

## ARBORICULTURAL ABSTRACTS

### PATTERN AND DIVERGENCE OF TREE COMMUNITIES IN TAIPEI'S MAIN URBAN GREEN SPACES

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Urban vegetation increasingly contributes to nature conservation and ecosystem services, but lacking understanding of site variations has restricted such uses. This study analyzed the spatial pattern and differentiation of tree communities in three major green landscape types (urban parks, riverside parks and street verges) in Taipei city. In each landscape type, 10 representative tree communities were studied. Statistical tests for ecological communities were employed: Jaccard and Q species similarity indices, two-way indicator species analysis (TWINSPAN), and new species fidelity, landscape fidelity and composite Q indices. Significant recent increase in Taipei's green spaces was traced. The study area contained 164 tree species, but few were shared by the three landscape types and none by 30 communities. Native evergreen broadleaf species with large final dimensions were dominant. Urban parks registered the highest species richness, landscape fidelity, rare species and urban endemics. Such exclusive species constitution deviated notably from riverside parks and street verges, with relatively simple and converging intra-site species ingredients. Pronounced species differentiation between urban parks reflected diversified site topography, natural woodland inheritance, woodland creation, and past landscape fashion. TWINSPAN classified the communities into nine groups each with signature characteristics. Inherent site variations offered main determinants of tree heterogeneity, superimposed by human modification to satisfy pre-determined site functions. A hybrid urban park with high species diversity and nature contents is advocated by amalgamating conventional but polarized designs of country and urban parks. The findings could inform management of urban forest, urban nature conservation, and ecological services of urban green spaces. (*Landscape and Urban Planning* 2008. 84(3–4):312–323)

### DEFENCE REACTIONS AND FUNGAL COLONISATION IN *FRAXINUS EXCELSIOR* AND *TILIA PLATYPHYLLOS* AFTER STEM WOUNDING

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Twenty 15-year-old ash and lime trees were each wounded by creating a chainsaw cut and an increment borer hole in May 2005. After sixteen months, trees were felled, dissected and the axial extent of both wood discoloration and barrier zone formation associated with the wounds was greater in ash than in lime. Barrier zones extended only around part of the stem circumference in both species. In ash, the barrier zone consisted of 10–20 cell rows of axial parenchyma within the earlywood and a heterogeneous matrix of libriform fibres, small vessels and concentric bands of 5–40 cell rows axial parenchyma within the latewood. In lime, the barrier zone consisted of a homogeneous layer of axial and xylem ray parenchyma, in which the cell walls

showed suberisation, a low cellulose content and few pits. Fungal culturing from the discoloured wood of both species yielded mainly deuteromycetes (Fungi Imperfecti). Only one basidiomycete, *Polyporus squamosus*, was consistently isolated. The evidently high decay-resistance features of the barrier zone of lime trees may enhance the trees ability to remain alive and intact, even when extensive decay develops within their central, poorly defended wood as a result of severe wounding. The results of the present study suggest a possible explanation why 'wall 4' i.e. a defensive layer that forms within the first annual growth ring after damage, is more effective in lime than in ash. (*Arboricultural Journal* 2008. 30(1):1–22)

### ESTABLISHING A RELATIONSHIP BETWEEN SOIL AERATION AND FINE ROOT DEVELOPMENT OF SEVEN TREE SPECIES USING THE STEEL ROD TECHNIQUE

Gary Watson

Steel rods were driven into the soil in spring and summer within the root zone of seven different tree species: American Elm (*Ulmus Americana* L.), Green Column black maple (*Acer nigrum* Michx. 'Green Column'), Green ash (*Fraxinus pennsylvanica* Marsh.), honeylocust (*Gleditsia triacanthos*), tuliptree (*Liriodendron tulipifera* L.), pin oak (*Quercus palustris* Muenchh.), and white oak (*Quercus alba* L.). After three months, the rods were extracted and the rusting pattern, an indicator of soil aeration, was assessed and correlated with fine root development (FRD). The correlation between FRD and soil aeration was high, indicating that FRD can be estimated by rusting. The steel rod technique may be a useful, low cost tool to help arborists evaluate soil aeration and FRD in urban landscapes. In the field, rapid assessment of the rusting pattern would be possible. Predominantly rusted metal is a good indicator of soil suitable for good fine root development. Predominantly matt grey metal is an indicator of soil that may severely limit root development. (*Arboricultural Journal* 2006. 29(3):161–172)

