



INTRODUCTION

The purpose of the Safety Element is to reduce the risk of death, injury, property damage, environmental damage, and economic and social dislocation associated with natural and human-caused hazards. Napa County faces the potential for natural and human-induced emergencies and disasters. Hazards to the county that are addressed in this Element include agricultural disaster, dam failure, drought, flooding, geologic and seismic hazards, hazardous materials, pandemic disease, severe weather, slope failure, and wildfire hazards. Many of these hazards are made worse by climate change, a topic also addressed in this Element.

This Safety Element identifies and describes each hazard and lists goals and policies to guide the planning and decision-making processes. At the same time, it implements these policies and actions, the County recognizes that the features that contribute to Napa County's beauty and wine industry—steep mountains, volcanic soils, numerous rivers and streams, forest-covered slopes—are themselves reminders of the ongoing potential for seismic activity, flooding, and fire. This Element therefore seeks to take a reasonable approach, making those improvements necessary to reduce hazards while recognizing that some hazards will remain despite the best efforts of the County and other agencies.



STATUTORY REQUIREMENTS

California Government Code Section 65302(g) identifies the requirements that should be addressed in a community's general plan safety element. These requirements are organized into nine subsections—65302(g)(1) through 65302(g)(9)—as summarized below.

- Section 65302(g)(1) identifies the primary hazards and issues that should be addressed in the safety element: seismically induced surface rupture, ground shaking, ground failure, slope instability leading to mudslides and landslides, tsunamis, seiche, dam failure, flooding, subsidence, liquefaction, other geologic hazards, wildland and urban fires, evacuation routes, military installations, peak-load water supply requirements, and minimum road widths and clearances around structures, as those items relate to identified fire and geologic hazards.
- Section 65302(g)(2), adopted through Assembly Bill (AB) 162 (2007), identifies the requirement to identify information regarding flood hazards, update floodplain mapping as needed based on specified information for the community and to establish a set of comprehensive goals, policies, and objectives.
- Section 65302(g)(3), adopted through Senate Bill (SB) 1241 (2012), identifies the requirement to update wildfire mapping, information, and goals and policies to address wildfire hazards.
- Section 65302(g)(4), adopted through SB 379 (2015), identifies the requirement to update the safety element to address potential impacts of climate change and potential strategies for adapting to and mitigating these hazards.
- Section 65302(g)(5), adopted through SB 99 (2019), requires the identification of specified evacuation constraints associated with residential developments.
- Section 65302(g)(6), adopted through SB 1035 (2018), requires the update of the safety element every time the housing element or local hazard mitigation plan is updated.
- Section 65302(g)(7) allows for the incorporation of a floodplain management ordinance into the safety element.
- Section 65302(g)(8) requires consultation with the California Geological Survey and California Office of Emergency Services.
- Section 65302(g)(9) allows cities to adopt a county's safety element if adequate detail is provided to address city-level concerns.

Additionally, California Government Code Section 65302.15, adopted through AB 747 (2019), includes the requirement to identify evacuation routes and their capacity, safety, and viability under a range of emergency scenarios.

SAFETY ELEMENT EXISTING CONDITIONS REPORT

The Safety Element Existing Conditions Report (**Appendix A**) provides detailed information on existing hazards, community vulnerabilities, and County capacity to respond to hazards. The information in the report provides the foundation for the update of the Safety Element, including the formulation of goals and policies. Refer to the Existing Conditions Report in Appendix A, as well as the Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) described below, for the most up-to-date and comprehensive information on the hazards affecting Napa County.



RELATIONSHIP TO OTHER GENERAL PLAN ELEMENTS

The hazards discussed in the Safety Element are related to other elements of the General Plan, including Land Use, Circulation, Housing, Community Infrastructure and Services, and Conservation and Open Space and Water Resources. For instance, policies related to areas at risk of recurring flooding, dam failure, slope failure, and wildfire are found in the Land Use and Conservation and Open Space Elements; policies associated with secondary access during an emergency are found in the Circulation Element; policies important to water resources are found in the Water Resources Element; and policies related to protecting critical facilities from hazardous threats are also found in the Community Infrastructure and Services Element. References to related policies are provided where appropriate within the Safety Element.

NAPA COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

In 2020, the County adopted the Napa County MJHMP 2020 Update, prepared in cooperation with the Cities of American Canyon, Calistoga, and St. Helena and the Town of Yountville. Because the MJHMP was a recent and comprehensive effort by multiple jurisdictions with a stake in overall public safety, this Safety Element draws broadly from this recently adopted plan. The Multi-Jurisdictional Local Hazard Mitigation Plan (MJHMP) for the Napa County planning area was developed in accordance with the Disaster Mitigation Act of 2000 (DMA 2000) and followed FEMA's Local Hazard Mitigation Plan guidance. The MJHMP incorporates a process where hazards are identified and profiled, the people and facilities at risk are analyzed, and mitigation actions are developed to reduce or eliminate hazard risk. The implementation of these mitigation actions, which include both short and long-term strategies, involves planning, policy changes, programs, projects, and other activities. The MJHMP includes a detailed assessment of prevalent hazards within the county, including a vulnerability assessment that illustrates how each hazard may affect populations, property, and critical facilities within the County's jurisdiction. The MJHMP presents a mitigation strategy and actions that work to achieve the greatest risk reduction based upon available resources. Many of these mitigation measures have been incorporated into the goals and policies of this Safety Element. The risk assessments for each hazard have been summarized and incorporated into this Element to serve as important background and context for the preparation of goals, policies, and actions.



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SAFETY HAZARDS IN NAPA COUNTY

Like many places in California, unincorporated Napa County is subject to a variety of potential safety hazards. Some derive from the natural environment; others result from human activities. The following discussion summarizes the safety and hazard topics relevant to Napa County.

- **Climate Change.** “Climate change” is defined as the significant and lasting alteration of global temperatures and weather patterns over a long period of time, caused by natural and human activity. Climate change has the potential to affect natural and human systems such as food production, water availability, public health, economic prosperity, and ecosystem biodiversity, sometimes creating or exacerbating hazards. Climate hazards include flooding, heat events, worsening air quality, wildfires, sea level rise, intensified droughts, and more. Because of its geographic location and environmental conditions, Napa County is expected to experience worsening impacts from air pollution, extreme weather, flooding, sea level rise, and wildfires. More specifically, regional air pollutants of ozone and fine particulate matter (PM_{2.5}) are of greatest concern to the County. Napa County’s valley environment makes the area particularly susceptible to the retention of pollution. Generally, agricultural activity, industrial operations, and truck traffic are the largest contributors to pollution.

In general, populations in unincorporated Napa County experiencing vulnerable conditions are the most at risk from climate change. Among the factors that influence a population’s vulnerability to climate change are income, race, linguistic isolation, access to health care, shelter, transportation, and access to preparedness information. Napa County has a large Hispanic population, much of which



consists of low-income agricultural workers and non-English speakers. These workers' low incomes and linguistic isolation place them at higher risk of experiencing climate change impacts and experiencing long-term effects of hazards. SB 379 (2015) identifies the requirement to update the safety element to address potential impacts of climate change and potential strategies for adapting to and mitigating these hazards. The goal of climate adaptation is to reduce impacts from current and future conditions, reduce system vulnerabilities, and increase long-term resilience. This means adjusting human behavior and systems.

- **Agricultural Disaster.** Napa County land is predominantly agricultural, famous for its grape vineyards and wine production. **Figure SAF-1** shows agricultural land uses in Napa County. Farmlands across Napa County are sensitive to natural and human-induced events, including climate change, which pose threats to the quantity, quality, and production timing of agricultural goods. "Agricultural disaster" specifically refers to impacts from natural disasters or human-induced events on agricultural lands. Most impacts on agriculture come from changes in climate conditions resulting in extreme heat, drought, or changing precipitation patterns. Other impacts can come from contaminated water bodies, land use changes, flooding, pandemic, pests, and wildfires. As climate change exacerbates environmental conditions, the severity and frequency of these threats will increase both on agricultural lands and in human populations.

Note to the Reader: For a discussion of the preservation of agricultural land and recovery from natural hazards, please refer to the County's Agricultural Preservation and Land Use Element.

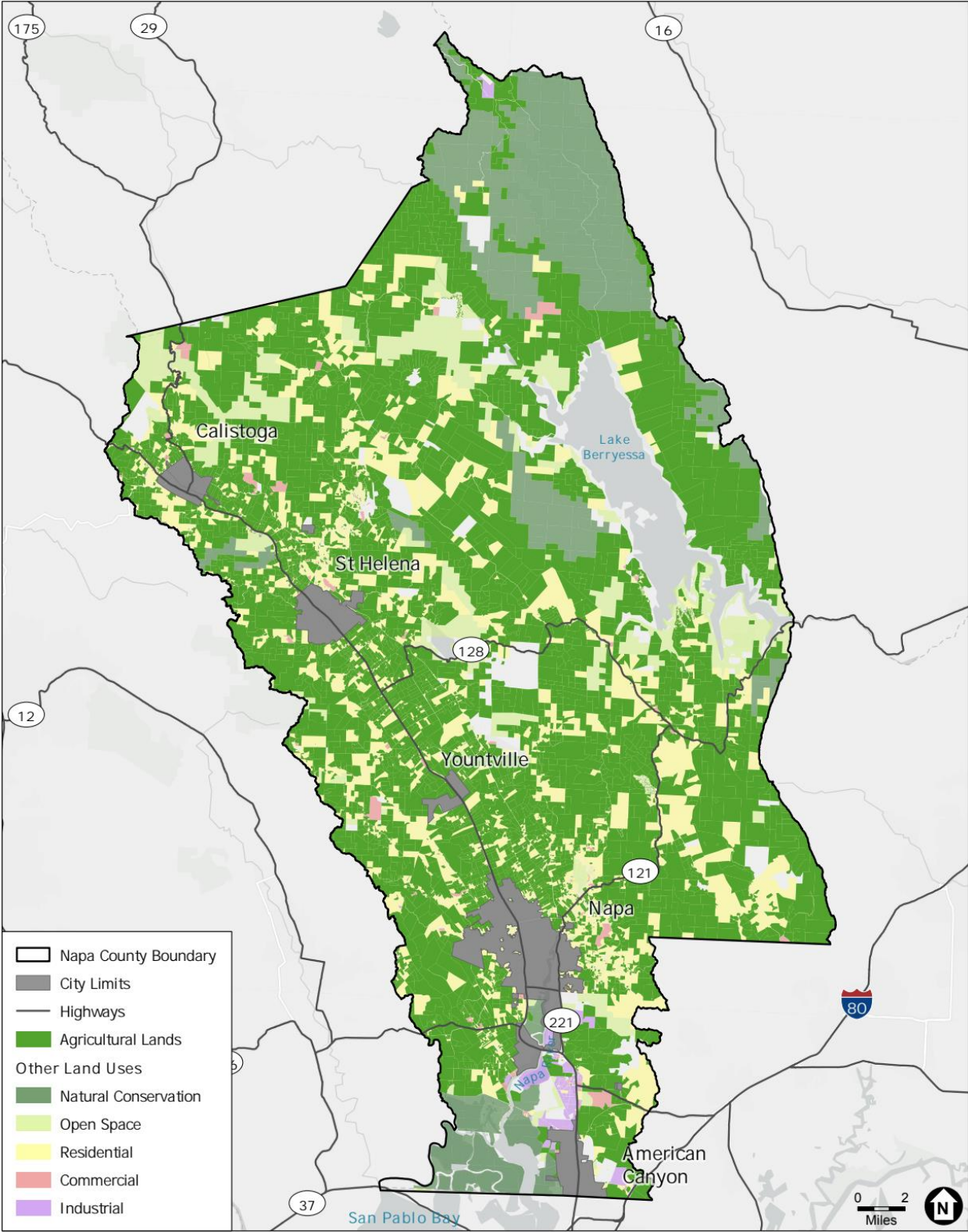


Figure SAF-1
Napa County Agricultural Lands



- **Dam Failure.** According to the California Department of Water Resources, Division of Dam Safety, there are 57 dams across Napa County. The United States Society on Dams identifies 12 different types of dams that are commonly found in the built environment. The MJHMP identifies two major types of dams that can be found in Napa County:

Earthen Dam—A dam made up mostly of compacted earth material generally smaller than 3 inches in size; also known as an “earthfill dam.” Oroville Dam, pictured at right, is one example of an earthen dam.



Concrete Gravity Dam—A dam constructed of concrete and/or masonry that relies on its weight and internal strength for stability. Shasta Dam is one example of a large concrete gravity dam.



The primary danger associated with dam failure is high-velocity flooding downstream of the dam and limited warning times for evacuation. Other potential secondary hazards of dam failure are landslides around the reservoir’s perimeter, bank erosion on the rivers, and destruction of downstream habitat. **Figure SAF-2** shows inundation zones for Napa County’s dams. The areas of the county most threatened by dam inundation are those along the Napa River corridor, including the cities of St. Helena, Yountville, and Napa. However, no dam failures have occurred in Napa County to date. Vulnerability varies by community and depends on the particular dam profile and the nature and extent of the failure.

- **Drought.** Droughts affect almost every county in California and have caused millions of dollars in collective damages. In Napa County, drought conditions have the potential to require water restrictions, reduce water quality, restrict recreational opportunities, worsen air quality, and create health and economic impacts. Napa County’s economy depends on a strong agricultural industry, which in turn provides the foundation for the county’s second largest industry, tourism. Drought could have a devastating and cascading impact on the wine industry and local economy, specifically by reducing agricultural productivity. A drought can cause farmers to be unable to plant crops or can lead to the failure of planted crops. These conditions result in a loss of work for farmworkers and those in food processing and winemaking jobs. In the event of long-term droughts, other water-dependent industries are commonly forced to shut down all or a portion of their facilities, resulting in further layoffs. A drought can harm water-based recreation providers (e.g., swimming pool companies, water parks, and river rafting operators), as well as landscaping businesses and nurseries because people will not invest in new plants if water is not available to sustain them.

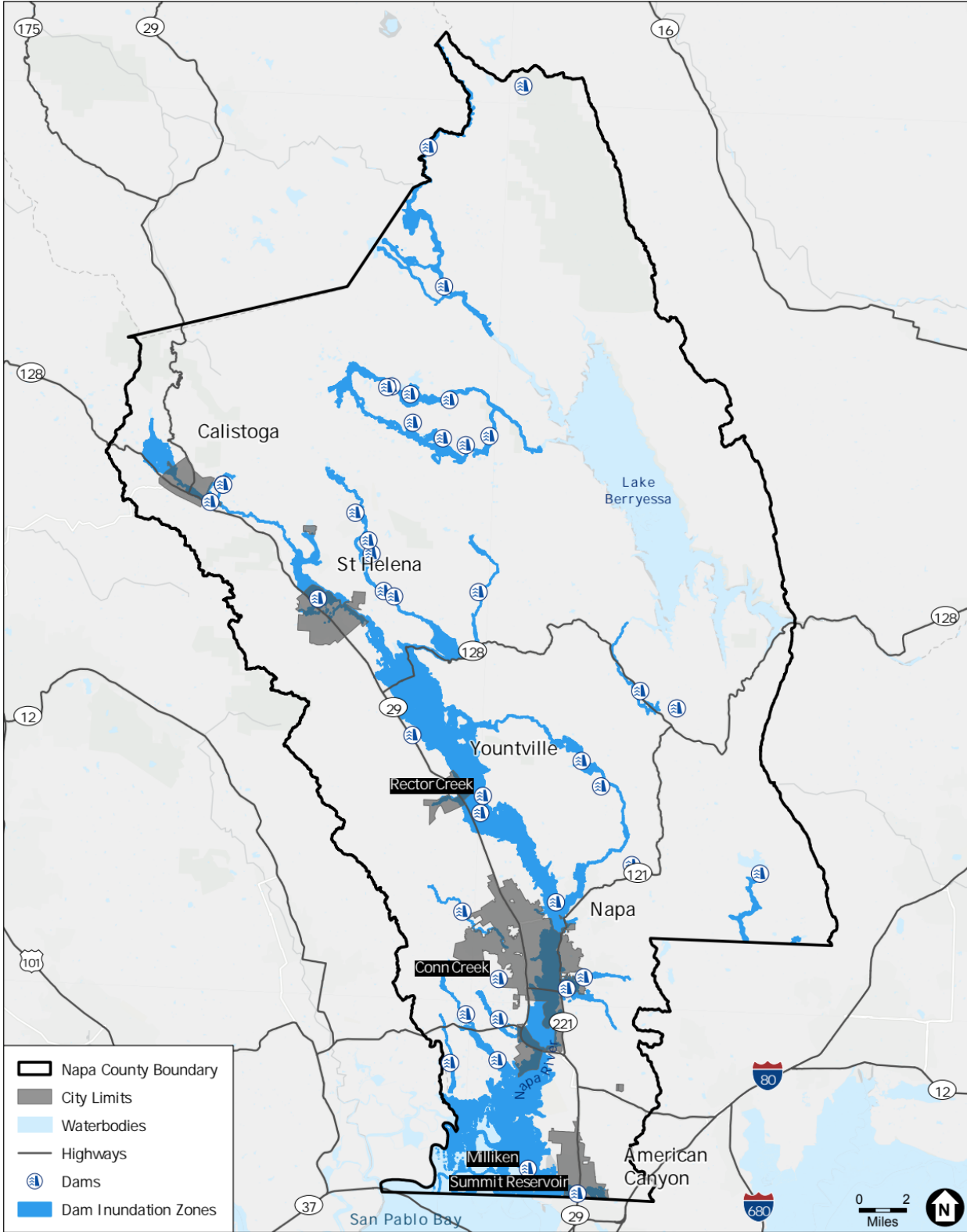


Figure SAF-2
Napa County Dam Inundation Zones



According to the National Drought Monitor, Napa County is currently experiencing Exceptional Drought conditions. Unlike hazards like wildfire and flooding, which provide direct impacts, drought produces a web of impacts extending beyond the areas experiencing physical drought. Drought vulnerability usually depends on water demand, the ways in which the demand is met, and the availability of water supplies to meet the demand. As a result of drought conditions and expected drought conditions moving forward, water demand in California is expected to increase. Climate change is expected to increase drought and extreme weather conditions. Although the duration of drought is always in question, it is certain that California and Napa County will continue to be affected by drought moving forward (California Drought Contingency Plan, 2013). As of 2021, the State of California has implemented statewide regulations and special projects in response to drought conditions. These types of regulations work to effectively manage water resources under drought conditions, thus ensuring community health and safety. Similar regulations have been enacted at the local level. The County has implemented several water conservation programs, including rebates for water-conserving appliances and free water-saving devices for residents; however, Napa County is still currently vulnerable to water supply issues because of drought and other factors.

- **Flooding.** To understand flood hazards, it is important to note that connections between a river and its floodplain are most apparent during and after major flood events. A “floodplain” is any land area susceptible to being inundated by floodwaters from any source. **Figure SAF-3** shows floodplains in Napa County, as mapped by the Federal Emergency Management Agency (FEMA). Flooding in Napa County most commonly occurs when existing stream channels, rivers, or other watercourses convey excess runoff from rainfall or snowmelt, resulting in overflow onto adjacent lands. Flooding may also be caused by high tides, extreme rain, and wind. All lands adjacent to the Napa River are subject to flooding. The Napa Valley floor has been subject to frequent flooding, resulting in severe damage to agriculture and urban development.

The Napa River/Napa Creek Flood Protection District is responsible for the effective management of and planning for resilience to catastrophic flooding along the river’s banks. Developed in collaboration between the district and the Napa County Department of Public Works and Napa County Community Coalition, the Napa River Flood Management Plan is a multi-objective and restorative approach to flood protection. Elements of the Napa River Flood Management Plan include bank terracing, bridge replacements, bypass channels, culverts, floodwalls, and levees. Once complete, the project will restore more than 650 acres of high-value tidal wetlands of the San Francisco Bay estuary while protecting 2,700 homes, 350 businesses, and more than 50 public properties from 100-year flood levels, a savings of \$26 million annually in flood damage costs. As of 2021, a number of project components have been completed. However, several components are still under construction, including the floodwalls/levees north of the Oxbow and bypass pump station, floodwalls and trail on the west side of the Napa River (Imola to Hatt), and floodwalls and trail on the east side of the Napa River.

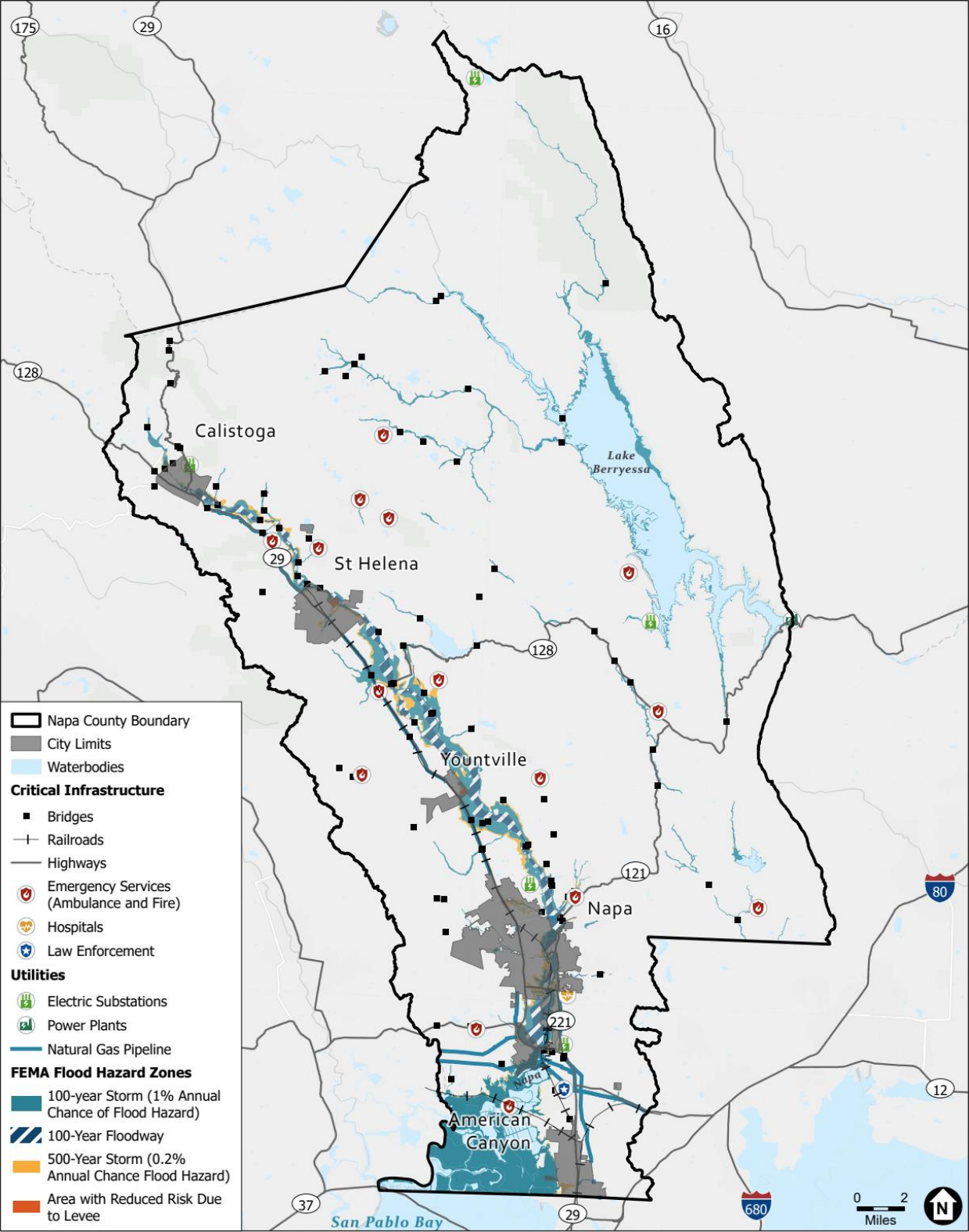


Figure SAF-3
Flood Zones and Critical Infrastructure/Utilities Exposure



- Tsunami.** Seismic sea waves, also known as tsunamis, result most commonly from earthquakes, but can also be caused by landslides or volcanic eruptions. An underwater disturbance close to the coast can result in a tsunami which reaches coastal communities within minutes (USGS, 2018). Strong currents and debris cause much of the damage inflicted by tsunamis and hazardous impacts include drinking water contamination and fires from ruptured gas lines (FEMA 2015). Tsunami hazard area maps from the California Geological Survey within the California Department of Conservation were updated in 2022 and display the most extreme tsunami potential from a variety of projected scenarios. Although the Napa County boundary resides inland from the coast, tsunami waves can travel much farther inland than normal waves. Tsunami waves from the Pacific Ocean can reach the County in areas which border parts of the San Pablo Bay. In the event of a tsunami residents and visitors are advised to move outside the hazard area as soon as possible. The tsunami hazard zones in Napa County lie adjacent to the San Pablo Bay in the southern part of the county surrounding the Napa-Sanoma Marshes Wildlife Area. **Figure SAF-4** maps the tsunami hazard inundation area in Napa County.
- Geologic and Seismic Hazards.** Earthquakes are identified as a priority hazard for Napa County, as five faults could affect the county. All people, property, and environments in the Napa County planning area would be exposed to direct and indirect impacts from earthquakes. **Figure SAF-5** shows the location of fault zones and the underlying quaternary faults near the county. In addition, the severity of an earthquake event could be aggravated by collateral emergencies such as fires, hazardous-material spills, utility disruptions, landslides, transportation emergencies, and potential failure of Napa County dams.

Seismic Faults. Two types of seismic faults exist in Napa County, as shown in Figure SAF-5:

“Normal faults” are those where two parts of the earth’s surface pass by each other.

“Thrust faults” are those where one part of the earth’s surface moves over another.

Earthquakes occur along either type of fault (normal or thrust) when the sideways or up-and-over movement is sudden and dramatic.
- Liquefaction.** Liquefaction occurs when land that is comprised of loose sand and silt shakes and behaves like a viscous liquid. Although most commonly caused by strong earthquakes, soil liquefaction can also result from construction practices such as blasting (USGS, 2016). When liquefaction occurs buildings may sink into the ground or become surrounded by liquefied soil. Liquefaction hazard reduction practices include ground stabilization to drain soil and increase soil density and strengthening of building foundations. **Figure SAF-6** maps the various zones of liquefaction susceptibility in the county.

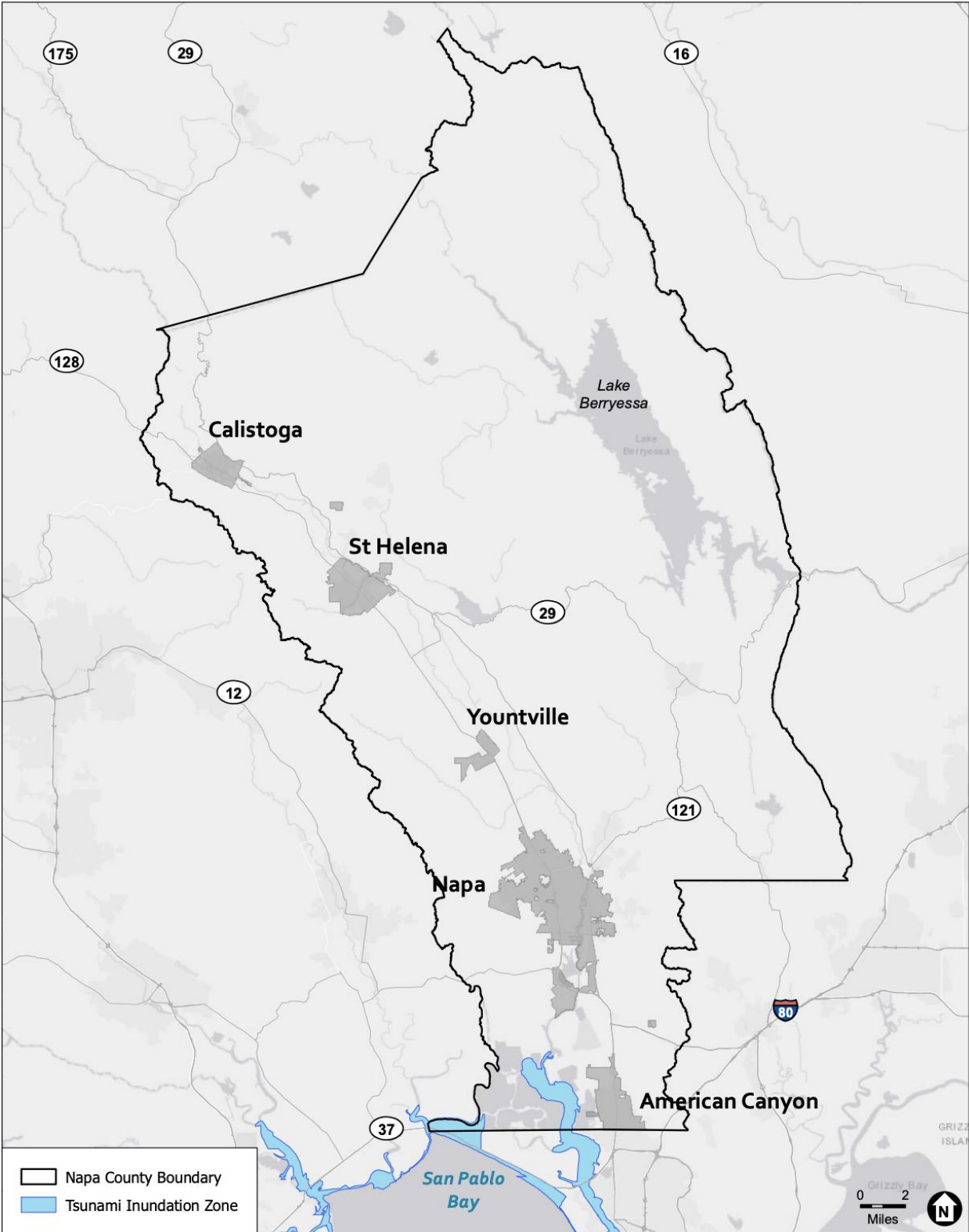


Figure SAF-4
Tsunami Inundation Zones

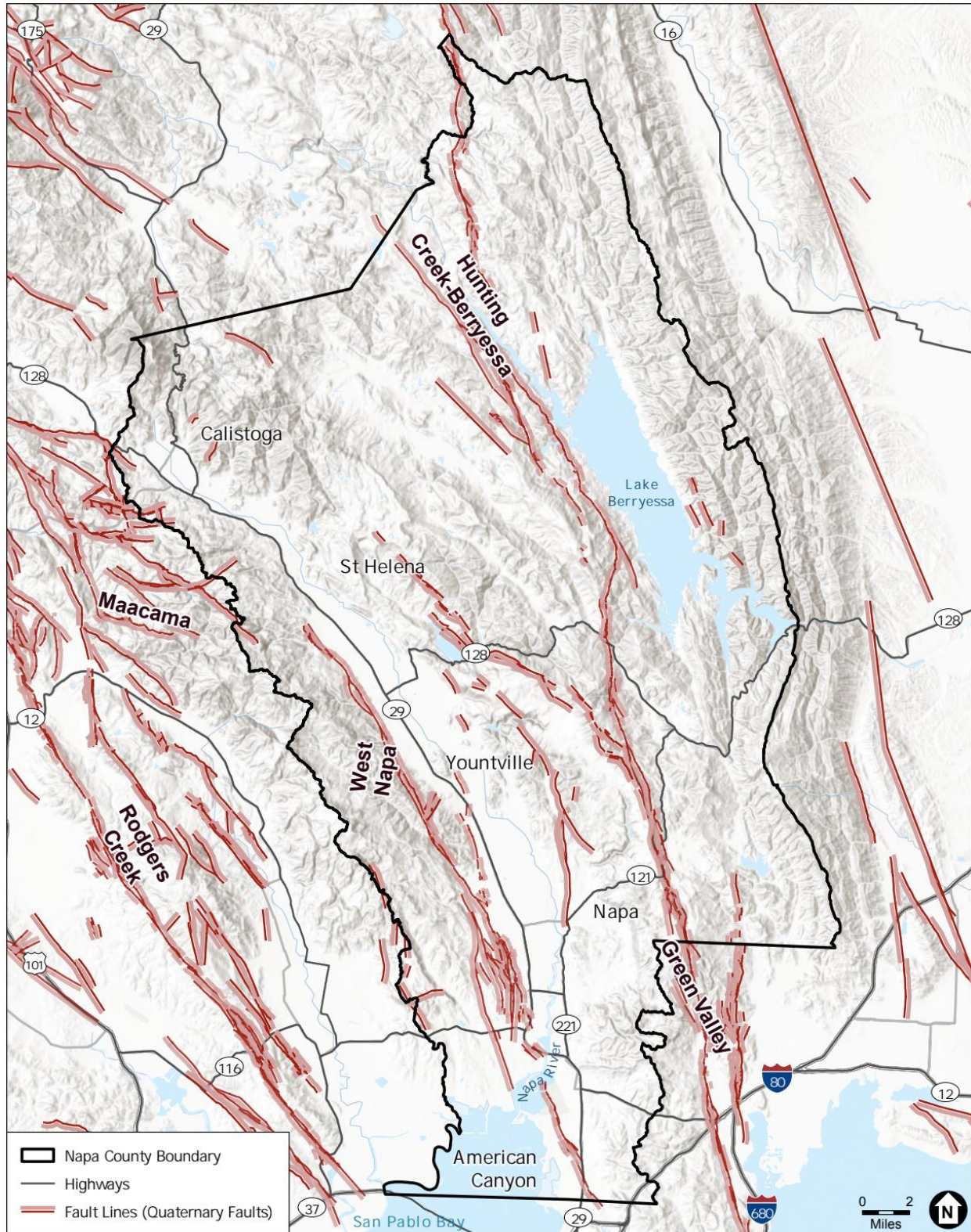


Figure SAF-5
Regional Fault Lines

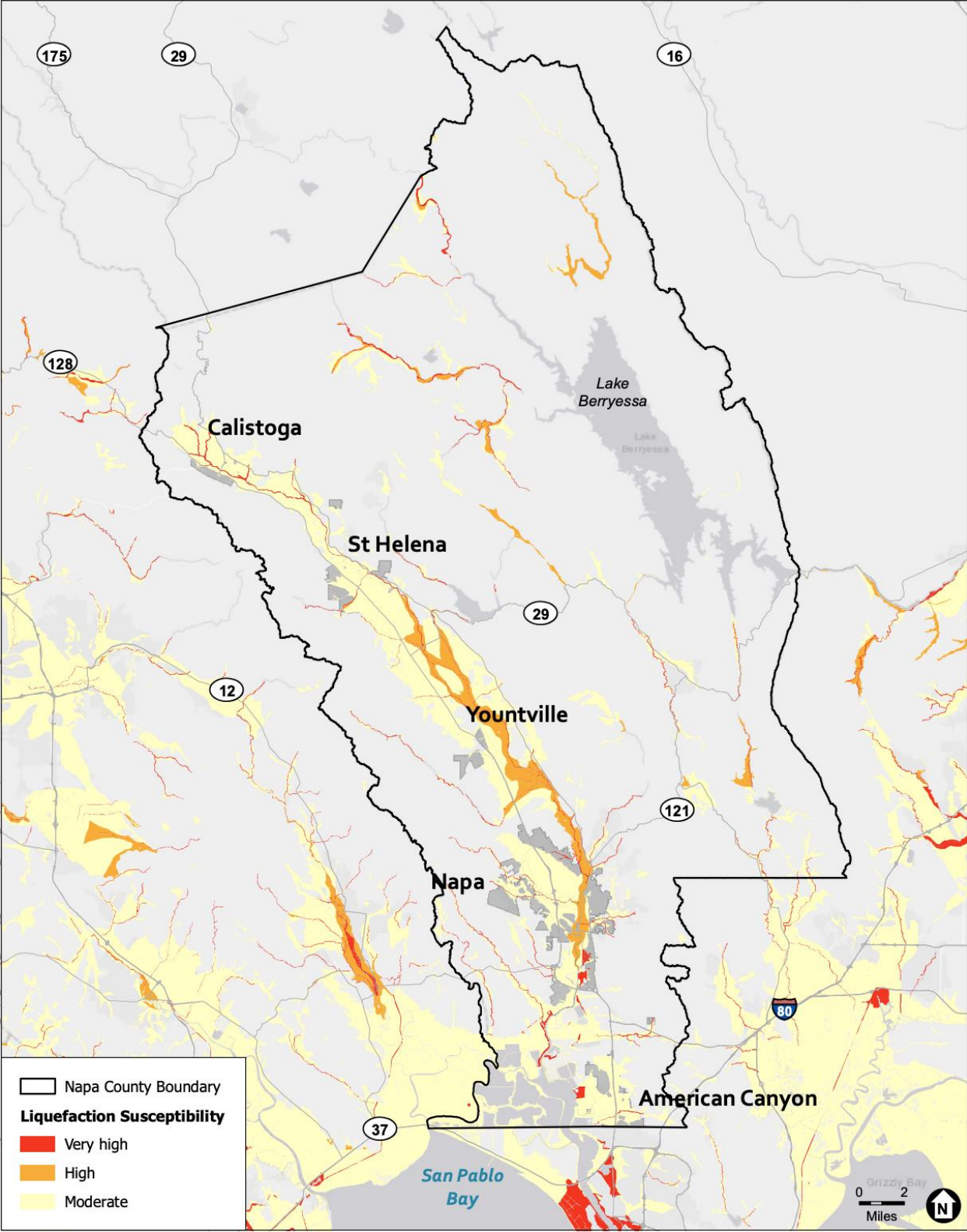


Figure SAF-6
Liquefaction Hazard Zones



- Hazardous Materials.** A “hazardous material” is defined in California Code of Regulations (CCR) Title 22 as a substance or combination of substances that may (1) cause, or significantly contribute to, an increase in mortality or an increase in serious illness; or (2) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of or otherwise managed (CCR Title 22, Section 66260.10). Hazardous materials can be found throughout any urban environment. In Napa County, hazardous materials include household hazardous waste; byproducts of industrial manufacturers and providers of diesel, gasoline, propane, lubricants, and compressed natural gas; and pesticides commonly used on vineyards. Areas where historical or ongoing activities have resulted in known or suspected releases of hazardous materials to soil and groundwater, and where current investigation and cleanup activities are located, are monitored by the U.S. Environmental Protection Agency (EPA), California Department of Toxic Substances Control (DTSC), and State Water Resources Control Board (SWRCB). Given the number of waste generators and hazardous materials facilities in Napa County, several federal, state, and local laws, policies, plans, and programs regulate hazardous materials. These laws and associated regulations include specific requirements for facilities that generate, use, store, treat, and/or dispose of hazardous materials. **Figure SAF-7** identifies the approximate locations of all hazardous materials sites from the collective databases regulated and/or maintained by EPA, DTSC, and the SWRCB, including toxic release sites, permitted underground storage tanks, hazardous waste facilities, hazardous waste cleanup sites, and groundwater cleanup sites.
- Pandemic Disease.** The U.S. Centers for Disease Control and Prevention define an “outbreak” as the occurrence of more cases of disease than normally expected within a specific place or group of people over a given period of time. An “epidemic” is a localized outbreak that spreads rapidly and affects many people or animals in a community. A “pandemic” is an epidemic that occurs worldwide or over a very large area and affects a large number of people or animals. Several major diseases have been found to be present in Napa County: Lyme disease, Rocky Mountain spotted fever, influenza, H1N1 flu, and COVID-19. Although not all will reach the level of pandemic, this Safety Element reviews each of these diseases, which are described in detail in Appendix A, the Safety Element Existing Conditions Report.

On June 15, 2021, Napa County aligned with the California Department of Public Health and the State of California to fully reopen, removing capacity limits and distancing restrictions for most businesses and activities. However, the County and other agencies across the San Francisco Bay Area continue to track a series of health indicators to monitor the impact of COVID-19 on the community. Making such data publicly accessible will ultimately work to assist the decision-making process and help to maintain community safety and a strong, functioning economy.

- Severe Weather.** Napa County experiences impacts from severe-weather conditions such as thunderstorms, powerful winds, heavy rains, hail, and heat waves. All people, property, and environments in the Napa County planning area are exposed to some degree to the impacts of severe-weather events. Populations living at higher elevations with large trees and surrounding power lines may be more susceptible to wind damage and blackouts, while populations in low-lying areas are at risk for possible flooding from increased rainfall. Vulnerable populations such as the elderly, low-income or linguistically isolated populations, the unsheltered, people with life-threatening illnesses, and residents of areas isolated from major roads have the potential to suffer to a greater extent during severe-weather events. Because severe-weather events consist of a suite of weather types that have the ability to affect the Napa County community as a whole, the ability to withstand these impacts lies in sound land use practices and consistent enforcement of codes and regulations for new construction. The most common problems associated with severe storms are immobility and loss of utilities.

