Abstract: Disproportionate and inequitable tree canopy cover and access to urban green space is a common issue in many cities of the United States, including Rochester, New York. Due to racially discriminatory practices in Rochester's past, such as redlining and resource distribution (e.g. tree replacement), many communities in the city experience an urban heat island effect, where surface temperatures in urban neighborhoods reach dangerous temperatures in the absence of vegetational interference. Communities which are the most impacted include those of high poverty levels and races other than white, such as the neighborhood near Clifford and Joseph Avenues in the notorious "Crescent of Poverty" of Rochester. This region of interest was identified due to: being historically redlined, being a crime hotspot, having many vacant lots, being exposed to high surface temperature, lacking in canopy cover, having high poverty rates and racial minority populations, and being within close proximity to a homeless shelter. This research project proposes solutions including increasing tree canopy cover and green spaces in place of concrete, asphalt, or abandoned lots in historically disadvantaged communities. This action would decrease surface temperature fluctuation, provide natural health benefits to residents, and foster a sense of community through a common initiative and shared space. Since beginning of this research project in Spring 2023, the city of Rochester actually began allocating resources to decrease tree canopy inequity in the city via the Tree Master Plan of 2024.

Shade Speaks Louder Than Words
An Analysis of and Solution to Tree Canopy Inequity in Rochester, NY

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Why Rochester?

Rochester is spatially segregated due to redlining practices that restricted lending and financial support for certain races. Redlining was a process established by the Federal Housing Authority which outlined certain regions of a map, typically those of concentrated minority populations or poverty, and deemed them risky to loan to, shown in Figure 1 [1]. This restricted residents from home ownership status and from accumulating wealth to relocate or increase their social status. Resources, such as residential trees, were denied to these areas due to their economic "risk" and a lack of direct demand from the primarily rental community [2].

Rochester's Discriminatory History

- Redlining
- Restrictive / racial covenants in property deeds (city & suburbs)
- White flight from central city to suburbs
- Racist neighborhood development practices by industry (Kodak, etc.)

"Rochester's low-income populations and communities of color are more likely to live in areas with less green space and are often more vulnerable to heat related and respiratory illnesses" – ROC Climate Action Plan 2022 [3].
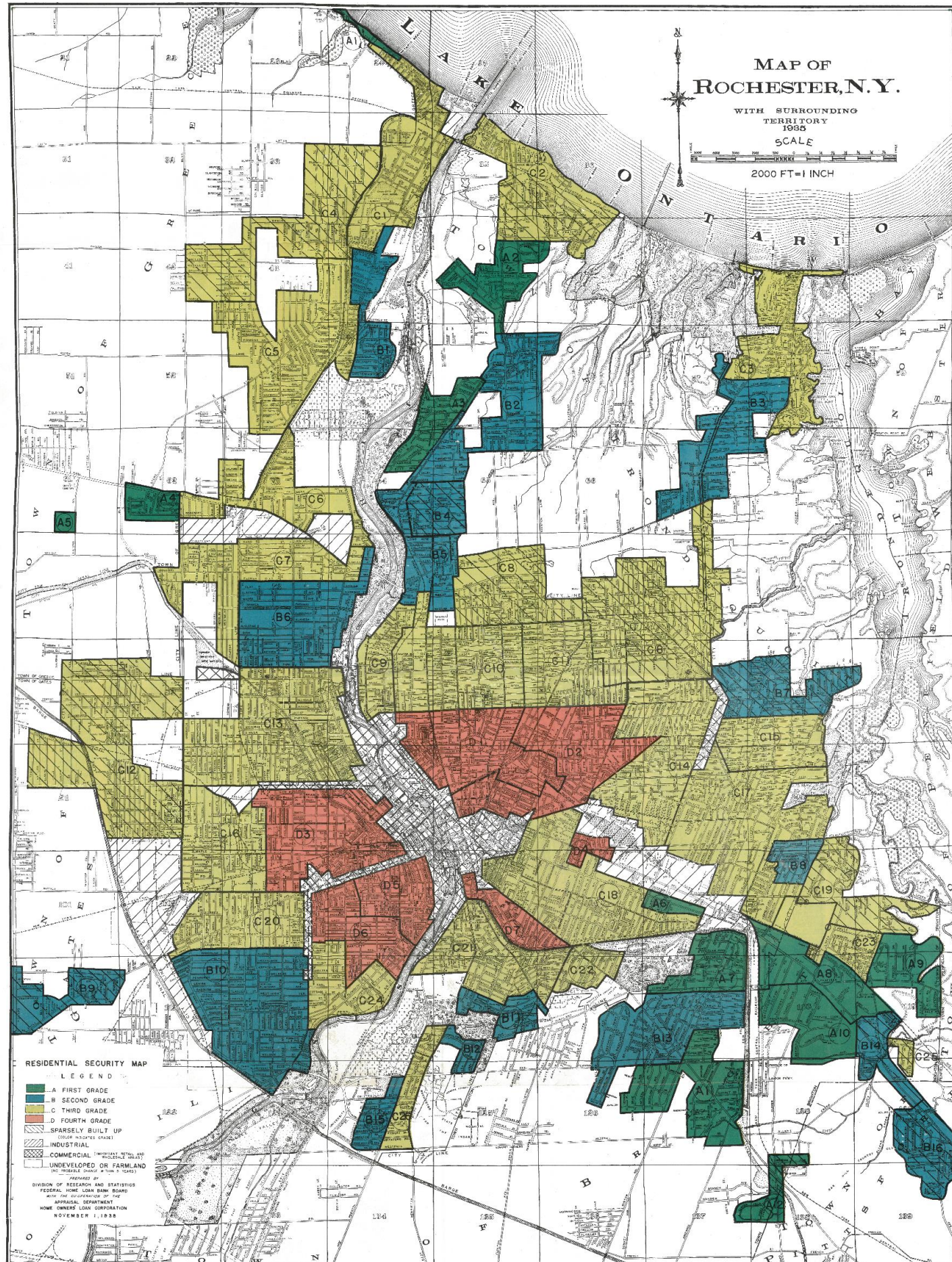

