



City of Camarillo

Safety Element Update

Climate Change Vulnerability Assessment

March 2024



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Table of Contents

1	Introduction	1
1.1	Background on Climate Change.....	1
1.2	Camarillo Snapshot.....	1
1.3	Report Overview.....	2
1.4	Lexicon.....	3
1.5	Vulnerability Assessment Methodology	4
2	Exposure to Climate Hazards	9
2.1	Climate Drivers	9
2.2	Hazards.....	10
3	Sensitivity.....	20
3.1	Vulnerable Populations	20
3.2	Natural and Managed Resources.....	22
3.3	Buildings and Facilities.....	22
3.4	Critical Infrastructure and Services.....	22
4	Adaptive Capacity	23
4.1	Extreme Heat and Warm Nights.....	23
4.2	Riverine and Stormwater Flooding, and Droughts.....	24
4.3	Wildfires, Landslides, and Air Quality	25
4.4	Multiple Climate Hazards	26
5	Vulnerability Analysis	27
5.1	Vulnerable Populations	27
5.2	Natural and Managed Resources.....	33
5.3	Buildings and Facilities.....	36

5.4	Critical Infrastructure and Services.....	38
6	Conclusion.....	41
7	References	44

Tables

Table 1	Impact and Adaptive Capacity Scoring Rubric	8
Table 2	Vulnerability Score Matrix	8
Table 3	Vulnerable Populations in Camarillo	21
Table 4	Program, Plans, and Policies to Manage Impacts of Increased Temperature.....	23
Table 5	Programs, Plans, and Policies to Manage Precipitation Impacts	24
Table 6	Programs, Plans, and Policies to Manage Wildfire Impacts	25
Table 7	Programs, Plans, and Policies to Manage Multiple Climate Hazard Impacts	26

Figures

Figure 1	California Adaptation Planning Phases to Assessing Vulnerability.....	4
Figure 2	Vulnerability Assessment Flow Diagram.....	5
Figure 3	Wildfire Hazard Severity Zones in Camarillo.....	14
Figure 4	Landslide Susceptibility in Camarillo	16
Figure 5	100 and 500 Year Floodplain in Camarillo	18

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1 Introduction

1.1 Background on Climate Change

This report evaluates how climate change may impact vulnerable populations, natural and managed resources, buildings and facilities, and infrastructure and critical services in Camarillo. This report is consistent with Government Code § 65302 (as amended by Senate Bill (SB) 379) which requires cities, counties, and unincorporated areas across California to prepare a Climate Change Vulnerability Assessment to inform updates to the Safety Element of the General Plan. Understanding Camarillo's vulnerabilities to climate change provides a foundation to develop required climate adaptation goals, policies, and implementation programs for the Safety Element.

1.2 Camarillo Snapshot

Camarillo is located along Highway 101 in western Ventura County and encompasses approximately 20 square miles at the base of the Conejo Grade within the Oxnard Plain. The city is located approximately 8 miles from the coastline and Pt. Mugu entrance to the Naval Base Ventura County. Camarillo is home to California State University Channel Islands, which was opened in 2002. The economy of Camarillo is made up of a mix of educational and health services, and agriculture. The largest employer in Camarillo is the Pleasant Valley School District. The City's local economy is comprised of many small to medium-sized businesses with 500 or less employees. Since being incorporated as a city in 1952 there has been a steady rate of growth with the current population of Camarillo at approximately 115,000 full-time residents (Ventura County LHMP 2022).

Causes of Climate Change

Climate change is caused by the addition of excess greenhouse gases (GHGs) to the atmosphere, which traps heat near the earth's surface raising global average temperatures creating the greenhouse effect. This increase in average temperatures across the globe affects precipitation patterns, the severity of wildfires, the prevalence of extreme heat events, water supply, and ocean temperatures and chemistry (NASA 2024). According to the Intergovernmental Panel on Climate Change (IPCC), GHGs are now higher than they have been in the past 400,000 years, raising carbon dioxide levels from 280 parts per million to 410 parts per million in the last 150 years (IPCC 2021). The dramatic increase in GHGs is attributed to human activities beginning with the industrial revolution in the 1800s, which represented a shift from an agrarian and handicraft-based economy to one dominated by industry and machine manufacturing (NASA 2024).

1.3 Report Overview

1. **Introduction** provides a lexicon of terms used throughout the report and describes the methodology and key data sources used to prepare the Climate Change Vulnerability Assessment.
2. **Climate Hazards** outlines climate drivers, relevant climate hazards, historical hazards events, how hazards are expected to change, and includes figures mapping climate hazards spatially across Camarillo.
3. **Sensitivity** identifies populations and assets most at risk to climate change.
4. **Adaptive Capacity** summarizes plans, policies, and programs that help Camarillo cope with climate hazard events.
5. **Vulnerability Analysis** describes potential impacts for each hazard based on sensitive community, natural, and built assets, with consideration given to their adaptive capacity. The chapter includes vulnerability scores of low, medium, or high for each population group and asset. See Vulnerability Scoring Methodology section below for more detail.
6. **Conclusion** presents the key findings of this report.

1.4 Lexicon

Several words and phrases are used throughout the plan to illustrate climate vulnerabilities within Camarillo.

- **Adaptation.** The process of adjustment to actual or expected climate and its effects, either to minimize harm or exploit beneficial opportunities. In natural systems, human intervention may facilitate adjustment to expected climate (IPCC, 2012).
- **Adaptive Capacity.** Camarillo’s ability to cope with and adjust to the impacts of climate change (Cal OES 2020).
- **Asset.** A resource, structure, facility, or service that is relied on by a community.
- **Cascading Impact.** Climate hazard caused impacts that compromise infrastructure or disrupt critical services (i.e., power supply or water conveyance) broadening the scope of impact past a singular subject to reliant subsystems and populations (Collins et al. 2019).
- **Climate Driver.** A change in the climate which acts as the main source of change for subsequent climate hazards. Climate drivers relevant to the county and discussed in this report are temperature and precipitation.
- **Climate Hazard.** A dangerous or potentially dangerous condition created by the effects of the local climate (Cal OES 2020). Climate hazards of concern for Camarillo are extreme heat and warm nights, drought, wildfire, landslides, riverine and stormwater flooding, and air quality.
- **Compounding Risk.** When two or more extreme events or average events occur simultaneously and increase the scope of impact or severity of the event; an additional risk brought about by increased frequency of events from climate change (Seneviratne et al. 2012).
- **Impact.** Effects on natural and human systems including effects on lives, livelihoods, health, ecosystems, economies, societies, cultures, services, and infrastructure due to the interaction of climate hazards and the vulnerabilities of the system or asset effected (IPCC 2012).
- **Mitigation.** An act or sustained actions to reduce, eliminate, or avoid negative impacts or effects (Cal OES 2020).
- **Resilience.** The capacity of an entity (an individual a community, an organization, or a natural system) to prepare for disruptions, to recover from shocks and stresses, and to adapt and grow from a disruptive experience (Cal OES 2020)
- **Sensitivities.** The degree to which a species, natural system, community, asset, or other associated system would be affected by changing climate conditions (Cal OES 2020).
- **Vulnerable Populations.** Vulnerable populations experience heightened risk and increase sensitivity to climate change and have less capacity and fewer resources to cope with, adapt to, or recover from climate impacts (Cal OES 2020).
- **Vulnerability.** The propensity or predisposition to be adversely affected (IPCC 2012).

1.5 Vulnerability Assessment Methodology

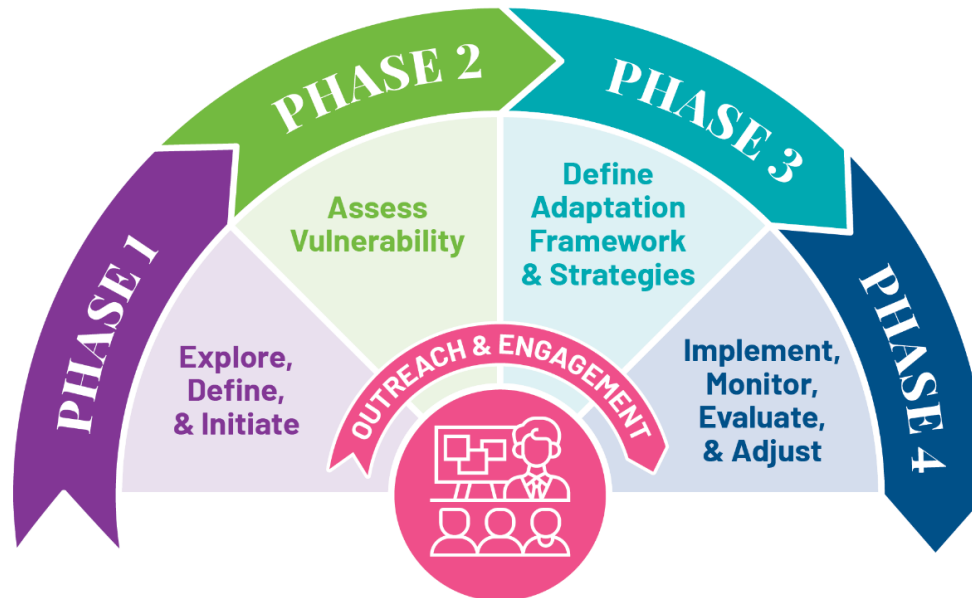
The following section details state guidance, methods, and sources used in the production of this report.

California Adaptation Planning Guide Phases

The City of Camarillo Climate Change Vulnerability Assessment follows the vulnerability assessment process recommended by the California Governor’s Office of Emergency Services (Cal OES), as documented in the 2020 California Adaptation Planning Guide (Cal APG). The adaptation planning process outlined by the Cal APG consists of four phases, illustrated in Figure 1, with Phase 2 detailing

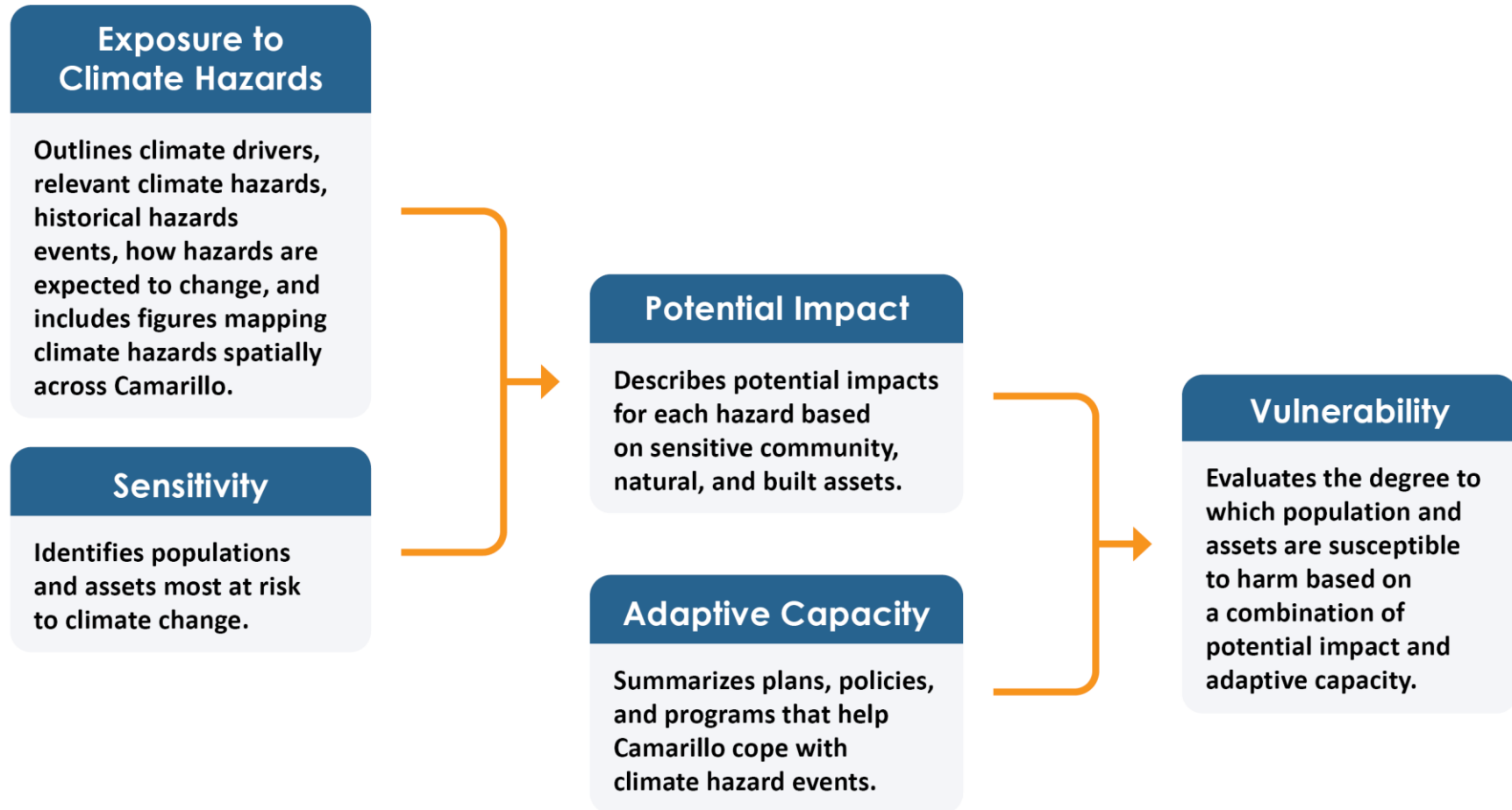
the vulnerability assessment process (Cal OES, 2020). The City of Camarillo Climate Change Vulnerability Assessment is prepared consistent with Phase 2 of the Cal APG and is composed of the following parts found in Figure 2.

