Canopy Considerations

By Ian Gray

In the course of their management efforts, urban foresters increasingly consider the metrics revealed by tree canopy cover measurements. Indeed, percentages of uncovered impervious landscape versus that shaded by trees have become critical benchmarks and inform best management targets. This discussion is perhaps a cautionary tale for those of us who may have hitched our wagons to this performance measure, as well as a discussion of the best way forward—is there a less traveled path diverging through the woods that offers a meaningful difference?

Consider this from the perspective of the aircraft carrying Light Detection and Ranging (LIDAR) equipment—lasers used for remote sensing that collect the reflected data from flyovers of a given city limit. They capture the total extent of tree cover on both private AND public property. This public/private distinction has implications for managing the coverage discussed below. The stark fact is this—tree canopy cover percentages have been dropping in cities across the board for decades. Indeed, if there were foresters in one of those aircraft ('arbonauts' if you will), they would be tempted to cry out, "Houston, we have a problem!"

There are a number of challenges to consider in navigating the air turbulence of the management conundrum relating to this issue. These will be addressed in turn.

- Land use
- Target setting
- Rates of survivability
- Ratios of replacement
- Appropriate ordinances
- Design standards and tree retention
- Fee-In-Lieu alternatives
- Bureaucratic politics
- Housing policy
- Property rights

Land Use

Because tree canopy evaluations typically capture everything within city limits, this is a combination of coverage of both private and public property, given as a percentage. From the point of view of the forester working for a municipal entity, the limiting factor is that management will pertain primarily to trees on public property. Given that there are often limited available planting spaces, the ability to plant enough trees can be hampered simply on the basis of available public land. Add to this the fact that in most cities the majority of the urban forest grows on private property and the ability of an urban forestry program to hit ambitious canopy cover targets can be nigh on impossible. Educating private property owners about the importance of trees on their parcels is both difficult but critical.

Target Setting

Setting canopy cover targets should be approached with caution. Past industry best practice standards have pegged 40% tree canopy cover as the urban ideal; current thinking has a more nuanced approach for optimal base lines (Leahy 2017). In practice, few municipalities come close to this, and most are steadily losing ground (Nowak et al. 2022). If an urban forestry program sets a target that is too ambitious—one that is too different from current conditions—it will be doomed to failure. Moving the needle upward and increasing canopy cover is incredibly difficult. Even if you had the space for enough trees, it takes a long time for the effect to take place.

Rates of Survivability

The sad fact about the survivability of urban street trees is that it is low. Depending on the study, the range is at best a paltry 15 years (Hilbert et al. 2019). Given that trees typically don't start returning meaningful benefits until well established after 12-15 years—in particular shade—the calculus for meaningful improvements in tree canopy cover becomes fraught. Urban street tree planting environments are tough to begin with, considering the degraded nature of typical soils, high amounts of reflected or radiated heat, pollution, and competing infrastructure. Where space allows and the local market will bear, it structural soil cells can improve growing space and soil conditions.

Ratios of Replacement

Many cities have tree replacement ratios nominally set at 1:1 or 2:1 when public trees are removed in the course of capital improvement or infrastructure projects (e.g., see Renton, WA, Renton Municipal Code [City of Renton 2024]). Sadly, this fails the sustainability mission entirely, especially for larger trees. Large trees do the heavy lifting when it comes to providing those important ecosystem benefits like shading and cooling, carbon absorption, stormwater mitigation, and air purification precisely because of

the size of their expansive spreading canopies. Replacing such large trees with the typical 2-inch (5-cm) caliper street tree is vastly insufficient. Even deploying replacements inch for diameter inch would be a difficult sustainability equivalence threshold to meet given the land use and survivability problems. Mitigation tree banks or offsite tree planting locations can be part of a solution.

Appropriate Ordinances

The quality of municipal tree ordinances across the country is highly variable. While there are certainly industry and best practice guidelines, consistency and effectiveness are elusive (see King County, WA, Tree Ordinance Guidelines [King County 2024]). The public/private applicability is particularly relevant here. Because more trees exist on private property, how a city uses ordinances to protect trees on private residential parcels or development parcels is incredibly important. Well written ordinances that give clear protections to larger trees and encourage their retention are critical. Trees over 24 inches (61 cm) in diameter often get designated as significant specimens (landmark, historical, cultural), but monitoring and meaningful enforcement of protections are often difficult. Development standards and ordinances that incentivize tree retention through credits accorded for larger trees retained show promise (City of Renton 2024).