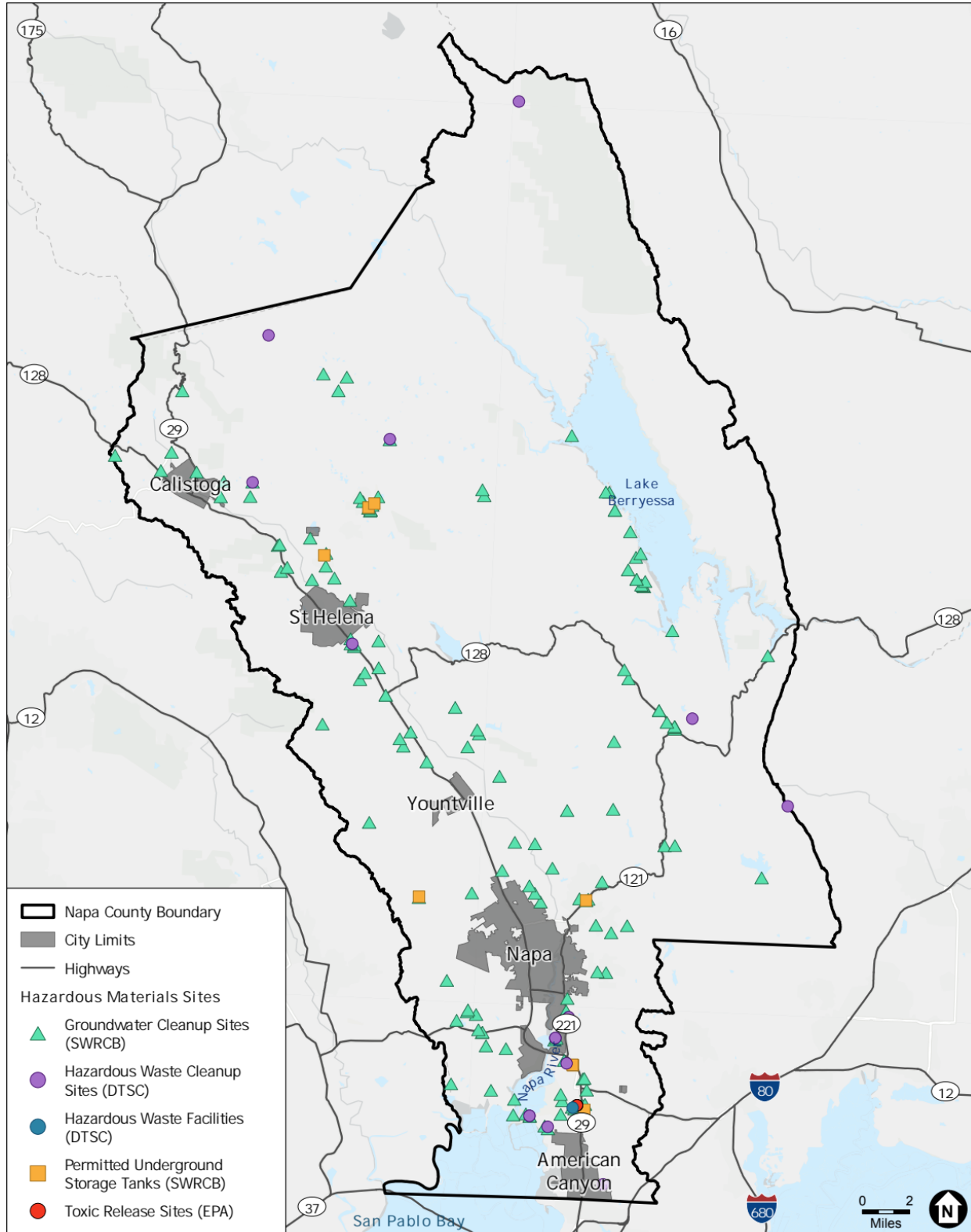


Figure SAF-7
Napa County Hazardous Materials Sites



- Slope Failure.** In Napa County, landslides and slope failure hazards pose a considerable threat to everyday services, including emergency response capabilities and transportation facilities. **Figure SAF-8** shows low, moderate, and high landslide susceptibility and vulnerable facilities in the county's unincorporated areas. Most of the high-susceptibility areas are in the hilly regions bordering the Napa Valley. Landslides are most frequently triggered during periods of high rainfall, which typically occur between November and April in Napa County. Seismic waves from earthquakes can also cause slope failure triggering landslides. Landslides caused by earthquakes are usually located on steeper and longer slopes than those triggered by heavy rainfall (American Geosciences Institute). Hazards are greatest in steeply sloped areas, although slides may occur on slopes of 15 percent or less if the conditions are right. Slope steepness and underlying soils are the most important factors affecting landslide hazards. However, surface and subsurface drainage patterns also affect landslide hazards, and vegetation removal can increase the likelihood of a landslide (Association of Bay Area Governments, 2018).
- Wildfire Hazard.** Historically, wildland fire risk in Napa County can be attributed to four factors: extreme vegetation diversity and density, volatile fire weather and fire behavior, dynamic fire history, and development in wildland urban interface (WUI) areas. Ignition sources, such as dry leaves, wood, and shrubs, and fuel loading are two ongoing factors of concern for Napa County residents. Ignition sources, or fuels, in the county include grass/oak woodland, 15- to 50-year-old chaparral, redwood forests, and timber more than 50 years old. Critical concerns arise when the dead-to-live ratio of chaparral exceeds 50 percent, and live fuel moisture approaches 60 percent in late summer and early fall (Strategic Fire Plan Sonoma-Lake-Napa Unit, 2017).

Fire Hazard Severity Zones Defined

California law requires the California Department of Forestry and Fire Protection (CAL FIRE) to identify "severity zones" in the state based on the severity of fire hazards that are expected to occur there. Severity zones are identified based on factors such as fuel, slope, and fire weather (CAL FIRE, 2021).

There are three zones, based on increasing fire hazard: medium, high, and very high.

In California, federal, state, local, and tribal organizations all have legal and financial responsibility for wildfire protection. To address jurisdictional responsibilities related to wildfire, in 1981 the California Legislature outlined various wildfire responsibility areas. In Napa County, the most prominent of these responsibility areas are State Responsibility Areas (SRAs) and Local Responsibility Areas (LRAs). **Figure SAF-9** illustrates the fire hazard severity zones in the SRA and the very high fire hazard zones in the LRA for Napa County. (Please refer to the most recent CALFIRE FRAPFHSZ for the most up to date map)¹. The County currently maintains agreements with all the fire agencies in Napa county, Solano, and Sonoma Counties as well as Napa City, American Canyon Fire Protection District, City of St Helena FD, Calistoga City FD, Schell Vista Fire Protection District and Cordelia Fire Protection District for assistance for all emergency incidents.

¹ The most recently updated SRA FHSZ maps were not publicly available at the time of production of this document. For the most recently updated SRA FHSZ maps please see: <https://calfire-forestry.maps.arcgis.com/apps/webappviewer/index.html?id=fd937aba2b044c3484a642ae03c35677>

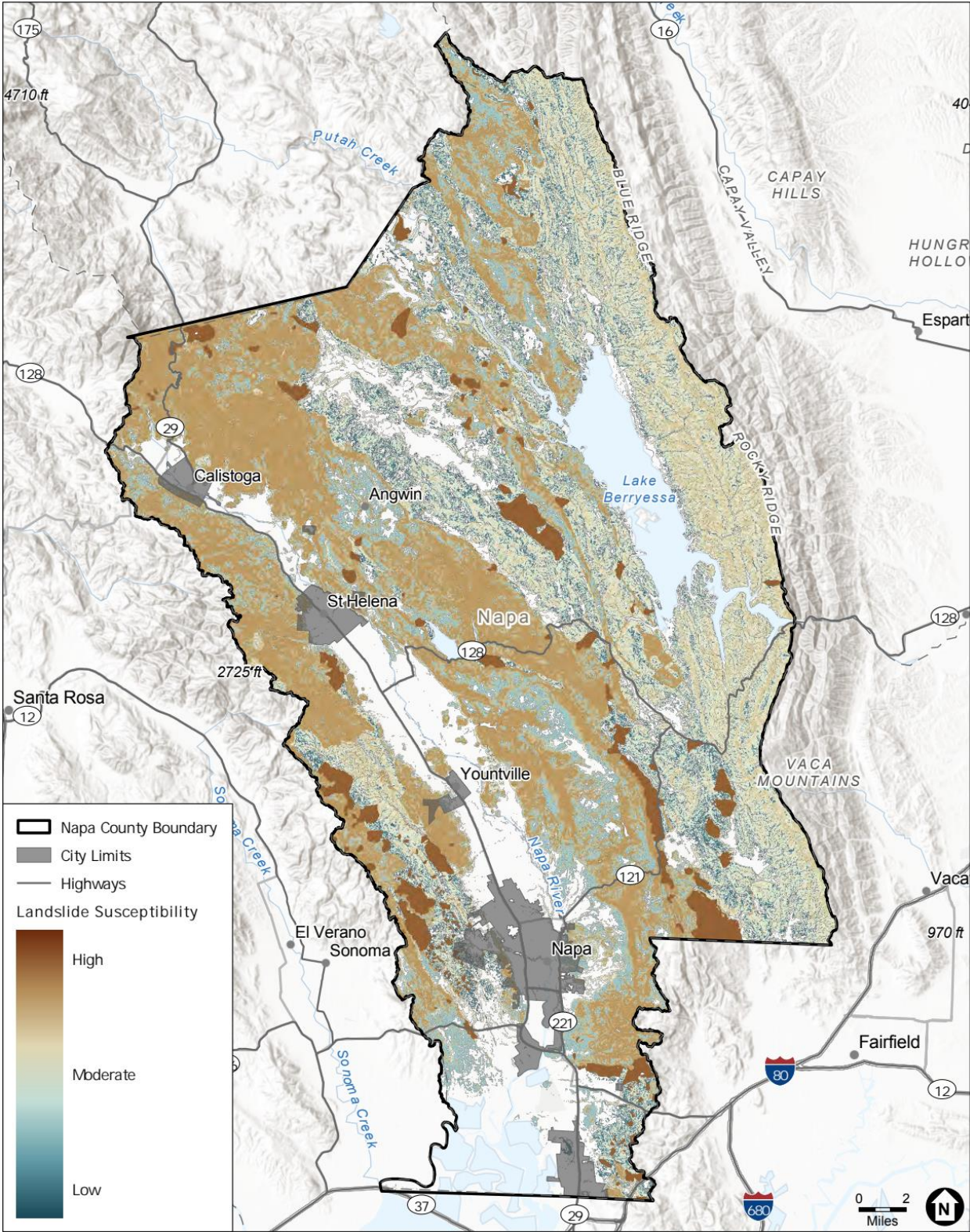


Figure SAF-8
Napa County Landslide Susceptibility

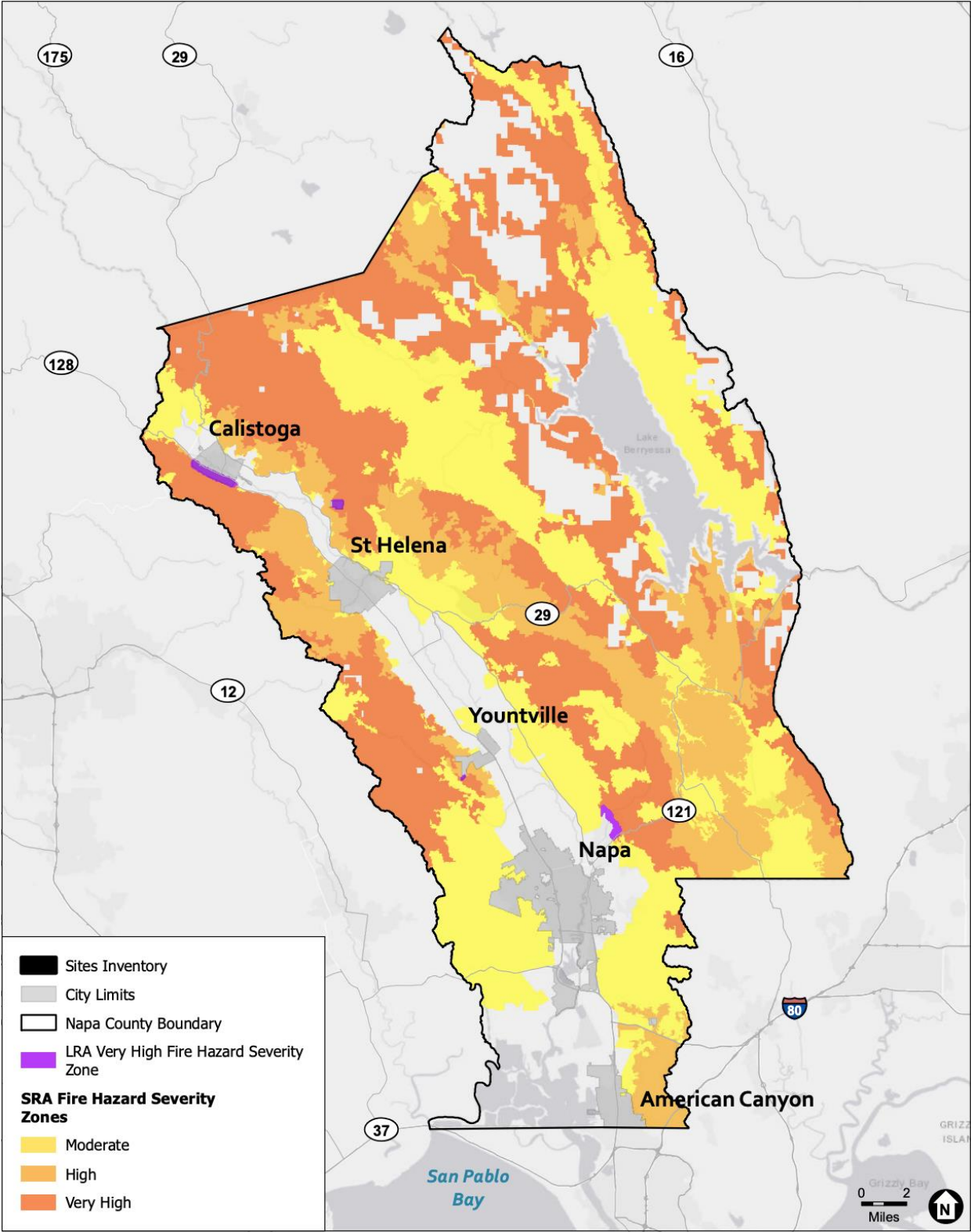


Figure SAF-9
Napa County Fire Hazard Severity Zones



The majority of past wildfire events in Napa County occurred during the summer months (typically June through August). Fire risk will continue to grow if more development is permitted in WUI areas, which increases fuel loads and the risk of human-caused fires. From 2000 to 2019, 10 wildfires—one of which was human-caused—burned more than 1,000 acres in Napa County (Napa County Office of Emergency Services, 2020). In Napa County, wildfires put lives and property at risk and compromise rivers and watersheds, open space, timberland, rangeland, recreational opportunities, historic and cultural assets, scenic resources, and local economies. Wildfire is of greatest concern to populations residing in the moderate, high, and very high fire hazard severity zones. **Figure SAF-10** shows Napa County's fire hazard severity zones, General Plan land uses, and vulnerable infrastructure. With regard to Figure SAF-10, the County currently has no areas lacking emergency service. As the local climate becomes warmer and drier and weather patterns become more volatile as a result, wildfire will remain a significant threat to the Napa County community. Climate change is projected to increase this current risk by anywhere from 10 to 20 percent, and the County will need to continue to adapt to this projected increase (Napa County Office of Emergency Services, 2020). This increase could cause additional threats to Napa County and has the potential to affect emergency services, roads, water supplies, housing access, and quality of life. While the County continues to increase its capacity to adapt to wildfire risk, goals and policies in this Safety Element will address site constraints with respect to wildfire hazards and potential impacts on community safety, as well as community education and preparedness.

- **Emergency Preparedness and Evacuation Planning.** Given current climate change, disasters including drought, severe weather, flooding, and other emergencies will likely increase in the coming years, making emergency preparedness even more important. Napa County has several organizations and plans that focus on how best to protect the public and the built environment in the event of a disaster. Disasters can include hazards such as fires, earthquakes, flooding, terrorism, hazardous waste accidents, and public health emergencies. These plans, which are listed throughout the text of the full Existing Conditions Report in Appendix A (including in the Resources section), include not just disaster response, but also recovery after the disaster. Overall, the Napa County Emergency Operations Division oversees the emergency operations plans, called the Concept of Operations Base Plan (CONPLAN). Because of the potential for increased wildfires and flooding in Napa County and the state, and because these types of disasters require coordinated evacuations to save lives, the State of California has enacted two new laws that focus on improvement of evacuation planning. Emergency evacuation—of residents, businesses, and in particular, vulnerable communities—has become an important focus of emergency preparedness. This recently enacted legislation requires that cities update their safety elements to identify and evaluate evacuation routes. AB 747 specifically requires that safety elements be updated to identify evacuation routes and assess the capacity, safety, and viability of those routes under a range of emergency scenarios. SB 99 similarly requires the agencies to identify residential developments in hazard areas that do not have at least two emergency evacuation routes. This information about emergency evacuation routes is shown in the maps found in **Appendix B**. These six maps identify areas and communities with only one access route, particularly in residential areas, and distances to evacuation gateways, or destinations for the three different evacuation scenarios described in Appendix B. The evacuation route analysis in this Safety Element is primarily concerned with (and planning for) wildfires as the cause of emergency evacuations. The County assumes that other natural disasters such as flooding and earthquakes do not require large-scale, concentrated travel over long distances or constrained time frames; response efforts related to these disasters are coordinated by the Emergency Operations Plan.

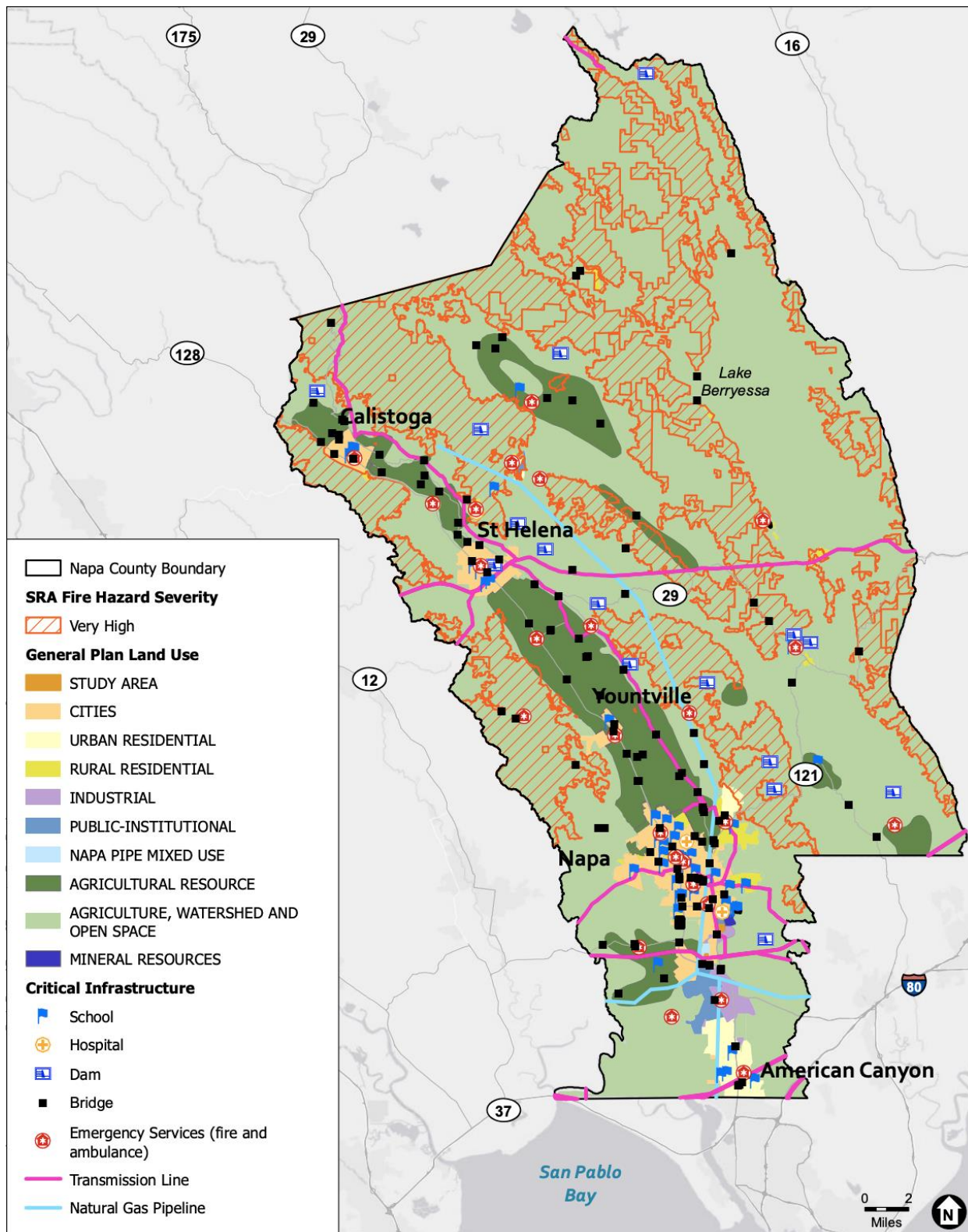


Figure SAF-10
Napa County Fire Hazard Severity Zones, General Plan Land Uses and Vulnerable Infrastructure

SAFETY ELEMENT GOALS AND POLICIES

EMERGENCY PREPAREDNESS

Goal SAF-1: Safety considerations will be part of the County's education, outreach, planning, and operations in order to reduce loss of life, injuries, damage to property, and economic and social dislocation resulting from fire, flood, geologic, and other hazards.

Policy SAF-1.1: **Promote intergovernmental cooperation and training.** The County supports and will promote intergovernmental cooperation among local, state and federal public agencies to reduce known hazards, further define uncertain hazards, and provide interagency training to effectively respond and coordinate during hazardous events. In particular, the County will work to develop cooperative working relationships with agencies having responsibility for flood and fire protection.

Action Item SAF-1.1a: **Education programs.** Participate in local, regional, and state education programs regarding fire, flood, and geologic hazards.

Action Item SAF-1.1b: **Safety training.** Work to ensure that all County fire departments and local law enforcement as well as other emergency office staff identify potential hazardous and cascading hazardous events and perform regular trainings biannually.

Policy SAF-1.2: **Provide up-to-date information.** Individuals and businesses should have access to up-to-date information which allows them to collaborate with regional agencies and community-based organizations to expand communications, to improve hazard preparation and response, and be able to make informed decisions about potential safety hazards and the level of risk they are willing to accept.

Policy SAF-1.3: **Evaluate safety hazards.** The County shall evaluate potential safety hazards when considering General Plan Amendments, rezoning, or other project approvals (including but not limited to new residential developments, roads or highways, and all structures proposed to be open to the public and serving 50 persons or more) in areas characterized by:

- 1) Slopes over 15 percent,
- 2) Identified landslides,
- 3) Floodplains,
- 4) Medium or high fire hazard severity,
- 5) Former marshlands, or
- 6) Fault zones.

Policy SAF-1.4: **Perform post-disaster evaluation.** Following disasters conduct an evaluation of redevelopment, particularly after large fires.



- Policy SAF-1.5: **Provide for continued high level of service.** Encourage intergovernmental and regional cooperation directed toward providing for a continuing high level of public services and coordination of services during a disaster.
- Policy SAF-1.6: **Develop intra-county evacuation routes.** The County shall cooperate with other local jurisdictions to develop intra-county evacuation routes to be used in the event of a disaster within Napa County.
- Policy SAF-1.7: **Plan for self-sufficiency.** Planning and outreach should recognize that Napa County may be cut off from surrounding areas following a natural disaster and may need to be self-sufficient in terms of providing emergency services, information, and support to residents and businesses.
- Policy SAF-1.8: **Support individual self-reliance.** The County supports and encourages the development of individual self-reliance in the wake of a disaster and supports and encourages individual, family, and community disaster plans. Annually, the County will distribute the Emergency Preparedness Guide to all households and businesses.
- Policy SAF-1.9: **Assessment of future emergency service needs.** Prepare an assessment and projection of future emergency service needs as part of the County's future General Plan Land Use Element Update and Master Fire Plan, and ensure that future growth projections are coordinated with emergency and fire service capacity and delivery.
- Policy SAF-1.10: **Increase workforce housing.** Support increasing the supply of workforce housing. Sufficient workforce housing will likely increase the number of Napa County's first responders living locally, allowing them to be immediately available in the event of a disaster or other emergency.
- Policy SAF-1.11: **Update evacuation routes.** In the next update to the MJHMP identify evacuation routes and their capacity, safety, and viability under a range of emergency scenarios.

Note to the Reader: Please refer to the Housing Element for policy and programs related to workforce housing development and worker proximity housing programs.

Goal SAF-2: The County will be prepared in the event of a disaster to protect residents and businesses from impacts and further harm, while beginning post-disaster reconstruction of uses destroyed by hazards or natural disasters as soon as reasonable.

- Policy SAF-2.1: **Engage private sector in disaster response and recovery.** The County encourages the involvement of the private sector in disaster response and post-disaster recovery efforts.
- Policy SAF-2.2: **Utilize diverse communication technologies.** The County supports the use of communication technologies to transmit information to other agencies and the public during emergencies, including:
- Alert Napa County emergency alert system.
 - Integrated Public Alert and Warning System (IPAWS).



- Social media operated by Napa County, the Napa County Sheriff's Office, the Napa County Fire Department, and other public safety agencies and municipalities.
- Other systems to provide outreach to residents without telephone or Internet service.

Policy SAF-2.3: **Maintain structural and operational integrity of essential public services.** The County will seek to maintain the structural and operational integrity of essential public services during flooding events and other natural disasters, including through the location of new essential public facilities outside of flood hazard zones when feasible. All critical public infrastructure intended for emergency use shall be provided with a source of alternate power.

Policy SAF-2.4: **Expedite disaster recovery programs.** The County's emergency services program shall be authorized to review and expedite implementation of appropriate federal, state, regional, and local disaster recovery programs. This may include but not be limited to:

- Preparation of potential mass care facilities;
- Hospital reserve disaster inventory modules;
- Packaged disaster hospitals;
- Disaster assistance centers;
- Multipurpose staging areas;
- Emergency water, food, and medical supplies;
- Instruction leaflets;
- Emergency operating centers; and
- Emergency broadcast systems.

Policy SAF-2.5: **Protect the frail during hazard events.** The County shall work with municipalities, emergency response providers, and others to develop plans and procedures for identifying frail individuals during weather emergencies (including heat waves, storms, and floods), and to mobilize resources for providing transport, shelter, or other assistance as needed.

Policy SAF-2.6: **Maximize Alert Napa County registrations.** Maximize citizen registration on Alert Napa County to provide consistent emergency and community notifications and ensure the greatest reach possible.

Policy SAF-2.7: **Address mental health in emergency planning.** Mental health interventions and programs should be considered in any updates to the County's emergency services planning process. The County should work with the Napa County Department of Health and Human Services Agency to identify persons who may require special assistance or counseling related to emergency situations, including residents and workers. To the extent the County is aware of special needs populations that require special assistance following a disaster, responders should be made aware of these populations and implement programs to reach out to them.

Action Item SAF-2.7a: **Community mental health and physical preparedness survey.** Working with the Napa County Department of Health and Human Services Agency and Office of Emergency Services, prepare and disseminate a survey to all residents and workers or a subset (e.g., vulnerable communities, frontline workers) before Natural Hazards Awareness Week to raise awareness and gather information related to



the community's mental and physical preparedness surrounding the issue of climate change and emergency preparedness. The findings of this survey will help to inform the materials presented during Natural Hazards Awareness Week and other programs.

Policy SAF-2.8: **Increase seismic resistance for critical facilities.** Consistent with state and federal requirements, critical facilities should be provided with additional earthquake resistance and damage control to allow such facilities to remain operational after a disaster.

Policy SAF-2.9: **Disseminate emergency planning information.** The Agricultural Commissioner will coordinate with the Napa County Farm Bureau and other agricultural organizations to disseminate emergency planning information to all populations affected by hazards that particularly affect the agricultural industry, such as drought, severe weather, wildfires, flooding, and disease outbreaks or pandemics.

Policy SAF-2.10: **Update evacuation planning actions.** Using the methodology and conclusions from the Emergency Planning & Evacuation analysis in Appendix B, consider including the following actions in conjunction with established fire standards when formalizing plans for potential or imminent evacuation routes:

- Increase capacity through the use of contraflow lanes or shoulders.
- Manage traffic control, including through turn restrictions and route or ramp closures, to maximize outflows from evacuation areas.
- Clear fire-induced road closures more quickly.
- Prohibit or restrict street parking on high-hazard days.
- Continually improve communication systems and implement strategies that improve disaster alerts.
- Instigate dynamic route guidance and monitoring.
- Implement phased evacuations.
- Promote reductions in vehicle volumes during evacuations, such as by encouraging households to use only one vehicle to evacuate.
- Closely monitor power issues that could affect traffic signals and slow down evacuations.

Action Item SAF-2.10a: **Update municipal code and street codes for fire safety.** Update municipal and street codes to utilize minimum standards of fire safe codes and measures for access/evacuation routes.

Action Item SAF-2.10b: **Mitigation measures for evacuation routes.** Establish mitigation measures and improvement plans for inadequate evacuation routes.

Policy SAF-2.11: **Provide evacuation information to residents, businesses and tourists.** To improve emergency preparedness, inform residents, at-risk populations, businesses and tourists before large-scale evacuations regarding shelter locations, evacuation routes, defensible space and procedures for storing valued items or taking such items with them.

Policy SAF-2.12: **Require emergency action planning for single-access neighborhoods.** Work with every community identified as having only one access route to complete an emergency action plan, using guidance from the Napa County Office of Emergency Services.



- Policy SAF-2.13: **Require emergency action planning for communities exposed to fire and flooding.** Work with every community identified as at-risk to wildfire or flooding to complete an emergency action plan, using guidance from the Napa County Office of Emergency Services.
- Policy SAF-2.14: **Require emergency action planning for residential care and assisted living facilities.** Require all residential care and assisted living facilities to produce an emergency action plan, to ensure that these facilities are well prepared for a disaster and have alternative access plan and evacuation routes to protect vulnerable people during a disaster.
- Policy SAF-2.15: **Require emergency action planning for all critical facilities.** Require all critical facilities to produce an emergency action plan, to ensure that these facilities are well prepared for a disaster and are accessible during emergencies.
- Policy SAF-2.16: **Conduct hardening and redundancy for public safety buildings.** Conduct hardening for security and build redundant (power and other) capability into public safety buildings.
- Policy SAF-2.17: **Modify evacuation orders as appropriate for agricultural protection.** To protect agricultural resources, work with CAL FIRE to modify evacuation orders when advisable to allow farmers to reenter areas to save crops that could be lost during long-term evacuations.
- Policy SAF-2.18: **Limit development to protect life and property from dam failure and wildfires.** Review all new development proposals relative to dam failure inundation maps and areas subject to wildfire to recommend denial of or limits on development if necessary to protect life and property.
- Policy SAF-2.19: **Require dam operators to maintain regularly updated emergency action plans.** To reduce the risks of loss of life and property from dam failure, require all dam operators to maintain and regularly review and update their emergency action plans for all high and significant-hazard potential dams for Napa County.
- Policy SAF-2.20: **Prioritize capital improvements on evacuation routes in need of repair.** Prioritize capital improvements on evacuation or emergency access routes needing repair, maintenance, or replacement, especially in wildland urban interface areas.
- Action Item SAF-2.20a: **Assessment of roads.** Bi-annually, conduct and document an assessment of roads typically used as evacuation routes, create a list of potential hazards that could be mitigated, and resolve those issues on a priority basis as determined by the Public Works Director and as funding allows.
- Action Item SAF-2.20b: **Evacuation routes in dense rural communities.** With regard to the assessment of evacuation routes, emphasis shall be placed on roads used for evacuation from relatively dense rural communities, such as Berryessa Estates, Berryessa Highlands, and Angwin.
- Policy SAF-2.21: **Install backup generators in public facilities.** Install backup power generators for fire stations, pump houses, emergency shelters, and cooling centers.
- Policy SAF-2.22: **Agricultural disaster management.** Encourage addressing disaster management issues within the agricultural sector at more localized levels.



- Policy SAF-2.23: **Provide farmworkers with emergency protection resources.** Provide resources to protect farmworkers (e.g., facilities, education) in the event of an emergency situation such as a wildfire, extreme heat, extreme weather, flooding, or an earthquake.
- Policy SAF-2.24: **Offer agricultural training and networking resources.** Offer agricultural disaster training and networking opportunities for farmers and agricultural regulatory agencies.
- Policy SAF-2.25: **Develop a “Natural Hazard Awareness Week” campaign to educate and prepare community members.** In collaboration with the Napa Valley Community Organizations Active in Disaster, the Napa County Office of Emergency Services, and other interested County agencies, develop a “Natural Hazard Awareness Week” campaign and conduct corresponding outreach to the community and all interested parties. Activities will focus on flooding, earthquakes, and other natural hazards, including associated hazard functions, governing laws/regulations, mitigation strategies, and precautions. Outreach will also be conducted throughout the year, wherever possible.
- Policy SAF-2.26: **Coordinate with utility agencies when developing climate action plans.** Coordinate with utility agencies (such as the Napa Sanitation District) when developing climate action plan adaptations.
- Policy SAF-2.27: **Work with organizations to enhance disaster communication processes.** Continue to work and collaborate with the Napa Valley Community Organizations Active in Disaster to enhance communication in the event of a disaster.
- Policy SAF-2.28: **Provide an informational sheet outlining agency responsibilities and hierarchy during disaster management.** The Napa County Office of Emergency Services shall create, and then provide to all agencies and community-based organizations with responsibilities for emergency response, an informational sheet designating the hierarchy and specific roles and responsibilities of each agency or organization when responding to a disaster. This is to prevent confusion and inefficiency during disaster response.

DROUGHT

- Goal SAF-3:** To reduce the impacts caused by drought for residents and the business community.
- Policy SAF-3.1: **Develop a public water conservation campaign.** Work with the Napa County Flood Control & Water Conservation District to develop a public education campaign to encourage water conservation during drought.
- Policy SAF-3.2: **Continue to invest in programs that promote water conservation in Napa County’s agricultural industry.** Continue collaboration efforts between the Agricultural Commissioner, Napa County Groundwater Sustainability Agency, Napa County Resource Conservation District, University of California Cooperative Extension for Agriculture and Natural Resources, and the agricultural industry to develop actions and invest in programs that lead to increased water conservation and sustainability in Napa County’s vineyards, wineries, and farmland.
- Policy SAF-3.3: **Water monitoring devices.** Install water monitoring devices on government-owned facilities.



- Policy SAF-3.4: **Plant drought tolerant landscaping at public facilities.** Install drought tolerant landscaping at government-owned facilities.
- Policy SAF-3.5: **Update water conservation policies for landscaping.** Amend or revise water conservation regulations for landscape design.
- Policy SAF-3.6: **Outdoor watering conservation ordinance.** Adopt a new water conservation ordinance for commercial and residential land uses limiting outdoor watering.

GEOLOGIC AND SEISMIC

- Goal SAF-4:** To the extent reasonable, protect residents and businesses in the unincorporated area from hazards created by earthquakes, landslides, and other geologic hazards.

- Policy SAF-4.1: **Require a geotechnical study for new projects and modifications along known hazard areas.** Consistent with County ordinances, require a geotechnical study for new projects and modifications of existing projects or structures located in or near known geologic hazard areas, and restrict new development atop or astride identified active seismic faults in order to prevent catastrophic damage caused by movement along the fault. Geologic studies shall identify site design (such as setbacks from active faults and avoidance of on-site soil-geologic conditions that could become unstable or fail during a seismic event) and structural measures to prevent injury, death and catastrophic damage to structures and infrastructure improvements (such as pipelines, roadways and water surface impoundments not subject to regulation by the Division of Safety of Dams of the California Department of Water Resources) from seismic events or failure from other natural circumstances.

Action Item SAF-4.1a: **Make updated maps publicly available.** Updated maps should be made available to the public at County offices, on the County's Web site, and through other appropriate channels.

- Policy SAF-4.2: **Plant native vegetation on unstable slopes to minimize erosion and landslide potential.** As part of the review and approval of development and public works projects, planting of vegetation on unstable slopes shall be incorporated into project designs when this technique will protect structures at lower elevations and minimize the potential for erosion or landslides. Native plants should be considered for this purpose, since they can reduce the need for supplemental watering which can promote earth movement.

- Policy SAF-4.3: **Prohibit extensive grading where geological hazards are present.** No extensive grading shall be permitted on slopes over 15 percent where landslides or other geologic hazards are present unless the hazard(s) are eliminated or reduced to a safe level.

- Policy SAF-4.4: **New hillside parcels shall be large enough for site flexibility.** Newly created hillside parcels shall be large enough to provide flexibility in finding a stable buildable site and driveway location.

- Policy SAF-4.5: **Prohibit road dedication where geological hazards would require excessive county maintenance.** The County shall not accept dedication of roads (a) on or jeopardized by landslides, (b) in hilly areas, or (c) in areas subject to liquefaction, subsidence, or settlement, which, in the opinion of the Public Works Department, would require an excessive degree of maintenance and repair costs.



- Policy SAF-4.6: **Cave construction requirements.** Facilities constructed in caves shall be required to conform to access/egress and fire suppression requirements as determined by the County based on the cave's use or occupancy. Mechanical, electrical, and plumbing permits are required for cave improvements, a building permit is required for the cave's portal, and a grading permit is required for movement or disposal of cave spoils.
- Policy SAF-4.7: **Regular review of slope failure maps.** Regularly update maps identifying all areas subject to slope failure, including locations of critical facilities and infrastructure that could be affected by the slope failure. This information can be used for improvement of public education and awareness, planning and public works projects, and development of a warning system.
- Policy SAF-4.8: **Slope stabilization projects.** Implement slope stabilization projects in the highest risk areas.
- Policy SAF-4.9: **Private critical facilities shall evaluate and address geological hazard resilience.** Encourage privately owned critical facilities (e.g., churches, hotels, other gathering facilities) to evaluate the ability of the buildings to withstand earthquakes and to address any deficiencies identified.
- Policy SAF-4.10: **Seismic retrofitting for county-owned critical facilities.** Retrofit County-owned critical facilities and buildings, increasing their capability to withstand earthquakes and liquefaction.
- Policy SAF-4.11: **Update and enforce seismic building codes.** Adopt and enforce updated building codes to reduce earthquake damage to structures.

DISEASE AND PANDEMIC

- Goal SAF-5:** It is the goal of Napa County to be prepared to effectively respond to an outbreak or disease.
- Policy SAF-5.1: **Upgrade existing hospitals.** Increase the capacity of existing hospitals through retrofits or upgrades with enhanced heating, ventilation, and air conditioning systems and isolation wings.
- Policy SAF-5.2: **Disseminate outbreak and disease information to agriculture sector.** Enlist the assistance of the Napa County Farm Bureau and other agricultural organizations to disseminate information and guidance to the agricultural sector regarding outbreaks and disease.
- Policy SAF-5.3: **Disease resources for vulnerable communities.** Focus education and health resources for disease control on the most vulnerable communities, which may include elderly residents, people with disabilities, African Americans, Latinx people, Pacific Islanders, and lower-income households. Provide all communication in multiple languages as needed by the population.
- Policy SAF-5.4: **Update insect identification and pest programs.** Collaborate with regional agencies and organizations to expand and improve insect identification and pest programs.



WILDFIRE

Goal SAF-6: It is the goal of Napa County to effectively manage forests and watersheds, and to protect homes and businesses from fire and wildfire and minimize potential losses of life and property.

Policy SAF-6.1: **Collaborate with other agencies for implementation of wildfire and hazard plans.** The County shall work with other agencies and organizations to implement the Community Wildfire Protection Plan (2021) and Multi-Jurisdictional Hazard Mitigation Plan (2021).

Policy SAF-6.2: **Maintain consistency with California codes.** Maintain consistency with California Code of Regulations Title 14 Natural Resources Division 1.5 Department of Forestry Chapter 7 - Fire Protection.

Action Item SAF-6.2a: **Update municipal code per state fire protection code.** Review and update the County Municipal Code as necessary to bring the Code into compliance with California Code of Regulations Title 14 Natural Resources Division 1.5 Department of Forestry Chapter 7 - Fire Protection.

Policy SAF-6.3: **Coordinate with fire agencies to plan for fire prevention and suppression needs.** The County shall coordinate with CAL FIRE and fire agencies in neighboring counties to plan for future fire prevention and suppression needs including identifying future water supply for fire suppression needs.