Figure 1 California Adaptation Planning Phases to Assessing Vulnerability



Source: 2020 California Adaptation Planning Guide

Figure 2 Vulnerability Assessment Flow Diagram



Key Data Sources

The following data sources and tools, many of which are recommended within the Cal APG, were used in preparation of this report.

- **Cal-Adapt** is an online tool that presents historic and modeled projections based on 10 different global climate models. The tool was developed and is maintained by the University of California with oversight from the California Energy Commission (CEC). This tool is used to present projection data related to minimum and maximum temperature, precipitation, extreme heat, warm nights, drought, and wildfire.
- **California's Fourth Climate Change Assessment** was developed by the CEC and other State of California coordinating agencies to present up-to-date climate science, projections and potential impacts associated with climate change. The CEC and coordinating agencies developed nine regional reports to provide regional-scale climate information to support local planning and action. The Los Angeles Region Summary Report (2018) presents an overview of climate science, regional projections, specific strategies to adapt to climate impacts, and key research gaps needed to spur additional progress on safeguarding the Los Angeles Region (including Camarillo) from climate change. The Los Angeles Region Summary Report was used to understand regional changes that may affect Camarillo both directly and indirectly.
- **Ventura County Multi-Jurisdictional Hazard Mitigation Plan** presents information on existing processes and plans in place that address the County and Camarillo's ability to prepare for climate change impacts and informed the adaptive capacity discussion of this report. The Multi-Jurisdictional Hazard Mitigation Plan (2022) was also used to identify recent historical events.
- **The California Healthy Places Index (HPI)** is an online mapping tool that reports on community conditions that are known to predict health outcomes and life expectancy. The tool was prepared by the Public Health Alliance of Southern California, a collaborative of local health departments in Southern California. HPI displays 25 community characteristics at various legislative boundaries, including census tracts and city and county boundaries. The community characteristics relate to the following identified Policy Action Areas: economic, education, housing, health care access, neighborhood, clean environment, transportation, and social factors. HPI applies a relative percentile score across all census tracts in California using statistical modeling techniques based on the relationship of the Policy Action Areas to life expectancy at birth. Low percentile scores reflect unhealthy conditions. HPI was used to prepare the social sensitivity index score as described in more detail below. HPI is a useful in providing both big picture and localized insights into community health HPI was used to prepare the social sensitivity index score as described in more detail below. HPI is useful in providing both big picture and localized insights into community health. HPI was updated in the Spring of 2022 to include data averages from the U.S. Census 2015-2019 ACS.
- **U.S. Census, 2015-2019 American Community Survey (ACS)** presents demographic data by census tract and was used to supplement the HPI percentile score. U.S. Census data was used to identify the percentage of the Camarillo population that corresponds to each vulnerable group.
- **CalEnviroScreen4.0** uses a variety of statewide indicators to characterize pollution burden (the average of exposures and environmental effects) and population characteristics (the

average of sensitive populations and socioeconomic factors). The model scores each of the indicators using percentiles and combines the scores to determine a CalEnviroScreen score for a given census tract relative to others in the state. Designated

disadvantaged communities are those communities that scored within the highest 25 percent of census tracts across California (CalEnviroScreen percentile scores of 75 or higher), in addition to other parameters relating to income status.

Data Limitations

The limitations of this report and analysis stem from gaps in data availability and completeness of data methods. Census data can miss portions of the population (e.g., unhoused populations) and general demographic information may not accurately capture populations vulnerable to climate change (Cantwell 2021). Federal Emergency Management Agency (FEMA) 100-year and 500-year flood plains do not account for climate change projections, flood zones are instead based on historical information. The California Department of Forestry and Fire Protection (CAL FIRE) Very High Fire Hazard Severity Zones (VHFHSZ) are based on vegetation, fire history, and terrain but also has similar limitations, projections of future fire hazard zones are not included (OSFM 2024). Extrapolating landslides and air quality hazard exposure data in the context of climate change is difficult for many reasons including compounding effects and therefore expected, exposures are likely to be underestimated.

The data presented in Cal-Adapt tools are projections, or estimates, of the future. The limitation in these projections is that the long-term behavior of the atmosphere is expressed in averages – for example, average annual temperature, average monthly rainfall, or average water equivalent of mountain snowpack at a given time of year. The averages discussed often downplay the extremes by which daily weather events occur and when presented as an average, only show moderate changes within the climate. For example, using averages can result in an omission of the frequency of extremes. For example, in the case of extreme weather events, atmospheric rivers may increase, while low-moderate intensity weather events decrease through the end of the century. In instances of modeled precipitation projections, an average maintains a quantification similar to historic levels which does not account for anticipated fluctuations in extremes (CEC 2024).

Vulnerable Communities Identification

Vulnerable population indicators are included in the report according to the following methodology, which determines the significance of the population in the city of Camarillo. The list of vulnerable populations considered in this assessment originates from the Southern California Climate Adaptation Planning Guide (SCAG APG). Each population statistic from the SCAG APG list is identified for the city from the U.S. Census American Community Survey (ACS). If the data is not available for the population, the Healthy Places Index (HPI) is used or the CalEnviroScreen resource is considered (more information can be found in the Key Data Sources section). A vulnerable population statistic is considered significant if the U.S. Census statistic is larger than the state average for that same population group. If the statistic originates from the HPI, it is considered significant between the 0-25 percentile for unhealthy conditions (in comparison to other cities in the state). If the statistic is acquired from CalEnviroScreen, it is considered significant above the 75th percentile.

Vulnerability Scoring Methodology

Vulnerability scoring is a valuable step in the climate vulnerability assessment process because it identifies which assets and populations face the highest threat to climate hazards. This can aid in the prioritization of adaptation actions. The vulnerability score is a combination of the impact and the adaptive capacity score. The impact and adaptive capacity scores are developed using a qualitative methodology outlined in the Cal APG, as seen in Table 1. Impact and adaptive capacity scores are identified for every asset and population for each climate hazard. The vulnerability score is calculated by combining the two scores as demonstrated in Table 2. The range of vulnerability scores spans between 1 through 5 with 4-5 indicating the highest vulnerability.

Table 1 Impact and Adaptive Capacity Scoring Rubric

Score	Impact	Adaptive Capacity
Low	Impact is unlikely based on projected exposure; would result in minor consequences to public health, safety, and/or other metrics of concern.	The population or asset lacks capacity to manage changes; major changes would be required.
Medium	Impact is somewhat likely based on projected exposure; would result in some consequences to public health, safety, and/or other metrics of concern.	The population or asset has some capacity to manage climate impact; some changes would be required.
High	Impact is highly likely based on projected exposure; consequences to public health, safety, and/or other metrics of concern.	The population or asset has high capacity to manage climate impact; minimal to no changes are required.

Source: Cal OES 2020

Table 2 Vulnerability Score Matrix

Potential Impacts	High	3	4	5
	Medium	2	3	4
	Low	1	2	3
		High	Medium	Low
		Adaptive Capacity		

Source: Cal OES 2020

2 Exposure to Climate Hazards

Climate change is a global phenomenon that can impact local health, natural resources, infrastructure, emergency response, and many other aspects of society. Projected changes to the climate are dependent on location. The Cal-Adapt tool provides climate data from global scale models that have been localized (downscaled) to 3.7 mile by 3.7-mile grids (CEC 2024). The data in Cal-Adapt is combined with information from the California Fourth Climate Change Assessment to model future changes in specific types of hazards within this assessment. Projections throughout this section are outlined by two separate Representative Concentration Pathways¹ (RCP) (CEC 2024).

- RCP 4.5 is a medium emissions scenario where global emissions peak by the year 2040.
- RCP 8.5 is a high emissions scenario in which global emissions continue to rise through the end of the 21st century.

Projections are forecasted to mid-century (2035-2064) and end-century (2070-2099) as 30-year averages to be compared to a modeled historical baseline (1961-1990) (CEC 2024).

This section presents information on temperature and precipitation, which are characterized as climate drivers. Subsequently, this section provides information on projected changes to natural hazards, including extreme heat, drought, wildfire, landslides, air quality, and riverine and stormwater flooding, which result from changes to climate drivers.

¹ Representative Concentration Pathways¹ (RCP) is a greenhouse gas concentration (not emissions) trajectory adopted by the Intergovernmental Panel on Climate Change (IPCC).

2.1 Climate Drivers

In Camarillo, the climate drivers of concern include temperature and precipitation. All projections are pulled from the Cal-Adapt Local Climate Change Snapshot tool and supplemented with the Los Angeles regional information found in the California Fourth Climate Change Assessment Los Angeles Regional Report (CEC 2024, Hall et al. 2018).

Temperature

Camarillo's historical (1961-1990) average maximum temperature is 73.3°F and average minimum temperature is 48.6°F. Camarillo mid-century projection for average maximum temperatures shows a 3.4°F (RCP 4.5) to 4.2°F (RCP 8.5) increase. The mid-century projection for average minimum temperatures shows a 3.1°F (RCP 4.5) to 3.9°F (RCP 8.5) increase in maximum temperatures. The end of the century projections for average maximum temperatures are expected to increase in Camarillo by approximately 4.4°F (RCP 4.5) to 7.0°F (RCP 8.5). The end of the century projections for average minimum temperatures are expected to increase by approximately 4.1°F (RCP 4.5) to 6.8°F (RCP 8.5) (CEC 2024). Temperature increases affects extreme heat and warm nights, drought, wildfire, and air quality (Hall et al. 2018).

Precipitation

Precipitation across the Ventura County region is highly variable, with some areas averaging 8 inches annually and others up to 38 inches (County of Ventura 2022). The observed 30-year average annual precipitation is 14.7 inches. Annual precipitation projections for Camarillo under RCP 8.5 demonstrate a 0.2-inch decrease by mid-century and 0.1-inch increase by end-century in annual precipitation totals (CEC 2024). Despite small changes in average precipitation, dry and wet extremes are both expected to increase in the future. By the late-21st century, the wettest day of the year is expected to increase across most of the Los Angeles region, with some locations experiencing 25-30 percent increases under RCP8.5 (Hall et al. 2018). There will be more dry periods punctuated by increased precipitation intensities of the largest storms or wet periods, producing little net change in precipitation totals but more extreme conditions (Hall et al. 2018). Precipitation changes are expected to affect wildfire, drought, landslides, riverine and stormwater flooding, and air quality.

