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CONTENTS

Abstract. Urban trees provide a range of environmental and public health benefits. However, urban trees may also have an adverse effect on human health by increasing exposure to pollen. Many types of tree pollen are considered to be allergens and have been linked to various manifestations of allergic disease, including allergic sensitization, exacerbation of allergic rhinitis, and exacerbation of allergic asthma. An emerging body of literature suggests that the amount of pollen deposited annually varies widely over small spatial scales. While the health impacts of spatial variation in tree pollen within metropolitan areas could be large, the current literature has not been systematically reviewed. To fill this gap in knowledge, this review synthesizes existing evidence on how tree pollen is distributed on an intra-urban spatial scale. A better understanding of the spatial distribution of allergenic tree pollen within urban environments and its relation to health could inform increasingly common urban tree planting programs.

Key Words. Allergic Rhinitis; Allergic Sensitization; Asthma; Pollen; Public Health; Spatial Variability; Urban Trees.

Abstract. Growth on one branch is suppressed in proportion to pruning severity, resulting in a predictable reduction in branch:trunk diameter (aspect) ratio. However, little is known about response to pruning multiple branches. Several of the largest branches on live oak (15.3 cm trunk diameter) were pruned with four severities (0%, 25%, 50%, and 75%), then branch, nearby stem, and trunk diameter were measured for five subsequent years. Rate of trunk diameter increase five years after pruning was greatest for trees pruned with the 25% severity. Aspect ratio on all three pruned and measured branches decreased with time after pruning, pruning severity, and increasing height in the crown. Mean aspect ratio ceased declining between three and five years after pruning. The decrease in aspect ratio over time and with increasing severity on pruned branches was less pronounced in the lower crown than in the upper crown. Smaller change in aspect ratio on pruned branches in the lower crown suggests that when structurally pruning trees, branches in the lower crown may require a higher pruning severity to effect the same change in aspect ratio as upper branches.

Key Words. Aspect Ratio; Branch Diameter; Growth Partitioning; Live Oak; Pruning; Pruning Dose; Pruning Severity; *Quercus virginiana;* Trunk Diameter.

Abstract. Influence of root collar depth in a nursery root ball and potential root remediation when planting into the landscape are subject of increasing research. Mulch placement on root ball surface at planting has also been called into question recently. Trees planted deeply in nursery containers required ≥41% more time to remove substrate and roots growing over the root collar at planting than trees planted shallowly. Circling roots on trees planted from 170 L containers persisted for five growing seasons after planting into the landscape unless remediated by pruning at planting. Root remediation improved *Ulmus* and *Acer* root systems by dramatically reducing percent trunk circled with roots without influencing post-planting xylem potential, crown growth, or anchorage during the first five years after landscape planting. Mulch placed on the root ball surface caused more re-growth of circling roots on *Acer*—but not *Ulmus*—following root remediation. Bending stress to tilt trunks was most correlated with cross-sectional area of leeward and straight roots on *Ulmus* or windward and straight roots on *Acer*. The initial increase with time in bending stress required to tilt trunks after planting followed by a drop in bending stress suggests that trees planted from nursery containers could be more susceptible to uprooting in a wind storm as they became established beyond three or four years.

Key Words. *Acer*; Bending Stress; Circling Roots; Elm; Maple; Root Ball; Root Collar; Root Flare; Root Remediation; Root Systems; Stem-Girdling Roots; Trunk Damage; Trunk Flare; *Ulmus*.

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Abstract. Four general-use insecticides (Astro®, Onyx®, Dominion® Tree & Shrub, and Xytect 2F®) were evaluated for their effectiveness at preventing attacks by the southern pine beetle (SPB) (*Dendroctonus frontalis*) and the small southern pine engraver (*Ips avulsus*) using a previously developed small-bolt method. Evaluations were conducted between 58 and 126 days post treatment. Southern pine beetles from New Jersey and Mississippi, U.S., were evaluated using a mixture of field and laboratory small-bolt trials; beetle origin did not appear to affect results. Astro and Onyx bole sprays were effective at reducing or eliminating attack by SPB, while the imidacloprid soil drench products (Dominion and Xytect) were ineffective. With *I. avulsus* in Louisiana, U.S., Astro was effective at reducing bole utilization at 58 and 83 days posttreatment but failed at 126 days. Onyx, Dominion, and Xytect were ineffective against *I. avulsus* in these tests. Imidacloprid phloem residues averaged 0.74 (µg/g phloem dry weight) for Dominion and 1.31 for Xytect, values that are similar to other studies but low for purposes of control. These results support previous findings that systemic imidacloprid is ineffective for protecting pines against *Dendroctonus* bark beetles and that bole sprays with bifenthrin or permethrin can be effective. However, permethrin was the only active ingredient that was effective against *I. avulsus* in the current study.

Key Words. Bifenthrin; *Dendroctonus frontalis*; Imidacloprid; Insecticide; *Ips avulsus*; Mississippi; New Jersey; Permethrin; *Pinus*; Soil Drench; Southern Pine Beetle; Southern Pine Engraver; Systemic Insecticide.

Abstract. The emerald ash borer (EAB), first discovered in North America in Michigan in 2002, continues to expand its distributional range. Early detection of EAB remains a major caveat in efforts to implement proactive management strategies. Past reports have shown that ash trees infested with EAB have an increased risk of branch failure and other symptoms associated with tree decline. Therefore, early detection efforts could be improved if a suite of tree symptoms—prior to visible signs of EAB infestation—can be identified. Researchers initiated a four-year study in Ohio, U.S. (2009–2012) to investigate and document symptoms associated with the EAB–ash tree complex in urban sites. The prior history of EAB at the study sites ranged from ash trees with no visible evidence of infestation to those that were infested for more than two years. In trees shown to be recently colonized by EAB, visible signs of infestation, such as adult emergence holes, presence of EAB galleries, bark loss, and canopy loss were not always apparent. However, in EAB-positive trees, there was a significant tendency for the presence of cracks in scaffold branches, branch fractures within the upper canopy, and branch fractures specifically located closer to the union with the stem as opposed to at the branch tip or at the branch's center of gravity. This study highlights tree symptoms associated with the initial colonization of EAB when host trees are still apparently healthy, which could greatly facilitate future detection efforts for EAB.

Key Words. *Agrilus planipennis*; Arboriculture; Ash; Branch Fracture; Early Detection; Emerald Ash Borer; *Fraxinus*; Invasive Species; Scaffold Crack; Urban Forestry.