Policy SAF-6.4: **Minimize hazards in high wildland fire hazard areas.** Avoid or minimize new residential development in the VHFHSZ. If new development occurs within the VHFHSZ's the County will ensure the most current State and Local Fire Regulations and Codes will be applied such as the State Fire Safe Regulations, Fire Codes, Defensible Space and utilize the most current State Home Hardening recommendations.

Action Item SAF-6.4a: **Develop standards for development in high fire hazard severity areas.** Develop site criteria and construction standards for development in high fire hazard areas and adopt standards to restrict urbanizing these areas as defined in Policy AG/LU-27 unless adequate fire services are provided.

Action Item SAF-6.4b: **Implement "Napa Firewise."** Continue to implement "Napa Firewise" through information and education programs, community outreach, and fuel modification.

Note to the Reader: Please refer to the Agricultural Preservation and Land Use Element for policy related to the reconstruction of uses destroyed by fire or natural disaster.

Policy SAF-6.5: **Support prescribed fuel management programs.** The County supports the use of prescribed fuel management programs, including prescribed burns and brush clearing, for managing fire hazardous areas; to reduce wildfire hazard, improve watershed capabilities, promote wildlife habitat diversification, and improve grazing.



Note to the Reader: Please also refer to Policy CON-11 for related policy statements on this topic.

- Policy SAF-6.6: **Meet or exceed fire safety standards for county buildings and roads.** The County should set a good example and meet or exceed fire safety standards and defensible space requirements for all County buildings and roads.
- Policy SAF-6.7: **Support new technology in fire suppression and prevention.** The County supports the development and use of new technology in the suppression and prevention of fires.
- Action Item SAF-6.7a: **Develop improved methods of fire planning and firefighting.** The County will work with CAL FIRE to develop improved methods of fire planning and firefighting for use in Napa County.
- Policy SAF-6.8: **New development compliance with fire safety standards.** All new development shall prepare a fire protection plan that complies with established fire safety standards. Ingress and egress will be constructed utilizing the most current State Fire Safe Regulations, Fire Code, Napa County Road and Street Standards, and/or County Code that meets these minimum requirements. Fire protection plans shall be referred to the appropriate fire agency and other public agencies for comment as to:
- 1) Risk analysis.
 - 2) Location of anticipated water supply.
 - 3) Adequacy of water supply for new development (i.e. maintenance and long-term integrity).
 - 4) Adequacy of fire flow (gallons per minute) to extinguish a fire at the proposed development.
 - 5) Fire response capabilities including site design for fire department access in and around structures.
 - 6) Ability for a safe and efficient fire department response.
 - 7) Traffic flow and ingress/egress for residents and emergency vehicles.
 - 8) Fire safety requirements including site-specific built-in fire protection, defensible space, infrastructure, building ignition resistance, and fuel modification.
 - 9) Mitigation measures and design considerations for non-conforming fuel modification (i.e. fuel modification out of compliance with the County's and CALFIRE's Fire Safety Standards).
 - 10) Potential impacts to emergency services and fire department response.
 - 11) Maintenance of vegetative clearance on public and private roads.
 - 12) Wildfire education maintenance and limitations.
- Policy SAF-6.9: **Preserve and maintain fire prevention techniques.** The County shall preserve and maintain existing fire trails, defensible space, and community fire breaks.
- Policy SAF-6.10: **Maintain fire breaks.** The county will work with CalFire, Fire Safe Councils, public works, fire districts and any other community organizations to ensure that the fire breaks will be maintained; seek grant money – both Federal and State, to fund fire breaks and their long-term maintenance.



- Policy SAF-6.11: **Utilize guidance from the community protection plan.** Implement the guidance found in the Community Wildfire Protection Plan, and continue to work with the Napa Communities Firewise Foundation to implement new programs and techniques as the plan changes.
- Policy SAF-6.12: **Address and mitigate human causes of ignition.** Focus on human causes of ignition and address the problem through education and enforcement actions. Develop mitigation related resources for residents in high-hazard areas, including resources and best-practice guides for fuel reduction and building material retrofits.
- Policy SAF-6.13: **County chipper program.** Continue the County Chipper Program and monitor the success of the program for improvement or expansion.
- Policy SAF-6.14: **Assist private property owners with fuel reduction.** Continue and expand technical assistance to private property owners to implement fuel reduction around their homes and businesses. Develop and conduct a defensible space community education program with specific programs for populations deemed at-risk.
- Policy SAF-6.15: **Regularly update county defensible space ordinance.** Update the County's defensible space ordinance regularly as necessary to meet or exceed the CAL FIRE defensible space ordinance.
- Policy SAF-6.16: **Support neighborhood-based Firewise councils.** Foster and form neighborhood-based firewise councils, using grant funding to support their operation.
- Policy SAF-6.17: **Retrofit critical public safety infrastructure.** Retrofit critical public safety infrastructure with fire resistant materials and maintain defensible space around structures.
- Policy SAF-6.18: **Conduct prescribed burns.** Conduct prescribed burns as part of a wildfire mitigation strategy.
- Policy SAF-6.19: **Fire resilient retrofitting for care facilities.** Require care facilities (adult care, childcare) to retrofit with fire-resistant materials when upgrading and require facilities to maintain defensible space around their structures.
- Policy SAF-6.20: **Vegetation management projects.** Complete vegetation management projects as prescribed in the Community Wildfire Protection Plan.
- Policy SAF-6.21: **Construct fuel breaks and roadside treatment projects.** Construct shaded fuel breaks and complete roadside treatment projects as prescribed in the Community Wildfire Protection Plan.
- Policy SAF-6.22: **Require proper addressing and signage.** All streets and homes shall have proper addressing and signage in compliance with Napa County Fire Department to assist in wildfire emergencies.
- Policy SAF-6.23: **Move utility lines underground.** Work with utility providers to move aboveground lines underground.
- Policy SAF-6.24: **Improve egress in wildland urban interface areas.** Construct or improve egress for wildfire emergencies in wildland urban interface areas.
- Policy SAF-6.25: **Farmworker wildfire education.** Coordinate with the Napa County Farm Bureau to train farmworkers and increase their situational awareness in the event of a wildfire.



Policy SAF-6.26: **Location of public facilities.** With the exception of fire stations, where location is based on a variety of factors, all essential public facilities shall be located outside high fire risk areas, where feasible.

Policy SAF-6.27: **Implement fire safety and evacuation recommendations.** The County shall implement recommendations to improve fire safety and evacuation within existing subdivisions with only point of egress, pursuant to recommendations provided by the Board of Forestry and Fire Protection.

Action Item SAF-6.27a: **Mitigate non-conforming development.** Mitigate existing non-conforming development to contemporary fire safe standards, in terms of road standards and vegetative hazards.

FLOODING

Goal SAF-7: To protect residents and businesses from hazards caused by flooding.

Policy SAF-7.1: **Evaluate construction in new flood plains.** New construction in flood plains shall be evaluated and placed above the established flood elevation or flood-proofed to minimize the risks of flooding and provide protection to the same level as required under County's Floodplain Management Ordinance.

Policy SAF-7.2: **Maintain areas subject to flooding in agricultural or open spaces.** The County recognizes that agricultural open space also serves a valuable purpose in promoting safety, and that maintaining areas subject to flooding in agricultural or open space uses minimizes the impacts of flooding on homes and businesses.

Note to the Reader: Please refer to Figure SAF-3 in this Safety Element for a map of areas subject to flooding.

Policy SAF-7.3: **Review potential flood impacts for new proposed projects in a floodway.** The review of new proposed projects in a floodway as mapped on the County's Flood Insurance Rate Maps (FIRM)² (Figure SAF-3) shall include an evaluation of the potential flood impacts that may result from the project. This review shall be conducted in accordance with the County's FEMA approved Flood Plain Management Ordinance, incorporated herein by reference, and at minimum include an evaluation of the project's potential to affect flood levels on the Napa River; the County shall seek to mitigate any such effects to ensure that freeboard on the Napa River in the area of the Napa River Flood Protection Project is maintained.

Policy SAF-7.4: **Review development proposals with reference to dam failure.** Development proposals shall be reviewed with reference to the dam failure inundation maps in order to determine evacuation routes.

Policy SAF-7.5: **Ensure proper maintenance and repairs for dams and levees.** Dam and levee maintenance is considered by the County to be the responsibility of the owner/operator

² Flood Insurance Rate Map, Napa County, California, Map Number 06055CIND0A (index sheet), Effective Date: September 26, 2008



of each dam and/or levee. The County will support other agencies in their efforts to ensure that proper maintenance and repairs are accomplished.

- Policy SAF-7.6: **Mitigate flood risk in areas not under protection from Measure A.** Mitigate flood risk for flood-prone residential structures in areas not receiving direct protection from the Measure "A" Flood Project.
- Policy SAF-7.7: **Inform property owners in inundation areas about voluntary flood insurance.** Develop a public outreach program that informs property owners within the dam or levee inundation areas about voluntary flood insurance (preferred risk policies), increasing participation in the National Flood Insurance Program.
- Policy SAF-7.8: **Adopt a stream channel ordinance.** Draft and adopt a stream channel ordinance that would place responsibility for maintenance on the property owner and give Napa County enforcement power.
- Policy SAF-7.9: **Maintain warning gauges on local dams.** Construct, install, and maintain warning gauges on local dams as the opportunity or need arises.
- Policy SAF-7.10: **Create an inventory to replace culverts.** Create an inventory and priority list to replace culverts, taking into account fish passage, flood depth reduction, and future losses avoided.
- Policy SAF-7.11: **Improve dam risk assessments.** Improve risk assessments for dams located within the county.
- Policy SAF-7.12: **Farm work centers in flood risk areas.** Relocate farm work centers from flood risk areas.
- Policy SAF-7.13: **Retrofit bridges and culverts.** Elevate and or retrofit bridges and culverts to allow proper 100-year flows of stormwater.
- Policy SAF-7.14: **Improve stormwater basins.** Construct and/or improve stormwater basins countywide to accomplish 100-year protection.
- Policy SAF-7.15: **Reduce floodplain risk through regulatory standards.** Adopt higher regulatory standards as means of reducing future flood risk and supporting a *no-adverse-impact* philosophy of floodplain management.
- Policy SAF-7.16: **Elevate new structures above 100-year flood level.** Require all new or substantially improved structures to be elevated higher than the 100-year flood to provide a margin of safety for extreme weather events and short-term effects of sea level rise.
- Policy SAF-7.17: **National insurance flood insurance floodplain maps.** Ensure that all new and revised National Insurance Flood Insurance floodplain maps depict how the floodplain will change over time, especially concerning sea level rise. Communities and developers rely on these maps to guide siting, design, and construction of all housing, commercial development, and public infrastructure and these depicted floodplains should be areas where development is restricted (with elevation required) or prohibited.

Note to the Reader: The Conservation Element should also be consulted for policies related to short- and long-term erosion control on construction sites, vineyards, and other projects.



SEVERE WEATHER

Goal SAF-8: To reduce the impacts caused by severe weather events for residents and the business community.

Policy SAF-8.1: **Resources for vulnerable populations.** Organize outreach to vulnerable populations, including establishing and promoting accessible shelters in the community.

Policy SAF-8.2: **Informational campaign for 72-hr kits.** Develop a public information campaign on the details and benefits of 72-hour kits.

Policy SAF-8.3: **Procure backup generators for public meeting spaces.** Procure backup generators in the event that public meeting spaces such as community centers or town halls will be used as emergency command centers. Perform regular maintenance on generators at water treatment plants.

HAZARDS FROM HUMAN ACTIVITIES

Goal SAF-9: To protect residents and businesses from hazards caused by human activities.

Policy SAF-9.1: **Policy development for electromagnetic field safety.** The County shall continue to monitor research being conducted under the auspices of the California Public Utilities Commission (CPUC) to define acceptable levels of exposure to electromagnetic fields (EMF). Once a specific numerical standard for EMF exposure has been adopted by the CPUC, the County's policy shall be that residential development (and other sensitive land uses such as schools, hospitals, childcare sites) that would expose persons to EMF which exceeds the standard should generally not be permitted.

Policy SAF-9.2: **Contribute to the location of new or relocated electrical transmission lines.** The County shall seek to be part of the decision-making process for the location of new or relocated electrical transmission lines in order to ensure that line locations are coordinated with the County's land use plans and aesthetic policies.

Policy SAF-9.3: **Consider potential hazards resulting from the release of liquids.** Potential hazards resulting from the release of liquids (wine, water, petroleum products, etc.) from the possible rupture or collapse of aboveground tanks should be considered as part of the review and permitting of these aboveground tanks.

Policy SAF-9.4: **Review and remedy sites suspected or known to be contaminated by hazardous materials.** All development projects proposed on sites that are suspected or known to be contaminated by hazardous materials and/or are identified in a hazardous material/ waste search shall be reviewed, tested, and remediated for potential hazardous materials in accordance with all local, state, and federal regulations.

Action Item SAF-9.4a: **Require confirmation of remediation of contaminated sites from applicable government agencies.** The County shall require written confirmation from applicable local, regional, state, and federal agencies that known contaminated sites have been deemed remediated to a level appropriate for land uses proposed prior to the County approving site development or require an approved remediation plan that



demonstrates how contamination will be remediated prior to site occupancy. This documentation will specify the extent of development allowed on the remediated site as well as any special conditions and/or restrictions on future land uses.

Policy SAF-9.5: **Ensure safety of all people in maintenance and construction of roadways.** Safety shall be considered in the maintenance and construction of all new roadways and related improvements to provide a safe environment for all modes of transportation and ensure the safety of neighboring uses and sensitive receptors. Safety measures should factor in protection from potential hazardous material spills, where spills could contaminate adjacent property and water bodies. Safety measures should also consider the need to protect adjacent uses from roadway pollutions through the use of green buffers, sound walls and other design interventions. The special needs of elder and disabled persons shall be addressed when designing new or modifying signs. Examples of features specific to the elderly include:

- Signals which provide pedestrians with slower mobility the opportunity to cross roadways in greater safety by providing for longer crossing times.
- Increased lighting at pedestrian crossings.
- Pedestrian crossing surfaces which provide greater traction to reduce slips and falls.
- Audible and/or “countdown” crossing signals.

Policy SAF-9.6: **Review plan compatibility of zoning and land uses within airport areas and facilities.** For maximum safety, all land uses and zoning within airport areas shall be reviewed for compatibility with the adopted plans for the Napa County Airport, Angwin Airport, and other general aviation facilities in the area.

Policy SAF-9.7: **Review commercial and multifamily development for public safety.** All new commercial and multi-family development shall be referred to the Sheriff's Department for review of public safety issues. If the proposed project is adjacent to or within an incorporated city/town, consultation with their law enforcement agency shall also be required.

Policy SAF-9.8: **Terrorism and civil unrest emergency response.** The County will prepare for and respond to emergencies related to terrorism and civil unrest in the same way as natural and man-made disasters.

Policy SAF-9.9: **Reduce or cease activities that could cause hazards.** Monitor to reduce or cease activities by governmental and private companies and agencies that could cause the artificial induction of earthquakes or other hazards.

CLIMATE CHANGE ADAPTATION

Goal SAF-10: The County will address and reduce hazards caused by climate change, with climate change adaptation.

Policy SAF-10.1: **Encourage public utility agencies to analyze and prepare for impacts of sea level rise on facilities.** Encourage public utility agencies with utilities located within the Napa County boundaries, such as the Napa Sanitation District, to analyze the potential impacts of sea level rise on their facilities and possible solutions. Based on the analysis, plan for



and construct sea level rise protection. Include in the analysis the need for any other regional flood control projects.

- Policy SAF-10.2: **Sea level rise monitoring and public education.** Annually monitor for sea level rise that could affect private and public buildings and facilities. Create a comprehensive outreach strategy that informs residents in potentially affected areas of the county regarding efforts to protect and increase community resiliency to sea level rise.
- Policy SAF-10.3: **Napa county climate action plan.** Implement the adopted Climate Action Plan for Napa County and continue to update the plan as climate change conditions improve or worsen.
- Policy SAF-10.4: **Implement safety and preparation measures from the MJHMP.** Implement the recommendations and mitigation measures of the MJHMP to provide climate change adaption throughout the county. These mitigation measures address topics such as emergency power, emergency preparedness, sea level analysis, assistance to vulnerable populations and the agricultural community, and improvement of critical facilities and infrastructure.
- Policy SAF-10.5: **Fuel reduction in high wildfire risk areas.** Implement fuel reduction techniques around all buildings located within high-wildfire-risk areas.
- Policy SAF-10.6: **Cooling centers near farmworker populations.** Construct new cooling centers near farmworker populations and improve others if identified as substandard.
- Policy SAF-10.7: **Review climate change impacts on farmworkers.** Work with other relevant organizations to review the impacts of climate change on the health of farmworkers, and thereafter adopt strategies to decrease these impacts.
- Policy SAF-10.8: **Climate change impact risk assessment.** Support risk assessments of climate change impacts on the agriculture and wine industries.
- Policy SAF-10.9: **Rainwater catchment systems.** Construct rainwater catchment systems to recharge groundwater in government rights-of-way.
- Policy SAF-10.10: **Assist vulnerable populations with acquisition of air conditioning systems.** Develop programs that will assist low-income and elderly residents in replacing and being reimbursed for air conditioning systems.
- Policy SAF-10.11: **Develop alternative water supplies.** Construct and develop alternative water supplies to augment single sources of water delivery.



APPENDIX A

NAPA COUNTY SAFETY ELEMENT EXISTING CONDITIONS REPORT

Draft

NAPA COUNTY GENERAL PLAN

Safety Element – Existing Conditions

Prepared for
Napa County

April 2022

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1.0 Introduction

1.1 Purpose

The purpose of the Safety Element is to reduce the risk of death, injuries, property damage, environmental damage and economic and social dislocation associated with natural and human-caused hazards. The County of Napa faces the potential for natural and human-induced emergencies and disasters. Hazards facing Napa County that are addressed in this Element include: Agricultural disaster, dam failure, drought, flooding, geologic and seismic hazards, hazardous materials, pandemic disease, severe weather, slope failure, and wildfire hazards. Many of these hazards are made worse by climate change.

This Element identifies and describes each hazard and includes goals, policies, and actions to guide the planning and decision-making process. At the same time that these policies and actions are implemented, the County recognizes that those features which help contribute to Napa County's beauty and wine industry—the steep mountains, the volcanic soils, the many rivers and streams, the forest-covered slopes—are themselves reminders of the ongoing potential for seismic activity, flooding, and fire. This Element therefore seeks to take a reasonable approach, making those improvements necessary to reduce hazards while recognizing that some hazards will remain despite the best efforts of the County and other agencies.

1.2 Statutory Requirements

California Government Code Section 65302 (g) includes the requirements that should be addressed in a community's general plan safety element. These requirements are organized into nine subsections [65302 (g) (1) through 65302 (g) (9)], which are summarized below:

- 65302 (g) (1) identifies the primary hazards/issues that should be included in the safety element, which include: seismically induced surface rupture, ground shaking, ground failure, slope instability leading to mudslides and landslides, tsunami, seiche, dam failure, flooding, subsidence, liquefaction, other geologic hazards, wildland and urban fires, evacuation routes, military installations, peakload water supply requirements, and minimum road widths and clearances around structures, as those items relate to identified fire and geologic hazards.
- 65302 (g) (2) adopted through AB 162 (2007) identifies the requirements to update floodplain mapping and information, which includes special requirements.
- 65302 (g) (3) adopted through SB 1241 (2012) identifies the requirements for updating wildfire mapping, information, and goals and policies to address wildfire hazards.
- 65302 (g) (4) adopted through SB 379 (2015) identifies the requirements for updating the safety element to address potential impacts associated with climate change and potential strategies to adapt/mitigate these hazards.
- 65302 (g) (5) adopted through SB 99 (2019) requires identification of specified evacuation constraints associated with residential developments.
- 65302 (g) (6) adopted through SB 1035 (2018) requires the update of the safety element every time the housing element or local hazard mitigation plan is updated.

- 65302 (g) (7) allows for the incorporation of a flood plain management ordinance into the safety element.
- 65302 (g) (8) requires consultation with the California Geological Survey, California Office of Emergency Services.
- 65302 (g) (9) allows cities to adopt a County Safety Element if adequate detail is provided to address city-level concerns.

Additionally, California Government Code Section 65302.15 was adopted through AB 747 (2019) and includes the requirement to identify evacuation routes and their capacity, safety, and viability under a range of emergency scenarios.

1.3 Relationship to Other Elements

The hazards discussed in the Safety Element are related to other Elements of the General Plan, including Land Use, Circulation, Housing, Community Infrastructure and Services, and Conservation and Open Space and Water Resources. For instance, policies related to areas at risk of recurring flooding, dam failure, slope failure and wildfire are found in the Land Use and Conservation and Open Space Elements; policies associated with secondary access during an emergency are found in the Circulation Element; policies important to water resources are found in the Water Resources Element; and policies related to protecting critical facilities from hazardous threats are also found in the Community Infrastructure and Services Element. References to related policies are provided where appropriate within the Safety Element.

1.4 Napa County Operational Area Hazard Mitigation Plan

In 2020, the County of Napa adopted the Napa County Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) 2020 Update, prepared in cooperation with the Cities of American Canyon, Calistoga, St. Helena, and the Town of Yountville. The MJHMP includes a detailed assessment of prevalent hazards within the County, including a vulnerability assessment that illustrates how each hazard may affect populations, property, and critical facilities within the County's jurisdiction. The MJHMP presents mitigation strategy and actions that work to achieve the greatest risk reduction based upon available resources. The risk assessments and for each hazard have been summarized and incorporated into this Element to serve as important background and context for the preparation of goals, policies and actions.

2.0 Existing Conditions

This section includes information for each prevalent hazard in Napa County. Each section includes a risk assessment, describes the County's capabilities to respond to each hazard, and summarizes the plans, policies, programs, and regulatory framework at the local, state and federal level in order to align proposed goals, policies and actions with existing planning and regulatory capabilities.

2.1 Agricultural Disaster

Napa County land is predominantly agricultural, famous for its grape vineyards and wine production. The County defines **agriculture** in Section 18.08.040 of the Napa County Municipal Code as the "raising of crops or livestock," and includes an extensive list of uses under this definition such as the production and processing of agricultural products, and related accessory uses. Preservation, conservation, economic prosperity, and sustainable management of agricultural lands is a priority for the County and the State. The California Department of Conservation designates several acres of Napa County farmland as Prime Farmland through its Farmland Mapping & Monitoring Program (FMMP). **Prime Farmland** is defined as land with the best physical and chemical characteristics for long-term agricultural production. There are also a number of unique and smaller parcels throughout the County that are designated as Farmland of Statewide Importance, Farmland of Local Importance, Unique Farmland and Grazing Land. **Figure 2.1-1** shows agricultural land uses in Napa County and **Figure 2.1-2** shows locations for prime farmland in the County.



Vineyard in Napa. Courtesy of Napa County.

Farmlands are sensitive to natural and **anthropogenic events** (i.e., environmental changes caused or influenced by people), including climate change, that pose threats to quantity, quality and timing of agricultural goods. **Agricultural disaster** refers to impacts from natural disasters or human-induced events on agricultural lands. Most impacts to agriculture come from changes in climate conditions resulting in extreme heat, drought, or changing precipitation patterns. Other impacts can come from contaminated water bodies, land use changes, flooding, pandemic, pests, and wildfires. This section provides an overview of these threats to agriculture, vulnerabilities to agricultural disaster, and relevant policies and regulation for the prevention, mitigation and response to agricultural impacts. In regard to the preservation of agricultural land and recovery from natural hazards, please refer to the County's Agricultural Preservation and Land Use Element.

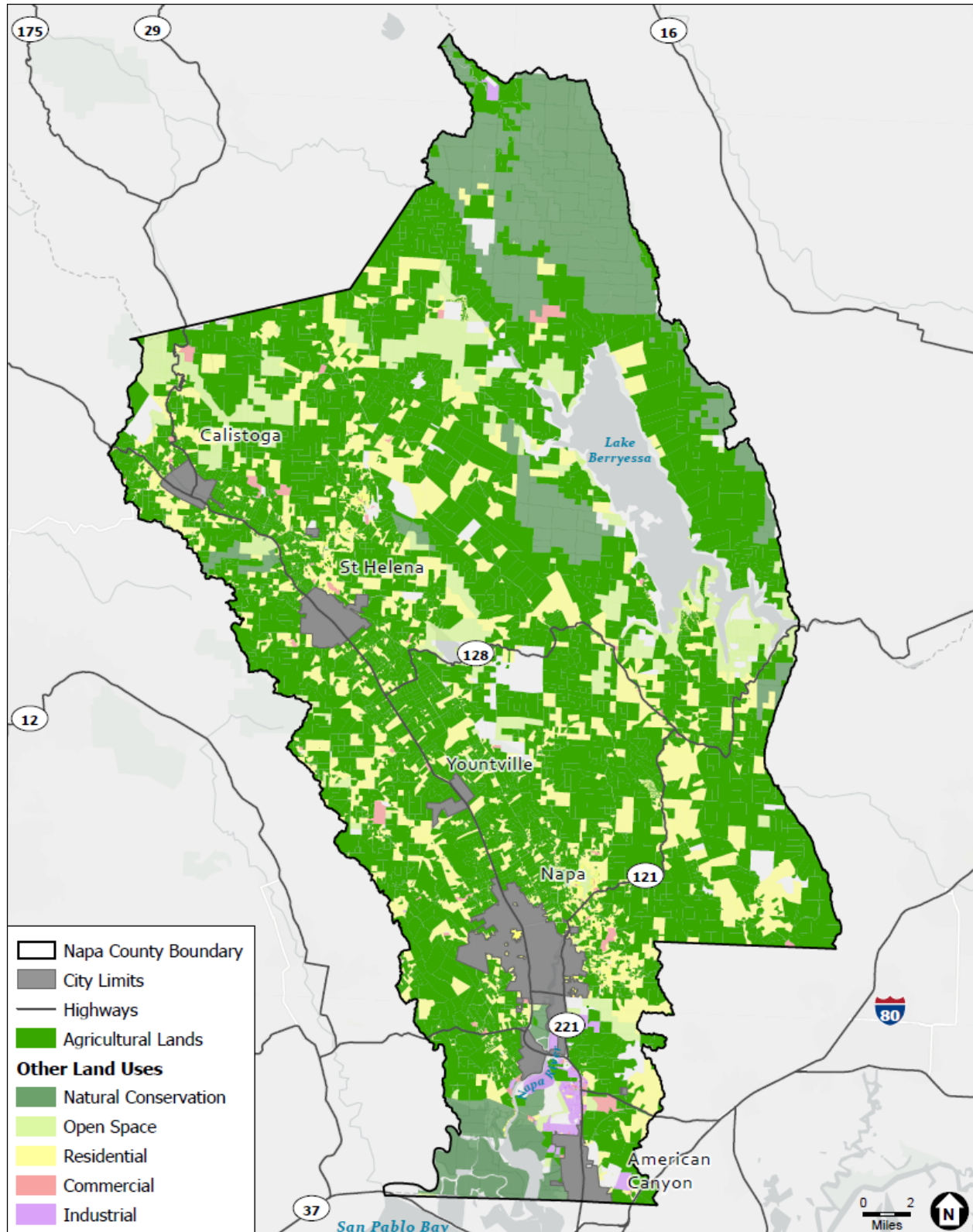


Figure 2.1-1
Napa County Agricultural Lands

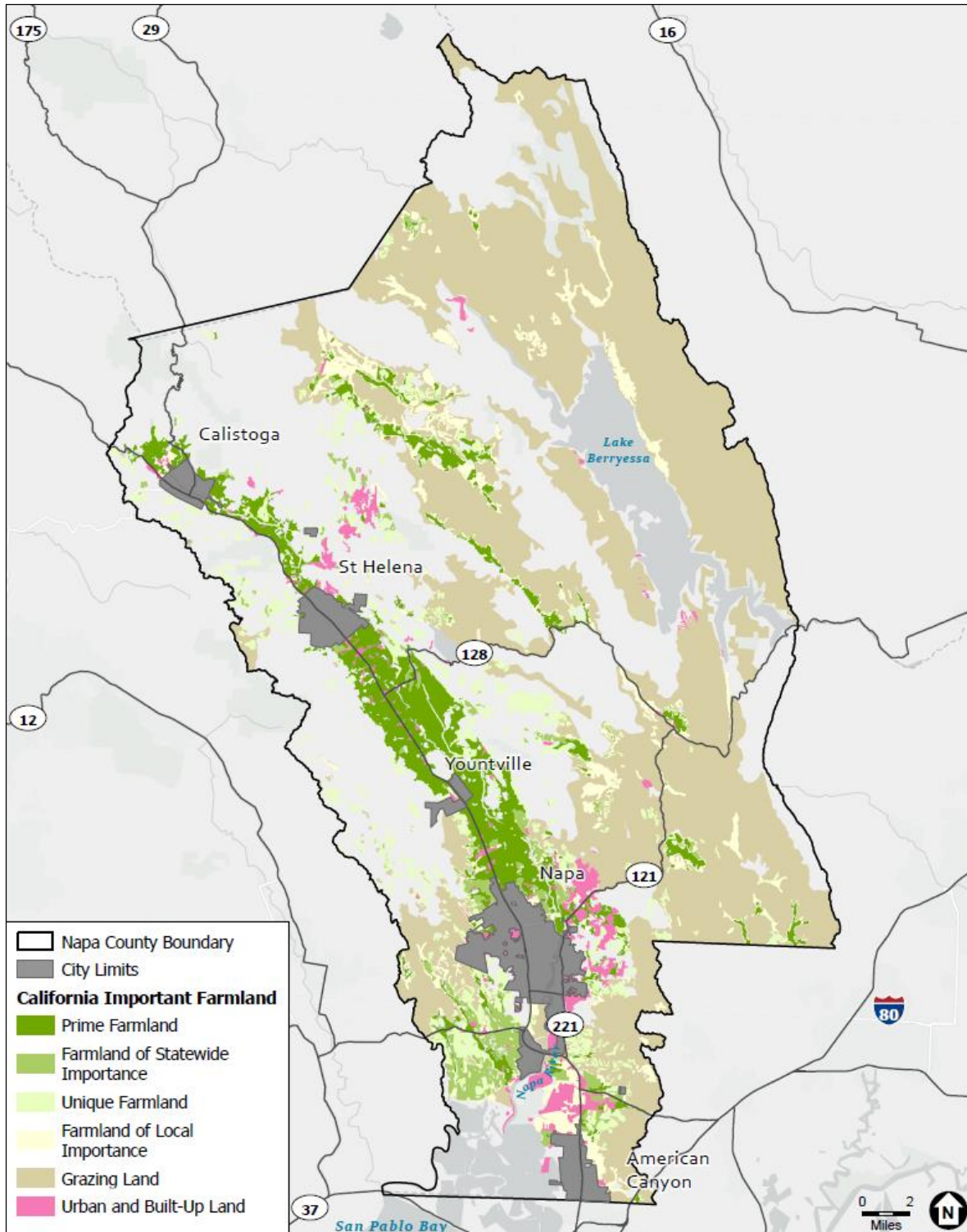


Figure 2.1-2
California Farmland Monitoring & Mapping
Designations in Napa County

Risk Assessment

In Napa County, the most prevalent threats to agriculture are due to agricultural pests, changing climate conditions, and wildfires. As climate change exacerbates environmental conditions, these threats will increase in severity and frequency on agricultural lands as well as on human populations.

Historic Data

The County's first agricultural industry was cattle, followed by dairy, horses, chicken, wheat, fruits, and orchards. Before the prominence of wine vineyards, prune orchards were the dominant crop in Napa County. The popularity of wine grapes began to grow in the 1890s, with approximately 16,000 acres of vines within the County by 1899. With the 1920 Prohibition, Napa grape production and wineries suffered, though some persisted with grape production marketed for nonalcoholic juice and sacramental wine. By the 1930s and following the end of Prohibition, grape vineyards exceeded prune orchards in land acreage. Napa County's wine industry became world-class in the late 1970s, following a wine tasting competition in France.

Historically, Napa County has been affected from severe drought events and pest infestations. The most recent five-year drought period from 2014-2017 saw much of the state in severe drought conditions due to unusually dry and warm climate, reduced snowpack and runoff, little precipitation, and increased temperatures. This resulted in water shortages to natural ecosystems, hydropower activities, drinking water supply, agriculture, and municipalities. Statewide, the drought affected biological and ecological resources, households and businesses, and resulted in economic losses.

Pest infestations from the Mediterranean fruit fly and glassy winged sharpshooters have threatened the entire Napa and California agricultural industry. In 1981, disasters were declared in several counties statewide due to an infestation of the Mediterranean fruit fly that threatened fruit and vegetable crops. According to the California Department of Agriculture, the Mediterranean fruit fly is considered the most important agricultural pest in the world. It has a wide range of hosts (fruits) that have significant gross value to the California economy. The fly affects crops by laying eggs in fruit, with larvae then feeding on fruit. This causes significant damage that makes the fruit unsuitable for consumption by humans.

The glassy winged sharpshooter poses threat to grape vineyards due to transmittal of **Pierce's disease**, a bacterium strain that damages plants by blocking their internal water-conducting structures (xylem).¹ In the late 1990s, Pierce's disease destroyed more than 1,000 acres of Northern California grapevines, resulting in \$30 million in damage.

Agricultural Pests

Agricultural lands are at risk from pests and diseases that can break down working lands and threaten public health. In California, there are a number of identified pests that are of concern to crops, vegetation, livestock and poultry, and humans, as listed in **Table 2.1-1**. A few species and diseases pose threats to all, such as the Red Imported Fire Ant, Bovine Spongiform Encephalopathy, and other zoonotic diseases.

Bovine Spongiform Encephalopathy, widely known as Mad Cow Disease, is a fatal disease that causes a neurological disorder in cattle. The disease results in decreased milk production, weight loss, and behavioral changes in cattle. **Zoonotic diseases** are illnesses caused by the transfer of germs between

¹ California Department of Agriculture

animals and humans. Common means of infection include direct or indirect contact, vector-borne transmission, foodborne transmission, or waterborne transmission.

TABLE 2.1-1. CALIFORNIA PESTS AND DISEASES

Dangers from California Pests and Diseases	
Agricultural crops and plants	
Caribbean fruit fly, European grapevine moth, guava fruit fly, gypsy moth, Japanese beetle, Mediterranean fruit fly, melon fruit fly, Mexican fruit fly, olive fruit fly, oriental fruit fly, bark beetle, viny mealybug, Asian citrus psyllid/-Huanglong Bing (HLB) disease, glassywinged sharp shooter/Pierce's Disease	
Livestock / Poultry	
Foot and mouth disease, highly pathogenic avian influenzas (H5 and H7), Exotic Newcastle Disease	
Trees	
Polyphagous shot hole borers, bark beetle, gold spotted oak borer, sudden oak death (<i>Phythora ramorum</i>), pitch canker, emerald ash borer, Asian longhorn beetle	
Humans	
Africanized honeybee, mosquito	
SOURCE: California State Hazard Mitigation Plan, 2018.	

Changing Climate

Climate conditions have the potential to impact agricultural lands. Severe cold and heat can impact the health of natural systems, agricultural production, exacerbate flooding and wildfire hazards, and increase pests. Climate conditions are also likely to increase potential for severe drought and reduce precipitation levels, which will decrease the amount of water resources available for agriculture use. This will have impacts to the health of farms and agricultural production. Napa County is expected to see an increase in local and regional temperatures, resulting in hotter and drier conditions over a long period of time (refer to section 2.2: Climate Change Impacts and Adaptation). This means less precipitation and extended heat duration annually, providing for potentially more suitable environments for pests and invasive species and affecting agricultural production. Additionally, more intense conditions are expected during the wet season. Flooding events can impact fields for crops through inundation, soil displacement, erosion, and sediment deposition. Erosion can significantly alter soil conditions and remove valuable nutrients and topsoil for crops. Flooding events can also pollute water sources used for agriculture.

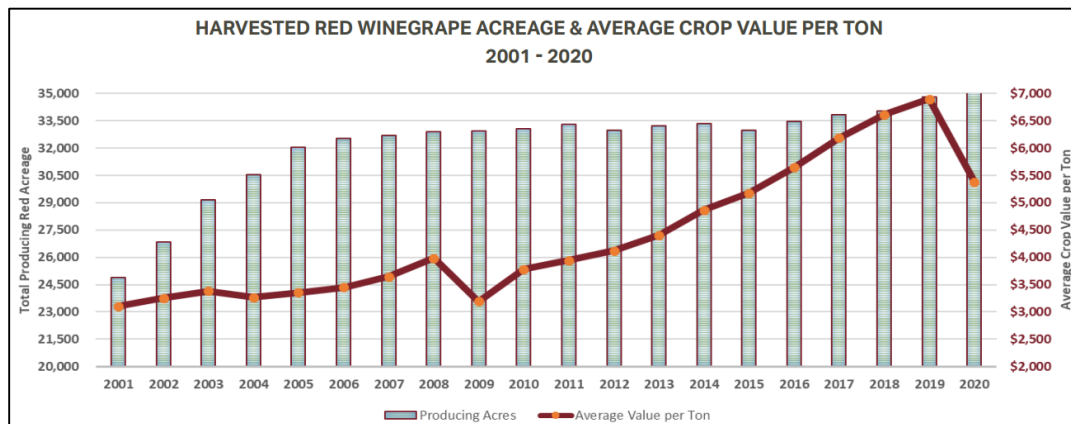
Land Use Changes

Increasing developmental pressure in Napa County is an ongoing challenge to the preservation of open and working lands. The need for affordable housing, supporting industrial, economic development and growth from urban cities can threaten the size and productivity of working lands. Policies within the General Plan encourage urban-centered growth without compromising agricultural lands.

Pandemic

The global COVID-19 pandemic significantly impacted farm workers and crop production in Napa County, and contributed to greater impacts to lands affected by wildfires. Total production of wine grapes decreased by approximately 60,000 tons from 2019 to 2020, and the value of wine grapes decreased by

approximately half.² Other goods, including fruits, nuts, olives and nursery crops also saw decreased production and value in 2020. This was due to industry closures, COVID-19 restrictions, and wildfires.



Trend graph showing the change in value of red wine grapes from 2001 to 2020. Courtesy of Napa County Agricultural Commissioner's Office.

Water

Agricultural lands in Napa County depend primarily on groundwater, some recycled water, and some surface water from the Napa River system and the State Water Project. In 2020, 81% of agricultural water use came from groundwater sources, while 16% came from surface water and 3% came from recycled water.³ Water resources are critical to the continued production and safety of agricultural lands and workers. Over time as climate change conditions affect groundwater recharge and reduce reliability of surface water, demand may increase on other sources of water supply. In addition to climate change impacts to water resources, contaminated water bodies and flooding hazards can also affect Napa's agricultural lands (refer to Section 2.5: Flooding for additional information on countywide impacts from flooding hazards and section 2.4: Drought for water supply conditions and hazards). Reductions in the amount of water or decline in the quality of water for agricultural use can impact agricultural production, economy, and health. The Napa River and its 47 tributaries experience pollution from run-off fertilizers and sediment deposits, which affect water supply, water quality, and aquatic life and habitat.

Wildfire

Wildfires can lead to severe damage and death of livestock and crops, and threaten the safety of agricultural employees. The majority of Napa County agricultural land lies within identified "Moderate" to "Very High" Fire Hazard Severity Zones. As shown in **Figure 2.1-3**. These are areas with physical conditions, such as slope, weather, and fuel, that increase likelihood for fires to occur. Wildfire is identified as both a cause, and secondary hazard, of agriculture disaster. Hotter and drier climates and pests can fatally impact crops, leaving dry or dead vegetation that presents favorable conditions for the start and growth of wildfires. Napa County cattle production saw a decline in 2020 due to the LNU Lighting Complex Fire and the Glass Fire, which forced evacuations of cattle and resulted in loss of rangeland⁴. Refer to Section 2.11 for general information on Wildfire Hazards.

