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Gregory Dahle, Aaron Carpenter, David DeVallance, and Mo Zhou

Does Modulus of Elasticity Vary Due to Dormancy and Temperature? 49

Abstract. The Intergovernmental Panel on Climate Change states with high confidence that extreme climatic events pose high risks on services such as electric service grids. Some of the extreme events will likely take place earlier in autumn, before deciduous trees complete the process of becoming dormant. The presence of leaves in a transitional season—before leaf drop (pre-dormant)—can be of concern if an unseasonal snow or ice storm occurs, as compared to after leaf drop (dormant).

Researchers harvested stump sprouts and measured the flexural modulus of elasticity (E) of wood to determine if it varies with seasonality (pre-dormant versus dormant) and with temperature (frozen -6.7°C versus warm 21.1°C) using a universal load press. While dormant sprouts (warm and cold) had higher average flexural elasticity than the warm pre-dormant sprouts, they were not statistically different than the cold pre-dormant sprouts. As such, it does not appear that the modulus of elasticity differs as trees enter dormancy. Surely, the presence of leaves will increase the bending moment that may lead to an increase in failure, but the slight increase in elasticity as trees enter dormancy should not reduce the likelihood of watersprouts undergoing significant bending during a snow or ice storm.

Key Words. Biomechanics; Climate Change; Dormancy; Flexural Elasticity; Modulus of Elasticity; Northern Red Oak; *Quercus rubra*; Temperature; Utility Arboriculture.

Wendy Kellogg, Brian Mikelbank, Robert Laverne, and Kathryn W. Hexter

The Economic Value of Tree Preservation in a Weak Land Development Market Region 55

Abstract. New residential development is most often a death sentence for the trees that stand in its way. This behavior might be altered if developers thought there was an economic value to being more selective. Unfortunately, the relationship between tree preservation and new development is not well studied. The purpose of this study was to characterize the economic value gained from the preservation of mature trees during the land development process. The study focused on six counties constituting the greater Cleveland, Ohio, U.S., real estate and land development market. A mixed quantitative and qualitative approach was used. GIS-based data and a series of hedonic models determined the value of tree canopy associated with new home sale prices from 2009 to 2011. Qualitative interviews of development and real estate professionals revealed a nuanced association of value and challenges to tree preservation during the residential land development process. Previous methods for estimating the economic value of trees were moved forward through aerial location of trees on parcels using Google Earth™ and the National Agricultural Imagery Program (NAIP) data and through the mixed-method approach. The study provided information to a state-level agency managing the state's incentive-based smart growth program.

Key Words. Cleveland; Economic Value; Ohio; Real Estate; Satellite Imagery; Tree and Canopy Preservation.

Mauricio Ponce-Donoso, Óscar Vallejos-Barra, and Francisco J. Escobedo

Appraisal of Urban Trees Using Twelve Valuation Formulas and Two Appraiser Groups 72

Abstract. Monetary valuation using urban tree appraisals can be performed with formulas, a common practice in many countries. This study compares twelve parametric type formulas: Amenity Valuation of Tree and Woodlands (Helliwell), Standard Tree Evaluation Method (STEM), French Method, Italian Method, Tedesco, Norma Granada, Trunk Replacement Formula (CTLA), Burnley Method, Danish Method, Swiss Method, and two Chilean formulas used in Municipalities of Concepción, La Pintana, and Maipú (COPIMA Method), and Peñalolén Method. Formulas were then applied to 30 trees located in Santiago, Talca and Concepción, Chile.

Researchers used eight appraisers divided into two groups, according to senior-level and junior-level experience. Statistical differences were determined using the Kruskal-Wallis test of non-parametric variance, while Fisher's least significant difference test was used to identify homogeneous groups. The results show a wide dispersion of values that were high for "emblematic" trees and low for young or low-vigor trees.

Formula, type of appraisers, and inter-appraiser differences formed nine, two, and three groups, respectively. The lowest-appraised trees were obtained using the Danish and French Method, while the highest values were obtained with the Burnley, Helliwell, and STEM formulas. Although there were differences in tree value according to the type of appraiser, when comparing difference among appraisers, researchers found these were not due to experience level. Given the wide range of values found, the study authors cannot recommend any specific formula(s) for assessing urban trees, as results will depend on the variables of interest used in the formulas and their intended application and use.

Key Words. Arboriculture; Parametric Formulas; Tree Assessment; Tree Valuation; Urban Forest Benefits.