Figure 1: Historic redlining map of Rochester, NY from 1935. Green regions are first grade for financial loans, blue are second, yellow are third, and red are fourth grade [4].
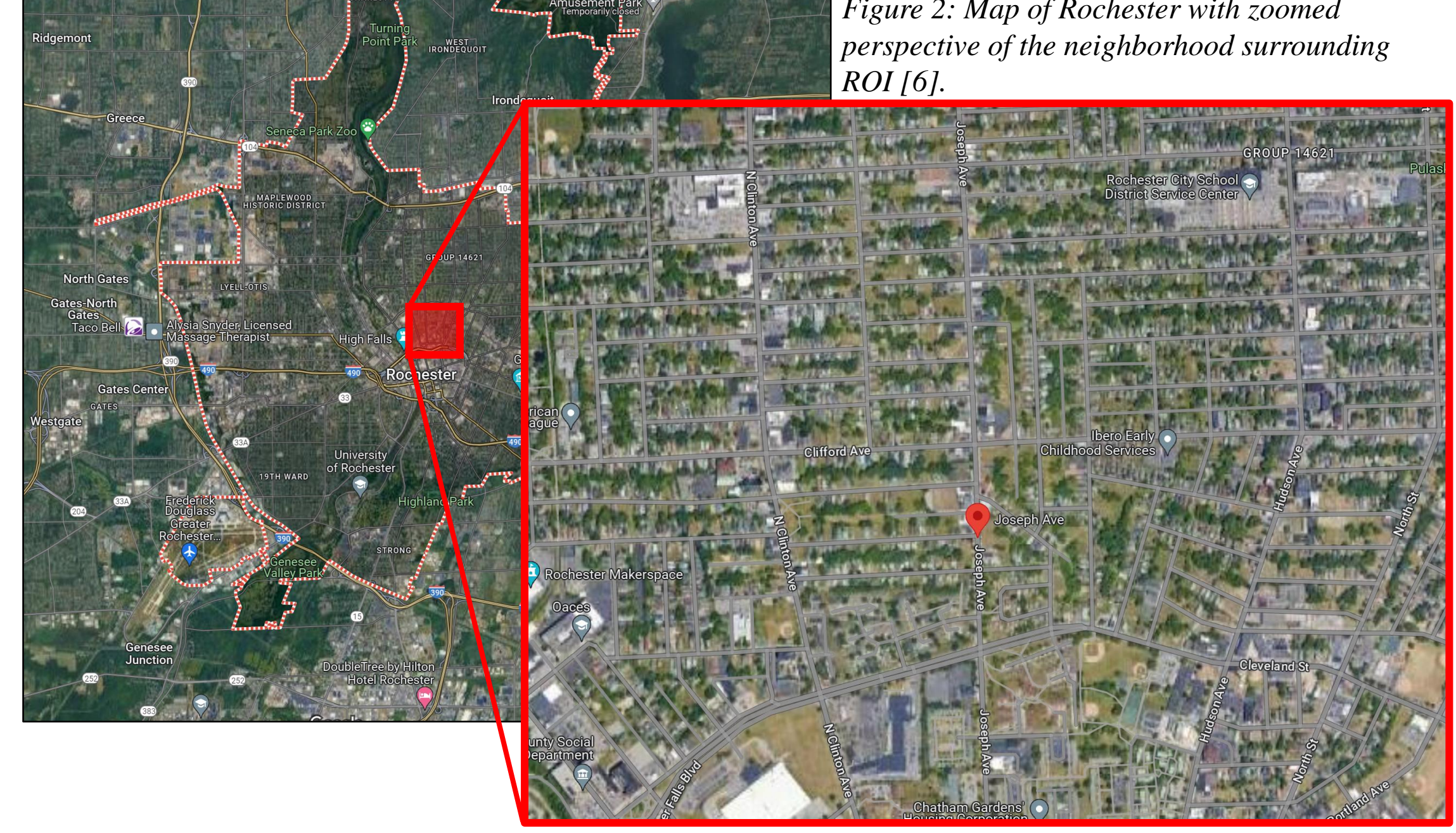
Why green spaces?