2.2 Hazards

This section outlines projected changes for the following climate hazards:



Extreme Heat and Warm Nights



Drought



Wildfire



Landslides




Riverine and Stormwater Flooding



Air Quality

Extreme Heat and Warm Nights


Extreme heat events are defined as days in which the daily maximum temperature exceeds the 98th percentile value of the historical average. For Camarillo, the threshold temperature is 92.1°F (CEC, 2022). Exposure to extreme heat can cause direct heat-related illness (heat cramps, heat exhaustion, and heat stroke) and death, and can also exacerbate certain existing medical conditions (Hall et al. 2018). Increased frequency of extreme heat days can result in increased public health risks, particularly to vulnerable populations like older adults, young children, and individuals with underlying chronic diseases, through heat-related illnesses and increased vector-borne illnesses. Warm nights can further exacerbate the risk of heat illness because they affect the body’s ability to cool after a day of heightened temperatures. In Camarillo, a warm night is when the daily minimum temperature is above the threshold temperature of 63.4°F. Camarillo has a historic average of 4 extreme heat days annually, which is projected to increase to 11 days by mid-century and 24 days by the end of the century under RCP 8.5. Camarillo has historically experienced 6 warm nights a year and is projected to experience a mid-century total of 28 nights (RCP 8.5) and an end-century total of 30 (RCP 4.5) to 63 nights (RCP 8.5) (CEC 2024). Extreme heat can also damage roadways, overload electrical grid systems, and result in vegetation die-off or stress. Future climate changes, especially increases in extreme heat, are expected to disproportionately burden low-income residents and communities of color across the region (Hall et al. 2018).




Extreme Heat & Warm Nights

Camarillo is expected to experience an increase in the number of extreme heat days, from 4 days annually to 11 days by mid-century and 24 days by end-century.


IMPACTS




CRACKED PAVEMENTS



GRID OVERLOAD



VEGETATIVE STRESS



HEAT RELATED ILLNESS

WARM NIGHTS

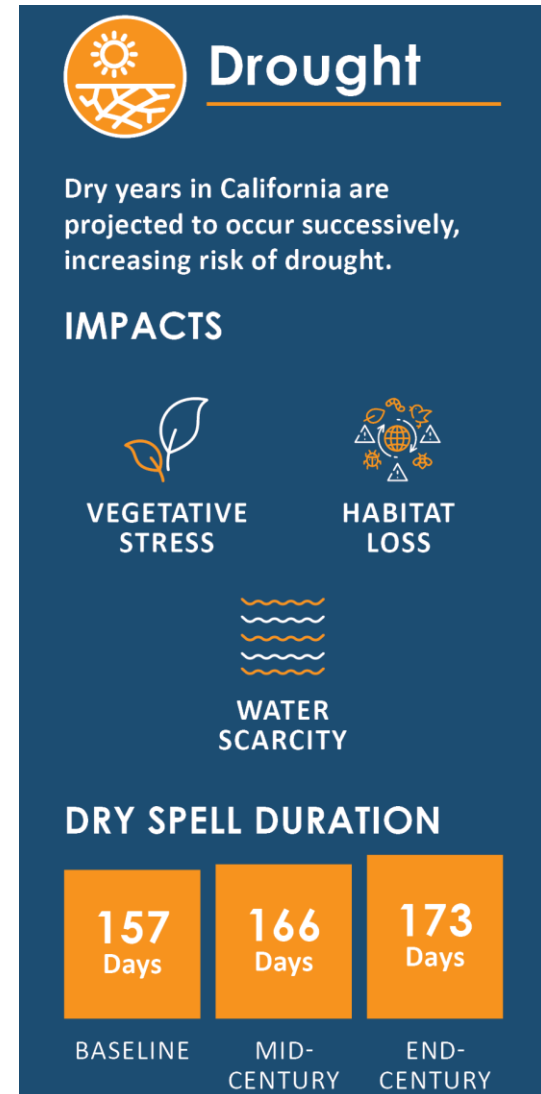
Camarillo is expected to experience an increase in the number of warm nights, from 6 nights annually to 28 by mid-century and 63 by end-century.

Drought

Climate change will increase the likelihood that low-precipitation years will coincide with above-average temperature years. Warming temperatures increase seasonal dryness and the likelihood of drought due to decreased supply of moisture and increased atmospheric demand for moisture as evaporation from bare soils and evapotranspiration from plants increases. The increased moisture loss from soils and vegetation amplifies dryness during periods without precipitation. The Southern California region is prone to periods of extreme drought and has experienced severe dry conditions between 2011-2015 (Hall et al. 2018). Extremely dry years are projected to increase over Southern California, potentially a doubling or more in frequency by the late-21st century (Hall et al. 2018).

The duration of dry spells, or the number of consecutive days with precipitation totals less than 1mm, is projected to vary based on emissions scenario. Like patterns in precipitation some of the annual variability is obscured within 30-year averages. Despite this, the clear trend is for maximum lengths of dry spells to increase through the end of century (CEC 2024). The modeled historical average maximum length of a dry spell for Camarillo is 157 days. The mid-century projections show an increase in the length of the average maximum dry spell between 8 days (RCP 4.5) and 9 days (RCP 8.5). Subsequently, the end of century projections shows an increase between 7 days (RCP 4.5) and 16 days (RCP 8.5).

Drought can affect vulnerable populations as well as economic productivity throughout Camarillo. Vulnerabilities for natural and managed resources can include stressed vegetation and habitat depletion while populations may be more vulnerable to heat stress and dehydration (Hall et al. 2018).



Wildfire

In Southern California, the occurrences of wildfires and the average burned area are projected to increase by the mid-21st century under RCP 8.5 (Hall et. al 2018). This trend is projected to occur in Camarillo through mid and end-century projections (CEC 2024). Wildfire events are a product of temperature increases compounded with precipitation declines creating wildfire prone conditions. Ventura County’s wildfires are influenced by Santa Ana Winds, which are responsible for the region’s most destructive wildfires. Nearly 80% of wildfires occur during the summer and fall, with a quarter of annual wildfires occurring during Santa Ana events (Hall et al. 2018). Areas in Camarillo that are at significant risk to wildfire are located along the northern, eastern, and northeastern portions of the city. These areas are categorized as CAL FIRE Very High Fire Hazard Severity Zones (VHFHSZ), shown in Figure 3. There are several critical facilities within the VHFHSZ including transportation infrastructure assets along Highway 101. The St. John’s Hospital in the northern portion of the city is adjacent to VHFHSZ. Several roads and residential areas are also located within the city’s fire zones including State Highway 101 in the southeastern portion of the city. Wildfires can create risk of injury, death, or financial hardship if personal property is damaged as well as physical damage to all other assets creating cascading risks for vulnerable populations when infrastructure is damaged or off-line. The 2017 Thomas Fire burned 281,893 acres in both Ventura County and Santa Barbara County, though Camarillo did not incur any structural damage, and was only indirectly impacted due to smoke and by providing mutual aid and evacuation centers. In 2018, the Hill Fire started in the Camarillo area and burned 4,531 acres (County of Ventura 2022).



Wildfire

Camarillo is expected to experience an increase in annual average area burned from 330.9 acres annually to 299.3 acres by mid-century, and 312.7 acres by end-century.

IMPACTS



**WORSENING
AIR
QUALITY**



**POWER
DELIVERY
DISRUPTION**



**STRUCTURE &
PROPERTY
DAMAGES**



**PUBLIC HEALTH
& SAFETY RISKS**

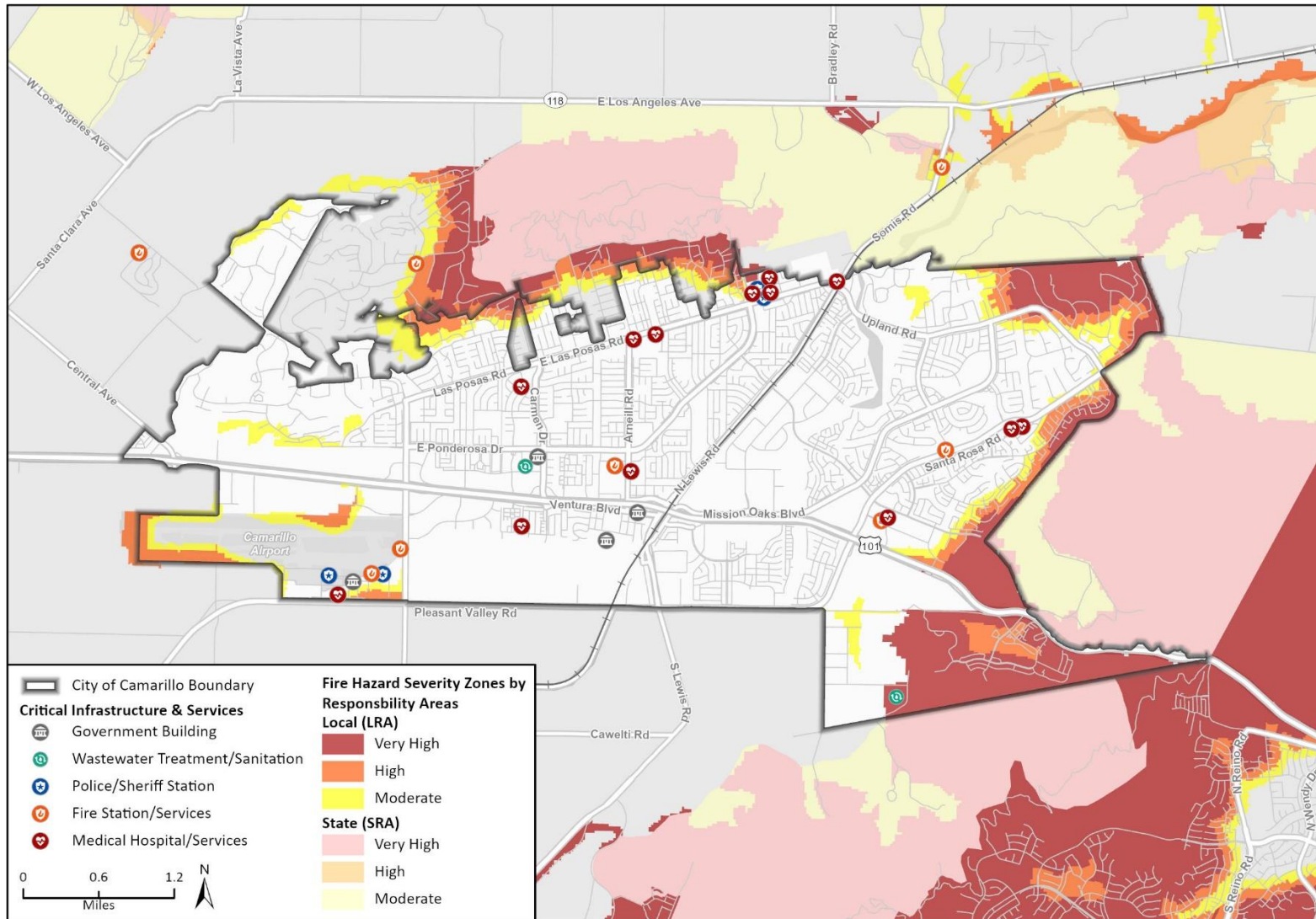


**HABITAT
LOSS**

HISTORIC WILDFIRES

Very dry air associated with Santa Ana winds was a catalyst for the Thomas Fire that devastated Ventura County in December 2017. Camarillo did not experience damage, and was only indirectly affected by heavy smoke.

