



Safety Element Update

Climate Change Hazards and Vulnerability Assessment

prepared by

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1 Introduction

Climate change is driven by the human contribution of certain gases like carbon dioxide and methane into the atmosphere. These gases, commonly known as greenhouse gases or GHGs, absorb and re-emit heat that has been discharged from the Earth's surface. This works to trap heat near the earth's surface, increasing the natural greenhouse effect. Greenhouse gases from human activities have been collecting in the atmosphere since the 1800's and are warming the climate more and more every year. This rise in average temperatures across the globe affects precipitation patterns, temperature, and ocean water levels. The Intergovernmental Panel on Climate Change (IPCC) has concluded that global climate change will impart adverse effects on the Earth's natural systems, resources, and populations.

St. Helena is, and will continue to be, affected by the impacts of climate change in the form of increased extreme heat days, increased average temperature, stronger storms, more severe floods, deeper droughts, and more frequent and larger wildfires. Specific impacts on the community of St. Helena will vary based on social, economic, and physical characteristics. This report assesses the projected impacts climate change will have on St. Helena.

2 Approach

Senate Bill 1035 (2018) requires St. Helena and all California cities and counties to update their safety element with new information on flood hazards, fire hazard, and climate adaptation and resilience in conjunction with the housing element or local hazard mitigation plan update cycle, which occur every 8 years and 5 years, respectively. In accordance with California Government Code Section 65302(g) (as updated by SB 379), St. Helena is required to complete a Climate Change Vulnerability Assessment in conjunction with the update to its safety element. The update to the safety element must consist of the following components:

1. A vulnerability assessment that identifies the risks climate change poses to the local jurisdiction and the geographic areas at risk from climate change.
2. Set of adaptation and resilience goals, policies, and objectives based on the information specified in the vulnerability assessment.
3. Set of feasible implementation measures designed to carry out the goals, policies, and objectives identified in the adaptation objectives.

The IPCC, a United Nations subgroup responsible with global advancement and communication of climate change understandings, has established several scenarios used to describe possible future GHG emissions and associated warming. Two of these are commonly used to compare possible futures and have been selected for this assessment.

- The Representative Concentration Pathway (RCP) 4.5 represents a “medium emissions” scenario in which emissions peak around 2040 and then decline at the end of the century. This scenario assumes global agreement and implementation of GHG reduction strategies.
- The RCP 8.5 represents a “high emissions” scenario in which emissions continue to rise throughout the 21st century (Intergovernmental Panel on Climate Change [IPCC] 2021).

This assessment relies on Cal-Adapt, an interactive online tool that is aligned with the IPCCs emissions scenarios, to present localized climate change projections and impacts. The tool was developed and is maintained by the University of California Berkeley with oversight from the California Energy Commission (CEC). These climate projections provide an understanding of possible future conditions for temperature, precipitation, and wildfire in St. Helena. California’s Fourth Climate Change Assessment San Francisco Bay Area Regional Report, released by the State in 2018, and the 2020 Napa County Multi-Jurisdictional Hazard Mitigation Plan are also used to determine projected climate impacts in St. Helena and Napa County. These projections will allow St. Helena to prioritize policies and actions that increase resilience and the ability for the community to adapt and prepare for the effects of climate change.

3 Climate Hazards

3.1 Temperature

Observations over the past century indicate that temperature has increased across the San Francisco Bay Area region, which includes Napa County. According to California's Fourth Climate Change Assessment San Francisco Bay Area Regional Report the region's average annual maximum temperature has increased by 1.7 degrees Fahrenheit from 1950-2005 (CEC 2019). As a result of these findings, warming is expected to increase in St. Helena in the coming decades as evidenced under the two GHG emission scenarios:

- Under RCP 4.5, future model-average temperature values are projected to increase by 3.3°F by mid-century (2040-2069) and 4.2°F by end of century (2070-2100) (CEC 2021). The average hottest day of the year is expected to increase by 3.9-6.4°F by the end of the century, depending on location in the San Francisco Bay Area Region (CEC 2019).
- Under RCP 8.5, future model-average temperature values are projected to increase by 4.4°F by mid-century and 7.2°F by end of century (CEC 2021). The average hottest day of the year is projected to increase by 6.3-10°F by the end of the century, depending on location in the San Francisco Bay Area Region (CEC 2019).

Additionally, the intensity and frequency of extreme heat days is expected to increase. In St. Helena an extreme heat day is when the maximum temperature exceeds 100.4°F. Historically, between 1961-1990, the city experienced four extreme heat days per year on average.

