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Jan Lukaszkiwicz and Marek Kosmala

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Abstract. This article evaluates the possibility of determining tree age based simultaneously on diameter at breast height (dbh) (1.3 m [4.3 ft]) and total tree height using common lime, common ash, and horsechestnut species. The first step was the identification and measuring groups of trees growing in similar conditions (streetside trees in Warsaw area, Poland) in which planting ages were known (mainly from archives). Next, multifactorial regression model was developed describing the growth of both tree parameters (dbh and height) over time. In the majority of cases, plotting tree age against diameter and height yielded a regression coefficient r value and determination coefficient r^2 value above 0.9. For graphic interpretation of elaborated multifactorial models, nomograms were applied. This kind of graph allows explaining tree age based on both dbh and height of trees. Another step was verification. The resulting model was applied to unrelated groups of trees of known age. Mean bias values were established for each model. The difference between the actual age and mean age calculated with the model was less than $\pm 15\%$. Presented model, although not meant for application to individual trees, might be useful to determine the age of groups of trees growing along streets and roads.

Key Words. Common Ash; Common Lime; DBH-Height Regression Model; Horse Chestnut; Streetside Trees; Tree Age Nomograms.

Tyler R. Stevenson, Henry D. Gerhold, and William F. Elmendorf

Attitudes of Municipal Officials Toward Street Tree Programs in Pennsylvania, U.S. 144

Abstract. Survey responses from 528 officials in 356 municipalities defined the developmental status of municipal street tree programs and the attitudes of three types of officials: elected chief officials, public works administrators, and municipal solicitors. In sustained programs, which had an ordinance, tree commission, inventory, and management plan, officials had more positive attitudes about trees than in developing programs, which had at least one of these elements, or in communities without a tree program. However, even in the latter, approximately half of the officials believed that benefits of street trees outweigh costs and any disadvantages, and 62% favored starting a tree program. No tree programs exist in 46% of the cities, 82% of the boroughs, and 97% of the townships, so there are many opportunities and also important barriers. Incomplete understanding of the benefits of trees and tree care practices leads to low public support, insufficient funding, and inadequate personnel and equipment. Most officials favor spending some money on trees but regard tree programs as less important than other civic responsibilities. Officials may be persuaded to start or improve tree programs by explaining benefits more fully and how public safety can be improved by proper pruning, inventories that locate dangerous trees, and management plans that arrange to remove them. Furthermore, funding may be alleviated by using volunteers, grants, and available technical advice.

Key Words. Attitudes; Municipal Officials; Ordinances; Pennsylvania; Street Trees; Tree Commissions; Urban and Community Forestry.

William Elmendorf

The Importance of Trees and Nature in Community: A Review of the Relative Literature..... 152

Abstract. A growing body of literature and experience revolves around the beneficial and connected relationships among nature, social settings, and social processes like interaction. This literature argues that the natural environment is a critical component of personal and community pride and well-being and a stimulus for collaborative action. Furthermore, it argues that empowering people to become involved in the process of landscape and park creation and maintenance increases social interaction, builds community capacity, and supports both development of community and community. Tree plantings and other civic environmental projects can be used to promote both healthy environments and healthy social structure even in the most deteriorated neighborhoods. As such, participatory environmental projects are strong tools of community development, and the work of arborists and urban foresters can play an important part in the process of community.

Key Words. Civic Environmentalism; Community; Community Capacity; Community Development; Empowerment; Interaction; Shared and Structured Symbols; Tree Planting.

Francesco Ferrini, Alessio Fini, Piero Frangi, and Gabriele Amoroso
Mulching of Ornamental Trees: Effects on Growth and Physiology 157

Abstract. Two organic mulching materials applied to newly planted *Tilia × europaea* and *Aesculus × carnea* trees were evaluated for effects on tree growth and physiology. Both mulches were efficient in maintaining a cleared area around newly planted trees, although pine bark was more durable than coarse compost from mixed green material. Trees mulched with compost generally had greater height, trunk diameter, and current-year shoot growth. Differences were more evident in the first year in *Aesculus* and in the second year in *Tilia*. Mulching with compost increased carbon assimilation of linden leaves in 2005 when compared with pine bark and chemical weeding. Both mulching materials increased transpiration of horsechestnut in 2005. Little effect on gas exchange was found in 2006 in both species. However, because mulched trees were larger with longer shoots, whole plant leaf gas exchange was probably greater. Mulching had very limited effects on chlorophyll fluorescence. Results of this project have shown that mulching materials applied around trees after planting can positively affect tree growth without significantly affecting tree physiology.

