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Abstract. Background: Winter color changes in boxwood occur when foliage shifts from green to shades of yellow, orange, or red. The degree of winter color change in boxwood may influence the aesthetic value of ornamental plants and raise concerns for plant health care professionals. Methods: In 2021 and 2022, 40 cultivars of boxwood, including the species *Buxus sempervirens*, *B. microphylla*, *B. sinica* var. *insularis*, *B. harlandii*, *B. balearica*, and hybrids were evaluated for winter color change. In late summer of 2021, 29 plants representing 8 cultivars with intense color change were covered with 75% shade cloth tents or left in full sun from August 2021 through March 2022. In a separate experiment in fall 2021, *B. sempervirens* 'American', *B. sempervirens* 'Rotundifolia', and *B. microphylla* 'Winter Gem' were fertilized or not to determine if slow-release fertilizer could lessen the winter color change. The study was conducted on the transitional area between USDA Hardiness Zones 7b and 8a. Results: In 2021, *B. sempervirens* (61.0%) and hybrid (65.8%) cultivars had the highest percentage of visible color change, followed by *B. microphylla* (26.1%) and *B. sinica* var. *insularis* (19.1%). *Buxus harlandii* and *B. balearica* had negligible color change. Shade significantly ($P < 0.001$) reduced the winter color change observed in March 2022. Fertilization did not influence the visible color change ($P = 0.2401$). Conclusions: The differences in winter color change across boxwood species, cultivars, and under shaded and fertilized conditions will help horticulture practitioners better select cultivars and sites in the landscape relative to winter color change.

Keywords. Boxwood; Cultivar Selection; IPM; Physiology; Winter Bronzing; Winter Color; Winter Damage.

Abstract. Potential impacts from climate change and other disturbances expedite the need to address vulnerabilities of urban forests. Low species diversity is a contributor to high urban forest vulnerability, and this study examined 40 public and private tree inventories in the metropolitan area of Milwaukee, Wisconsin, USA. Applying an established vulnerability framework, this study helps to identify the current and future resilience of the urban forest in the face of climate change and other urban forest threats. A Milwaukee metropolitan area tree inventory was compiled and includes 439,974 trees. This inventory then was assessed under 2 climate change models through the end of the century (2070 to 2099). It also was assessed for species diversity under multiple diameter classes, and the Shannon Diversity Index was used to determine correlations between tree size and diversity. The resulting data analysis revealed a poorly diversified urban tree canopy in the Milwaukee metropolitan area. However, when looking at tree size and diversity, diversity increased as tree diameters decreased. Additional analysis revealed that under a low climate change scenario (RCP 4.5), only 9.5% of the overall inventory was within the moderate, moderate-high, or high vulnerability categories through the end of the century. Under a high climate change scenario (RCP 8.5), 55.52% of the inventory fell within those same vulnerability categories. Diameter class did not have a significant impact on vulnerability under either climate change scenario. This data can help inform urban forestry practitioners during species selection for planting trees in their communities.

Keywords. Climate Change; Disturbance; Inventories; Resilience; Urban Forestry.

Abstract. Background: The urban heat island (UHI) phenomenon, resulting from rapid urbanization and aggravated by persistent climate change, is intensifying heat stress and temperature anomalies inside the urban microclimate, requiring the implementation of suitable adaptation measures for sustainable development. The integration of street trees inside the urban landscape is a strategy to alleviate the thermal stress of pedestrians. However, trees have variable potential for the regulation of thermal comfort depending on their different canopy shapes/drag. Therefore, a holistic understanding of tree plantings and species with respect to a particular climate is necessary for urban sustainability.

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Methods: In this study, computational fluid dynamics (CFD) that employ unsteady Reynolds-averaged Navier-Stokes (URANS) equations were performed using FLUENT solver to analyze the cooling potential of isolated tree species based on 5 morphological characteristics and canopy shapes (i.e., tree height, trunk height, crown width, crown height, and leaf area density) in an urban area. Results: Results revealed a variable temperature regulation (i.e., 0.6 to 1.2 °K) depending on the tree species. Overall, the cooling effect was only observed in the vicinity of the tree canopy. This was due to the availability of shading and increased moisture content provided by the canopy foliage, which blocked shortwave radiation from the sun, as compared to its surroundings. Conclusions: The study findings show that leaf area density is the morphological trait that has the greatest impact on thermal comfort, as it results in low ambient air temperature irrespective of the type of urban density. Additionally, the most effective way to reduce thermal stress is to implement taller trees with uniform foliage density, which will produce a well-ventilated environment.

Keywords. CFD; Sub-Configuration Validation; Thermal Stress; Tree Morphological Characteristics; Urban Microclimate.

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