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Matthew Stobbart and Mark Johnston

A Survey of Urban Tree Management in New Zealand 247

Abstract. Local authorities in New Zealand are responsible for managing many of the publicly owned trees in their district and have a statutory duty to act as an environmental guardian for trees that have a significant amenity or cultural value. No previous research had been completed to investigate, on a national scale, the efficiency and effectiveness of local authority tree management. A survey questionnaire was designed to assess the extent that tree management is planned, systematic, and integrated and to identify the key challenges and limitations local authorities face in managing the urban forest. A survey questionnaire was sent to each of New Zealand's 73 local authorities. Thirty questionnaires were returned giving a response rate of 41%. Many local authority tree management programs were found to be operating under difficult conditions and often within severe financial constraints. A lack of basic information about the urban forest was making it difficult for many local authorities to develop meaningful strategies and budgets and was reflected in low levels of planned maintenance. Resource constraints, conflicting priorities, and a lack of public and political support were all highlighted as being significant threats to many tree programs.

Key Words. Local Authority; New Zealand; Surveys; Tree Management.

Michael Booth and Mark Goettel

Control of Red Elm Bark Weevil (*Magdalis armicollis*) in American Elm (*Ulmus americana*) by Trunk Injection of Azadirachtin..... 255

Abstract. Trunk injection of azadirachtin into elm trees (*Ulmus americana*) using the Ecoject™ Microinjection System to reduce emergence numbers of red elm bark weevil (*Magdalis armicollis*) was evaluated. Twelve mature trees were each injected with TreeAzin™ in early August 2010 at a rate of 16 ml per 15.2 cm trunk circumference at breast height. The following year, weevil activity was monitored at weekly intervals for four weeks using sticky traps placed in the canopies. There was a significant reduction of 55%–60% in weevil activity in early summer in the treated tree canopies as compared to the control, suggesting that this method may be an effective management tool for this pest.

Key Words. American elm; *Azadirachta indica*; Ecoject™ Microinjection System; *Magdalis armicollis*; Neem; Red Elm Bark Weevil; Sticky Trap Sampling; TreeAzin™; Trunk Injection; *Ulmus americana*.

Jonathan M. Banks and Glynn C. Percival

Evaluation of Biostimulants to Control *Guignardia* Leaf Blotch (*Guignardia aesculi*) of Horsechestnut and Black Spot (*Diplocarpon rosae*) of Roses 258

Abstract. Biostimulants are classified as materials that are neither a fertilizer nor a pesticide, but when applied to a plant will enhance their health, growth, and protection. Manufacturers claim biostimulants have underexploited potential in providing protectant properties to plants against pathogen attack. This study evaluated the efficacy of seven commercially available biostimulants against the foliar pathogens *Guignardia aesculi*, leaf blotch of horsechestnut (*Aesculus hippocastanum* L.) and *Diplocarpon rosae* black spot of roses (*Rosa* "Pretty Polly"). None of the biostimulant products tested in this investigation achieved a sufficient degree of pathogen control to warrant replacement of or supplementation with conventional synthetic fungicides.

Key Words. *Aesculus hippocastanum* L.; Bio Control; Biostimulant; *Diplocarpon rosae*; *Guignardia aesculi*; Integrated Pest Management; Plant Health Care; Pathogen Suppression.

P. Eric Wiseman, Susan D. Day, and J. Roger Harris

Organic Amendment Effects on Soil Carbon and Microbial Biomass in the Root Zone of Three Landscape Tree Species 262

