ARBORICULTURAL ABSTRACTS

ADAPTIVE MANAGEMENT APPROACH TO INCREASING THE DIVERSITY OF A 30-YEAR-OLD PLANTED FOREST IN AN URBAN AREA OF JAPAN
Akihiro Nakamura, Yukihiro Morimoto, and Yasuko Mizutani

Thirty years have passed since the completion of land reclamation and the planting of broad-leaved evergreen trees at the Expo'70 Commemorative Park, which was developed in an urban area of Osaka, the second largest city in Japan. Canopy closure and biomass development of the forests in the park are proof of the success of the revegetation of laurel forests. However, because low penetration of solar radiation to the forest floor seemed to restrict the diversity of forest floor vegetation, we carried out adaptive forest management to increase the diversity. To improve the light environment on the forest floor, we created four artificial gaps, each 15 by15 m (49.5 ft). Further, to establish a new diverse population from seed, we spread forest topsoil from a secondary forest containing a diverse seedbank over these gaps. The average gap fraction under the intact canopy was 0.09. Partial removal of trees (52% of basal area) increased the average gap fraction to 0.19 and heavy removal (more than 88% of basal area) increased it to 0.29–0.54. Species number and density of germinated seedlings became significantly greater in the gaps than under the intact canopy. Many seedlings arose in the gaps from the seedbanks that have built up over the last 30 years in the topsoil of the park forest. Only 1 year after creation of gaps, the spread of forest topsoil had resulted in the germination of six species that did not exist in the park before, indicating the possibility of creating diverse populations. In the partial removal plot, the seedling density was the highest, but the seedling death rates were also large and the seedlings grew the least. Differences in the light environment as determined mainly by removal intensity might affect patterns of revegetation from a seedbank. (Landscape and Urban Planning. 2005. 70(3–4): 291–300)

THE URBAN FOREST IN BEIJING AND ITS ROLE IN AIR POLLUTION REDUCTION
Jun Yang, Joe McBride, Jinxing Zhou, and Zhenyuan Sun

Tree planting has been proposed by the municipal government as a measure to alleviate air pollution in Beijing, the capital of China. This study examines that proposal. It is based on the analyses of satellite images and field surveys to establish the characteristics of current urban forest in the central part of Beijing. The influence of the urban forest on air quality was studied using the Urban Forest Effects Model. The results show that there are 2.4 million trees in the central part of Beijing. The diameter distribution of the trees is skewed toward small diameters. The urban forest is dominated by a few species. The condition of trees in the central part of Beijing is not ideal; about 29% of trees were classified as being in poor condition. The trees in the central part of Beijing removed 1261.4 t of pollutants from the air in 2002. The air pollutant that was most reduced was PM_{10} (particulate matters with an aerodynamic diameter smaller than 10 μm), the reduction amounted to 772 t. The carbon dioxide (CO_2) stored in biomass form by the urban forest amounted to about 0.2 million t. Future research directions to improve our understanding of the role of individual tree species in air pollution reduction are discussed. (Urban Forestry & Urban Greening. 2005. 3(2):65–78)

THE INFLUENCE OF WIND ON BRANCH CHARACTERISTICS OF *PINUS RADIATA*
M.S. Watt, J.R. Moore, and B. McKinlay

Measurements taken from trees growing in exposed and sheltered areas within two structurally similar forests were used to investigate the influence of wind on branch characteristics of mature New Zealand–grown *Pinus radiata*. A widely used branch model was used to remove the influence of treatment and site differences in tree stem diameter and height, so that the influence of wind on branch diameter could be examined. At site 1, average windspeed in the exposed treatment exceeded average windspeed in the sheltered treatment by 62%. When averaged across sites, mean branch diameter, branch index (mean diameter of the largest branch, in each of the four azimuthal quadrants), and largest branch diameter in exposed areas significantly exceeded values for trees in sheltered areas by 9 mm (0.4 in, 25%), 42 mm (1.7 in, 54%), and 72 mm (2.9 in, 72%), respectively. Treatment and site differences in tree stem diameter and height partially accounted for the observed increases in branch diameter. However, after these effects were removed by the model, branch diameter in exposed areas still significantly exceeded that in sheltered areas by 21 mm (0.9 in) for branch index and 44 mm (1.8 in) for the largest branch. Treatment and site variation in this residual branch diameter was almost entirely attributable to topographical exposure to 1 km (0.6 mi), a variable that has been found to be strongly correlated to windspeed. Possible

reasons for these observed wind-induced increases in branch diameter are discussed. (Trees —Structure and Function. 2005. 19(1):58–65)