### APPLICATION OF LAND SUITABILITY ANALYSIS AND LANDSCAPE ECOLOGY TO URBAN GREENSPACE PLANNING IN HANOI, VIETNAM

Pham Duc Uy and Nobukazu Nakagoshi

Urban green spaces, an important component of urban ecosystems, provide many environmental and social services that contribute to the quality of life in cities. One of the key tasks of planners is how to optimize the benefits of urban green spaces. This study introduces a program for developing green spaces in urban areas through (1) land suitability analysis based on GIS; (2) quantifying green areas based on the ecological factor threshold method to maintain ecological balance; and (3) applying landscape-ecology principles in organizing green spaces in urban areas. A case study was made for Hanoi, Vietnam and its results show that most of the planned green spaces in the 2020 Hanoi

Master Plan are suitable for development. However, the recommended 18 m<sup>2</sup> green area per capita seems not to be enough to maintain ecological balance and organization of the green spaces in the 2020 plan seems to lack a theoretical basis, or a holistic framework, at different scales. From this perspective, we propose that Hanoi should set aside an extra green area from 6842 to 10,228 ha, and that the 2020 Hanoi green structure plan at regional, city and neighborhood scales includes three green wedges, one green belt, various parks and other green ways to create a green network ecologically more effective than the sum of the individual green spaces. This green structure and the combined data approaches used here will form a base for building a garden city or an eco-city in the future. (Urban Forestry and Urban Greening 2008. 7(1):25–40)

### **TREE FAILURE FOLLOWING A WINDSTORM IN BREWSTER, MASSACHUSETTS, USA**

**Brian Kane**

While there are many *ex post facto* studies of tree failures due to catastrophic storms, relatively few have considered the effect of defects, and even fewer have explored the effect of tree maintenance, on the likelihood of failure. In light of the heightened climate of litigation in the United States, and the complexity of reliably predicting tree failure, additional studies are justified. A catastrophic windstorm in December 2005 on Cape Cod in Massachusetts, USA, provided an opportunity to study how structural defects and maintenance history affect the likelihood of tree failure. Species, height, diameter at breast height (DBH), the presence of defects, and whether trees had been pruned or nearby trees removed were recorded on trees at campsites in a park affected by the storm. The percentage of trees that failed varied among species, and evergreens failed more frequently than deciduous trees, which were leafless at the time of the storm. Large trees were more likely to fail than smaller trees, although this was not true of all species. The defects were more common on standing trees and trunk failures than root failures. Pruning trees had little effect on the failure, but removing trees increased the likelihood of root failure. The results are discussed in the context

of managing tree risk. (Urban Forestry and Urban Greening 2008. 7(1):15–23)

### **PREDICTING OPPORTUNITIES FOR GREENING AND PATTERNS OF VEGETATION ON PRIVATE URBAN LANDS** **Austin Troy, J. Grove, J. O'Neil-Dunne, S. Pickett, and M. Cadenasso**

This paper examines predictors of vegetative cover on private lands in Baltimore, Maryland. Using high-resolution spatial data, we generated two measures: "possible stewardship," which is the proportion of private land that does not have built structures on it and hence has the possibility of supporting vegetation, and "realized stewardship," which is the proportion of possible stewardship land upon which vegetation is growing. These measures were calculated at the parcel level and averaged by US Census block group. Realized stewardship was further defined by proportion of tree canopy and grass. Expenditures on yard supplies and services, available by block group, were used to help understand where vegetation condition appears to be the result of current activity, past legacies, or abandonment. PRIZM™ market segmentation data were tested as categorical predictors of possible and realized stewardship and yard expenditures. PRIZM™ segmentations are hierarchically clustered into 5, 15, and 62 categories, which correspond to population density, social stratification (income and education), and lifestyle clusters, respectively. We found that PRIZM 15 best predicted variation in possible stewardship and PRIZM 62 best predicted variation in realized stewardship. These results were further analyzed by regressing each dependent variable against a set of continuous variables reflective of each of the three PRIZM groupings. Housing age, vacancy, and population density were found to be critical determinants of both stewardship metrics. A number of lifestyle factors, such as average family size, marriage rates, and percentage of single-family detached homes, were strongly related to realized stewardship. The percentage of African Americans by block group was positively related to realized stewardship but negatively related to yard expenditures. (Environmental Management 2007. 40(3):394–412)