Conflict between trees and streets? Yes, but UF scientists find equation to ease tension

by Brad Buck

BALM, Fla. — Too often, trees are planted in urban areas, only to be removed a few years later because their root system runs into sidewalks and other infrastructure, say UF/IFAS researchers.

With proper tree selection and spacing, UF researchers hope they can save more urban trees so that everyone can gain the ecosystem benefits they provide, including oxygen and the carbon they prevent from getting into the atmosphere.

So, a team led by UF/IFAS scientists found an equation that would let urban foresters ensure the right trees are planted far enough apart so they don't cause unintended consequences.

UF/IFAS researchers — along with colleagues from the University of Wisconsin-Stevens Point and University of Nebraska-Lincoln — sampled a total of about 1,500 trees in Tampa, Florida; Milwaukee, Wisconsin; Minneapolis and St. Paul, Minnesota.

Scientists measured the diameters of the trees at breast height – a standard trunk measurement — and at the base of the trunk flare – where the roots come out. Researchers found a strong relationship between those two measurements. The study shows that in the 10 species they surveyed, trunk thickness can predict the size of the regions where the highest roots emerge from the trunk.

"Practitioners could use our equations — along with recommended distances between trunks and infrastructure — to come up with minimum planting space sizes," said Deborah Hilbert, a biological scientist and doctoral student at the UF/IFAS Gulf Coast Research and Education Center in Balm.

For example, a user could search existing tree inventory or other data for the maximum trunk diameter of a target species, insert this value into the appropriate equation, and get the estimated maximum root flare diameter.

That means that diameter at breast height can be used to design minimum growing space to potentially prevent root and infrastructure conflicts. Community foresters have access to diameters at breast height if they've inventoried trees, or they will know how to get the measurement if they don't have an inventory.

The findings by researchers are critical because it takes a while to see return on investment with planted urban trees. It takes nursery production costs, water, transportation, mulch, maintenance and more to keep the trees alive, Hilbert said.

She gives a good example of how the research finding works: The largest live oak the research team studied was about 50 inches in diameter at breast height. If you plug that figure into the live oak equation, you get a trunk flare diameter of 85 inches, or 7 feet. They want the oak to live to maturity, so they need to plant it in a spot with 7 feet of space for the base of the tree, plus another 4 feet on each side to further prevent root conflict with infrastructure.

That means the live oak should not be planted in a strip less than 15 feet wide, Hilbert said.

“This means large-stature trees like live oaks, laurel oaks, sycamores and others would be excluded from the typical tiny planting strips found between sidewalks and curbs – but that is arguably more sustainable in the long-run,” she said. “Better-informed tree selection and more creative planting strip designs are needed to support the big-canopy trees — especially as street trees — which will in turn provide a multitude of benefits to the community.”

Hilbert, a Ph.D. student in the UF/IFAS College of Agricultural and Life Sciences, does her research under the supervision of Andrew Koeser, an assistant professor of environmental horticulture at GCREC.

“Community planners, urban foresters and others can use this information to make informed planting decisions, potentially reducing conflict between trees and adjacent infrastructure and leading to more sustainable urban forests,” Koeser said.

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