

Studying Extreme Weather Event Impacts for Transit Reliant Unhoused Populations

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16. Abstract As climate change leads to more frequent and extreme weather events, people experiencing homelessness face increasing risks, including those related to mobility access. This study examines the challenges faced by unhoused individuals in Santa Clara County while accessing weather-respite services (e.g., cooling and warming centers) during extreme weather events. The research combines geospatial analysis with insights from 120 semi-structured interviews conducted with encampment residents, along with focus group discussions involving homeless service providers. Using cluster and outlier analysis (Anselin Local Moran's I), the geospatial study identifies statistically significant areas where accessibility challenges are concentrated, revealing areas where encampments have limited access to public transit or warming or cooling centers. The qualitative findings indicate that unhoused individuals rely heavily on public transit and active transportation modes, increasing their vulnerability during extreme weather events. Access to emergency services is further constrained by transportation challenges, limited service accessibility, operational barriers, communication gaps, and other behavioral factors. The study finds that current weather respite facilities do not consistently meet the needs of the unhoused population. To address these gaps, it recommends an approach that strengthens mobility systems, expands the use of local community resources such as faith-based organizations, and enhances communication through trusted community networks. Overall, improving climate resilience for unhoused populations requires a coordinated approach that integrates transportation planning, emergency management, homelessness services, and community-based outreach.			
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Executive Summary

Introduction

As climate change exacerbates extreme weather events such as heatwaves, wildfires, and floods, ensuring access to emergency services becomes increasingly important. Unhoused individuals often rely on transportation networks and active transportation modes to reach critical weather respite facilities. Therefore, transit systems should not only be viewed as mobility infrastructure but also as critical components of emergency preparedness and climate response. As the homelessness crisis continues, and more encampments exist along urban stream corridors, transportation barriers increase exposure to climate-related hazards.

Existing emergency response frameworks often do not reflect the lived realities of the unhoused population. Also, despite growing attention to homelessness and climate vulnerability, limited research has examined how transportation access shapes unhoused individuals' ability to reach emergency weather services during extreme weather events. By analyzing the spatial accessibility of weather respite services such as warming and cooling centers and incorporating perspectives of unhoused individuals and service providers, this study addresses the following research questions:

1. What are the key barriers preventing unhoused individuals from effectively accessing emergency weather services during extreme weather events in Santa Clara County?
2. How spatially accessible are transit services and weather-related emergency facilities for urban stream encampment residents in the City of San José?
3. How can transportation agencies, local governments, and community organizations improve emergency preparedness and climate resilience for transit-reliant unhoused populations?

Key Methods

This study uses a mixed-methods approach to examine the barriers faced by the unhoused in accessing weather respite services in Santa Clara County. It integrated geospatial analysis with qualitative data from the interviews with unhoused residents and surveys and focus groups with homeless service providers. Through Cluster and Outlier Analysis (Anselin Local Moran's I), the study identified statistically significant concentrations of encampments with accessibility challenges. These service gap areas represent locations where the unhoused have restricted access to public transit and emergency respite facilities, including warming and cooling centers. The research team also conducted 120 semi-structured interviews at 12 encampment sites in San José using convenience and snowball sampling.

Researchers also gathered perspectives from homeless service providers through an online survey and focus group discussions. The qualitative data was analyzed using descriptive statistics and thematic coding to reveal trends as well as the information about the lived experiences of the unhoused related to mobility, extreme weather challenges, and emergency service accessibility. By integrating spatial accessibility analysis with firsthand accounts from unhoused residents and service providers, the study captures both geographic service gaps and the lived realities that influence emergency shelter utilization.

Key Findings

Major findings can be summarized as follows: (1) Heavy dependence on public transit and active transportation significantly increases climate vulnerability among unhoused populations. (2) Unhoused residents living along urban streams reported substantially greater exposure to flooding than heatwaves, potentially illustrating a tradeoff between the cooling benefits provided by stream corridors and heightened flood risk. (3) The geospatial analysis reveals spatial inequalities in access to emergency weather respite services for the unhoused and identifies service gap areas across San José. (4) Operational and administrative barriers in the public transit network limit unhoused individuals from using emergency shelters during extreme weather events. (5) Behavioral and social barriers further restrict unhoused individuals' access to emergency weather shelters during extreme weather events. (6) Weak communication systems and emergency alerts prevent unhoused populations from adequately preparing for extreme weather events. (7) Communication barriers are compounded by limited digital connectivity, as many unhoused individuals lack functioning phones or active data plans needed to receive emergency alerts and information about available services. (8) Community-based assets, such as faith-based organizations, remain underutilized due to a lack of formal frameworks.

Policy Takeaway

A major takeaway from this research is that improving climate resilience for unhoused populations requires a coordinated approach that integrates transportation planning, emergency management, homelessness services, and community-based outreach. Addressing only one dimension of vulnerability in isolation is unlikely to substantially improve emergency preparedness outcomes. The key policy implications are: (1) Emergency response policies for the unhoused should be specifically designed around their lived realities and mobility patterns to strengthen resilience against extreme weather events. (2) Public transit needs should be better integrated with emergency services for the unhoused during extreme weather events. (3) Improving communication, outreach, and public awareness during extreme weather events should be prioritized in emergency preparedness for unhoused populations, as information barriers and social stigma often limit access to these services. (4) The policies to improve emergency services during severe weather conditions must address barriers that discourage the utilization of these services, such as fear of losing essential survival belongings. (5) Stronger

interagency coordination should be established between transit agencies, emergency management departments, homelessness service providers, and community organizations during extreme weather events. (6) Service gap areas identified through geospatial analysis provide a practical framework for prioritizing future investments, outreach efforts, shelter expansion, and emergency transportation resources.

1. Introduction

1.1 Significance of the Project

As climate change intensifies extreme weather events, including heat waves, wildfires, floods, and severe storms, the demand for accessible emergency services is becoming increasingly important. During such extreme weather events, improving transit accessibility for the most vulnerable populations strengthens overall community resilience. For unhoused individuals who rely heavily on walking, biking, and public transit, transportation access can determine whether they are able to safely evacuate, reach warming or cooling centers, obtain medical care, or access emergency services during climate-related disasters. Transportation systems therefore function not only as mobility infrastructure, but also as critical components of emergency preparedness and climate resilience. As the homelessness crisis continues in the San Francisco Bay Area and encampments are cleared from central business districts, there has been a growth of encampments located along urban streams.¹ While living in business districts may increase unhoused individuals' vulnerability to heatwaves, stream corridors often provide cooler conditions but place the unhoused at a greater risk of flash floods.

The paper uses the term “unhoused” rather than “homeless” to align with evolving policy discourse that frames housing insecurity as a structural issue and reflects more destigmatizing terminology.² This research project examines the accessibility barriers and challenges that unhoused individuals face, especially during extreme weather events in California, drawing on findings from Santa Clara County.

1.2 Background

People experiencing homelessness are a transit-dependent population. Many people experiencing homelessness do not have access to a vehicle and are reliant on public transit or active transportation (i.e., walking and biking).³ Studies on the geography of homeless encampments show that people experiencing homelessness concentrate in areas near services, basic needs, income, safety, food, etc.⁴ In cities, this usually correlates with central business districts. Studies have also found that there is a significant spatial relationship between land use types, transit stations, and encampment locations, which suggests that transit access is a high priority for the unhoused.⁵ Nonetheless, an analysis of the literature suggests that transportation is a critical but relatively under-researched variable in the lives of individuals experiencing homelessness.⁶

Today, in the San Francisco Bay Area (hereafter referred to as the Bay Area), similar to other large metro areas in California and across the nation, encampments are being pushed out of more visible city center areas that often have better access to transit and other key services. Land use policies and NIMBY political pressure have also concentrated homeless services away from

desirable residential areas into often low-resource areas.⁷ This has the potential to increase travel times and distances to needed services, which is particularly problematic during extreme weather events. The literature has established that longer commutes by transit lead to more environmental exposures. A study of Bay Area demographics and weather demonstrated that low-income and zero-car households make more trips by foot and bicycle and are disproportionately exposed to dangerous heat effects.⁸ Research in Winnipeg, Canada showed that socially disadvantaged groups disproportionately bear the social costs of environmental exposure while walking to and transferring at transit stops in extreme weather.⁹ A systematic review of the literature suggests that unhoused individuals and vulnerable-housed populations are disproportionately exposed to extreme weather events,¹⁰ and access to transportation options (e.g., free shuttle buses and transit) is critical for emergency preparedness.¹¹

As encampments are increasingly displaced toward environmentally vulnerable and geographically isolated areas, transportation disadvantage becomes compounded by climate risk. Unhoused individuals who lack private vehicles must often travel longer distances by foot, bicycle, or public transit to reach emergency shelters, cooling centers, food distribution sites, and healthcare services. During extreme weather events, these mobility constraints can significantly increase exposure to environmental hazards and reduce the ability to access safety.

This research project builds directly on the findings of the Resilient and Equitable Urban Stream Corridors project, a two-year interdisciplinary social science and hydrography project funded by a University of California Climate Action Seed Grant.¹² Connecting researchers across SJSU, UC Davis, and Northeastern University, the project aims to generate findings that help local agencies plan for the intertwining futures of climate change hazards, humans, and ecology.

1.3 Research and Policy Gap

The aforementioned funded project did not focus on transportation; the initial findings from the project show that virtually no urban stream encampment residents have access to a working vehicle, confirming the transit dependence of the population. This research systematically examines the accessibility of weather-related emergency services for urban stream encampment residents in Santa Clara County, using a mix of geospatial analysis of urban stream encampment locations, encampment resident surveys, and key stakeholder interviews.

Many studies and government policies have emphasized that transit access is a meaningful way to alleviate poverty,¹³ but few have addressed the social cost of transit dependence. And despite significant disruptions due to extreme weather events, there is little extant research on climate hazards for transit networks to inform mitigation strategies for unhoused individuals.¹⁴ This project helps fill the knowledge gap in both areas.

Additionally, existing research has rarely examined the intersection of homelessness, transportation accessibility, and climate resilience simultaneously. In particular, few studies

combine geospatial analysis of service accessibility with firsthand perspectives from unhoused individuals and homeless service providers. As a result, limited evidence exists to guide transportation agencies and local governments in designing emergency response systems that account for the mobility realities of unhoused populations during extreme weather events.

More broadly, this study argues that climate resilience planning and emergency transportation systems are currently not designed around the lived realities of transit-reliant unhoused populations. Existing emergency response frameworks often assume stable shelter access, reliable communication technologies, and predictable mobility patterns, conditions that do not reflect the experiences of many people living in encampments. By examining both the spatial accessibility of emergency services and the lived experiences of unhoused individuals during extreme weather events, this research highlights the need for more inclusive and mobility-sensitive approaches to climate resilience planning.

