DETECTIVE DENDRO
THE DIAGNOSTIC SLEUTH

By John Lloyd

The Case of the Confounding Clues

The heat of the summer had passed, and I was finishing up the last of my reports from the autumn herbicide injury season. The news media had educated most of my clients about issues with herbicides over the last several years. I was feeling worn down because the diagnostic part of most of my consulting work was over, and now the issues were more about money, compensation, and neighbor-versus-neighbor squabbling. While I enjoyed working with most of my attorney colleagues on diagnostic issues, I certainly felt that they got the short end of the stick when it came to dealing with the clients.

As soon as I finished the reports, Codit could invoice the attorneys, and we would be set for the winter teaching season. Codit and I enjoy the chance to share our experiences with and learn from other professionals at winter meetings. The pay isn't as good, but what the meetings lack in pay is more than made up for with the opportunity to converse and collect memories with colleagues and friends.

I was just heading to the kitchen to pour myself another cup of pine needle tea when Codit came to me holding a note. Codit and I don't exchange e-mails or voicemail messages. We'd rather talk to each other in person. By taking notes and talking to each other face to face, we avoid getting trapped in the virtual world of instant messaging and the cycle of instantaneous responses.

"This just came in from Mr. Danielson," he said.

I responded by raising my brow. It had been awhile since our friend Mr. Avian Danielson, a consulting sales arborist with Prism Exterior Services, in Landover, Maryland, had given us a call. It's like that in our business. We're all too busy sometimes and lose touch until a problem arises. That's one of the good things about diagnostics. Inevitably, it brings us back together.

I grabbed the note and proceeded into the kitchen. One of the benefits of pine needle tea—besides the Vitamin C and antioxidants—is that it makes the kitchen smell like Christmas. Once you get past the initial taste of turpentine, it's a nice and warm pick-me-up. And while it hadn't been too cold of an autumn in the northern plains of the U.S., the temperatures were slowly dropping, and we were starting to get snow flurries. The tea helps take away the chill. I read the note while Codit filled his mug.

"Looks like he's having issues with a tree not responding to root pruning and fertilization," Codit offered as he eagerly sipped the tea, slightly burning his tongue.

"Indeed," I replied, "it sounds like just the distraction we need to get away from this mundane paperwork. Give him a call, Codit, and find out if he's available this afternoon."

"Boss, I figured that would be your response, so I already checked with him. He's ready to meet with us in half an hour."

"Splendid! Now, where did I put my diagnostic case?"

We were a little late in arriving at the residence in question, since we took some extra time to dress for the conditions. Although the snow hadn't fallen too heavily that week, we figured we'd likely be getting muddy and dirty. That's always a given when dealing with root issues. I wore my rubber boots and Codit had his favorite pair of hip waders. They'd saved him from many a muddy mess in our adventures, and I was glad that he was always willing to go the extra mile, if needed, in digging out the diagnostic evidence.

Avian was standing with his client under the canopy of a sugar maple (*Acer saccharum*) that was obviously in a state of decline. The tree was 20 inches (51 cm) DBH and looked like it had been planted at least 20 years ago. It was winter, so we couldn't see the leaves, but could easily discern that the tips of the topmost branches were dead and bleached. In addition, many of them had broken tips, which is a real giveaway that the twigs are dead and fracturing. *Hosta* plants had been planted around the base of the tree in a three-foot (1 m) ring of wood mulch. It looked typical of what you would expect after a root excavation.

While I have not observed too much success with root extractions on hard maples, like sugar maple, I know that Avian wouldn't have called us in if it was just a case of the tree continuing to decline because they were too late in removing the girdling roots.

As if on cue to my thoughts, Avian explained that the initial consult on the property occurred five years ago when the client noticed the tree wasn't growing with its previous vigor. The arborist on-site at that time recommended enhanced deep root fertilization, since he said, "growth

was being limited by a lack of soil nutrients." Two years of fertilization had yielded nothing but further dieback, and that's when the client called Avian.

During Avian's original consult, he noticed that the maple had mower damage to the trunk, had a "bark split," also called a winter crack, coming up from the base, and seemed to go into the ground without any trunk flare. He remembered hearing something from Dr. Johnson at the University of Minnesota about bark cracks being a diagnostic characteristic related to stem-girdling root syndrome. The lack of trunk flare made him speculate that the tree was originally planted too deep or that fill had been brought in to bury the roots. Whatever was causing the decline of the tree was likely something under the soil surface, so he recommended that his client do a root examination. Avian explained that it was like exploratory surgery in humans. They brought in an air knife and compressor and cut away the turf for a three-foot ring around the tree.

Fibrous epicormic roots can generate rapidly from damaged cambial tissues if mulch and amended soils are placed in direct contact with the excised roots and trunk tissues after girdling roots have been removed.

