also called segments, columns, or vascular pathways) that connect to the most vital portions of the crown are expanding the fastest, so they have the deepest grooves cut by the iron strap. Columns on both sides of the cavity are eloquently expanding, telling a tale of hope for this old giant."

Codit looked confused. "How can something eloquently expand?

"Good question!" Vaughn Verdier said, his hands probing the edges of the north entrance . "If our oldest, most valuable trees are removed for reasons of general liability, their features cannot be familiar to arborists. This type of regenerating growth is actually quite common, if you know where to look. Stored resources, and food made during future photosynthesis, nourishes callus tissue that rolls over hard surfaces—like the new wood inside this cavity!

"The sheer mass and strength of this elephantine expansion is speaking out, "eloquently," for the tree's vigor. Beauty's more than skin deep: high vitality creates these beautiful vascular pathways, from leaves to roots. The orange of the rhytidome shines through when bark cannot be created fast enough. We will mark and measure sections over time, to document regeneration. This phenomenon demonstrates that older trees can grow inward, as well as downward."

The group cheered up, and vowed to see the necessary works carried out.

Additional Reading

Anonymous. 2008. ANSI A300 Part 1: Pruning. TCIA, Londonderry, New Hampshire, U.S. 13 pp.

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Guy Meilleur is an ISA Board Certified Master Arborist with historictreecare.com. This is his 32nd episode in this series. Photography courtesy of the author.

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The tree's interior growth is the greenest.