² Napa County Agricultural Crop Report, 2020

³ Napa County Groundwater Sustainability Agency, *Annual Report – Water Year 2020*

⁴ Napa County Agricultural Commissioner's Office, *2020 Napa County Agricultural Crop Report*

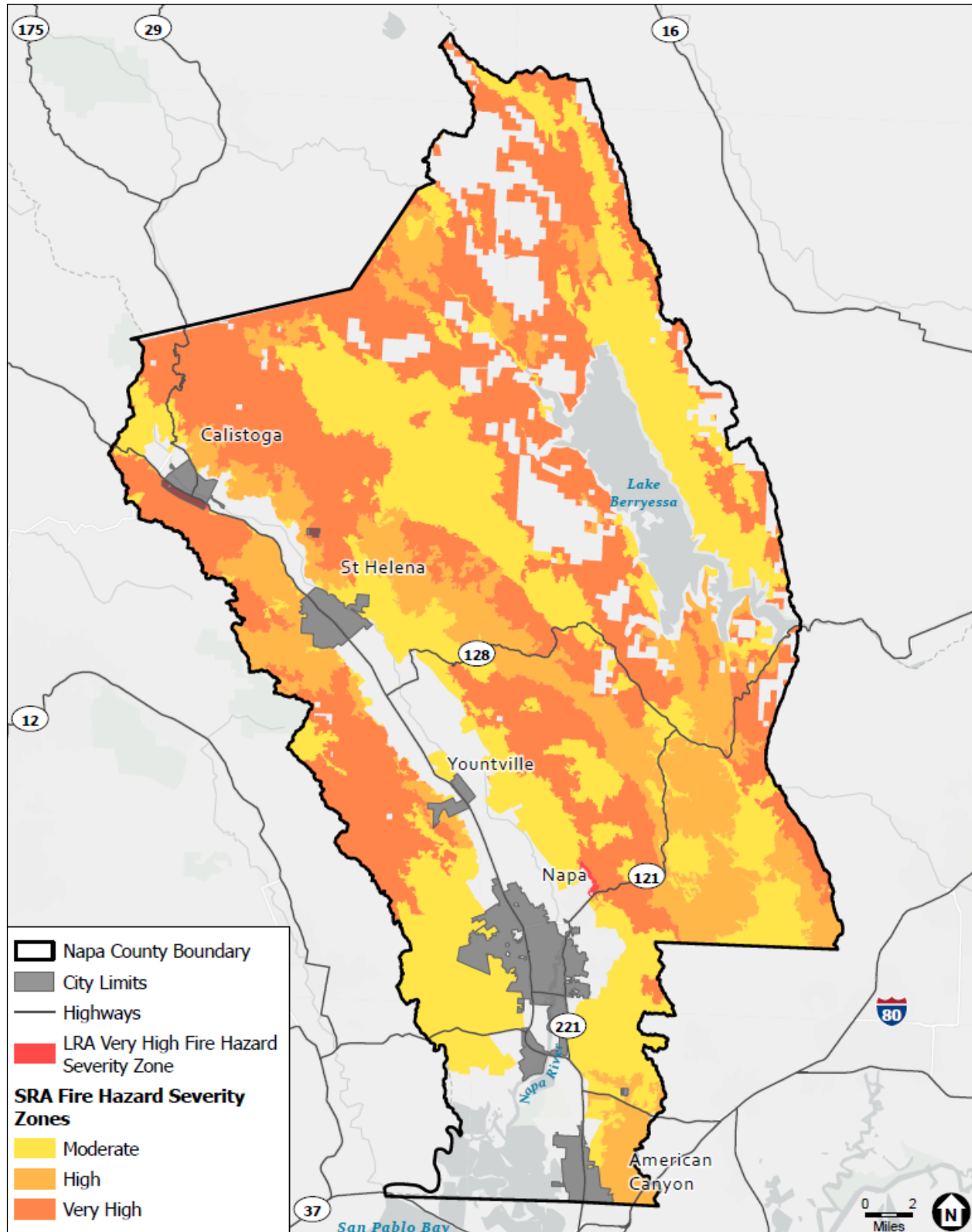
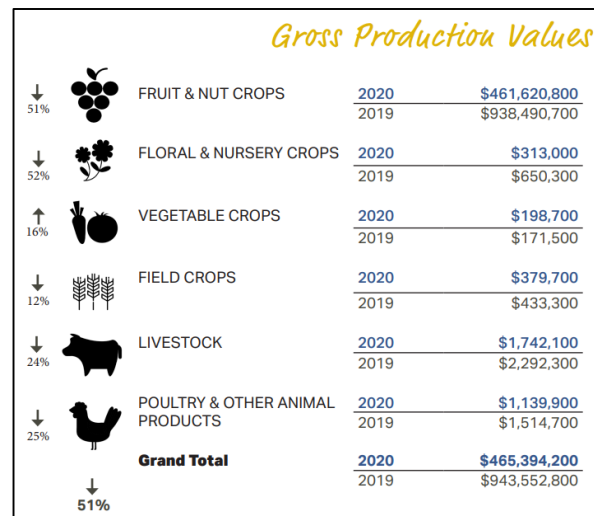


Figure 2.1-3
Fire Hazard Severity Zones

Vulnerability Assessment

Population and Economy

All humans are also vulnerable to agricultural disaster from pests, particularly mosquito and bee species that transmit disease. Population groups that face the highest threat to agricultural disaster are those that work directly within the agriculture industry. Agricultural disasters can significantly affect the economy, employment of farmworkers, and families of employed farm workers. Economic loss occurs from agricultural disaster due to disruption or damage to production, leading to shortages or damages of goods. Impacts to agriculture can affect all people at local, state and national levels as Napa produces and distributes goods all over the nation. According to the Napa County Agriculture Commissioner's Office, the wine industry provides more than \$9.4 billion locally and \$34 billion nationally. The wine industry also provides approximately 44,000 jobs Countywide and almost 190,000 nationally.



Loss of Napa County agriculture production value from 2019 to 2020. Courtesy of Napa County Agricultural Commissioner's Office.

Critical Facilities, Infrastructure and Community Amenities

Napa County critical facilities are not directly affected by agricultural disasters. However, there is potential for indirect impacts from secondary hazards. Specific to agriculture, critical facilities include industrial facilities involved in the processing and distribution of agricultural goods. Similarly, infrastructure, including those that support agriculture, are not at risk from agricultural disaster.

County Capacity to Respond to Hazards

Agricultural lands face numerous threats from pests and climate hazards. The County collaborates with state departments and other organizations to prevent and mitigate for agricultural impacts. Most recently in June 2020, the County approved a new policy relating to bird control to mitigate damage to commercial crops.⁵ Pests can impact all areas of agriculture, from farming to employment and economic gains. Prevention and mitigation of agricultural impacts, particularly from pests, is done through collaboration of various jurisdictions at local, regional and state levels. Sustainable agriculture management is also prioritized for quality production of goods and safety of the environment.

Napa County

Agricultural Commissioner's Office (Commissioner's Office)

The Agricultural Commissioner's Office is charged with the protection of County agriculture, including its environmental conditions and public health and safety as it relates to agriculture. The Commissioner's Office implements several programs to achieve these goals. The County provides insect collection and

⁵ Napa County Accepted Customs and Standards for Propane Cannons

identification services for commercial agriculture and residential garden settings. The County's Sentinel Trapping Program monitors and detects specific pests known to pose significant threats to the wine grape industry, such as the Grape Berry Moth, European Grape Moth, and Grape Tortrix Moth. The Sentinel Trapping Program focuses on pests that don't generally occur in California or may occur in very limited quantities. The program works to detect early presence of these pests to minimize potential impacts. The Commissioner's Office also administers the General Trapping Program, to detect the presence of pests within the County. This is done by placing traps that attract specific pests. The Commissioner's Office also provides educational materials on agricultural threats and disaster, and conducts inspections for vegetation that enters the county.

Winegrape Pest and Disease Control District (District)

The District supports the detection, prevention and education of agricultural diseases in Napa County. The majority of this work is focused on the prevention and mitigation of Pierce's disease, which affects grapevines and is caused by the glassy-winged sharpshooter. The District also provides funding for projects to reduce impacts to farmers and the economy.

Napa County Mosquito Abatement District

The Napa County Mosquito Abatement District serves as a resource to the County for the identification of agricultural pests and invasive species, including mosquitos, wasps, flies, ticks, and other insects. Potential pest sightings can be submitted for identification.

The California Conservation Corps

The California Natural Resources Agency manages the California Conservation Corps Program which works with local and state agencies to mitigate and respond to impacts on the environment, including agriculture-related emergencies. The CCC provides services such as invasive species removal, watershed restoration, and re-forestry, all of which support the health of agricultural lands.

California Land Stewardship Institute

The California Land Stewardship Institute (CLSI) is a non-profit organization located in Napa County that provides programs for farmers dedicated to environmental stewardship, enhancement, and restoration. CLSI operates the Fish Friendly Farming (FFF) Certification Program, a sustainability program that recognizes agricultural properties for responsible management towards habitat restoration and improved water quality. Farmers receive access to information and resources on agricultural management, including soil erosion and water quality degradation. Fish friendly Farming sites that are certified through the program achieve compliance with Total Maximum Daily Load (TMDL) regulations that are part of state and federal water quality laws. Certified farms are organized into groups by watershed or drainage area. Several farms within Napa County are certified under the FFF program, with many focused mostly along the Napa River watershed.

Napa Green

Napa Green Land offers third-party certification program for agricultural businesses dedicated to environmental stewardship and climate action in Napa County. The organization promotes green business standards with the goal of contributing to county climate action, reducing greenhouse gas emissions from

the agricultural sector, and improving Napa watersheds. Two program certifications are offered through Napa Green. Napa Green Vineyard certification is for businesses striving for resilient, carbon-neutral vineyards with standards implemented for forest preservation, strict pesticide regulation, water efficiency practices and carbon farming practices. Napa Green Winery certification offers soil and bottle certification for businesses that are energy efficient, prevent waste, practice environmentally-friendly purchasing, and reduce greenhouse gas emissions. These programs encourage sustainable management of working lands and increase resilience to agricultural disasters.

Policies, Plans, and Regulatory Environment

Napa County General Plan

The County addresses agricultural disaster policies within the Agricultural Preservation and Land Use Element of the General Plan. Within the Safety Element, agricultural land is addressed as it relates to the health of forestry and water resources, and its relation to flooding and wildfire hazards. communities.

Napa County MJHMP

Agricultural Disaster is addressed in the County’s MJHMP with descriptions of pests, diseases, and weather events that threaten agriculture. Mitigation actions within the MJHMP that address agricultural disaster include:

- **NC-56-2020:** Allow disaster management issues within the agricultural sector to be addressed at more localized levels.
- **NC-57-2020:** Offer agricultural disaster training and networking opportunities for farmers and ag regulatory agencies.
- **NC-32-2020:** Develop a “Natural Hazard Awareness Week” campaign and conduct corresponding outreach to the community and all interested parties. Activities will focus on flooding and other natural hazards, including associated hazard functions, governing laws/regulations, mitigation strategies and precautions. Outreach will also be conducted throughout the year, wherever possible.
- **SH-12-2020:** Provide hazard mitigation information (e.g. ways to reduce risk) to first responders living within hazard-prone areas.
- **NC-27-2020:** Support risk assessments in relation to warmer climate on the agriculture and wine industries.
- **AC-02-2020:** Require mandatory water conservation measures during drought emergencies.
- **CL-09-2020:** Augment City water supply systems with supply contingency projects for Drought years, such as increasing water supply and treatment capacity of Kimball Reservoir. Contingency planning/projects will include provisions for ag sector.
- **NC-39-2020:** Relocate farmwork centers from flood risk areas.
- **NC-45-2020:** Complete vegetation management projects as prescribed in CWPPs.

California Department of Food and Agriculture (CDFA)

The CDFA is charged with the protection and promotion of state agriculture, in addition to monitoring of invasive species, diseases, and ensuring food safety. The CDFA coordinates with local and regional

jurisdictions for agricultural management. There are six divisions within the CDFA that provide oversight and regulatory tasks: Animal Health and Food Safety Services, Fairs and Expositions, Inspection Services, Marketing Services, Measurement Standards, and Plant Health and Pest Prevention Services. Through these divisions the CDFA manages several programs targeted towards the health and safety of animals, vegetation, and food. General responsibilities include:

- Oversee safety of poultry and livestock;
- Detect and eradicate agricultural pests and diseases;
- Inspect and analyze agricultural products for safety standards;
- Promote California agriculture; and
- Enforce quality standards for agricultural goods.

Invasive Species Council of California

The state established the ISCC to lead in detection and response to invasive species, in collaboration with local and state agencies. The ISCC also manages educational campaigns on the spread of invasive species and identifies policies for the protection against invasive species. Through its California Invasive Species Advisory Committee, the ISCC:

- Identifies and keeps a list of invasive species;
- Manages a system for reporting and referral of invasive species sightings and outbreaks;
- Provides education and outreach activities;
- Provides best management practices; and
- Prepares a statewide Invasive Species Action Plan and Rapid Response Plan.

California Farmland Mapping & Monitoring Program (FMMP)

The California Department of Conservation (DOC) FMMP provides data and spatial analysis to support analysis of the state's agricultural resources. The FMMP identifies important farmland classifications based on environmental features. Based on the FMMP, several land areas within Napa County are designated as Prime Farmland, defined as land with the best physical and chemical characteristics for long-term agricultural production. The state encourages preservation of important farmlands and open space areas.

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2.2 Climate Change and Adaptation

Climate change is defined as the significant and lasting alteration of global temperatures and weather patterns over a long period of time, caused by natural and **anthropogenic activity** (i.e., influenced by people, either directly or indirectly). There is scientific consensus that anthropogenic greenhouse gas (GHG) emissions are the primary cause of global climate change. Human activities of agriculture, land use changes, and burning of fossil fuels have contributed significantly to atmospheric concentrations of GHG emissions. Over time, increased GHG emissions into the Earth's atmosphere have changed the climate worldwide, resulting in a warmer atmosphere and ocean, diminished snow and ice, changing precipitation patterns, and sea level rise. Climate change has the potential to impact natural and human systems including food production, water availability, public health, economic prosperity, ecosystem biodiversity and beyond.

Climate adaptation refers to the actions that help natural and human systems to withstand climate impacts. The goal of climate adaptation is to reduce the impact from current and future conditions, reduce vulnerabilities in our systems, and increase long-term resilience. This means adjusting human behavior and systems.

Climate conditions and hazards are expected to worsen over time. Climate hazards include flooding, heat events, worsening air quality, wildfires, sea level rise, intensified droughts, and more. Napa County, due to its geographic location and environmental conditions, is expected to experience worsening impacts from air pollution, extreme weather, flooding, sea level rise, and wildfires.

This section focuses on climate change hazards of air pollution, climate conditions, and sea level rise. Please refer to other sections of the Safety Plan for Drought, Flooding, Severe Weather and Wildfire Hazards.

Risk Assessment

Local Conditions

Air Quality

According to the California Environmental Health Screening Tool (CalEnviroScreen) 4.0, the majority of Napa County, with the exception of southeastern portions of the County, presents relatively healthy conditions as it relates to air quality to the rest of the state. **Figure 2.2-1** shows the CalEnviroScreen map for Napa County. The southeast area of Napa County is shown as an area of concern, within the top-most percentile range for pollution burden (74-100%) meaning the area experiences greater vulnerability and burden from pollution than other census tracts statewide. Based on individual indicators, Napa County faces environmental burden from toxic pesticides used, toxic release sites, groundwater pollution, hazardous waste generators and facilities, impaired water bodies, and solid waste sites and facilities.

Regional air pollutants of ozone and fine particulate matter (PM 2.5) are of greatest concern to the County. Napa County's valley environment makes the area particularly susceptible to retention of pollution. Generally, agriculture activity, industrial operations, and truck traffic are the largest contributors to pollution. Increased population and anthropogenic activity will worsen greenhouse gas emissions and air quality conditions.

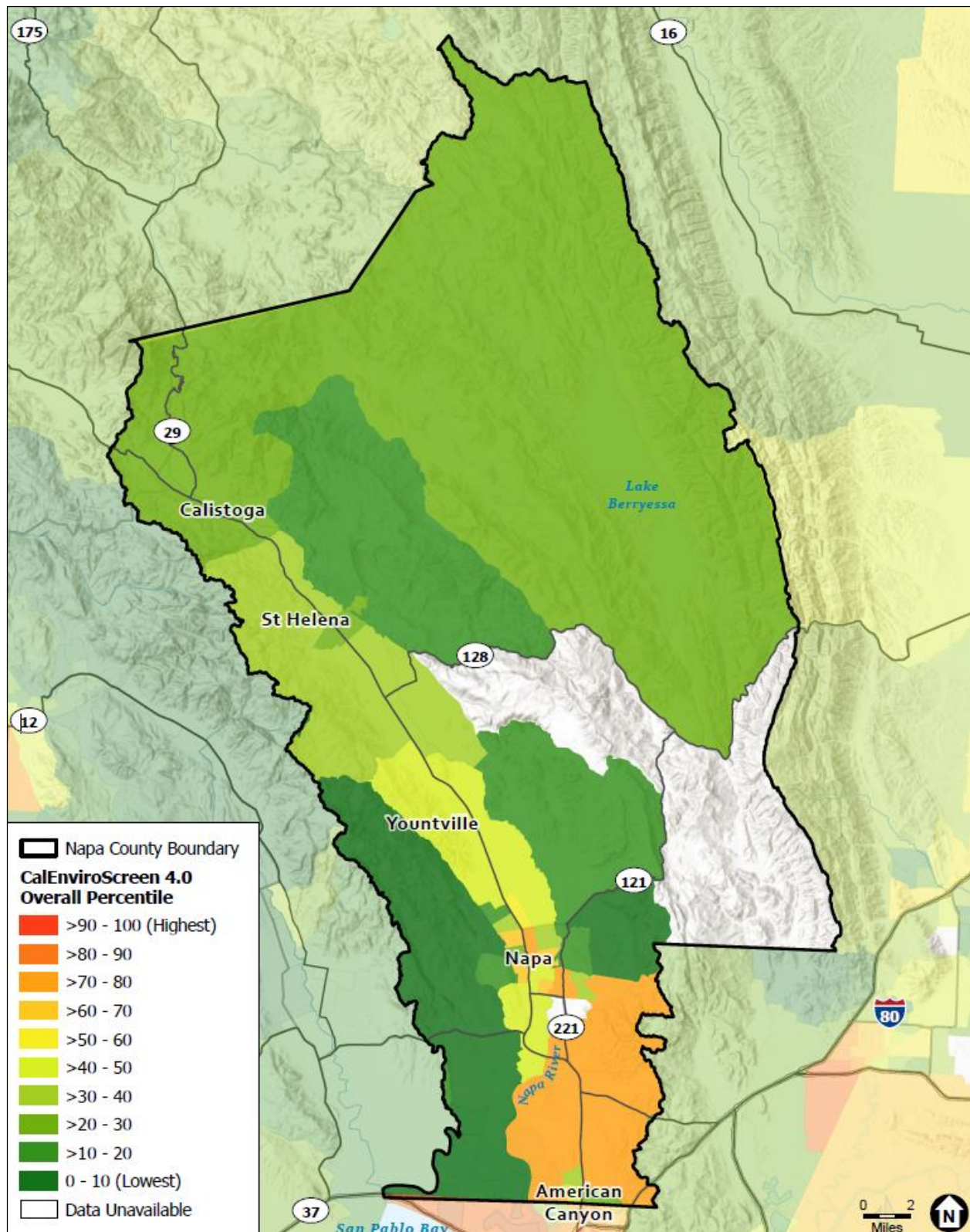


Figure 2.2-1
CalEnviroScreen 4.0 Vulnerability

Extreme Weather / Extreme Temperatures

The increase in human-generated GHG emissions into the atmosphere causes short- and long-term changes in the Earth's climate system. Global average temperatures are warming due to climate change, which will lead to changes in the frequency, duration and intensity of climate events, particularly extreme heat. The State defines **extreme weather** as highly unusual conditions and events than historically recorded. Napa County, in addition to the rest of the state, is expected to experience hotter temperatures and increased heat wave events. In Napa County, average temperatures are expected to increase by 4-6 degrees Fahrenheit by the end of the century. **Figure 2.2-2** shows historical and projected temperature increase in California from 1961 to 2099. In contrast, precipitation levels are expected to decline, with a decrease of 4-5 inches in annual rainfall by 2100. Refer to Section 2.9: Severe Weather for additional details on weather hazards in Napa County.

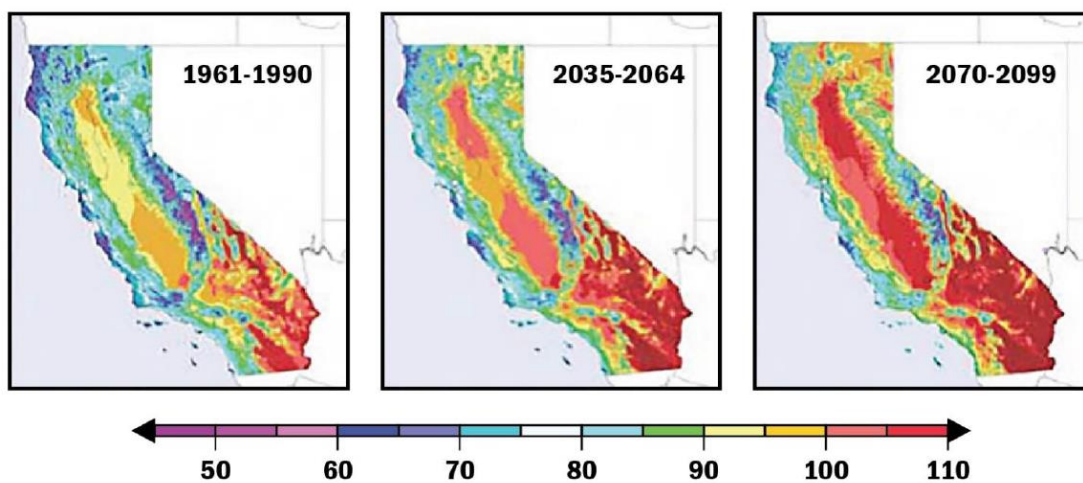


Figure 2.2-2
California Historical and Projected Temperature Increase

Sea Level Rise

Sea level rise poses a risk to southern Napa County, within the northern Bay Area. Sea level rise is the direct result of warming temperatures and subsequent melting of the earth's ice caps. Climate science projects sea level rise up to 55 inches by 2100, threatening coastal resources and communities.

Figure 2.2-3 shows the potential rise in sea levels in southern Napa County.”.

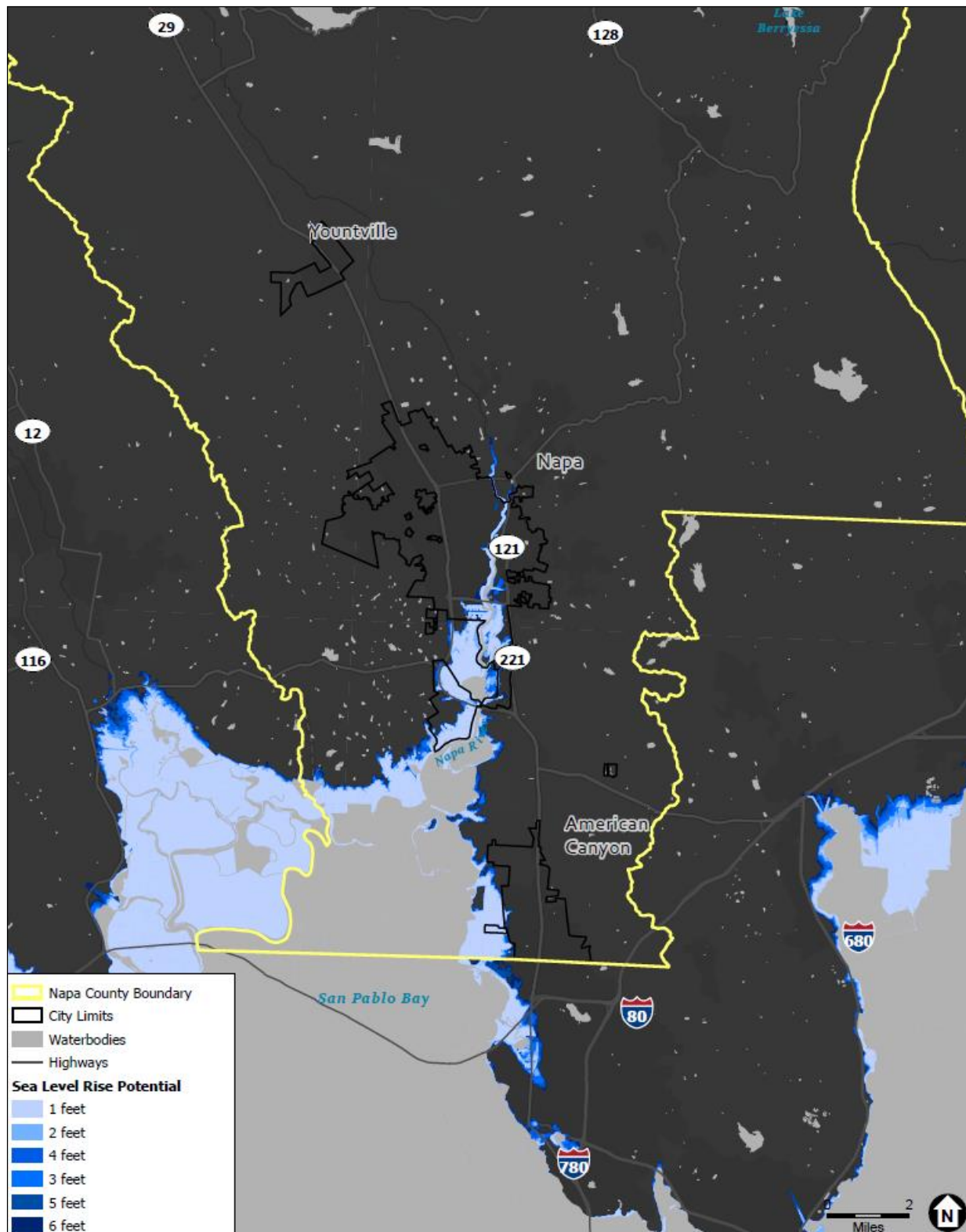


Figure 2.2-3
Projected Sea Level Rise Scenarios (2030, 2050, 2100)

Historic Data

Climate policy and regulation in the United States kicked off with the establishment of the United States Environmental Protection Agency (EPA) and national health-based standards for air quality pollutants, including toxic air contaminants and criteria pollutants, in 1971. The Bay Area, including Napa County, saw its worst year for air quality in 1969, after recording 65 days in exceedance of national ozone standards. The 1970s were instrumental in forming climate and air quality regulations that limited and protected against organic compounds, hydrocarbons, carbon monoxide and more. Over time, science details unusual patterns in climate conditions, sea level rise, and natural hazard events, and projects future hazards that will impact all areas of the environment.

Vulnerability Assessment

Populations experiencing vulnerable conditions are most at risk from climate change. Factors that increase vulnerability are income, race, linguistic isolation, access to healthcare, shelter, transportation, and access to preparedness information. Napa County has a large Hispanic population, many of which are low-income, agricultural workers and non-English speakers. This places them at high risk of experiencing climate change impacts and experiencing long-term effects of hazards.

Critical infrastructure, such as roadways, hospitals, schools and emergency facilities are at risk from climate change impacts, particularly sea level rise, flooding and wildfires. Important utility facilities, including Napa Sanitation District Water Treatment Plant and American Canyon Plant are also at risk, mostly from sea level rise as these are located in southern Napa County, within sea level rise and 100-year flood event hazard areas. Much of Napa County lies within identified fire hazard severity zones (see Section 2.11: Wildfires). While not infrastructure, agricultural lands are at high risk from all climate change hazards (see Section 2.1: Agricultural Disaster).

Secondary Hazards

All people and environments will feel the effects of climate change. Climate change will exacerbate the duration, intensity, and frequency of extreme weather and other secondary, natural hazards. These include:

- Drought
- Flooding
- Wildfire
- Extreme heat
- Increased precipitation
- Snowpack decline

County Capacity to Respond to Hazards

Climate Action Plan

Napa County's 2019 Draft Climate Action Plan is in development to address climate change impacts and reduce greenhouse gas emissions. The CAP identifies sector-based strategies and measures that can be implemented to reduce emissions and increase community capacity to adapt to climate change. The CAP

also provides a set of actions that comprise the implementation strategy, with potential funding sources, monitoring program, and CEQA streamlining. **Table 2.2-1** shows Napa County's 2014 Greenhouse Gas inventory that identifies the County's major contributing emission sources.

TABLE 2.2-1. NAPA COUNTY 2014 GREENHOUSE GAS INVENTORY

Sectors	Percentage of Total Emissions	Emissions (MTCO ₂ e/year)
Building Energy Use	31%	148,338
On-Road Transportation	26%	125,711
Solid Waste	17%	83,086
Agriculture	11%	52,198
Off-Road Transportation	9%	42,508
High GWP Gases	3%	13,481
Wastewater	2%	11,189
Land Use changes	1%	7,684
Imported Water Conveyance	<1%	88
Total		484,283

SOURCE: Napa County Climate Action Plan EIR, 2019.

Bay Area Air Quality Management District (BAAQMD)

The BAAQMD is a public health agency comprised of the jurisdictions within the Bay Area, including Napa County. The Air District works to monitor air pollution and implement plans to meet national and state emission standards. The Air District also provides informational materials and alerts regarding air quality conditions and public health concerns. With increasing concerns of climate change, the Air District prioritizes emissions reductions from mobile sources, land use planning, innovative technology, and policy development.

Policies, Plans, and Regulatory Environment

Napa County General Plan

In response to climate change, *Climate Protection and Sustainable Practices for Environmental Health Goals and Policies* are identified in the Conservation Element of the Napa County General Plan. Further, there are existing policies within the 2009 Safety Element that address hazards related to climate change and speak to the protection and resiliency of the community.

Napa County MJHMP

Climate change is addressed in detail the County's MJHMP with descriptions of hazards, impacts, and mitigation policies:

- **CL-14-2020:** Develop microgrids to provide emergency power during natural disasters.
- **NC-11-2020:** Construct/Install back up power generators for fire stations, pump houses, emergency shelters and cooling centers.

- **SH-06-2020:** Inform residents and tourists of shelter locations and evacuation routes and procedures for storing or taking valued items before large scale evacuations.
- **SH-12-2020:** Provide hazard mitigation information (e.g. ways to reduce risk) to first responders living within hazard-prone areas.
- **AC-04-2020:** Plan for and construct sea level rise protection for American Canyon Critical Infrastructure such as Public Works Yard, Sewer Treatment Plant, and Pump Station.
- **CL-08-2020:** Map and identify locations and implement fuel reduction projects in high risk areas in the City such as the areas west of Highway 128.
- **NC-20-2020:** Support ongoing analysis of sea-level rise data.
- **NC-21-2020:** Create a comprehensive outreach strategy that informs residents in potentially affected areas of County efforts to protect and increase community resiliency to sea-level rise.
- **NC-24-2020:** Construct or identify existing locations for cooling centers near farmworker populations.
- **NC-25-2020:** Develop air conditioning replacement/reimbursement program for low income and elderly residents.
- **NC-27-2020:** Support risk assessments in relation to warmer climate on the agriculture and wine industries.
- **NC-28-2020:** Construct and develop alternative water supplies to augment single sources of water delivery.
- **NC-29-2020:** Construct rainwater catchment systems to recharge groundwater in government ROWs
- **CL-07-2020:** Identify schools that have been designated as emergency shelters by the Red Cross within City Limits and ensure they have sufficient back up power generators.
- **NC-12-2020:** Organize outreach to vulnerable populations, including establishing and promoting accessible shelters in the community.
- **NC-15-2020:** Procure backup generators in the event that public meeting spaces such as community centers or town halls will be used as Emergency Command Centers. Perform regular maintenance on generators at water treatment plants.
- **CL-03-2013:** Retrofit Critical Public Safety Infrastructure.
- **NC-07-2013:** Retrofit critical public safety infrastructure with fire resistant materials and or create defensible space around structures.
- **YV-05-2020:** Work with local agencies to develop evacuation plans and provide education and outreach to populations vulnerable to wildfire.
- **HM-02-2020:** Construct/Install back up power generators or alternative communication systems to mitigate the potential for power outages or loss of cell service during emergencies.
- **HM-05-2020:** Develop alternate access and evacuation routes to ensure critical facilities are accessible during emergencies.

U.S. Federal Emergency Management Agency

The U.S. Federal Emergency Management Agency (FEMA) provides disaster response and preparedness across the country for a number of hazards, including flooding. According to FEMA flood maps, the

majority of Napa County is classified within areas of minimal flood hazards (See Section 2.5, Flooding). There are a few County areas to the south identified as Base Floodplain Elevation, which is the area that may experience elevation of surface water from the 1% annual chance flood. Climate change may potentially worsen conditions related to increased precipitation and snowpack melting, and affect the area and intensity or frequency of flood potential.

California Office of Emergency Services

The state addresses climate action and the need for greenhouse gas emissions reductions through the California Adaptation Planning Guide (APG). The Guide provides best practices, tools and current science to support jurisdictions in climate adaptation efforts. The state also prepares a Safeguarding California Plan: California's Climate Adaptation Strategy, that serves as a roadmap for state agencies to address climate change impacts.

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2.3 Dam Failure

Dam failures in the United States typically occur in one of four ways (Association of State Dam Safety Officials, 2021):

- **Overtopping** of the primary dam structure, which accounts for 34 percent of all dam failures, can occur due to inadequate spillway design, settlement of the dam crest, blockage of spillways, and other factors.
- **Foundation defects** due to differential settlement, slides, slope instability, uplift pressures, and foundation seepage can also cause dam failure. These account for 30 percent of all dam failures.
- **Failure due to piping and erosion** accounts for 20 percent of all failures. These are caused by internal erosion due to piping and seepage, erosion along hydraulic structures such as spillways, erosion due to animal burrows, and cracks in the dam structure.
- **Failure due to problems with conduits and valves**, typically caused by the piping of embankment material into conduits through joints or cracks, constitutes 10 percent of all failures.



Monticello Dam – Napa County, CA



Oroville Dam Failure - Courtesy of Los Angeles Times

The most recent concerning dam failure in California was the 2017 collapse of a spillway on the Oroville Dam in Butte County, California after heavy snowmelt delivered a surge of runoff to Feather River and Lake Oroville. As a result of the February 2017 incident, failures in the spillways of Oroville Dam forced the evacuation of 188,000 people and caused \$1 billion in damage repairs (Monroe, 2020). Ultimately, an independent analysis concluded that poor design and construction and inadequate state oversight contributed to the collapse of the concrete spillway. (Water Education Foundation, 2020)

As the consequences of dam failure in Napa County have the potential to have widespread effects, this hazard has been considered in the analysis for this Safety Element.

Types of Dams

The United States Society on Dams (USSD) identifies twelve different types of dams that are commonly found in the built environment. The MJHMP identifies two major types of dams that can be found in Napa County:

- **Earthen Dam:** Also known as earthfill dams, earthen dams are made up mostly of compacted earth material generally smaller than 3-inches in size. Oroville Dam, pictured right, is one example of an earthen dam.



- **Concrete Gravity Dam:** A dam constructed of concrete and/or masonry which relies on its weight and internal strength for stability. Lake Shasta Dam is one example of a large concrete gravity dam.



Risk Assessment

Dam Failure Vulnerability Analysis

According to California Department of Water Resources Division of Dam Safety, there are 57 dams across Napa County. Dams in Napa County are owned by a mixture of public utility districts, public agencies, water agencies, and private entities. The primary danger associated with dam failure is high velocity flooding downstream of the dams and limited warning times for evacuation. Other potential secondary hazards of dam failure are landslides around the reservoir perimeter, bank erosion on the rivers, and destruction of downstream habitat. **Figure 2.3-1** shows inundation zones for the dams in Napa County. Areas of the County most threatened by dam inundation are those along the Napa River corridor, including the cities of St. Helena, Yountville, and Napa. However, no dam failures have occurred in Napa County to date. Vulnerability varies by community and depends on the particular dam profile and the nature and extent of the failure. Per the MJHMP, the chances of a dam failure in Napa County are low, but the consequences if dam failure were to occur are quite severe.

Warning Time

Warning time for dam failure depends on the cause of failure. For example, in an event of extreme precipitation or massive snowmelt, evacuations can be planned with sufficient time. On the other hand, in the event of a structural failure, there may be no warning time. Jurisdictions and private dam owners are required to have established protocols in their emergency operations plans (EOPs) for warning and response to imminent dam failure.

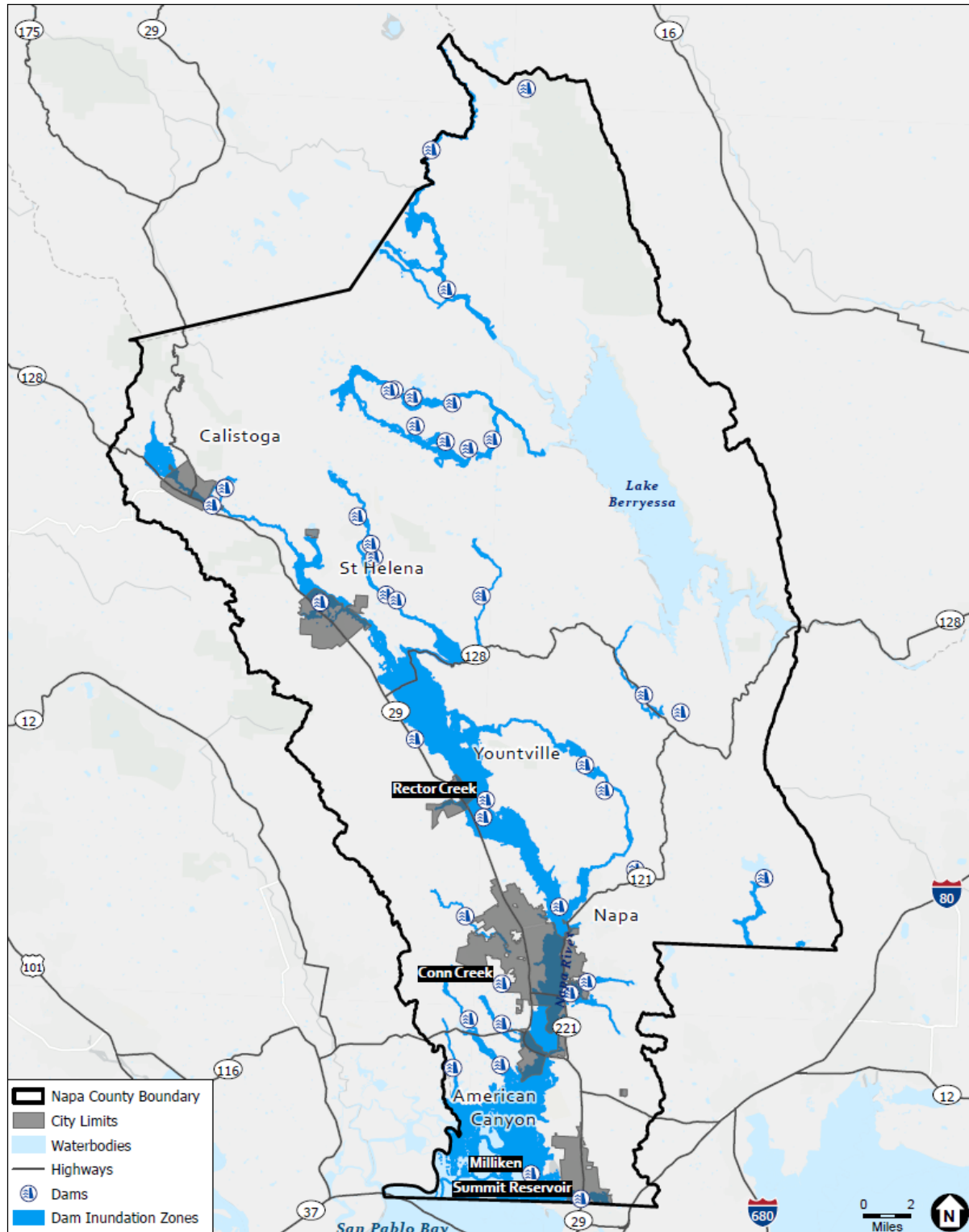


Figure 2.3-1. Napa County Dam Inundation Zones

MJHMP FIGURE 4-52 NAPA COUNTY DAM INUNDATION MAP

Population

In the event of dam failure and subsequent flooding, vulnerable populations are all populations downstream from dam failures that are incapable of escaping the area within the allowable time frame. This population includes the elderly and young who may be unable to get themselves out of the inundation area. The vulnerable population also includes those who would not have adequate warning from a television, radio emergency warning system, have not registered with reverse 911, or do not have cell phones that can receive amber alerts. The potential for loss of life is affected by the capacity and number of evacuation routes available to populations living in areas of potential inundation. The entire population in a dam failure inundation zone is exposed to the risk of a dam failure.

Approximately 12% of the total population in Napa County lives within mapped dam inundation zones. The estimated population exposed to dam inundation is summarized in **Figure 2.3-2**. It is important to note that this exposure summary includes all dam inundation areas across Napa County. However, the greatest population exposed to dam failures are residents living in proximity to Milliken Dam, Conn Dam, and Rector Creek Dam.

Vulnerable Development, Critical Facilities, and Infrastructure

Per OPR Guidelines, critical facilities are “facilities that either (1) provide emergency services or (2) house or serve many people who would be injured or killed in case of disaster damage to the facility. Examples include hospitals, fire stations, police or emergency service facilities, utilities, or communications facilities. Low-lying areas are vulnerable to dam inundation, especially transportation routes. This includes all roads, railroads, and bridges in the flow path of water.

According to the Napa County MJHMP, approximately 431 of the planning area’s critical facilities and infrastructure are in a mapped dam inundation area (Napa County Office of Emergency Services, 2020). These are illustrated in **Figure 2.3-1** and **Figure 2.3-2** below.

