CLIMATE READY
SAN MATEO COUNTY

Extreme heat events can have significant impacts on transportation infrastructure. Heat events may lead to travel disruptions due to expanded and warped railway tracks and pavement. Extreme heat events will have disproportionate impacts on older adults, people who do not live or work in climate-controlled conditions, people who rely on public or multi-modal transportation, and those with pre-existing medical conditions. See the Heat and Health Fact Sheet for more information.

Key Definitions

High Heat Day: Temperature greater than 85°F.

Extreme Heat Day: Temperature greater than 100°F.

Public Health Impacts of Extreme Heat

Nationwide, extreme heat is one of the deadliest climate related hazards. Health risks exist when temperatures rise above 85°F, and risks vary depending on who is exposed and how long the exposure lasts. Extreme heat events can trigger heat-related conditions, such as heat exhaustion, heat stroke, and respiratory problems. Higher temperatures also contribute to the build-up of harmful air pollutants. The number of extreme heat days are expected to increase due to climate change. Modeling conducted by the Stanford Future Bay Initiative provides projections at the city and census block group levels for high heat events over the near- and long-term. This factsheet provides an overview of the risks facing San Mateo County communities and transportation networks from extreme heat and outlines preliminary strategies to help local communities adapt to this threat.

Impacts on Transportation Infrastructure

High heat adversely impacts transportation infrastructure. Several factors determine whether speed restrictions will be placed on a commuter railway during an extreme heat event, including the duration of high air temperatures, the resulting temperature of the metal tracks, the exposure of the tracks to direct sun, and the compression of the tracks by running trains.

Sustained heat can cause the expansion of asphalt surfaces, resulting in potholed and rutted roads. Sustained temperatures high temperatures may cause train tracks to expand, resulting in the buckling of rail lines and the derailing of trains. Impacts to roadways and rail lines can lead to closures and travel delays in the short term and accelerate the breaking down of infrastructure in the long term. Bay Area Rapid Transit (BART) and Caltrain cannot operate at full speed during high-heat events due to these risks. Caltrain will slow train speeds from 80 miles per hour during sustained 90-100°F temperatures to prevent tracks from buckling, resulting in increased wait times and extended heat exposure for commuters.

Project Description and Modeling Overview

In 2019, the County launched the Climate Ready Initiative to better understand how climate change impacts could affect transportation systems and vulnerable communities in the county.

This factsheet is meant to be used for:

- Informing decision-makers, community, and cross-sector leaders.
- Planning for hazards; prioritizing hotspots, and identifying opportunities for action and collaboration.
- Developing climate adaptation strategies, policies, and plans (e.g., General Plans); and

Additional Resources

Stanford Future Bay Initiative:

Heat projections for this project are provided by the Stanford Future Bay Initiative. To access projected heat data, visit the Future Bay Initiative online viewer at:

https://stanfordfuturebay.shinyapps.io/sanmateo_heat/.

This resource allows users to view projected high heat days equal to or greater than six different temperature thresholds at either the city or census block group scale. Users can also toggle between results by time range, with near-term (2020-2029) averages, and long-term (2016-2045) averages.

Cal-Adapt:

For state-level heat projection models, visit https://cal-adapt.org/tools/extreme-heat/
Cal-Adapt offers downloadable datasets for extreme heat days and warm nights, with users able to select their temperature threshold of interest, as well as the user's preferred combination of climate models.

Climate Ready SMC:

Visit ClimateReadySMC.org to access climate resilience resources and learn about adaptation strategies. This resource will be continuously updated to communicate new heat-related projects and planning taking place at the County.

Average Number of Extreme Heat Days in SMC

The following table shows the average number of extreme heat days that reach or exceed 100°F, in the near-term (over the next ten years) and in the long-term (over thirty years). It is important to note that heat illness and some transportation impacts can occur at temperatures well under 100°F. Modeling suggests the average number of high heat days will increase for many jurisdictions across the county, with more extreme heat days in Atherton, North Fair Oaks, East Palo Alto, Redwood City, and Menlo Park. Where decimal days appear in the table below, this means that while there may not be an extreme heat day exceeding 100°F in one year, there will be at least one high heat day exceeding 100°F over a specific period of years (e.g., a value of 0.5 indicates the location would experience a ≥100°F day once every two years, on average).

