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CONTENTS

Abstract. Background: Along electric distribution corridors in urban-exurban landscapes, forest edges are susceptible to damage associated with storm events. Disturbances and management interventions designed to preempt their effects (e.g., tree trimming) alter characteristics of tree structure and morphology (e.g., branch and crown structure), which may be associated with tree failure and likelihood of associated infrastructure damage. This study assessed the relationship between 3-dimensional tree crown structure and tree biomechanics and characterized the effect of utility tree trimming on tree sway dynamics using terrestrial laser scanning (TLS). Methods: In this study we extracted and analyzed measures of crown structure (i.e., crown asymmetry, crown area, total volume, crown diameter to height ratio, and crown evenness) for individual trees during leaf-off conditions before and after implementation of tree trimming and linked these measures to tree biomechanics data, to evaluate how commonly implemented trimming practices affect both tree sway frequency and displacement—important indicators of tree stability. Results: Results illustrated the effects of common tree trimming practices on tree crown structure, but there were not consistent changes to tree movement characteristics directly following tree trimming across our 24 study trees. However, we found that the associated changes in crown structure through tree trimming affected tree displacement in moderate wind conditions. Additionally, we found there were no significant differences between frequencies across treatment types. Conclusions: This pilot project lays the foundation for understanding the intricate relationship between 3-dimensional crown structure and tree biomechanics following roadside tree trimming.

Keywords. Biomechanics; Displacement; Terrestrial Laser Scanning; Trimming; Utility Vegetation Management.

Abstract. Background: Codominant stems are a common condition of concern on landscape trees. Understanding the impact of varying degrees of stem reduction can assist practitioners in making informed pruning decisions. Methods: To determine this, a single reduction or removal cut was made on each pair of codominant stems on medium-aged *Acer rubrum* 'October Glory' at approximately 25%, 50%, 75%, and 100% of the diameter relative to the basal diameter at the shared union or left as nonpruned controls. Changes in stem diameter ratio, trunk diameter growth, sprout production, wound closure, and aesthetics were documented for 4 years starting in 2020. Results: Stem diameter ratio was significantly reduced in codominant stems pruned to a relative diameter of 50% or 75% after a single growing season. The 75% treatment reduced growth for 2 growing seasons. There were no significant differences in change of stem diameter ratio with any treatment after 3 growing seasons. Larger pruning cuts resulted in the growth of more sprouts and more exposed wood after 3 years. Aesthetics of trees following pruning were acceptable for nonpruned, 25%, and 50% treatments in all years but were rated as not acceptable or moderately acceptable for 75% and 100% treatments after 2 growing seasons. Trees with the 75% treatment became aesthetically acceptable after 3 growing seasons. Conclusions: Pruning codominant stems of *A. rubrum* 'October Glory' with a cut that is 50% or 75% the diameter of the basal diameter at the shared union is appropriate at reducing stem diameter ratio, minimizing exposed wood, and maintaining overall aesthetic appearance after 2 to 3 years.

Keywords. Pruning Specifications; Sprouts; Stem Diameter Ratio; Structural Pruning.

Abstract. Urban forest management is a multistakeholder, multi-objective situation whereby a surfeit of synergistic or competing goals may exist. Greater research and applied guidance for what works in which urban forest contexts could help improve urban tree and forest outcomes. The challenge in conducting research of this nature is systematic definitions of "what works" and "which contexts" across multidimensional, polycentric urban forest social-ecological systems. This paper presents a comprehensive framework for studying the complexities in urban forest systems (synthesized from numerous other frameworks in the field) that could be used to generate context-specific insights into urban forest management and dynamics. The logic of using frameworks and specific frameworks that already exist within the field are reviewed. Then, I present the urban forest social-ecological system (UFSES) framework. The UFSES framework specifies 5 first-tier factors: the *Characteristics of Trees in the Urban Forest (T)*; the *Surrounding Growing Environment (E)*; *Management & Institutions (M)*; and *Characteristics of the Human Community (H)*; which influence *Urban Forest Outcomes (O)*. A detailed set of second-tier variables nested within these factors are presented in tables at the end of the paper. The framework can foster holistic systems thinking in a systematic yet flexible way; provide a working draft of a common language for thinking about and studying urban forest systems; and enable comparative case research.

Keywords. Conceptual Model; Framework; Growing Environment; Human Community; Institutions; Interdisciplinary; Management; Social-Ecological System; Systems Thinking; Transdisciplinary; Urban Forest Outcomes.