Rochester residents gather in a vacant lot at the corner of Jefferson Avenue and Ruff Alley [5].

- Health benefits (mental and physical)
- Carbon sequestration
- Storm buffering
- Prevent pollution and eutrophication
- Community building
- Surface temperature decrease
- Soil remediation

A Visible Difference

"You can see when you just walk or drive around this part of town – you just don't see trees. In the summer it's just so bright. Then when you go on Park Avenue and those side streets, it's so comfortable."
– Luis Burgos, former director of Recreation and Youth Services in Rochester [5]

Joseph Avenue   **Park Avenue**

Photographs of Joseph Ave (left) and Park Ave (right) in Rochester, NY. Tree canopy inequity in residential areas trends were evident during this cite visit [6].

Figure 2: Map of Rochester with zoomed perspective of the neighborhood surrounding ROI [6].

Region of Interest (ROI)

Justification of ROI
- Significant lack of canopy cover
- High surface temperatures
- High poverty rates
- Majority non-white population
- High crime rates
- Many vacant lots
- Historically redlined fourth grade ("hazardous" / Grade D)

	North of Clifford Ave - Census Tract 36055005200	South of Clifford Ave - Census Tract 36055000700	Park Avenue - Census Tract 36055003100	Rochester, NY	New York	United States
Population Living In Poverty (%)	48	36	16	27.9	14.3	11.5
Non-White Residents (%)	95	97	10	63.7	45.8	41.1
Temperature – Summer Day (°F)	78.5	78.5	76.2			
Tree Canopy Cover (%)	29	27	36			