1.4 Justification for the Research and Benefits to Californians

California faces both a growing homelessness crisis and increasing frequency of climate-related extreme weather events, including heat waves, atmospheric rivers, urban flooding, and wildfire smoke exposure. As these crises increasingly overlap, local governments and transit agencies require evidence-based strategies to ensure that vulnerable populations can safely access emergency services and weather respite facilities. This research project benefits Californians by providing insights that can inform policies and programs aimed at improving access to weather-related emergency services for unhoused populations. The findings have direct policy implications for cities, local transit agencies, and homeless service providers across California. By understanding how unhoused populations are exposed to extreme weather risks and how access to transit and emergency services varies spatially, the study supports equitable planning interventions. The broader implications of this research extend beyond Santa Clara County, as its findings and methodologies can be adapted by other jurisdictions across California facing similar challenges.

1.5 Research Questions

This project asks:

1. What are the key barriers preventing unhoused individuals from effectively accessing emergency weather services during extreme weather events in Santa Clara County?
2. How spatially accessible are transit services and weather-related emergency facilities for urban stream encampment residents in the City of San José?

3. How can transportation agencies, local governments, and community organizations improve emergency preparedness and climate resilience for transit-reliant unhoused populations?

To address these questions, the study combines geospatial analysis of encampment locations and emergency weather services with qualitative interviews of unhoused encampment residents and surveys and focus groups with homeless service providers in Santa Clara County. This mixed-methods approach allows the research to examine both the spatial dimensions of service accessibility and the lived experiences of unhoused individuals navigating extreme weather conditions.

1.6 Organization of the Report

This report is organized into four main sections. The first section introduces the study and provides background context. The second section focuses on a geospatial analysis of service accessibility, looking at the spatial gaps between encampment locations and available warming and cooling centers in the City of San José. The third builds on this analysis by incorporating qualitative data from surveys of encampment residents and interviews with key stakeholders. These findings highlight physical and social barriers experienced by the unhoused which limit their effective access to public transit and available weather respite facilities. The final section brings together qualitative and geospatial results to develop key recommendations. It synthesizes the key findings, discusses their policy implications, and concludes with directions for further research.

2. Geospatial Analysis of Environmental Risk and Service Accessibility for Unhoused Populations

This chapter presents the geospatial framework and analytical methods used to assess accessibility to emergency weather services, including warming and cooling centers and transit stops, for the unhoused population, and to identify areas with service gaps. The primary objective of the analysis is to determine geographic areas where concentrations of encampments are located at greater distances from this critical infrastructure, thereby highlighting spatial disparities in service accessibility across the study area. The chapter identifies these service gap areas in San José using Cluster and Outlier Analysis (Anselin Local Moran's I). While the analysis focuses on data from the City of San José, the broader research context extends to Santa Clara County, providing a wider regional perspective for understanding service accessibility for the vulnerable unhoused population.

2.1 Data Synthesis

A combination of spatial data sets and analytical tools was used to identify the geographic service gaps in access to warming and cooling centers and transit. Data on homeless encampments, the location of San José Public Libraries, and the location of overnight warming centers provided by homeless service providers were some of the primary datasets used in the geospatial analysis of this study. Table 1 summarizes all the data sources and software tools used in this study along with their roles in geospatial analysis.

Cooling Centers and Daytime Warming Centers: San José Public Libraries (SJPL) help vulnerable populations cope with extreme weather events by functioning as emergency weather respite centers. During such events, SJPL branches remain open during their regular operating hours and serve as both cooling and warming centers throughout the daytime. However, the demand for warming centers is generally greater during nighttime hours, when temperatures tend to drop significantly. Location details of the 25 SJPL branches designated as daytime cooling and warming centers used in this study are provided in Appendix II of this report.

Overnight Warming Centers: During the winter months, the city partners with HomeFirst, a nonprofit service provider supporting individuals experiencing homelessness. The city designates specific facilities as Overnight Warming Centers, which provide unhoused residents with a safe and warm place to stay during periods of cold weather. Details of two such centers operating as overnight warming locations are provided in Appendix III of this report.

Table 1. Summary of Datasets and Tools Used in Geospatial Analysis of Transit and Warming and Cooling Centers Accessibility from the Encampment Locations

Sr. No	Dataset/Tool	Source	Application in Study
1.	Encampment Location Data	City of San José (311 Call Data)	Geolocated encampments to evaluate the distribution of the unhoused population and used as the Origin dataset.
2.	Transit Stops	VTA (Santa Clara Valley Transportation Authority)	Geolocated transit stop locations to evaluate accessibility to public transportation and used as a Destination data set.
3.	Warming/Cooling Centers	City of San José Open Data Portal	Geolocated SJPL locations in the city that also serve as warming/cooling centers during regular hours. It is used as a Destination data set.
4.	Street Centerlines	City of San José Open Data Portal	Used to perform network analysis and calculate actual distances to the Destination data sets.
5.	Warming Centers	HomeFirst (Nonprofit Providers of Homeless Services)	Geolocated overnight warming center locations to evaluate weather relief access and used as a Destination data set.
6.	Faith-Based Organizations	City of San José Open Data Portal	Geolocated locations of faith-based organizations that have the potential to serve as overnight warming centers in the city.
7.	ArcGIS Pro 3.3	Esri	Conducted spatial processing, buffering, origin destination cost matrix (network analysis), cluster and outlier analysis, and mapping.

The geographic locations of homeless encampments, warming and cooling centers, and transit stops are represented in Figures 1 and 2 below. For unhoused populations who rely heavily on walking, biking, and public transit, the geographic distribution of emergency weather services is particularly important. Unlike housed populations with access to private vehicles, unhoused individuals often face substantial mobility constraints during extreme weather events. As a result, even relatively short increases in travel distance can create significant barriers to accessing safety, shelter, healthcare, and other emergency resources. The research team identified 6,806 reported encampments using 311 call data from the City of San José. Transit stop locations, including both light rail stations and bus stops, were obtained from VTA's Open Data Portal. Street Centerlines data was also obtained from the City of San José's Open Data Portal and used in further analysis. The cooling centers located on the map in Figure 1 correspond to SJPL locations that operate during regular hours and provide respite during periods of extreme weather. The locations of warming centers located on the map in Figure 1 correspond to the locations provided by HomeFirst. All the data sets were projected into NAD 1983 State Plane California III coordinate system in ArcGIS Pro 3.3.

Figure 1. Distribution of Encampment Locations, Warming and Cooling Centers in the City of San José

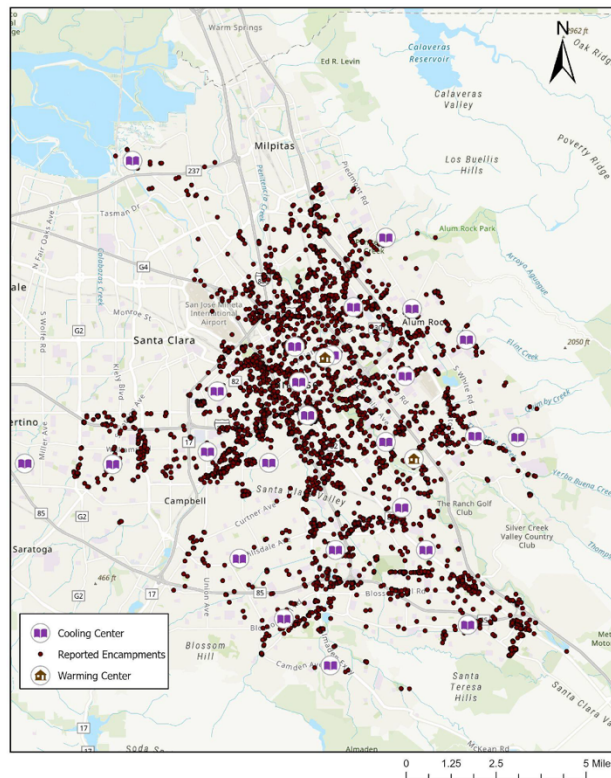
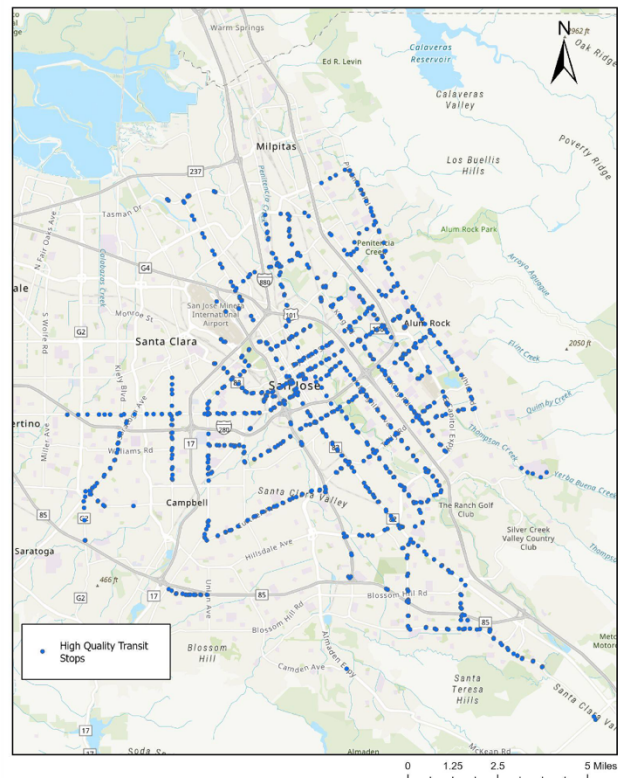


Figure 2. Location of High-Quality Transit Stops in the City of San José



2.2 Data Analysis

Origin-Destination (OD) Cost Matrix: Utilizing network-based distance is essential for a realistic assessment, as it accounts for the street grids and physical barriers.¹⁵ The analysis utilized the Origin-Destination (OD) Cost Matrix in ArcGIS Pro 3.3, a network analysis technique. The tool was used to measure spatial relationships between homeless encampments, nearby transit stops, and warming and cooling centers in the city. Using an OD Cost Matrix, it is possible to calculate least-cost paths between multiple origins and destinations and allow for assessment of travel distance or time along a transportation network. For this study, encampment locations were defined as origin points, while transit stops and warming and cooling centers were defined as destination points. The street centerlines were used as the network dataset. The OD Cost Matrix was used to model pedestrian network distance measured in meters along the City of San José's street centerlines data. The analysis parameters were configured to find the single closest accessible facility (destination) for each encampment location.