The total parcel values at risk from dam inundation in unincorporated Napa County is over 2.5 billion dollars (Napa County Office of Emergency Services, 2020).

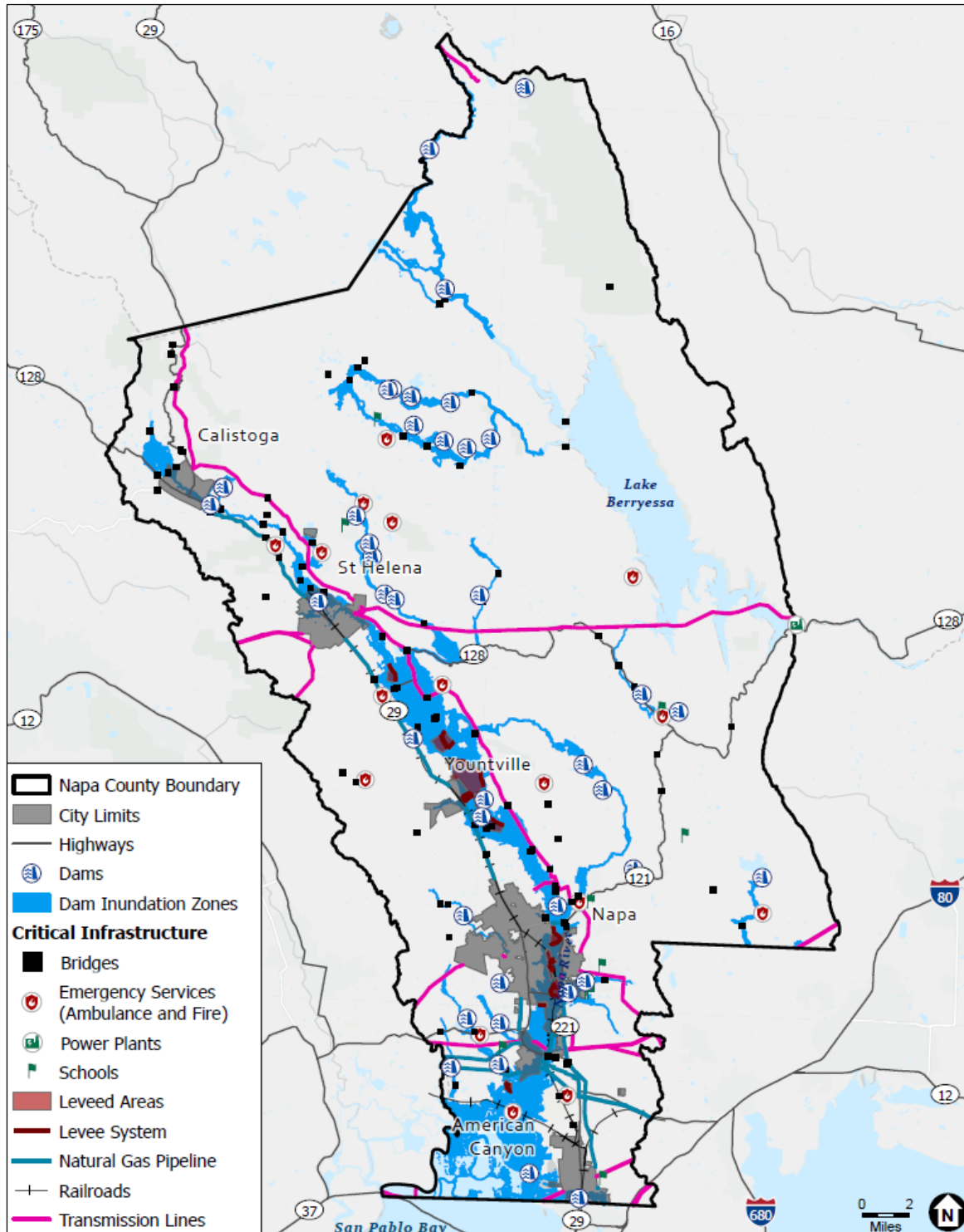


Figure 2.3-2. Napa County Dam Failure Vulnerability Snapshot

MJHMP FIGURE 4-54

Plans, Policies, Programs, and Regulatory Environment

Poor construction, lack of maintenance and repair, and deficient operational procedures are preventable or correctable through regular inspections by regulatory agencies and programmatic and policy actions, as detailed below.

U.S. Army Corps of Engineers Dam Safety Program

The U.S. Army Corps of Engineers (“Corps”) is responsible for safety inspections of some federal and nonfederal dams in the United States that meet the size and storage limitations specified in the National Dam Safety Act. The Corps has inventoried such dams and surveyed each state and federal agency’s capabilities, practices, and regulations regarding design, construction, operation, and maintenance of the dams. The Corps develops guidelines for inspection and evaluation of dam safety.

California Division of Safety of Dams

California’s Division of Safety of Dams, a division of the Department of Water Resources, monitors the dam safety program at the state level. When a new dam is proposed, Division staff inspects the site. The Division reviews dam applications and building plans to ensure that the dam is designed to meet minimum requirements and that the design is appropriate for known geologic conditions. It also inspects construction to ensure that the work is done in accordance with the approved plans. The Division inspects constructed dams on an annual basis to ensure that it is performing as intended and is not developing problems. Roughly a third of these inspections include in-depth instrumentation reviews. The Division periodically reviews the stability of dams and their major appurtenances in light of improved design approaches and requirements, as well as new findings regarding earthquake hazards and hydrologic estimates in California. (Cal. Dep’t of Water Resources, 2019)

Senate Bill 92: Dam Safety

Senate Bill 92 was signed into law on June 27th, 2017 and it provides new requirements focused on dam safety. Specifically, it requires dam owners to submit inundation maps to the Department of Water Resources. After they have been approved, the dam owner must then submit an emergency action plan (EAP) to Cal OES (California Office of Emergency Services, 2020).

Napa County Multi-Jurisdictional Hazard Mitigation Plan (MJHMP)

The County’s MJHMP provides for long-term mitigation planning by identifying goals, objectives, mitigation strategies and implementation methods that can be incorporated over the long term to reduce risk and future losses to dam failure hazards. These have been incorporated into this Safety Element as they apply to unincorporated Napa County.

County Capacity to Respond to Hazards

While no dams have failed in Napa County to date and the chances of dam failure are low, the consequences are severe. Napa County has established protocols in their emergency operations plans for warning and response to dam failure within flood zones, including collaboration with private dam owners to implement these emergency action plans. As warning time is the most crucial component of responding to dam failure, emergency action plans contain procedures and information to assist dam owners in

issuing warning and notification messages to emergency management authorities. It is important to note that emergency action plans are not publicly available but are on file at the Napa County Office of Emergency Services or with individual dam owners and California DWR.

Moving forward, along with other regulatory agencies identified, the County should consider the dam failure hazard when permitting development in mapped dam inundation zones and downstream of high hazard and significant hazard dams in the County.

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2.4 Drought

Drought has impacted almost every county in California and has caused millions of dollars in collective damages. In Napa County, drought conditions have the potential to affect numerous aspects given impacts on water, including water restrictions, reduced water quality, restricted access to recreational opportunities, reduced air quality, health impacts, and economic impacts.

Understanding Drought

Napa County's economy is dependent upon a strong agricultural industry, which in turn provides the foundation for the second largest industry in the County, tourism. Drought could have a devastating and cascading impact on the wine industry and local economy, specifically in terms of agricultural productivity. A drought can result in farmers not being able to plant crops or the failure of planted crops. This results in loss of work for farm workers and those in food processing and wine making jobs. In the event of long term drought events, other water-dependent industries are commonly forced to shut down all or a portion of their facilities, resulting in further layoffs. A drought can harm recreational companies that use water (e.g., swimming pools, water parks, and river rafting companies) as well as landscape and nursery businesses because people will not invest in new plants if water is not available to sustain them.

Climate change is expected to increase drought and extreme weather conditions. While the duration of drought is always in question, it is certain that California and Napa County will continue to be impacted by drought moving forward. (California Drought Contingency Plan, 2013).

Risk Assessment

Past Drought Events

The most recent major drought in California spanned 2014-2017. California State Governor Jerry Brown declared a drought state of emergency on January 17, 2014. On April 17, 2017, Brown issued Executive Order B-40-17, officially ending the drought state of emergency in all California counties except Fresno, Kings, Tulare, and Tuolumne.

According to the National Drought Monitor, Napa County is currently experiencing Exceptional Drought conditions. The National Drought Monitor provides drought data and maps nationally and on a localized scale. The National Drought Monitor is the product of eleven agencies, from the National Drought Mitigation Center (NDMC), National Oceanic and Atmospheric Administration (NOAA) and the United States Department of Agriculture (USDA). **Figure 2.4-1** depicts the U.S. Drought Monitor conditions in California for December 2017, December 2018, and conditions as of September 7th, 2021.



Napa River near the Trancas Street Bridge , September 20, 2021.
Courtesy of Napa Valley Register

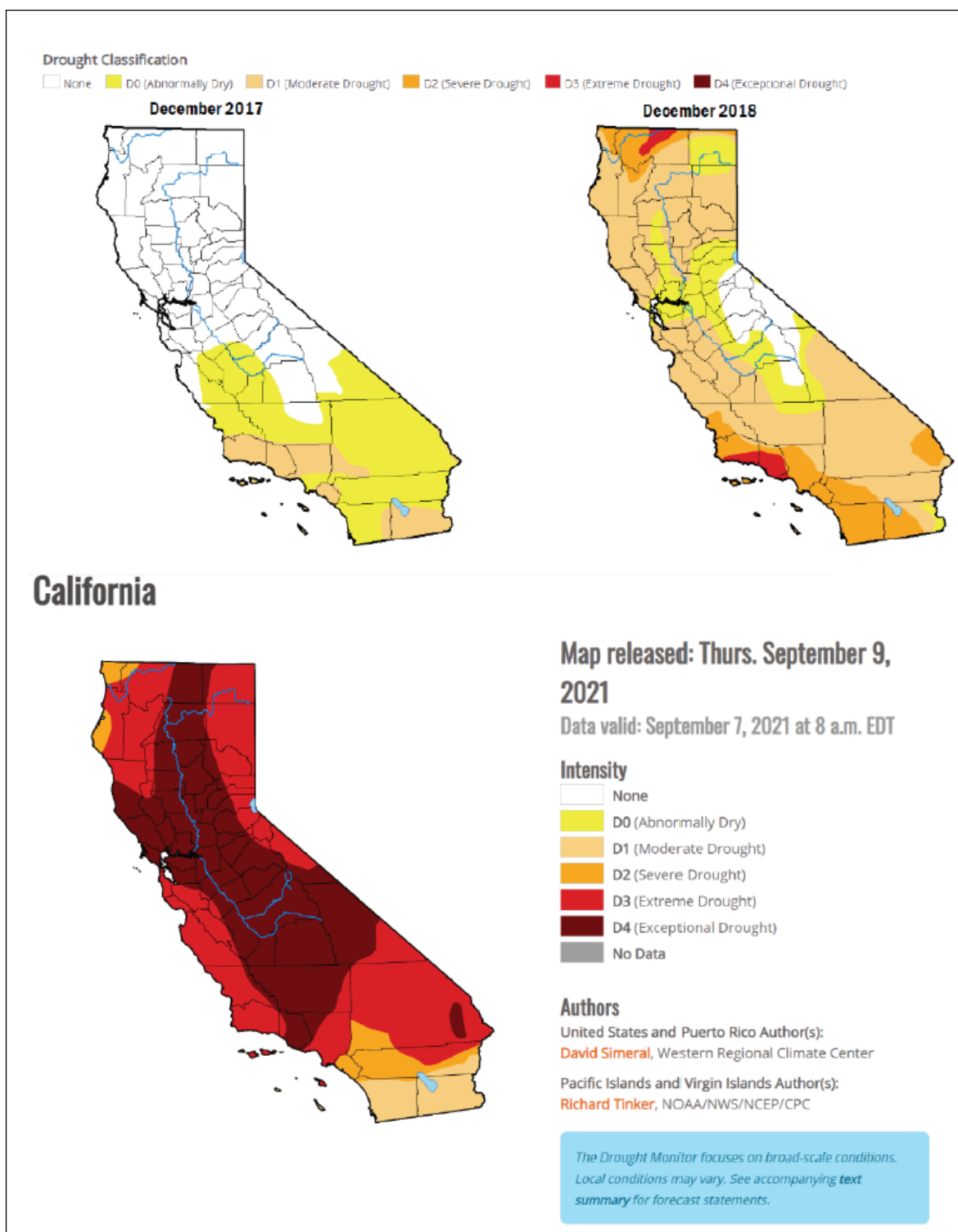


Figure 2.4-1. State of California Drought Conditions 2017, 2018 And 2021

Note to Reviewer – this graphic was used in the Napa County MJHMP

FIGURE 4-42 CALIFORNIA DROUGHT CONDITIONS 2017 VS 2018

Drought Vulnerability Analysis

Unlike hazards like wildfire and flooding which provide direct impacts, drought produces a web of impacts beyond the areas experiencing physical drought. As illustrated by the regulatory environment above, drought vulnerability usually depends on water demand, how the demand is met, and what water supplies are available to meet the demand. As a result of drought conditions and expected drought conditions moving forward, water demand in California is expected to increase. Napa County vulnerability to these drought conditions are described below.

Population

All people, property, and environments in the Napa County planning area would be exposed to some degree to the impacts of moderate to extreme drought conditions.

Frequency/Probability of Future Occurrences

Currently there is no data on the probability of drought. However, according to the results of the risk factor exercises for the participating jurisdictions as part of the Napa County MJHMP planning process, the probability of drought occurring in Napa County is likely (between 10 and 100% annual probability) (Napa County Office of Emergency Services, 2020).

Vulnerable Development, Critical Facilities, and Infrastructure

Overall, critical facilities, as defined for this plan, will continue to be operational during a drought. However, secondary hazards that could result due to drought conditions are wildfire and severe weather. A prolonged lack of precipitation dries out vegetation, which becomes increasingly susceptible to ignition as the duration of the drought extends. Extinguishing fires further stresses water supplies which can exacerbate the impacts of drought.

Severity

The severity of a drought depends on the degree of moisture deficiency, the duration, and the size and location of the affected area. The longer the duration of the drought and the larger the area impacted, the more severe the potential impacts. According to the 2050 Napa Valley Water Resources Study, water users in unincorporated Napa County areas are at the greatest risk of water shortage due to reliance on wells and groundwater, and may face water supply shortages regardless of normal rainfall years or dry years and if demands continue to increase. Droughts are not usually associated with direct impacts on people or property, but they can have significant impacts on agriculture due to loss of production, which can impact people indirectly. Other water-dependent industries are commonly forced to shut down all or a portion of their facilities, resulting in further economic losses.

On April 1, 2015, Governor Jerry Brown ordered mandatory water reductions across California (Executive Order B-37-16). This order called for residents to reduce water usage by 25 percent after recorded snowpack levels in the previous year were 20 percent of the average date. This reduction mandated lawn replacements throughout the state, customer rebates for water efficient appliances, and a prohibition on watering lawns with potable water unless water efficient drip irrigation systems are used. Furthermore, this order was enforced by the State Water Board, with assistance from local government

agencies. Although not yet mandated, similar orders could happen in response to drought conditions in the future.

According to an economic analysis of the 2016 California drought prepared by Medellín-Azuara et al, the 2016 drought cost the state’s agricultural sector \$247 million. “Spillover” loss across sectors was around \$600 million and 4,700 jobs. Overall, this represents the cascading effect that prolonged drought conditions can have on the local economy and illustrates the need for resilience efforts to be in place during drought conditions.

Secondary Hazards and Climate Change Impacts

The secondary hazard most associated with drought is wildfire. A prolonged lack of precipitation dries out vegetation, which becomes increasingly susceptible to ignition as the duration of the drought extends. In addition to increased wildfire hazards, global water resources are experiencing stresses that are further exacerbated by climate change. Adaptation strategies to future wildfires that are being implemented by the State and County are discussed in the Wildfire section of this report. With a warmer climate, drought conditions could increase in severity, frequency, and duration. More frequent extreme events such as droughts could end up being more cause for concern than the long-term change in temperature and precipitation averages.

Plans, Policies, Programs, and Regulatory Environment

California Sustainable Groundwater Management Act

Groundwater Basin: An aquifer or system of aquifers that has well defined boundaries. Under SGMA, high and medium priority groundwater basins must establish groundwater sustainability plans to manage groundwater resources.

Sustainability: The management and use of groundwater in a basin that can be maintained during the SGMA planning and implementation time period

On September 16, 2014, Governor Brown signed into law a package of bills (SB1168, AB1739 and SB1319) collectively called the Sustainable Groundwater Management Act (SGMA). SGMA requires governments and water agencies of **high and medium priority basins** to bring basins into sustainability, meaning to halt overdraft and bring groundwater basins into balanced levels of pumping and recharge. There is one high priority basin (Napa Valley) and one medium priority basin (Napa- Sonoma Lowlands) in the County. Under SGMA, these basins should reach

sustainability within 20 years of implementing their sustainability plans. For critically over-drafted basins, that will be 2040. For the remaining high and medium priority basins, 2042 is the deadline.

Executive Order B-37-16

As described above, Executive Order B-37-16 was ordered by Governor Jerry Brown in 2015. This executive order sets forth actions to use water more wisely, eliminate water waste, strengthen local drought resilience, and improve agricultural water use efficiency and drought planning. Directive #10 specified that, “For areas not covered by a Water Shortage Contingency Plan, the Department shall work with counties to facilitate improved drought planning for small water suppliers and rural communities.” As of September 2021, all the Napa Valley governments, including Napa County, are working towards completing a new regional study called the Napa Valley Drought Contingency Plan.

California Water Plan

The California Water Plan is the State's strategic plan for sustainably managing and developing water resources for current and future generations. Required by Water Code Section 10005(a), it presents the status and trends of California's water-dependent natural resources; water supplies; and agricultural, urban, and environmental water demands for a range of plausible future scenarios. The California Water Plan was updated most recently in 2018.

Napa County Flood Control and Water Conservation District

The Napa County Flood Control and Water Conservation District (NCFCWCD) was established by the California State Legislature in 1951. Since its formation, NCFCWCD has developed two principal and distinct service activities: water conservation and flood control. The District's water conservation services primarily involve administering contracts with the State of California and the United States Bureau of Reclamation for annual water supply entitlements from the State Water Project and the Solano Project, respectively. As part of its administrative duties, the District subcontracts its imported water supply entitlements to cities and special districts throughout Napa County.

Napa County Multi-Jurisdictional Hazard Mitigation Plan (MJHMP)

The County's MJHMP provides for long-term mitigation planning by identifying goals, objectives, mitigation strategies and implementation methods that can be incorporated over the long term to reduce risk and future losses to drought events. These have been incorporated into this Safety Element as they apply to unincorporated Napa County.

Napa County General Plan

The 2009 Napa County General Plan includes goals, policies, and action items specifically pertaining to water conservation.:

Napa County Drought Tolerant Landscaping Requirements

Napa County Ordinances require drought tolerant landscaping measures in development projects, including the following:

- **Commercial Limited District-** All required landscaping shall be irrigated and permanently maintained and shall include drought-tolerant plantings to the maximum extent feasible. § 18.28.050
- **Marine Commercial District-** All required landscaping shall be irrigated and permanently maintained. Landscaping shall be limited to drought-tolerant plantings to the maximum extent feasible. § 18.34.050
- **Public Lands District-** In the selection of new plant materials, preference shall be given to native and drought-tolerant species, and to species which are hardy, long-lived, and require little maintenance. § 18.50.060
- **Commercial Neighborhood District-** All required landscaping shall be irrigated and permanently maintained by the owner, lessee or occupant and shall include drought-tolerant plantings to the maximum extent feasible. § 18.32.060
- **General Industrial Zoning District-** In the selection of new plant materials, preference shall be given to native and drought-tolerant species, and to species which are hardy, long-lived, and require

little maintenance. Landscaping material shall also be consistent with any applicable approved master landscape plan. § 18.44.110

- **Conservation Regulations-** Plant materials shall be drought-tolerant and compatible with the existing habitat area in which the project is located. § 18.108.100

Special Projects

CA Division of Water Rights Water Supply/Demand Visualization Tool

In April 2021, the State Water Resources Control Board, Division of Water Rights (Division) developed an online tool that shows basic monthly water balance data for past years in major watersheds throughout California. Although this tool at this time is intended for informational purposes and will not be used to make water allocation or shortage decisions, the Water Supply and Demand Visualization Tool allows stakeholders interested in California's water accounting to have a transparent way to see supply and demand information, locations of diversions, and water right types throughout the state. Collecting and displaying the best available data helps to protect senior water rights, community and industry water needs, and the environment as a whole.

Napa County Flood and Water Resources Water Conservation Programs

Like many cities and counties across California, Napa County has implemented water conservation incentive programs and resources to help combat the effects of the drought at the local and regional level, while helping residents save money. These programs include, but are not limited to, water bill rebates for reductions in water use around the home, water wise landscaping resources, and free water conservation devices.

County Capacity to Respond to Hazards

As of 2021, the State of California has implemented statewide regulations and special projects in response to drought conditions. These types of regulations work to effectively manage water resources under drought conditions and ensure community health and safety as a result. Similar regulations at the local level have been enacted, such as policy that new and future development must comply with. The County has implemented several water conservation programs, including rebates for water conserving appliances and free-water saving devices for residents; however, the County is still currently vulnerable to water supply issues because of drought and other factors.

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2.5 Flooding

Flooding occurs when the existing channel of a stream, river, canyon, or other water course cannot contain excess runoff from rainfall or snowmelt, resulting in overflow on to adjacent lands. These are also the most common causes of flood in Napa County (Napa County Office of Emergency Services, 2020). Flooding may also occur due to high tides, extreme rain, and wind.

Understanding Floods

In order to understand flood hazards, it is important to note that connections between a river and its floodplain are most apparent during and after major flood events. A **floodplain** is any land area susceptible to being inundated by floodwaters from any source. This can include coastal areas impacted by storm surge, land along a river or bayou that is flooded when that waterway rises out of its banks, or low-lying land that fills with water when it rains. As defined by the Federal Emergency Management Agency (FEMA), these include:

- **500-year flood plain.** This is the portion of land that would be covered during a flood event that has a 0.2 percent chance of being equaled or exceeded each year.
- **100-year flood plain.** This is the portion of land that would be covered during a flood event that has a one percent chance of being equaled or exceeded each year.

Floodplains in Napa County, as determined by FEMA, are mapped in **Figure 2.5-1** below.



Napa River and Downtown Napa. Courtesy of the Napa County Flood Control and Water Conservation District

Floodways are the channel of the river or stream and the adjacent land that must remain free from obstruction

Flood Fringes are the remaining portion of the floodplain. FEMA and state regulations permit communities to allow the flood fringe to be obstructed and developed if specific development standards are met.

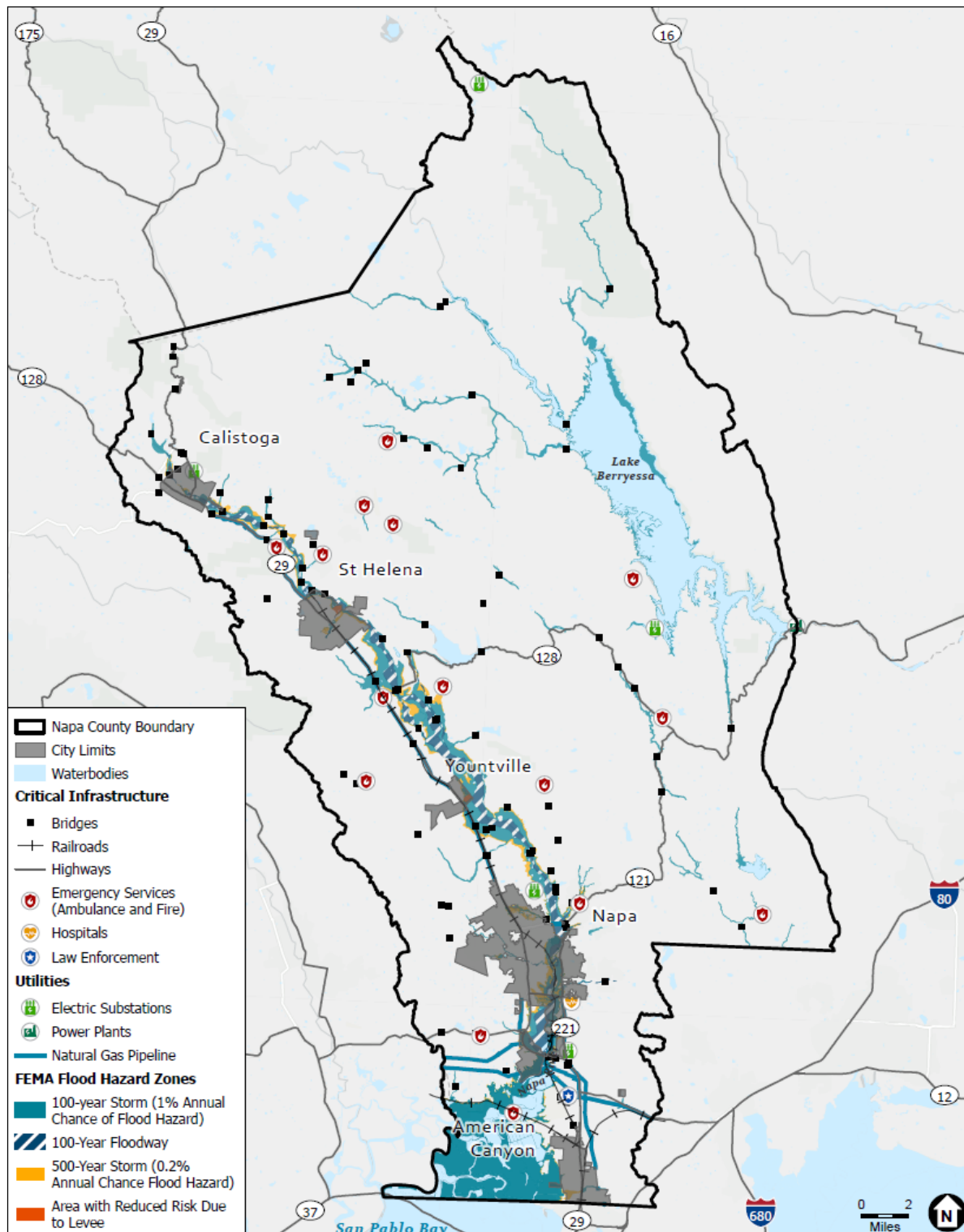


Figure 2.5-1 FEMA Flood Zone Exposure Map

MJHMP FIGURE 4-25 FEMA FLOOD ZONE EXPOSURE MAP

Risk Assessment

Local Conditions

All lands adjacent to the Napa River are subject to flooding. The floor of Napa Valley has been subject to frequent flooding, resulting in severe damage to agriculture and urban development. **Figure 2.5-1** shows the location of flood hazard zones in Napa County, which are mainly located around the Napa River. Streamflow of flood-producing magnitude is the result of storms causing precipitation over the entire Napa River basin for periods in excess of approximately 12 hours (Napa County Office of Emergency Services, 2020). In Napa County, the most intense periods of rainfall typically occur in December, January and February. (FEMA, 2016).

While the Napa River serves as the main drainage in Napa County, there are several creeks to the east and west of the Napa River that can harm communities if a flooding event were to occur. Garnett Creek is the uncontrolled headwaters of the Napa River in the northwest end of the valley. On the west side of the watershed, Sulphur Creek, Dry Creek, Hopper Creek, Redwood Creek, Napa Creek and Browns Valley Creek all contribute substantial runoff to the Napa River drainage during the wet season. On the east side, Conn Creek, Rector Creek, and Milliken Creek all have similar characteristics.

As described in more detail below, the Napa River/Napa Creek Flood Protection Project is responsible for the effective management and planning for resilience to catastrophic flooding along the river's banks.

Flood Vulnerability Analysis

This section describes vulnerabilities to flooding in terms of population, property, and infrastructure, and provides graphic representation of these assets and are overlaid on FEMA floodplains. Low lying populations and infrastructure, such as roads, are especially vulnerable to flood hazards and serve critical access functions for residents and emergency responders.

Population

According to the Napa County MJHMP, it was estimated that the total exposed population is 3,785 within the 100-YR floodplain and 4,068 within the 500-YR floodplain. The entire population in a dam failure inundation zone is exposed to the risk of a dam failure. Approximately 12% of the population in unincorporated Napa County lives within mapped 100- and 500-year floodplains, and 7% of parcels are located within these areas (Napa County Office of Emergency Services, 2020). The estimated population exposed to dam inundation is summarized in **Figure 2.5-2**.

Vulnerable Development, Critical Facilities, and Infrastructure

Per OPR Guidelines, critical facilities are “facilities that either (1) provide emergency services or (2) house or serve many people who would be injured or killed in case of disaster damage to the facility. Examples include hospitals, fire stations, police or emergency service facilities, utilities, or communications facilities. Low-lying areas are vulnerable to dam inundation, especially transportation routes. This includes all roads, railroads, and bridges in the flow path of water.

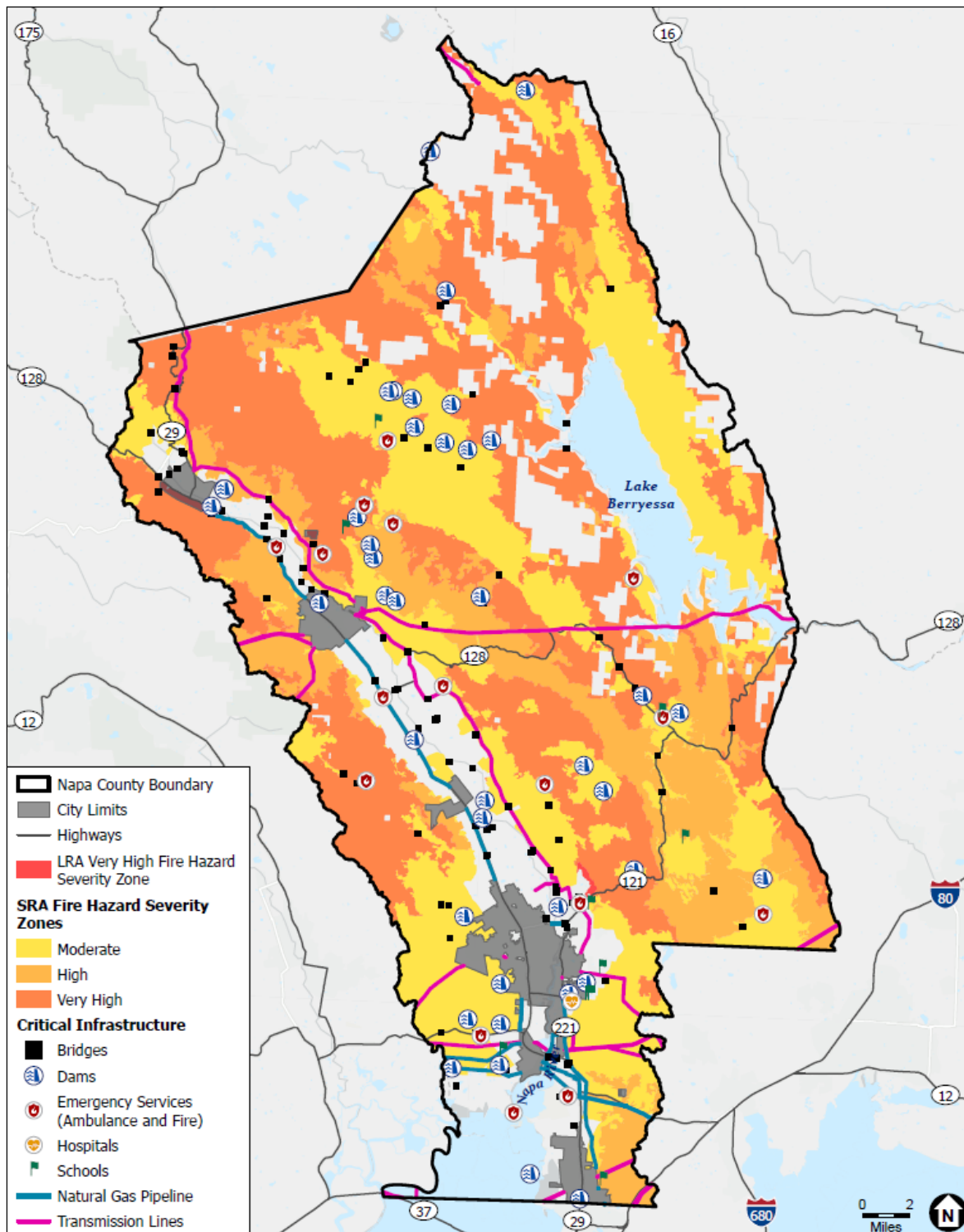


Figure 2.5-2. Napa County Vulnerable Development

MJHMP FIGURE 4-35 FEMA FLOOD ZONE EXPOSURE AND SNAPSHOT MAP

According to the Napa County MJHMP, approximately 3 of the planning area's critical facilities and 57 linear miles of transportation and linear infrastructure points are mapped within designated floodplains. Similar to wildfire hazards, transportation infrastructure is especially important in planning for flood hazards, as these facilities provide ingress and egress in the event of an emergency. These are identified in **Figure 2.5-2** and more specifically include the following transportation and linear facilities:

Roads

The following major roads in Napa County pass through the 100-year floodplain and thus are exposed to flooding:

- State HWY 29
- State HWY 128
- Silverado Trail
- Yount Street
- Trancas Street
- Zinfandel Lane
- Deer Park Road
- Sage Canyon Road
- Solano Avenue

Bridges

Flooding events can significantly impact road bridges. An analysis showed that there are 56 bridges that are in or cross over the 100-YR floodplain and no bridges in or crossing the 500-YR floodplain.

Water and Sewer Infrastructure

Water and sewer systems can be affected by flooding. Similarly, these facilities also convey floodwaters.

Levees

Levees have been built in Napa County to protect areas from the 100-YR flood event. Levees and flood control channels have been built along the Napa River to protect surrounding agricultural areas and populated parts of the County from the 100-year flood event.

County Capacity to Respond to Hazards

Since the 1970s, Napa County residents have suffered \$542 million in property damage alone from flood hazards (Napa County Public Works, n.d.). Napa County has implemented measures to increase adaptive capacity to ensure that development projects can withstand flood hazards. On a planning level, these interventions include, but are not limited to, public agency responsibilities, development and regulatory standards, capital improvements, and other long term flood protection and resilience projects. The Napa County Public Works, the Napa County Flood and Water Conservation District, and other regulatory agencies such as the Army Corps of Engineers (ACOE), have built and are planning critical pieces of

flood infrastructure that can convey floodwaters in the event of a flood hazard. Regulations and projects that aim to increase adaptive capacity to flood hazards are detailed below.

Special Projects

Napa River Flood Management Plan

The Napa River/Napa Creek Flood Protection District is responsible for the effective management and planning for resilience to catastrophic flooding along the river's banks. Developed in collaboration by the District, Napa County Department of Public Works, and the Napa County Community Coalition, the Napa River Flood Management Plan is a multi-objective and restorative approach to flood protection. Elements of the Napa Project include bank terracing, bridge replacements, bypass channels, culverts, floodwalls, and levees. Once complete, the Project would restore more than 650 acres of high-value tidal wetlands of the San Francisco Bay Estuary while protecting 2,700 homes, 350 businesses, and over 50 public properties from 100-year flood levels, a savings of \$26 million annually in flood damage costs.

As of 2021, a number of project components have been completed. However, several are still in the construction process, including floodwalls/levees north of the Oxbow and bypass pump station, floodwalls and trail on west side of Napa River (Imola to Hatt), and floodwalls around Oxbow and floodwalls and trail on east side of Napa River (Tulocay Creek to Third Street).

Plans, Policies, Programs, and Regulatory Environment

Given the proximity of navigable waterways that are subject to flood hazards in Napa County, there are multiple responsible agencies and policy measures that have been put in place in order to make the County more resilient to flood hazards. For example, Napa County Flood Control and Water Conservation District is the local sponsor for the award-winning Napa River Flood Management Plan and administers water supply contracts, watershed management and stormwater management programs throughout Napa County. Relevant regulations and agencies are described below.

Napa County Flood Control and Water Conservation District (District)

The District's flood management services focus on managing and coordinating projects intended to protect local communities from inundation by maintaining and clearing tributary channels and sponsoring capital improvements. This includes implementing the voter-approved "Napa River/Napa Creek Flood Protection Project," which includes projects to protect the City of Napa from a 100-year flood.

Napa County Multi-Jurisdictional Hazard Mitigation Plan (MJHMP)

The County's MJHMP provides for long-term mitigation planning by identifying goals, objectives, mitigation strategies and implementation methods that can be incorporated over the long term to reduce risk and future losses to flood hazards.

Flood protection for development in Napa County Code, § 16.04

The Napa County Code addresses flooding through regulation of land use activities (§ 16.04). Regulations include prohibiting land uses that could result in increased erosion and flooding; requiring flood protection at initial construction; limiting the alternation of natural floodplains and stream

channels during construction; and avoiding constructing barriers that could unnaturally divert floodwaters or increase flood hazards. The regulations also include development restrictions for the protection of riparian areas.

Drainage and flood control facilities in Napa County Code, § 17.36

Napa County Code outlines requirements for drainage and flood control facilities and flood control protection for new development, based on the size of development. Drainage facilities should be designed to capture projected runoff from a storm with a frequency of one in one hundred years, and must be approved by the County before installation. Similar requirements are in place for improvement plans for flood control facilities.

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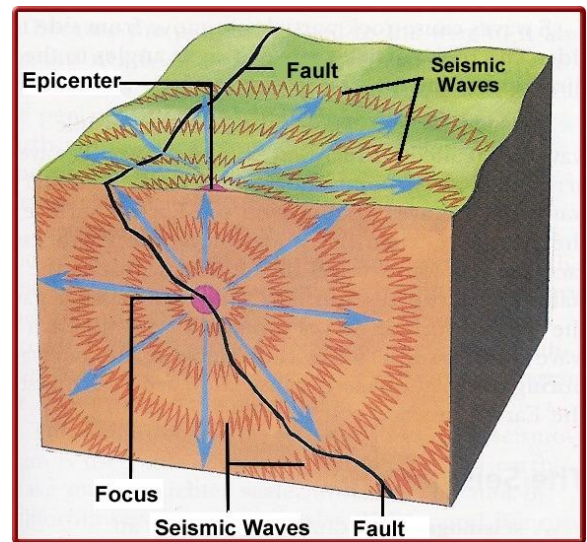
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2.6 Geologic and Seismic Hazards

The Napa County Multi-Jurisdictional Hazard Mitigation Plan (MJHMP) identified and profiled earthquakes as a priority hazard, which is included in the list of nine natural hazard threats (Napa County Office of Emergency Services, 2020). An **earthquake** is the sudden shaking of the ground caused by the passage of seismic waves through Earth's rocks. **Seismic waves** are produced when some form of energy stored in Earth's crust is suddenly released, usually when masses of rock straining against one another suddenly fracture and slip. Earthquakes associated with this type of energy release are called tectonic earthquakes. The energy also can be released by elastic strain, gravity, chemical reactions, or even the motion of massive bodies. Earthquakes occur most often along geologic faults. **Faults** are narrow zones where rock masses move in relation to one another. Earthquakes can also result in fault rupture, which occurs when movement on a fault deep within the earth breaks through to the surface creating an offset in the ground as the two sides of the fault slip past each other. The intense shaking of an earthquake can cause damage and lead to the collapse of buildings and structures.



Earthquake cross section. Courtesy of Essentials of Geology

Earthquake Classifications

Earthquakes are typically classified in one of two ways: by the amount of energy released, measured as magnitude; or by the impact on people and structures, measured as intensity.

Magnitude measures the strength of earthquakes and is the most common method for measuring earthquakes. The magnitude of an earthquake is related to the total area of the fault that ruptured, as well as the amount of offset, or displacement, across the fault. As shown in **Table 2.6-1**, there are seven earthquake magnitude classes, which range from micro to great. A magnitude class of great can cause tremendous damage to infrastructure, compared to a micro class, which results in minor damage to infrastructure.

Intensity refers to the effect of an earthquake on the Earth's surface. Earthquake intensity decreases with increasing distance from the epicenter of the earthquake. Although various intensity scales have been developed to evaluate the effects of earthquakes, the one currently used in the United States is the Modified Mercalli Intensity (MMI) Scale. The MMI value assigned to a specific site after an earthquake has a more meaningful measure of severity to the nonscientist than the magnitude because intensity refers to the effects experienced at that place.