Key Words. *Aesculus × carnea*; Chlorophyll Fluorescence; Compost; Leaf Gas Exchange; Mulching; Pine Bark; *Tilia × europaea*.

Andy Moffat, Kirsten Foot, Fiona Kennedy, Martin Dobson, and Geoff Morgan
Experimental Tree Planting on U.K. Containment Landfill Sites: Results of 10 Years' Monitoring 163

Abstract. A series of experiments was set up in England in the early 1990s on five containment landfill sites engineered to modern standards to test the relative performance of 14 native and nonnative woodland tree species. This article describes the results of monitoring their survival, growth, and nutrition over a 10-year period. The experiments demonstrated that several species, notably ash, whitebeam, white poplar, and wild cherry, can usually be established on landfill sites with survival rates comparable to other brownfield sites. Despite general site infertility, growth of many tree species (for example, ash, beech, English oak, sycamore, Italian alder, silver maple, white poplar, and whitebeam) was similar to that expected on greenfield sites in the locality of the landfill sites. As well as infertility, soil droughtiness and mammal browsing were identified as limiting tree performance of particular species on some sites. After 10 years, there was no evidence of interaction with landfill containment systems or landfill gas.

Key Words. Landfill; Nutrition; Tree Growth; Tree Species; Tree Survival.

Pascal Nzokou, Samuel Tourtellot, and D. Pascal Kamdem
Impact of Pesticides Borate and Imidacloprid on Insect Emergence from Logs Infested by the Emerald Ash Borer 173

Abstract. The Emerald Ash Borer (EAB) was discovered on North American soil in the summer of 2002 near Detroit, Michigan, U.S., and has since spread to six states/provinces. To alleviate these costs, a method of sanitization is urgently needed. This study evaluated four different chemical sanitation methods in laboratory and field conditions. Treatments included two borate treatments, spray and dip, with concentrations ranging from 5% to 16.5% boric acid equivalents by mass and Preventol, a technical grade imidacloprid treatment with solution concentrations ranging from 0.005% to 0.02% applied as sprays. When logs were reared indoors subsequent to treatment, the technical grade imidacloprid and the borate dip treatments reduced the infection levels significantly. For the outdoor-reared logs, only the technical grade imidacloprid had a significant effect. All chemical treatments did better under indoor rearing than they did under outdoor rearing. This has heavy implications for the development of a sanitization treatment to be used in actual applications. Observations of EAB adults after emergence indicate that borate treatments may negatively affect EAB adult health and survivability after emergence.

Key Words. *Agrilus*; Borate; Emerald Ash Borer; Exotic Pests; Imidacloprid; Quarantine; Sanitization; Value Added.

E. Thomas Smiley
Comparison of Methods to Reduce Sidewalk Damage from Tree Roots 179

Abstract. Tree roots growing under sidewalks are known to crack or lift pavement often creating a tripping hazard for pedestrians. This experiment was conducted to determine the long-term effects of below- and alongside-pavement treatments on tree root development and sidewalk damage. London, U.K. plane trees (*Platanus × acerifolia*) were planted next to sidewalks at the Bartlett Tree Research Laboratory in Charlotte, North Carolina, U.S., in 1996. Treatments installed at the time of planting were: DeepRoot Universal Tree Root Barrier (UB18-2), vertical polyethylene sheet, gravel, Foamular®150 extruded polystyrene, and a structural soil. The sidewalks and soil beneath them were removed in 2006. Minimal sidewalk lifting or cracking was associated with the DeepRoot barrier, gravel, and foam treatments. Vertical root barriers and foam resulted in fewer and deeper roots under the pavement. Treatments had no impact on tree diameter growth.

Key Words. Deep Root Barriers; Foamular®; Infrastructure Damage; Root Barriers; Sidewalk Lifting; Structural Soil; Styrofoam; Tripping Hazard.

