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Predicting Wood Decay in Eucalypts

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Abstract. The evaluation of decayed wood in a tree trunk is essential for hazard tree assessment in arboriculture. In this study, an IML-Resistograph was highly successful as a field instrument in its ability to locate and predict the presence of decay in the trunk wood of eucalypts. A system for using the IML-Resistograph to estimate the area of decay in the cross-section of a eucalypt was evaluated for field use. The data from the IML Resistograph F300S can be used as part of an expert system to estimate the area of wood decay in a cross-section of a standing eucalypt.

Key Words. Eucalypts; Hazard Trees; Resistograph; Tree Failure; Tree Risk Analysis; Wood Decay.

Mary L. Duryea, Eliana Kampf, and Ramon C. Littell

Hurricanes and the Urban Forest: I. Effects on

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Abstract. Several hurricanes struck Florida, U.S. in 2004 and 2005 causing widespread damage to urban and rural areas. We measured the impacts of five of these hurricanes on the urban forest and combined these results with four other hurricanes to present an assessment of wind resistance for southeastern United States coastal plain tree species. Urban forest loss was positively correlated with wind speed. Tree species demonstrating the highest survival in winds were sand live oak (*Quercus geminata*), American holly (*Ilex opaca*), southern magnolia (*Magnolia grandiflora*), live oak (*Quercus virginiana*), wax myrtle (*Myrica cerifera*), sweetgum (*Liquidambar styraciflua*), crapemyrtle (*Lagerstroemia indica*), dogwood (*Cornus florida*), and sabal palm (*Sabal palmetto*). In a statistical comparison of sand live oak, live oak, and laurel oak (*Quercus laurifolia*) survival after four panhandle hurricanes, laurel oak had significantly poorer survival than both live oak and sand live oak. Among all species, larger trees lost more branches than medium and smaller trees. Leaf loss had a positive relationship with survival; losing leaves during the hurricane meant higher survival. Trees growing in groups or clusters had greater survival than those growing as individual trees. Tree species with higher wood density had greater survival. Tree species categorized as having dense crowns lost more branches than those with moderate and open crowns; however, contrary to the literature, dense-crowned species survived best. A survey of arborists, scientists, and urban foresters ranked species for their wind resistance. Using our results from hurricane measurements and incorporating results from the survey and the scientific literature, we have developed lists of relative wind resistance for tree species in the southeastern coastal plain. These lists should be used with caution with the knowledge that no species and no tree is completely windproof. In addition, local considerations such as soil, cultural practices, tree age and health, and other urban forest conditions need to be taken into account.

Key Words. Trees; Tropical Storms; Urban Trees; Wind.

Mary L. Duryea, Eliana Kampf, Ramon C. Littell, and Carlos D. Rodríguez-Pedraza

Hurricanes and the Urban Forest: II.

Effects on Tropical and Subtropical Tree Species..... 98

Abstract. In 1998 when Hurricane Georges (177 km/h) crossed over the entire island of Puerto Rico, and in 2004 when Hurricanes Jeanne (193 km/h) and Charley (233 km/h) struck south Florida, U.S., we measured the impacts of these hurricanes on the urban forest composed of tropical and subtropical species. In addition, we also used previous published data for Hurricane Andrew for some analyses. The percent urban forest loss ranged from 13% for Georges to 16% for Jeanne to 18% for Charley. In Hurricanes Jeanne and Charley, palms survived significantly better than all other trees. Some of the best surviving species in Florida's hurricanes were gumbo limbo (*Bursera simarouba*), sea grape (*Coccoloba uvifera*), strangler fig (*Ficus aurea*), live oak (*Quercus virginiana*), laurel oak (*Quercus laurifolia*), and baldcypress (*Taxodium distichum*). Of the species measured in Puerto Rico, the species with the highest survival and least branch damage were Santa Maria (*Calophyllum calaba*), Caribbean pine (*Pinus caribaea*), schefflera (*Schefflera actinophylla*), and West Indian mahogany (*Swietenia mahogani*). Losing leaves during these hurricanes had no relationship with how well trees survived. In Hurricanes Jeanne, Charley, and Georges, 3%, 4%, and 11%, respectively, of the trees that fell damaged property. Native tree species survived better than exotic species in Hurricanes Jeanne and Charley but not in Hurricane Georges. Trees growing in groups had greater survival and less branch loss in Hurricane Jeanne than those growing individually. Wood density was not related to survival or branch loss for tree species in Hurricanes Jeanne, Charley, Georges, or Andrew. Two other measurements of wood strength, modulus of elasticity and modulus of rupture, were related to survival and branch loss in Jeanne but not Charley. Tree species with dense crowns had greater survival and less branch loss than moderate- or open-crowned species. Tree species with decurrent growth form survived better than excurrent trees in Hurricane Jeanne with no difference in Charley. Trees with the most rooting space (>7 m²) had the lowest branch loss and the greatest survival in Hurricane Georges. A reanalysis of seven dicot species and their survival in Hurricane Andrew showed that survival for pruned trees was 73% compared with 47% for unpruned trees. A survey of 85 arborists, scientists, and urban foresters ranked species for their wind resistance. Using our results from hurricanes and incorporating results from the survey and the scientific literature, we have developed lists of relative wind resistance for tropical and subtropical tree species. These lists are presented with the caveat that no tree is completely wind-proof and that other factors such as soil conditions, wind intensity, cultural practices, and tree health and age also contribute to wind firmness.

