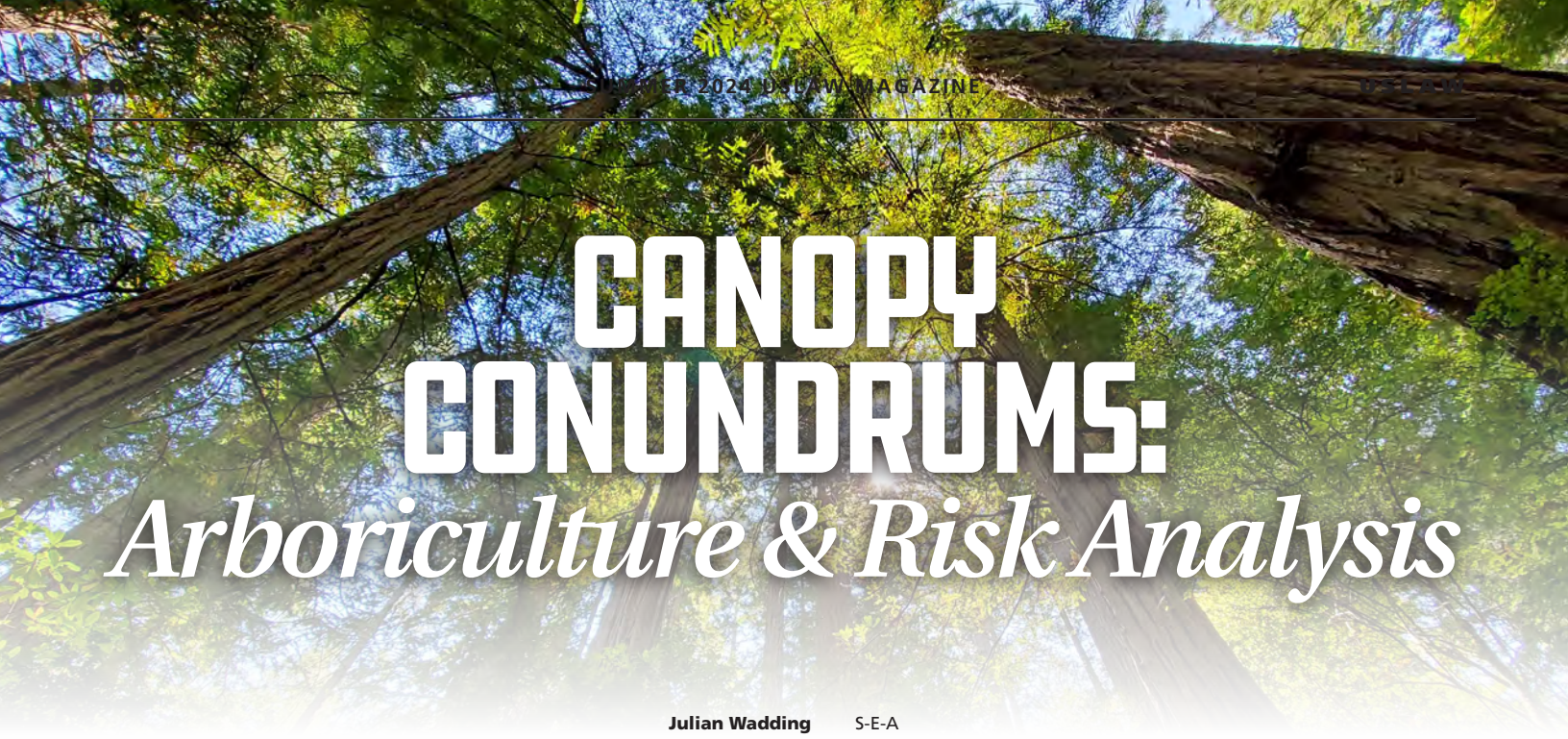


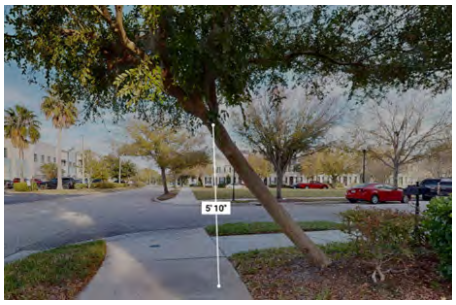
CANOPY CONUNDRUMS: *Arboriculture & Risk Analysis*

Julian Wadding S-E-A

When most think of an arborist, they think of someone who trims trees for aesthetic reasons. While arborists do engage in this activity, they also specialize in other areas of arboriculture relating to both urban landscapes and utility infrastructure. For Certified Arborists (Arborists), the industry of arboriculture has many different specializations. Arborists may be responsible for following best management practices involving the care of trees in an urban environment or could work alongside engineers and city planners to improve the beauty, drainage, and air quality in urban environments. These same Arborists can be responsible for the health of the trees, how they interact with the public, and ensuring the trees do not interact with critical infrastructure such as power lines.