E. Thomas Smiley

Deep-Rooted Trees for Urban Environments: Selection and Propagation..... 184

Abstract. Seedling liners of three tree species (*Fraxinus uhdei*, *Pistacia chinensis*, and *Zelkova serrata*) were planted in the field and grown for 18 months. Pneumatic air excavation followed by digital photography, three-dimensional modeling, and root analysis showed there were significant differences in root architecture among the three species and within each species' population. Among the three species, *Pistacia chinensis* had, on average, the deepest, most vertically oriented root systems and *Fraxinus uhdei* and *Zelkova serrata* the shallowest; however, there were shallow-rooted and deep-rooted genotypes in each species. Shallow-rooted and deep-rooted genotypes of *Fraxinus* and *Zelkova* selected from the seedling populations were propagated vegetatively by cuttings, planted in the field, and grown for 5 to 6 years. On excavation and three-dimensional model creation, the root architecture of the cutting-propagated clones was assessed using liminal angles and individual root angles. Cutting-propagated clones of shallow-rooted parents were shallow-rooted; thus, they maintained the parents' root architecture. Cutting-propagated clones of deep-rooted parents were also shallow-rooted; they did not maintain their parents' root architecture. Results are discussed in terms of genetic, physiological (e.g., auxin treatment, adventitious root formation), and environmental (e.g., soil moisture) factors that can affect tree root growth and development.

Key Words. Arboriculture; Gravitropism; Infrastructure Damage; Liminal Angle; Root Architecture, Root Growth; Root System Genetics; Street Tree; Urban Forestry.

Glynn Percival and Sally Barnes

Calcium-Induced Freezing and Salinity Tolerance in Evergreen Oak and Apple cv. 'Golden Crown' 191

Abstract. Greater variability in weather patterns and later spring frosts equate to poor winter hardiness, premature spring budbreak, and greater susceptibility to low-temperature damage and concomitant deicing salt application. A field trial was undertaken to determine the influence of a range of commercially available calcium fertilizers applied as foliar sprays on the freezing and salinity tolerance of two tree species, evergreen oak (*Quercus ilex* L.) and apple (*Malus* cv. 'Golden Crown'). In all cases, application of calcium sprays increased twig, leaf, and root freezing and salt tolerance of both species as measured by leaf chlorophyll fluorescence and tissue electrolyte leakage bioassays. In the case of apple, a hardiness gain of 4.3°C (7.74°F) was recorded in twig tissue. In the case of evergreen oak, a hardiness gain of 2.1°C (3.78°F) was recorded in leaf tissue. After a -5°C (23°F) (apple) and -6.5°C (20°F) (evergreen oak) freezing stress, root electrolyte leakage values as a measure of cell membrane structural damage were 16% to 27% less in calcium-treated trees compared with noncalcium-treated controls. The salt concentration needed to cause 50% reductions in leaf chlorophyll fluorescence as a measure of photosynthetic efficiency rose by 0.2% to 1.2% in calcium-fertilized trees indicating a positive influence of calcium on enhancing leaf tissue tolerance to salt damage. Differences in the magnitude of freezing and salinity tolerance gained were noticeable between the calcium products used. In general, calcium hydroxide, calcium nitrate borate, and calcium metalosate improved twig, leaf, and root freezing and salt tolerance in both tree species to a greater degree than calcium chloride, calcium sulphate, calcium nitrate, and a calcium-magnesium complex. A significant correlation existed between increased freezing tolerance and internal tissue calcium content. Results of this study indicate that calcium sprays during late summer and fall can increase the freezing and salinity tolerance of evergreen oak and apple during the winter. This should be considered noteworthy for individuals involved in the management of trees in areas subject to subzero temperature fluctuations and/or concomitant applications of deicing salts in the form of sodium chloride.

Key Words. Chlorophyll Fluorescence; Cold Tolerance; Electrolyte Leakage; Fertilizer; Landscape Management; Plant Health Care; Stress.

Louis Anella, Thomas C. Hennessey, and Edward M. Lorenzi

Research Note

Growth of Balled-and-Burlapped versus Bare-Root Trees in Oklahoma, U.S. 200