Figure 3 Wildfire Hazard Severity Zones in Camarillo

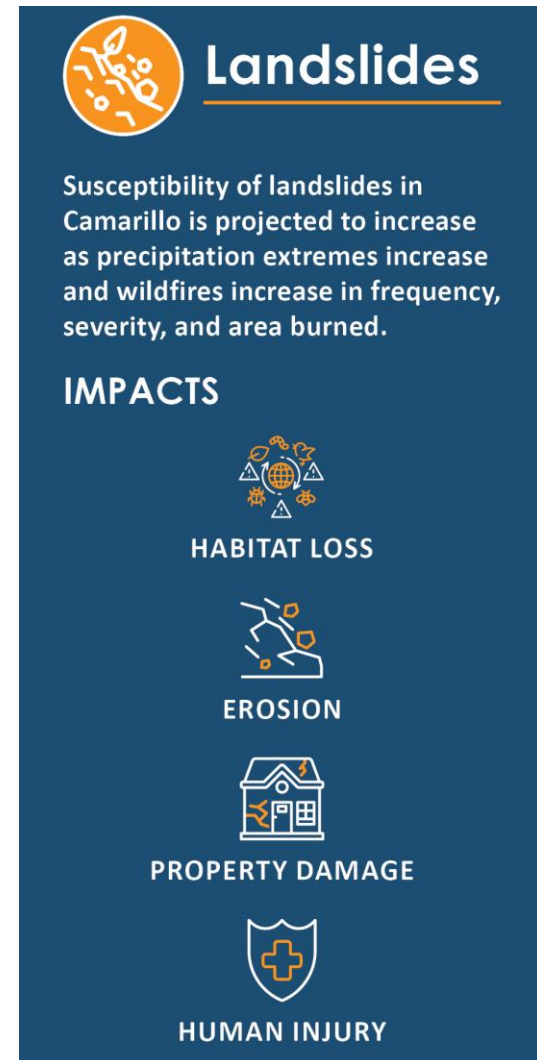


Basemap provided by Esri and its licensors © 2024.
 Additional data provided by CAL FIRE, 2007.

01-12007 Vulnerability Assessment
 Fig 2 Critical Infrastructure and Fire Hazard Severity Zones in Camarillo

Landslides

The Ventura Region is projected to experience increases to wildfire exposure and precipitation extremes and subsequently landslide-prone conditions (CEC 2024). Landslide risks in Camarillo occupy regions that overlap with wildfire zones, and along sloped areas in the hills north of the city. The Ventura County Multi-Jurisdictional Hazard Mitigation Plan Exposure Assessment details past natural hazard events and specific assets at risk within Camarillo to landslides, as well as the number of people affected in the city. Figure 4 shows landslide susceptibility in Camarillo, with the highest risk areas being situated in the northern portion of the city. Specifically, landslide risk is significant in the region north of Ventura Boulevard and west of Las Posas Road, as well as in the region east of North Lewis Road and north of Mission Oaks Boulevard.



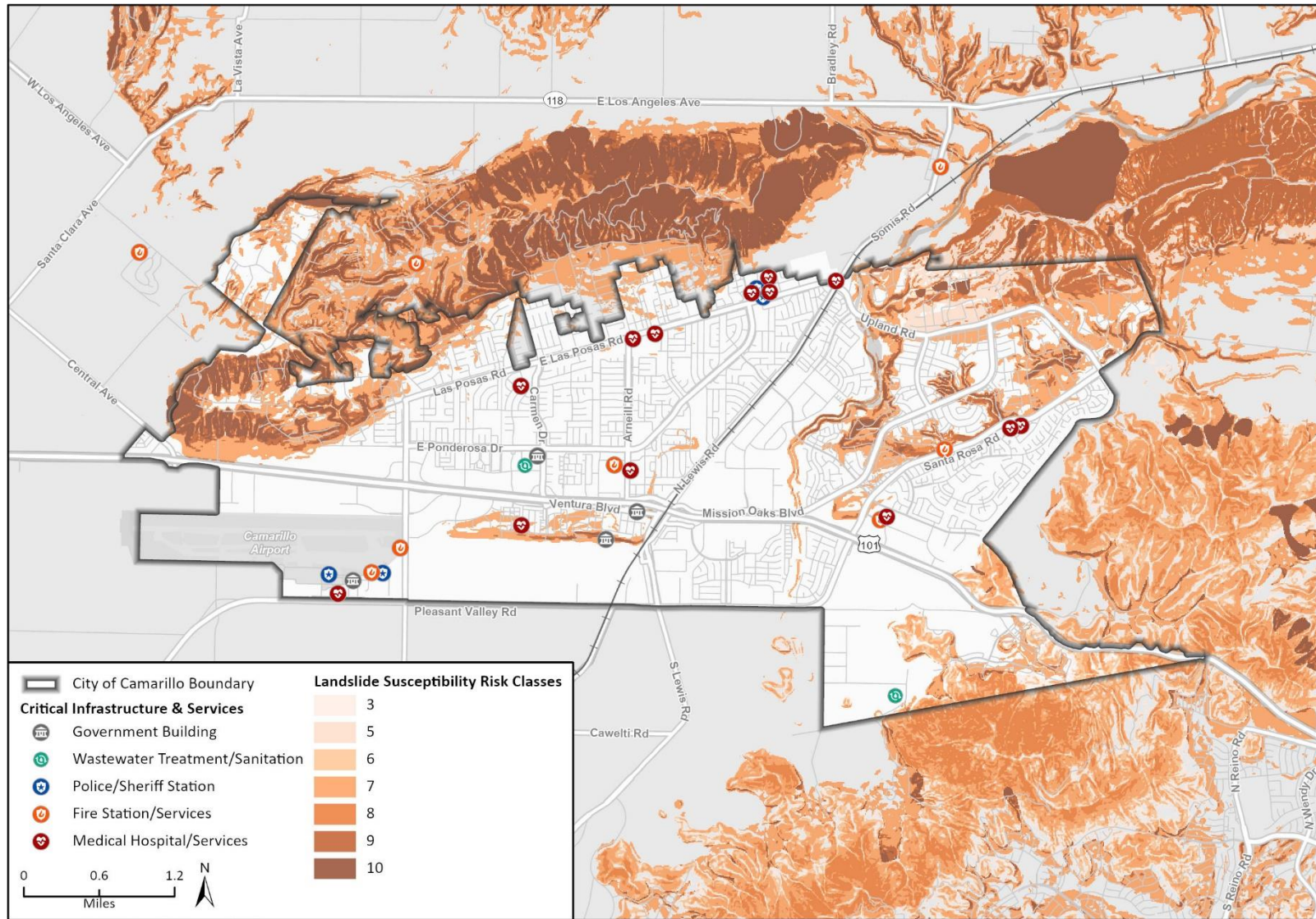
Landslides

Susceptibility of landslides in Camarillo is projected to increase as precipitation extremes increase and wildfires increase in frequency, severity, and area burned.

IMPACTS

- HABITAT LOSS
- EROSION
- PROPERTY DAMAGE
- HUMAN INJURY

Figure 4 Landslide Susceptibility in Camarillo




Basemap provided by Esri and its licensors © 2024.
 Additional data provided by CGS, Map Sheet 58, 2015.

21-12057 Vulnerability Assessment
 Fig 3 Critical Infrastructure and Landslide Susceptibility in Camarillo

Riverine and Stormwater Flooding

Climate change may cause low-lying areas throughout Camarillo to experience more frequent flooding and could increase the extent of 100-year floods. Riverine flooding is projected to increase as precipitation extremes increases (CEC 2024). Figure 5 maps the 100- and 500-year floodplains within Camarillo. Stormwater systems may be overwhelmed more frequently as more extreme rain events occur, causing localized flooding which could impact properties and close streets. Numerous facilities and infrastructure occupy 100-year or 500-year floodplains in Camarillo including several parks, a hospital, fire stations within and adjacent to floodplains, several schools, and wastewater facility are in existing flood plains.


Flooding impacts directly create physical damages from inundation (Hall et. al 2018). Flooding can also cascade into power, wastewater, and storm drainage infrastructure, exacerbating public health concerns.




Riverine and Stormwater Flooding

There are several FEMA 100-year and 500-year flood zones within Camarillo. Riverine and stormwater flooding is projected to increase as precipitation extremes increase.


IMPACTS




STRAINED EMERGENCY SERVICES



STRESSED WATER DRAINAGES

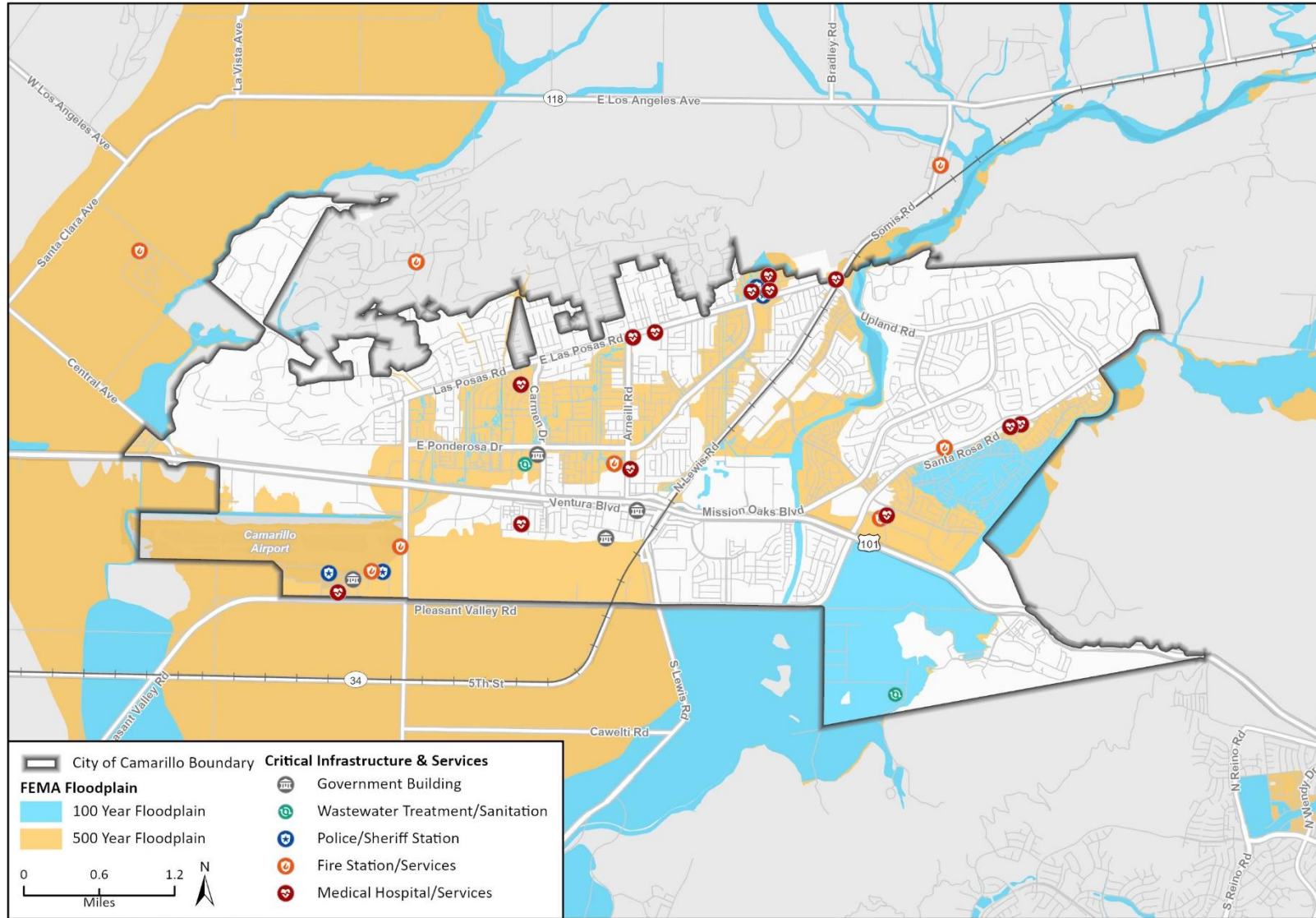


HABITAT LOSS



PROPERTY DAMAGE

Figure 5 100 and 500 Year Floodplain in Camarillo



21-12057 Vulnerability Assessment
 Fig 4 Critical Infrastructure and FEMA Flood Zones in Camarillo

Air Quality

Worsening air quality due to climate change can create respiratory issues for vulnerable populations and impact indoor areas without adequate air filtration systems. There are several types of air quality decline sources found below:

- **Dust.** Increased temperature leads to lack of soil moisture and increased dry, dusty conditions (Hall et al. 2018).
- **Smog.** Increases in ambient temperature can lead to higher rates of smog also referred to as ozone. Ground-level ozone specifically will be experienced at higher rates leading to raised cardiovascular and respiratory morbidity and mortality rates (CDPH 2014). Ground-level ozone has also been shown to have particularly disproportionate adverse impacts on populations experiencing houselessness and lower median income (PNAS 2021). Camarillo will experience increases in ozone concentrations in parallel to temperature increases.
- **Fewer Natural Filtrations.** Precipitation variability and long periods of dry spells lead to less reliable air quality for the entire region. Moisture in the air can filter pollutants and provide for overall improved conditions (Hall et al. 2018).
- **Wildfire Smoke.** Temperature, severe wildfire conditions, and the area burned by wildfires throughout the state has increased and will continue to increase. Higher temperatures accompanied by an increase in the incidence and extent of large wildfires will lead to increased wildfire smoke exposure and associated toxins, air pollution, and particulate matter (Hall et. al 2018).

