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Daniel K. Struve, Francesco Ferrini, Alessio Fini, and Laura Pennati

### **Relative Growth and Water Use of Seedlings from Three Italian Quercus Species ..... 113**

**Abstract.** A species' water use characteristics and growth habits are important to urban foresters. Seedlings from three species (and two sources)—*Quercus cerris* L., *Q. pubescens* Willd., and *Q. robur* L.—were container-grown and subjected to a three day water use trial under nonlimiting soil moisture conditions. Water use varied among species and between sources within a species. Larger seedlings used more water than smaller seedlings; *Q. robur* seedlings were the tallest, 70.5 cm (27.8 in), and had the greatest water use seedling, 73.4 g (2.5 oz) water, while *Q. pubescens* and *Q. cerris* seedlings were shorter, 46 and 45 cm (18.1 and 17.7 in), and averaged 47.5 and 44.9 g (1.68 and 1.58 oz) water, respectively. *Quercus pubescens* seedlings had the highest water use cm<sup>-2</sup> leaf area (0.111 g); *Q. cerris* seedlings had the highest height-adjusted water use (1.4 g water cm<sup>-1</sup> height). There were significant differences in water use between sources within species. Principal component analysis, using 20 variables, showed that seedlings of *Q. robur* and *Q. pubescens* sources clustered while seedlings of the two *Q. cerris* sources were separate from each other and the *Q. robur* and *Q. pubescens* sources. The clustering reflected the proportionally greater distribution of dry weight to shoot growth and correspondingly less to root growth of the *Q. robur* and *Q. pubescens* seedlings, than that for *Q. cerris* seedlings. The results are related to the species' relative value to nursery producers and to the potential value to urban forest managers and the potential for cultivar development.

**Key Words.** Drought Resistance; Dry Weight Partitioning; Seedling Growth; Water Use.

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Michael R. Kuhns and Douglas K. Reiter

### **Tree Care and Topping Beliefs, Knowledge, and Practices in Six Western U.S. Cities ..... 122**

**Abstract.** A survey of households was conducted in six cities in the interior western United States to determine homeowners' knowledge of tree biology and tree care and their knowledge and practice of topping. Tree biology and tree care knowledge was low, depending on the specific subject, and few respondents had any formal training in tree care. Respondents' topping knowledge was moderate to poor if they had topped trees before, regardless of whether they received a topping-related educational brochure. Those who had not previously topped trees were fairly knowledgeable and the brochure increased knowledge in some cases. Topping was fairly commonly practiced, even by those who cared about trees, and often was done for safety and to improve tree appearance and tree health. Amongst those who had topped trees, the survey explored who performed the topping, why it was done, and their satisfaction with the practice. Examples of ways the tree care industry and others may be contributing to misunderstanding, such as inconsistent practices, are discussed. Recommendations are made for changing knowledge and attitudes about tree care as well.

**Key Words.** Planting; Pruning; Topping; Tree Care; Urban Forestry.

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Raul I. Cabrera

### **Revisiting the Salinity Tolerance of Crapemyrtles (*Lagerstroemia* spp.) ..... 129**

**Abstract.** The crapemyrtle (*Lagerstroemia* L.) is one of the most popular flowering trees in the U.S. and abroad. *L. indica* cultivars have dominated urban and landscape settings until their recent displacement by modern interspecific *L. indica* × *L. fauriei* Kohene hybrids. This study evaluated the salt tolerance of an older *L. indica* cultivar, 'Pink Lace,' and the hybrids 'Natchez' and 'Basham's Party Pink.' While the growth of these three cultivars was significantly and negatively affected by increasing NaCl salinity (0 to 24 mM) in the irrigation water, the shoot to root ratio (S/R) and aesthetic parameters (chlorophyll content and salt burn ratings) of 'Pink Lace' was the most affected. This cultivar showed the most responsive relationships between salt burn ratings and sodium (Na) and chloride (Cl) accumulation in leaf tissues. 'Basham's Party Pink' was rated as the most salt tolerant, with relatively steady S/R, chlorophyll contents and salt burn rating across all salinities, and its leaf tissues had the lowest accumulation of Na and Cl. Results from this study also support the hypothesis that geographical and ecological origins of the parent *Lagerstroemia* species and selections largely influences the relative salinity tolerance of the cultivars.

