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CONTENTS

Abstract. Planning to prepare for storms should involve the estimation of tree debris. This paper tested an improvement of a rapid estimation model of tree debris following ice storms. An initial model found using 30-m resolution National Land Cover Database (NLCD) tree canopy cover (TCC) data did not significantly ($P \approx 0.20$) improve estimation of tree debris within a community right-of-way (ROW) following an ice storm. We tested if finer resolution National Agriculture Imagery Program (NAIP) TCC imagery (2-m resolution or better) could more accurately predict tree debris after an ice storm. Tree canopy cover was estimated with NAIP across the entire community (TCC_{CITY}) and also the area that only covered the ROW plus a 15.24-m (50-foot) buffer on each side (TCC_{ROW}). The TCC_{CITY} ($P = 0.08$) estimate marginally improved tree debris prediction in the overall multiple regression model (R^2 adj = 0.917; $F = 133.8$; df = 3,33), but this was not the case with the TCC_{ROW} ($P = 0.66$) estimate. The TCC_{CITY} estimate was 34.7% (SEM = 2.0) and significantly ($P < 0.001$) 2 times greater than in the 16.2% (SEM = 2.2) TCC estimate from NLCD imagery. We found the TCC_{ROW} was 32.6% (SEM = 1.6) and significantly lower ($P = 0.003$) than in TCC_{CITY}. Results from this study may improve the overall ability to predict tree debris following ice storms from the regional models currently used to a more local estimate for a city. Future investigations are needed to determine if this is the case.

Keywords. Decision Making; Green Spaces; Planning and Management; Tree Canopy; Urban Forestry.

Abstract. Apple and pear scab are foliar pathogens of apple and pear trees. Unmanaged, yield and aesthetic losses can be severe. The risk of resistance associated with over-reliance on fungicides means novel pathogen management methods and products are increasingly required. Chitin and chitosan are widely recognised as induced resistance (IR) agents that trigger plant defence responses that in turn enhance plant resilience to pathogen ingress. A container and field trial was conducted using apple (*Malus sylvestris*) and pear (*Pyrus communis* 'Conference') respectively to assess the efficacy of a range of liquid and granular chitin/chitosan-based IR agents and fertilisers against apple and pear scab. A synthetic fungicide (penconazole) spray program used within the UK for apple and pear scab control was included for comparison. Application of chitin/chitosan IR agents at concentrations above 1% caused phytotoxicity. Limited efficacy as scab protectants was also demonstrated when chitin/chitosan IR agents were applied at concentrations of 0.25%. However, chitin IR agents when applied at 0.5% and 1% and chitosan IR agents at 1% demonstrated efficacy as scab protectants and resulted in an increased leaf chlorophyll content, increased fruit yield, and reduced leaf scab severity when compared against the watered control. Only one of three chitin/chitosan fertilisers evaluated demonstrated efficacy as scab protectants (liquid chitosan). A synthetic fungicide penconazole spray program provided the greatest protection against apple and pear scab in the container trials. However, under field conditions the degree of scab control following application of chitin and chitosan at 1% and the chitosan containing fertiliser liquid chitosan was statistically comparable to fungicide treated trees. Results suggest application of an appropriate chitin/chitosan IR agent(s) and fertiliser offers a useful addition to existing methods of apple and pear scab management under field and container conditions.

Keywords. Fungicides; Integrated Disease Management; Orchard Management; Pathogen Control; Plant Health Care; Urban Landscapes; *Venturia inaequalis*; *V. pirina*.

Abstract. Background: Production of high-quality 3D models of trees has a practical application in arboriculture, allowing the assessment, measurement, and recording of aboveground structural features of individual trees. Commercially available hobby UAVs (uncrewed aerial vehicles) with integrated cameras in combination with a low-cost photogrammetry software package can produce high-definition 3D models

of tree structures with low financial investment. Methods: Our study compared an established orbital flight strategy and 2 novel close-range flight strategies for collecting digital imagery to produce 3D models of features of interest (FOIs) in trees. We used 3 separate tests to establish if these different flight strategies resulted in reliable, measurable, and complete models for FOIs in mature broadleaf trees. Results: Our study substantiated the findings of previous studies, in that a well-planned, automated orbital strategy of flight can render full models of trees from which accurate measurement of dimensions can be obtained. A flight strategy involving collecting clusters of images from different angles whilst the UAV stayed in one location was trialled, and the resulting models were typically incomplete and of low quality. However, the second close-range strategy of hand-flown missions running parallel with the FOI yielded highly detailed, complete models from which observations of the FOI's surface and accurate measurements of its dimensions could be obtained. Conclusions: We conclude that there are substantial opportunities for the use of low-cost UAVs to undertake visual tree assessments of the aerial parts of trees, subject to ease of access to the feature and the right choice of flight strategy.

Keywords. 3D Modelling; Arboriculture; Drones; Tree Risk Management; Tree Surveying; UAV; Visual Tree Inspection.

Abstract. Background: An urban site index is an approach for identifying site quality for optimal matching of urban tree tolerances to site conditions and for determining the efficacy of soil management actions. The Rapid Urban Site Index (RUSI) was previously developed and found to significantly relate to urban tree performance. However, the RUSI needs further testing to verify its accuracy in other urban tree populations. Furthermore, calibration of the RUSI with parameter weighting and additional parameters might also improve its accuracy. Methods: The objectives of this study are to: (1) evaluate the RUSI in 3 Wisconsin cities; (2) evaluate RUSI parameter weighting models to improve its accuracy; and (3) examine the addition of a labile organic matter indicator to the RUSI for detection of a soil management action. Results: The RUSI was found to significantly correlate to urban tree metrics in 3 Wisconsin cities ($r = 0.29$ to 0.31; $n = 90$). Parameter weighting increased significant correlation values between urban tree metrics and the RUSI model ($r = 0.24$ to 0.37; $n = 90$). The Solvita® soil respiration test detected differences in soils from a biosolids application ($P = 0.0275$), and its addition to the RUSI model improved significant correlation values to urban tree metrics ($r = 0.27$ to 0.38; $n = 90$). Conclusions: This research demonstrates effective approaches for RUSI refinement. These findings show the RUSI to be a valid approach for urban site assessment and demonstrate how the RUSI can be tailored and refined for use in specific urban tree populations.

Keywords. Site Assessment; Soil Quality; Urban Soils; Urban Tree Growth; Urban Tree Health.