TABLE 2.6-1. EARTHQUAKE MAGNITUDE CLASSES

Magnitude Class	Magnitude (M) Range	Description
Great	M>8	Tremendous damage
Major	7<=M<7.9	Widespread heavy damage
Strong	6<=M<6.9	Severe damage
Moderate	5<=M<5.9	Considerable damage
Light	4<=M<4.9	Moderate damage
Minor	3<=M<3.9	Rarely causes damage
Micro	M<3	Minor damage

SOURCE: Napa County Multi-Jurisdictional Hazard Mitigation Plan, 2020

The lower numbers of the intensity scale generally deal with the manner in which the earthquake is felt by people. The higher numbers of the scale are based on observed structural damage. Structural engineers usually contribute information for assigning intensity values of VIII or above. **Table 2.6-2** includes the description of the levels of MMI.

TABLE 2.6-2. MODIFIED MERCALLI INTENSITY LEVEL DESCRIPTIONS

Intensity	Description
I	Not felt, except by a very few people under especially favorable conditions.
II	Felt only by a few people at rest, especially on the upper floors of buildings.
III	Noticeable by people indoors, especially on the upper floors of buildings, although it is not widely recognized as an earthquake. Parked vehicles may move slightly.
IV	Felt indoors by many and felt outdoors by some. May awaken sleeping people. Dishes, windows, and doors disturbed. Parked vehicles move noticeably.
V	Felt by almost everyone. Sleeping people awaken, and some dishes and windows broken. Unstable objects overturned, and pendulum clocks may stop.
VI	Felt by everyone. Some heavy furniture moved, and some instances of falling plaster. Damage slight, although many people may be frightened.
VII	Considerable damage in poorly built or badly designed structures, slight to moderate damage in well-built ordinary structures, and negligible damage in buildings of good design and construction. Some chimneys broken.
VIII	Great damage in poorly built structures, considerable damage and partial collapse of well-built ordinary structures, and slight damage in specially designed structures. Chimneys, factory stacks, columns, monuments, and walls fall. Heavy furniture overturned.
IX	Well-designed structures thrown out of plum, considerable damage in specially-designed structures. Substantial buildings suffer great damage and partial collapse. Buildings shifted off foundations.
X	Some well-built wood structures destroyed. Most masonry and frame structures and foundations destroyed. Rails bent.
XI	Few if any masonry structures remain standing. Bridges destroyed and rails greatly bent.
XII	Total damage. Lines of sight and level are distorted. Objects thrown into the air.

SOURCE: USGS, 2019 and Napa County Multi-Jurisdictional Hazard Mitigation Plan, 2020

Risk Assessment

Local Conditions

The Alquist-Priolo Act established earthquake fault zones in California. These Alquist-Priolo Earthquake Fault Zones encompass surface traces of active faults that have a potential for future surface fault rupture and are mapped across California. These zones have been established by the State Geologist and indicate an active fault within the zone. The fault may pose a risk to existing or future structures from a surface fault rupture.

Figure 2.6-1, Regional Fault Lines, shows the location of fault zones as well as the underlying quaternary faults near the County. According to the MJHMP, the faults most likely to produce strong ground shaking in the County include the Northern Hayward/Rodgers Creek in the west, the Maacama in the northwest, the Hunting Creek-Berryessa in the north, the Green Valley in the southeast and the West Napa in the south central. The Green Valley and the West Napa Fault are the only two major faults that pass through County boundaries. (Association of Bay Area Governments, 2014)

Past Earthquake Events

According to the MJHMP, multiple earthquakes have occurred in and near the County over the last 20 years. As outlined in **Table 2.6-3**, there have been seven earthquake events with a magnitude of 4.0 or greater since the year 2000. Two large-scale earthquakes in Napa County, a 5.2 on the West Napa Fault and the South Napa earthquake, caused damage, death, and injuries. The August 24, 2014 South Napa earthquake was the largest in the San Francisco Bay Area since 1989, registering at 6.0 on the magnitude scale with a MMI of VIII (Severe). Total damage from the South Napa earthquake ranged from \$362 million to \$1 billion, resulted in 200 injured, and one fatality.

TABLE 2.6-3. EARTHQUAKE EVENTS IN NAPA COUNTY 2000 – 2018

Date	Location	Magnitude	Description ^a
1/4/2018	2 km from Berkeley	4.4	Moderate damage
5/22/2015	10 km ENE of Yountville	4.1	Moderate damage
8/24/2014	South Napa	6.0	Severe damage
8/3/2006	Northern California	4.5	Moderate damage
5/8/2005	Northern California	4.1	Moderate damage
5/25/2003	Northern California	4.1	Moderate damage
9/3/2000	4.8 km SSW of Yountville	5.2	Considerable damage

^a Descriptions were derived from Table 2.6-1, Earthquake Magnitude Classes, above.

SOURCE: USGS; Napa County Multi-Jurisdictional Hazard Mitigation Plan, 2020

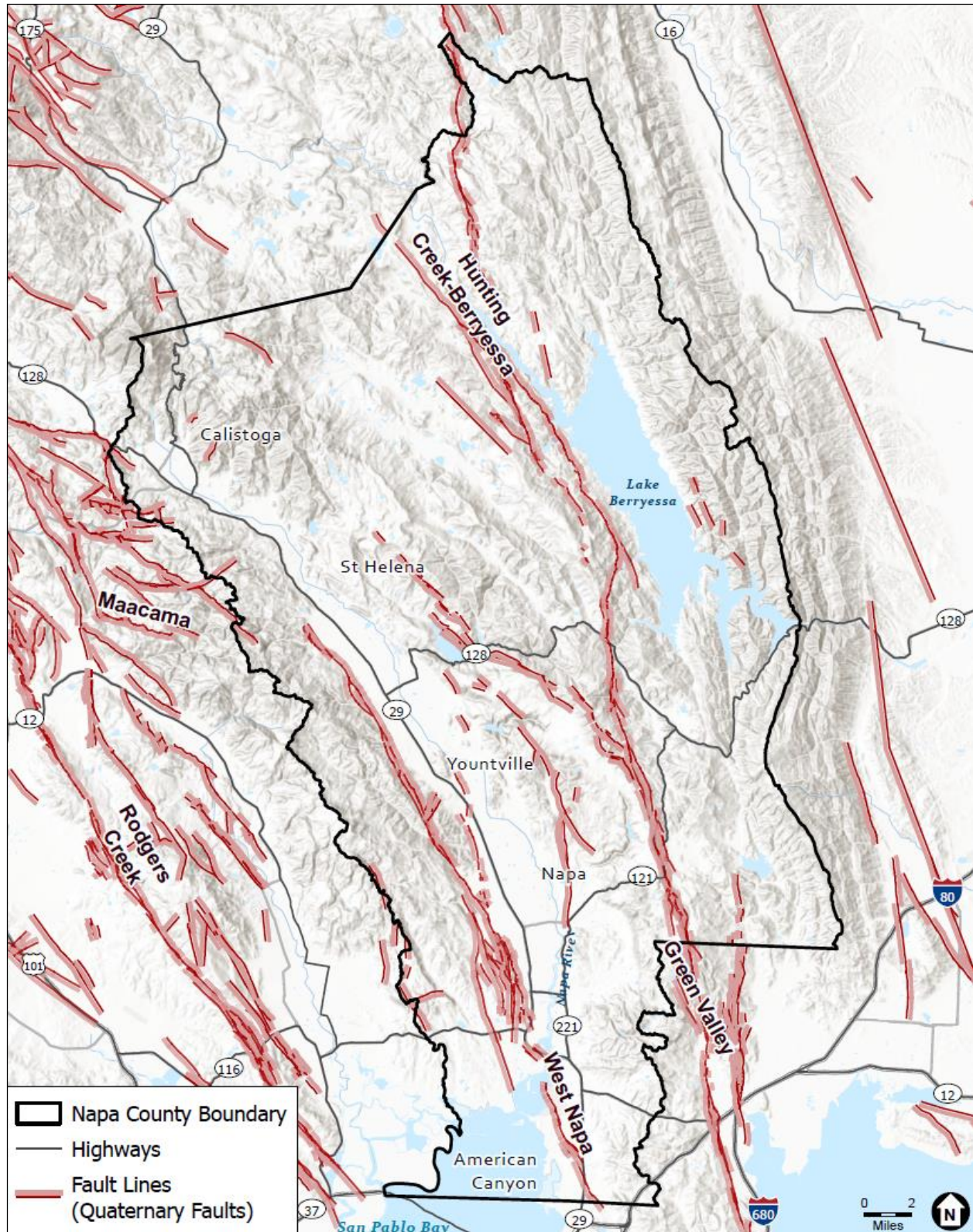


Figure 2.6-1. Regional Fault Lines

Earthquake Vulnerability Analysis

Earthquakes are a considerable threat to life and property in Napa County. A moderate to severe seismic incident on any fault zone in close proximity to the County is expected to cause:

- Extensive property damage, particularly to pre-1930's unreinforced masonry structures,
- Possible fatalities and injuries,
- Damage to water and sewage systems,
- Disruption of communications systems,
- Broken gas mains and petroleum pipelines,
- Disruption of transportation arteries, and
- Competing requests for regional aid resources.



2014 South Napa Earthquake damaged unreinforced masonry building on Main St. in Napa Downtown. Courtesy of USGS

The vulnerability analysis contained in the County MJHMP included analyses on population, frequency/probability of future occurrences, critical facilities, hazardous material fixed facilities, utilities and infrastructure, which are discussed briefly below.

Population

All people, property, and environments in the Napa County planning area would be exposed to direct and indirect impacts from earthquakes. As shown in **Figure 2.6-2**, approximately 100 percent of the population is either in Very Strong, Severe, or Violent probabilistic shake intensity zones.

Frequency/Probability of Future Occurrences

The probability of earthquake event in Napa County is based on the approximate location of earthquake faults within and outside the region. According to the MJHMP, the probability of an earthquake occurring in the County is likely between a 10 and 100 percent annual probability. According to the USGS's earthquake probability maps, shown in **Figure 2.6-3**, the Hunting Creek-Berryessa fault has a 5 percent chance of producing an earthquake of 6.7 magnitude or greater in the next 30 years, while the Rodgers Creek / Hayward North fault, located just outside County boundaries, has more than 10 percent chance. The combined probability of a major earthquake occurring on one of the major faults passing through the County is 63 percent over the next thirty years (Association of Bay Area Governments, 2014).

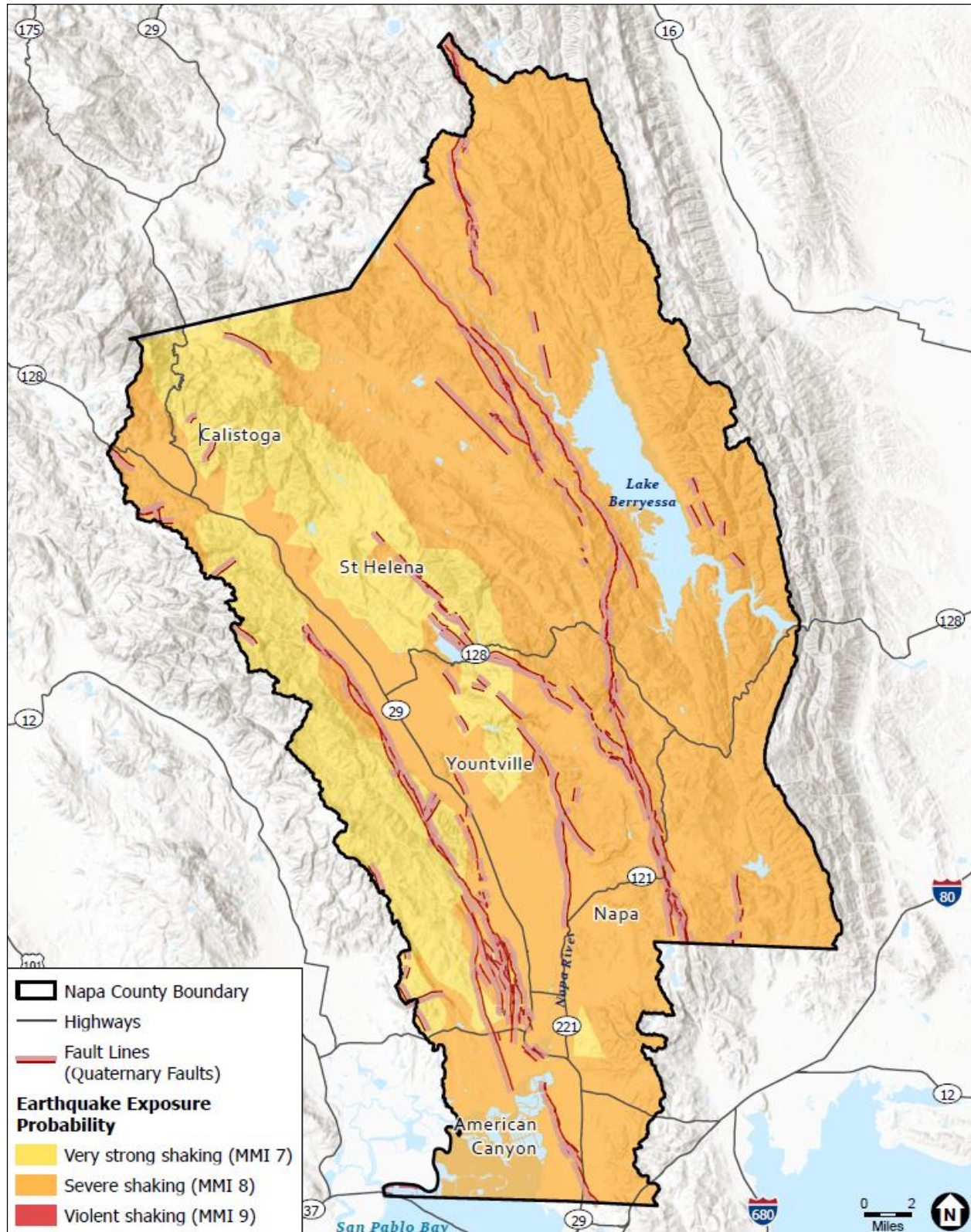


Figure 2.6-2. c Exposure Probability Map

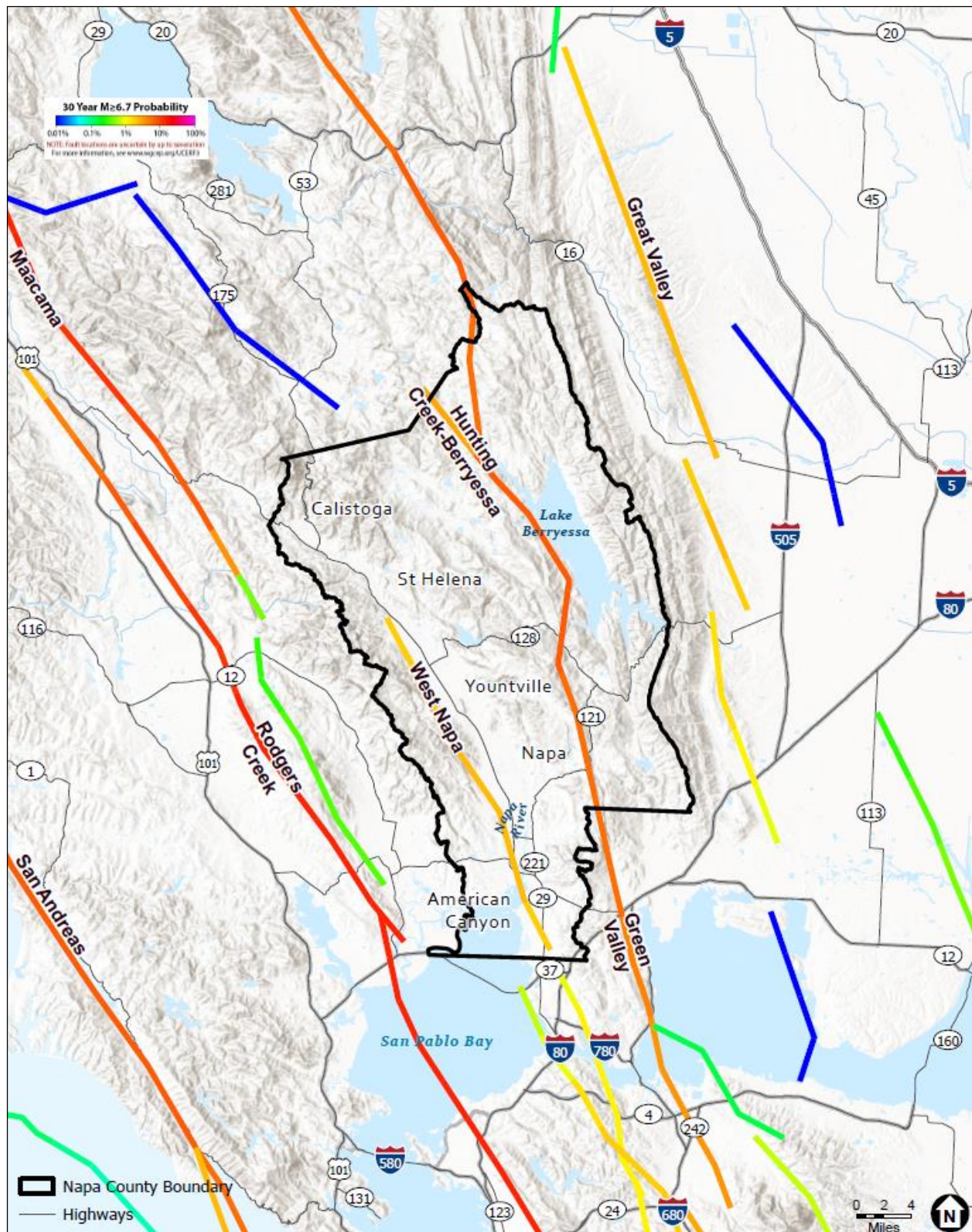


Figure 2.6-3. Fault Probability Map

Critical Facilities, Hazardous Material Fixed Facilities, Utilities and Infrastructure

All critical facilities in Napa County are exposed to earthquake hazards. Seismic risks, or losses, that are likely to result from exposure to seismic hazards include:

- Utility outages;
- Economic losses for repair and replacement of critical facilities, roads, buildings, etc.;
- Indirect economic losses such as income lost during downtime resulting from damaged public infrastructure; and
- Roads or railroads that are blocked or damaged preventing access throughout the area and isolating residents and emergency service providers needing to reach vulnerable populations or to make repairs.

Earthquakes can produce hazardous materials threats at very high levels. Depending on the build and construction of each hazardous materials facility, the earthquake-initiated hazardous material release potential will vary. Hazardous materials contained within masonry or concrete structures built before certain benchmark years (1996, 1992, 1990, and 1977) may be particularly vulnerable (County Building Department; Napa County Office of Emergency Services, 2020).

Linear utilities and transportation routes are vulnerable to rupture and damage during and after a significant earthquake event. The impact of a single failure can have affects across multiple systems and utility sectors, especially degrading infrastructure systems that could result in outages that last weeks to multiple months.

Water supply utilities and their availability to distribute water to support life and treating the sick and the injured after an earthquake event are of major concern to the County. There are three water reservoirs within the City of Napa that have all been recently retrograded and covered, and one reservoir in the City of St Helena that will likely provide ample potable water to meet demands.

Napa County's natural gas utility, Pacific Gas and Electric Company (PG&E), is responsible for designing, constructing, maintaining, and operating the natural gas system safely and efficiently. Gas customers and County residents are responsible for using gas safely on their property and within their buildings and other facilities. Customers meet this responsibility by maintaining their gas appliances in good working condition, assuring that only qualified individuals are able to modify or maintain their gas service and facility piping, and knowing what to do before and after earthquakes to maintain the safe operation of their natural gas service.

Telecommunication systems will be affected by system failure, overloads, loss of electrical power and possible failure of some alternate power systems. Immediately following an event, numerous failures will occur, compounded by system use overloads.

Severity

The severity of an earthquake in the County was analyzed using the magnitude 6.7 West Napa Fault earthquake scenario to show possible shake severity in the region and was modeled after the South Napa

Earthquake in 2014. The scenario showed that in the event of a 6.7 magnitude earthquake along the West Napa fault, the County would experience moderate to severe shaking, similar to that of the South Napa Earthquake in 2014. A 6.7 magnitude earthquake would be classified as a strong earthquake that would result in severe damage and would have an intensity of VIII (Severe). As shown in **Table 2.6-2**, above, an earthquake with VIII intensity is described as resulting in great damage to poorly built structures, considerable damage and partial collapse of well-built ordinary structures, and slight damage in specially designed structures.

In addition, severity of an earthquake event could be aggravated by collateral emergencies such as fires, hazardous material spills, utility disruptions, landslides, transportation emergencies, and the possible failure of the Napa County dams.

Secondary Hazards

Secondary hazards that could be created by earthquakes include soil liquefaction and tsunamis. Additionally, artificial induction may potentially trigger earthquakes and has been identified as a hazard of concern for the County. These hazards are defined below.

Soil Liquefaction

Soil liquefaction occurs when material that is ordinarily a solid behaves like a liquid. Soil liquefaction is a phenomenon in which the strength and stiffness of a soil is reduced by earthquake shaking or other rapid loading. Soil liquefaction and related phenomena have been responsible for tremendous amounts of damage in historical earthquakes around the world. Saturated or partially-saturated soil substantially loses strength and stiffness in response to an applied stress such as shaking during an earthquake or other sudden change in stress condition. Soil liquefaction can cause severe damage to property, including damaging pipes, compromising building foundations, and bucking roads and airport runways.

Tsunamis

A tsunami is a series of traveling ocean waves of extremely long length that are generated by disturbances occurring below or near the ocean floor that are primarily associated with earthquakes. However, tsunamis can also be generated by submarine landslides, submarine volcanic eruptions, the collapse of volcanic edifices, and, in very rare instances, large meteorite impacts in the ocean. Tsunamis diffuse around land masses and typically affect beaches that are open to the ocean, bay mouths, tidal flats, and the shores of large coastal rivers. Tsunami are not symmetrical, as such, the waves may be much stronger in one direction than another, depending on the nature of the source and the surrounding geography. However, because tsunamis propagate outward from their source, coasts in the shadow of affected land masses are usually fairly safe.

Artificial Induction

Earthquakes are sometimes caused by human activities, including the injection of fluids into deep wells, pumping of ground water, the excavation of mines, and the filling of large reservoirs. In fluid injection, the slip is thought to be induced by premature release of elastic strain, as in the case of tectonic earthquakes, after fault surfaces are lubricated by the liquid.

Other hazards can also occur from earthquakes and are profiled in other parts of this Element, such as dam failure or wildfires, and are discussed in detail in Sections 2.3, *Dam Failure* and 2.11, *Wildfire Hazards* respectively.

County Capacity to Respond to Hazard

In any earthquake, the primary consideration is saving lives. Time and effort must also be given to providing for people's mental health by reuniting families, providing shelter to the displaced persons, and restoring basic needs and services. A major effort will be needed to remove debris and clear roadways, demolish unsafe structures, assist in reestablishing public services and utilities, and provide continuing care and temporary housing for affected citizens.

There is currently no reliable way to predict the day or month that an earthquake will occur at any given location. The County MJHMP states that there is research being done with warning systems that use the low energy waves that may anticipate major earthquakes. Seconds and minutes of advance warning can allow people and systems to take actions to protect life and property from destructive shaking. Even a few seconds of warning can enable protective actions such as:

- Public: Citizens, including schoolchildren, drop, cover, and hold on; turn off stoves, safely stop vehicles.
- Businesses: Personnel move to safe locations, automated systems ensure elevator doors open, production lines are shut down, sensitive equipment is placed in a safe mode.
- Medical services: Surgeons, dentists, and others stop delicate procedures.
- Emergency responders: Open firehouse doors, personnel prepare and prioritize response decisions.
- Power infrastructure: Protect power stations and grid facilities from strong shaking.

Napa County has had several participating jurisdictions identify issues and/or weaknesses through Planning Committees for their respective facilities as part of the mitigation identification process. The committees utilized the Risk Assessment Mapping Platform (RAMP) mapping tool and earthquake data. **RAMP** is a web based and interactive platform made specifically for mitigation planning. RAMP allows the user a robust discovery of risk, vulnerability, and exposure data developed especially for Napa County. The Planning Committee developed mitigation actions, as both planning activities and projects, to address problems that could originate from hazards identified in the County MJHMP. Mitigation actions were created by identifying hazard problem statements. These problem statements were based on the risk assessment and vulnerability analysis. The County has listed the identified Earthquake problem statements for all participating jurisdictions in Table 4-27 and 5-6 of the County MJHMP.

Policies, Plans, and Regulatory Environment

Alquist-Priolo Earthquake Fault Zoning Act and Seismic Hazards Mapping Act (1972)

The 1971 San Fernando Earthquake resulted in the destruction of numerous structures built across its path. This led to passage of the Alquist-Priolo Earthquake Fault Zoning Act in 1972. This Act prohibits the construction of buildings for human occupancy across active faults in the State of California. Similarly, extensive damage caused by ground failures during the 1989 Loma Prieta Earthquake focused

attention on decreasing the impacts of landslides and soil liquefaction. This led to the creation of the Seismic Hazards Mapping Act, which increases construction standards at locations where ground failures are probable during earthquakes.

2019 California Building Standards Code

Pursuant to Chapter 15.12, Building Code, of the Napa County Municipal Code, the 2019 California Building Code (CBC) has been adopted by Napa County. The 2019 California Code of Regulations (CCR) Title 24, Part 9 (CBC) is a compilation of building standards, including materials requirements, construction methods, and maintenance standards for earthquake protection and resiliency. The 2019 CBC standards are based on building standards that have been adopted by State agencies without change from a national model code; building standards based on a national model code that have been changed to address particular California conditions; and building standards authorized by the California legislature, not covered by the national model code. (CBSC, 2019)

Napa County General Plan

The 2008 Napa County's General Plan was updated to include goals and policies to mitigate the effects of earthquakes.

Napa County MJHMP

The County's MJHMP provides for long-term mitigation planning by identifying goals, objectives, mitigation strategies and implementation methods that can be incorporated over the long term to reduce risk and future losses. The following mitigation actions are identified as County wide priority for implementation:

- **SH-06-2020:** Inform residents and tourists of shelter locations and evacuation routes and procedures for storing or taking valued items before large scale evacuations.
- **AC-05-2013:** Develop a public outreach program for mitigation of earthquake risk for residents of American Canyon proper.
- **AC-06-2020:** Retrofit critical facilities that are vulnerable to extreme and violent shaking.
- **CL-12-2020:** Retrofit critical facilities that are vulnerable to failure during extreme and violent shaking.
- **CL-13-2020:** Develop a public outreach program for mitigation of earthquake risk for residents of Calistoga proper.
- **NC-10-2013:** Earthquake month public education program. Develop a comprehensive public outreach program for earthquake risk reduction for Napa County Residents.
- **NC-51-2020:** Encourage privately owned critical facilities (e.g. churches, hotels, other gathering facilities) to evaluate the ability of the buildings to withstand earthquakes and to address any deficiencies identified.
- **NC-52-2020:** Retrofit / Harden County-owned critical facilities and buildings and their ability to withstand earthquakes.
- **NC-54-2020:** Adopt and enforce updated building codes to reduce earthquake damage to structures.
- **NCOE-02-2020:** Retrofit / Harden Main Office to withstand extreme and violent earthquakes.

- **NVC-02-2020:** Encourage communities and constituents to participate in the Great California ShakeOut. Continue staff EOC and emergency messaging training.
- **NVC-04-2020:** Design and construct new critical facilities to higher than the minimum seismic standards required by building codes, especially for facilities that may serve as emergency shelters or their public infrastructure.
- **NVC-05-2013:** Research geological soil makeup of lower tier of campus to determine if additional structural mitigation steps are necessary.
- **SH-14-2020:** Develop resource kits for mitigation of earthquake risk for residents of St. Helena proper. This includes targeted outreach and project development for adult care providers, private schools and other gathering facilities.
- **YV-06-2020:** Earthquake month public education program.

Seismic Retrofit Ordinances

Communities in the Napa County Operational Area have all adopted Seismic Retrofit ordinances to reinforce all historic buildings. During the last Building & Fire Code update, all jurisdictions in the county adopted a single Countywide Building & Fire Code to streamline permitting and enforcement.

Napa County Code Section 18.119.080

Along with the seismic retrofit ordinances, the Napa County Code includes requirements for telecommunications facilities to be constructed to withstand the forces of the “maximum credible earthquake.” Section 18.119.080.

Field Act

The Field Act was enacted on April 10, 1933, one month after the Long Beach Earthquake where many schools were destroyed or suffered major damage. Public school construction has been governed by the Field Act since 1933 and enforced by the Division of the State Architect (DSA). In any community, public schools constructed under the Field Act after 1978 are likely to be among the safest buildings in which to experience a major earthquake.

The Field Act requires:

- School building construction plans to be prepared by qualified California licensed structural engineers and architects;
- Designs and plans to be checked by the DSA for compliance with the Field Act before a contract for construction can be awarded;
- Qualified inspectors, independent of the contractors and hired by the school districts, to continuously inspect construction and verify full compliance with plans;
- The responsible architects and/or structural engineers to observe the construction periodically and prepare changes to plans, as needed, subject to approval by DSA;
- Architects, engineers, inspectors and contractors to file reports, under penalty of perjury, to verify compliance of the construction with the approved plans.

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2.7 Hazardous Materials

A **hazardous material** is defined in Title 22 of the California Code of Regulations (CCR) as a substance or combination of substances that may cause, or significantly contribute to, (1) an increase in mortality or an increase in serious illness; or (2) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported or disposed of or otherwise managed (CCR, Title 22, Section 66260.10). **Hazardous wastes** are the



Napa Recycling and Waste Services Facilities. Courtesy of the Napa Recycling and Waste Services Website

byproducts of various processes. For purposes of this section, the term “hazardous materials” refers to both hazardous substances and hazardous wastes.

In Napa County, hazardous materials include household hazardous waste, byproducts of industrial manufacturers and providers of diesel, gasoline, propane, lubricants, compressed natural gas, and pesticides commonly used on vineyards.

Understanding Hazardous Materials & Regulations

Hazardous materials can be found throughout any urban environment. Homeowners often store used batteries, car oil, pesticides, cleaners, and paint, all of which are potentially hazardous. However, the quantity, concentration, and types of these household products are often not high enough to pose a substantial risk to human health and safety or to the environment. Hazardous materials are more often associated with select commercial, industrial, and agricultural operations as they have potential to present harm to the health of humans and the environment through groundwater and/or soil contamination.

Hazardous materials are classified based on the form of hazard(s) they pose, namely flammable, combustible, poisonous, and/or radioactive. Since 1990, State law has required that hazardous waste be properly disposed of in approved hazardous waste treatment or disposal facilities. To accomplish this, treatment methods and facilities have been developed and approved to pre-treat hazardous waste before its final disposal.

Risk Assessment

Local Conditions

Releases, leaks, or disposal of chemical compounds within the County, such as **petroleum hydrocarbons**, on or below the ground surface, can lead to contamination of surface water and underlying soil and groundwater. Disturbance of a previously contaminated area through grading or excavation operations could expose the public to health hazards from physical contact with contaminated materials or hazardous vapors. Areas where historical or ongoing activities have

Petroleum hydrocarbons are a broad range of chemicals that comprise oil and products refined from oil, such as gasoline and diesel.

An Underground Storage Tank is defined by the EPA as a tank and any underground piping connected to the tank that has at least 10 percent of its combined volume underground.

resulted in known or suspected release of hazardous materials to soil and groundwater, and where current investigation and clean-up activities are located, are monitored by the California Department of Toxic Substances Control (DTSC), the California State Water Resources Control Board (SWRCB), or the U.S. Environmental Protection Agency (EPA). The hazardous facilities in unincorporated Napa County are identified below under the respective monitoring agency. Further information on each agency is provided within the Policies, Plans and Regulatory Environment Section below.

California State Water Resources Control Board (SWRCB)

The SWRCB oversees the statewide **Underground Storage Tank (UST)** Program, which is aimed at protecting public health and safety and the environment from releases of petroleum and other hazardous substances from tanks. There are 44 UST facilities in Napa County and of those, 43 are permitted.

GeoTracker is the State Water Resources Control Board's (SWRCB's) internet-accessible database system used by the SWRCB, regional boards, and local agencies to track and archive compliance data from authorized or unauthorized discharges of waste to land, or unauthorized releases of hazardous substances from USTs.

U.S. Environmental Protection Agency (EPA)

The U.S. EPA **Toxic Release Inventory (TRI)** is a database that tracks the management of certain toxic chemicals that may pose a threat to human health and the environment. Certain industrial facilities in the U.S. must report annually how much of each chemical is recycled, combusted for energy recovery, treated for destruction, and disposed of or otherwise released on- and off-site. The U.S. EPA TRI lists one site in the County that is Boral Stone Products, located at 350 Tower Road in American Canyon.

California Department of Toxic Substances Control (DTSC)

The DTSC maintains the **Envirostor Data Management System**, which provides information on hazardous waste facilities (both permitted and corrective action) as well as any available site cleanup information.

According to the DTSC, there are approximately 465 sites in the County. Of those 465, there are 63 sites that are actively being remediated, assessed, are pending review of an agency or are in a verification monitoring program. In addition, from the 465 listings, 383 sites have been closed and require no further action, 7 sites are inactive, and 2 sites are eligible for closure. The remaining 10 sites are groundwater cleanup and hazardous waste cleanup sites that are open, active, or certified operations and maintenance facilities.

Figure 2.7-1, Hazardous Materials Sites, identifies the approximate locations of all hazardous sites from the collective databases that are regulated and/or maintained by the U.S. EPA, DTSC, and the SWRCB, including toxic release sites, permitted underground storage tanks, hazardous waste facilities, hazardous waste cleanup sites, and groundwater cleanup sites.

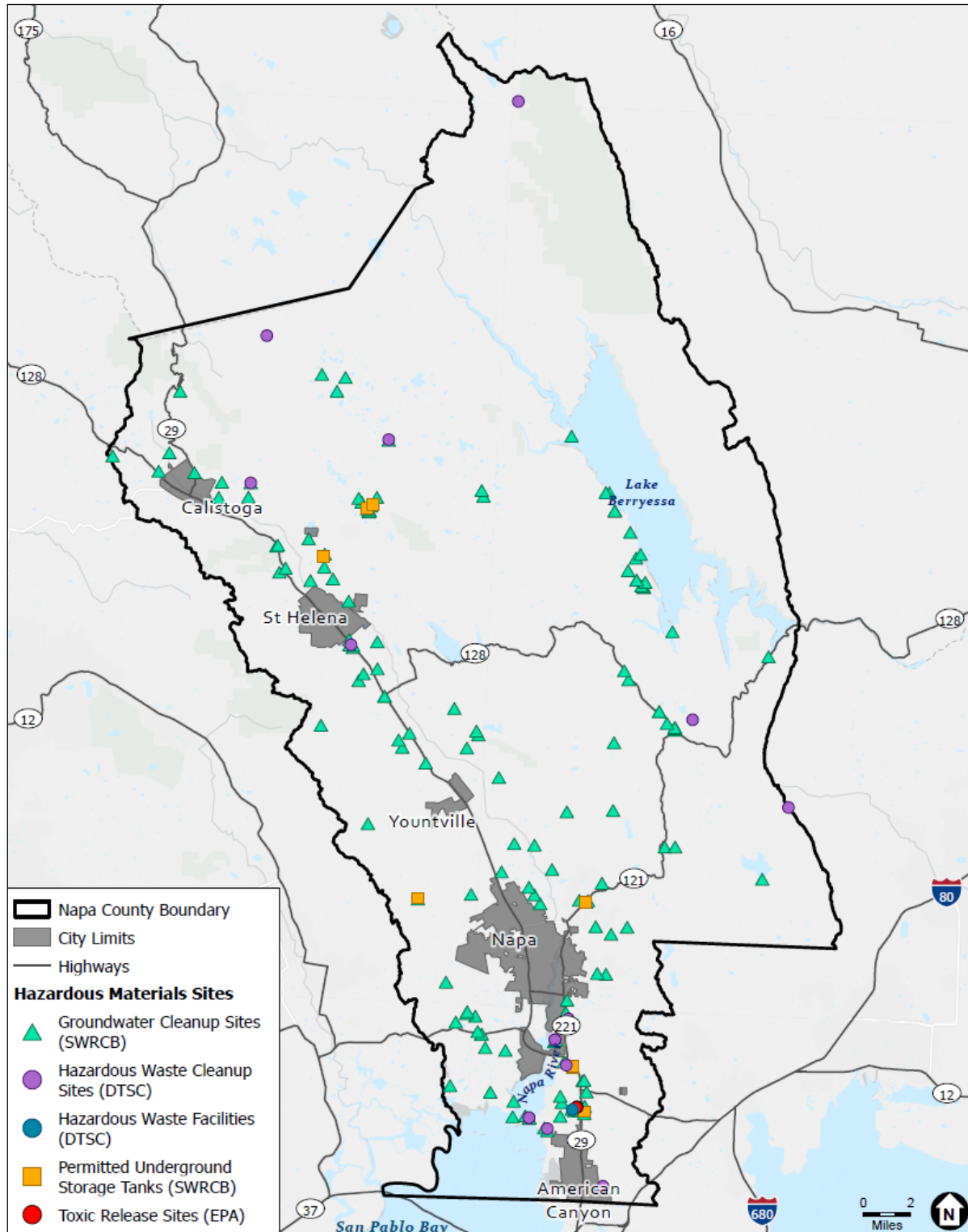


Figure 2.7-1
Hazardous Materials Sites

In addition, there are certain regulated substances, known as extremely hazardous substances, that require extensive emergency planning. The most common regulated extremely hazardous substance found in the County is anhydrous ammonia, which requires a Risk Management Plan (RMP). There are over 400 other chemicals that may require a RMP.

Policies, Plans, and Regulatory Environment

Given the amount of waste generators and hazard facilities in Napa County, there are a number of Federal, State, and local laws, policies, plans and programs that regulate hazardous materials. These laws and associated regulations include specific requirements for facilities that generate, use, store, treat, and/or dispose of hazardous materials. Relevant regulations and agencies are described below.

Federal

Environmental Protection Agency

The U.S. EPA is the agency primarily responsible for enforcement and implementation of federal laws and regulations pertaining to hazardous materials. The U.S. EPA works closely with other Federal agencies, State and local governments, and Indian tribes to develop and enforce regulations under existing environmental laws. U.S. EPA is responsible for researching and setting national standards for a variety of environmental programs and delegates to states and tribes responsibility for issuing permits, and monitoring and enforcing compliance. The U.S.EPA holds the TRI database as a resource for learning about toxic chemical releases and pollution prevention activities reported by industrial and federal facilities.

Other Federal Agencies

Other Federal agencies that regulate hazardous materials include the Occupational Safety and Health Administration (OSHA) and the Department of Transportation (DOT). The following Federal laws and guidelines govern hazardous materials:

- Federal Water Pollution Control
- Clean Air Act
- Occupational Safety and Health Act
- Federal Insecticide, Fungicide, and Rodenticide Act
- Comprehensive Environmental Response, Compensation, and Liability Act
- Guidelines for Carcinogens and Biohazards
- Superfund Amendments and Reauthorization Act Title III
- Resource Conservation and Recovery Act
- Safe Drinking Water Act
- Toxic Substances Control Act

Prior to August 1992, the U.S. EPA was the principal agency at the Federal level regulating the generation, transport and disposal of hazardous waste, under the authority of the Resource Conservation

and Recovery Act (RCRA). As of August 1, 1992, however, the EPA authorized transfer of authority to implement the State's hazardous waste management program to the California Department of Toxic Substance Control (DTSC). The Federal EPA continues to regulate hazardous substances under the Comprehensive Response Compensation and Liability Act (CERCLA). Under CERCLA, the U.S. EPA has authority to seek the parties responsible for releases of hazardous substances and ensure their cooperation in site remediation. CERCLA also provides federal funding (the "Superfund") for remediation.

State

California Environmental Protection Agency

The California Environmental Protection Agency (CalEPA) and the State Water Resources Control Board (SWRCB) establish rules governing the use of hazardous materials and the management of hazardous waste. Applicable State and local laws include the following:

- Public Safety/Fire Regulations/Building Codes
- Hazardous Waste Control Law
- Hazardous Substances Information and Training Act
- Air Toxics Hot Spots and Emissions Inventory Law
- Underground Storage of Hazardous Substances Act
- Porter-Cologne Water Quality Control Act

CalEPA protects Californians from hazardous waste and hazardous materials by ensuring local regulatory agencies consistently apply statewide standards when they issue permits, conduct inspections and engage in enforcement activities. This program is known as the Unified Program, which is a consolidation of multiple environmental and emergency management programs.