Air Quality

Air quality is expected to worsen in Camarillo due to extended droughts, more frequent wildfires, increased ambient temperatures, and variable natural filtrations of fog and wind.

IMPACTS

- RESPIRATORY HEALTH PROBLEMS
- VEGETATIVE STRESS

TYPES OF AIR QUALITY HAZARDS

- DUST
- SMOG
- FEWER NATURAL FILTRATIONS
- WILDFIRE SMOKE

3 Sensitivity

Populations and assets are affected by climate change depending on their sensitivity to climate hazards. This section identifies sensitive populations and assets within Camarillo. Potential impacts from the climate hazards of concern on sensitive populations and assets are presented in the Vulnerability Analysis section.



Vulnerable Populations



Natural and Managed Resources



Buildings and Facilities



Infrastructure and Critical Services

3.1 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. Several factors influence sensitivity to climate hazards including an individual's health, age, and ability, societal disadvantages, inequities in access to health care, economic opportunity, education and other resources, and inequities found in basic needs and exposure to environmental stressors (Cal OES 2020). Vulnerable populations

experience heightened risk to climate change and have fewer resources to adapt and recover from climate change impacts. Camarillo has several vulnerable populations that will be disproportionately impacted by climate change. These include those listed in Table 3 below.

- **Individuals with high outdoor exposure.** People experiencing homelessness and outdoor workers.
- **Under-resourced individuals.** Renters and individuals without a computer.
- **Individuals facing societal barriers.** Communities of color.
- **Individuals with chronic health conditions or health related sensitivities.** Older adults, children, individuals with disabilities (physical and cognitive), and Military Veterans.

Table 3 Vulnerable Populations in Camarillo

Population	Population Description	Percentage of Population or Households
People experiencing houselessness	Individuals who currently lack fixed, regular, and adequate housing	0.07%
Outdoor workers	Individuals older than 16 who work outdoors	7%
Unemployed	Individuals without active employment	17.1%
Older adults	Individuals 65 years or older	20.4%
Children	Individuals 5 years and younger	6.2%
Military Veterans	Individuals who have served but are not currently serving in the US Armed Forces	6.4%
Communities of color	All individuals that do not identify as white	25.4%
Renters	Housing units that are renter occupied	34.8%
Individuals with disabilities	Individuals with access and functional needs (physical and mental)	12.9%
Households without broadband internet	Households without access to broadband internet.	10.2%

Source: The percentages used in this table were acquired from the California Healthy Places Index 3.0, U.S. Census, 2015-2019 American Community Survey (ACS), Ventura County 2022 Homeless Count, and CalEnviroScreen 4.0.

3.2 Natural and Managed Resources



Natural and managed resources within Camarillo as detailed in the Open Space and Conservation Element of the General Plan include agriculture and open space, water, watersheds, air and arable soil, soil quality, and the foothill recreational areas (City of Camarillo 2006). Prime agricultural land is primarily along the southern city border, between highway 101 and Pleasant Valley Road. Natural watercourses include the Calleguas Creek, Conejo Creek, and the Revolon/Beardsley Wash, all of which provide groundwater and aquifer recharge as well as storm runoff. The City offers recreational areas, primarily in the foothills, as well as municipal and regional parks (City of Camarillo 2006). These various resources provide habitat and improve air and water quality, and are sources of community resilience, recreation, and economic productivity to the city. They are spread throughout the city and face various levels of exposure to climate hazards.

3.3 Buildings and Facilities



Climate change is expected to amplify extreme weather and climate hazards in Camarillo. A jurisdiction's vulnerability increases when buildings and facilities are not designed, operated, and/or maintained to function effectively under extreme weather conditions or can be damaged by extreme weather conditions. The following buildings and facilities would be particularly sensitive to climate change: municipal buildings, educational facilities, and residential and commercial developments.

3.4 Critical Infrastructure and Services



Within Camarillo there is a large array of critical infrastructure and services that are vulnerable to climate change. Assets within this category include water services, wastewater, solid and hazardous waste and recycling, fire services, emergency Services, medical services, utilities and major utility corridors, public transportation, roadways, and active transportation routes. The Camarillo Airport is in the southwestern region of the city, and contains other critical services, such as the Hazardous Materials unit.

4 Adaptive Capacity

Adaptive capacity is the ability to adjust to the consequences of climate change. This section summarizes the ways in which the City currently manages for the negative impacts of climate change. Types of adaptive capacity include adjustments in behavior, resources, and technologies. The City of Camarillo has actively taken steps to increase the county’s adaptive capacity. Existing policies, plans, programs, and institutions that increase the city’s resilience to climate change impacts are organized by climate hazard and listed in Table 4, Table 5, Table 6, and Table 7. The Adaptive capacity findings are overlaid with impacts of each climate hazard on different asset categories to produce a vulnerability score for each asset in the Vulnerability Analysis section (section 5).

4.1 Extreme Heat and Warm Nights

Table 4 lists programs, plans, and policies that help communities become more resilient to an increase in extreme heat and warm nights.

Table 4 Program, Plans, and Policies to Manage Impacts of Increased Temperature

Existing and Planned Programs, Plans, and Policies	Objectives
Ventura County Cooling Centers	Ventura County maintains designated cooling centers for county residents, especially those more susceptible to heat related illness. The location in Camarillo is the Camarillo Public Library, which operates as a cooling center in response to extreme heat events.
Ventura County Contingency Plan for Heat/Cold Weather Events (County of Ventura 2020)	This plan describes the roles, responsibilities of County agencies and disaster-related organizations and potential issues associated with an extended weather emergency. Additionally, this plan was developed to ensure effective support and interagency coordination in accordance with the following laws and guidelines including Emergency Services Act (ESA) and Standardized Emergency Management System (SEMS) and the National Incident Management System (NIMS).
Southern California Edison (SCE) Medical Baseline Allowance Program (SCE 2022)	SCE provides additional electricity at discounted rates to customers with a qualifying medical need. This program often allows heat sensitive individuals to continue operating space cooling equipment more consistently.

4.2 Riverine and Stormwater Flooding, and Droughts

Table 5 lists programs, plans, and policies that help increase the community’s resilience to droughts and riverine and stormwater flooding.

Table 5 Programs, Plans, and Policies to Manage Precipitation Impacts

Existing and Planned Programs, Plans, and Policies	Objectives
Calleguas Municipal Water District (CMWD 2020).	The CMWD Urban Water Management Plan includes descriptions of the CMWD services to its retail water purveyors to deliver water supply to Camarillo, projected water demands, and supply reliability during normal water years, single-dry years, and five consecutive dry years.
City of Camarillo Urban Water Management Plan (Camarillo UWMP 2020).	The Camarillo Urban Water Management Plan includes descriptions of CMWD water supply sources, projected water demands, and supply reliability during normal water years, single-dry years, and five consecutive dry years. The City of Camarillo supplies most of the water for residents and the remaining residents are served by the Camrosa Water District, Pleasant Valley County Water District, Pleasant Valley Mutual Water Company, and Crestview Mutual Water Company. The plan includes a short chapter discussing the impacts of climate change on the water system with limited strategies for mitigation and adaptation.
Camrosa Water District (CWD) Urban Water Management Plan (Camrosa Water District 2020). Calleguas Municipal Water District (CMWD).	The CWD Urban Water Management Plan includes descriptions of CMWD water supply sources, projected water demands, and supply reliability during normal water years and periods of drought. The plan includes a discussion of the impacts of climate change on the system.
Ventura County Integrated Regional Water Management Plan (County of Ventura 2019)	Integrated Regional Water Management (IRWM) is a paradigm for managing water and related resources on a regional scale. IRWM “regions” have been formed across California to develop plans that identify water management challenges, resolve conflicts over the best use of resources, bridge gaps in data, find common ground, and seek innovative solutions among stakeholders. Ultimately the goal is implementation of projects and programs that efficiently address water management priorities. The plan highlights the need to consider the impacts of climate change on water management.

4.3 Wildfires, Landslides, and Air Quality

Table 6 lists programs, plans, and policies that help increase the community’s resilience to wildfires.

Table 6 Programs, Plans, and Policies to Manage Wildfire Impacts

Existing and Planned Programs, Plans, and Policies	Objectives
Ventura County Fire Hazard Reduction Program (FHRP) (VCFD 2022)	The Ventura County Fire Hazard Reduction Program is managed by the Ventura County Fire Department to comply with AB 38 which requires real estate sales of property within a High or Very High Fire Hazard Severity Zone to involve an inspection by local fire authorities to demonstrate compliance with state and local laws regarding defensible space and vegetation management. The Ventura County Fire Department’s Ordinance is designed to minimize fire danger by controlling the density and placement of flammable vegetation. The goal is to maintain trees and vegetation that benefit a property, and to remove hazardous vegetation that provides a combustible fuel supply for wildfire.
Ventura Community Wildfire Protection Plan (Ventura Land Trust 2022)	The County’s Community Wildfire Protection Plan (CWPP) identifies wildfire risks and clarifies priorities for funding and programs to reduce impacts of wildfire on communities at risk. Some actions include vegetation management, wildfire safety education programs, and establishment and maintenance of evacuation routes.
Ventura County Fire Department's Fire Prevention Bureau (VCFD 2022)	The Ventura County Fire Department’s Fire Prevention Bureau works to ensure safety of communities as an all-hazard full-service agency and provides requirements for rebuilding of structures that were damaged or destroyed. The Bureau’s responsibilities include working with property owners to establish defensible space as part of the Fire Hazard Reduction Program and conduct public education events.
Southern California Edison (SCE) Wildfire Mitigation Plan (SCE 2023)	The SCE Wildfire Mitigation Plan details the various mitigation efforts the utility is making to reduce the risk of and increase resilience to wildfire. These efforts include risk assessment and mapping, situational awareness and forecasting, public safety power shutoffs, grid hardening, vegetation management, grid operations and protocols, and emergency preparedness. This Plan takes into consideration climate change impacts on wildfire and resilience.
Ventura County Wildfire Action Plan (Ventura County Fire Department 2016)	The Ventura County Wildfire Action Plan (“Ready, Set, Go!”) is a guide for making homes resistant to wildfires and preparations for leaving in an emergency wildfire situation. The guide includes information on how to establish defensible space, home hardening, and how to conduct a Family Disaster Plan checklist.
Southern California Edison (SCE) Public Safety Power Shutoff (PSPS) Customer Care Programs fact sheet (SCE 2022)	SCE operates a notification system to alert customers at least 1 to 2 days prior of a Public Safety Power Shutoff during periods of elevated wildfire risk. During a PSPS, SCE provides various supportive services to customers with qualifying needs including backup power systems rebates and incentives, transportation (Community Crew Vehicles), and community resource centers providing back up power to essential services such as pharmacies, grocery stores, and gas stations.

4.4 Multiple Climate Hazards

Table 7 lists programs, plans, and policies that help increase the community’s resilience to multiple climate hazards including hazards outlined previously and in conjunction with others.