Data from [5] and [7] – US Census Bureau

Region of Interest:
North of Clifford Ave, South of Laforce and De Jonge St, West of Joseph Ave, East of N Clinton Ave
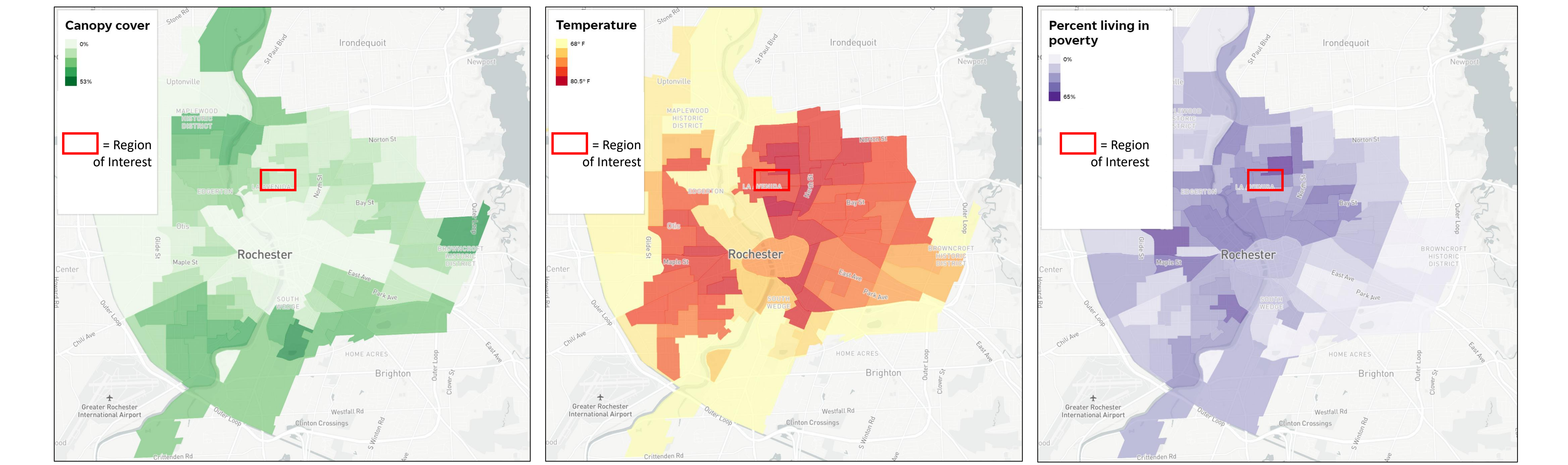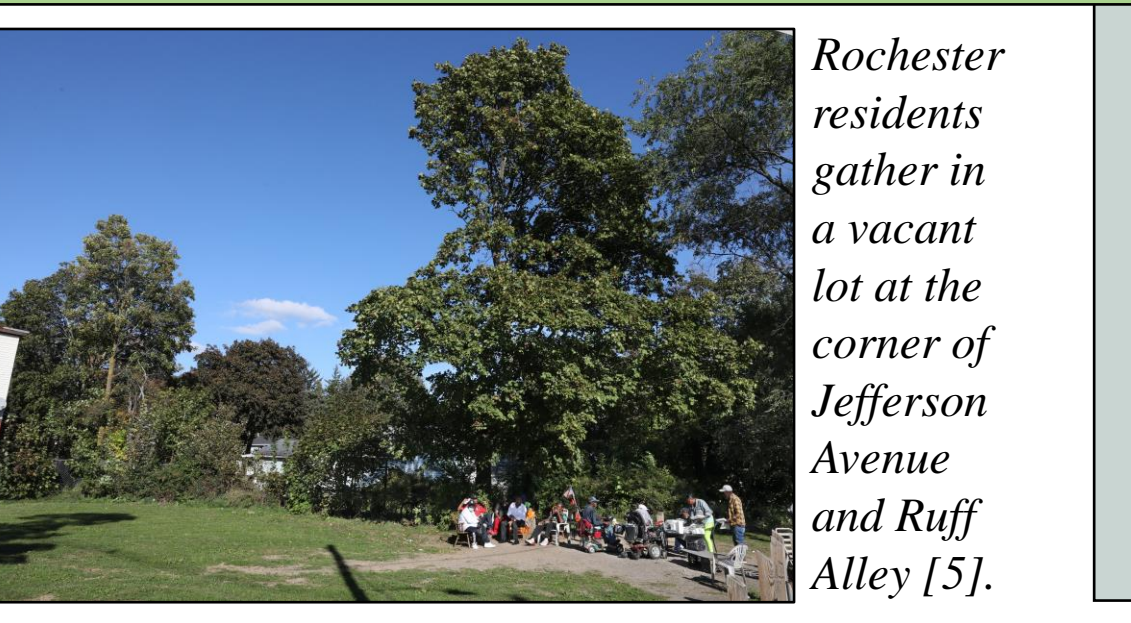

Figure 3: Three maps of Rochester, NY with the left depicting relative spatial tree canopy cover, the middle depicting surface temperatures, and the right depicting poverty rates (note the infamous "Crescent of Poverty" to the Northwest of downtown. The ROI of this study is highlighted in red and shows high concentrations of dangerous surface temperatures and percent of people living in poverty. [5]

A Mutually Beneficial Solution

Vacant lots on Clifford Ave with potential to be a new green space.

One solution is **community-centered, ground up development** (park, urban farm, outdoor recreation space) of city-owned vacant lots in the Clifford and Joseph neighborhood. During a field study, people were observed walking past these lots, even in the rain, suggesting that a redevelopment project would be frequented by locals. Projects would provide **more vegetated areas for local residents** who have been deprived of tree cover access. The area could be used as a **community building and event location** due to its proximity to transportation routes. Additionally, this would aid the city in the process of **rightsizing**.