Certified Arborists are credentialed by the International Society of Arboriculture (ISA) and are recognized nationally throughout the United States without any need for state-specific licensure. With 36,000+ Certified Arborists, only a small percentage of them are certified in sub-specialties such as a Utility Specialist, Municipal Specialist, or Master Arborist.

Regardless, all Certified Arborists are to perform their duties within an established best practice to ensure a level of public safety. Central to this effort, when a tree has a heavy concentration of public exposure underneath it, the Arborist should monitor the tree for compliance with local and municipal codes or standards. These codes and standards define distances or heights from the ground to the first lateral branching to establish a distance that is appropriate. This confirms that pedestrians or vehicles may be able to pass without contacting any of the subject trees. As with many codes and standards established at the local municipal level, requirements may vary throughout the nation. Accordingly, when injuries or property damage arise from contact with trees along trafficked pathways, a Certified Arborist will need to evaluate their compliance with the governing municipal codes and standards. Additionally, they must ensure that the health and condition of these trees are acceptable and pose no risk to the public.



Evaluate tree/limb clearance for compliance with municipal codes and standards.

A lesser-known industry is vegetation maintenance. All utilities are required to ensure they provide safe and reliable power to their customers. While an ISA Certified Utility Specialist may not be required to oversee this vegetation management, they are uniquely positioned to evaluate the best management practices applied throughout the various utility infrastructures and easements.

When a power plant utilizes a transmission system to deliver power to substations, the infrastructure often consists of massive structures that transmit this power over large distances, high above the ground. The importance of vegetation management in the utility industry cannot be underestimated in this regard. Vegetation is a biological entity that is innately dynamic. Ensuring that vegetation does not interfere with overhead electrical transmission requires due diligence, appropriate planning, and purposeful execution.

An important distinction when understanding the interaction of vegetation and electric utilities is the difference between distribution and transmission systems. Transmission systems, with respect to vegetation management, are their own entity and have their own management practices. The large structures often seen in rural areas are subject to the Electrical Reliability standard FAC 003-4, regulated by the North American Electric Reliability Corporation (NERC). This requires a minimum clearance between vegetation and transmission lines. However, it does not establish a maximum clearance or a particular management program for vegetation. That is typically accomplished by the utility via a holistic approach based on flora and fauna endemic to the respective area. Mismanagement can not only affect the reliability of power transmission, but may increase the likelihood of forest fires, via contact with trees or tree failure into the lines.

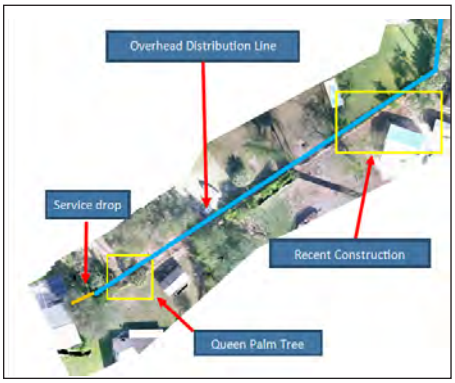
Distribution systems, however, are the utility infrastructure that delivers power to the customer. This system typically consists of structured poles that carry the overhead electrical transmission via conductors directly to the consumer. Understanding the difference between these two systems is key as both take a very different approach to vegetation management.

The vegetation clearance distances for distribution systems are often decided by the utility and its contractors, or by the state or local municipalities. Therefore, one size does not fit all, and the best practices take a holistic approach to achieve the most appropriate vegetation management schedule. Considering that vegetation is a

biological variable that can change based on weather patterns such as precipitation and sunlight as well as growth rate, the extent to which the vegetation can interfere with overhead distribution systems can vary. Accordingly, it not only matters how the trees are maintained, but how they are trimmed. Utilities use methodologies consistent with the ANSI A300 Pruning Standards and directional pruning methods to discourage growth into the overhead electrical facilities.

