



CONTENTS

O. Arabomen, P.W. Chirwa, and F.D. Babalola

Understanding Public Willingness to Participate in Local Conservation Initiatives of Urban Trees in Benin City, Nigeria 247

Abstract. As global populations become increasingly urban, public participation has emerged as a new and more direct initiative for the conservation of urban trees and ecosystem services (ES). However, little effort has been made to understand the willingness of residents to participate in conservation programs for trees and ES in Benin City, Nigeria. To fill this gap, a survey to understand residents' knowledge of ES and their perceptions around ES conservation, i.e., personal willingness to participate in voluntary conservation initiatives (VCIs), was conducted. Unlike the general misconception that trees are not appreciated in African cities, this study showed that most residents had a positive appreciation for the ES provided by urban trees in Benin City. Additionally, irrespective of respondents' demographics, the findings from this study indicated a growing importance of the ES that trees provide, such as regulation of excess heat, scenic beauty, flooding and erosion control, and provision of shade. Hence, willingness to participate in VCIs was related to the growing importance of ES in the study area. Respondents' knowledge of ES, education, and years of residency increased the probability of an individual's participation in VCIs in the city. Other socio-demographic factors commonly related to urban forest participation (e.g., gender, marital status, income, profession, and residential location) did not significantly influence the willingness to participate in the conservation programs. Findings from this seminal study could assist future planning and emphasize to city developers, government (at all levels), resource managers, and decision makers the need to consider public values and perceptions towards enhancing conservation initiatives for urban trees in Benin City.

Keywords. Ecosystem Services; Indigenous Knowledge; Socio Survey; Urban Forests; Urban Residents; Voluntary Conservation Initiatives.

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The Influence of Canopy Cover on Property Values in a Small Southern US City 262

Abstract. Urban forests have been shown to impact residential property values in the United States and other countries. This study demonstrates a hedonic pricing analysis estimating the impact of urban forest canopy cover on single-family residential property values using Lakeland, Tennessee, during the period of 2001 to 2005 as a typical study area for the southern United States. Canopy cover on the lot was not a significant contributor to property values. However, a 1.0% increase in canopy within buffers of 100 m, 500 m, and 1 km surrounding the lot was associated with a 0.12%, 0.17%, and 0.21% increase in home sales prices, respectively. Although the percentage increases were small, given the price of a home in areas like these, the dollar values were high. These results can be used to assist urban planners and policy makers in prioritizing forested lands for conservation and to evaluate economic effects of urban forestry policies and programs.

Keywords. Canopy Cover; Hedonic Pricing; Residential Property; Urban Forests.

Anna O. Conrad, Caterina Villari, Patrick Sherwood, and Pierluigi (Enrico) Bonello

Phenotyping Austrian Pine for Resistance Using Fourier-Transform Infrared Spectroscopy.... 276

Abstract. Austrian pine (*Pinus nigra*) is a valuable component of the urban landscape in the Midwestern USA. In this area, it is impacted by the fungal pathogen *Diplodia sapinea*, which causes a tip blight and canker on infected trees. While the disease can be managed through the application of fungicides and/or by preventing environmental conditions that are favorable for the pathogen, these practices only temporarily alleviate the problem. A more sustainable solution is to use resistant trees. The objective of this study was to evaluate whether Fourier-transform infrared (FT-IR) spectroscopy combined with chemometric analysis can distinguish between trees that vary in susceptibility to *D. sapinea*. Trees were phenotyped for resistance to *D. sapinea* by artificially inoculating shoots and measuring ensuing lesions seven days following inoculation. Then, three different chemometric approaches, including a type of machine learning called support vector machine (SVM), were used to evaluate whether or not trees that varied in susceptibility could be distinguished. Trees that varied in susceptibility could be discriminated

based on FT-IR spectra collected prior to pathogen infection using the three chemometric approaches: soft independent modeling of class analogy, partial least squares regression, and SVM. While further validation of the predictive models is needed, the results suggest that the approach may be useful as a tool for screening and breeding Austrian pine for resistance to *D. sapinea*. Furthermore, this approach may have wide applicability in other tree/plant pathosystems of concern and economic value to the nursery and ornamental industries.