Key Words. Rooting Space; Urban Trees; Wind; Wind Resistance; Wood Density.

Susan D. Day and J. Roger Harris

Fertilization of Red Maple (*Acer rubrum*) and Littleleaf Linden (*Tilia cordata*)

Trees at Recommended Rates Does Not Aid Tree Establishment..... 113

Abstract. Landscape trees typically grow slowly for several years after transplanting. We investigated whether fertilization could speed tree growth during this establishment period, which fertilization regimes were most effective, and whether fertilization interacted with irrigation. Fifty-four each of landscape-sized, balled-and-burlapped red maple (*Acer rubrum*) and littleleaf linden (*Tilia cordata*) were planted into a relatively infertile silt loam soil and were fertilized (1.5 kg N/100 m² [3 lb N/1000 ft²]) each spring (either including or not including at planting), each fall, or not fertilized. Each of these fertilizer regimes was either irrigated or not irrigated during 3 years. An additional treatment of an unirrigated, split (spring/fall) fertilizer application was included. There was no evidence that fertilization affected irrigated trees differently than unirrigated trees. Overall, fertilization did not speed establishment and did not affect trunk growth, shoot extension, or leaf nitrogen content. There was no evidence that fall fertilization might be more effective than spring fertilization. There was no indication that fertilized trees experienced increased drought stress. Nitrogen rates and factors affecting fertilizer uptake are discussed.

Key Words. Fertilization; Nitrogen; Transplanting; Tree Establishment; Urban Forestry; Urban Soils.

A.H. Nelson and G.W. Hudler

A Summary of North American Hardwood Tree Diseases with Bleeding Canker Symptoms 122

Abstract. Although the presence of bleeding cankers on deciduous trees may raise fears of the presence of *Phytophthora ramorum*, the cause of sudden oak death, other pathogens also cause similar symptoms. This review of hardwood tree diseases with bleeding canker symptoms provides an overview of available information of these diseases, providing a diagnosis guide as well as a stimulus for continued research in these areas.

Key Words. Bacterial Cankers; *Phytophthora*; Plant Health Care; Ramorum Blight; Sudden Oak Death; Tree Pathology.

Kim Camilli, David N. Appel, and W. Todd Watson

Studies on Pruning Cuts and Wound Dressings for Oak Wilt Control..... 132

Abstract. *Ceratocystis fagacearum* causes the destructive tree disease called oak wilt. One means of pathogen spread is by insect vectors (Nitidulidae) that transmit spores into fresh wounds on healthy trees. Experiments were conducted in central Texas on native live oaks (*Quercus fusiformis*) to test pruning methods and paints on disease development. Three treatment combinations were tested on 30 trees (10 trees/treatment): flush cut unpainted, flush cut painted, and unpainted pruning cuts made according to the Shigo method. Unpainted puncture wounds were made on the lower trunks of an additional 20 trees as controls. *C. fagacearum* spores were applied to the pruning cuts and half of the puncture wounds (positive controls) after treatment, whereas the other half of the punctures received distilled water as negative controls. Oak wilt symptoms first appeared in the flush cut unpainted treatment 31 days after inoculation. Infection rates, in decreasing order, were; positive control (70%), flush cut unpainted (60%), Shigo pruning method (40%), flush cut painted (20%), and negative control (10%). Pruning wounds, regardless of method, were effective infection courts for the oak wilt pathogen. Fewer trees became infected when pruning cuts were painted, but differences among infection rates for pruning cuts were not statistically significant. Tree diameters and stem aspect ratio had no bearing on infection rates. The Shigo method is recognized as a superior method for pruning, but there is no reason to change current recommendations to paint fresh wounds on susceptible oaks in high-hazard oak wilt areas.