California Department of Toxic Substance Control

Within CalEPA, Department of Toxic Substances Control (DTSC) has primary regulatory responsibility, with delegation of enforcement to local jurisdictions that enter into agreements with the state agency, for the management of hazardous materials and the generation, transport and disposal of hazardous waste under the authority of the RCRA and the California Health and Safety Code. Senate Bill 1082 requires the establishment of a unified hazardous waste and hazardous materials management program. The result was the CalEPA Unified Program. The Unified Program consolidates, coordinates, and makes consistent the administrative requirements, permits, inspections, and enforcement activities of six environmental and emergency response programs. State agencies responsible for these programs set the standards, while local governments implement the standards. CalEPA oversees implementation of the program and agencies involved in the program are known as the Certified Unified Program Agency, or CUPA.

The Napa County Division of Environmental Health (DEH) is the CUPA for pollution prevention in all cities, towns, and areas of Napa County and is discussed in detail under the Local section, below.

State Water Resources Control Board (SWRCB)

The SWRCB and nine regional water quality control boards (RWQCBs) are responsible for ensuring implementation and compliance with the provisions of the federal Clean Water Act and the Porter-Cologne Act of 1969. The Porter-Cologne Act is California's statutory authority for the protection of water quality. Along with the SWRCB and RWQCBs, water quality protection is the responsibility of numerous water supply and wastewater management agencies, as well as city and county governments, and requires the coordinated efforts of these various entities. Individual RWQCBs are responsible for identifying, monitoring, and cleaning up leaking underground storage tanks (LUSTs). LUSTs are an important threat to groundwater and pose a potential threat to human health, safety, and the environment. The San Francisco RWQCB's UST cleanup unit provides technical and regulatory oversight for the investigation and cleanup of sites with leaks from USTs.

Aboveground Petroleum Act (APSA)

The APSA went into effect on August 16, 1989. The APSA regulates facilities with aggregate aboveground petroleum storage capacities of 1,320 gallons or more, which include aboveground storage containers or tanks with petroleum storage capacities of 55 gallons or greater. These facilities typically include large petroleum tank facilities, aboveground fuel tank stations and vehicle repair shops with aboveground petroleum storage tanks. The Act does not regulate non-petroleum products. Facilities with total petroleum storage quantities at or above 10,000 gallons are inspected at least once every three years by a CUPA.

Local

Napa County Area Plan

In 1986 and pursuant to California Health and Safety Code Chapter 6.95, Section 25503, the Area Plan program was established as a planning tool for local government agencies to respond to and minimize the impacts from a release or threatened release of a hazardous material. It requires creating an Area Plan which:

- Identifies the hazardous materials which pose a threat to the community
- Develops procedures and protocols for emergency response
- Provides for notification and coordination of emergency response personnel
- Provides for public safety including notification and evacuation
- Establishes training for emergency response personnel
- Identifies emergency response supplies and equipment
- Provides for the critique and follow-up after a major incident

Napa County General Plan

The 2008 Napa County General Plan includes goals and policies to mitigate potential safety issues from hazardous materials.

County CUPA Unified Programs

Pursuant to Senate Bill 1082 (1993), the Unified Hazardous Waste and Hazardous Materials Management Regulatory Program (Unified Program) consolidates, coordinates, and makes consistent hazardous materials and hazardous waste program elements. A CUPA is a county, city, or joint powers agency approved and designated by CalEPA to implement the Unified Program. The Napa County DEH is the CUPA for pollution prevention in all cities, towns and areas of Napa County.

County Capacity to Respond to Hazard

The County currently has programs under the Napa County DEH to address hazardous materials, including: Hazardous Materials Business Plan, Hazardous Waste, Aboveground Petroleum Storage, Underground Storage Tank and California Accidental Release Programs (Napa County CUPA, 2021). Program requirements include container labeling, management and proper disposal to hazardous waste facility, and inventory statements from businesses that handle large quantities of hazardous materials/hazardous waste.

As the CUPA, the Napa County DEH administers the following Unified Programs:

Hazardous Waste Generator

Hazardous waste is subject to storage time limits, container labeling and management, and disposal requirements. As previously mentioned, there are approximately 460 facilities permitted as hazardous waste generators in Napa County. They are inspected triennially.

Underground Storage Tank (UST)

All USTs are subject to monitoring for leakage and are inspected annually by DEH to verify compliance with state laws, regulations, and permit conditions. All new tank installations, modifications/repairs, and removals/closures are permitted by DEH. As indicated above, there are 44 UST facilities in Napa County and of those, 43 are permitted.

Hazardous Materials Business Plan/Hazardous Materials Inventory Statement

DEH conducts regulatory oversight (review of plans and inspections) of all businesses including farms, federal agencies, state agencies, and local agencies that handle quantities of hazardous materials/hazardous waste greater than or equal to 55 gallons of liquid, 500 pounds of solids, and 200 cubic feet of a compressed gas at any time. There are an estimated 1,250 facilities throughout the County that are subject to the regulatory requirements of this program that are inspected once every three years (triennially). There are 9 facilities throughout Napa County that are subject to the regulatory requirements of this program that are inspected triennially.

Stormwater Management & Control

DEH inspects two type of facilities that are already permitted for a Unified Program: Facilities that are required, per their Standard Industrial Classification (SIC) code, to prepare a Stormwater Management Plan and those facilities that may otherwise pose a threat to stormwater. There are approximately 500 facilities that are inspected triennially.

Abandoned Vehicle Abatement

DEH responds to complaints within the unincorporated County regarding vehicles that are considered abandoned, which means a vehicle or parts thereof that is left on a highway, public property, or private property in such inoperable or neglected condition that the owner's intent to relinquish all further rights or interest in it may be reasonably concluded. In reaching a reasonable conclusion, factors to consider include the amount of time the vehicle has not been moved, its condition, statements from the owner and witnesses.

Remediation Oversight of Contaminated Properties

If contamination is discovered at a property, DEH may issue an order requiring corrective action whenever it determines that there is or has been a release, as defined in the California Health and Safety Code, Chapter 6.8 (commencing with Section 25300), of hazardous waste or constituents into the environment. All remedial activities will be conducted with oversight pursuant to Chapter 6.8.

Technical Reference for Emergency Response

DEH coordinates with emergency response agencies to aid in the identification of chemicals released into the environment during an incident and to ensure their proper remediation.

Napa Risk Management Plan

Risk management plans are required to be prepared upon identification of a regulated substance (highly hazardous material). A risk management plan describes what the hazardous material is, when it was identified, as well as the mitigation and monitoring systems in place. Pursuant to the California Accidental Release Prevention Program, the County requires businesses that meet threshold quantities specified by U.S. EPA that are subject to both state and federal RMP requirements to provide their RMP to both the local CUPA and the U.S. EPA on the date on which the regulated substance is first present. Every three years the owner must certify compliance of their processes and practices and every five years the owner must update their RMP and reevaluate that their process hazard analysis remains current.

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2.8 Pandemic Disease

The U.S. Center for Disease Control defines an **outbreak** as the occurrence of more cases of disease than normally expected within a specific place or group of people over a given period of time. An **epidemic** is a localized outbreak that spreads rapidly and affects many people or animals in a community. A **pandemic** is an epidemic that occurs worldwide or over a very large area and affects a large number of people or animals.



Understanding Disease

The following are the most common types of pandemic diseases in the Napa County planning area (Napa County Office of Emergency Services, 2020):

- **Influenza**

Influenza (Flu) is a contagious respiratory illness caused by influenza viruses that infect the nose, throat, and sometimes the lungs. Symptoms include fever, cough, sore throat, runny or stuffy nose, muscle or body aches, and fatigue. According to Tokars et al, on average, about 8% of the U.S. population gets sick from flu each season, with a range of between 3% and 11%, depending on the season.

- **West Nile Virus**

West Nile virus (WNV) is a mosquito-borne disease that is common in Africa, west Asia, the Middle East, and more recently, North America. Human infection with WNV may result in serious illness.

- **Hepatitis C**

Hepatitis C is a liver infection caused by the hepatitis C virus (HCV). Hepatitis C is spread through contact with blood from an infected person. Today, most people become infected with the hepatitis C virus by sharing needles or other equipment used to prepare and inject drugs. For some people, hepatitis C is a short-term illness, but for more than half of people who become infected with the hepatitis C virus, it becomes a long-term, chronic infection. Chronic hepatitis C can result in serious, even life-threatening health problems like cirrhosis and liver cancer. While there is no vaccine for Hepatitis C, the best way to prevent transmission of this virus is by avoiding behaviors that can spread the disease, especially injecting drugs.

- **Lyme Disease**

Lyme disease is an infectious disease caused by a bacterium known as a spirochete. People get Lyme disease when a tick infected with the Lyme disease bacterium attaches and feeds on them. Lyme disease has been reported from many areas of the country, including California.

- **Rocky Mountain Spotted Fever (RMSF)**

Like Lyme Disease, Rocky Mountain spotted fever (RMSF) is a bacterial disease spread through the bite of an infected tick, and is one of the diseases identified by the California Department of Public Health as present within Napa County. RMSF can be deadly if not treated early with the right antibiotic.

- **Measles (Rubeola)**

Also called rubeola, measles is a childhood infection caused by a virus. Measles is especially prominent in small children. As the result of vaccination, measles was declared eliminated (absence of continuous disease transmission for greater than 12 months) from the United States in 2000. Since 2010, there have been approximately 3,309 reported cases of Measles in the United States, six (6) of which have occurred in 2021. In a given year, more cases of measles cases can occur if there is an increase in the number of travelers who get measles abroad and bring it into the U.S. Furthermore, although a vaccine has been developed, further spread of measles cases occur in U.S. communities, especially within pockets of unvaccinated people.

- **Rabies**

Rabies is a fatal but preventable viral disease that infects the central nervous system. It can spread to people and pets if they are bitten or scratched by a rabid animal. In the United States, rabies is mostly found in wild animals like bats, raccoons, skunks, and foxes. However, in many other countries dogs still carry rabies, and most rabies deaths in people around the world are caused by dog bites.

Rabies can be prevented by vaccinating pets, staying away from wildlife, and seeking medical care after potential exposures before symptoms start.

- **Covid 19**

COVID-19 is a dangerous disease caused by a virus discovered in December 2019 in Wuhan, China. It is very contagious and has quickly spread around the world. COVID-19 most often causes respiratory symptoms that can feel much like a cold, a flu, or pneumonia, but COVID-19 can also harm other parts of the body. On February 11, 2020, the World Health Organization announced an official name for the disease: coronavirus disease 2019, abbreviated COVID-19. ‘CO’ stands for ‘corona,’ ‘VI’ for ‘virus,’ and ‘D’ for disease. The virus that causes COVID-19, SARS-CoV-2, is a coronavirus.

Over 380 million doses of the COVID-19 vaccine have been given in the United States from December 14, 2020, through September 13, 2021, and have been scientifically proven to be safe and effective. COVID-19 vaccines were evaluated in tens of thousands of participants in clinical trials and have met the Food and Drug Administration’s (FDA) rigorous scientific standards for safety, effectiveness, and manufacturing quality needed to support approval or authorization of a vaccine.

- **H1N1 Flu**

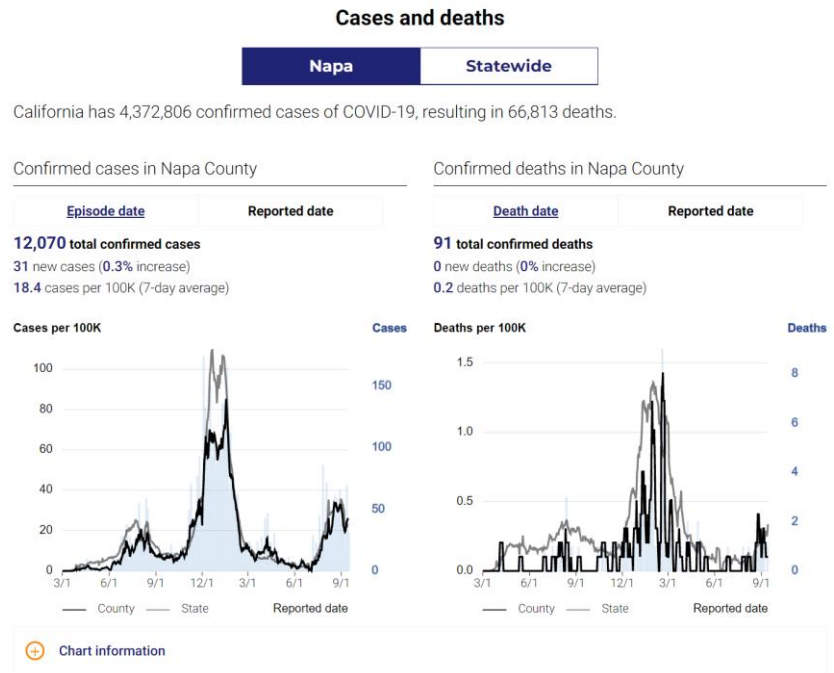
H1N1 emerged in the Spring of 2009 and spread quickly across the globe. H1N1 was subsequently designated a pandemic shortly thereafter. While similar to the common flu, the H1N1 virus contains a unique combination of influenza genes not previously identified in animals or people. It is estimated that 0.001 percent to 0.007 percent of the world’s population died of respiratory complications associated with (H1N1)pdm09 virus infection during the first 12 months the virus circulated (CDC, 2019). On August 10, 2010, WHO declared an end to the global 2009 H1N1 influenza pandemic. However, the H1N1 virus continues to circulate as a seasonal flu virus, and causes illness, hospitalization, and deaths worldwide every year.

Risk Assessment

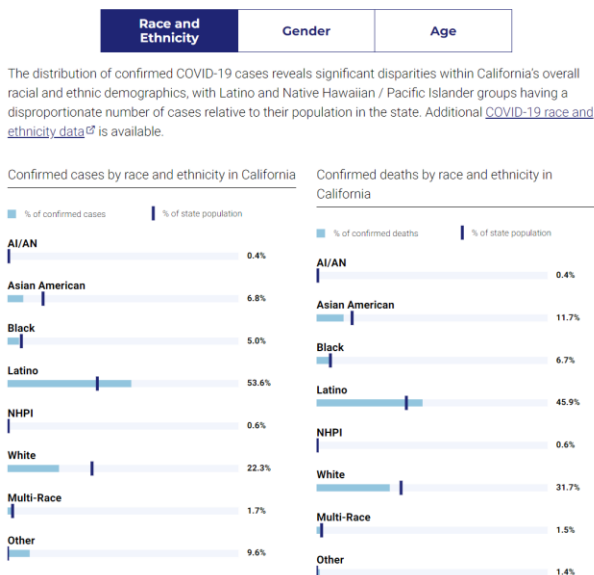
Recent Events

As mentioned above, there are several major diseases that have been found to be present in Napa County, including Lyme Disease, Rocky Mountain Spotted Fever, Influenza, H1N1 flu, and COVID-19 (California Department of Public Health; Napa County Mosquito Abatement District; Association of Bay Area Governments).

In March of 2020, all Bay Area counties, including Napa County, declared a regional shelter in place order to limit the spread of COVID-19. Although the State of California has lifted these restrictions as of June 15th 2020, the COVID-19 pandemic is still present. As of September 17th 2021, there is a daily average of 8,153 new coronavirus cases (California For All, 2021). According to the California Department of Public Health's State Dashboard, in Napa County, there have been 12,070 total confirmed cases of COVID-19 and 91 total confirmed deaths as of October, 2021 (California Department of Public Health, 2021).



Cases and deaths by ethnicity, gender, and age



COVID-19 data has shown significant risk and health disparities within several communities in California, most notably in the Latinx, Native Hawaiian / Pacific Islanders, and African American communities. . As a whole in the State of California, Latino people account for 53.6% of confirmed cases, while making up 38.9% of California's population. This effectively translates to 1 of 2 Latinx people infected with COVID-19, while the White population has accounted for 22.3% of confirmed cases of COVID-19, while making up 22.3% of California's population.

Pandemic and Disease Vulnerability Analysis

According to the MJHMP vulnerability assessment, none of the health hazards addressed are considered to have a measurable impact on the built environment in the planning area. However, the entire planning area, including all citizens in Napa County, are susceptible to human health hazards discussed in this profile. Unlike other hazards discussed in this analysis, pandemic and disease are difficult to map due to the way in which viruses and diseases are transported.

Vulnerable Development, Critical Facilities, and Infrastructure

None of the health hazards addressed in this profile are considered to have any measurable impact on critical facilities in the planning area. However, healthcare facilities (and veterinary clinics) are prepared for pandemic disease hazards. These facilities in Napa County are illustrated in **Figure 2.8-1**. Emergency management planning incorporates all disciplines responding to an event, (fire agencies, law enforcement, first responder ground and air ambulance agencies, public health, mental and spiritual health). Planning includes identifying shelters, alternate treatment facilities, isolation capacity, and methods to immediately expand physical and human resources.

County Capacity to Respond to Hazards

The economic impact of a human health hazard could be localized to a single population or could be significant, depending on the number of cases and available resources to care for those affected. The Napa County Department of Health and Human Services Public Health Division is the primary agency charged with increasing capacity to respond to pandemics and diseases in Napa County. The County has several programs in place that work to combat the effects of these diseases including, but not limited to:

- Alcohol and Drug Services
- Child Abuse and Neglect Reporting
- Mental Health Services
- Immunization Clinics
- Health Equity
- Public Health Communication

As illustrated by these programs and activities, Napa County is consistently working to increase capacity to respond to current and future pandemics and diseases. Specific agencies that aim to increase adaptive capacity to flood hazards are detailed below.

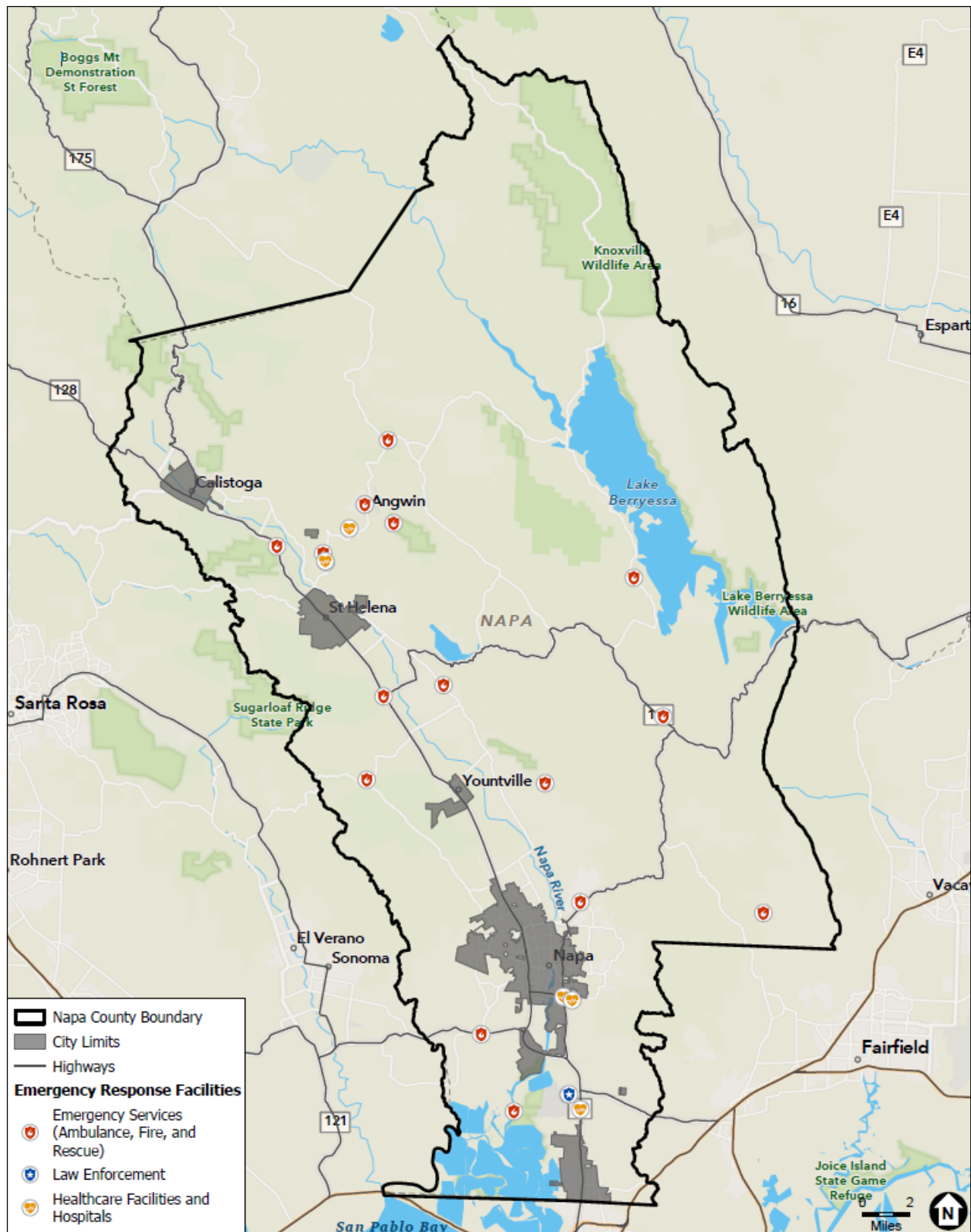


Figure 2.8-1. Napa County Emergency Response Facilities Map 2000 – 2020

The COVID-19 Pandemic

On June 15, Napa County aligned with California Department of Public Health (CDPH) and the State of California to fully reopen, removing capacity and distancing restrictions for most businesses and activities. However, Napa County and other agencies across the San Francisco Bay Area continues to track a series of health indicators to monitor the impact of COVID-19 in our community. Making this data publicly accessible will ultimately work to assist the decision-making process and help to maintain community safety and a strong, functioning economy.

Table 2.8-1 shows the 7 Day Average of Hospitalized COVID-19 patients at two hospitals serving Napa County residents (The Californian, 2021)

TABLE 2.8-1. 7 DAY AVERAGE OF HOSPITALIZED COVID-19 PATIENTS- NAPA COUNTY

Hospital	All Hospital Beds	7 Day Average of Hospitalized COVID-19 Patients
Queen of the Valley Medical Center	155.0	8.6
Adventist Health St Helena	53.9	4.9

Plans, Policies, Programs, and Regulatory Environment

In the United States, there are several regulatory agencies that drive public health policy. These agencies are present at all levels of government and are described below:

U.S. Department of Health and Human Services (DHS)

The U.S. Department of Health and Human Services has statutory responsibility for preventing the introduction, transmission, and spread of communicable diseases in the United States.

California Department of Public Health (CDPH)

The essential functions of the Department are critical to the health and wellbeing of people and communities. CDPH's fundamental responsibilities are comprehensive in scope and include infectious disease control and prevention, food safety, environmental health, laboratory services, patient safety, emergency preparedness, chronic disease prevention and health promotion, family health, health equity and vital records and statistics.

CDPH's key activities and services include protecting people in California from the threat of preventable infectious diseases like Zika virus, HIV/AIDS, tuberculosis and viral hepatitis, and providing reliable and accurate public health laboratory services and information about health threats.

The State of California Beyond the Blueprint

The California Department of Public Health developed this action plan to facilitate the reopening of the economy and state in response to the COVID-19 pandemic. This document identifies the general public health requirements and recommendations that different businesses and economic sectors must follow given the ongoing impacts of the COVID-19 pandemic.

Napa County Mosquito Abatement District (NCMAD)

Napa County Mosquito Abatement District (NCMAD) has been controlling mosquito populations for the citizens of Napa County since 1925. The Board of Trustees comprises representatives from each incorporated City and the County and governs the District. There are currently eight employees who are responsible for controlling mosquitoes throughout the County.

NCMAD works closely with other public agencies, park districts, and wineries to provide an effective and environmentally-sound mosquito control program. The District also works with planning agencies to minimize mosquito production in wetland restoration and enhancement projects.

Napa County Department of Health and Human Services – Public Health Division

The Napa County Public Health Division serves the people of Napa County by serving the Napa County community and supporting its health and well-being. The Public Health Division works towards its mission by administering localized public health programs related to maternal child and adolescent health, communicable diseases, chronic disease, health equity, and more.

Napa County Multi Jurisdictional Hazard Mitigation Plan (MJHMP)

The County's MJHMP provides for long-term mitigation planning by identifying goals, objectives, mitigation strategies and implementation methods that can be incorporated over the long term to reduce risk and future losses from pandemics and diseases.

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2.9 Severe Weather

Severe weather refers to any dangerous meteorological phenomena with the potential to cause damage, serious social disruption, or loss of human life. Severe weather includes thunderstorms, powerful winds, heavy rains, hail, heat waves, tornadoes, dust storms, winter weather and freeze events (i.e., snowstorms and ice storms).

Severe weather events can be categorized into two groups: general severe weather, which form over wide geographic areas; and localized severe weather, which occur in a limited geographic area. It is important to note that severe weather is not the same as extreme weather, which refers to unusual weather events at the extremes of the historical distribution for a given area.



The Napa County MJHMP Planning Committee identified four types of severe weather events that most typically impact Napa County (Napa County Office of Emergency Services, 2020).

- high wind
- snowstorms/ice storms/freeze events
- hail
- high heat/heat waves
- Heavy rainfall

Risk Assessment

Local Conditions

Each of the five severe weather events listed above are described in detail below (Napa County Office of Emergency Services, 2020):

High Wind

Damaging winds are classified as those exceeding 60 mph and account for half of all severe weather reports in the contiguous United States.

Figure 2.9-1 below illustrates average wind speeds that occur in Napa County. The highest wind speeds in Napa County can be experienced along the Highway 29 corridor, north of the City of Calistoga. According to WeatherSpark, high winds in Napa County most often occur from the west for 8.4 months from February to November and from the north for 3.6 months, from November to February.

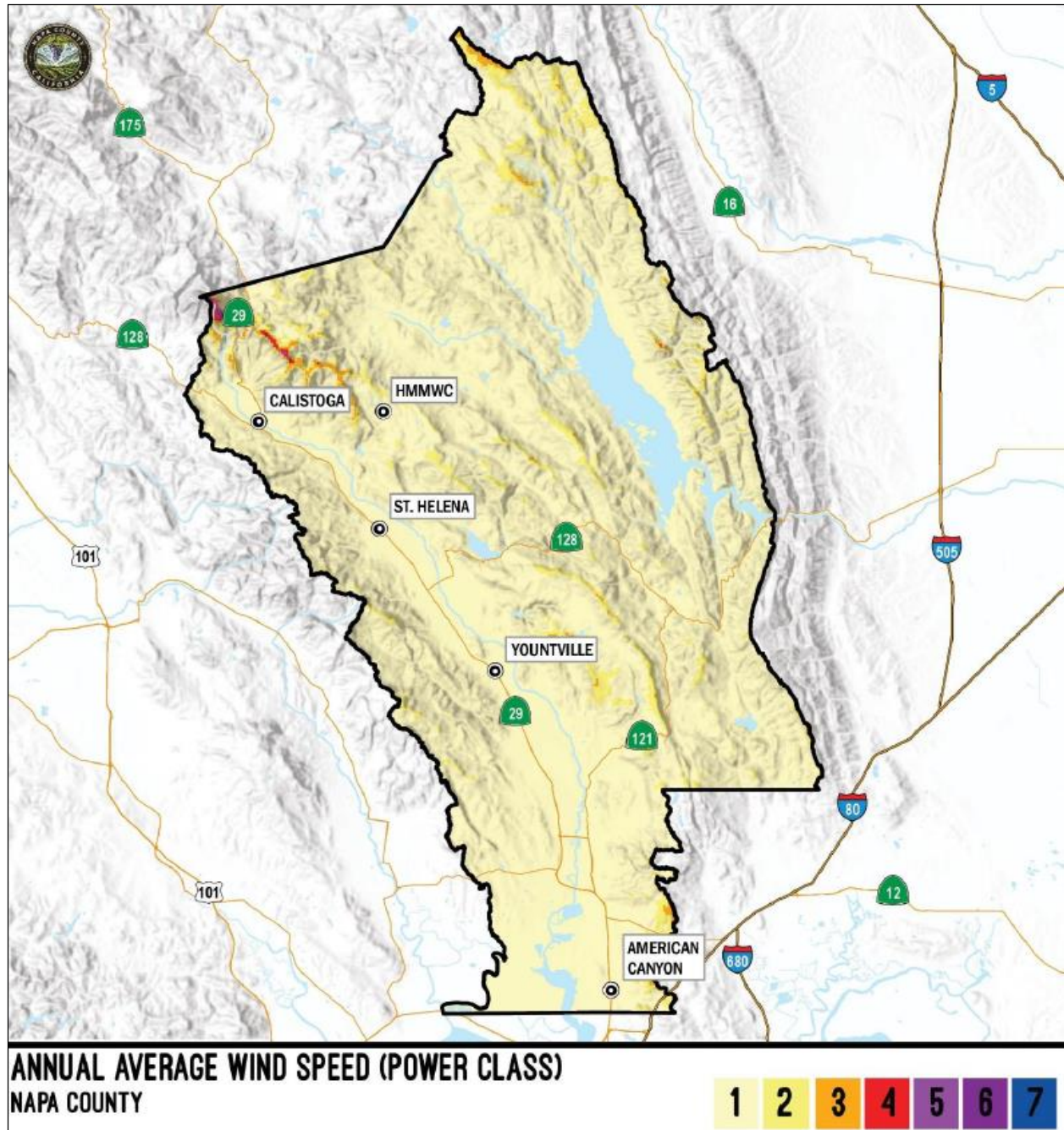


Figure 2.9-1. Annual Average Wind Speed

MJHMP FIGURE 4-41 NAPA COUNTY ANNUAL AVERAGE WIND SPEED

High Heat / Heat Waves

Heat waves are periods of abnormally hot weather lasting days to weeks. According to information provided by FEMA, extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks.

Figures 2.9-2 and 2.9-3 below illustrate average minimum and maximum temperature patterns that have occurred in Napa County over the course of a 30-year period. The maximum temperature that has occurred in this period exceeds 95 degrees, while the minimum temperature is below 30 degrees. Recent climate research indicates that extended periods of volatile weather could become more common in the future. According to the MJHMP, historic heat events have occurred within the summer months from May to September.

Lastly, both winter weather and heat waves pose significant public health risks to humans.

Winter Weather / Freeze Events

Winter weather in Napa County usually consists of heavy rains from November to April and occasional frost events. Late or early freeze events can have a devastating effect on agriculture and the economy of the region. Freeze events are becoming less exceptional as extreme weather conditions become more common due to climate change and weather patterns become more volatile.

Although not listed in the MJHMP as one of the frequent severe weather events that occur in Napa County, many of the severe weather events that have occurred since the year 2000 are related to heavy rain. Heavy rain events since the year 2000 have caused a total of \$105,000 worth of property damage in Napa County (Napa County Office of Emergency Services, 2020).

Hail

Hail occurs when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere where they freeze into ice.

Increased Rainfall

Although not listed in the MJHMP as one of the frequent severe weather events that occur in Napa County, many of the severe weather events that have occurred since the year 2000 are related to heavy rain. **Figure 2.9-4** illustrates the County's average annual precipitation in inches. Heavy rain events since the year 2000 have caused a total of \$105,000 worth of property damage in Napa County (Napa County Office of Emergency Services, 2020).

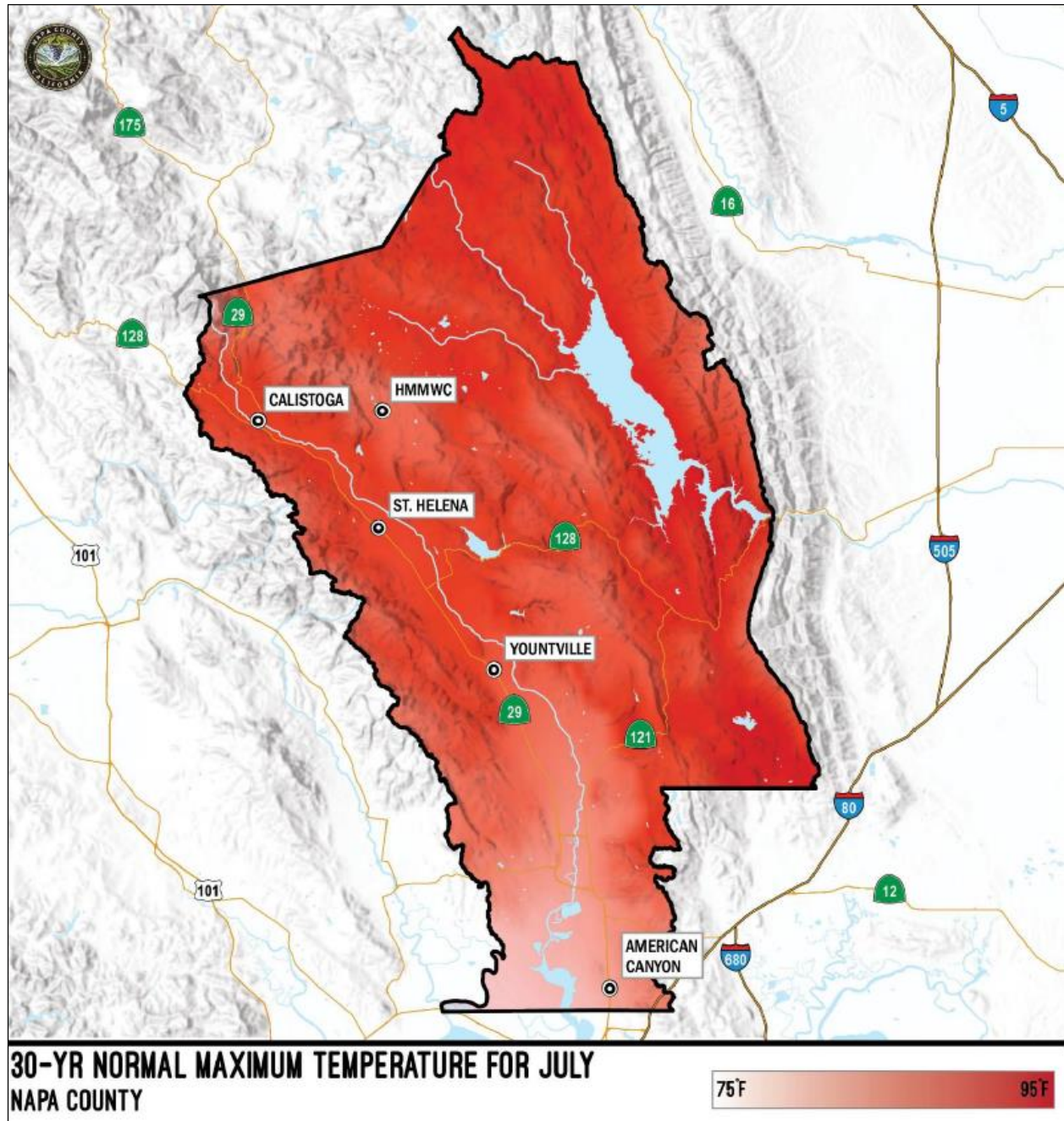


Figure 2.9-2. 30-Yr Maximum Normal Temperature for July

MJHMP FIGURE 4-39 AVERAGE ANNUAL PRECIPITATION (1981 – 2010)

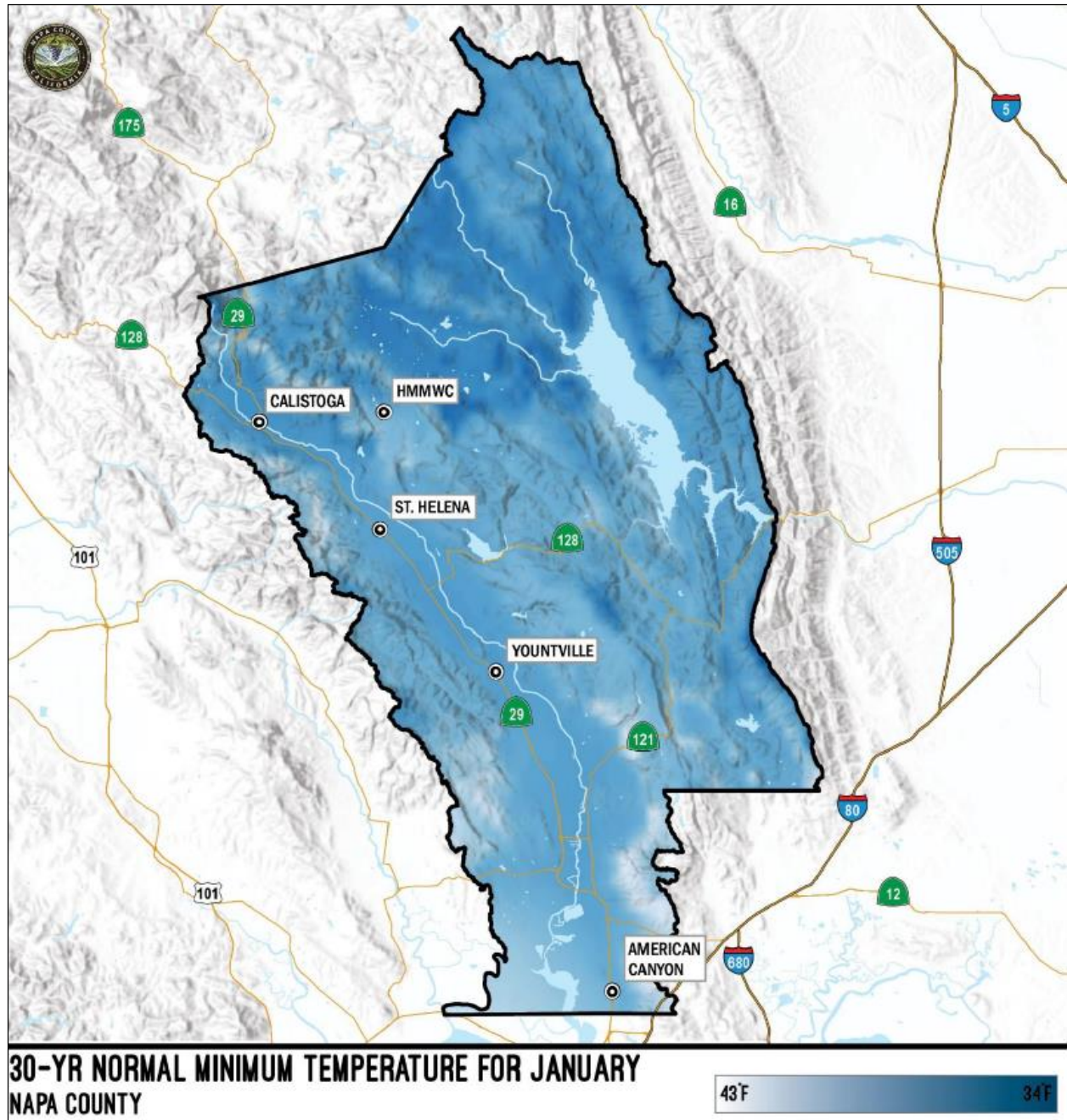


Figure 2.9-3. 30-Yr Minimum Temperature for January

MJHMP FIGURE 4-40 30-YR NORMAL MINIMUM TEMPERATURE FOR JANUARY (1981 – 2010)

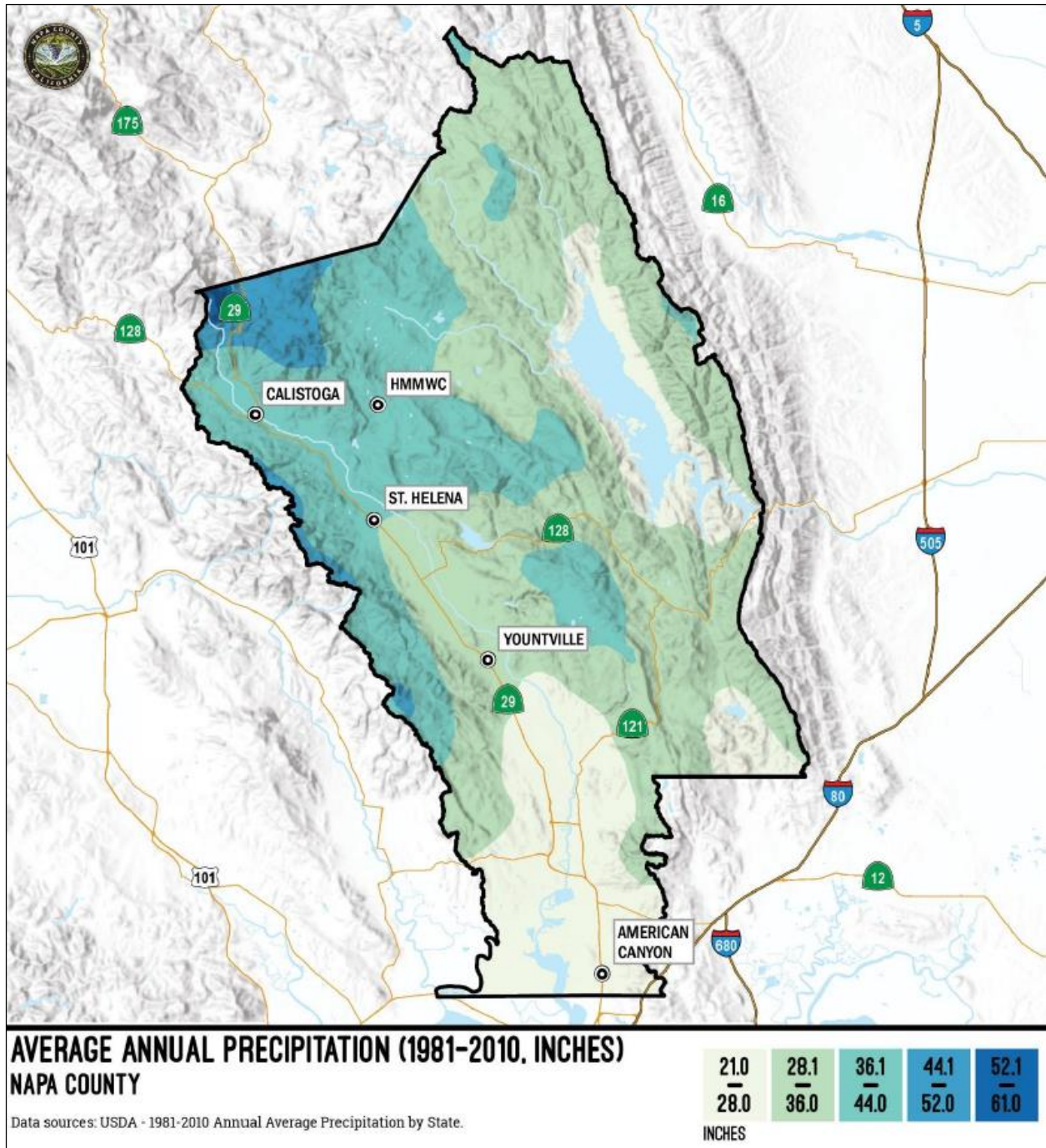


Figure 2.9-4. Napa County Annual Average Precipitation (1981 – 2010)

MJHMP FIGURE 4-38 AVERAGE ANNUAL PRECIPITATION (1981 – 2010)

Severe Weather Vulnerability Analysis

Population

All people, property, and environments in the Napa County planning area would be exposed to some degree to the impacts of severe weather events. Populations living at higher elevations with large trees and surrounding power lines may be more susceptible to wind damage and black out, while populations in low-lying areas are at risk for possible flooding from increased rainfall.

