Arboriculture & Urban Forestry 2007. 33(5):371–372.

ARBORICULTURAL ABSTRACTS

TRANSFORMATION OF THE OAK FOREST SPATIAL STRUCTURE IN THE MINNEAPOLIS/ST. PAUL METROPOLITAN AREA, MINNESOTA, USA OVER 7 YEARS

Kathleen Ward, Kathryn Kromroy, and Jennifer Juzwik

The Twin Cities Metropolitan Area (TCMA) oak (*Quercus* spp.) forest area decreased by 5.6% between 1991 and 1998. Accompanying spatial transformation of the forest can have great impacts on forest health, water flow and quality, wildlife habitat, potential for the spread of invasive species, and the quality of life of urban residents. The types of spatial transformation that occurred along with the loss of oak forest in the TCMA were investigated through the integration of remote sensing, a Geographic Information System (GIS), and landscape and patch metrics in seven ecological subsections between 1991 and 1998. Oak forest patches in the TCMA as a whole decreased in area, number, and complexity. Fragmentation of oak forest took place in all subsections and attrition occurred in three subsections. Knowledge of how the oak forest has changed over time can be integrated with land use change information to help planners make decisions about zoning and development that will minimize the impacts of increasing land conversion pressure on forest areas. (Landscape and Urban Planning 2007. 81(1–2):27–33)

THE POTENTIAL OF URBAN TREE PLANTINGS TO BE COST EFFECTIVE IN CARBON CREDIT MARKETS

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Emission trading is considered to be an economically sensitive method for reducing the concentrations of greenhouse gases, particularly carbon dioxide, in the atmosphere. There has been debate about the viability of using urban tree plantings in these markets. The main concern is whether or not urban planting projects can be cost effective options for investors. We compared the cost efficiency of four case studies located in Colorado, and used a model sensitivity analysis to determine what variables most influence cost effectiveness. We believe that some urban tree planting projects in specific locations may be cost effective investments. Our modeling results suggest that carbon assimilation rate, which is mainly a function of growing season length, has the largest influence on cost effectiveness, however resource managers can create more effective projects by minimizing costs, planting large-stature trees, and manipulating a host of other variables that affect energy usage. Urban Forestry & Urban Greening 2007. 6(1):49–60)

FORMULAIC EXPERT METHOD TO INTEGRATE EVALUATION AND VALUATION OF HERITAGE TREES IN COMPACT CITY

C. Jim

Urban trees serve important environmental, social and economic functions, but similar to other natural endowments they are not customarily depicted in monetary terms. The needs to augment protection, funding and community support for urban greening call for proper valuation. Heritage trees (HTs), the cream of urban-tree stock, deserve special attention. Existing assessment methods do not give justice to outstanding trees in compact cities deficient in high-caliber greenery, and to their social-cultural-historical importance. They artificially separate evaluation from valuation, which should be a natural progression from the former. Review of tree valuation methods suggested the formula approach to be more suitable than contingent valuation and hedonic pricing, and provided hints on their strengths and weaknesses. This study develops an alternative formulaic expert method (FEM) that integrates evaluation and valuation, maximizes objectivity, broadly encompasses the key tree, tree-environment and tree-human traits, and accords realistic monetary value to HTs. Six primary criteria (dimension, species, tree, condition, location, and outstanding consideration) branched into 45 secondary criteria, each allocated numerical marks. Each primary criterion was standardized to carry equal weight, and a tree's maximum aggregate score is capped at 100. A Monetary Assignment Factor (MAF) to consign dollar value to each score unit was derived from three-year average per m^2 sale price of medium-sized residential flats. The applicability of FEM was tested on selected HTs in compact Hong Kong. The aggregate score of a tree multiplied by MAF yielded monetary value, which was on average 66 times higher than the result from the commonly-adopted Council of Tree and Landscape Appraisers method. The computed tree values could be publicized together with multiple tree benefits to raise understanding and awareness and rally support to protect HTs. The property-linked FEM could be flexibly applied to other cities, especially to assess HTs in compact developing cities. (Environmental Monitoring and Assessment 2006. 116(1–3):53–80)

DATA AND METHODS COMPARING SOCIAL STRUCTURE AND VEGETATION STRUCTURE OF URBAN NEIGHBORHOODS IN BALTIMORE, MARYLAND

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Recent advances in remote sensing and the adoption of geographic information systems (GIS) have greatly increased the availability of high-resolution spatial and attribute data for examining the relationship between social and vegetation structure in urban areas. There are several motivations for understanding this relationship. First, the United States has experienced a significant increase in the extent of urbanized land. Second, urban foresters increasingly recognize their need for data about urban forestry types, owners and property regimes, and associated social goods, benefits, and services. Third, previous research has focused primarily on the distribution of vegetation cover or diversity. However, little is known about (1) whether vegetation structure varies among urban neighborhoods and (2) whether the motivations, pathways, and capacities for vegetation management vary among households and communities. In this article, we describe novel data and methods from Baltimore, MD, and the Baltimore Ecosystem Study (BES) to address these two questions. (Society and Natural Resources 2006. 19(2):117–136)

RIPARIAN WOODY PLANT DIVERSITY AND FOREST STRUCTURE ALONG AN URBAN-RURAL GRADIENT

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Changes in riparian woody plant assemblages are anticipated in the southeastern United States due to increases in urbanization rates. Because riparian forests serve important roles in maintaining water quality and biodiversity, understanding how they respond to urbanization is crucial. The objective of this study was to examine forest structure and woody vegetation diversity indices of riparian communities in response to an urbanization gradient in West Georgia, USA. Measures of forest structure and diversity were compared to measures of urbanization and land cover. Although *Liquidambar styraciflua*and *Quercus nigra*were dominant species in the forest stand and regeneration layer for all riparian communities, the invasive, non-native shrub *Ligustrum sinense* was the most dominant species observed in the regeneration layer for urban, developing, and agriculture communities. The proportion of non-native species in the forest stand and regeneration layer decreased and Shannon diversity of the regeneration layer increased with increasing distance from the urban center. Shifts in diversity indicate that anthropogenic disturbance may subdue the ability of diverse communities to resist non-native plant invasions. (Urban Ecosystems 2005. 8(1):93–106)

THE EFFECT OF URBAN LEAF AREA ON SUMMERTIME URBAN SURFACE KINETIC TEMPERATURES: A TERRE HAUTE CASE STUDY

Perry J. Hardin and Ryan R. Jensen

The urban heat island effect (UHIE) has been documented in many temperate region cities. One cause of the UHIE is the replacement of green spaces with impervious materials as urbanization commences and the city builds up and fills in. During the summer, elevated urban temperatures result in increased electricity usage, higher pollution levels, and greater resident discomfort. Through evapotranspiration and the interception of solar radiation, increasing urban tree canopy cover can help mitigate the UHIE. While this is universally accepted, the exact statistical relationship between urban leaf area (as measured by leaf area index, LAI) and urban temperatures has not been extensively studied. In a case study conducted in urban/suburban Terre Haute, Indiana, USA, simple linear regression was employed to quantify the relationship between in situ ceptometer LAI measurements and surface kinetic temperatures (SKTs) measured using thermal satellite imagery acquired at 1100 local time. For the 143 sample sites located in the study area, LAI accounted for 62% of the variation in surface temperature. For every unit increase in LAI, surface temperature decreased by 1.2°C. (Urban Forestry & Urban Greening 2007. 6(2):63–72)