Deriving distance to the nearest facility: The OD Cost Matrix tool generated OD Lines, which served as the primary dataset for assessing accessibility between each origin (encampments) and its nearest destination (transit stops or warming and cooling centers). Accessibility from the origin to its nearest destination was evaluated using network-based distances in meters that gave

a representation of travel paths along the street network. The OD lines output layer generated through the analysis in ArcGIS Pro 3.3 included tabular records that specified the distance to the nearest facility. The distance values generated were integrated back to the encampment layer. Subsequently, a new field representing the distance to the nearest service was created within the encampment dataset, which gave a clear and quantifiable distance measure.

Created threshold-based accessibility variable: To assess the spatial relationship between encampments and essential infrastructure, a threshold-based accessibility variable was defined by a distance of 804 meters (0.5 miles). A half-mile threshold is commonly regarded as a reasonable walking distance, within which most users can access services on foot.¹⁶ In ArcGIS Pro 3.3, encampments located within 804 meters of the nearest service were categorized as having access to the nearest transit or warming or cooling center, while those located beyond this threshold were identified as having limited accessibility. It was therefore possible to identify the encampments that have poor accessibility to the weather respite facilities.

While a half-mile walking threshold is commonly used in transportation accessibility studies, this threshold may still underestimate the mobility burdens faced by unhoused individuals during extreme weather events. Carrying personal belongings, physical disabilities, health conditions, flooding, heat exposure, and safety concerns can significantly increase the difficulty of traveling even short distances. The threshold therefore serves as a conservative benchmark for identifying accessibility challenges.

Cluster and Outlier Analysis (Anselin Local Moran's I): Cluster and outlier analysis in ArcGIS Pro 3.3 uses Anselin's Local Moran's statistic to identify spatial patterns where similar values cluster together (hot spots), as well as locations that stand out as spatial outliers compared to their neighbors. In this analysis, encampment locations were used as the input features, and network distance to nearest service was used as the analysis field. A fixed distance band was applied with a threshold of 804 m, where each encampment was compared to neighboring locations within this constant distance. By examining the network distances associated with each encampment, the analysis revealed where locations with similar levels of accessibility were spatially grouped. For each feature, p -values were calculated to assess statistical significance, with results considered significant at a 95% confidence level ($p \leq 0.05$). Features with $p \geq 0.05$ were considered not significant and not interpreted further.

This approach enabled the identification of statistically significant spatial clusters and outliers, through which service gaps are identified in the subsequent analysis. It allowed us to locate the areas where encampments experience consistently poor or consistently better access to nearby transit stops or warming and cooling centers, as well as the locations that differed. By analyzing these spatial patterns, it was possible to identify the areas with concentrated poor access to these facilities.

2.3 Findings from Geospatial Analysis

Spatial Clusters of Encampments with Poor Accessibility to Transit and Weather Respite Facilities

The results of the Cluster and Outlier Analysis (Anselin Local Moran's I) indicated that areas with limited accessibility to facilities such as transit stops and warming or cooling centers are not randomly distributed, but instead form part of broader, statistically significant spatial patterns across the City of San José (95% confidence level, $p \leq 0.05$). The analysis identified High-High (HH) clusters. These are the areas with concentrated poor access from the encampment locations. HH Clusters include multiple encampments with network distances to the nearest transit stops or warming and cooling centers that exceed the 804-meter (0.5 mile) threshold. The spatial distribution of the HH Cluster Analysis results is indicated in Figure 3.

High-High (HH) clusters are of importance because they represent statistically significant concentrations of encampments experiencing poor accessibility to transit stops and warming and cooling centers. These clusters indicate areas where multiple encampments are consistently located beyond the 804-meter (0.5-mile) accessibility threshold, thereby revealing concentrated service gaps for the unhoused population.

These HH clusters are particularly significant because they reveal areas where transportation disadvantage and climate vulnerability overlap spatially. Encampments located within these clusters face compounded risks during extreme weather events because residents must travel longer distances to access both transit and emergency weather services. This increases the likelihood that vulnerable individuals will remain exposed to hazardous environmental conditions during storms, flooding events, and extreme temperatures.

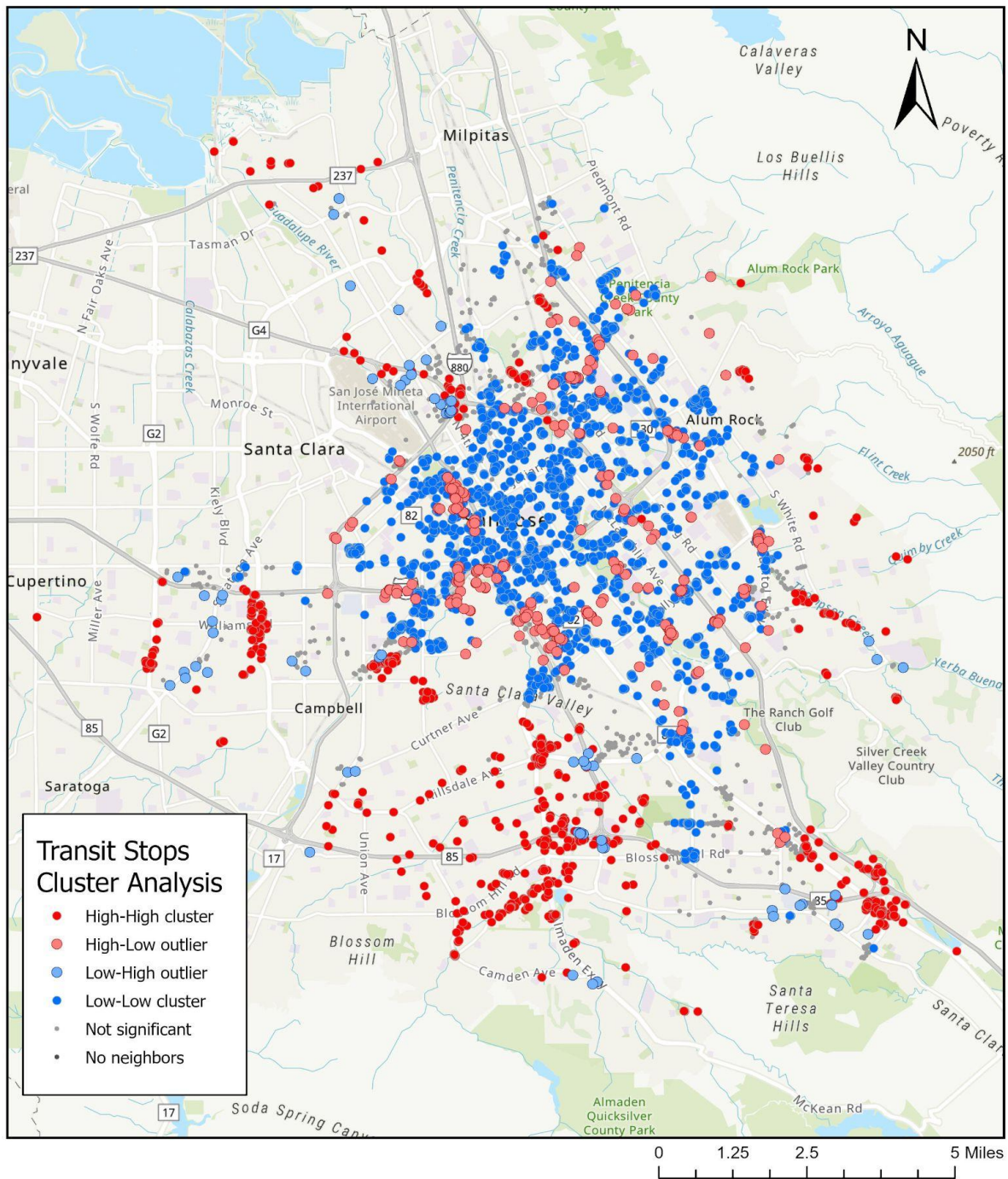
Spatial Clusters of Encampments with Higher Accessibility to Transit and Weather Respite Facilities

The analysis also delineated Low-Low (LL) clusters, as shown in Figure 3. These clusters represent areas where multiple encampments exhibit comparatively better accessibility to weather respite facilities, including transit stops or warming and cooling centers.

Spatial Outliers in Accessibility to Transit and Weather Respite Facilities

High-Low (HL) and Low-High (LH) outliers were identified, representing encampment locations that differ from their spatial neighbors. HL outliers refer to encampments with poor accessibility (i.e., greater network distances to the nearest facilities) that are surrounded by nearby encampments with better access. In contrast, LH outliers indicate encampments with relatively good accessibility that are located among others with poorer access. Features with $p \geq 0.05$ are marked as not significant in the analysis as shown in Figure 3. They do not form a part of any identifiable cluster or an outlier and are interpreted as randomly distributed with respect to accessibility patterns to the nearest transit stops or warming and cooling centers.

Figure 3. Cluster and Outlier Analysis of Transit Stops Accessibility (Anselin Local Moran's I)