SPRAWL AND FOREST COVER: WHAT IS THE RELATIONSHIP?
K. MacDonald and T.K. Rudel

For decades, observers have expressed concern about losses of farmland to sprawl, but until recently they have neglected the effects of sprawl on forests. In this paper, we examine how suburban real estate development affected forest cover in New Jersey, U.S., between 1986 and 1995. This paper also describes the geographical patterns of forest change in this state and how the different regions within the state vary from the overall pattern. Increases in development did accelerate losses of forest cover, primarily in the wealthy, suburban belt of communities that ring New York City. Forest cover remained stable or increased slightly in places with few forests or protected forests. Central place theory provides the most succinct explanation for the pattern of forest losses and gains across communities. (Applied Geography. 2005. 25(1):67–79)

COMMUNITY LEADERS AND THE URBAN FOREST: A MODEL OF KNOWLEDGE AND UNDERSTANDING
D. McLean and R. Jensen

Foresters have a sound understanding of the urban forest, but this level of understanding rarely extends to the people who are able to effect change in communities—leaders. This article describes knowledge and understanding of the urban forest based on personal interviews conducted with leaders in two cities using qualitative research methods. Interpretation of the data suggests a knowledge and understanding model with three main constructs: urban forest meaning, processes, and benefits and outcomes. Respondents described the urban forest through categories (e.g., greenspaces, quality of life) in terms of these constructs in a gradient ranging from entry to bridging to mature. The emergence of the constructs and categories provides a better understanding of how leaders perceive the urban

forest and gives direction to future research that will continue the development of the model. (Society & Natural Resources. 2004. 17(7):589–598)

QUERCUS MACROCARPA AND *Q. PRINUS* PHYSIOLOGICAL AND MORPHOLOGICAL RESPONSES TO DROUGHT STRESS AND THEIR POTENTIAL FOR URBAN FORESTRY
Nicholas Drunasky and Daniel K. Struve

Bur (*Quercus macrocarpa* Michx.) and chestnut (*Q.* prinus L.) oaks are nearly allopatric species. Both are drought resistant and tolerant of basic soils and, thus, potentially suitable for urban sites. Their morphological and physiological responses to substrate moisture stress were studied by subjecting container-grown seedlings to no, one, or two substrate moisture stress cycles. There were greater differences in response to the stress cycles between species than within species. *Quercus macrocarpa* seedlings had fourfold higher root:shoot ratios than *Q. prinus* seedlings receiving no, one, or two stress cycles and twice the root surface areas as *Q. prinus*. However, *Q. prinus* roots absorbed twice as much water per unit root surface area as *Q. prinus*. Unstressed *Q. prinus* seedlings had twice the leaf area ratio (LAR) and were twice as tall as stressed or unstressed *Q. macrocarpa* seedlings. Unstressed *Q. macrocarpa* seedlings had the highest relative growth rate (RGR) and twice-stressed *Q. prinus* seedlings the lowest. Within a species, moisture stress had no effect on LAR or net assimilation rate (NAR), but *Q. macrocarpa* had lower LAR and higher NAR than *Q. prinus* seedlings. Seedlings of both species had similar leaf water potentials when unstressed but were significantly lowered following one or two stress cycles. Twice-stressed *Q. macrocarpa* had significantly lower leaf solute potentials than similarly stressed *Q. prinus* seedlings. In both species, drought postponement traits were more strongly expressed than drought tolerance traits. We propose that *Q. prinus* maybe better adapted to urban planting sites than *Q. macrocarpa* because of its more efficient water-absorbing root system and its apparent adaptation to shallow soils. (Urban Forestry & Urban Greening. 2005. 4(1):13–22)