Average Number of Extreme Heat Days ≥100°F by Jurisdiction	Near-Term (2020-2029)	Long-term (2016-2045)
Atherton	3.27	3.44
Belmont	1.13	1.26
Brisbane	0.02	0.06
Burlingame	0.13	0.25
Colma	0.01	0.02
Daly City	0	0.02
East Palo Alto	1.75	1.91
Foster City	1.16	1.28
Half Moon Bay	0.04	0.03
Hillsborough	0.27	0.4
Menlo Park	2.26	2.45
Millbrae	0.02	0.07
North Fair Oaks	3.58	3.73
Pacifica	0.01	0.02
Pescadero	0.08	0.07
Portola Valley	1.75	1.89
Redwood City	2.65	2.84
San Bruno	0.03	0.06
San Carlos	1.64	1.78
San Mateo City	0.7	0.83
South San Francisco	0.04	0.07
Woodside	2.31	2.5

Table 1

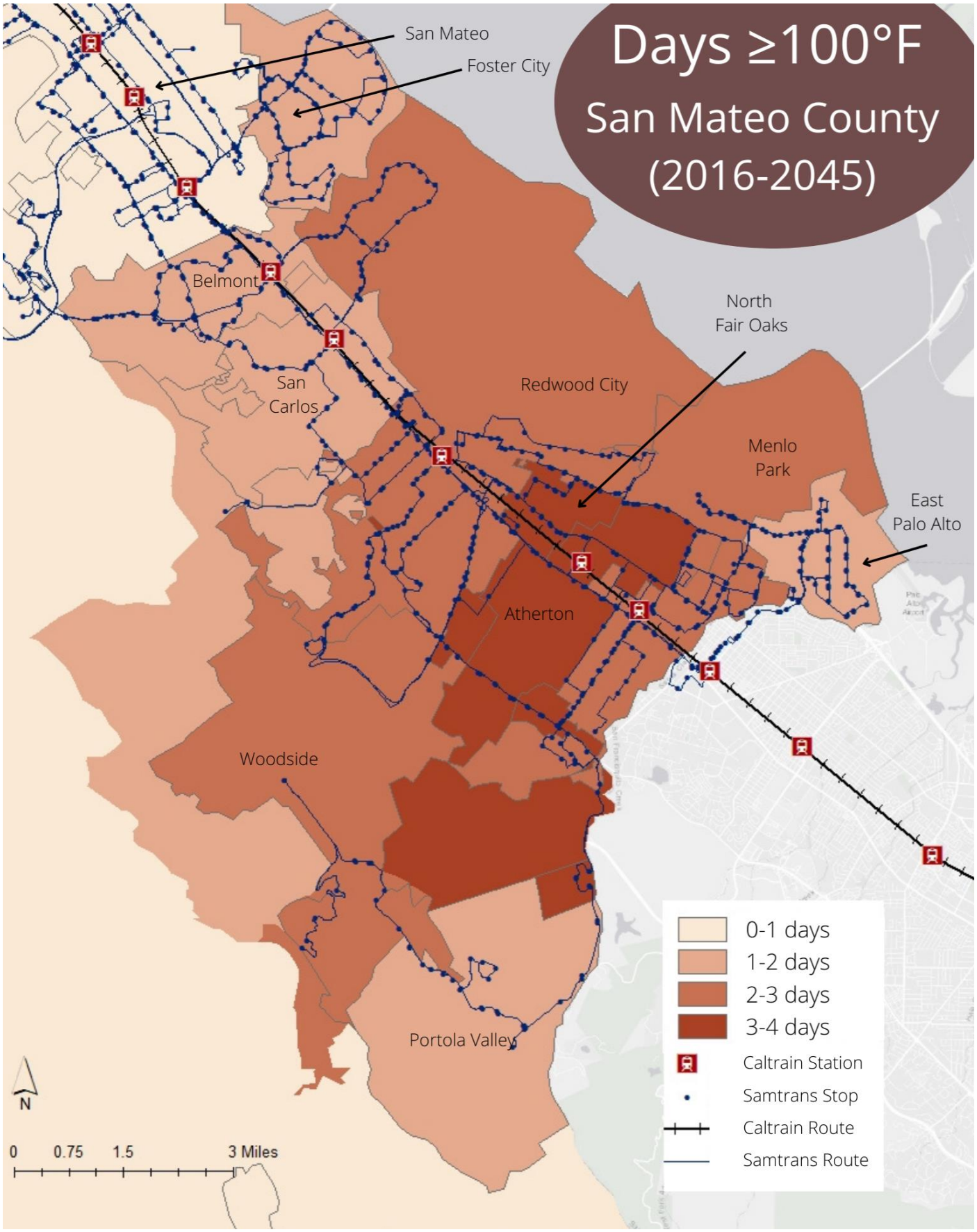

Figure 1. Projected average number of annual days to reach or exceed 100 degrees F by jurisdiction.

Average Number of Extreme Heat Days in SMC: Near-term and Long-term

Figure 1 demonstrates how stakeholders might leverage available heat data to explore how projected extreme heat events in the near-and long-term could impact areas with transit infrastructure, which are likely to be impacted with temperatures over 100°F. Transit infrastructure such as SamTrans routes and stops and Caltrain tracks and stations, with areas projected to experience high numbers of heat days in the future can be overlaid with areas expected to experience extreme heat. The Stanford Future Bay Initiative dataset expresses extreme heat in average days per year that will exceed 100°F. Notably, it only requires one high heat day to potentially do damage to transit infrastructure or cause delay in service. The Stanford viewer, linked in the *Additional Resources* section above, allows users to explore near-term heat scenarios (2020-2029) as well as long-term heat scenarios (2016-2045). Most geographic areas of San Mateo County are expected to see increased numbers of extreme heat days between the near- and long-term, as demonstrated in Table 1.

