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Andrew K. Koeser, Drew C. McLean, Gitta Hasing, and R. Bruce Allison

**Frequency, Severity, and Detectability of Internal Trunk Decay of Street Tree *Quercus* spp. in Tampa, Florida, U.S. .... 217**

**Abstract.** Wood decay is a factor considered in all commonly accepted tree risk assessment methods; however, few studies have attempted to assess its presence in the urban forest or its predictability given visual cues and site factors. A random sampling of trees situated on hurricane evacuation routes was inventoried and assessed for risk in the city of Tampa, Florida, U.S. In addition to a basic visual assessment, a sampling of larger diameter (>30.5 cm) live oak (*Quercus virginiana*) and all large diameter laurel oak (*Quercus laurifolia*) trees were tested with a resistance-recording drill to determine the amount of decay present (looking specifically at the sound-wood-to-stem-diameter ratio). Overall, 56.9% of the trees tested had some level of decay, though the incidence of decay was higher in laurel oak (67.4%) than in the live oak (29.4%). Additionally, tree species ( $P < 0.01$ ), diameter ( $P < 0.01$ ), and the presence or absence of visual decay indicators ( $P = 0.03$ ) were all significant predictors of decay presence.

**Key Words.** Advanced Assessment; Basic Assessment; Decay Incidence; Decay Severity; Florida; Laurel Oak; Live Oak; *Quercus laurifolia*; *Quercus virginiana*; Risk Assessment; Tampa; Visual Risk Assessment.

Gregory Dahle, Aaron Carpenter, and David DeVallance

**Non-Destructive Measurement of the Modulus of Elasticity of Wood Using Acoustical Stress Waves ..... 227**

**Abstract.** Many biomechanical models include modulus of elasticity ( $E$ ) but it is not always available in the literature. It would be useful to directly measure  $E$  for species, and one of the standard techniques for doing so is to utilize a universal testing machine (UTM). While laboratory testing can determine static flexural modulus of elasticity using a UTM, it requires destructive sampling and therefore is only useful after a tree or limb has been removed. Acoustic testing can be used to estimate the dynamic modulus of elasticity (DMOE) of wood, by measuring the speed of sound through a sample of wood without the need to remove any wood samples. This research investigated if acoustic testing can be used to accurately estimate the modulus of elasticity of green wood.

Stump sprouts arising after a shelterwood harvest were cut and left at room temperature (21.1°C, warm) or conditioned to -6.7°C (frozen). The modulus of elasticity was measured using a stress-wave timer (DMOE) and a UTM ( $E_s$ ). The DMOE was higher in the frozen samples, but temperature did not affect  $E_s$ . While the stress-wave timer used in the study found a slightly higher  $E$  than a UTM, a simple prediction equation was determined for converting the results. Researchers believe tools such as this can be successfully utilized by the arboriculture industry to rapidly assess the modulus of elasticity of standing trees in the field.

**Key Words.** Acoustic Testing; Biomechanics; Dynamic Modulus of Elasticity; Green Wood; Northern Red Oak; *Quercus rubra* L.; Stress Wave; Temperature.

Edward F. Gilman, Maria Paz, and Chris Harchick

**Effect of Liner Container Size, Root Ball Slicing, and Season of Root Pruning in a Field Nursery on *Quercus virginiana* Mill. Growth and Anchorage After Transplanting ..... 234**

**Abstract.** Size of liner, root ball slicing when field planting, and field root pruning season were tested with intention of optimizing post-transplant performance of field-grown nursery stock. Trees planted into a field nursery from three container sizes and either root ball sliced or not when shifted to larger containers or planting to the field nursery, and root pruned in the field nursery in either the dormant season or growing season all had the same trunk diameter (144 mm) and tree height (6.4 m) three years after transplanting into the landscape. Container size influenced root attributes—including number and orientation—and anchorage rating of field-harvested trees. Trees planted from 11 L containers required more bending stress to winch trunks evaluated 12 and 25 months after transplanting than larger containers. Percentage of root systems graded as culls was reduced from 88 to 66 by root pruning when field planting, but root pruning resulted in a slight reduction in anchorage rating. Diameter of the ten largest roots at edge of field-harvested root ball decreased with size of container planted into field soil. Root pruning season had no impact on final tree height (4.3 m) at the conclusion of field production.

**Key Words.** Anchorage; Bending Stress; Container Volume; Dormant Season; Growing Season; Live Oak; Planting; *Quercus virginiana*; Root Architecture; Root Depth; Root Pruning; Transplanting.