During the examination, they found a couple of girdling roots compressing the trunk tissue right underneath the bark crack. The roots were removed with a hammer and chisel. They blew out the soil and also discovered that the tree was planted between 6–10 inches (15–25 cm) too deep. After the root surgery, Avian said they added a little compost to the soil, mixed it in with the air knife, and top dressed it with mulch, which was their standard procedure.

For the year after the root treatment, it appeared that the tree was in recovery—the new foliage in the season following treatment was green. By the end of the season, the tree looked like it was definitely in a state of recovery—the terminal buds were well set, and terminal twig growth was more than it had been in years. Expectations were high for the following season. The second season after treatment, the leaves again came out looking lush and green, but it only took a month for the expectations to be dashed. Over time, the leaves lost their vigorous appearance and the tree looked like it was declining again.

Avian explained that if the maple had continued to decline that first full season after the treatment, without any evidence of recovery, then we could say we did too little too late, and accept that we couldn't save the tree. But, since recovery was obvious in the season following treatment, both he and his client were convinced there was something else going on with the tree.

"I see," I said, trying to sound rather professorial. I stooped to my knees and dug my hand into the mulch at the edge of the bed trying not to disturb the hostas. Under the mulch, the soil was a rich, black color and had a very fine texture. I smelled the soil and noticed the musty odor indicative of a healthy and viable population of soil microbes. "Hmm." I scratched around the base of the trunk with my hand spade. I was able to dig down to the first and second girdling root that had been removed. Everything looked clean and healthy.

I decided to step back from the base and take a look at the bigger picture. Sometimes we look too close for symptoms and miss seeing larger landscape issues that are contributing to the problem. The approach always seems to help when the situation's clues aren't leading to any obvious solutions. I was getting to the point of feeling slightly stumped.

As I was thinking through all of the possibilities, I looked over the branches and noticed that this last year, there was little, if any, terminal growth. During the previous year, there had been about an inch (2.5 cm) of growth. The year before that, there was less than an eighth of an inch. So the story Avian had shared with us was accurate.

Avian and his client looked at me expectantly. I didn't have any idea what was going on. I knew my diagnostic ego was going to take a beating on this one. But then Codit, who was lying down in the dirt, called me over.

Rather than focus on the severed roots and the soil conditions like I had done, Codit took it upon himself to rake back all the mulch and the treated soil. He hadn't been very successful. The mulch that was close to the base of the trunk was still there, and that's where Codit was pointing.

"Boss, look at all the roots in the mulch," he said. "I can't rake it away because the roots and the mulch are one big, tangled mess."

I joined him on my knees and started digging around the base of the trunk. What we discovered was a mass of fine roots that had emerged from the ends of the severed roots and from the trunk tissues that had been compacted by the original circling roots. The mulch had been placed over the excavation sites and the area where the soil had been amended and tilled with the airspade. The trunk and excised root tissues were covered by a mulch mat, which from all appearances, had created an ideal environment for the creation of epicormic and adventitious roots. The entire trunk had fine roots extruding into the mulch and had created a literal mat of roots and wood mulch that could not be raked or pulled apart.

As we continued to dig, it became apparent that while the new root proliferation might have helped recovery in the first season, it had created such a mass of roots tissue that it had re-girdled the trunk with epicormic tissues within two growing seasons of the original roots being severed. It was a perfect example of another reason to keep mulch and soils away from the trunk tissues of trees, especially in this situation where the root extractions created damaged tissues that could easily generate adventitious roots.

Pulling out our pruners, we cut away all the girdling root tissues coming from the trunk and the wounded root tissues. We borrowed a propane torch from Avian's client and burned the surface tissue away from the severed area of the roots to prevent them from growing back again. Our plan was to cauterize the wound tissue and thereby prevent epicormic rooting from occurring from the damaged tissues, preventing a repeat girdling issue due to massive root regeneration. We also made absolutely sure that the client kept the mulch and the amended soils away from direct contact with the trunk tissues.

Avian assured us that he would keep an eye on the tree and keep us updated if the situation improved.

On our way home, Codit and I discussed the tenacity of trees to take advantage of environments. The sugar maple took advantage of a great rooting habitat by creating a plethora of new feeder roots, but in the process created a physical issue due to the inappropriate placement of the mulch. I praised Codit for his diagnostic tenacity. I'm certain we would not have arrived at an answer to the conundrum had he not persisted in his efforts.

He smiled and said, wryly, "If you don't like getting dirty, stay out of my way!"

We both laughed and looked forward to getting back to our mugs of warm, pine needle tea and the piles of paperwork that we had postponed for this delightfully dendrological, diagnostic dilemma.

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Photo courtesy of the author.