Redwood City, North Fair Oaks, Menlo Park, and **East Palo Alto** have a significant concentration of Caltrain and Samtrans transit infrastructure and are projected to experience an average of between 2 and 4 days over 100°F per year over the next thirty years. These areas may require priority adaptation measures to reduce expected higher heat impacts over the next thirty years. Notably, many of these higher heat risk areas also have higher proportions of residents that are more socially vulnerable to heat (Please see the fact sheet on *Heat and Public Health* for more on this topic). If more frequent high heat events intersect with dense transit infrastructure in under resourced neighborhoods, this is likely to create public health and safety emergencies, particularly during the first- and last-mile of a trip.

Governments and communities can act now to help reduce the risk of future emergencies. The actions and adaptation solutions described in the blue column provide a non-exhaustive list of mitigative measures related to extreme heat and transit infrastructure.

Key Actions and Adaptation Solutions

Transportation Infrastructure

Rising temperatures means that BART, Caltrain, and roads are at risk from buckling or warping, which could lead to delays and affect infrastructure safety and reliability. At the same time, the people who depend on public transit may be exposed to extreme heat, increasing health risks. Adaptation measures that reduce extreme heat risks to infrastructure and passengers include:

- Installation of additional heat sensors along rail lines could help identify sections that have been compromised due to extreme heat. This would allow transportation agencies to make informed safety decisions, improve response times, and reduce travel delays.
- Many Caltrain and SamTrans bus stations are exposed, with minimal tree cover. To reduce transit passenger heat exposure, additional shaded or enclosed transit stops could be constructed, and service frequency could be increased during high-heat events. Rail operators could frequently verify on-board air-conditioning systems are working effectively.
- Increased funding for and frequency of maintenance for transportation infrastructure, in addition to updated materials requirements, would mitigate roadway failure during periods of high heat. Proactive planning of detour routes and signage placement by transit agencies would help reduce delays on roadways and rail lines.