

Thesis Project Portfolio

Student Steel Bridge Competition

(Technical Report)

The Struggle to Increase Tree Cover in US Cities

(STS Research Paper)

An Undergraduate Thesis

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Our capstone team designed and fabricated a steel bridge to compete in the 2025 ASCE Student Steel Bridge Competition. The bridge was designed to fit competition requirements and to model improvements for the Skunk River Trail. The team optimized structural performance, constructability, and aesthetics through iterative modeling and analysis in Revit and RAM Elements. After completing the model, steel was ordered, and the bridge was fabricated by the team. The fabrication process included welding, cutting, punching bolt holes, grinding, and painting. The bridge was tested under an oscillating 2500lb load in the UVA structures laboratory.

Alongside technical objectives, the team prioritized reviving the UVA Steel Bridge Team by recruiting underclassmen, structuring leadership roles, and holding workshops. The report includes detailed drawings, design evolution, and compliance documentation with AISC and ASCE competition standards. Our team was successful in constructing the bridge and competing in the ASCE Regional Symposium at the end of March 2025. Although the bridge was disqualified due to slightly overtime construction, the bridge performed well under load tests, and the competition provided valuable insights for future years. Future teams will look to build a lighter bridge with fewer connections and smaller members. Our team satisfied its goals of constructing the bridge, attending competition, and building a strong foundation of the UVA Steel Bridge Club for the future.

The lack and loss of urban tree canopies is a growing concern in many U.S. cities due to its impact on public health, environmental resilience, and social equity. This research paper investigates the sociotechnical dimensions of efforts to increase tree cover in urban settings. Using Actor-Network Theory (ANT) as a guiding framework, the research emphasizes the

importance of understanding trees not merely as passive environmental elements, but as active participants in complex networks that shape urban life and social relations.

Urban forestry projects across the US show how diverse actor-networks shape the success of tree-planting initiatives. These projects show how government agencies, nonprofits, residents, businesses, technology, and trees themselves form dynamic networks that drive collective action. Through the Actor-Network Theory, key processes such as identifying problems, aligning interests, engaging participants, and sustaining momentum become visible. Emphasizing these relationships reveals how collaboration and adaptive strategies can help address environmental and social disparities in urban tree canopy coverage.