**Key Words.** Irrigation; Salinity Tolerance; Water Quality.

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Justin Morgenroth and Graeme D. Buchan

**Soil Moisture and Aeration Beneath Pervious and Impervious Pavements ..... 135**

**Abstract.** Pervious paving has been increasingly installed in urban areas as a stormwater management strategy. Pervious pavements exhibit similar strength to impervious analogues, but are highly permeable to air and water. These functional characteristics have led to speculation that pervious paving, used instead of impervious paving, could benefit urban trees. Given that permeability to air and water will have a direct effect on the soil environment, this paper describes research that explores the effect of pervious pavement on underlying soil physical conditions. Results indicate that while soil moisture and aeration dynamics differ greatly beneath paved and unpaved surfaces, differences are usually insignificant between pervious and impervious paving. If urban trees do benefit from overlying pervious paving relative to impervious paving, it is probably not a consequence of soil moisture or aeration. The results challenge existing theories and contribute to the understanding of how pervious pavements affect the moisture and aeration dynamics of underlying soils.

**Key Words:** Concrete; Permeable; Porous; Road; Sidewalk; Water.

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Tomás Martínez-Trinidad, W. Todd Watson, Michael A. Arnold, Leonardo Lombardini,  
and David N. Appel

**Carbohydrate Injections as a Potential Option to Improve Growth and Vitality of Live Oaks..... 142**

**Abstract.** This study evaluates the effects of carbohydrate injections on the growth and vitality of live oak (*Quercus virginiana* P. Miller). Glucose, sucrose, or a 50:50 mixture of both carbohydrates at increasing concentrations [0, 40, 80, and 120 g/L (0, 5.3, 10.6, and 16.0 oz/gal)] were injected into live oaks. Trunk and root growth, net photosynthesis, root and twig carbohydrate concentration, and chlorophyll fluorescence were monitored. Isotope composition of twig and root samples was measured as an indicator of injected carbohydrate distribution. There were significant differences ( $P < 0.05$ ) in trunk growth among types of carbohydrates, but no significant differences for carbohydrate concentrations. The mixtures of sucrose and glucose had the largest effect on growth compared to either sugar alone, suggesting that glucose and sucrose alone were used in processes other than trunk growth. 50:50 mixtures caused a greater effect on overall mean growth indices than either sugar alone. Glucose content in twigs and starch in roots were significantly different ( $P < 0.05$ ) among overall means for concentrations with increased levels found in trees treated with the greatest concentrations. Chlorophyll fluorescence Fv/Fm revealed highly significant differences ( $P < 0.001$ ) among overall concentrations. Carbon isotope values did not reveal a definite trend that corroborated the exogenous carbohydrate distribution. Results from this experiment suggest that carbohydrate trunk injections can have an impact on growth and vitality of live oak.

**Key Words.** Glucose; *Quercus virginiana*; Sucrose; Sugars; Tree Vitality.

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Michael Booth and Dan Johnson

**Pressurized-Canister Trunk Injection of Acephate, and Changes in Abundance of Red Elm Bark Weevil (*Magdalis armicollis*) on American Elm (*Ulmus americana*) ..... 148**

**Abstract.** Portable pressurized injection vials (Ecoject System) were used in an experiment to assess injection of acephate into elm trees (*Ulmus americana*) as a means of reducing within-tree abundance of red elm bark weevil (REBW), *Magdalis armicollis*. A total of 25 elm trees were treated, each paired with an untreated tree. A total of 400 pressurized canisters were used in the study. REBW population density, as indicated by sticky-paper trap catches, on treated and untreated trees did not differ significantly at the time of trunk injection. Two weeks after injection, the average REBW trap catch on the 25 untreated trees had increased, whereas the average trap catch on the 25 treated trees had decreased. The resulting average trap catch from the treated trees was significantly lower than that of the control trees. Although subsequent declines in REBW populations precluded a longer record of the effects of tree injection, the significant reductions apparent in the first two weeks following injection indicated the method was effective in reducing REBW abundance. The impact on REBW populations was detectable even though treated and untreated trees were contiguous, indicating that selective treatment of individual trees could be part of an effective operational treatment for REBW management. No phytotoxic effects were detected by spectrophotometric assessment of leaf chlorophyll.

**Key Words.** Acephate; American elm; Canadian Prairies; Chlorophyll; Ecoject; *Magdalis armicollis*; Population Reduction; Red Elm Bark Weevil; Spectrophotometric; Sticky Trap Sampling; Trunk Injections; *Ulmus americana*.

