

Researchers study how urban trees affect environment

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Everyone knows that trees provide shade. What may be less obvious are their contributions to evaporative cooling. Think of tree roots drawing water from the ground and pumping it to their leaves, which effectively

sweat H₂O, cooling the air around them in the process.

How far does that cooling go in an [urban environment](#) that seems to be getting hotter?

And how do trees impact [storm water](#)? As rainfall moves through their branches, does it change chemical composition? Rainwater effectively feeds trees, but do trees also feed rainwater?

Experiments in St. Paul parks

Those are the kinds of questions fueling a series of science experiments in four St. Paul parks. A team of interdisciplinary researchers from the University of Minnesota has outfitted 30 trees in parks across the city with a variety of sensors, rainwater and temperature gauges in a multi-faceted effort to better understand "transpiration," or tree water loss, and to test rainfall filtered through the [tree canopy](#) for nitrogen, phosphorous, carbon and ions.

As tree research goes, that's fairly well-trod ground, so to speak. While these wouldn't be unusual experiments in woodsier, more secluded environments, what sets these set-ups apart is that they're situated by parking lots next to popular urban libraries, rec centers and outdoor ballfields next to busy St. Paul streets.

In other words, the city.

"City trees and [forest trees](#) are different," said Xiating Chen, a doctoral candidate in the U of M's Department of Civil, Environmental and Geo-Engineering, standing in front of a series of trees wrapped in aluminum-like sheathing by the Highland Rec Center. "City trees have more competition."

The long-term goal, said Chen, is to bring together the disciplines of forestry management and urban storm water management under a single roof. Diana Karwan, associate professor of forest resources, said the experiments are part of the university's long-term ecological research on "urban nature."

"We want to know what trees do to rainwater both ways—between the sky and the ground, and between the ground and the sky," Karwan said. "As scientists, we're learning how to modify our studies because people are all around us and interacting with this. If we were in the middle of the woods, the set-up would look different. There would be wires all over the place."

How trees impact the urban environment

The experiments are being hosted on small groupings of trees by the Highland, Linwood, Dayton's Bluff and Orchard recreation centers.

Instead of caution tape and cables running between each tree sending data back and forth, each tree cluster is tagged with a small plastic label bearing a QR code, which can be scanned by smart phone to direct visitors to an explanatory website.

Most, but not all, of the trees in question are ash trees likely to be removed by the end of the researchers' three-year grant. If their funding gets renewed, the researchers would then be able to conduct many of the same experiments in the same sites where the ash trees once stood, offering compelling before-and-after comparative data that could shed even more light on how trees impact the urban environment.

Chen pointed to a "sap flux sensor," or a pair of nodules or thermal probes hidden beneath a sheath of aluminum-like material. The thermal couples are heated to different degrees, creating a temperature

differential. When the temperature difference falls, that's an indication of increasing water flow. "It measures how quickly the liquid is flowing through the sap wood," she said. In other words, transpiration.

The 30 trees, which were wrapped in June, will stay that way into October, and then testing will resume next summer. The scientists are also using storm water data already collected by the Capitol Region Watershed District at key outlets such as Como Lake to help inform their research, which is just one series in a growing catalog of urban ecology experiments involving everything from pollinators to watersheds. Another team of U of M researchers is studying tree species resilience at Crosby Farm Park in St. Paul.

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