- Under RCP 4.5, by the end of the century, extreme heat days are expected to increase to 17 days per year.
- Under RCP 8.5, extreme heat days are expected to increase to 31 days per year (CEC 2021).

Changes in average maximum temperature and extreme heat days are presented in Figure 1 and Figure 2, respectively. In both figures, the purple lines show high emissions scenario (RCP 8.5), the blue line shows the medium emissions scenario (RCP 4.5), the grey lines show the current trend (observed). The shaded areas indicate the range for the emissions scenario to account for uncertainty in future projections and variability between climate models. For example, the blue shaded areas represent the range of data for the medium emissions scenario (RCP 4.5) (CEC 2021). Because these scenarios are driven by global GHG emissions and regional climate change caused by global emissions, the scenarios applicable to St Helena and the San Francisco Bay Region will likely vary based primarily on regional, national, and global actions to reduce such emissions and adapt to such climate changes.

Figure 1 Annual Average Maximum Temperature

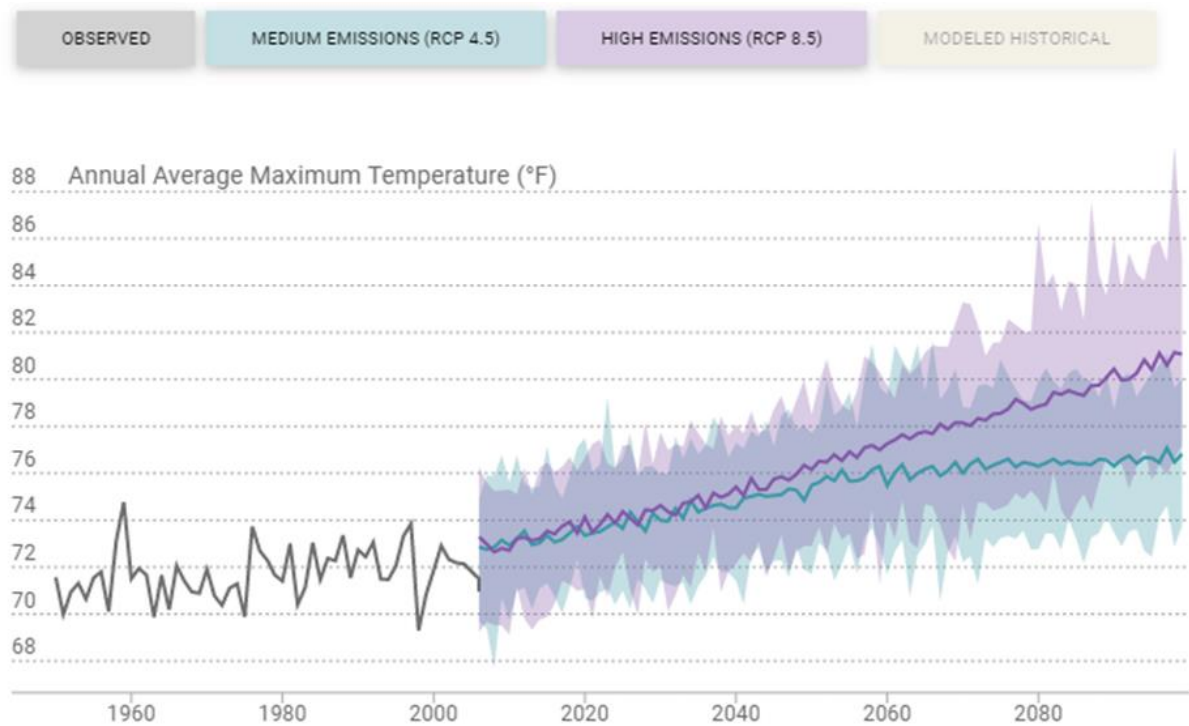
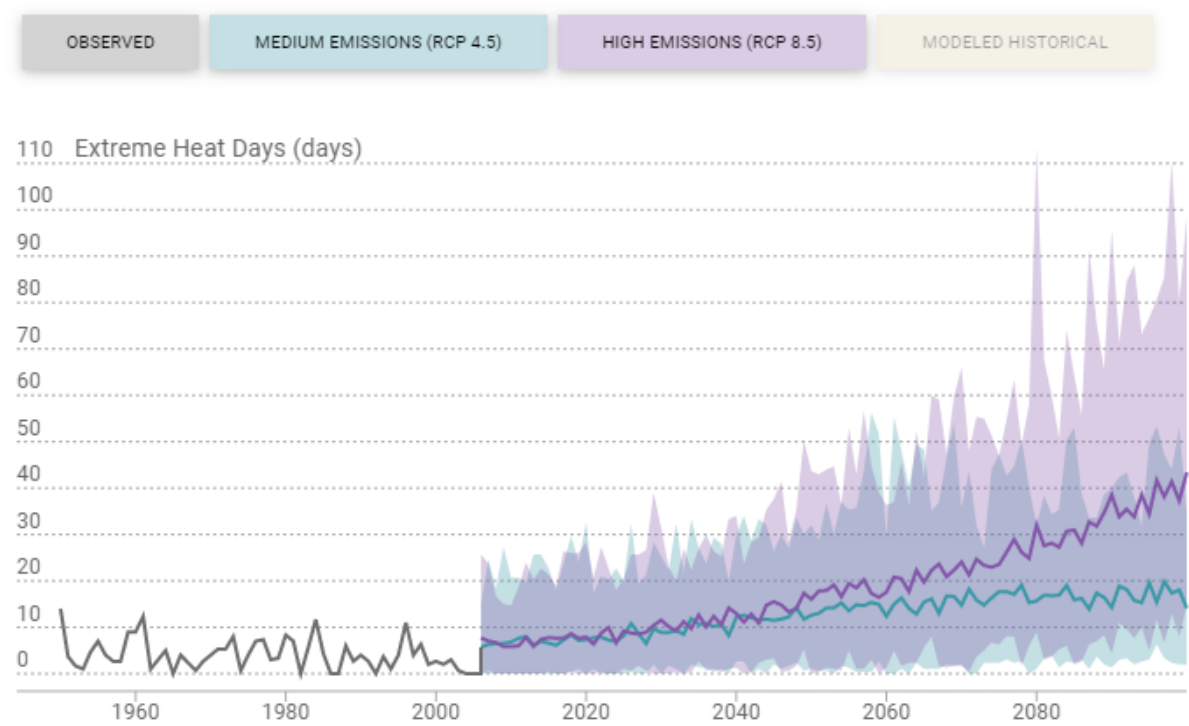