Abstract. There is increasing interest in amending degraded soils with organic matter to improve soil quality, especially in urban areas where rehabilitation of damaged soils may enhance tree growth and provision of ecosystem services. To assess the potential of such organic amendments for producing a sustained alteration in soil biological characteristics, researchers studied the effects of three organic amendments incorporated into the root zone of three tree species on root development, soil carbon dynamics, and soil microbial biomass over one year beginning 20 months after amendment application. Soil amendment with leaf-based, and to a lesser extent, biosolids-based composts increased root length within the amended root zone of red maple (*Acer rubrum*), but not of pin oak (*Quercus palustris*) or chestnut oak (*Q. montana*). There was a concomitant increase in microbial biomass carbon for red maple. Across all species, sphagnum peat moss amendment reduced microbial biomass carbon by 47% compared to unamended root zones and suppressed maximum seasonal soil respiration relative to composts. In contrast, leaf-based compost increased microbial biomass carbon by 12% ($P = 0.0989$) compared to unamended root zones. Carbon/nitrogen ratios remained stable throughout most of the year except in the root zones of chestnut oak and pin oak amended with peat, where it declined 44%–85%. Total soil carbon was stable in all treatments, although unamended soils averaged about 40% lower than amended soils. Across all species and treatments, cumulative fine root length explained 19% of the variation in microbial biomass carbon. The study authors conclude that soil microbial activity can be increased by compost amendment of the root zone and that this increase is mediated to some degree by tree roots. In addition, stable C/N ratios suggest this alteration in the root zone may be sustainable. Further research may clarify whether compost amendment combined with tree planting can accelerate soil restoration.

Key Words. *Acer rubrum*; *Quercus montana*; *Quercus palustris*; Soil Food Web; Soil Rehabilitation; Soil Respiration; Tree Roots; Urban Soil.

Daniel C. Burcham, Eng-Choon Leong, Yok-King Fong, and Puay-Yok Tan

An Evaluation of Internal Defects and Their Effect on Trunk Surface Temperature in *Casuarina equisetifolia* L. (Casuarinaceae) 277

Abstract. Tree risk assessment is important when communities choose to cultivate trees near people and property, and many tools may be used to enhance these assessments. The effectiveness of determining internal tree stem condition by measuring trunk surface temperatures with infrared cameras was assessed in this study. The trunk surface temperature of 48 *Casuarina equisetifolia* was evaluated; the trees were felled and dissected to quantify internal stem defects; and a mixed-methods approach was employed to determine the presence of defects. In total, 27% of trees were decayed, 62% discolored, 6% cavitated by termite infestations, and 2% undamaged. Qualitative visual evaluation of the infrared images revealed the close association of external stem features, opposed to internal defects, with surface temperature distributions. External features, such as cankers, detached bark, and mechanical damage, were associated with temperature anomalies. The trees' internal condition accounted for a small percentage of the variability in evaluated temperature measurements ($r^2 = 0.001$ – 0.096). Overall, no clear relationship was found between the extent of internal defects and surface temperature distributions. These results are practically important for the arboricultural professional community because they show the technique does not provide accurate results about the internal condition of trees.

Key Words. *Casuarina equisetifolia*; Diagnostic Device; Infrared Camera; Internal Defect; Singapore; Temperature; Thermal.

E. Thomas Smiley, Brian Kane, Wesley R. Autio, and Liza Holmes

Sapwood Cuts and Their Impact on Tree Stability 287

Abstract. Sapwood may be lost due to wood decay fungi or mechanical damage. Assessing the impact of sapwood loss on the likelihood of tree failure has not been empirically tested. The purpose of this research was to determine the effect of the loss of sapwood on the flexural stiffness of tree trunks for different species and trunk sizes. Three tree species (*Acer rubrum*, *Liquidambar styraciflua*, and *Quercus acutissima*) were tested at two sites using pull testing techniques. A portion of the stem was mechanically removed and the trees were again pull tested. As the percent reduction in cross-sectional area increased, the percent reduction in stress to deflect trunks decreased linearly, regardless of species. Stress from sapwood loss was compared to an equivalent calculated loss in heartwood with the same cross-sectional area. The calculated loss of heartwood to cause an equivalent magnitude of stress was almost twice as large as cut area of sapwood. Trees were also tested by pulling in opposite directions with respect to sapwood loss. The percentage reduction in stress was greater for trees tested in compression.

Key Words. *Acer rubrum*; Decay; Likelihood of Impact; *Liquidambar styraciflua*; Notch Cuts; *Quercus acutissima*; Sapwood Loss; Strength Loss; Tree Risk Assessment.