Edward F. Gilman, Chris Harchick, and Maria Paz

**Impact of Landscape Tree Stabilization System and Nursery Production Method on Anchorage and Growth ..... 246**

**Abstract.** The purpose of this study was to evaluate growth and anchorage one year after landscape planting of red maple (*Acer rubrum* L. 'Florida Flame') from both a field and container nursery that were stabilized with above- or belowground systems. Trunk diameter increased more for trees planted from containers with soilless substrate (17 mm) than trees with a soil root ball from a field nursery (14 mm); however, there was no impact of nursery production method on tree height. Trees secured with a guying system grew less in trunk diameter than trees secured with a belowground system, with a tall wood stake system, or the non-staked control. Guyed trees were taller than trees secured with a root-ball stabilization system. More bending stress was required to winch trees transplanted from the field nursery than trees from containers immediately after releasing stakes one year after planting. There was no difference among stabilization systems in bending stress to winch to any trunk tilt angle, indicating similar anchorage across systems. Moreover, trees stabilized for one year required the same bending stress to winch as controls, indicating that stabilizing trees for one year with any of the systems tested did not reduce anchorage compared to non-stabilized trees.

**Key Words.** *Acer rubrum*; Lateral Stability; Nursery Production; Planting; Red Maple; Root Cross-Sectional Area; Staking; Transplanting; Trunk Tilt; Winching.

Christopher A. Nowak and Caryl J. Peck

**Large Oriental Bittersweet Vines Can Be Killed by Cutting Alone: Implications for Utility Arboriculture and Other Hazard Tree Work..... 253**

**Abstract.** Oriental bittersweet (*Celastrus orbiculatus*) is an invasive, exotic, woody vine introduced to North America in the mid- to late 1800s from East Asia. This vine is problematic because it can kill trees through competition and mechanical stress, which in turn creates problems for tree care professionals in utility right-of-way and other hazard tree work. Oriental bittersweet is becoming more prevalent as a problem throughout the eastern United States. Two manipulative field experiments were conducted across the Hudson Valley in New York State to test the timing of cutting and glyphosate herbicide effects on large vine mortality. While results from the first year indicated that herbicides were needed with vine cutting to achieve high mortality rates, this was not true with second year results. Cutting vines without herbicides produce the same, high rate of mortality of oriental bittersweet vines after the second year (>90% kill) as cut-stump treatments with herbicides. It may be important that high kill of cut vines is related to large vine size, and that stumps were in forest shade. Herbicides may not be necessary to kill cut-stump methods to kill oriental bittersweet vines that have a minimum stem diameter >2-3 cm and are growing in areas where stumps are in shade.

**Key Words:** Accord®; *Celastrus orbiculatus*; Cut Surface; Danger Tree; Efficacy; Hazard Tree; Hudson Valley; Liana; New York; Oriental Bittersweet; Vegetation Management.

Keith O'Herrin and Patricia Shields

**Assessing Municipal Forestry Activity: A Survey of Home-Rule Municipalities in Texas, U.S..... 267**

**Abstract.** Municipal forestry programs in the United States have been the subject of dozens of surveys over the past 40 years that offer valuable insight into what is occurring now and act as a point of reference in the future. Researchers surveyed home-rule municipalities (pop. 5,000 or greater) in Texas, U.S. to assess the commonality of the components of a municipal forestry program, municipal spending on urban forestry, and amount of assistance received from the Texas A&M Forest Service. Spending on urban forestry in Texas cities averaged USD \$4.88 per capita overall. Basic tree ordinances, tree boards, non-profit tree advocacy groups, and proactive maintenance cycles were all fairly common. Urban forest management plans and tree inventories were very uncommon. About 70% of municipal forestry programs are housed in their cities' Parks and Recreation Department, with the majority of the remainder occurring in their Public Works Department. The level of assistance received by municipalities from the Texas A&M Forest Service is consistent with the budget priorities and mission statement of that organization, which focuses on delivering technical and educational assistance over financial assistance. A lack of recent national trends to compare against greatly hampers understanding the efforts of Texas municipalities relative to other states. However, identifying current trends in Texas offers value to the Texas A&M Forest Service to understand the effect of their service delivery strategy. Urban foresters and city managers can also use these results to compare themselves against their peers, a common practice in setting municipal budgets and policy.

**Key Words.** Advocacy; Performance Measurement; Program Evaluation; Tree City USA; Urban and Community Forestry.