Figure 2 Extreme Heat Days

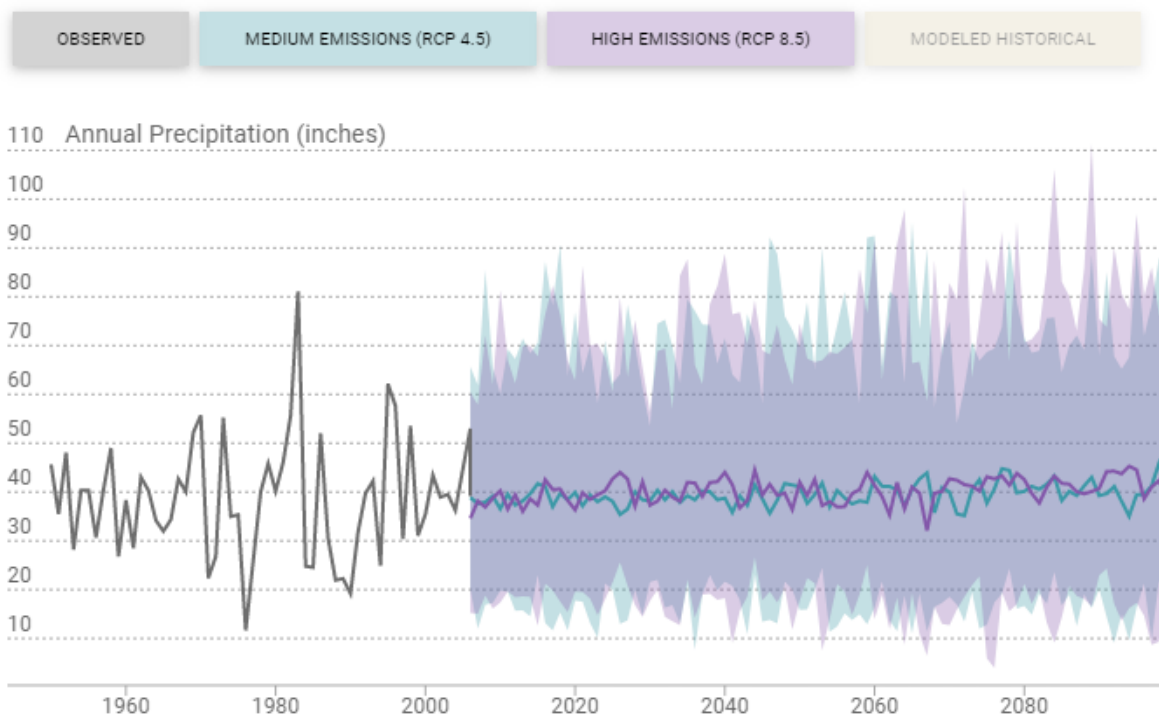


3.2 Precipitation

Historically, precipitation over the San Francisco Bay Area region is highly variable from year to year. In this region, and in most of California, large, discrete storms generate a significant portion of the region's total precipitation. Generally, model projections suggest that potential changes in average precipitation in the coming decades will be trivial in comparison to the region's historic natural variability (see Figure 3). However, both wet and dry periods are expected to become more extreme and frequent, leading to overall increased variability in the region and in California. Climate models project that by the end of the century the largest precipitation events in the Bay Area region will increase in volume (inches of rain per day) between 6% to 21% under RCP 4.5 and 37% under RCP 8.5 (CEC 2019). Increased heavy precipitation events can pose particular risk to St. Helena's low-lying residential areas near the Napa River, which are prone to flooding (Napa County Multi-jurisdictional Hazard Mitigation Plan [MJHMP] 2020).

Climate projections suggest that with overall temperatures increasing through the century, irrespective of whether average precipitation increases or decreases, there will likely be longer and more extreme droughts in the state. Changes in precipitation are shown in Figure 3. The purple line shows the high emissions scenario (RCP 8.5), the blue line shows the medium emissions scenario (RCP 4.5), the grey line shows the current trend (observed). The shaded areas indicate the range for the emissions scenario. For example, the blue shaded areas represent the range of data for the medium emissions scenario (RCP 4.5) (CEC 2021). However, such changes in precipitation in St. Helena are likely to vary primarily based on global, national, and regional activities to reduce or adapt to such changes.

Figure 3 Figure Annual Precipitation



3.3 Wildfire

Climate change is projected to exacerbate wildfire risk by creating hotter and dryer landscapes, notably, due to increased variability in precipitation. In the San Francisco Bay Area Region, wildfire risk is influenced by a multitude of compounding factors that include its mostly warm and dry Mediterranean-type climate, continuing expansion of the wildland urban interface, drought events, periodic episodes of offshore Diablo winds, historical fire suppression, human activities, topographical factors, and the type and spatial distribution of vegetation (CEC 2019).

Napa County's unique topography is marked by a narrow valley with surrounding and intermixed hilly, wooded landscapes that are at high risks to wildfires, according to the Napa County Multi-Jurisdictional Hazard Mitigation Plan. St. Helena lies in the center of Napa Valley and is surrounded on the east and west by CAL FIRE designated State Responsibility Area (SRA) and Local Responsibility Area (LRA) very high fire hazard severity zones. SRAs are lands in which CAL FIRE has financial and legal responsibility for wildfire protection and where CAL FIRE administers fire hazard classification and building standard regulations. LRAs are lands in cities, unincorporated areas with low wildfire risk, cultivated agricultural area, lands that not do not meet the criteria for SRA or Federal Responsibility Areas (FRA), and fire-prone lands that are owned by a federal agency.

Many cities in Napa Valley, including St. Helena, have areas that are within the Wildland Urban Interface (WUI). Land and developments in the WUI are susceptible to property damage as a result of wildfire events. Wildfires pose a significant threat to St. Helena's vineyards and winery properties. California's 6th largest wildfire on record, the Lake Napa Unit (LNU) Lightning Complex, scorched Napa County along with five other surrounding counties in August 2020. Residents in St. Helena and the surrounding area were evacuated as fires drew nearer and air quality levels rose to unhealthy levels. In this event, dry vegetation, decreases in precipitation, and high temperatures were contributing factors in the rate of wildfire spread and the total acreage burned.

Findings from modeling studies suggest that overall, there will be increased fire probability in the Bay Area, due to variable and decreasing precipitation and increasing temperatures. However, over time, urban and rural areas may see reduced fire risk as high-density human development increases and vegetation land are subject to human-initiated defensible space and wildfire hazard mitigation activities and projects.

