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CONTENTS

Abstract. In the aftermath of a wind storm that interrupted service on more than 40% of Puget Sound Energy's transmission system, the regulator or-dered an investigation to evaluate options for hardening the electric system. The initial phase of the study quantified the extent of tree exposure along the transmission system and examined the correlation between various field measurable variables and tree-caused outage frequency. This phase of the work correlated 10 years of wind data with 10 years of outage data. Tree failure rates were calculated and used to model tree-caused outage expecta-tions based on wind speed. Models were developed to assess the outage impact of interventions that reduce the transmission system exposure to trees.
Key Words. Electric System Reliability; Reliability Modeling; Tree–Conductor Contacts; Tree Exposure Risk; Tree Risk Quantification; Tree-related Outages; Storm Hardening; Utility Arboriculture; Wind Loading.

Abstract. Increasing local urban and community forestry (U&CF) programs and activities in the United States is a goal of state and federal U&CF programs. This study found local U&CF programs within the 50 United States increased in activity between 1997 and 2002 at a 2.1% annual rate of increase. Several attributes of state U&CF forestry programs from a multiple regression model and correla-tion analysis partially explain the increase in local U&CF program activity. The number of technical assists in a state were a strong pre-dictor for increased local activity. Less certainty was found with state money used to fund the state U&CF program or the use of cost-share assistance (Federal Cooperative Forestry Assistance Challenge Cost-share Grants) and this increase. Study findings provide evidence that state and federal U&CF programs within the United States are furthering the building of capacity and development of local U&CF programs.
Key Words. Building Capacity; Financial and Technical Assistance; Urban and Community Forestry.

Abstract. This study involved locating tree roots with a ground-penetrating radar (GPR) system and then examining excavated roots in the same soil volume to compare the accuracy of the GPR system with true root location. In 2003, *Acer platanoides* 'Emerald Queen' Norway maples were planted in trenches containing two compacted soils (native silt loam and CU-Structural Soil). The trenches were paved with 10 cm of concrete. In 2008, a GPR system consisting of a 900 MHz antenna mounted on a root-scanning cart was used to conduct linear scans on top of the concrete. Immediately after scanning, the concrete was removed for selected trees and whole root systems were excavated (as an entire system attached to the tree trunk) using an air excavation tool. Regression analysis using mixed effect models showed that the radar reliably predicted root presence in both the native and structural soils. The root count correlations were $r^2 = 0.76$ and $r^2 = 0.81$ for the native and structural soils, respectively. In the compacted native soil under concrete, the radar out-put overestimated the presence of roots at the minimum detection diameter but did provide a signal associated with root presence at this detection level. In the structural soil under concrete, the radar output reliably predicted roots with only slight overestimation. This study showed that GPR data reliably predicted the presence and locations of roots under the concrete pavement in two compacted soils.
Key Words. CU-Structural Soil; Root Counting; Root Detection; Root Mapping; Root Morphology; Soil Excavation; Virtual Trench.

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Abstract. Ohio, U.S.'s Shade Tree Evaluation Project began in 1965. Two of the original plantings in Brooklyn, Ohio, U.S. included 17 smaller growing, Lavalle hawthorn (*Crataegus* × *lavallei* Hérincq ex. Lavallee) and 84 larger growing thornless honeylocusts (*Gleditsia triacanthos* L. Sunburst). One consequence of selecting trees is the differing values of environmental benefits generated by trees of various sizes and survival rates. Values of environmental benefits have not been considered in plant selection but the i-Tree free suite of software now allows this to be calculated.

Algorithms recovered from i-Tree Streets were used to calculate environmental benefits in ten, randomly selected trees in each of the two plantings in Brooklyn, and adjusted for survival rates, 89% survival on Morton Avenue for honeylocusts and 65% for hawthorns as planted on Orchard Grove. When adjusted for survival, honeylocusts deliver USD $430 per tree in benefits in contrast to the $57 per tree for hawthorn. When viewed on a per surviving tree basis, honeylocusts provide more than 7.5 times the environmental benefits. Regardless of how it is viewed there is a significant reduction in environmental benefits when using smaller statured trees compared with larger trees. Communities should consider this aspect when space for larger trees is available.

Key Words. *Crataegus*; Community Forestry; Environmental Benefits; Gleditsia; Hawthorn; Honeylocust; i-Tree; i-Tree Streets; Street Trees; STRATUM; Urban Forestry.

Abstract. UrbanCrowns is a software program developed by the USDA Forest Service that computes crown attributes using a side-view digital photograph and a few basic field measurements. From an operational standpoint, it is not known how well the software performs under varying photographic conditions for trees of diverse size, which could impact measurement reproducibility and therefore software utility. Researchers evaluated the robustness of crown dimension computations made with UrbanCrowns for open-grown sugar maples (*Acer saccharum*) across a range of sizes from recently transplanted to full maturity. It was found that computations of both crown volume and density were highly repeatable across varying photographic distances. For the majority of tree size classes, crown volume and density varied less than 5% on average over distances ranging from 1.5× to 3.0× tree height; however, crown volume errors of 5%–10% were common for larger trees (>46 cm trunk diameter). UrbanCrowns calculations of crown volume showed strong agreement with calculations derived from equations for geometric solids, both in terms of precision (R^2 = 0.9783) and accuracy (B_1 = 1.0033). These findings suggest that UrbanCrowns has potential as an objective, reliable method for measuring tree crown attributes that are commonly assessed during urban forest inventories.

Key Words. Crown Density; Crown Transparency; Crown Volume; Leaf Area; Tree Inventory; Tree Measurement; Tree Monitoring.

Abstract. Climbers are increasingly using ascenders to access trees, both as a substitute for Prusik loops used in footlocking a doubled rope and with the single rope technique. Manufacturers, however, have explicit limitations on use of ascenders, many of which are violated when used in tree climb-ing. Ascenders were tested on four arborist climbing ropes in a dynamic drop test; impact load and arrest distance were measured. Of 67 tests, arrest distance met the EN 12841-2006 Standard (≤2 m) only 10 times. Impact loads averaged more than five kN, adding a backup friction hitch to the as-cender increased impact load to more than six kN. Climbers need to be made aware of the appropriate use of ascenders, and only use compatible ropes.

Key Words. Ascender; Climbing; Rope.