Key Words. Branch Protection Zone; Natural Target Pruning; Nitidulid Beetles; Oak Wilt; Pruning Paints; Shigo.

Angela Rivenshield and Nina L. Bassuk

Using Organic Amendments to Decrease Bulk Density and Increase Macroporosity in Compacted Soils..... 140

Abstract. Samples of compacted sandy loam and clay loam soil were amended with organic matter: sphagnum peat or food waste compost. Amendments were incorporated into the soil samples at 0%, 10%, 33%, 50%, and 75% on a volume-to-volume basis. Changes in bulk density and macroporosity resulting from amendment were measured. In every permutation but one, macroporosity increased and bulk density decreased to below root-restricting thresholds. These results held true for the half of the samples that were manually recompact. Differences between the amendments were not significant. Amendment with sufficient amounts of sphagnum peat or food waste compost alleviates compaction, creating an environment more conducive for root growth.

Key Words. Aeration Porosity; Amendments; Bulk Density; Compaction; Compost; Macroporosity; Root Growth; Root Restriction; Sphagnum; Woody Plants.

Richard H. Yahner, Richard T. Yahner, and Russell J. Hutnik

Long-Term Trends in Small Mammals on a Right-of-Way in Pennsylvania, U.S..... 147

Abstract. The State Game Lands 33 Research and Demonstration Area, Centre County, Pennsylvania, U.S., has been studied since 1953 with the objective of comparing the effectiveness of commonly used mechanical and herbicidal maintenance treatments on vegetation and wildlife on a right-of-way (ROW). Small mammals are important wildlife species on a ROW by consuming tree seeds, thereby reducing invasion of undesirable tree species, and these mammals are important components of a healthy ecosystem. As a follow up to a 2-year study of small mammals conducted 15 years earlier (1989 to 1990) on the State Game Lands 33 ROW, we initiated a 2-year live-trapping study in 2004 on small mammal populations on this ROW. The objectives of our study were to determine relative abundance and species richness (number of species) in six major cover types and in the adjacent forest. One hundred twenty-one individuals of eight species were observed in 2004 and 2005 combined; the most common species was the white-footed mouse (*Peromyscus leucopus*). One of the most important cover types to small mammals on the ROW was forb-grass, whereas the forest cover type tended to be less diverse in terms of number of mammal species than in cover types on the ROW.

Key Words. Herbicides; Pennsylvania; Populations; Right-of-Way; Small Mammals; Vegetation.

Henry D. Gerhold

Callery Pear Cultivars Tested As Street Trees: Final Report on a 12-year Study 153

Abstract. Cooperators in the Municipal Tree Restoration Program planted nine Callery pear (*Pyrus calleryana* Decne.) cultivars in 11 Pennsylvania, U.S. communities for evaluation as street trees, comparing two cultivars (three in one case) in each community. Cooperators measured them annually with standardized methods for 3 years and then at 3-year intervals until the 12th year. The most noteworthy differences occurred in tree height and crown width. The tallest were 'Aristocrat', 'Cleveland Select', and 'Redspire', attaining more than 8 m (26 ft) on average by the twelfth year and even 10.3 m (34 ft) in one community. 'Autumn Blaze', evaluated only at one location, was ≈ 1.5 to 2 m (5 to 6.6 ft) shorter in the 12th year. Heights of the other cultivars, tested at just one or two locations, were similar to the tallest ones. Crown widths differed more in the first 9 years than at the twelfth when on average most were ≈ 6.5 m (21.5 ft) wide. 'Cleveland Pride', 'Cleveland Select', 'Valiant', and 'Whitehouse' were narrower than the others until the ninth year, but only 'Cleveland Select' at ≈ 5.6 m (18.5 ft) remained narrower in the twelfth year and not ever. All cultivars were in good health during the whole period, although the foliage of 'Whitehouse' exhibited minor injuries in many years. As street trees, the Callery pears were not invasive and did not yet experience branch breakage, which can become a serious problem. All of the cultivars are too tall to be planted under utility wires.

Key Words. Callery Pear Cultivars; Performance Testing; *Pyrus calleryana*; Street Tree Evaluation.
