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CONTENTS

Abstract. Campinas Metropolitan Region is the third richest city in Brazil. This study assesses the urban street trees of Campinas based on data from a survey performed using satellite images in the year 2011. All public domain trees in the street system were counted and separated into trees, shrubs, palm trees, and seedlings. The density of trees was obtained using the images census and expressed as trees per linear kilometer for the perimeter of the block. The number of trees per linear kilometer was grouped into nine classes of different densities for data validation. The final number of trees was estimated based on the validation's results. The Gini coefficient shows that the number of trees per person is very irregular in city neighborhoods (i.e., Campinas has a fairer income distribution than street trees distribution). There is a lower density of trees in the downtown area, due to the high concentration of population, and in more peripheral neighborhoods, due to the lack of design planning. The results obtained here may be used to support a new setting of local priorities for planting actions aimed at urban forestry management.
Key Words. Brazil; Campinas; Census; Density; Geoprocessing; Gini Coefficient; Remote Sensing; Street Trees; Urban Ecology; Urban Forest.

Abstract. Until recently the only way to investigate tree root architecture and distribution involved the physical removal of soil. However, in the past decade, ground-penetrating radar (GPR), which has been used in many other industries for about 30 years, has been used to study tree roots. GPR is relatively new to Australia and the aim of this research was to assess its spatial accuracy and ability to detect tree roots.

Three experiments were conducted using a 900 MHz GPR device (Tree Radar®). The first experiment tested the ability of GPR to detect roots of sizes 10 mm, 20 mm, and 40 mm in diameter at depths of 200 mm, 400 mm, and 800 mm, while the second experiment tested its capacity to resolve two roots placed close together. Roots of 20–30 mm in diameter were placed in pairs at 20 mm, 40 mm, and 80 mm apart at depths of 200 mm, 400 mm, and 800 mm. The final experiment used GPR to analyze the *in situ* root system of a small *Pistacia chinensis* (Chinese pistachio) after which the root system was excavated using an AirSpade® and counts of root numbers were undertaken and compared with the predicted results.

GPR detected and discriminated tree roots accurately at 200 mm depth, but as the depth increased to 400 mm and then to 800 mm, the levels of error increased, probably due to the choice of antenna available for the experiments, leading to the presence of phantom roots in some results and the misdetection of true roots in others. Confounding of the signal with unexpected interference or inadequate signal processing was most likely the cause. In the final experiment, GPR missed many small roots in the trenches close to the tree and appeared to detect multiple roots as one. In the outer trenches, GPR predicted 52 roots in total but excavation revealed only one in these disturbed urban soils.
Key Words. Discriminating Roots; Ground-Penetrating Radar; Root Architecture; Root Detection; Tree Radar; Tree Roots.

Abstract. Plants were grown in a 2 × 2 factorial combination of planting depth in nursery containers and at a landscape installation to study effects on root architecture, growth, and mechanical stability of *Magnolia grandiflora* L. Planting depth into containers or landscape soil had no impact on bending stress to tilt trunks 40 months after landscape planting, and impacted neither trunk diameter nor tree height growth 68 months later. Trees planted 128 mm deep into 170 L containers had more circling roots at landscape planting and 68 months later than trees planted shallow in containers. Root pruning at landscape planting reduced the container imprint rating on the root system to one-third of that absent root pruning with only a 4 mm reduction in trunk diameter growth over 68 months. Improvement in root architecture from root pruning likely outweighs the rarely encountered downside of slightly less anchorage in an extreme weather event simulated by winching trunks. Trees planted 5 cm above grade were slightly—but significantly—less stable in landscape than trees planted deeper (10 cm below grade). Root pruning at planting to remove roots on root ball periphery appeared to improve root architecture while only slightly impacting growth and anchorage.
Key Words. Anchorage; Bending Stress; Circling Roots; *Magnolia grandiflora*; Nursery Containers; Planting; Root Pruning.

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Abstract. Emerald ash borer is a pest of North American ash that has caused significant mortality within its introduced range. The timeline for tree mortality, once infested by emerald ash borer, is variable for individual trees, with a small proportion surviving infestation. Using tree health assessments and signs of emerald ash borer infestation, researchers developed decision models to predict the probability of mortality. Two resulting models performed well at correctly predicting mortality (>83% correct) and significantly separating probability of mortality for those trees. Both models used diameter at breast height (DBH) and presence of bark splits, with one including percent crown dieback and the other including vigor rating (overall tree health assessment). A third model had reduced correct prediction of mortality, but was still potentially an effective model. Other tested models had shortcomings in prediction of mortality or in separation of probabilities of mortality. Using variables from three potential decision models, the year of mortality was modeled. However, specific year prediction was not as effective. Because of a wide range of external factors, prediction of a specific year of mortality may not be appropriate. Using DBH and rapid health and infestation assessment data, the authors were able to correctly predict ash mortality within a three-year period for the majority of trees within this study. Management strategies that use these models for developing hierarchical removal programs for infested ash may distribute financial and environmental costs over multiple years as opposed to mass removal of street and park trees.

Key Words. *Agrilus planipennis*; Ash; Decision; EAB; Emerald Ash Borer; *Fraxinus*; Pests; Tree Survival.

Abstract. The CTLA Trunk Formula Method is an industry-standard tool for appraising large trees. The goal of this study was to measure its precision in the field and to look for possible ways to improve the formula or its implementation. Fourteen certified arborists independently appraised the same ten trees, and the results of their appraisals were analyzed. This study focused on the attributes of Trunk Area, Species, Location, and Condition. In the results, the attributes with the highest variance among appraisers were Trunk Area and the Condition Rating. In the past, much of the variation among appraisers has been attributed to personal bias due to lack of experience, and it has been suggested that variance would decrease with experience. These results give evidence to the contrary—the group of appraisers with the highest variance was the group that performed appraisals most frequently. The most valuable information from this study was the identification of four key elements of error involved in the appraisal process: personal value error, personal observation error, measurement error, and systematic error.

Key Words. Cross-Sectional Area; Guide for Plant Appraisal; Measurement Error; Personal Observation Error; Personal Value Error; Rating; Systematic Error; Tree Appraisal; Trunk Formula Method.