Wildfire often generates secondary hazards that can greatly impact public health and community safety. For example, wildfires can trigger smoke events that can travel long distances and negatively impacts public health in the region. Wildfire smoke can cause health impacts, from mild eye burning to irritated air ways, heat stroke and even cardiac issues. Wildfire smoke disproportionately impacts children, elderly, people with chronic diseases, pregnant people, and outdoor workers (Napa County MJHMP 2020).

4 Vulnerable Populations

While all people in a community will experience climate change, some may be more affected than others. For example, older adults and young children may be more at-risk to heat illness during an extreme heat event. Sensitivity to climate hazards can be influenced by several factors, including: differences in individual health, age, and ability; institutional bias or exclusion from political and decision-making power; inequities in infrastructure and access to health care, economic opportunity, education and other services; and inequities in environmental and living conditions. Vulnerabilities within a community can inhibit that community's adaptive capacity or their ability to cope with climate change impacts. Development and implementation of programs and projects that improve the community's adaptive capacity, including addressing some of the underlying contributing factors will reduce the negative impacts that climate change could have on vulnerable populations.

Climate change may disproportionately impact certain populations in St. Helena, depending on the interaction of climate change with other variables, such as availability of social services; hazard mitigation programs; emergency preparation and assistance; and climate adaptation programs. The following vulnerable populations have been identified in St. Helena based on the Healthy Places Index mapping tool:

- **Young Children.** St. Helena has one of the highest concentrations of children in Napa County (St. Helena General Plan 2019). Children are particularly at risk to climate hazards because they are dependent on others for care, are vulnerable to injury or sickness, and may not understand or are not capable of taking the measures needed to protect against or evacuate from climate hazards.
- **Older Adults.** Silverado Orchards Retirement Community and Vineyard Valley Mobile Home Park are two particularly vulnerable facilities in the city, as they are home to a substantial population of elderly individuals.
- **Outdoor Workers.** Extreme heat and smoke events pose disproportionate health risks to the city's outdoor workers who are employed in viticulture, agriculture, construction, and other outdoor occupations
- **Individuals that are Linguistically Isolated.** Individuals that are linguistically isolated have no to limited English proficiency. Linguistically isolated households may not understand important safety, public health, or evacuation orders and communications when conducted exclusively in English during a hazard event, which may compromise the ability of residents to remain safe and healthy.
- **Visitors.** St. Helena is surrounded by an expanse of vineyards and agricultural lands. The city is a popular tourist destination in Napa County. Visitors are at risk during climate hazard events as they may not receive warning and may not have knowledge regarding access to emergency services.

All residents of St. Helena rely on various infrastructure and services such as water systems, electricity, natural gas, and roads. These systems and assets are vulnerable to the impacts of climate change, which puts the wellbeing of residents at risk. Those with pre-existing and chronic health conditions that rely on services and systems, are particularly vulnerable in situations where hazard events impact access to electricity, food, water supplies, healthcare, sanitary resources,

transportation, and communication platforms. To help reduce negative impacts on vulnerable populations and increase adaptive capacity, it is vital that strategies and policies are implemented to ensure continuity of systems and services in the event of climate hazard events.

5 Conclusion

The Climate Change Vulnerability Assessment provides a brief summary of the climate conditions projected to occur in St. Helena and the populations most vulnerable to climate change impacts. Although climate change is one of the more pressing challenges that St. Helena faces, it presents an opportunity to address the overarching City of St. Helena General Plan goal to address both the needs of current and future generations, provided that the General Plan is consistent with and recognizes global, national, and regional efforts that primarily address and adapt to the causes of climate change, including GHG emissions. The assessment provides a foundation for the City to begin to understand vulnerabilities to climate change in the community and to take actions that serve to increase community resilience.

The update to the Public Health, Safety, and Noise Element will include goals, policies and programs that will better prepare the community for the effects of climate change, based on the information provided in this Climate Change Vulnerability Assessment and best practice. The City's General Plan (2019) and Napa County's Multi-Jurisdictional Hazard Mitigation Plan (2020) include policies and mitigation actions that address climate change related to drought, wildfire, and flood risk. As discussed in this assessment, additional consideration may be needed to prepare for extreme heat and increased temperatures as well as the unique needs of vulnerable populations. The updated Public Health, Safety, and Noise Element will include new policies to increase resilience for vulnerable populations. There may also be opportunities to augment the existing policies relating to drought, wildfire, and flood risk to better increase resilience.

6 References

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