Proof of Concept - Widespread Greening of Rustbelt Cities

Baltimore   Cleveland   Pittsburgh   Detroit
[8] [9] [10] [11]

Rochester mayor, Malik Evans, stated that city leaders "want to make sure that as we [people of Rochester] position ourselves as a climate refuge city, that positioning is equal around all the neighborhoods" [13].
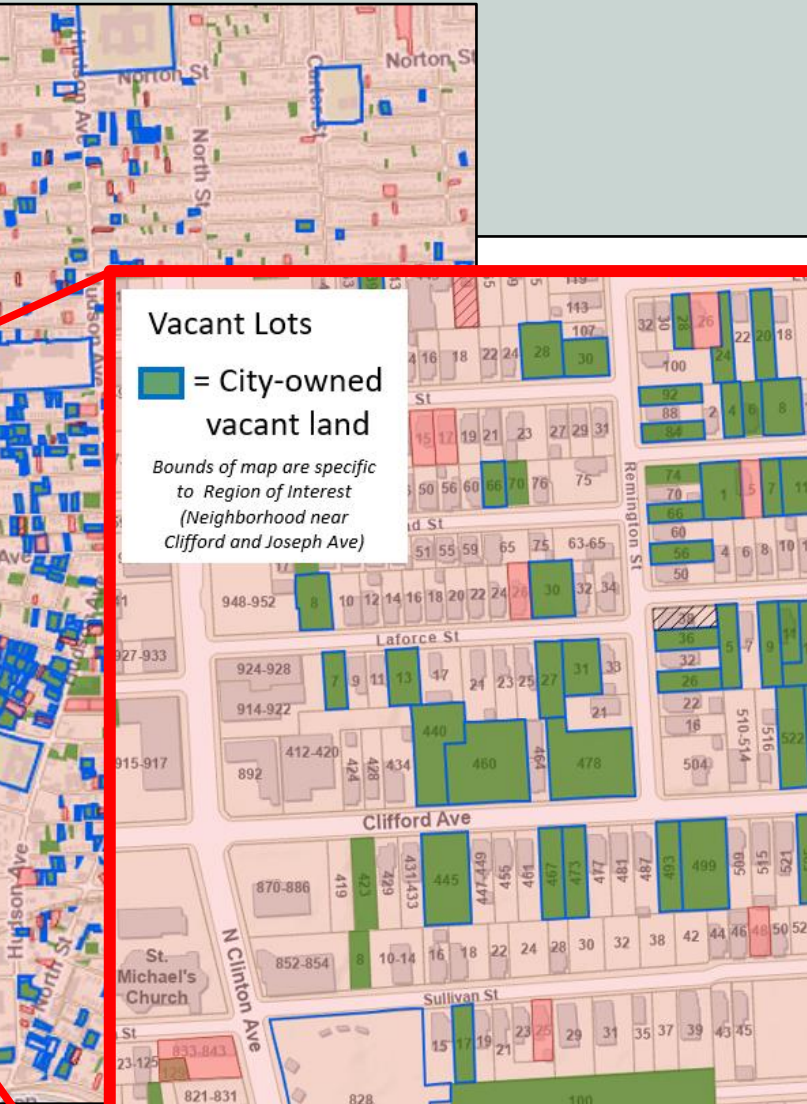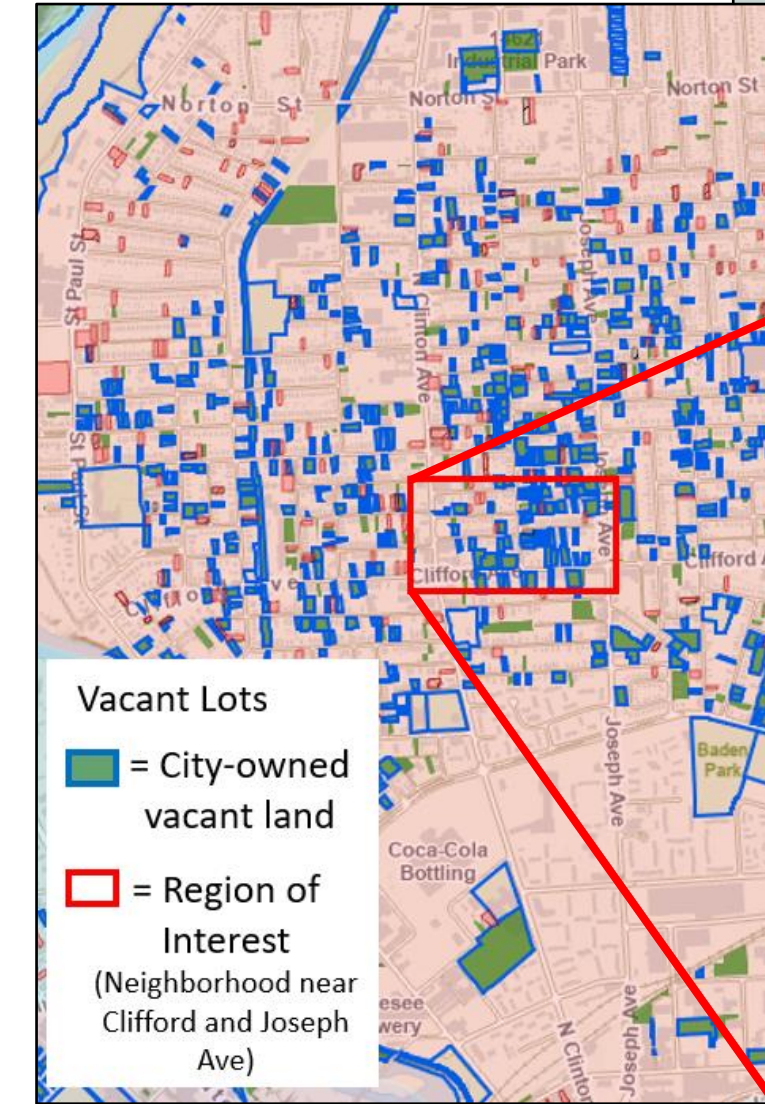
Figure 4: City-owned vacant areas for repurposing within ROI [12].