Table 7 Programs, Plans, and Policies to Manage Multiple Climate Hazard Impacts

Existing and Planned Programs, Plans, and Policies	Objectives
Ventura County Multi-Jurisdictional Hazard Mitigation Plan (County of Ventura 2022)	The Plan assesses hazards within the County and identifies mitigation strategies that reduce or eliminate long-term risks to people and property from those hazards. Climate hazards planned for include drought, flood, landslides, extreme heat, severe storms, and wildfire. The Plan outlines goals and objective to mitigate risk to vulnerable populations and physical assets across Ventura County.
City of Camarillo Emergency Operations Plan (EOP) (City of Camarillo 2021)	The City’s EOP details a comprehensive emergency management system which enables a planned response to a wide variety of disaster situations. The high-level goals of the EOP are 1) to provide effective life safety measures, reduce property loss, and protect the environment; 2) to provide for the rapid resumption of impacted businesses and community services; 3) the provide accurate documentation and records required for cost recovery efforts. While the plan does not address climate change directly, it establishes a framework of response to multiple hazards exacerbated by climate change including flooding, drought, wildfire, and landslides.
City of Camarillo Emergency Operations Plan (City of Camarillo 2021)	Camarillo’s Emergency Operations Plan details protocols to prevent, protect, mitigate, respond, and recover from the effects of disasters. The plan includes and Emergency Operations Center for the effective management of emergency situations during a major emergency or disaster and identifies lines of authority and responsibility. The plan reviews potential hazards to impact the city including wildfires, flooding, dam failure, earthquakes, and landslides.
Ventura County Emergency Response Team (CERT) Program (VCFD 2021)	The CERT program trains volunteers in basic first aid, light search and rescue, and small fire suppression, and are closely associated with Ventura County’s Fire Department. CERT volunteers may assist neighbors and other emergency personnel in times of emergency, and support evacuations along with other responsibilities. The City of Camarillo has CERT Coordinator and provides local educational programs as described above.
Ventura County Alert Program (County of Ventura 2022)	The County of Ventura uses an emergency notification system for residents to send alerts if there is an emergency in a community. The alert system can be used to alert a home or business using the address, landline, cell phone, email, and TTY device to receive emergency alerts in English and Spanish.
Camarillo General Plan Safety Element (City of Camarillo 2013)	The Camarillo General Plan Safety Element provides policy direction that supports laws and regulation of future development that will minimize the risk of personal injury, loss of life, property damage, and environmental damage associated with natural and human-caused hazards. The Safety Element does not include goals related to climate adaptation and resilience, and policies that will support the community’s capacity to better withstand the impacts associated with climate change. However, this Climate Change Vulnerability Assessment will inform updates to the Safety Element of the General Plan.

5 Vulnerability Analysis

The following section outlines the impacts each climate hazard has on vulnerable population groups and assets as described in the Sensitivity section (section 3). Existing plans, policies, and programs that contribute to the adaptive capacity of the assets outlined in the Adaptive Capacity section (section 4) is summarized throughout. An impact score and an adaptive capacity score is identified for each asset and climate hazard type producing the overall vulnerability score. Vulnerable populations in the City of Camarillo include the following:

- People experiencing houselessness
- Outdoor workers
- Older adults
- Children
- Renters
- Communities of color
- Military Veterans
- Individuals with disabilities (physical and cognitive)
- Individuals without a computer

5.1 Vulnerable Populations



Individuals with high outdoor exposure including people experiencing houselessness and outdoor workers face disproportionate direct exposure to climate hazards, causing them to be extremely vulnerable to the effects of climate change. Individuals in these groups often live in homes that are less protected against climate hazards, lack a permanent residence, or

The following sections discuss these vulnerable populations, within the subgroups delineated below, their disproportionate risk to climate hazards in the city, and why there is a connection between specific populations and each relevant climate hazard risk. The vulnerable groups are as follows:

- **Individuals with high outdoor exposure.** People experiencing houselessness and outdoor workers.
- **Under-resourced individuals.** Renters and individuals without a computer.
- **Individuals facing systemic discrimination.** Communities of color.
- **Individuals with chronic health conditions or health related sensitivities.** Older adults, children, individuals with disabilities (physical and cognitive), and Military Veterans.

don't have shelter altogether. People experiencing houselessness may not have access to healthcare coverage or financial resources to address health concerns either caused by or exacerbated by climate hazards.

Under-resourced individuals often do not have access or the ability to afford resources needed to prepare for, cope with, and recover from climate change impacts. People in this group often face financial barriers and limited access to resources when preparing for and recovering from climate change hazards. Under-resourced individuals often lack the financial resources to evacuate from a climate hazard and/or find an affordable place to evacuate to. Households without a computer may not receive emergency alerts or governmental guidance before or during a climate hazard event, leaving them in dangerous situations during evacuation scenarios (Gamble and Balbuls 2016).

Individuals facing systemic discrimination also face additional impacts of climate change. Communities of color are more likely to live in high hazard risk areas and less likely to be homeowners, which leaves them vulnerable to climate hazards.

Individuals with chronic health conditions or health related sensitivities are socially and physiologically vulnerable to climate change impacts and hazards. Older adults and individuals with disabilities may have limited or reduced mobility, mental function, or communication abilities, making it difficult to evacuate during or prepare for a climate hazard event (CDPH 2020). They may also have medical needs for electricity which may be impacted during a public safety power shutoff or climate hazard event. Individuals in these groups are more likely to have pre-existing medical conditions or chronic illnesses that may exacerbate the risk of illnesses and medical problems from climate hazards. Children are socially and physiologically vulnerable to climate hazards with limited understandings of climate hazards and insufficient resources to independently prepare for and safely respond during a climate hazard event. Children, especially young ones, are reliant on their parental figures to ensure their health, safety, and wellbeing (CDPH 2020). Children also have vulnerable physical characteristics

because they have not fully physiologically developed and are therefore more vulnerable to health effects of climate change impacts (Kenney et al. 2014). Military Veterans are more likely to be low-income and experience houselessness after their service, which also makes them vulnerable to preparing and responding to climate hazards (Olenick et al. 2015).

Potential Impacts

Extreme Heat and Warm Nights

People experiencing houselessness, older adults, and young children are at risk to health impacts from extreme heat. People experiencing houselessness are exposed to health-related impacts associated with extreme heat because they have limited access to shelter and air conditioning. The primary health impacts to these populations are heat-related illnesses, such as heat stress, heat stroke, and dehydration, which can be life-threatening (CDPH 2020).

Under-resourced individuals may not be able to pay for adequate air conditioning or fans, increasing their exposure to extreme heat. Under-resourced individuals are less likely to receive medical care for illnesses triggered or exacerbated by extreme heat. Households without a computer may not receive heat advisory warnings or governmental guidance, causing them to experience health impacts from extreme heat exposure (CDPH 2017). Communities of color often live in housing with insufficient protection from extreme heat events and limited or no affordable air conditioning. The primary health impacts to these populations are heat-related illnesses, such as heat stress, heat stroke, and dehydration, which can be life-threatening (CDPH 2020).

Individuals with chronic health conditions or health related sensitivities are particularly at risk to heat related illnesses during extreme heat events. Individuals with disabilities, older adults, and

children may have difficulty turning on air conditioning or traveling to cooling centers during extreme heat events. Extreme heat conditions can exacerbate certain disabilities, and other respiratory and cardiovascular conditions, potentially causing heat-related illnesses such as heat stress, heat stroke and dehydrations, which can be life threatening (CDPH 2020). Children are still physiologically developing which means that they are less able to regulate their bodies during extreme heat events (Kenney et al. 2014).

Drought

People experiencing houselessness are at risk to drought conditions and associated cascading impacts. During prolonged drought conditions, people experiencing houselessness may have difficulty accessing clean and affordable drinking water (Gamble and Balbuls 2016).

During periods of prolonged drought, under-resourced individuals are more likely to experience the cost burden associated with increased water rates (Feinstein et al. 2017). These individuals may struggle to access clean and affordable drinking water which may cause dehydration and/or exacerbate underlying health conditions and illnesses (Gamble and Balbuls 2016). Droughts often trigger cascading economic impacts through the agricultural sector, decreasing job availability and leaving under-resourced individuals particularly vulnerable to financial hardships (Howitt et al. 2015). Communities of color are at risk to drought conditions and associated cascading impacts and may face systemic and/or cultural barriers when seeking to access affordable and clean drinking water, which may cause dehydration and/or exacerbate underlying health conditions and illnesses (Gamble and Balbuls 2016).

Individuals with chronic health conditions or health related sensitivities are at risk to drought conditions and associated

cascading impacts. Prolonged drought conditions can lead to water scarcity and individuals may need to rely on poor quality water supplies. Children and older adults are especially at risk to dehydration as their bodies are not able to regulate as well (Kenney et al. 2014). Dehydration may exacerbate underlying health conditions and illnesses.

Wildfire

People experiencing houselessness are particularly at-risk during wildfire events as they often suffer from respiratory conditions, mental illness, and chronic health conditions that may be exacerbated from physical contact with wildfire or smoke inhalation. People experiencing houselessness have limited access to shelter and do not have access to transportation to evacuate from burning areas. They may also have their personal belongings destroyed or damaged during a wildfire event (CDPH 2017). After wildfires, there are additional issues of displacement and needs for temporary shelters for uprooted communities.

Under-resourced individuals may experience injuries or death from smoke inhalation or burns and are less likely to receive medical treatment (CDPH 2017). These individuals may have their belongings and homes damaged by a wildfire. If this occurs, under-resourced individuals are likely to suffer from the cost burden associated with losses or damage. Households without a computer may not receive communications and evacuations to safely evacuate from hazard areas. Renters have limited control over home hardening and improvements that may protect against fire and smoke. Subsequently, they may experience economic and health impacts and a greater loss of belongings than homeowners (Gamble and Balbuls 2016).

Communities of color are more likely to live in wildfire hazard zones and in housing with insufficient protection against wildfire.

Individuals in these groups have may face systematic and/or cultural barriers to access resources to safely evacuate hazard areas (Gamble and Balbuls 2016). Individuals in these groups may experience injuries or death from smoke inhalation or burns (CDPH 2017).

Individuals with chronic health conditions or health related sensitivities may experience injuries or death from smoke inhalation or burns (CDPH 2017). Older adults and Military Veterans are vulnerable to health impacts from wildfire smoke and pollutants because they are more likely to have underlying respiratory and/or cardiovascular conditions and illnesses. Children may experience respiratory health impacts from wildfire smoke because their respiratory systems are not fully developed and are sensitive to stressors. Individuals with disabilities, children, and older adults may have difficulty evacuating from wildfires, increasing the risk of health impacts from wildfire smoke inhalation or fire burns (EPA 2022).

Landslides

Vulnerable populations living in areas with high landslide risk may be subjected to disproportionate negative impacts during landslide and debris flow events. People experiencing houselessness have limited access to shelter and do not have access to transportation to evacuate in the event of a landslide. They may also have their personal belongings destroyed or damaged during a wildfire event (CDPH 2017).

Under-resourced individuals may experience injuries during a landslide event and are less likely to receive medical treatment (CDPH 2017). These individuals may have their belongings and homes damaged by a landslide. If this occurs, under-resourced individuals are likely to suffer from the cost burden associated with losses or damage. Households without a computer may not receive

communications and evacuations to safely evacuate from hazard areas. Renters have limited control over home hardening and improvements that may protect against debris-flow related damage. Subsequently, they may experience economic and health impacts and a greater loss of belongings than homeowners (Gamble and Balbuls 2016).

Communities of color are more likely to be situated in wildfire scar zones or landslide prone areas (Gamble and Balbuls 2016).

Landslides may limit access to transportation systems, healthcare centers, and emergency response to those that are injured or in need or consistent medical care, such as those with chronic health conditions or illnesses. Children, older adults, and individuals with disabilities may not be able to safely evacuate landslide hazard areas.

