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Daniel W. McKenney and John H. Pedlar

To Treat or Remove: An Economic Model to Assist in Deciding the Fate of Ash Trees Threatened by Emerald Ash Borer 121

Abstract. A model is presented to assist in deciding the fate of ash trees (*Fraxinus* spp.) threatened by the arrival of emerald ash borer (*Agrilus planipennis* Fairmaire) in North America. The model tracks ongoing treatment costs versus one-time costs associated with removal and replacement. All future values are discounted following standard economic practice. For each year over a period of interest, the net treatment gain/loss is calculated, indicating the period of time over which a homeowner would be financially ahead/behind by treating the existing ash tree. The model was populated, with values that may be expected in Canadian conditions, where treatment options are more limited than in the United States. Optional model features include property value premiums, energy savings, runoff and pollution benefits, and ongoing maintenance costs. When these extended benefits and costs are included, positive treatment gains for a medium-sized ash persist for about 17 years. Negative values can be interpreted as a “break-even existence value,” an amount a homeowner would be required to pay in order to protect their ash if various other benefit flows fail to compensate the costs. An interactive version of the model is available online (<http://gmaps.nrcan.gc.ca/apm/index.php>).

Key Words. *Agrilus planipennis*; Canadian Forest Service Ash Protection Model: CFS-APM; Cost-benefit Analysis; Emerald Ash Borer; Insecticide Treatments; Urban Forest Management

M.A. Grande-Ortiz, E. Ayuga-Téllez, and M.L. Contato-Carol

Methods of Tree Appraisal: A Review of Their Features and Application Possibilities 130

Abstract. Urban trees perform a number of basic functions related to the environment and the welfare of city dwellers (ecological, recreational, psychological), although their benefits are not readily quantifiable. However, in certain situations, it is essential to assign an economic value to the trees. There are currently various methods for valuing the benefits of trees and greenspaces in human settlements, including statistical methods, the travel cost method, contingent valuation, the hedonic pricing method, and integrated methods. However, these methods are not used in official valuations of urban trees; in these cases, appraisal methods are used. The aim of this paper is to study the appraisal methods used for their detailed features and the possibilities of their application. The main conclusion of this review is that there are a number of methods with different types of application. The best method is selected according to tree location, type of land ownership, and the availability of data. Methods with a higher degree of applicability are CTLA, a parametric method of low difficulty, and Contato, a mixed method of medium difficulty. In any case, it is advisable to increase efforts to objectify the correction index in the case of parametric and mixed methods.

Key Words. Appraisal; Parametric Indexes; Urban Trees; Valuation.

Gregory A. Dahle and Jason C. Grabosky

Determining if Lateral Imbalance Exists in First-order Branches Leading to a Potential Development of Torsional Stress 141

Abstract. The management of urban trees requires an ability to appraise the stability of trees to select where and when a maintenance task is required to increase the functionally useful period of the tree. Torsion is often ignored during static bending trials and the goal of this study was to determine if first-order branches on open grown trees are laterally balanced. It is not known if lateral branch development leads to a parent branch that is evenly balanced. Second-order branch mass and center of gravity were measured and used to estimate the load acting on first-order branches. It appears that development can lead to imbalance in branches, because more than 60% of the first-order branches were imbalanced. Furthermore, 80% of the first-order branches in this specific study had more loading to the left side of the branch. Researchers should consider whether it is appropriate to ignore torsion when predicting how branches will behave during loading exercises. Additionally, the data suggests that it is possible to develop a strong predictive equation between branch length and the center of gravity ($r^2 = 95\%$) which, tied with predicted branch mass, could be useful when modeling self-loading and later balance in branches.

Key Words. Biomechanics; Branches; Center of Gravity; Mass; Stress, *Tilia cordata*; Torsion.

Timothy K. Broschat and Kimberly A. Moore

Fertilization Rate and Placement Effects on Areca Palms Transplanted from Containers or a Field Nursery 146

Abstract. Areca palms (*Dyopsis lutescens* [(H. Wendl.) Beentje and J. Dransf.]) were transplanted from containers or a field nursery and were treated with fertilizer placed at the bottom of the planting hole, incorporated into the backfill, or on the surface of the root ball to determine the effects of fertilizer placement at planting on palm growth and quality. Fertilizer was applied at 0, 250 g (20 g N), or 500 g (40 g N) per tree for each placement method to determine fertilization rate effects. Areca palms transplanted from containers grew best when fertilizer was incorporated into the backfill, but any fertilizer placement or rate was better than no fertilizer. When areca palms were transplanted from a field nursery, there was no consistently best fertilizer placement method. However, fertilized plants grew better and had less severe nitrogen and potassium deficiency symptoms than unfertilized palms. There was no benefit to higher fertilization rate for either container- or field-grown areca palms.

Key Words. Areca; *Dyopsis lutescens*; Nitrogen Deficiency; Plant Establishment; Potassium Deficiency; Root Growth.

Barbara A. Fair, James D. Metzger, and James Vent

Characterization of Physical, Gaseous, and Hydrologic Properties of Compacted Subsoil and its Effects on Growth and Transpiration of Two Maples Grown Under Greenhouse Conditions 151

Abstract. City foresters and horticulturists often seek trees suited for urban conditions. Two maples often used were selected to assess response to compacted soil: 'Armstrong' Freeman maple and 'Brandywine' red maple. Soil physical parameters were assessed to determine effects of high density on movement of gas and water. Rigid-walled lysimeters constructed from polyvinyl chloride pipe were filled with clay subsoil compacted to 1.64 g·cm⁻³ (MODERATE-density) and 1.78 g·cm⁻³ (HIGH-density). Compaction decreased total porosity and saturated hydraulic conductivity. In addition, CO₂ concentrations in compacted soil were 5–18 times higher than atmospheric concentrations, while O₂ concentrations were similar to atmospheric levels despite density. O₂ concentration played no real role in plant growth response to compaction. Trees growing in MODERATE-density soils had higher transpiration rates than trees growing in HIGH-density soils, although differences decreased over time. A high soil density did not affect caliper growth, but did reduce annual height growth, leaf area and dry weight, and stem dry weight, but responses varied over time and between species. Root dry weight and volume were unaffected by compaction, but root:shoot ratio was higher for trees growing in HIGH-density soils, which is expected as aboveground biomass is typically reduced by soil compaction.

Key Words. *Acer × freemanii* 'Armstrong'; *Acer rubrum* 'Brandywine'; Bulk Density; Lysimeter; Saturated Hydraulic Conductivity; Soil Compaction; Transpiration; Urban Forestry.

Yaoqi Zhang and Bin Zheng

Urban Trees Programs from Municipal Officials' Perspective: Evidence from Alabama, U.S. 160

Abstract. Using survey data, this study explored Alabama municipal employees and policy makers' perception of urban trees, financing, governing, and information sharing regarding urban forest management. Results suggest that the importance of urban trees is widely recognized by local municipal employees and policymakers. They also believe that urban trees would increase property value and promote community pride. Ecological benefits were, however, less valued. Alabama, U.S. cities spent less than USD \$60,000 per year on tree planting, tree maintenance, debris, and tree removal. Cities with a large population usually appear to spend more on urban trees; likewise, cities with higher household incomes and lower poverty rates would have higher expenditures on urban tree programs. Relatively minor differences were found among the three types of employees and administrators: mayors, council members, and administrators. The results indicate many municipal officials were not aware of, or informed about, related agencies providing urban tree management services.

Key Words. Environmental Awareness; Municipal; Perceptions; Public Infrastructure; Regional Development; Survey; Urban Planning.