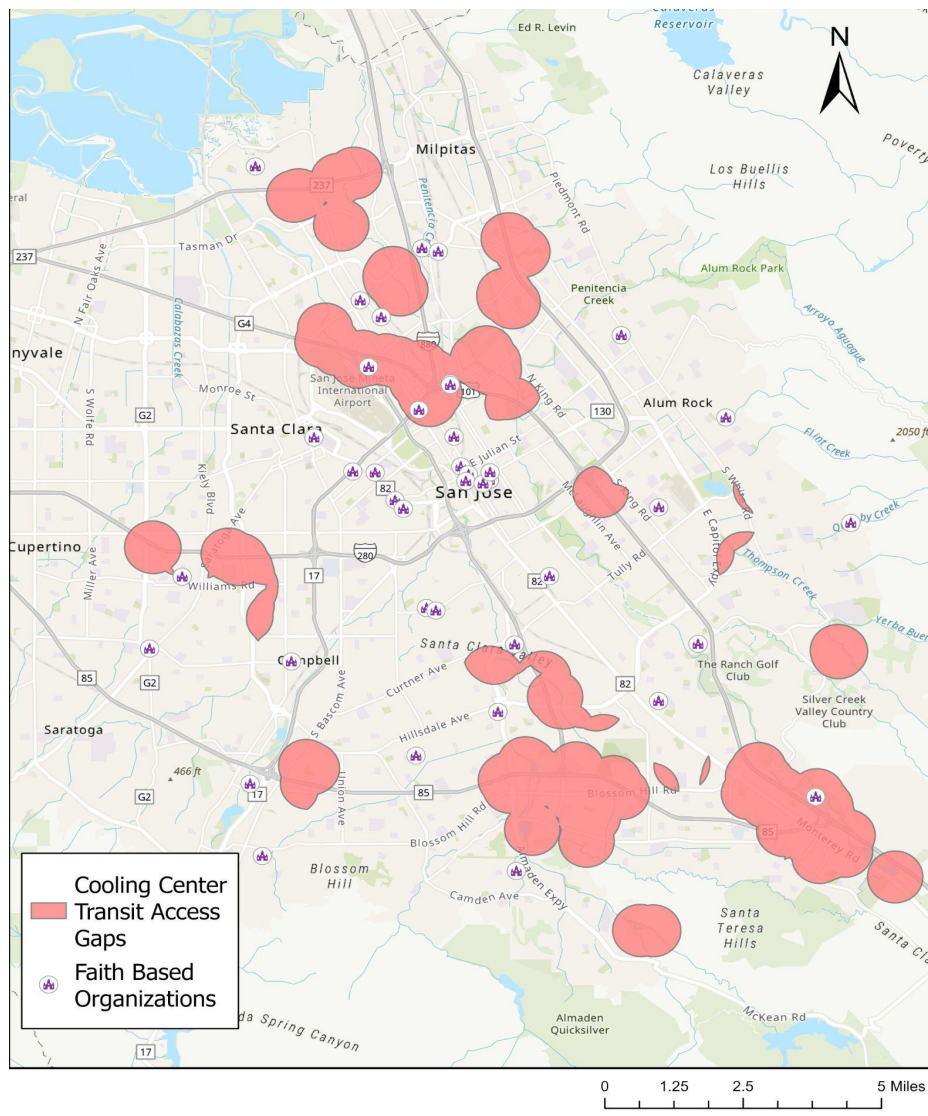


A 400-meter buffer was created around the identified HH locations to form contiguous zones. These buffered areas capture zones surrounding encampments where access to essential facilities such as warming and cooling centers or transit stops is inadequate. The resulting geographic buffers, shown in Figure 4, represent service gap areas in San José. These continuous areas provide a spatial understanding of where access to services is limited and support more targeted, area-based planning interventions. Importantly, these service gap areas should not be interpreted simply as geographic absences of infrastructure. Rather, they represent areas where existing emergency response systems fail to adequately align with the mobility realities of transit-reliant unhoused populations. Identifying these zones can help local governments prioritize outreach, transportation investments, emergency shelter expansion, and community partnerships during climate-related emergencies.

Faith-Based Organizations Located Within and Near Service Gap Areas

The research team mapped the locations of faith-based organizations across the city in relation to the service gap areas identified in Figure 4, highlighting facilities with the potential to function as warming and cooling centers for vulnerable populations during extreme weather events. A detailed list of these organizations is provided in Appendix III of this report. These sites may also function as overnight shelters, which are essential during periods of extreme cold, unlike public libraries, which are constrained by regular operating hours. As shown in Figure 5, four such locations are already situated within the identified service gap areas. However, the study found that there is presently no formal framework established by Santa Clara County to enable such organizations to operate as emergency weather shelters.

Figure 5. Geographic Locations of Places in Context to the Service Gap Areas within the City of San José



2.4 Summary of Key Findings

The geospatial analysis reveals clear and statistically significant spatial inequalities in access to emergency weather services across the City of San José. HH Clusters identify concentrated areas where 25.20% of encampments experience poor accessibility to transit stops and emergency shelters, highlighting critical service gap areas. By contrast, LL clusters represent areas with better access, indicating an uneven distribution of these services across the city.

Spatial outlier analysis further shows that certain encampments do not follow accessibility patterns of surrounding encampments. These locations have significantly better or worse access to emergency weather services than their neighboring areas. This suggests that accessibility to transit stops and warming and cooling centers is not randomly distributed but forms distinct spatial patterns of advantage and disadvantage.

To better understand inequities in access to weather respite facilities, service gap areas were delineated using 400 m buffers around HH clusters, creating continuous zones that have limited access. These areas represent priority locations for intervention and resource allocation.

Finally, the overlay of potential overnight shelter resources, such as faith-based organizations, located within or near these service gap areas, indicates an opportunity to expand weather emergency support infrastructure. However, the absence of any formal framework for their use as emergency shelter services also highlights an important gap in addressing extreme weather vulnerability among unhoused populations.

Overall, the geospatial analysis demonstrates that climate vulnerability among unhoused populations is shaped not only by exposure to environmental hazards, but also by uneven spatial access to transportation and emergency services. The findings suggest that climate resilience planning for vulnerable populations must account for both geographic accessibility and transportation dependence when designing emergency response strategies.

These findings highlight spatial inequities and provide evidence for targeted interventions to improve service accessibility for vulnerable populations in San José. To further support these findings and offer a more comprehensive understanding of homelessness and service access, the next chapter presents the qualitative study, including interviews with urban stream encampment residents, as well as online surveys and focus group discussions with homeless service providers in Santa Clara County.

3. Surveys of Encampment Residents and Interviews of Key Stakeholders

This chapter presents the data collection and analytical methods used to understand the role that public transit plays in helping unhoused community members access emergency services during extreme weather events. The primary objective of the analysis is to identify commonly cited barriers to obtaining emergency services from the perspectives of individuals experiencing homelessness and those who work closely with them, focusing on the role of transit in visiting warming and cooling centers. This analysis is then used to provide actionable recommendations for Santa Clara Valley Transportation Authority and homeless service providers in Santa Clara County.

3.1 Data Collection and Analysis Methods

This chapter summarizes data from interviews with homeless encampment residents living along urban streams, as well as an online survey and a focus group with homeless service providers in Santa Clara County.

Interviews with unhoused community members in Santa Clara County: The research team worked with local homeless service providers in Santa Clara County, including the Bill Wilson Center, LifeMoves, and HomeFirst, to identify homeless encampment sites along urban streams in Santa Clara County and to design a questionnaire to conduct interviews with encampment residents. After drafting the initial questionnaire, the research team circulated it to these organizations and conducted virtual meetings to gather their feedback. This made the researchers ensure that the survey instrument was relevant, interesting, and useful to the service providers, while remaining clear, respectful, and empathetic towards the residents. The questionnaire was revised to incorporate the insights from homeless service providers and then finalized.

Once the sites were selected, the research team used convenience sampling and snowball sampling to select residents from within each encampment for semi-structured interviews. Overall, the team conducted 120 interviews at 12 encampment sites in San José and one encampment site in Gilroy (see Appendix IV and Figure 6).

This map displays the geographical distribution of encampment sites within Santa Clara County. The county's boundary is delineated by a thick black line. Encampment sites are marked with black pin icons, showing a concentration in the central urban areas, particularly around San Jose and Milpitas, with a few sites also located in the northern and eastern parts of the county. The map includes major transportation routes such as State Routes 101, 880, 805, 280, 9, 17, 152, and 168, as well as local roads like G3, G5, G6, G8, G21, and SR 17. Key geographical features include the San Francisco Bay National Wildlife Refuge, the Calaveras Reservoir, and various open space preserves and parks such as Rancho San Antonio, Monte Bello, Longridge, Castle Rock, El Sereno, Almaden Quicksilver, Calero, Tilton Ranch, and Anderson Lake. The map also identifies several watersheds, including the Calaveras and San Jose. A legend in the bottom left corner clarifies the symbols for encampment sites and the county line. A scale bar at the bottom indicates distances up to 10 miles, and a north arrow is positioned in the top right corner.

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Table 2. Demographic Characteristics of the Participants Interviewed
at the Encampment Sites

Demographic Characteristics of the Participants (n = 120)	
Gender Identity	Percentage
Male	67%
Female	33%
Non-Binary	0%
Transsexual	0%
Racial/Ethnic Identity	Percentage
Hispanic or Latino/a/x/e	61%
White or Caucasian	18%
Native American in Combination with Another Race	7%
Black or African American	5%
Asian	4%
Other	3%
Multiracial or Two or More Races	2%
Pacific Islander or Native Hawaiian	0%
Middle Eastern or North African	0%
Age	Percentage
18 to 24 years	3%
25 to 34 years	23%
35 to 44 years	27%
45 to 54 years	23%
55 to 64 years	23%
65 to 74 years	1%
75 years and over	0%

Online survey and focus group with homeless service providers in Santa Clara County: The research team recruited key informants to participate in this project through the Santa Clara County Service Provider Network (SPN). SPN is a mailing list for providers, advocates, and volunteers supporting people experiencing homelessness or housing instability in Santa Clara County. The mailing list allows homeless service providers and others to network, share and seek resources for their clients, and receive updates on related events and opportunities. The research team sent an email through the SPN mailing list on April 1, 2026, asking SPN members to either fill out an online survey or volunteer to participate in an online focus group. In total, the team collected 8 responses to the online survey and held one focus group on April 24, 2026 that had 4 participants. As part of the survey and focus group, key informants were asked to answer 11 questions about transit reliance, transportation alternatives, proximity of transit to facilities, free ride utilization, barriers to emergency shelter access, early warning communication, and resource needs (see Appendix V). Survey and focus group participants work for ten different agencies and non-profit organizations that operate in Santa Clara County (see Appendix VI for list of agencies and organizations).

3.2 Findings from Interviews with People Experiencing Homelessness in Santa Clara County

Reliance on Public Transit

Transportation plays a key role in making it possible for unhoused community members to evacuate during extreme weather events and to travel to cooling and warming centers. Of the 120 interviewees, 7% reported having a car, while 86.5% mentioned biking, skateboarding, scootering or walking as their primary mode of transportation. Heavy reliance on active transportation modes is problematic during extreme weather conditions because these modes are dependent on physical mobility, and they can be hindered by bad weather. For example, bike paths and sidewalks can become flooded during a heavy storm. Additionally, active modes of transportation can increase the risk of heat-related illnesses during a heatwave because they require physical exertion, active travelers are directly exposed to the environment, and active modes of transportation increase the duration of travel compared to motorized vehicles. Of the 120 interview participants, 23% said that public transit was their primary mode of transportation. Finally, when asked what challenges they face in accessing essential resources or services, 44% of the unhoused respondents mentioned distance to essential services and transportation as key barriers. As one interviewee said: “I don’t have a car and I don’t have enough money for a bus fare.”

These findings suggest that transportation disadvantage functions as a structural vulnerability for unhoused populations. Limited mobility reduces the ability to access not only daily services, but also emergency resources during periods of environmental stress. Transportation insecurity therefore becomes closely tied to climate resilience and personal safety.