Riverine and Stormwater Flooding

People experiencing houselessness are disproportionately at risk to health impacts during flood events because they often live in flood hazard areas and do not have access to transportation to evacuate inundated areas. They may also have their personal belongings destroyed or damaged during a flood event (Ramin and Svoboda 2009).

Under-resourced individuals may experience injuries or death from high velocity flooding and are less likely to receive medical treatment (CDPH 2017). Individuals in these groups may experience cost burdens if their belongings and homes are damaged from floodwater inundation. Households without a computer may not receive communications and emergency alerts to safely evacuate from hazard areas (CDPH 2020). Renters have limited control over home improvements that may protect against flood damage. Subsequently, they may experience economic and health impacts

and a greater loss of belongings than homeowners (Gamble and Balbuls 2016).

Communities of color are more likely to live in flood hazard areas and in housing with insufficient protection against riverine and stormwater flooding. They may face systematic and/or cultural barriers when seeking access to the resources needed to safely evacuate hazard areas (Gamble and Balbuls 2016).

Older people and children are particularly at risk to injury and/or death from high velocity flooding (CDPH 2017). Riverine and stormwater flooding may also limit access to transportation systems, healthcare centers, and emergency response to those that are injured or in need of consistent medical care, such as those with chronic health conditions or illnesses. Children, older adults, and individuals with disabilities may not be able to safely evacuate floodwater hazard areas.

Air Quality

People experiencing houselessness are disproportionately vulnerable to poor air quality because they are outdoors and are directly exposed to air pollutants (CDPH 2017). They may experience exacerbation or development of respiratory diseases and conditions, such as asthma and chronic obstructive pulmonary disease, and respiratory infections, which in some cases may be life-threatening (Ramin and Svoboda 2009).

Under-resourced individuals may be disproportionately impacted by poor air quality because their housing may lack sufficient air filtration and they may not be able to afford supplemental air filtration equipment (Gamble and Balbuls 2016). Individuals in these groups may experience the development or exacerbation of respiratory illnesses and are less likely to receive medical treatment (CDPH 2017).

Communities of color are vulnerable to health impacts associated with poor air quality because their housing may lack sufficient air filtration and they may not be able to afford supplemental air filtration equipment (Gamble and Balbuls 2016).

Children are extremely vulnerable to health impacts from poor air quality because their respiratory system has not fully developed yet (CDPH 2017). Older adults and Military Veterans are vulnerable to health impacts from poor air quality because they are more likely to have underlying respiratory and/or cardiovascular conditions.

Adaptive Capacity for Vulnerable Populations

Camarillo has plans, policies and programs in place that protect vulnerable populations across all climate hazards. The level of enforceability, implementation, and efficacy varies based on the hazard type.

Camarillo has many plans and policies in place to address extreme heat and its impacts on vulnerable populations. The city has a cooling center at the Camarillo Public Library, which operates in response to extreme heat events. Other extreme heat related plans include the Ventura County Contingency Plan for Heat/Cold Weather Events includes public safety power shut offs in the case of extreme heat conditions that may exacerbate wildfire potential. These shutoffs may negatively impact vulnerable populations such as older adults and children, who may rely on at-home cooling systems to avoid heat-related health issues. The program does include various support services to customers with qualifying needs to receive backup power systems, rebates and incentives, transportation, and access to essential services.

The Southern California Edison Medical Baseline Allowance Program provides additional electricity at discounted rates to customers with a qualifying medical need, and often allows heat sensitive

individuals to continue operating their space-cooling equipment at home.

Plans concerning stormwater flooding and drought mainly address infrastructure resilience and water reliability and drainage, in turn helping vulnerable populations. The City provides most of the water to residents, and the City of Camarillo Urban Water Management Plan includes a discussion of climate change impacts to the water system as well as strategies for mitigation and adaptation. The Calleguas Municipal Water District Urban Water Management Plan also includes plans for supply reliability during drought conditions. Additionally, the City operates the North Pleasant Valley Desalter Facility (Facility) which transforms unusable, brackish groundwater into a local source of high-quality and affordable drinking water while also removing damaging salts from the regional watershed. This Facility increases the City’s resilience to drought by diversifying the water supply and doubling the City’s local potable water supply. In addition, this Facility provides enhanced affordability and water

rate stability for customers through this drought-resistant local water source. Plans and projects like these can serve as a form of drought and flooding resilience. The Ventura County Multi-Jurisdiction Hazard Mitigation Plan assigns a medium capacity to the City residents’ ability to adapt to climate impacts. The plan acknowledges that vulnerable populations within the City may not be able to relocate or protect their home in the case of a flood but provides no guidance on how to address vulnerable populations in the case of flooding events (Ventura County 2022).

There are many programs, plans, and policies in place to mitigate wildfire impacts in Camarillo:

- Ventura County Fire Hazard Reduction Program (FHRP)
- Ventura County Fire Department’s Fire Prevention Bureau
- Southern California Edison’s (SCE) Wildfire Mitigation Plan
- Ventura County Wildfire Action Plan
- SCE Public Safety Power Shutoff

Vulnerability Score for Vulnerable Populations

Climate Hazard	Impact Score	Adaptive Capacity Score	Vulnerability Score
Extreme Heat and Warm Nights	High	Medium	4- High
Drought	High	High	3- Medium
Wildfire	High	Medium	4- High
Landslides	Medium	Low	4- High
Riverine and Stormwater Flooding	Medium	Medium	3- Medium
Air Quality	High	Low	5- Very High

Vulnerable populations in Camarillo are most vulnerable to extreme heat/warm nights, drought, wildfire, landslides, and air quality.

5.2 Natural and Managed Resources



Primary vulnerabilities for natural and managed resources are associated with climate hazard-caused stress and physical damage to resource types within this asset group. Compounding climate hazards stress natural ecosystems beyond their capacity to absorb individual climate hazards. Wildlife will seek out more conducive habitats during climate events such as extreme heat or drought, which can tend to be where people recreate (USDA 2018). Recreational areas are also placed under increased risk via climate projections creating additional stress and competing needs for safe habitats. Impacts related to habitat shifts are exacerbated compared to larger areas as densely populated and limited lands presents issues with re-seeding or re-habitation. Natural and managed resources are highly vulnerable to the effects of climate change in Camarillo.

Potential Impacts

Extreme Heat and Warm Nights

The impacts to natural and managed resources in Camarillo during extreme heat and warm nights are similar to the impacts experienced by vulnerable populations. Wildlife under these conditions face heat stress and heat related illness as well as disrupted reproductive cycles, and compounding risks associated with early and extended seasonal temperature increases (Backlund 2008). Because it is seasonally warmer earlier in the year species can emerge early with no food source and potentially face an untimely cold front, which increases mortality rates. Timing of seasonal warmth may not overlap with food sources and extreme heat may stress dependent vegetation communities and wildlife

(Dale 1997, Hamerlynck 1995, Maclean et al. 2011). Plants are more likely to experience heat stress and drying, habitat ranges may shift, and native species may be outcompeted by invasive species capable of surviving the harsh conditions. Some pests can proliferate more easily with warmer temperatures (Hamerlynck 1995), and some plants and animals ill-suited to the new warmer conditions may suffer increased mortality rates (Hall et al. 2018). Natural resources are highly exposed to extreme heat and warm nights. Both mid- and end- of century projections depict dramatic increases in extreme heat days (CEC 2024).

Higher temperatures will decrease the snowpack and raise the snowline, decreasing one of the most important surface water reserves for agriculture (Hall et al. 2018). Extreme heat and warm nights can result in declines in crop yields because of heat stress and anomalous warmth during periods that are typically cooler (Parker et al. 2020). Lower crop yields can increase costs and ultimately decrease agriculture profitability.

Drought

Impacts from drought involve risks associated with water scarcity and availability for reliant natural resources. Drought will disrupt habitats and will decrease the resiliency of wildlife. Extended or variable drought conditions effect the amount and duration of water available in ephemeral and permanent sources, which impacts plants and wildlife dependent on those aquatic resources (Burkett and Kusler 2000).

Like extreme heat and warm nights, drought is linked to declines in crop yields, increasing costs, and decreasing crop profitability. Drought can result in regional losses of crops and can stress the

statewide water supply. Many crops grown in Camarillo, such as avocados, lemons, grapefruits are dependent on high depths of water and subsequently higher water intensity needs.

Wildfire

The largest direct impacts to natural resources are caused by wildfires. The severity and frequency of wildfires can lead to long term habitat conversions, or vegetative communities that no longer support reliant species, and the landscape provides minimal alternative habitats (Bell et al. 1999, Coop et al. 2020). As discussed within the Exposure to Climate Hazards section, extreme wildfire risk days in Camarillo are projected to increase through the end of the century (CEC 2024).

Figure 3 depicts the delineation of Very High Fire Hazard Severity Zones (VHFHSZ) which both border and fully encompassing areas with natural resources including some of the city's prime agricultural land. Given the projected expansion of wildfire prone areas, larger areas of croplands may be within fire hazard severity zones in the future due to climate change. Wildfires can destroy crops and disrupt rangeland operations while wildfire smoke may stress the health of crops and livestock.

Landslides

Landslide susceptibility is limited and the likelihood of landslides occurring is determined by precipitation and wildfire occurring sequentially (Hall et al. 2018). In the event of a landslide there is potential for loss of lands, habitat, and disruption of waterbodies in areas of debris flow. Wildlife and plants face a compounding risk when presented with landslide events. Figure 4 shows landslide susceptibility in Camarillo, with the highest risk areas being situated in the northern portion of the city. Specifically, landslide risk is significant in the region north of Ventura Boulevard and west of Las

Posas Road, as well as in the region east of North Lewis Road and north of Mission Oaks Boulevard. Some of the areas with high landslide susceptibility overlap with prime agricultural land or other natural resources in the city.

Riverine and Stormwater Flooding

The major impacts of flooding on natural and managed resources are the damage and destruction that occurs because of related erosion, as well as the degradation of water quality, which impacts survival rates of aquatic species and fish (Talbot et al. 2018). One way that stormwater flooding reduces water quality is by causing algae blooms which lead to plant and wildlife health issues within wetlands and waterbodies (EPA 2022). Other impacts include damage from inundation in storm flooded areas including natural habitats and public and private land surrounding waterbodies in the city. Riverine and stormwater flooding will mostly affect sensitive species of plants and wildlife that are based in low-lying areas of the city, specifically those adjacent to the creeks in the area.

Agricultural operations situated within the FEMA flood zones in Camarillo susceptible to the impacts riverine and stormwater flooding. These operations have the potential to be disrupted during flood events, and inundation is likely to result in crop yield reductions. Agricultural worker's residences could also be damaged by floodwater inundation (VCAC 2020).

Air Quality

The direct effects of poor air quality on natural resources relates to plant and wildlife health as increased air pollutants are correlated with increased stress and mortality rates. Impacts from air quality can further impact natural resources since air quality declines correspond with other hazards (such as wildfire and extreme heat events), which compounds risks.

The direct impacts of air quality on crop yield within Camarillo of concern is that smoke damage may render crops unsaleable, or poor air quality may impact harvest ability.

Adaptive Capacity for Natural and Managed Resources

There are no relevant plans programs or policies directly increasing the adaptive capacity of Camarillo natural and managed resources to the climate hazard of extreme heat.

Related to wildfire, there are existing programs and plans outlined in the Ventura County Community Wildfire Protection Plan. The plan identifies natural and managed resources that are susceptible to wildfire and plans for vegetation management as a mitigation

effort. Implementation of planning efforts, such as emergency notification and alert systems, exists within the 2020 Urban Water Management Plan, the 2022 Ventura County Multi-Jurisdictional Hazard Mitigation Plan, and the City of Camarillo Emergency Operations Plan to provide awareness of natural and managed resources impacts around climate hazards.

Indirect planning exists around adaption for natural resources around flooding and drought including the Ventura County Integrated Regional Water Management Plan: Integrated Flood Management Planning Report, Calleguas Municipal Water District (CMWD) Urban Water Management Plan, and the City of Camarillo Urban Water Management Plan.

