



## CONTENTS

Edward F. Gilman, Maria Paz, and Chris Harchick

**Effect of Container Type and Root Pruning on Growth and Anchorage After Planting *Acer rubrum* L. into Landscape Soil ..... 73**

**Abstract.** *Acer rubrum* L. ‘Florida Flame’ were grown in #3 containers of eight types, then shifted to #15 containers, then finally into #45 containers. Half the trees were root pruned by removing periphery 3 cm of root ball at each shift to larger containers. In addition to and simultaneous with being shifted into successively larger containers, some trees from each container size were planted directly into soil. Type of container and root pruning had no impact on trunk diameter, tree height, or root cross-sectional area on trees planted into soil from any container size. Type of container influenced architecture of planted root systems evaluated when all trees were five-years-old with limited impact on anchorage. Container type only impacted anchorage of trees planted from #45 containers, and impact was small. In contrast, shaving root balls during production substantially reduced imprint left by all containers evaluated when trees were five-years-old. Shaving during production also improved anchorage by 20%–25% compared to not root pruning. More roots grew on north than the south side of tree in the nursery and landscape. Bending stress increased with trunk angle and its square while winching trunks to five degrees tilt.

**Key Words.** Lateral Stability; Root Architecture; Root Circling; Root Cross-Sectional Area; Root Defects; Tree Health.

Stephen A. Wyka, Joseph J. Docola, Brian L. Strom, Sheri L. Smith, Douglas McPherson, Srđan Aćimović, and Kier D. Klepzig

**Effects of *Grosmannia clavigera* and *Leptographium longiclavatum* on Western White Pine Seedlings and the Fungicidal Activity of Alamo®, Arbotect®, and TREE-äge® ..... 84**

**Abstract.** Bark beetles carry a number of associated organisms that are transferred to the host tree upon attack that are thought to play a role in tree decline. To assess the pathogenicity to western white pine (WWP; *Pinus monticola*) of fungi carried by the mountain pine beetle (MPB; *Dendroctonus ponderosae*), and to evaluate the potential for systemic prophylactic treatments for reducing fungal impacts, experiments were conducted with WWP seedlings to meet three objectives: 1) evaluate pathogenicity of two MPB-associated blue-stain fungi; 2) evaluate phytotoxicity of tree injection products; 3) evaluate the anti-fungal activity of tree injection products, *in vitro* and *in vivo*, toward the associated blue-staining fungi. To evaluate pathogenicity, seedlings were inoculated with *Grosmannia clavigera* or *Leptographium longiclavatum*, common fungal associates of MPB. Seedling mortality at four months after inoculation was 50% with *L. longiclavatum* and 90% with *G. clavigera*, both significantly higher than controls and thereby demonstrating pathogenicity. Phytotoxic effects of TREE-äge®, Alamo®, and Arbotect® were evaluated by stem injection; no phytotoxic effects were observed. Anti-fungal properties of the same three products were evaluated *in vitro* against *G. clavigera*, where Alamo was most active. Co-inoculation of *G. clavigera* and *L. longiclavatum* into seedlings after a stem injection of Alamo showed significantly less mortality and lesion formation than either species alone. Results support the hypothesis that MPB blue-stain associates, particularly *G. clavigera*, promote death of WWP when attacked by MPB. These findings suggest that the administration of a fungicide with insecticide for tree protection against bark beetles may be advantageous.

**Key Words.** Bark Beetles; Blue-Stain Fungi; Emamectin Benzoate; *Grosmannia clavigera*; *Leptographium longiclavatum*; Mountain Pine Beetle; *Pinus monticola*; Propiconazole; Systemic Fungicide; Systemic Insecticide; Thiabendazole; Tree Injection; Western White Pine.

Chris Haugen, Kevin Tucker, Alex Smalling, Emily Bick, Steve Hoover, Grant Ehlen, Todd Watson, and Shawn Bernick

**The Efficacy of Paclobutrazol Soil Application as it Relates to the Timing of Utility-Right-of-Way Pruning ..... 95**

**Abstract.** The plant growth regulator paclobutrazol’s effect on live oak trees (*Quercus virginiana*) was evaluated to determine optimum timing of application and pruning time in Louisiana. Variables considered included length of branch regrowth, branch distance to conductor, pruning time and biomass chipping time. Data were evaluated to determine the ideal application timing of paclobutrazol relative to time of pruning. Live oak trees treated with paclobutrazol had significantly reduced branch regrowth, pruning time and chipping time, as compared to control trees regardless of application timing. Paclobutrazol application on live oak trees was idealized within 90 days pre- to 90 days post-prune. Economically, significant gains were found by utilizing this tool ranging from 180 days pre- to 180 days post-prune, allowing for application timing flexibility to reduce the growth of trees near power lines. Paclobutrazol treated live oak trees demonstrated significantly less re-growth response.