Vacant Lots
- = City-owned vacant land
- = Region of Interest (Neighborhood near Clifford and Joseph Ave)

BREAKING NEWS!

Since this project began in Spring 2023, Rochester is updating the 2012 *Urban Forest Master Plan* to address tree inequity. There have been webinars, open meetings, tree ambassador programs, and extensive analysis of how green space resources are distributed throughout the city [14].

PRO: This initiative has been paired with other climate actions, such as invasive species removal and community education. Community involvement events have been spatially well distributed around the city.

CON: Resident engagement in the process primarily relies on resident self engagement, which takes time and is an equity issue.

THE CITY OF ROCHESTER **Forestry Division** & Urban Forest Master Plan
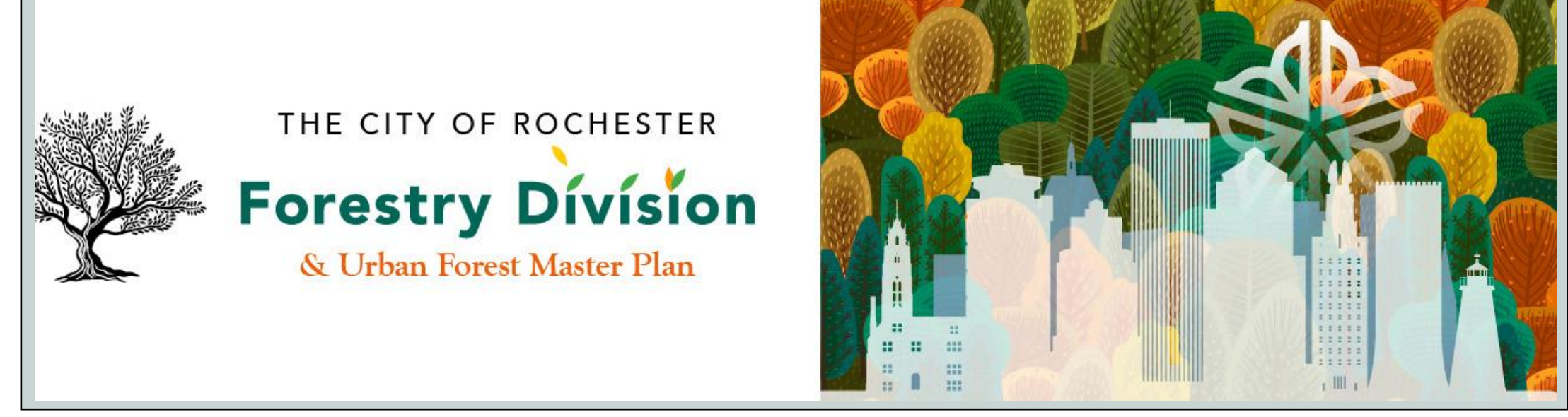
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