



DISSERTATION DEFENSE



April 9, 2026

11:00 AM | PFEN 120

Urban ecology as a system integrating climate, biodiversity, and urban forest management

Urban forests are important components of city ecosystems, as they provide environmental benefits that improve urban resilience and quality of life. Trees moderate local temperatures, reduce stormwater runoff, improve air quality, and support biodiversity. However, urban forests are increasingly shaped by two major influences, climate change and humans. Rising temperatures, shifting precipitation patterns, and increasing atmospheric moisture demand are altering the climatic conditions in which urban trees grow. At the same time, historical patterns of development, economic and social inequality, and urban management influence where trees are planted, which species are present, and who has access to the ecosystem services that trees can provide. Understanding how these ecological and social forces interact is necessary for developing sustainable and equitable urban forestry practices and strategies. In this dissertation, I explored how biome shifts, social vulnerability, and urban forest management interact to influence future forestry practices across the United States. I found that climate projections indicate many urban areas are expected to experience substantial shifts in temperature and precipitation patterns, potentially altering biome conditions and affecting urban vegetation through increased physiological stress. I also found that urban biodiversity is unevenly distributed within cities and that community science plays an important role in documenting urban tree diversity. Finally, I identified institutional characteristics that influence how municipalities plan for and manage urban forests. While many municipalities recognize the need for climate adaptation strategies, implementation varies depending on local resources, governance structures, and planning capacity. Together, these findings illustrate that urban forests cannot be understood through climate or ecology alone. Rather, urban forestry emerges from the interaction of ecological change, social inequality, and institutional decision-making, shaping how cities manage and sustain urban tree systems in a changing climate.



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BIO

Troy Weber is a PhD Candidate in Environmental and Ecological Engineering, affiliated with the Interdisciplinary Ecological Sciences and Engineering Program. He received a B.S. in Environmental and Ecological Engineering from Purdue University in 2022. His research focuses on urban ecology and urban forestry, particularly how climate and humans shape the distribution, diversity, and management of urban forests. He integrates climate projections, biodiversity metrics, and socioecological indicators to understand how cities can develop resilient and equitable urban forestry strategies.

Outside of academia, Troy is the co-founder of Flora Candle Company with his partner, Nolan. Together, they own a small business specializing in eco-conscious candle making and providing an inclusive space for the local community. Troy serves as a founding member of the Downtown Lafayette Business Owners Association, supporting small business development and improving the quality of life in downtown Lafayette. In addition, he serves on the City of Lafayette Bike and Pedestrian Committee.