Accessing Emergency Shelters

All the interviews were conducted with unhoused community members living along urban streams, and they reported experiencing flooding events during the rainy season much more often than they experienced heatwaves during the summer months. Indeed, 62% of interviewees told us they experienced a flood at their encampment, and over a third of those experienced it at least once per year. As one interview participant recalled: “It ruins everything, you cannot sleep when it rains, and you have to stay awake so your stuff doesn’t get ruined.” Another described the trauma of living through a flooding event: “It took all my things. It rained all day and night; at 3 in the morning, I had to leave to save myself.” In contrast, only 23% of the interviewees said they had experienced a heatwave, likely because of the cooling effect that urban waterways and their riparian canopy provide during hot weather.

When asked whether they relocated to warming or cooling centers during extreme weather events, a majority of respondents said “No.” Only 34% said they went to cooling centers during heatwaves, and even fewer (28%) checked in to warming centers during storms and cold snaps. Interviewees cited a plethora of barriers preventing them from accessing inclement weather shelters including: lack of information about emergency shelter locations and rules, overcrowded or unsafe shelters, mistrust of agencies operating emergency shelters, attachment to their space, a desire for privacy, not wanting to leave their pets behind, and fear of theft. As one participant shared: “No shelters [are] gross, [they] don’t accept dogs, and people don’t follow rules.” Another interviewee who struggles with mobility told us: “[I don’t go to inclement weather shelters], because I can’t walk, my things are there, so I prefer to stay.” Other challenges that unhoused interviewees faced when trying to access emergency shelters include lack of transportation and feeling stigmatized. As one person explained: “I don’t feel comfortable going to the library [...] because people look at me badly, [they think] I am up to something.” And another one added: “We are like aliens to [the general public].”

These findings demonstrate that access to emergency weather shelters is influenced by far more than physical proximity or transportation availability alone. Social stigma, mistrust, personal safety concerns, attachment to community networks, and fear of losing belongings all shape whether unhoused individuals choose to utilize available emergency services. As a result, expanding shelter access requires not only infrastructure investment, but also trust-building and service design that reflects the lived realities of unhoused populations.

Extreme Weather Early Warnings and Weather-Related Emergency Services and Resources

When asked how they learned about an impending extreme weather event, nearly half of the interviewees said they received weather alerts on their phones, while 39% learned about them through word of mouth, and 17% found out by watching or listening to the news. Only 16% of the interview participants said they received early warnings from local service providers. Besides early warnings, respondents identified several other ways through which service providers can support unhoused community members during extreme weather events. Interviewees consistently mentioned needing more water and ice during heatwaves. Respondents also said they needed expanded access to showers and laundry facilities, electricity to charge their phones or power electric fans and heaters, and tarps and other materials to weather-proof their tents. Finally, some interview participants told us they needed assistance to ensure they had working cellular phones. Indeed, cellular phones can act as lifelines during extreme weather events, allowing unhoused community members to not only receive weather warnings and evacuation orders, but also to schedule medical appointments and other essential services. Of the 120 interviewees, only 69% reported having a cellular phone, and only a third of those who had a cell phone also had a data plan.

3.3 Findings from Surveys and Focus Groups with Service Providers in Santa Clara County

Reliance on Public Transit

Survey and focus group participants were asked to describe to what extent their clients rely on public transportation and other means of transportation to access key services. All respondents confirmed that unhoused clients depend heavily and almost exclusively on public transit to access medical appointments, social services, emergency shelters, and basic necessities. Several noted that a small percentage of their clients have personal vehicles or get rides as favors. One respondent stated that her male clients specifically used bikes and scooters, but her female clients never did. Respondents also explained that bikes are vulnerable to theft, disrepair, and flat tires, and offer no protection during extreme weather.

A significant and recurring concern was the inadequacy of transit pass programs. Helping Hands Silicon Valley purchases monthly bus passes through the Sunnyvale Community Services Emergency Access Network, but the supply is perpetually insufficient given growing demand. Respondents described the VTA Uplift Pass (a program providing quarterly transit passes for the unhoused) as routinely administered too late by case managers. This leaves clients with coverage gaps during which they must pay out of pocket or go without transit access entirely. In multiple instances, people displaced by encampment sweeps were relocated to areas far from their prior locations or service hubs and were not provided bus passes, effectively stranding them.

Overall, when public transit is unavailable or unaffordable, unhoused individuals may have to rely on bartering food stamps or found items. Survey and focus group respondents explained that women face different challenges when it comes to transportation. For example, women face safety risks when men offer rides to them. Similarly, women with cars are also pressured into providing rides to men, placing them in difficult or dangerous situations.

Use of Free VTA Rides During Weather Emergencies

The Santa Clara Valley Transportation Authority offers free fares for light rail and buses to designated Santa Clara County cooling or warming centers during extreme weather emergencies. However, awareness and uptake among the unhoused population is inconsistent. Key informants identified communication as one of the biggest issues. One participant suggested putting a big, bright sign on bus or light rail windows to easily communicate to riders that they could ride for free. Another issue preventing unhoused community members from taking advantage of this resource is the burden of moving their personal belongings. Boarding a bus with carts, large bags, or suitcases is difficult, and bus drivers often deny access to unhoused folks carrying too many belongings. Unhoused community members are generally unwilling to leave belongings unattended or abandon them for a one-night shelter stay. It was also noted that bus drivers sometimes allow unhoused riders to board buses without tickets during weather events, especially for those with pending Uplift passes. However, this is informal and inconsistent across routes and drivers.

Accessing Emergency Shelters

Key informants identified a range of overlapping barriers that prevent unhoused individuals from utilizing emergency shelters such as cooling centers and overnight warming locations. First, without a bus pass, clients in areas far from shelters have no feasible way to reach them. Survey and focus group respondents also noted that existing overnight warming locations and emergency shelters in Santa Clara County are chronically full and, as a result, many of their clients refuse to pack up all their belongings and travel to a shelter on the mere possibility that space might be available. Respondents also mentioned safety concerns, specifically for LGBTQ individuals, as well as substance abuse as serious barriers to accessing emergency shelters.

Additionally, several barriers were also mentioned that prevent unhoused individuals from using public transit even when passes and shelter space are available. Pets emerged as a particularly significant obstacle as many unhoused individuals view their pets as part of their family and won't leave them behind in order to board public transit or access emergency shelters. As one focus group respondent said: "A lot of people have pets, and if they can't bring their pet, they won't go." It was also noted that bus and light rail drivers sometimes refuse to pick up individuals displaying signs of mental illness, largely because they lack the training necessary to understand

whether they pose an actual safety risk. One participant described personally experiencing buses driving past her stop without stopping during a period when she herself was unhoused.

Extreme Weather Early Warnings

Survey and focus group respondents were asked whether they provide early warnings of extreme weather events to their clients to help them prepare for heatwaves, cold snaps, or intense rain storms. Respondents said they primarily communicate weather warnings to their clients through in-person contact and, when possible, text messages or phone calls. In-person outreach at encampments, libraries, and community distribution events remains the most reliable channel, as many clients lack functioning phones. Key informants also emphasized that unhoused individuals are far more likely to heed weather warnings from trusted outreach workers and community advocates than from city officials, media, or formal emergency communications.

While participants appeared to be effective at passing information along to clients, how they themselves receive weather and resource information in the first place is less systematic. The primary channels are the Santa Clara County emergency alert system and communications distributed through the Silicon Valley Poverty Network (SPN). However, most respondents did not describe a consistent or proactive routine for checking weather forecasts or resource availability outside of these incoming alerts. A recurring frustration was that alerts and notifications tend to arrive at the last minute, leaving little time for providers to coordinate a meaningful response. By the time a weather emergency is officially declared and communicated, there is often insufficient time to locate clients across dispersed encampments and arrange transportation to available emergency shelters. When information does arrive, it is inconsistent in quality and content. The participants described receiving conflicting or outdated flyers from multiple agencies, which creates confusion and can misdirect their clients. As one focus group respondent stated: “Sometimes the flyer has a lot of information, sometimes it doesn't. There's no consistency in what we're getting or when we're getting it.”

Transit System Improvements

Respondents identified several practical and structural improvements that transit agencies could implement to better serve unhoused riders, particularly during weather emergencies. One commonly suggested change was the introduction of a highly visible sign to clearly communicate when fares to designated emergency shelters are waived. As one focus group respondent said: “If you just put something in the window, something bright, something visual, people would know. You don't need a phone for that. You don't need to speak English for that.” Additionally, participants emphasized the need for enhanced mental health training for bus drivers to help them distinguish between individuals in distress and those posing legitimate safety risks.

Participants also called for extended transit service hours during extreme weather events, particularly on routes that serve areas near shelters. Suggestions included extending evening

service from approximately 5:30 p.m. to as late as 9:00 or 10:00 p.m. to ensure continued access during emergencies. In the context of Sunnyvale, many routes are concentrated along El Camino Real and are oriented toward commuter travel rather than access to essential services. As a result, service providers in Sunnyvale advocated for increased frequency and expanded route coverage within the city. Another recommendation focused on fare policy, with participants suggesting that agencies adopt a more consistent approach to fare flexibility during weather emergencies, allowing riders without passes to board without relying on the discretion of individual drivers.

Finally, survey and focus group respondents recommended more permissive pet policies that would allow unhoused community members to board public transit with their animals during weather emergencies. While concerns regarding pet incompatibility, behavioral issues, and resident allergies are valid, these risks can be effectively managed through operational policies than prohibiting pets altogether. Establishing written pet policies, requiring pets to remain leashed or secured in carriers where appropriate, providing staff training in animal behavior, and partnering with local animal welfare organization to provide vaccinations, veterinary care, temporary boarding, and emergency pet supplies can reduce barriers to accessing weather-responsive services for unhoused individuals with companion animals.¹⁷

Collectively, these recommendations suggest that relatively small operational and communication changes within transit systems could substantially improve emergency accessibility for unhoused populations. Many of the identified barriers are not solely infrastructure deficiencies, but rather policy and administrative challenges that shape how transit services are experienced during emergencies.

Weather-Related Emergency Services and Resources

Survey and focus group respondents were asked to identify other weather-related emergency services, resources, or supplies (besides cooling and warming centers) that could help their clients better cope with extreme weather events. Respondents all agreed that there is a consistent need for blankets, rain ponchos, hand warmers, sleeping bags, waterproof shoes, and replacement clothing, especially socks. Participants emphasized that these items are not only scarce during storms but also subject to ongoing demand, as many become saturated and unusable in wet conditions, requiring frequent replacement.