Keywords. *Diplodia sapinea*; Diplodia Tip Blight; FT-IR; *Pinus nigra*; Predictive Modeling.



Jian Lin, Charles N. Kroll, and David J. Nowak

Ecosystem Service-Based Sensitivity Analyses of i-Tree Eco..... 287

Abstract. Trees are known to provide various ecosystem services and disservices to urban communities, which can be quantified using models based on field and environmental data. It is often uncertain how tree structure and environmental variables impact model output. Here we perform a sensitivity analysis (SA) of i-Tree Eco, a common urban forest model, to analyze the relative impact of different model inputs on three module outputs: biogenic volatile organic compound (BVOC)(isoprene and monoterpenes) emissions, carbon storage and sequestration, and dry deposition of nitrogen dioxide, sulfur dioxide, and ozone. The SA methods included novel applications of the Morris one-at-a-time method and a variance-based decomposition method, which integrates Monte Carlo simulation with Latin hypercube sampling and Iman Conover analysis. A case study was performed in New York City, New York, USA, with field plot data collected in 2013. Genus has the largest influence on BVOC emissions by determining base emission rates and its high interactions with other input factors, and BVOC emissions are sensitive to leaf biomass in a concave manner and temperature in a convex manner, while isoprene emissions show a strong linear relationship with photosynthetically active radiation (PAR). Diameter at breast height plays the most important role for both carbon storage and sequestration estimators; crown light exposure and tree condition are also important for carbon sequestration. Dry deposition velocity is sensitive to leaf area index and relative humidity in a nearly linear way, while sensitive to temperature and PAR in a concave manner. The results provide guidance to facilitate future field plot campaigns and model development. The knowledge revealed by the SA is also beneficial for model uncertainty reduction, which in turn facilitates more effective urban forest management and decision-making.

Keywords. Air Pollutant; Carbon Storage and Sequestration; Monte Carlo; Urban Forests; Volatile Organic Compounds.

Djamel Ouis

Monitoring of a Cross-Sectional Vibrational Mode in the Trunk of a Palm Tree..... 307

Abstract. Palm trees, like all other tree species, are living entities that may be subject to the attack of several natural agents which affect the strength of the trunk. The most serious of these damaging agents are parasites and rot fungi, which proliferate in the substance of the stem, destroying its cells and fibers and weakening it. Consequently, this decay affects the physical characteristics of the modes of vibration in the tree trunk regarding resonance frequency, shape, and damping. Advanced stages of rot infection in a tree trunk may reach such an extreme level that substantial amounts of its solid mass are removed, ultimately leading to a hollow trunk rather than one of substance. In cases like these, the trunk presents less resistance to forced vibrations, and the active modes affecting the cross section of the trunk exhibit decreased resonance frequency values. This paper aims to present a method based on vibrations which might be employed for tracking a specific mode of radial vibrations known as the *ovalling* mode. To achieve this goal, the trunk of a palm tree was set into vibration via mechanical excitation in the radial direction and its response at some specific point on the trunk was examined. This method uses a single concentrated source of excitation and two vibration sensors, which are diametrically positioned and fastened to the surface of the tree trunk. The *ovalling* mode might be extracted from the frequency response by adding the signals recorded by the two sensors, which are in phase for a test specimen with a perfectly circular, cylindrical shape made of homogeneous, isotropic material. This study provides a preliminary investigation into the feasibility and reliability of this nondestructive method when applied for the identification of rot hosting by the trunks of standing trees, wooden poles, and logs, as well as the level of severity of rot attack.

Keywords. Inspection; Ovalling Mode; Palm Tree; Resonance; Rot; Trunk; Vibration.