Directional pruning in proximity to a circuit body.

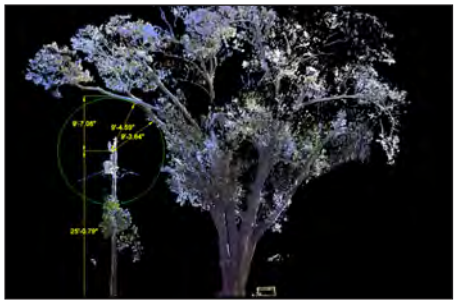
Directional pruning combined with a strategic IVM Plan (Integrated Vegetation Management Plan) is a strong way to mitigate contact with overhead electrical facilities, thus reducing the possibility of public interaction, such as contact with vegetation, that can lead to fires at/around residential structures. If such an event occurs, a thorough evaluation of all the conditions may be needed to understand how and why a loss occurred.



Evaluate vegetation interference along a circuit body for fire origin and cause.

Direct contact with live transmission and distribution lines is not always required for electrocutions to occur. Downed powerlines and flashover can result in electrocutions. According to the specialty insurance provider NIP Group, electrocution is the second-most common cause of death among tree service workers. A set of distance metrics known as the Minimum Approach Distances (MAD) defined within OSHA 1910.269, sets the standard distances for activities based on the voltage of the overhead electrified line. OSHA 1910.269 also provides different tables for use by qualified line professionals and unqualified line professionals, respectively.

While the distinction between qualified and unqualified line professionals is defined by ANSI Z133, the employing institution defines the level of proficiency needed in the work practices involved to become a qualified line professional. Line clearance professionals should be aware of these approach distances. Loading, weather, temperature, and their respective effects on overhead lines become critical to the safe approach of these lines. Evaluation of these effects, along with the evaluation of the approach distances employed, are considerations when evaluating the factors leading up to an electric shock event.



Evaluating the distance for distribution infrastructure after electric shock and contact events.

When evaluating a tree for vitality, it may exhibit several clues that can indicate ailments. These clues can be physical manifestations like defoliation or chlorosis (yellowing leaves). Other visual cues can manifest in forms of fungal conks or insect damage to indicate a possible systemic health issue. If these issues are not addressed in time, they can increase the likelihood of failure in a tree. These failures can take the form of decayed branches breaking off from wind loading, or a bark inclusion that could split a tree in two. These failures can also be at the center of disenchantment by HOAs, property owners, and planned communities when expectations of tree caliper after a period of years is not met.

The initial design choices, construction practices, adjacent structures, and historical maintenance can all affect the growth of trees and plants. Combinations of these factors can lead to a mismatch of actual growth with respect to an expected growth projection over a period of years. Accordingly, claims are made against a variety of businesses where the demands are for full replacement with mature trees throughout a community. These claims can be made against the original designers, original contractors, and/or maintenance companies that were charged with meeting certain contractual obligations.

Appropriate construction practices are also something to consider. For example, if a tree by a home is subject to nearby construction activities, this could cause shearing of roots or suffocation from mechanical compaction, which can invite pests and diseases. Design practices should consider the expected use function and proximity of trees in relation to critical infrastructure such as roadway curbs, sidewalks, and driveways in addition to the effects of drainage profiles for stormwater runoff. In turn, maintenance practices should consider the effects of certain machinery and the interactions they will have with root systems, branch growth, and resilience against windstorms. While these practices may have immediate deleterious effects on vegetation, some of these symptoms may manifest themselves a great deal of time later and be misconstrued with respect to the proximate cause.

Evaluate damage to trees in urban settings relating to design, construction, and maintenance deficiencies.

Recognizing the importance of trees and vegetation, their relationship with urban environments, and their interaction with the public is key to understanding the associated risk. As trees are a vital component to any ecosystem, the importance of appropriate management methodologies cannot be understated. Recognizing all of this will help mitigate risk and assist in determining the cause surrounding events such as fires, line contacts, tree failures, and bodily injuries. A Certified Arborist can help navigate the multitude of considerations that these evaluations require.

Julian Wadding is a civil consultant, EIT and ISA-Certified Arborist in S-E-A's Tampa Office and a member of the Utility Arborist Association. He holds a Bachelor of Science in civil engineering. Prior to S-E-A, he worked as a design arborist, where he worked for a utility in assisting with vegetation maintenance of distribution infrastructure.