Vulnerability Score for Natural Resources

Climate Hazard	Impact Score	Adaptive Capacity Score	Vulnerability Score
Extreme Heat/Warm Nights	High	Low	4- High
Drought	High	Low	4- High
Wildfire	High	Medium	4- High
Landslides	High	Low	4- High
Riverine and Stormwater Flooding	High	Medium	4- High
Air Quality	Medium	Medium	3- Medium

Natural and managed resources in Camarillo are most vulnerable to extreme heat/warm nights, drought, wildfire, and landslides.

5.3 Buildings and Facilities



Vulnerabilities within this asset category primarily concern physical exposure and damages related to climate hazards. Impacts associated with operations of critical services are discussed under Critical Infrastructure and Services (section 5.4).

Potential Impacts

Extreme Heat and Warm Nights

Extreme heat could impact occupants of buildings and facilities that are not adequately weatherized for increased temperatures.

Drought

Drought will have minimal impact on the physical structures of buildings and facilities across Camarillo.

Wildfire

The structures and buildings that occupy wildfire hazard zones are at risk of structural damage from wildfires. Wildfire hazard zones may expand by end of century which could lead to more facilities at risk of structural damage. There are many several critical facilities in Camarillo's wildfire hazard zones shown in Figure 3.

Landslides

Landslide susceptibility in Camarillo overlaps with sloped wildfire hazard zones, in the Camarillo and Las Posas hills (CDOC 2021). Impacts to buildings and facilities as outlined in the Multi-Jurisdiction Hazard Mitigation Plan encompass some residential neighborhoods as well as some commercial developments.

Riverine and Stormwater Flooding

There is some risk of riverine and stormwater flooding to the physical structures outlined under this asset category. The location of floodplains in Figure 5 show a risk of impact based on the 100- and 500-year flood plains, primarily to residences along East Ponderosa Drive, Santa Rosa Road, and along the Calleguas Creek Bed. Commercial buildings below Ventura Boulevard, such as the Camarillo Premium Outlets, are within the 500-year floodplain and are subject to flooding damage.

Air Quality

The impact of reduced air quality will have a similar effect as extreme heat for buildings and facilities. The ability to filter air will greatly affect the reliant subsystems, services, and populations reliant on the buildings and facilities. The direct impact on structures is low.

Adaptive Capacity for Buildings and Facilities

Camarillo has completed some existing adaptive capacity efforts to increase the weatherization of buildings and facilities throughout the city. The Ventura County Fire Hazard Reduction Program is managed by the Ventura County Fire Department to comply with AB 38 which requires real estate sales of property within a High or Very High Fire Hazard Severity Zone to involve an inspection by local fire authorities to demonstrate compliance with state and local laws regarding defensible space and vegetation management. The Ventura County Fire Department's Ordinance is designed to minimize fire danger by controlling the density and placement of

flammable vegetation. The goal is to maintain trees and vegetation that benefit a property, and to remove hazardous vegetation that provides a combustible fuel supply for wildfire. The 2013 Camarillo

General Plan Safety Element and the Ventura County Emergency Operations Plan mention structural resilience and contain planned responses to emergencies that include reducing property loss.

Vulnerability Score for Buildings and Facilities

Climate Hazard	Impact Score	Adaptive Capacity Score	Vulnerability Score
Extreme Heat/Warm Nights	Medium	Low	4-High
Drought	Low	Low	3-Medium
Wildfire	High	Medium	4-High
Landslides	Medium	Medium	3-Medium
Riverine and Stormwater Flooding	Medium	Medium	3-Medium
Air Quality	Medium	Low	4-High

Buildings and facilities in Camarillo are most vulnerable to extreme heat/warm nights, wildfire, and air quality.

5.4 Critical Infrastructure and Services



Overall vulnerabilities associated with this asset category involve structural preparedness and service reliability in the face of climate change. This section is mainly concerned with the cascading impacts physical damages to buildings and facilities can have on services and infrastructure.

Potential Impacts

Extreme Heat and Warm Nights

As temperatures increase, roadways, active transportation routes, and railroads are vulnerable to heat-related damages such as buckled highways, railroad tracks and premature deterioration of infrastructure (Hall et al. 2018). Additional impacts from extreme heat are associated with increased emergency service calls which could strain medical services. Electrical infrastructure could be overwhelmed by demand and result in blackouts or energy providers could conduct power safety shutoffs to avoid impacts to electrical facilities. Power outages have significant impacts on communication networks, water conveyance, and vulnerable populations. The ability for emergency services to fully function is a cascading impact of power outages which can place additional strain on services during extreme heat events.

Drought

Drought can impact water reliability and water infrastructure. All emergency services depend on water, particularly firefighters who require adequate water supply for fire suppression. Water providers within the county will encounter increased difficulty as drought impacts general service reliability. Drought impacts can create service strain for emergency and medical services. Cracked

pavements from drought, compounded with extreme heat, affects roadways and transportation routes.

Wildfire

There are some critical facilities located in the Very High Fire Hazards Severity Zones (VHFHSZ) as shown in Figure 3 such as those along Santa Rosa Road, or in the northern portion of the city, along East Las Posas Road and Upland Road. Additionally, the Camarillo Airport is situated near moderate to high fire hazard zones, placing the airport and the neighboring critical facilities at risk of wildfire damage. These facilities and services are at risk of structural damage from wildfire. Infrastructure and dependent populations experience additional cascading impacts around power outages from downed utility lines, power safety shut offs and grid overload. All forms of power outages can affect how critical services are able to perform their needed functions during a hazard.

Utility lines have the potential to be damaged in high-risk locations, resulting in oil and gas leaks and power outages. Certain high wind conditions can often trigger wildfires, especially when power lines are downed or damaged (Hall et al. 2018). Power safety shut offs in response to wildfire risk can affect service reliability of power. Increased frequency of wildfires can place strain on fire and emergency services. Evacuation routes could be disrupted during a wildfire event limiting emergency responders and ability for people to evacuate as well.

Landslides

Risk of landslides in Camarillo is significant in the region north of Ventura Boulevard and west of Las Posas Road, as well as in the

region east of North Lewis Road and north of Mission Oaks Boulevard. This leaves critical facilities and services, such as those along Las Posas Road and Santa Rosa Road vulnerable, including the police station, a fire station, and several medical facilities.

Riverine and Stormwater Flooding

Impervious surfaces can impede the absorption of water and augment stormwater flooding in areas of Camarillo. There is risk of damage from increased extreme precipitation events including erosion, washouts, and sinkholes. Storm drainage and flood protection services for the city may be impacted by these events. Water supply for fire suppression as well as wildfire-caused declines in water quality are additional cascading impacts. Critical facilities, located below Ventura Boulevard, near the Camarillo airport are located within the 500-year floodplain. This includes two fire stations, a police station, a medical facility, and a government building. The airport and the related critical services will also be vulnerable during flood events. Additionally, there are several critical facilities in flood zones along Santa Rosa Road, East Las Posas Road, and East Ponderosa Drive that are vulnerable to flood and storm related damages.

Air Quality

Higher incidence of unsafe air quality generated by increased smog, dust and wildfire smoke can create general strain on existing critical infrastructure and services through increased rates of hospitalization and emergency and medical services (CDPH 2020).

Adaptive Capacity for Critical Services and Infrastructure

The relevant existing plans, policies, and programs for Camarillo are mainly multi-hazard based. All multi-hazard plans, programs and

systems are designed to address service and infrastructure failings and contingencies. The City of Camarillo Urban Water Management Plan includes a discussion of the impacts of climate change on the water system, with minimal strategies for adaptation and mitigation. Additionally, there is discussion in the City of potential uses for Desalination facilities in the future, but there are currently none operating or under construction. However, as mentioned under *Adaptive Capacity for Vulnerable Populations*, the City operates the North Pleasant Valley Desalter Facility which transforms unusable, brackish groundwater into a local source of high-quality and affordable drinking water, while also removing damaging salts from the regional watershed. This Facility increases the City's resilience to drought by diversifying the water supply and doubling the City's local potable water supply. In addition, this Facility provides enhanced affordability and water rate stability for customers through this drought-resistant local water source. Plans and policies that are relevant to critical infrastructure and services are found below:

- Ventura County Multi-Jurisdictional Hazard Mitigation Plan
- Ventura County Emergency Operations Plan (EOP)
- Ventura County Emergency Response Team
- Camarillo Emergency Operations Center
- Ventura County Alert Program
- Camarillo General Plan Safety Element

Cascading risks of services not being provided, and power dependencies are addressed in relation to wildfire and other climate related hazards throughout these plans and programs.

Vulnerability Score for Critical Infrastructure and Services

Climate Hazard	Impact Score	Adaptive Capacity Score	Vulnerability Score
Extreme Heat	High	Medium	4-High
Drought	High	High	3- Medium
Wildfire	High	Medium	4- High
Landslides	High	Low	5- Very High
Riverine and Stormwater Flooding	High	Medium	4-High
Air Quality	Medium	Low	4-High

Critical infrastructure and services in Camarillo are most vulnerable to extreme heat/warm nights, drought, wildfire, landslides, riverine and stormwater flooding, and air quality.

6 Conclusion

This report evaluates how climate change may impact vulnerable community members, natural resources, critical facilities, buildings, services, and infrastructure in Camarillo. The report provides a list of vulnerable population groups and assets for which adaptation policies and programs should be developed and implemented to increase community resilience. Vulnerability is based on the combination of potential impacts and adaptive capacity, as identified in the Vulnerability Analysis section of the report.

A list of asset categories and related vulnerability scores is provided on the next page. Highly vulnerable assets are discussed below:

- All sensitive population groups identified are highly vulnerable to many climate hazards including extreme heat and warm nights, wildfire, landslides, and air quality.
- Natural and managed resources are highly vulnerable to extreme heat and warm nights, drought, wildfire, and landslides.
- Buildings and facilities in Camarillo are highly vulnerable to extreme heat and warm nights, wildfire, and air quality.
- Critical infrastructure and services are highly vulnerable to all climate hazards, including extreme heat/warm nights, wildfire, landslides, riverine and stormwater flooding, and air quality.

This report establishes a foundation for identifying adaptation policies and programs that can increase resilience in Camarillo. The City of Camarillo Safety Element Update will include policies and programs to increase the resilience of the population groups and asset categories with the highest vulnerability to climate change.

Vulnerability Score for Population Groups and Assets

Climate Hazard	Impact Score	Adaptive Capacity Score	Vulnerability Score
Vulnerable Populations			
Extreme Heat/Warm Nights	High	Medium	4- High
Drought	High	High	3- Medium
Wildfire	High	Medium	4- High
Landslides	Medium	Low	4- High
Riverine and Stormwater Flooding	Medium	Medium	3- Medium
Air Quality	High	Low	5- Very High
Natural and Managed Resources			
Extreme Heat/Warm Nights	High	Low	4- High
Drought	High	Low	4- High
Wildfire	High	Medium	4- High
Landslides	High	Low	4- High
Riverine and Stormwater Flooding	High	Medium	3- Medium
Air Quality	Medium	Medium	3- Medium
Buildings and Facilities			
Extreme Heat/Warm Nights	Medium	Low	4-High
Drought	Low	Low	3-Medium
Wildfire	High	Medium	4-High
Landslides	Medium	Medium	3-Medium
Riverine and Stormwater Flooding	Medium	Medium	3-Medium
Air Quality	Medium	Low	4-High

Climate Hazard	Impact Score	Adaptive Capacity Score	Vulnerability Score
Critical Infrastructure and Services			
Extreme Heat/Warm Nights	High	Medium	4- High
Drought	High	High	3- Medium
Wildfire	High	Medium	4- High
Landslides	High	Low	5- Very High
Riverine and Stormwater Flooding	High	Medium	4- High
Air Quality	Medium	Low	4- High

This assessment is a starting point for identifying adaptation policies and programs that can increase resilience in the city of Camarillo. The City of Camarillo Safety Element Update will include policies and programs that provide resilience benefits to the population groups and asset categories in Camarillo with the highest vulnerability.

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