**Key Words.** Integrated Vegetation Management; Live Oak; Louisiana; Paclobutrazol; PBZ; Plant Growth Regulator; *Quercus virginiana*; Utility Vegetation Management.

Emma Schaffert and Glynn Percival

**The Influence of Biochar, Slow-Release Molasses, and an Organic N:P:K Fertilizer on Transplant Survival of *Pyrus communis* ‘Williams’ Bon Chrétien’ ..... 102**

**Abstract.** High mortality rates result from transplanting bare-rooted plants into urban landscapes where unsuitable soil conditions, such as low fertility and poor structure, often exist. Coupled with little aftercare, these losses can cause high economic losses to the industry. Previous studies have shown lowered transplant stress and higher survival rates through the addition of soil amendments at the time of planting to improve soil conditions. The efficacy of three soil amendments applied singly and in combination—biochar, slow-release molasses, and an organic N:P:K fertilizer—were investigated for their potential to reduce transplant losses of *Pyrus communis* ‘Williams’ Bon Chrétien. Results of this investigation showed that use of these soil amendments in virtually all cases had significant positive effects on tree growth and vitality across two growing seasons. For example, all amendments reduced mortality of *Pyrus communis* ‘Williams’ Bon Chrétien’ by 20% compared to none in treated controls, while increases in fruit yield and crown canopy coverage per tree ranged from 19.3% to 46.7% and 14.4% to 31.1% over non-amended soils when averaged over two growing seasons. Amendments of biochar with an organic N:P:K fertilizer and an organic N:P:K fertilizer alone showed, on average, the highest improvements in vitality and growth. Results indicate use of biochar, slow-release molasses, and organic N:P:K fertilizer amendments offer potential for increasing bare-root transplant survival and establishment of *Pyrus communis* ‘Williams’ Bon Chrétien.

**Key Words.** Biochar; Fertilizer; *Pyrus communis*; Soil Amendments; Transplant Stress; Tree Mortality; Tree Planting; Urban Trees.

Monica L. Elliott, Timothy K. Broschat, and Lothar Göcke

**Preliminary Evaluation of Electrical Resistance Tomography for Imaging Palm Trunks ..... 111**

**Abstract.** In a preliminary study, electrical resistance tomography (ERT) was used to obtain trunk images of *Syagrus romanzoffiana*, a common ornamental palm grown in southern Florida, U.S. Seven palms, four healthy and three diseased, were evaluated in the middle of the dry season, with four located in an irrigated site and three in a non-irrigated site. Two healthy and three diseased palms were felled and cross sections obtained to examine their internal structure and compare to the tomograms obtained. ERT was effective in illustrating the relative electrical resistance value of healthy palms, as the tomograms obtained for palms situated in the irrigated site (low electrical resistivity) were distinctly different from the tomograms of palms situated in the non-irrigated site (high electrical resistivity). ERT was also effective in visualizing internal palm trunk areas affected by the fungal pathogens *Ganoderma zonatum*, a wood decay pathogen, and *Fusarium oxysporum* f. sp. *palmarum*, a vascular wilt pathogen, as these areas had a low electrical resistivity.

**Key Words.** Electrical Resistance Tomography; Electrical Resistivity; Florida; *Fusarium oxysporum* f. sp. *palmarum*; *Ganoderma zonatum*; Palms; *Syagrus romanzoffiana*; Wood Decay.

Adam Berland, Dustin L. Herrmann, and Matthew E. Hopton

**National Assessment of Tree City USA Participation According to Geography and Socioeconomic Characteristics ..... 120**

**Abstract.** Tree City USA is a national program that recognizes municipal commitment to community forestry. In return for meeting program requirements, Tree City USA participants expect social, economic, and/or environmental benefits. Understanding the geographic distribution and socioeconomic characteristics of Tree City USA communities at the national scale can offer insights into the motivations or barriers to program participation, and provide context for community forestry research at finer scales. In this study, researchers assessed patterns in Tree City USA participation for all U.S. communities with more than 2,500 people according to geography, community population size, and socioeconomic characteristics, such as income, education, and race. Nationally, 23.5% of communities studied were Tree City USA participants, and this accounted for 53.9% of the total population in these communities. Tree City USA participation rates varied substantially by U.S. region, but in each region participation rates were higher in larger communities, and long-term participants tended to be larger communities than more recent enrollees. In logistic regression models, owner occupancy rates were significant negative predictors of Tree City USA participation, education and percent white population were positive predictors in many U.S. regions, and inconsistent patterns were observed for income and population age. The findings indicate that communities with smaller populations, lower education levels, and higher minority populations are underserved regionally by Tree City USA, and future efforts should identify and overcome barriers to participation in these types of communities.

**Key Words.** Arbor Day Foundation; Community Forestry; Community Size; Geographic Region; Green Infrastructure; Municipal Management; Tree City USA.