Access to laundry services emerged as another pressing concern, especially during and after multi-day storms. Respondents described how the ability to wash and dry clothing at scale is essential for maintaining health and dignity, yet current services are limited in both capacity and accessibility. Investment in large-scale, temporary laundry facilities similar to those deployed in disaster responses can significantly improve the situation and reduce the need for clothing

distribution. As one focus group respondent stated: “We need laundry. Not just one or two machines, we need something like what they bring in after a hurricane.”

Survey and focus group participants also highlighted the importance of access to phone chargers and emergency power sources. For unhoused individuals who do have mobile phones, the ability to keep them charged enables them to receive emergency alerts and communicate with outreach workers. Lastly, all respondents emphasized the need for expanded access to shelter. Participants called for more overnight, multi-day shelter options that can accommodate personal belongings, pets, and a diverse range of individuals, underscoring that existing capacity is insufficient to meet demand during extreme weather events.

3.4 Summary of Key Findings

As expected, the data collected from unhoused community members and service providers in Santa Clara County reveals a heavy reliance on public transit by the Santa Clara County unhoused population. Interviews with homeless encampment residents also pointed to a heavy reliance on active transportation strategies such as biking and walking. Alas, active travelers tend to be more vulnerable to weather extremes and these transportation options are not equally accessible to everyone.

Transportation was repeatedly mentioned as a barrier to accessing key services by both people experiencing homelessness and their service providers. The service providers who participated in the survey and focus group also identified several improvements that transit agencies can implement to better serve unhoused riders, particularly during weather emergencies, such as increasing frequency and expanding route coverage, fare flexibility during weather emergencies, and more permissive pet policies.

While transportation was identified as a key obstacle in accessing emergency shelters and other services during extreme weather events, both key informants and unhoused community residents identified a plethora of other barriers keeping people away from emergency shelters. Indeed, most unhoused individuals interviewed for this project prefer to remain outdoors during an extreme weather event, rather than to take refuge in a cooling or warming center. Figuring out how to make emergency weather shelters more appealing and welcoming to unhoused community members would improve the county’s capacity for emergency response.

The data analyzed in this chapter also reveals an opportunity for Santa Clara County service providers to play a larger role in disseminating extreme weather early warnings to the county’s unhoused residents. Unhoused individuals are much more likely to heed warnings from trusted sources. Working with service providers to develop a systemic approach to receiving extreme weather forecasts and dispersing early warnings would improve how effectively and quickly unhoused community members can prepare for emergency weather events.

Finally, unhoused study participants and key informants mentioned several other services and supplies that could help people experiencing homelessness better cope with extreme weather, including shower and laundry facilities, reliable access to electricity, and working cell phones.

Overall, the qualitative findings reinforce the argument that climate resilience for unhoused populations cannot be separated from transportation accessibility, social trust, and institutional coordination. Extreme weather vulnerability is shaped not only by environmental exposure, but also by whether emergency systems are designed around the mobility patterns, communication realities, and lived experiences of transit-reliant unhoused individuals.

4. Conclusions and Implications

This study examined accessibility to emergency weather services for unhoused populations in Santa Clara County through a combination of geospatial analysis, surveys of encampment residents, and interviews with homeless service providers in Santa Clara County. Previous research and policy discussions have often highlighted the importance of transit in reducing poverty,¹⁸ but there has been less focus on the challenges and risks faced by people who depend heavily on public transit, especially the unhoused population. In addition, limited research has looked at how extreme weather events affect people experiencing homelessness. This study has helped fill these gaps by exploring the relationship between transit access, emergency weather services, and homeless encampments. More broadly, the findings suggest that current climate resilience and emergency transportation systems are insufficiently designed around the lived realities of transit-reliant unhoused populations. The study demonstrates that emergency preparedness for vulnerable populations requires greater attention to mobility constraints, spatial accessibility, institutional coordination, and trust between unhoused communities and service providers.

The findings from geospatial analysis indicate that a significant service gap exists for the unhoused population to access facilities such as transit or warming and cooling centers. Survey and interview findings highlight barriers related to transportation, service accessibility, operational limitations, and other behavioral factors. Consistent with prior literature, this study indicates that vulnerable populations often experience uneven access to critical emergency services during periods of extreme weather. This chapter presents an integrated discussion of findings from both methodological approaches, considers their planning and policy implications, identifies study limitations, and provides directions for future research.

4.1 Synthesis of Key Findings

Heavy dependence on public transit and active transportation significantly increases climate vulnerability among unhoused populations. Findings from the interviews with unhoused residents and local service providers indicate a high dependence on public transit and active transportation modes, including walking, biking, scootering, and skateboarding. While 23% of the 120 interviewed urban stream residents identified public transit as their primary travel mode, 86.5% relied heavily on active transportation. This dependence increases vulnerability during extreme weather events.

Active transportation requires prolonged physical exertion and direct environmental exposure which increases risks during events such as heatwaves, storms, and other climate hazards. This is consistent with prior studies in the San Francisco Bay Area, which show that low-income and zero-vehicle households largely rely on walking and cycling, thereby facing greater exposure to extreme environmental conditions.¹⁹ In addition, 44% of respondents identified long distances to

essential services and inadequate transportation as major challenges. These findings also align with the existing literature where the vulnerable lack access to the services they need by being pushed into more peripheral or less accessible areas due to regulations and local opposition.²⁰ When conditions make transportation unaffordable or inaccessible, barriers to reaching essential resources can reduce an individual's ability to seek shelter, services, and protection during extreme weather events.

These findings suggest that transportation disadvantage should be understood as a form of climate vulnerability. The inability to reliably access mobility options during extreme weather events can directly affect whether unhoused individuals are able to reach safety, maintain communication, or access emergency resources.

Unhoused residents near urban streams face a higher exposure to floods than heat waves in summer. These individuals experience weather-related events differently. Overall, 62% of interviewees reported experiencing flooding, with over one-third facing such incidents at least annually. Respondents described repeated experiences of sleep disruption, property loss, and emergency evacuations caused by rising water. In contrast, only 23% of respondents reported direct exposure to heatwaves.

The lower rate of reported heat exposure highlights an important spatial understanding that locations of the unhoused near urban streams provide a cooling effect from urban waterways and their riparian canopy during hot weather, but it forces them into high-risk flood zones during the rainy season.

The geospatial analysis reveals spatial inequalities in access to emergency weather respite services for the unhoused and identifies service gap areas across San José. Although 25 SJPL locations offer emergency weather shelter during regular operative hours, only two overnight warming shelters were identified. Further, by mapping encampment locations and analyzing their proximity to the nearest transit access stops or warming or cooling centers, the study indicates that the City of San José has clear geographic patterns of inequalities for the unhoused population. It identified clusters totaling 25.20% of encampments that are inaccessible to the emergency weather services as they are located more than half a mile away via active transportation modes.

A 400 m buffer around these accessibility-deficit clusters was used to identify Service Gap Areas shown in Figure 4 of this report. These areas are critical from a policy perspective given that 86.5% of the unhoused population largely relies on walking and cycling as their primary means of travel. The study also identified multiple encampments that are located within a half-mile distance from the nearest transit stops or weather respite facilities. These homeless encampments have relatively stronger access via active transportation modes. The findings,

therefore, demonstrate that structural access to safety during extreme weather is also shaped by location and distance from the critical services.

Operational and administrative barriers in the public transit network limit unhoused individuals from using emergency shelters during extreme weather events. Even when there are multiple encampments located within half a mile of transit stops and emergency warming or cooling centers, there are challenges that continue to limit access to emergency weather facilities for the unhoused. The Santa Clara Valley Transportation Authority (VTA) provides free fares to cooling and warming centers during declared weather emergencies, but both awareness of the program and actual utilization are inconsistent. Homeless service providers also identified other shortcomings such as insufficient availability of monthly passes and delays in the distribution of VTA Universal Pass for Life Improvement from Transportation (Uplift) passes. These passes are often delivered late by case managers, leaving vulnerable populations stranded especially during periods of extreme weather.

At the same time, transit networks are less aligned with the needs of the unhoused. Fixed routes are largely oriented towards peak commuter demand rather than providing access to essential services to the unhoused. Operating hours also pose a barrier as many services are reduced at night, which can limit access to overnight shelters. Additionally, at times, stigma about mental health or homelessness leads to transit drivers skipping stops altogether. These findings also highlight that public transit infrastructure is not always designed with the needs of vulnerable populations in mind, especially during the periods of extreme weather events.

Importantly, many of these barriers are institutionally produced rather than inevitable consequences of homelessness or extreme weather. Fare policies, route structures, service hours, communication systems, and driver discretion all shape whether emergency transportation systems function equitably during climate-related emergencies.

Behavioral and social barriers further restrict unhoused individuals' access to emergency weather shelters during extreme weather events. Only 34% of respondents used cooling centers and just 28% used warming centers during extreme weather events. Unhoused individuals are often unable to board transit at all if they have pets or are carrying large bags and carts to store essential survival items. This forces them into a difficult choice between reaching weather respite shelters or leaving behind their belongings. Many unhoused people are also reluctant to travel long distances without knowing whether shelter space will be available. Because shelters are often full, the risk of being turned away and losing access to their belongings and support networks leads to many remaining in their existing camps despite extreme weather conditions.

Women face transportation challenges such as safety risks when accepting rides from men and pressure to provide rides to men, putting them in unsafe and uncomfortable situations. The study also found that the respondents avoid weather respite shelters because of stigma and mistrust.

They feel unwelcomed in public spaces such as libraries, which pushes them back into their encampments. These factors align with previous studies that highlight the existing weather respite services may not fully align with the experiences of the unhoused as they often struggle to accommodate their personal, behavioral, and social needs that are important to help them feel safe and accept help.²¹

These findings indicate that emergency response systems often fail because they are designed around assumptions that do not reflect the realities of unhoused populations. Policies that overlook the importance of pets, belongings, social networks, privacy, and safety concerns may unintentionally discourage the use of emergency shelters even when transportation access exists.

Weak communication systems and emergency alerts prevent unhoused populations from adequately preparing for extreme weather events. An effective weather response system depends on timely early warnings. Only 16% of the respondents received warnings from local service providers such as the Santa Clara County emergency alert system and the Silicon Valley Power Network (SPN). Although nearly 69% of the unhoused respondents reported owning a cell phone, only one third of those had an active data plan, making online emergency alerts inaccessible to many.

Weather bulletins and resource updates often arrive at the last minute, leaving outreach workers with little time to locate dispersed encampments. In addition, the information provided is often inconsistent or confusing. The study also shows that unhoused individuals are more likely to respond to evacuation orders and severe weather warnings when they are directly communicated by trusted outreach workers and community advocates rather than through official media channels, city notices, or any formal communications.