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Richard Stalter, Dwight Kincaid, and Michael Byer

**Control of Nonnative Invasive Woody Plant Species at Jamaica Bay Wildlife Refuge, New York City ..... 152**

**Abstract.** Jamaica Bay Wildlife Refuge (JBWR) is situated within Jamaica Bay, an inlet of the Atlantic Ocean at the western end of Long Island, New York, U.S. (40°35' N latitude, 72°52' W longitude) within Brooklyn and Queens, boroughs of New York City. The vouchered vascular flora of the refuge consists of 456 species within 270 genera and 90 families of which 222 species, 49% of the flora, are nonnative. The most aggressive woody alien species are tree of heaven (*Ailanthus altissima*), Oriental bittersweet (*Celastrus orbiculatus*), multiflora rose (*Rosa multiflora*), Russian olive (*Elaeagnus angustifolia*), autumn olive (*E. umbellata*), buckthorn (*Rhamnus frangula*), Japanese honeysuckle (*Lonicera japonica*), and porcelain berry (*Ampelopsis brevipedunculata*). *Ailanthus altissima*, *Ampelopsis brevipedunculata*, and *Celastrus orbiculatus* are the most aggressive of the aforementioned aliens. These and additional woody nonnative vascular species can be removed from small areas of a few square meters by cutting, herbicide treatment or hand-pulling. It may be impossible to control, much less eradicate these alien invasives from Jamaica Bay Wildlife Refuge. This article presents guidelines for a scientific and experimental approach to this problem.

**Key Words.** *Ailanthus altissima*; *Ampelopsis brevipedunculata*; *Celastrus orbiculatus*; *Elaeagnus* spp.; Jamaica Bay Wildlife Refuge; *Lonicera japonica*; New York City; Nonnative Vascular Plants; *Rhamnus frangula*; *Rosa multiflora*.

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Alexis A. Alvey, P. Eric Wiseman, and Brian Kane

**Efficacy of Conventional Tree Stabilization Systems and their Effect on Short-Term Tree Development..... 157**

**Abstract.** We evaluated three conventional tree stabilization systems (staking, guying, and root ball anchoring) on 6.4 cm (2.5 in) caliper field-grown, balled and burlapped white ash (*Fraxinus americana* L. 'Autumn Purple'). At five weeks and at seven months after planting, performance of the stabilization systems was evaluated under ambient wind conditions as well as wind-simulating pull tests. Nonstabilized ash trees remained upright during both the 5-week and 7-month studies despite occasionally substantial wind gusts. From the pull tests, the study found the stabilization systems performed equally well and that even nonstabilized ash trees were tolerant of moderate to heavy wind loads. Stabilization systems differed in the maximum force they endured before component failure. The guying system withstood forces 1.7 to 2.5 times greater than the root ball anchoring and staking systems, respectively. Stabilization system components were very durable during the first growing season and did not substantially impact tree height growth, shoot elongation, root diameter, root length, or root mass seven months after planting. After one growing season, both nonstabilized and previously stabilized trees remained upright until unrealistically large loads were applied. Practical implications for landscape tree management are discussed.

**Key Words.** Anchoring; Guying; Planting; Pull Tests; Staking; Tree Stabilization; Tree Support; Wind.

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Yaoqi Zhang, Bin Zheng, Brenda Allen, Neil Letson, and Jeff L. Sibley

**Tree Ordinances as Public Policy and Participation Tools: Development in Alabama ..... 165**

**Abstract:** Following a brief overview of the historical evolution of tree ordinances in the United States, this paper focuses on the development of tree ordinances in the state of Alabama to demonstrate how the tree ordinances evolve into law and the role such ordinances have on urban trees. Even though tree ordinances have a long history in the United States, they have been rapidly developing since the 1970s. Among the 100 municipalities that have some type of tree ordinance in Alabama, based on this investigation, the major responsibilities of tree ordinances include: having a tree commission (board), defining tree planting, removal and replacement of trees on public land, public tree protection and care, tree species selection, and dead tree removal on public and private property. Considering the broadness and complexity of urban trees, this paper indicates tree ordinances provide not only a legal framework, but also an effective tool to engage public participation and awareness of urban trees in the process of formulating, implementing, and amending of the tree ordinances. Development of tree ordinances requires government support, citizen participation, and consideration of local resources.

**Key Words:** Green Law; Landscape Ordinance; Public Attitude; Public Survey; Southeast United States.

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