Development Design Standards and Tree Retention

Having clear standard specifications for tree protection during construction is fundamental. Without stringent work-site application of the standards, severe tree impacts and continued tree loss are unavoidable. Furthermore, tree retention requirements are often a low bar, and tree protection zones (TPZ) are poorly understood, defended, and monitored. For example, it is not uncommon to see retention percentages calculated AFTER right-of-way designations are laid out—any trees in those areas aren't included in the retention calculation. Add to that the typical lot layout which often emphasizes the most linear and least 'encumbered' geometry, as per contractor preference, with little thought to actually retaining the best trees on the parcel, such that anything resembling meaningful retention is lost. Good pre-application short plat designs and pre-construction tree inventories are important in establishing baselines—not all trees are necessarily worth retaining, but without this data, good decisions can't be

made, and appropriate tree protection zones designed, deployed, and safeguarded.

Fee-In-Lieu Alternatives

These alternatives are used as a relief valve or mechanism of sorts, offering a means of collecting fees for either tree code violations or variances for developers unable to meet mitigation planting requirements for construction projects. These funds often go directly to street tree planting programs. In some instances, there are 'tree bank' programs where trees can be planted in designated off-site areas. This seems like a tenable idea in practice, but in principle it erodes the purpose of tree retention—an effort to maintain tree densities and retaining trees where they are currently growing throughout a city should be the rule. Fees or fines for the value of trees removed can be substantial. A healthy 25-inch (63.5-cm) DBH tree in good condition can be worth north of $30,000 as a replacement value, and that doesn't even account for the ecosystem services lost in the process (CTLA 2020).

Bureaucratic Politics

Politics is an unavoidable reality of the bureaucratic process, and it inserts itself in insidious ways. Favored infrastructure projects get fast-tracked, additional variances are allowed, code violation fines are substantially reduced, tree retention requirements are temporarily suspended for a pet project—you get the picture. In a recent news article, a Pacific Northwest tree commission responsible for redrafting a fairly anemic city tree ordinance was found to have commissioners who openly admitted to having specific sympathies for developers and had agitated on their behalf in the process (Fryer 2024). Creating new ordinances can be a fraught and lengthy process in any event, so effecting quick, meaningful change this way may be difficult. That said, urban foresters must have a thorough understanding of their city's ordinances and shouldn't be averse to driving necessary changes with updates to the code.

Housing Policy

The headlines are replete with references to the lack of housing inventory. In Washington State, this has resulted in House Bill 1110 (Washington State Legislature 2023), sometimes referred to as the "middle housing" bill. The intention is to increase densification by offering a greater range of housing types and moving away from low-density residential single family detached house lots. This includes various multi-plex options and up to 4 to 6 units per residential lot. This could certainly help ease in-fill development pressure and improve both inventories and affordability, but it will likely have a devastating effect on tree canopy cover if not handled thoughtfully and potentially result in a carte blanche incentive to remove thousands of trees to accommodate the expanded construction footprint. Because housing or zoning policy at the state level can be so impactful, some larger cities have lobbyists to monitor changes. Cultivating relationships with State Departments of Natural Resources and other industry professionals can be useful for sharing best practices and navigating unintended consequences.

Property Rights

Complicating the political process, the creation of meaningful tree ordinances and adding housing are property rights. It is not unusual to see developer or contractor organizations file lawsuits against cities seeking to improve or strengthen tree ordinances (Randel 2022).

The 'just use' of property is one thing but unfettered property development should not come at any expense. Cities that fail to recognize the critical importance of trees and meaningful greenspace in the urban environment fail the most basic criteria for what makes urban living tolerable and fail the most basics tenets of environmental justice and equity. This is not a zero-sum game—a decision to have this but not that. Healthy living is also a right, and retaining, protecting, or planting trees are often the simplest and most cost-effective ways of obtaining this goal.

