Growing Climate Resilience in Colorado's Communities Impacted by Increasing High Heat through Community-Informed, Data-Driven Urban Forestry

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BACKGROUND

Colorado faces high heat every year, and climate modeling projections show that the state will continue to experience more frequent and intense heat over the next few decades.[1] This may lead to an increase in heat-related injury, illness, and death for residents. One particularly promising solution is leveraging urban forests in disproportionately impacted communities [DICs] with low tree canopy where additional plantings can have an outsized impact in reducing high heat effects.

PURPOSE

This project was completed with the Colorado State Forest Service and the Governor's Office of Climate Preparedness and Disaster Recovery. It provides a framework of guidance for community leaders to enable effective community-informed, data-driven tree planting projects. These projects will mitigate high heat in communities across Colorado and leverage the benefits of tree canopy for climate adaptation.

1. Bolinger, R.A., J.J. Lukas, R.S. Schumacher, and P.E. Goble (2024): Climate Change in Colorado, 3rd edition. Colorado State University, https://doi.org/10.25675/10217/237323.

METHODS

Statewide Scope

We began with a statewide high-impact tree canopy analysis to identify communities which met two requirements: (1) have a tree canopy equivalent at or below the state average of 13.4% and (2) met the definition of a DIC. We then analyzed the climate data for these communities, including the number of extreme heat days over 95°F and cooling degree days which measure the associated estimated demand on the electric grid. Finally, we created a numerical index which provides a composite score for each of the three categories (canopy, heat days, cooling degree days). All of this information was recorded in a database and an interactive map on ArcGIS Online.

Pilot Communities

Pilot projects in three communities included:

- On-the-Ground Tree Inventory and Analysis
- Community Engagement
- Community Guides Informed by Engagement

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KEY DATA AND FINDINGS

High-Impact Tree Canopy Analysis

We identified 142 cities and communities across the state of Colorado as high-impact communities (Figure 1). Each community has below 13.4% canopy and is defined as a DIC. While pressures from climate change affect each community differently, these communities are likely to benefit the most from a bolstered tree canopy to help mitigate heat.

Tree Inventory and Analysis

The tree inventories revealed that many neighborhoods have low tree canopy, and the urban forests in the identified areas are at risk due to their health condition (Figure 2) and species composition. The most common trees spotted were invasive trees (Tree of Heaven, *Ailanthus altissima*) or trees susceptible to pests and diseases (Green ash, *Fraxinus pennsylvanica*). The dead and unsuitable trees should be removed and replaced with appropriate species.

Engagement Results

Community surveys revealed that roughly 75% of residents value trees; however, residents face barriers with the cost of watering, professional care, and long-term maintenance (Figure 3). Shade, cleaner air and water, and improved mental health were the most common benefits of trees that resonated with residents. When asked what information would be beneficial in a guide, residents indicated proper pruning, planting, and watering techniques. The takeaways from the surveys informed the substance of the community guides developed for this project for each city.
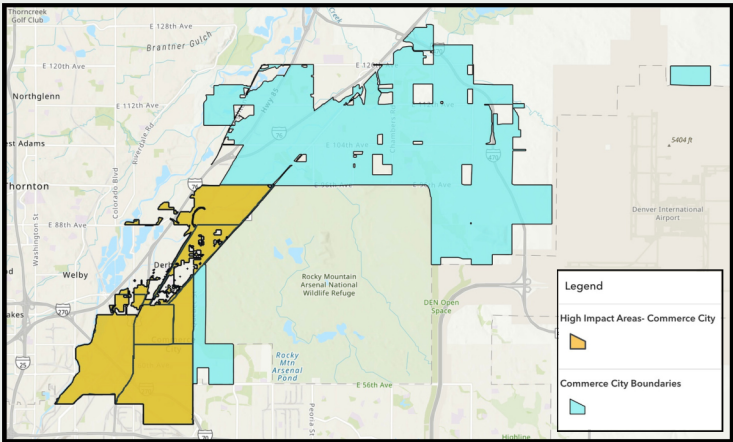

Figure 1. High-Impact Tree Canopy Analysis Map (Example: Commerce City)
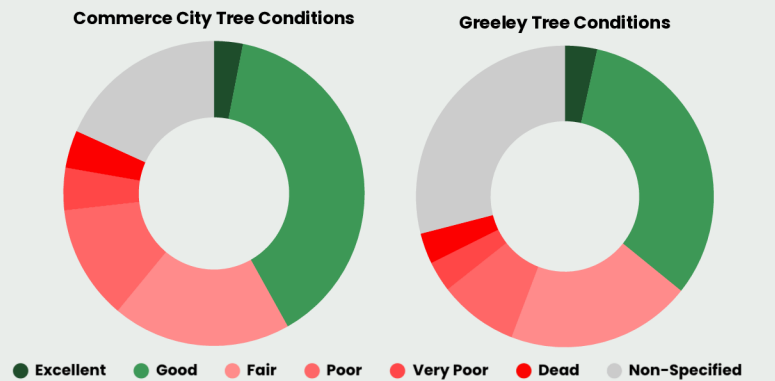
Figure 2. Sample tree inventory assessment results for tree conditions.
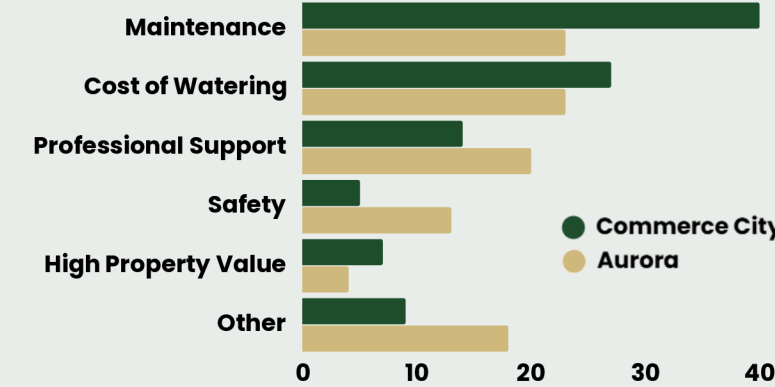

Figure 3. Example of community survey results. Survey responses shown in percent.

OUTCOMES

This project produced a set of complementary deliverables that were combined into a toolkit which includes an explanation of and access to the High-Impact Tree Canopy Analysis map and database, community guides, and a framework for community engagement. With this toolkit, the Colorado State Forest Service, Governor's Office of Climate Preparedness and Disaster Recovery, other municipalities, and organizations across the state can invest in and establish tree planting programs that are community-informed, data-driven, and city-supported. As a climate adaptation strategy, this will help alleviate heat-related risks for communities that are more susceptible to high heat.

ACKNOWLEDGEMENTS