Community-based assets, such as faith-based organizations, remain underutilized due to a lack of formal frameworks. Geospatial analysis identifies faith-based organizations as an important but underused resource for reducing weather emergency service gaps across San José. The mapping in Figure 5 of the report shows that four such sites are already located within the major service gap areas identified.

Unlike public libraries, which are limited by fixed operating hours, faith-based organizations often can function as weather respite centers especially overnight during extreme weather events. However, this potential remains largely unused and unexplored because Santa Clara County currently lacks a formal system and processes to support these organizations in operating as emergency weather shelters. This suggests that an important local resource, such as faith-based organizations that could improve climate resilience, remains underutilized.

4.2 Policy Implications

Overall, the findings of this study suggest that improving climate resilience for unhoused populations requires a coordinated approach that integrates transportation planning, emergency management, homelessness services, and community-based outreach. Addressing only one dimension of vulnerability in isolation is unlikely to substantially improve emergency preparedness outcomes.

Emergency response policies for the unhoused should be specifically designed around their lived realities and mobility patterns to strengthen resilience against extreme weather events.

The findings from the study indicate that access to weather respite facilities is impacted by multiple barriers. These include not only the physical distance to the nearest services, but also constraints that limit mobility, operational and administrative challenges within the public transit systems, and behavioral and social stigma that discourage the use of available services. In addition, gaps in communication and unreliable weather alert systems further prevent timely awareness and access to emergency resources, limiting the ability of the unhoused to reach safety during extreme weather events.

Public transit needs should be better integrated with emergency services for the unhoused during extreme weather events. Public transit is a primary travel mode for 23% of the respondents and, therefore, effective access to transit during extreme weather events becomes even more critical. The findings indicate boarding challenges, inconsistent driver decisions, and unclear emergency fare policies due to lack of awareness often create a major barrier to accessing warming or cooling centers. Further, transit is largely oriented toward peak commuter demand, and reduced night time operating hours limit access to overnight shelters.

VTA currently implements fare-waiver policies during declared weather emergencies, allowing passengers to ride free to and from designated warming and cooling centers.²² VTA allocates 2,500 Uplift transit passes each quarter to the Santa Clara County Office of Supportive Housing, which then distributes them to homeless service providers according to prior pass usage and number of clients served.²³ However, the demand for these passes often exceeds the supply and there are often delays in reaching those who need them, creating an additional barrier. Provision of these passes should be prioritized and streamlined, considering the need for timely access during extreme weather events. Additionally, incorporating a clear framework for the unhoused to board public transit without confusion or fear of being denied will guarantee reliable access to warming and cooling centers for the unhoused population.

Santa Clara County should consider expanding and formalizing its existing mobile and decentralized emergency response strategies during extreme weather events. While the county and partner organizations already conduct outreach to encampments and operate temporary warming and cooling programs, the findings suggest that many unhoused individuals remain unwilling or unable to travel to centralized shelters. Expanding mobile outreach capacity to

distribute weather supplies, medical assistance, transportation support, charging access, and emergency information directly at encampment locations may improve emergency response effectiveness. The county could also explore additional decentralized respite spaces located closer to encampments in order to reduce transportation barriers during severe weather conditions.

Improving communication, outreach, and public awareness during extreme weather events should be prioritized in emergency preparedness for unhoused populations, as information barriers and social stigma often limit access to these services. Santa Clara County has local service providers such as the Santa Clara County emergency alert system and the Silicon Valley Power Network (SPN) to provide early warnings. The findings indicate that unhoused individuals often do not have reliable phone or internet access and are more likely to trust information received directly from the outreach worker. Therefore, working with service providers to develop an early warning “trusted network” for the unhoused population, considering limited provider resources and inconsistent phone access, should be considered while strengthening outreach systems.

Clearer public communication is also needed regarding free transit rides during inclement weather, so that the unhoused can access transportation without confusion or fear of being turned away. In addition, better communication with the general public is required to promote the use of libraries as weather service centers by the unhoused, helping reduce stigma and making them feel accepted when accessing these spaces during cold snaps or heat waves.

The policies to improve emergency services during severe weather conditions must address barriers that discourage the utilization of these services, such as fear of losing essential survival belongings. The findings suggest that concerns around safety, trust, and potential loss of personal belongings influence their decisions. Establishing secure storage programs would further support this goal by allowing unhoused individuals to safely store their belongings while accessing public transit and emergency weather shelters. This would reduce a significant barrier to the use of warming and cooling centers, as many unhoused individuals avoid relocating due to risk of losing essential survival items.

Additionally, many unhoused individuals avoid weather-support services because they do not want to abandon or be separated from their pets. Santa Clara County has some existing facilities for people experiencing homelessness with pets such as PATH’s (People Assisting the Homeless) accommodation of service and support for pets within its housing programs²⁴ and HomeFirst’s provision of pet services.²⁵ However, access to emergency services and shelter for the unhoused individuals who have pets is less clearly defined. Although concerns regarding pet compatibility, behavioral challenges, sanitation, and resident allergies are valid, they can be mitigated through carefully structured guidelines and appropriate shelter procedures. Developing comprehensive practices, including clear accommodation procedures, staff capacity-building, and partnerships

with animal welfare organizations for medical care and emergency pet resources, can help create more accessible and responsive services for the unhoused individuals with companion animals.²⁶

Santa Clara County should expand the spatial distribution and accessibility of warming and cooling centers. The findings from geospatial analysis identified significant service gap areas where unhoused residents remain far from transit access and emergency facilities. Given that there are only two such overnight warming centers identified in the City of San José, it is essential to address this service coverage gap on a priority basis. The study also highlights faith-based organizations as an important but underutilized resource for addressing these gaps, with some sites already located within or near major deficit areas in San José. They have the potential to function as weather respite spaces during severe events. The county can establish a formal framework and process to activate such community organizations as emergency shelters.

Stronger interagency coordination should be established between transit agencies, emergency management departments, homelessness service providers, and community organizations during extreme weather events. Establishing formal coordination protocols, shared communication systems, and clearly defined emergency responsibilities could improve the speed and consistency of emergency response efforts for unhoused populations.

4.3 Limitations of the Study

Although the broader research framework covers Santa Clara County, the geospatial and qualitative analyses are based on the City of San José. As such, the findings may not fully capture conditions or experiences across all areas of the county. The encampment locations used in the geospatial analysis were derived from 311 call data, which may not represent the complete distribution of the unhoused population, as some encampments may go unreported. However, the dataset includes approximately 6,806 reported encampment locations collected across San José, providing extensive spatial coverage and a valuable representation of encampment patterns within the city. Consequently, the results should be interpreted as reflecting the distribution of reported encampments rather than a complete census of all unhoused individuals. In addition, qualitative findings are based on interviews conducted at 12 encampment sites located along urban streams within San José, which limits the geographic scope of participant perspectives. Consequently, certain findings such as the fact that only 23% of interviewees reported experiencing heat waves would not represent the broader unhoused population, especially those who do not live along waterways.

Despite these limitations, the study provides an important framework that can be adapted and replicated in other jurisdictions facing overlapping challenges related to homelessness, transportation accessibility, and climate vulnerability.

4.4 Recommendations for Future Research

The geospatial analysis indicated clear and significant service gaps, highlighting the need to expand the use of existing community spaces to address these gaps. Further research can explore how community assets such as faith-based organizations can be used more effectively as weather respite facilities, provide feasibility studies, and identify institutional barriers that would help set up a formal framework for Santa Clara County. Also, future research can help identify how transportation agencies can better integrate climate adaptation planning with homelessness response strategies, including the role of fare policies, flexible transit services, emergency evacuation planning, and mobility-focused resilience programs for vulnerable populations. Encampment sites may also provide a range of important non-material benefits, including privacy, access to calming natural environments, and the ability to maintain social connections.²⁷ The clearing of encampments can disrupt these informal support networks and contribute to further instability among unhoused individuals. Future research should also examine how encampment clearings affect the ability of unhoused populations to access critical resources such as warming and cooling centers during extreme weather events.

Endnotes

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Appendix I

List of San José Public Libraries used in this study

Sr. No.	Name of the Public Library	Address	Zip Code
1	Vineland Library	1450 Blossom Hill Road	95118
2	West Valley Library	1243 San Tomas Aquino	95117
3	Willow Glen Library	1157 Minnesota Avenue	95125
4	Dr. Martin Luther King, Jr. Main Library	150 E. San Fernando Street	95112
5	Joyce Ellington Library	491 E. Empire Street	95112
6	Almaden Library	6445 Camden Avenue	95120
7	Berryessa Library	3311 Noble Avenue	95132
8	Biblioteca Latino-Americana Library	921 S. First Street	95110
9	Cambrian Library	1780 Hillsdale Avenue	95124
10	Calabazas Library	1230 S. Blaney Avenue	95129
11	Alviso Library	5050 N. First Street	95002
12	Edenvale Library	101 Branham Lane East	95111
13	East San José Carnegie Library	1102 E. Santa Clara Street	95116
14	Evergreen Library	2635 Aborn Road	95148
15	Hillview Library	1600 Hopkins Drive	95122
16	Pearl Avenue Library	4270 Pearl Avenue	95136
17	Dr. Roberto Cruz Alum Rock Library	3090 Alum Rock Avenue	95127
18	Rose Garden Library	1580 Naglee Avenue	95126
19	Santa Teresa Library	290 International Circle	95119
20	Seven Trees Library	3590 Cas Drive	95111
21	Bascom Library	1000 S. Bascom Avenue	95128
22	Tully Community Library	880 Tully Road	95121
23	Educational Park Library	1772 Educational Park Drive	95133
24	Village Square Branch Library	4001 Evergreen Village Square	95135
25	Mt. Pleasant Neighborhood Library	3411 Rocky Mountain Drive	95127

Appendix II

List of overnight warming centers provided by HomeFirst

Sr. No	Name of the location	Address	Zip code
	Roosevelt Community Center	901 E Santa Clara St, San José, CA	95116
	Evergreen Community Center	2887 McLaughlin Ave, San José, CA	95121

