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F.D. Cowett and Nina Bassuk

### **Street Tree Diversity in Three Northeastern U.S. States ..... 1**

**Abstract.** Street tree diversity is widely viewed as a key component in the resilience of street tree populations to pests, diseases, and climate change. Assessment of street tree diversity is considered integral to sustainable street tree management and preservation of the ecosystem services and social benefits that street trees provide. This paper assesses street tree diversity in three northeastern U.S. states—New Jersey, New York, and Pennsylvania—by analyzing municipal street tree inventory data stratified by the 2012 USDA Plant Hardiness Zones. Despite the lesson learned from the historical devastation of overplanted American elms (*Ulmus americana*) by Dutch elm disease, and awareness of the contemporary threats posed to ashes (*Fraxinus* spp.) by the emerald ash borer (*Agrilus planipennis*) and to maples (*Acer* spp.), and other tree genera by the Asian longhorned beetle (*Anoplophora glabripennis*), results presented here indicate a current concentration of street trees among a relatively small number of species and genera, and in particular the dominance of maples as street trees. Results also show a positive relationship between street tree diversity and warmer average minimum winter temperatures. Consequently, there is a clear need in all three states for greater species and genus diversity in state-wide and municipal street tree populations. However, meaningful impediments exist to increasing street tree diversity, especially in the short term.

**Key Words.** *Acer* spp.; Diversity Indices; Ecosystem Services; New Jersey; New York; Pennsylvania; Resilience; Street Trees.

Clifford S. Sadof, Gabriel P. Hughes, Adam R. Witte, Donnie J. Peterson, and Matthew D. Ginzel

### **Tools for Staging and Managing Emerald Ash Borer in the Urban Forest..... 15**

**Abstract.** Advances in control can help municipal foresters save ash trees from emerald ash borer (EAB) [*Agrilus planipennis* (Fairmaire)] in urban forests. Although ash trees of any size can be protected from this pest, cities often do not implement programs because they fail to recognize and act on incipient populations of EAB. In this study, researchers develop a model for predicting ash mortality over an eight-year period, and validated with data from the removal of >14,000 ash trees killed by EAB in Fort Wayne, Indiana, U.S. researchers then developed a sampling scheme to help foresters map their ash trees along the expected progression of ash decline. This model was then used to modify a web-based EAB cost calculator that compares discounted annual and cumulative costs of implementing a variety of management strategies. It was determined that strategies that most heavily relied on saving ash trees were less expensive and produced a larger forest than those strategies that mostly removed and replaced ash trees. Ratios of total discounted costs to discounted cumulative benefits of strategies that saved most ash trees were over two-thirds lower than strategies of proactive tree removal and replacement. Delaying implementation of an ash management program until damage would be visible and more obvious to the community (Year 5 of the model) decreased the cost-benefit ratio by <5%. Thus, delays that rely on the abundance of locally damaged trees to bolster community support do not necessarily diminish the utility of implementing a control strategy.

**Key Words.** *Agrilus planipennis*; Ash; Ash Tree Decline Model; EAB Cost Calculator; Emerald Ash Borer; Indiana; Pest Management; Projection.

Edward F. Gilman, Maria Paz, and Chris Harchick

### **Effects of Retention Time in Nursery Containers and Root Pruning at Planting on Landscape Establishment and Anchorage of Three Tree Taxa..... 27**

**Abstract.** Tree lodging in landscapes during storms has been attributed to root architecture in nurseries. Objectives of this study were to evaluate influence of retention time in three progressively larger nursery containers, and root pruning at landscape planting, on establishment, anchorage, and root architecture in the first four post-planting years. All trees were retained in three progressively larger containers (11, 57, and 170 L) for a total of 32 months, with varying retention times in each. Retention time had little influence on post-planting xylem water potential for *Acer rubrum* and *Ulmus parvifolia*. There were few differences in aboveground growth among retention times. Except for *Acer*, retention time had a negligible influence on anchorage. Root pruning by shaving 170 L root ball periphery when planting had no impact on growth except for one post-planting year. However, root pruning invoked a dramatic reduction in circling and descending roots four years after planting caused by root deflection in the final nursery container. Although root pruning had no influence on bending stress required to winch *Magnolia* trunks to any degree of trunk tilt, approximately 10% more bending stress was required to winch *Acer* trunks up to five degrees tilt when root balls were shaved at planting.

**Key Words.** *Acer rubrum*; Anchorage; Bending Stress; *Magnolia grandiflora*; Planting; Post Planting; Root Architecture; Transplanting; *Ulmus parvifolia*; Xylem Water Potential.

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Gary Watson and Angela Hewitt

**Fine Root Growth Response to Soil-Applied Nitrogen and Paclobutrazol ..... 38**

**Abstract.** Practices to promote tree root growth have been sought in arboriculture for many years, especially as a treatment for trees that are stressed or in decline. Tree fertilization is a common practice in arboriculture. A few research reports have shown that nitrogen fertilization can increase fine-root density in localized areas of soil where the fertilizer has been applied, but the effect on the whole root system has not been investigated. Research has reported fine-root stimulating effects from basal application of the growth regulator paclobutrazol, but results have not been consistent. More information is needed. A slow-release granular formulation of nitrogen was broadcast over the entire root system of mature oaks for four consecutive years, with or without a paclobutrazol basal drench in the first year. Nitrogen was also applied to younger green ash and black maple as granular broadcast or sub-soil liquid soil injection for two consecutive years. There was no overall increase in fine-root development from any of the treatments, and no localized increase from soil injection application of nitrogen. Growth response of the crowns was minimal. Soil profiles were undisturbed with moderate natural nitrogen availability. The results suggest that routine fertilization of trees at standard recommended rates may be ineffective if soil fertility is moderate.

**Key Words.** *ANSI A300 Standard for Tree Care Operations*; Fertilization; Growth Regulator; Injection; Nitrogen; Paclobutrazol; Root Growth; Root Stimulation.

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