Recommendations

To land this plane, as it were, and make it something the average citizen can get behind, education and outreach are essential. Figure out how to tell the story about the importance of trees in meaningful and culturally appropriate ways. Encourage people to plant more trees on their own private property, and encourage the creation of conservation easements even on small residential parcels to protect significant trees for the duration of their lifespan.

Be conservative with your canopy cover targets. Often it may be more strategic and successful to embark on a campaign of stabilization—focus on limiting losses and keeping tree canopy cover percentages at their current levels. Ambition may be your enemy if you overreach and miss the mark. An oft-used arboriculture mantra is, "right tree, right place." This is important, and we absolutely need to plant more, but more critically we need to add, "right care" (Plymouth City Council 2021). Without appropriate species selection, placement, AND watering, the tree won't survive. Inch for inch replacement would be the best way to have a fighting chance of meeting the sustainability challenge in our planting efforts, and likely remains a lofty goal, but we can still aim for it.

Better ordinances are much needed—the variability from city to city makes it difficult not only for comparative purposes but for residents to navigate. There are moves afoot by various county and state entities to help collate guidelines for what constitutes a 'good' set of base-level tree ordinances, and this should help. New ordinances for development standards may be more effective if they incentivize the retention of larger trees. Managers should also be firm in requiring developers to plan and build around specimen trees, to design outside of those linear boxes—it might make for a marginally more complicated or expensive build, but they will still make money. There are good standard specifications for things like tree protection zones and what constitutes a tree worthy of retention. The trick for urban foresters in the development process is (A) being part of the land-use and design conversation early in the process; (B) having city inspectors who understand TPZ details; and (C) prioritizing compliance from contractors as a project builds out.

Minutiae like required tree retention densities may seem frivolous to some, but they remain important details that will vary from city to city. Improvements will be incremental unless there is a state-mandated minimum and there is local enforcement with teeth. Fee-In-Lieu mechanisms can have a place in this, but their use should be limited unless they can be leveraged to actually expand the urban forest. As a priority, large trees especially need to be protected and retained where they are growing, and mitigation planting done *in situ*. When fees or fines for violation or mitigation are unavoidable, there must be a degree of resolve in applying accepted industry methods for assessing lost tree value. These can result in big numbers, but people need to start appreciating just how valuable trees are, however unpalatable the figure may be. Zoning and housing types will have an increasingly outsized impact on tree retention. Hopefully buildings with smaller footprints and more vertical design will be favored—stacked flats or apartments with courtyards and space for trees.

As for politics, these are an unavoidable part of the social condition. Precisely because politicians are sensitive to pressure from the citizenry, there needs to be more vocal advocacy for all things trees. Residents should be encouraged to get involved and mechanisms created for that purpose if it is important to them. Volunteer organizations and citizen tree boards can sometimes help fill these roles. Alternatively, simply engaging and activating stakeholders to work within existing systems can be just as effective in sending messages to elected officials. That message is clear—urban forests are retreating, and trees are being unnecessarily removed on a daily basis. If we don't step up and advocate for them, our cities will be increasingly unhealthy and inequitable places to live. Trees shouldn't be seen as an extra amenity that are 'nice to have,' but as critical healthcare infrastructure.

Literature Cited

City of Renton. 2024. Renton Municipal Code. Title IV Development Regulations, Chapter 4 City-Wide Property Development Standards, 4-4-130 Tree Retention and Lang Clearing Regulations, Tree Credits H.1.b. Renton (WA, USA): City of Renton. https://www.codepublishing.com/WA/Renton

Council of Tree and Landscape Appraisers (CTLA). 2020. *Guide for plant appraisal.* 10th Edition, Revised. Atlanta (GA, USA): International Society of Arboriculture. 170 p.

Fryer A. 2024 May 24. Seattle's tree protection ordinance: Rising above the canopy cacophony. *Seattle Times*. https://www.seattletimes.com/opinion/seattles-tree-protection-ordinance-rising-above-the-canopy-cacophony

Hilbert DR, Roman LA, Koeser AK, Vogt J, van Doorn NS. 2019. Urban tree mortality: A literature review. *Arboriculture & Urban Forestry*. 45(5):167-200. https://doi.org/10.48044/jauf.2019.015

King County. 2024. Guide to developing effective urban tree regulations on private property. Seattle