Appendix III

List of faith-based organizations in the City of San José

Sr. No	Organization	Address	Unit	Zip Code
1	South Bay Islamic Association	325 N 3rd St		95112
2	SVLG	2001 Gateway Place	#101E	95110
2	Pact	1100 Shasta Ave		95126
3	South Bay Islamic Association	2345 Harris Way		95131
4	Sikh Gurdwara Sahib	3636 Gurdwara Avenue		95148
5	The Church of Jesus Christ of Latter-Day Saints	1336 Cherry Ave		95125
6	The Church of Jesus Christ of Latter-Day Saints	1655 Noreen Dr		95124
7	The Church of Jesus Christ of Latter-Day Saints	66 S 7th St		95135
8	The Church of Jesus Christ of Latter-Day Saints	2295 Ringwood Ave		95131
9	The Church of Jesus Christ of Latter-Day Saints	3975 Mclaughlin Ave		95121
10	The Church of Jesus Christ of Latter-Day Saints	925 Cera Dr		95129
11	The Church of Jesus Christ of Latter-Day Saints	3060 Patt Ave		95133
12	Valley Christian Schools	100 Skyway Dr		95111
13	First Unitarian Church of San José	160 N 3rd St		95112
15	Trinity Cathedral	81 N 2nd St		95113
16	Lieu Quan Buddhist Cultural Center	1425 Clayton Rd		95127
18	Cityteam Ministries	2304 Zanker Rd		95131
19	Temple Emanu-El	1010 University Ave		95126
20	Cityteam Ministries	1297 N 13th St		95112
21	Willow Glen United Methodist Church	1420 Newport Ave		95125
22	Maranatha Christian Center	1811 S 7th St	#A	95112
23	Cityteam Ministries	1174 Old Bayshore Hwy		95112
24	Jubilee Christian Center	105 Nortech Pkwy		95134
25	Gateway City Church	5883 Eden Park Pl		95138
26	Holy Spirit Parish	1200 Redmond Ave		95120
27	First Christian Church of San José	80 S 5th St		95112
28	Cathedral Of Faith	2315 Canoas Garden Ave		95125
30	Destination Home	3180 Newberry Dr	Suite 200	95118
32	Catholic Charities of Santa Clara County	2625 Zanker Rd		95134
33	San José Buddhist Church Bestuin	640 N 5th St		95112
34	The Health Trust	1043 Garland Ave		95126
36	Our Lady Of La Vang Parish	389 E Santa Clara St		95113

Sr. No	Organization	Address	Unit	Zip Code
37	Saint Nickolas Greek Orthodox Church	1260 Davis St		95126
39	Diocese Of San José Social Ministry	1150 North First St	Suite 100	95112
40	Westgate Church	1735 Saratoga Ave		95129
41	Most Holy Trinity	2040 Nassau Dr		95122

Appendix IV

List of encampment site locations and number of interviews conducted with unhoused population per location

Sr. No	Location	Creek/River	Number of Interviews
1.	800 Tully Rd, San José	Coyote Creek	9
2.	Selma Olinder Park, San José	Coyote Creek	8
3.	Spring & Asbury St, San José	Guadalupe River	22
4.	Julian St & Coleman, San José	Guadalupe River	6
5.	Tomkins Court, Gilroy	West Branch Llagas Creek	8
6.	Piedmont St & Penitencia Creek Rd, San José	Penitencia Creek	1
7.	Mossdale Way & N. Jackson Ave, San José	Penitencia Creek	11
8.	1426 Stokes St. San José	Los Gatos Creek	11
9.	2099 Hamilton Place, San José	Los Gatos Creek	3
10.	Coleman Ave & Guadalupe River Trail, San José	Guadalupe River	13
11.	Watson Park, San José	Coyote Creek	18
12.	1015 Blossom Hill Road, San José	Guadalupe River	10

Appendix V

Interview Questionnaire

Name of interviewer: _____

Date & time: _____

County: _____

Name of river/creek: _____

Location of encampment (street name, etc.):

Individual Interview / Group Interview (circle one)

If group interview, # of participants:

1. What is your gender identity?
2. What is your racial/ethnic identity?
3. How old are you?
4. Do you have a car or other mode of transportation (bike, scooter, skateboard)?
5. Do you have family and/or a support system in the Bay Area? Probe about county?
6. Do you have any health conditions that affect your daily life/activities?
7. Do you struggle with substance abuse?
8. Are you currently employed?
9. Are you looking for employment?
10. Do you have a cell phone? If not, what other means of communication do you use?
11. Where have you been living for the last 2 years?

(Now I'm going to ask a few questions about living patterns and relationship with others in the encampment.)

12. Does this encampment have a leader or unspoken rules that residents must follow?
Keep note of leader's name, ask how to recognize
13. Do you know how long this encampment has been around?
14. How long have you lived at this encampment?
15. How/why did you choose this location?
16. What are the advantages and disadvantages of this location?
17. Do you have access to hygiene facilities such as showers and bathrooms? If not, how do you manage hygiene needs?
18. Do you have cooking facilities at the encampment? If not, how do you warm food?
19. How do you keep warm and dry during the winter (electric heater, open fire, etc.)?
20. What do people in the encampment usually do with their trash?
21. Do you have any close friends, partners, or family members that live here with you?
22. Do you have animals that live here with you?
23. Do you live elsewhere as well? If so, how often do you stay here vs there?
24. How many people live here (in this encampment) approximately?
25. Has there ever been a fire at the encampment while you lived here?
26. Do you use the river/creek for drinking?
27. Do you get fish or other food sources from the river/creek (birds, etc.)?
28. Are you concerned about the pollution of the river/creek and how it affects you/your health?

(Now I'm going to ask a few questions about some impacts of extreme weather.)

29. Have you experienced a flood at this encampment? If so, how did it affect you and what did you do to protect yourself and your stuff?
30. How often do you experience floods here?
31. Do you relocate elsewhere during a flood?
 - a. If yes, where (e.g., emergency shelter)?
 - b. If not, why not?

32. If it rains lightly for many days in a row, is it worse than if it rains hard for one day?
33. Have you experienced a landslide here? (A landslide is when a lot of rocks, dirt, and other materials suddenly slide down a hill or mountain, often caused by heavy rain, earthquakes, or loose soil, and can be very dangerous.)
34. What is it like to live near the river/creek during a heatwave/drought? Does the river/creek dry up? How does this affect you and the encampment?
35. Do you relocate elsewhere during a heatwave/drought?
- If yes, where (e.g., cooling center)?
 - If not, why not?
36. Does the city/county and service providers help you and others in the encampment during floods/droughts/heatwaves?
37. What more can service providers do to help during extreme weather events like floods or droughts?
38. How do you learn about extreme weather that is about to happen (e.g., floods, landslides, heatwaves, service providers, news service)?
39. Do people who live in the encampment help each other during floods?
(The last couple of questions will be about your access to resources and services in the area.)
40. Do you receive any government assistance, social services, or healthcare services?
41. When was the last time you saw a doctor?
42. (If applicable) Have you received any rehab support?
43. What are the top 2 challenges you face in accessing essential resources or services?
44. Would you accept shelter if it was available and offered to you? What kind?

“Thank you so much for your time. Do you know anyone else who lives in the encampment and might be interested in talking to us? If so, could you introduce them to us now or should we come back another time? If this interview caused you some discomfort, we can refer you to counseling services in the area. Would you like a referral?”

PROVIDE THEM WITH A GIFT CARD

Key Informant Interview Questionnaire List

Primary Mode of Transportation of Their Clients

- To what extent do your clients rely on public transportation to access the services they need?
- What other means of transportation do your clients use and how do these methods meet the needs of their daily living (e.g., walking, biking, vehicles, ride-sharing)?

Key Barriers Preventing People Experiencing Homelessness from Effectively Accessing the Public Transit System

- Are there any public transit stops near your facility/facilities?
- Do your clients take advantage of the free rides that VTA offers during weather emergencies? If not, why not?
- What are some barriers your clients face when using public transit (e.g., pets, cost, stops not close to destination, privacy, navigation difficulty, not feeling welcome)?
- Are there any specific changes that, if made by transit agencies, would provide better public transit services and access to your clients?

Early Warnings of Extreme Weather Events

- What methods, if any, does your staff use to monitor and prepare for extreme weather events (heatwaves, cold snaps, atmospheric rivers)?
- Do you inform your clients about upcoming extreme weather events and proper emergency response procedures? If so, how?
- What type of resources would you need to more effectively provide early warnings to your clients?

Key Barriers People Experiencing Homelessness Face When Accessing Weather-Related Emergency Services (e.g., Warming/Cooling Centers)

- Does your organization operate cooling and/or warming centers? If not, to which cooling and warming centers do you direct your clients?
- What are some barriers or challenges that your clients face when trying to access cooling or warming centers (or reasons why they might not use them at all)?
- Besides cooling and warming centers, what are some other weather-related emergency services, resources, or supplies that can help your clients cope with extreme weather events?

Appendix VI

List of agencies/organizations affiliated with survey and and focus group participants, along with their primary missions

Sr. No	Agency/Organization	Mission
1.	Helping Hands Silicon Valley	A non-profit organization that aims to empower and uplift unhoused community members and low-income families by providing comprehensive support, resources, and opportunities to help them regain their independence.
2.	Unhoused Response Group	A San José based non-profit organization providing supplies, outreach, and advocacy with a particular focus on encampment sweeps and weather-related crises.
3.	Stanford Health Care	An academic medical center serving the Santa Clara and San Mateo counties that has made addressing housing instability and homelessness a formal component of its community health strategy.
4.	Santa Clara County- Department of Family and Children's Services	A government agency that provides a wide range of services designed to protect children when a threat of abuse, neglect, exploitation, or abandonment presents a danger to a child's safety. The Department's focus is to recognize the family's abilities and to assist the family to build upon its strengths.
5.	Silicon Valley Independent Living Center	A cross-disability, intergenerational, multicultural disability justice non-profit organization that creates fully inclusive communities that value the dignity, equality, freedom, and worth of every human being.
6.	HomeFirst	One of the region's largest nonprofit providers of homeless services. The organization serves over 10,000 individuals annually across Santa Clara and Sonoma counties, including chronically unhoused adults, families with children, youth aged 18–25, veterans, and seniors.
7.	St. Jude Children's Research Hospital	The mission of St. Jude Children's Research Hospital is to advance cures and means of prevention for pediatric catastrophic diseases through research and treatment.

Sr. No	Agency/Organization	Mission
8.	LifeMoves	A non-profit organization dedicated to helping individuals and families experiencing homelessness to return to stable housing and self-sufficiency by providing interim housing and supportive services, and building collaborative partnerships. LifeMoves operates in the counties of San Mateo and Santa Clara.
9.	Martha's Kitchen	A nonprofit organization dedicated to fighting hunger by providing nutritious meals to people in need by mobilizing volunteers and rescued food, ensuring no one is left behind
10.	Maitri	A nonprofit organization based in the San Francisco Bay Area that primarily helps families and individuals from South Asia facing domestic violence, emotional abuse, cultural alienation, or family conflict.

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