Vulnerable populations such as the elderly, low income or linguistically isolated populations, the unsheltered, people with life-threatening illnesses, and residents living in areas that are isolated from major roads have the potential to suffer to a greater extent during severe weather events.

Vulnerable Development, Critical Facilities, and Infrastructure

As mentioned above, all property is vulnerable during severe weather events, but properties in poor condition or in particularly vulnerable locations may risk the most damage. Those in higher elevations and on ridges may be more prone to wind damage. Those that are located under or near overhead lines or near large trees may be vulnerable to falling ice or may be damaged in the event of a collapse. Crops may be damaged by frost, especially in February when the first stages of vine growth are occurring, and plants are more susceptible to damage.

Loss of roads, power, and communication lines are the primary failures resulting from severe weather, including damage caused to infrastructure by high winds, snowstorms, and freeze events.

County Capacity to Respond to Hazards

Like with many hazards that have the potential to occur with little warning time, Napa County Emergency Services Department uses the Integrated Public Alert and Warning System (IPAWS) to provide the public with life-saving information quickly. IPAWS notifications can be sent directly to mobile phones and broadcasted via radio or television.

As severe weather events consist of a suite of weather types that have the ability to affect the Napa County community as a whole, the ability to withstand these impacts lies in sound land use practices and consistent enforcement of codes and regulations for new construction. The most common problems associated with severe storms are immobility and loss of utilities.

Plans, Policies, Programs, and Regulatory Environment

The Napa County MJHMP acknowledges that there are very few formal regulations that pertain directly to severe weather events. However, the **International Building Code**, adopted by several jurisdictions in Napa County, is generally adequate to properly address development impacts from severe weather events through specific building code standards.

Napa County Multi-Jurisdictional Hazard Mitigation Plan (MJHMP)

The County's MJHMP provides for long-term mitigation planning by identifying goals, objectives, mitigation strategies and implementation methods that can be incorporated over the long term to reduce risk and future losses to severe weather events, as a whole.

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2.10 Slope Failure

In Napa County, slope failure hazards are a considerable threat to everyday services, including emergency response capabilities and transportation facilities. **Slope stability** refers to the landslide susceptibility of slopes composed of natural rock, soils, artificial fill, or combinations thereof.

Slope failure refers to debris flow, landslides, mudflow, and rockfall, which collectively may cause damage across the County. These hazards rarely present a threat to human life, but most often result in a disruption of everyday services such as emergency response capabilities. Landslides can block transportation routes, dam creeks and drainages, and contaminate water supplies. When these hazards affect transportation routes, they are frequently expensive to clean-up and can have significant economic impacts to the County.



Landslide and Debris Flow. Courtesy of Napa County

The County has identified three types of slope failure: landslides, debris flow, and rockfall as hazardous concerns, which are described in detail below.

Landslide

Landslides are masses of rock, earth, or debris that move down a slope. Landslides move along surfaces of separation by falling, sliding, and flowing, giving rise to many characteristic features. The features range in appearance from being clearly noticeable, largely unweathered and uneroded, to highly weathered and eroded, recognized only by topographic layouts.

Landslide types include rotational slides and translational slides. A **rotational landslide** is the downward and

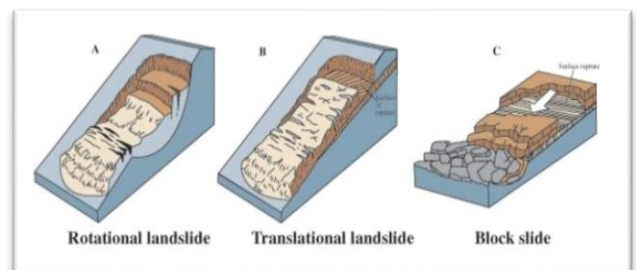
outward movement of a mass on top of a curved surface

where the toe is often a large, disturbed mound of geologic material, forming as the landslide moves past its original rupture surface. The toe of the landslide marks the end of the moving mass (material). A

translational landslide is a mass that slides downward and outward on top of an inclined flat surface

where material accumulates at the front of the landslide. A **block slide** is a translational slide in which the moving material consists of a single unit or a few closely related units that move downslope as one mass.

Rotational landslides commonly show slow movement, while translational landslides are rapid movements.



Landslide Types. Courtesy of Napa County

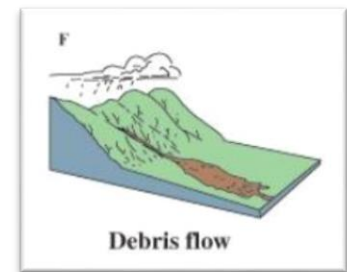
Landslides are characteristically abundant in areas of high seismicity, steep slope, and high rainfall, but may be triggered by any, or a combination, of the following:

- Type and structure of earth materials,
- steepness of slope,
- water,
- vegetation,
- erosion, and
- earthquake-generated groundshaking.

Debris Flow

Debris flow may develop when slope material becomes saturated with water. From a geologic perspective, there are generally two types of debris flows described in detail below.

Debris Flows Related to Shallow Landslides occurs on hillslope due to soil failure in which soil liquefies and runs downhill. This type of debris flow generally results from a shallow landslide (less than 10 to 15 feet deep) and has a discrete initiation zone depositional area (specific area where sediments are deposited). Shallow landslides tend to occur in winter but are most likely after prolonged periods of heavy rainfall when soil materials are saturated. Debris flows are typically more dangerous because they are fast moving, causing both property damage and loss of life.



Debris Flow. Courtesy of Napa County

Post-Wildfire Debris Flows are a result of post-fire conditions, where burned soil surfaces enhance rainfall runoff that concentrates in a channel and picks up debris as it moves. The post-fire debris flow has a less discrete initiation zone but is similar to a debris flow derived from hillslopes in that it may result in inundation and a detrimental impact on lives and property within its zone of runout and deposition (where the sediments are deposited). It can result in downstream flooding.

An example of a catastrophic post-fire debris flow is the event that occurred in Santa Barbara County on January 9, 2018, when, after the Thomas Fire, numerous canyons deposited debris flows onto urbanized alluvial fans (triangle-shaped deposit of gravel, sand, and even smaller pieces of sediment, such as silt) in Montecito and Carpinteria. (CalOES, 2018)

According to the National Oceanic and Atmospheric Administration (NOAA), debris flow is the most common type of slope failure in Napa County, occurring typically during winter months. **Table 2.10-1, Debris Flow Events in Napa County**, lists the debris flow events that have taken place in the County between 2000 and 2018

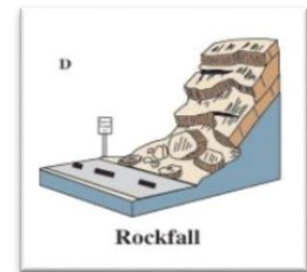
TABLE 2.10-1. DEBRIS FLOW EVENTS IN NAPA COUNTY 2000 – 2018

Date	Deaths	Injuries	Property Damage	Crop Damage
4/1/2006	1	0	\$14.4 million	\$20 million
4/2/2006	0	0	\$11.5 million	None Reported
1/6/2016	0	0	None Reported	None Reported
10/28/2016	0	0	None Reported	None Reported
1/3/2017	0	0	None Reported	None Reported
1/18/2017	0	0	None Reported	None Reported
1/22/2017	0	0	None Reported	None Reported
2/7/2017	0	0	None Reported	None Reported
2/20/2017	0	0	None Reported	None Reported
1/8/2018	0	0	None Reported	None Reported

SOURCE: NOAA; Napa County Multi-Jurisdictional Hazard Mitigation Plan, 2020

Rockfall

Rockfalls are the falling of a newly detached mass of rock from a cliff or rock outcrop or a loose rock that erodes out of unconsolidated debris on a hillside and rolls or falls down a very steep slope. Over-steepened slopes such as at roadcuts or in glaciated terrain are susceptible to rockfall due to the steep slopes that are not highly vegetated or benched, which can help reduce rockfall. Rock outcrops that are highly fractured and/or undercut by weaker rock layers are also susceptible to rockfall.



Rockfall. Courtesy of Napa County

Risk Assessment

Local Conditions

Slope Failure where movement of slides and earth flows might occur are predicted per the location of past movements. Past landslides can be recognized by their distinctive topographic shapes, which can remain in place for thousands of years and can range from a few acres to several square miles. Most landslides show no evidence of recent movement and are not currently active. A small proportion of them may become active in any given year, with movements concentrated within all or part of the landslide masses or around their edges. These areas are recognized as they are important to identify current areas susceptible to flows and slides, because they can be reactivated by earthquakes or by exceptionally wet weather. **Figure 2.10-1, Napa County Landslide Susceptibility**, shows low, moderate, and high landslide susceptibility in unincorporated Napa County. Most of the high susceptibility areas are in the hilly regions bordering the Napa Valley.

Landslides are most frequently triggered in periods of high rainfall, which is typically between November and April in Napa County. The hazard is greatest in steeply-sloped areas, although slides may occur on slopes of 15 percent or less if the conditions are right. Slope steepness and underlying soils are the most important factors affecting the landslide hazard. However, surface and subsurface drainage patterns also affect the landslide hazard, and vegetation removal can increase the likelihood of a landslide (Association of Bay Area Governments, 2018).

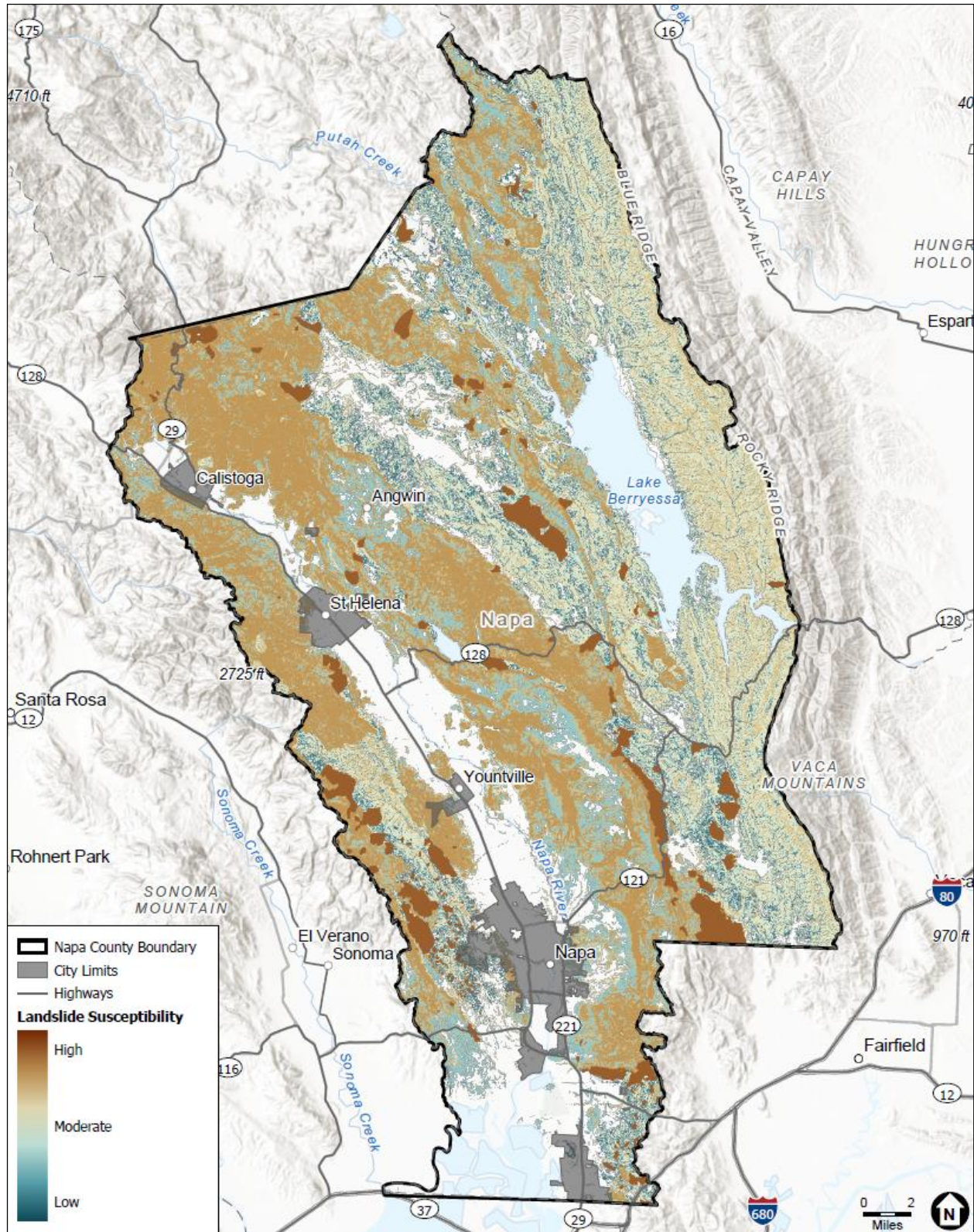


Figure 2.10-1. Napa County Landslide Susceptibility

Landslides are often triggered by other natural hazards such as earthquakes, heavy rain, floods, or wildfires, so landslide frequency is often related to the frequency of these other hazards. The probability of slope failure occurring in Napa County is likely (between 10 and 100% annual probability).

Landslide Vulnerability Analysis

Population

According to the Napa County MJHMP, approximately 19,942 persons, or 58 percent of the County population (34,147), are exposed to slope failure areas as shown in Figure 2.10-1 above. **Table 2.10-2, Population Exposure to Landslide Susceptibility**, shows a breakdown of landslide susceptibility by population count and percentage of total population. Susceptibility was determined by analyzing the proximity of County parcels to landslide hazard areas identified by the California Geologic Survey (CGS). The estimated population was calculated using Geographic Information Systems (GIS) and U.S. Census Bureau information and taking the weighted population within each census block with the percentage of slope hazard areas.

TABLE 2.10-2. POPULATION EXPOSURE TO LANDSLIDE SUSCEPTIBILITY

Landslide Susceptibility	Population Count	% of Total
High	10,717	31.39%
Moderate	3,700	10.84%
Low	5,525	16.18%
Total	19,942	58.40%

NOTES: Population estimates within slope failure areas were generated by analyzing County assessor and parcel data that intersect with landslide hazard areas identified by CGS and avalanche hazards developed by the planning team. Using GIS, U.S. Census Bureau information was used to intersect slope failure hazards an estimate of population was calculated by weighting the population within each census block and track with the percentage of slope hazard areas.

Property

According to the Napa County MJHMP, predominant zoning classes in cities are single-family, vacant and manufactured homes. Parcels and property value exposure to landslides were assessed for 14,654 parcels within unincorporated Napa County. The assessment identified that out of the 14,654 total parcels at a value of 18.3 billion, 2,501 parcels valued at 3.1 billion would be within high susceptibility, 1,965 parcels valued at 1.6 billion would be within moderate susceptibility, and 3,302 parcels valued at 4 billion would be within low susceptibility for a total of 7,768 parcels or 53 percent of total parcels valued at 8.7 billion or 48 percent of total property values.

Critical Facilities, and Infrastructure

The County MJHMP identified 40 critical facilities as being exposed to the landslide hazard to some degree, including essential facilities (hospitals, police stations, and fire stations); high potential loss (church, dams, and historical buildings); transportation and lifeline (roads, bridges, and power lines); and hazmat (landfill). Several types of linear infrastructure can be exposed to mass movements, including

transportation, water, sewer, and power infrastructure. The County MJHMP identified roads, bridges, and power lines as significant infrastructure with a potential for mass movement exposure.

- **Roads:** Access to major roads is crucial to life-safety, response, and recovery operations after a disaster event. Landslides can block egress and ingress on roads, causing isolation for neighborhoods, traffic problems, and delays for public and private transportation, which can also result in economic losses for businesses.
- **Bridges:** Landslides can significantly impact bridges, by knocking out bridge abutments or significantly weaken the soil supporting them.
- **Power Lines:** Power lines are generally elevated above steep slopes, but the towers supporting them can be subject to landslides. A landslide could trigger failure of the soil underneath a tower, causing it to collapse and rip down the lines. Power and communication failures due to landslides can create problems for vulnerable populations and businesses.

Figure 2.10-2, Landslide Vulnerability shows the landslide susceptibility for population and infrastructure in unincorporated Napa County along with exposure summaries for high susceptibility for population, parcel count, parcel value, and critical infrastructure.

Secondary Hazards

Secondary hazards that could trigger or exacerbate slope failure include flooding, wildfires, and post-wildfires. Flooding could undercut the toe of a slope which can remove the support for the slope and cause a landslide or rockfall. Wildfires create an immediate hazard of their own (as discussed in Section 2.11, *Wildfire Hazards*) but can also create long-term impacts by altering the soil structure. Wildfires impede soil ability to absorb moisture and destroy vegetation that binds the soil with roots and absorbs rainfall and runoff with foliage. Post-wildfire could trigger or exacerbate slope failure as rainfall events could create devastating mudflows, debris flows, and landslides.

County Capacity to Respond to Hazard

According to the Napa County MJHMP, the County is equipped to handle future growth within landslide hazard areas. The County has educational programs on how to prepare for slope hazards, including an Emergency Preparedness Guide that holds information on how to prepare emergency kits for resident homes, car, and workplace, (<https://www.countyofnapa.org/DocumentCenter/View/1771/Emergency-Preparedness-Guide-English-PDF?bidId=>).

The County had several Planning Committees from participating jurisdictions identify issues and/or weaknesses for their respective facilities as part of the mitigation identification process. These issues and/or weaknesses were based on the risk assessment and vulnerability analysis, utilizing the Risk Assessment Mapping Platform mapping tool and historic flood data. Slope failure hazard issues and weaknesses included a need for stability issue area maps as well as identified facilities within a moderate landslide area as a concern for potential casualties. Prevention and public education awareness as well as structural projects were listed as County wide priority mitigation actions.

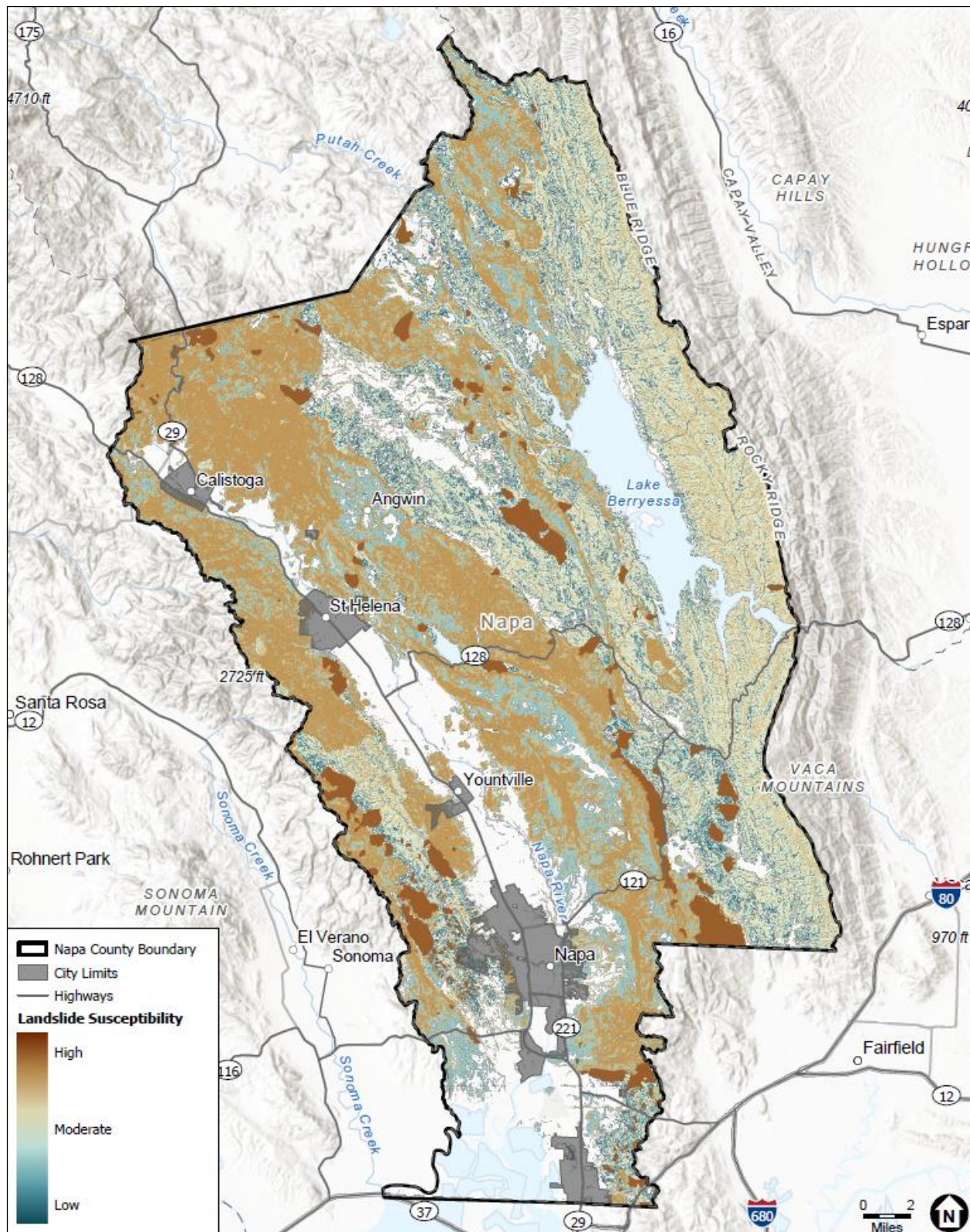


Figure 2.10-2. Landslide Vulnerability

There is still the issue of warning the public of the potential for slope hazard risks. Warning time for hazards such as debris flows, rockfall, and landslides, is often very short and may not occur at all. Identifying areas where these events are known to have occurred, or which have ideal characteristics for these hazards to occur, could help with hazard preparedness when triggering-type events such as earthquake or intense rainfall occur. The County's development of a warning system would be beneficial as it would make proactive response to potential triggering events more effective.

Policies, Plans, and Regulatory Environment

Napa County Operational Area Emergency Operations Plan

The Napa County Public Works Department maintains the County's Emergency Operations Plan (EOP), which provides a framework for Napa County to use in performing emergency functions before, during, and after an emergency event. This EOP supports the National Incident Management System (NIMS) and the Standardized Emergency Management System (SEMS). The County works together with State, Federal, and local agencies to prevent, prepare for, respond to, and recover from incidents regardless of cause, size, or complexity effectively and efficiently. The EOP supports the overall mission of Napa County Office of Emergency Services (Napa County OES). The Napa County OES is responsible for the development and maintenance of the EOP. The Napa County EOP lists the Public Works Department and Planning, Building, and Environmental Services department as the primary agencies responsible for emergency operations under debris management.

Napa County General Plan

The 2008 Napa County General Plan includes goals and policies to mitigate slope failure.

Napa County Code Section 18.108

Napa County Code includes regulations prohibiting construction, improvement, grading, earthmoving activity or vegetation removal associated with the development or use of land in areas characterized by steep slopes, high erosion potential, unstable soils, combustible vegetation and other sensitive environmental resource areas.

Napa County Landslide Hazard Evaluations

For development projects, the County requires the preparation of a landslide hazard evaluation, which is submitted to the County Planning, Building & Environmental Services Department. The evaluation must be prepared by a California Registered Geologist or Certified Engineering Geologist and include a filed survey as well as a report. The landslide hazard evaluation is conducted in order to determine the effect of slope failures such as landslides on proposed development and more importantly the effect of the proposed project on slope stability and the threat to both existing and proposed improvements. In addition, such evaluations provide some of the information needed to determine how the project will affect the total amount of sediment delivered from the property to the drainage ways involved. (Planning, Building & Environmental Services, 2017)

Napa County MJHMP

The County's MJHMP provides for long-term mitigation planning by identifying goals, objectives, mitigation strategies and implementation methods that can be incorporated over the long term to reduce risk and future losses. The following mitigation actions are identified as County wide priority for implementation:

- **NC-41-2020:** Establish a priority list of slope failure locations and implement slope stabilization projects in the highest risk areas.
- **NC-42-2020:** Construct a slope stabilization project to protect the Angwin Volunteer Fire Department storage facility.

Napa County Code

County Code Chapter 18.108, Conservation Regulations, states that no extensive grading shall be permitted on slopes over 15 percent where landslides or other geologic hazards are present unless the hazard(s) are eliminated or reduced to a safe level to the satisfaction of the County.

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2.11 Wildfire Hazards

A **wildfire** is any uncontrolled fire occurring on undeveloped land that requires fire suppression. Wildfires can be ignited by natural causes such as lightning and severe weather, increased fuels that are exacerbated by drought conditions, or by human-caused activity such as smoking, campfires, downed powerlines, equipment use, and arson. Wildfire can be further exacerbated by severe weather, such as wind, extreme heat, and drought conditions.

In Napa County, wildfires put lives and property at risk and compromise rivers and watersheds, open space, timber, range, recreational opportunities, historic and cultural assets, scenic resources, and local economies. The potential for significant damage to life and property significantly increases in Wildland Urban Interface (WUI) areas. The WUI is the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland and vegetative fuels (FEMA, 2021).



Courtesy of Napa Valley Register

This section will illustrate existing environmental conditions that influence wildfire hazards in Napa County, will characterize wildfire hazards in the unincorporated portions of Napa County, and will provide graphical assessment of community vulnerability to wildfire hazards. Finally, this section will describe relevant state and local regulations that are in place to make Napa County more resilient to wildfire.

Risk Assessment

Local Conditions

According to the Napa County MJHMP, Napa County is characterized by a narrow valley floor surrounded by and intermingled with steep, hilly, wooded terrain—areas highly susceptible to wildfires (Napa County Office of Emergency Services, 2020). The hilly/mountainous terrain on the east and west side of Napa Valley strongly influences both wildland fire behavior and fire suppression capabilities.

The areas in Napa County that are dense with vegetation and contain development can serve as sites for new spot fires that then spread to adjacent structures. The flying embers resulting from fuels are a principal driver of wildfire in wildland urban interface (WUI) areas. The WUI in Napa County is comprised of 486,236 acres and includes Yountville and Lake Berryessa (Napa FireWise, 2020).

Past Wildfire Events

In Napa County, there are four major factors that contribute to historic wildfire events (Napa County Office of Emergency Services, 2020):

- Extreme vegetation diversity and density
- fire weather and fire behavior
- Dynamic fire history
- Development in the WUI

From 2000-2019 there were 10 wildfires burning over 1,000 acres in Napa County, one of which was human caused (Napa County Office of Emergency Services, 2020). As of October 2021, there have been two fires in Napa County. Both of these fires were contained within two days of their start. These events are listed in **Table 2.11-1**, displayed in **Figure 2.11-1**, and are described in greater detail below.

TABLE 2.11-1. WILDFIRE EVENTS IN NAPA COUNTY 2000 – 2020

Date	Event Name	Size in Acres
10/12/2021	Newell Fire	132
9/23/2021	Fremont Fire	116
9/27/2020	Glass Fire	67,484
9/8/2018	Snell Fire	2,488
6/30/2018	County Fire	89,831
10/8/2017	Tubbs Fire	36,702
10/8/2017	Atlas Fire	51,625
10/8/2017	Nuns Fire	55,798
8/2/2016	Cold Fire	5,730
9/12/2015	Valley Fire	76,085
8/9/2015	Jerusalem Fire	25,118
7/22/2015	Wragg Fire	8,049
7/1/2014	Butts Fire	4,297
SOURCE: CALFIRE; Napa County Multi-Jurisdictional Hazard Mitigation Plan, 2020		

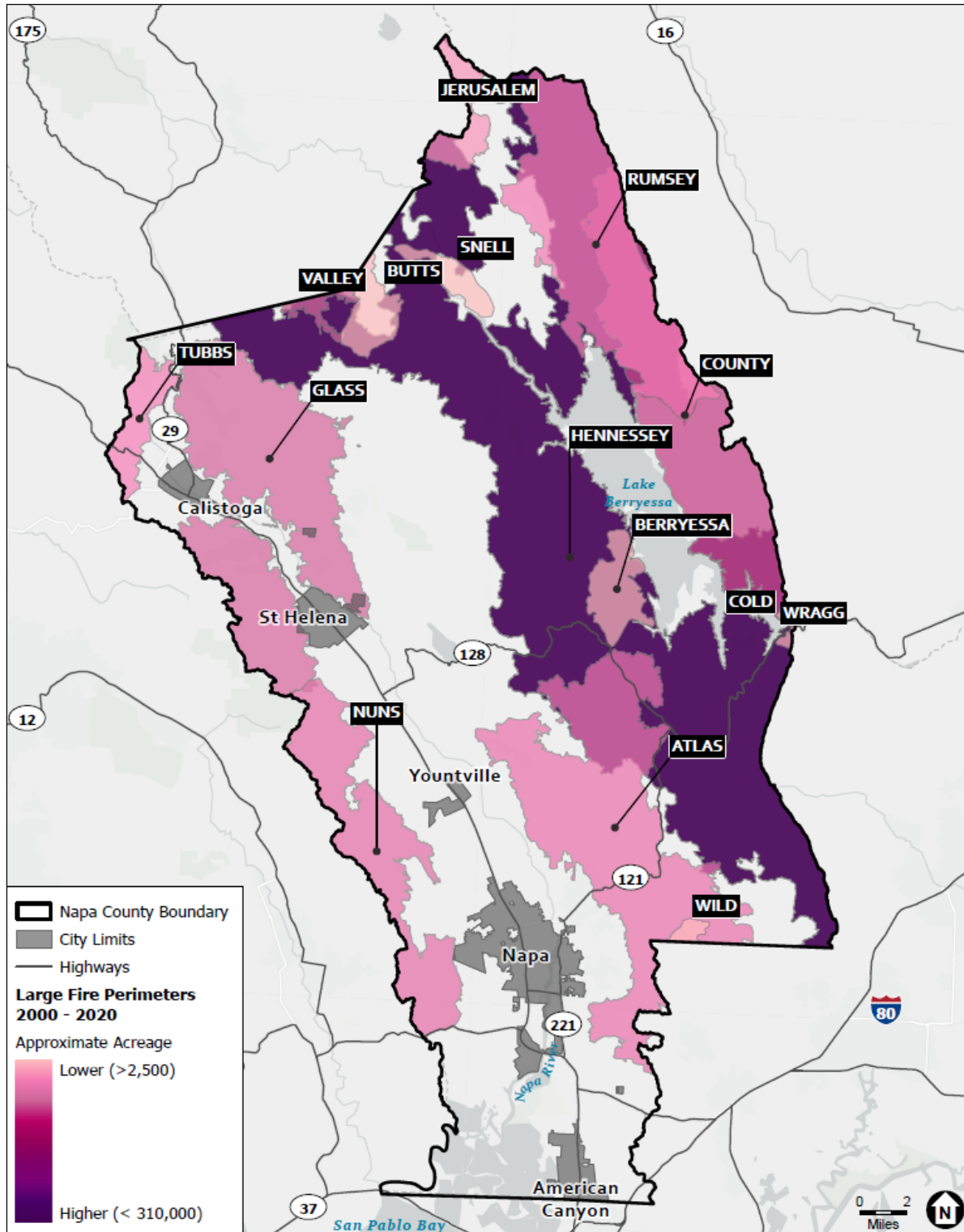


Figure 2.11-1. Napa County Large Fire Perimeters 2000 – 2020

MJHMP FIGURE 4-9 HISTORIC FIRE OCCURRENCE MAP (FIRES GREATER THAN 1,000 ACRES, 2000 - 2019)

Recent Wildfire Events 2014 – 2020

Butts Fire (2014) and Wragg Fire (2015)

Fire activity in 2014 and 2015 in Napa County include the Butts Fire of 2014 and the Wragg Fire of 2015. Ultimately, the Butts Fire consumed 4,300 acres and destroyed 2 residences, while the Wragg Fire consumed 8,051 acres and destroyed 2 outbuildings. (Cal Fire, 2017)

Atlas Fire, Tubbs Fire, and Nuns Fire (also known as Central Lake – Napa – Unit (LNU) Complex Fires) (2017)

The October 2017 Northern California wildfires, also known as the Central LNU Complex, include the Atlas Fire, Tubbs Fire, and Nunns Fire. These fire events affected Napa, Lake, Sonoma, Mendocino, Butte and Solano Counties during severe fire weather conditions. In total, the Tubbs Fire collectively burned 36,807 acres, destroyed 5,636 structures, and resulted in 22 fatalities. At the time, the Tubbs Fire was the most destructive wildfire in California history, burning parts of Napa, Sonoma, and Lake counties and inflicting its greatest losses in the City of Santa Rosa. In Napa County specifically, the Nunns and Tubbs Fires damaged over 1,110 structures (Cal Fire, 2018).

Glass Fire (2020)

The most recent large fire activity in Napa County occurred with the Glass Fire in September 2020. The Glass Fire was contained on October 20, 2020, and burned 67,484 acres and destroyed 1,555 structures (Cal Fire, 2020).

Fremont Fire (2021)

There were two smaller scale vegetation fires that occurred in 2021 in Napa County in terms of duration and acres burned. These were the Fremont Fires and the Newell Fires. The Fremont Fire occurred near the Sonoma – Napa county line off of Highway 12. No injuries or structural damage was reported because of the Fremont Fire.

Newell Fire (2021)

The Newell Fire occurred in October 2021 and was quickly contained by Cal Fire Sonoma Lake Napa Unit. Although only active for one day, the Newell Fire burned 132 acres near the Newell Open Space Preserve in Napa County. The Newell Fire was a vegetation fire and did not burn any structures. Pictured left is view of the smoke plumes from Newell Fire as seen from the City of Vallejo.



Newell Fire north of Vallejo.
Image courtesy of PG&E and SF Gate, 2021

Wildfire Vulnerability Analysis

While Napa County has capacity to address wildfire risks, the County is still vulnerable to wildfire impacts. As mentioned above, the historical wildland fire risk in Napa County can be attributed to four factors. These include extreme vegetation diversity and density, volatile fire weather and fire behavior, dynamic fire history, and development in the WUI. Ignition sources, such as dry leaves, wood, and shrubs, and fuel loading are two ongoing factors of concern for residents in Napa County. Ignition sources, or fuels, in Napa County include grass/oak woodland, 15 – 50-year-old chaparral, redwood forests, and timber over 50 years old. Critical concerns are when the chaparral dead-to-live ratio exceeds 50%, and live fuel moisture approaches 60% in late Summer and early Fall. (Strategic Fire Plan Sonoma-Lake-Napa Unit, 2017)

Fire Hazard Severity Zones Defined

California law requires CAL FIRE to identify areas in the State based on the severity of fire hazard that is expected to occur there. These areas, or “severity zones,” are based on factors such as fuel, slope and fire weather (Cal Fire, 2021).

There are three zones, based on increasing fire hazard: medium, high and very high.

The majority of past wildfire events in Napa County were in summer months (typically June through August). Fire risk will also continue to grow if more development is permitted in WUI areas, which increases fuel loads and the risk of human-caused fires.

This section describes vulnerabilities to wildfire in terms of population, property, and infrastructure and provides graphic representation of these assets, overlaid by CalFire Wildfire Hazard Severity Zones.

Population

Wildfire is of greatest concern to populations residing in the moderate, high and very high fire hazard severity zones. Approximately 20,859, or 36% of the Napa County population live within wildfire hazard severity zones, as illustrated in **Figure 2.11-2**. As shown in **Table 2.11-2**, 8,618 people reside in areas mapped as Moderate Wildfire Hazard Severity Zones, 5,118 people reside in High Wild Severity Zones and 7,123 people reside in Very High Wildfire Hazard Severity Zones.

TABLE 2.11-2. NAPA COUNTY WILDFIRE POPULATION EXPOSURE

<i>Population Count by Wildfire Hazard Severity Zone</i>	
Very High	7,123
High	5,118
Moderate	8,618
SOURCE: Napa County Office of Emergency Services, 2020	

Vulnerable Development, Critical Facilities, and Infrastructure

Per the State’s Office of Planning and Research Guidelines, critical facilities are “facilities that either (1) provide emergency services or (2) house or serve many people who would be injured or killed in case of disaster damage to the facility. Examples include hospitals, fire stations, police or emergency service facilities, utilities, or communications facilities.

In unincorporated Napa County, there are six essential facilities in Very High Wildfire Severity Zones, including five fire stations and one hospital. Linear infrastructure, such as roads and railroads, are normally not susceptible to fire damage. However, fires can create conditions that can prevent ingress and egress and can isolate residents and emergency service providers as a result. Similarly, communication towers also increase capacity in the event of a wildfire. Vulnerable development and critical facilities, as described, are shown in Figure 2.11-2, below.

County Capacity to Respond to Hazards

Fire suppression services in Napa County are provided by California Department of Forestry and Fire Protection (CAL FIRE) Sonoma-Lake-Napa Unit (LNU). The LNU serves the counties of Sonoma, Lake, Napa, Solano, Yolo, and Colusa. As this unit covers a large geographic region spanning several counties, suppression resources and personnel during peak fire season include approximately 260 career personnel and approximately another 250 seasonal personnel. As of 2020, the LNU's inventory includes 21 fire stations, 31 engines, 6 bulldozers, 2 Conservation Camps, 1 Fuels Crew, 1 Helicopter and many other Support Staff positions. In addition to fire suppression services, there are also ongoing fuel reduction projects occurring in Napa County.

Special Projects: Fuel Reduction

In Napa County, fuel reduction projects are ongoing on federal, state, and private lands in Napa County. These projects include vegetation management, controlled burns, and removal of dead, dying, and diseased trees. Similar fuel reduction projects are active and enforced on private lands. The CAL Fire Sonoma Lake Napa Unit is active in enforcing the Forest Practice Rules on private timberland where Timber Harvesting Plans (THPs) have been submitted and where timber harvesting is occurring. Rules and standards include provisions for the operation of fire causing equipment, use of hydrocarbon powered engines near forest, grass, or brush lands, and for the operation of chainsaws in the forest environment. Lastly, all jurisdictions participating in the MJHMP planning process have identified mitigation measures and strategies to adapt to future wildfire hazards that have the potential to occur across Napa County.

As the local climate becomes warmer and drier and weather patterns become more volatile as a result, wildfire will continue to remain a significant threat to the Napa County community. Climate change is projected to increase this current risk by anywhere from 10 to 20 percent, and the County will need to continue to adapt to this projected increase (Napa County Office of Emergency Services, 2020). This increase could cause additional threats to the County and has the potential to affect emergency services, roads, water supplies, housing access, and quality of life. While Napa County continues to increase its adaptive capacity to wildfire risk, goals, policies and actions within this Safety Element will address site constraints with respect to wildfire hazards and potential impacts to community safety, as well as community education and preparedness.

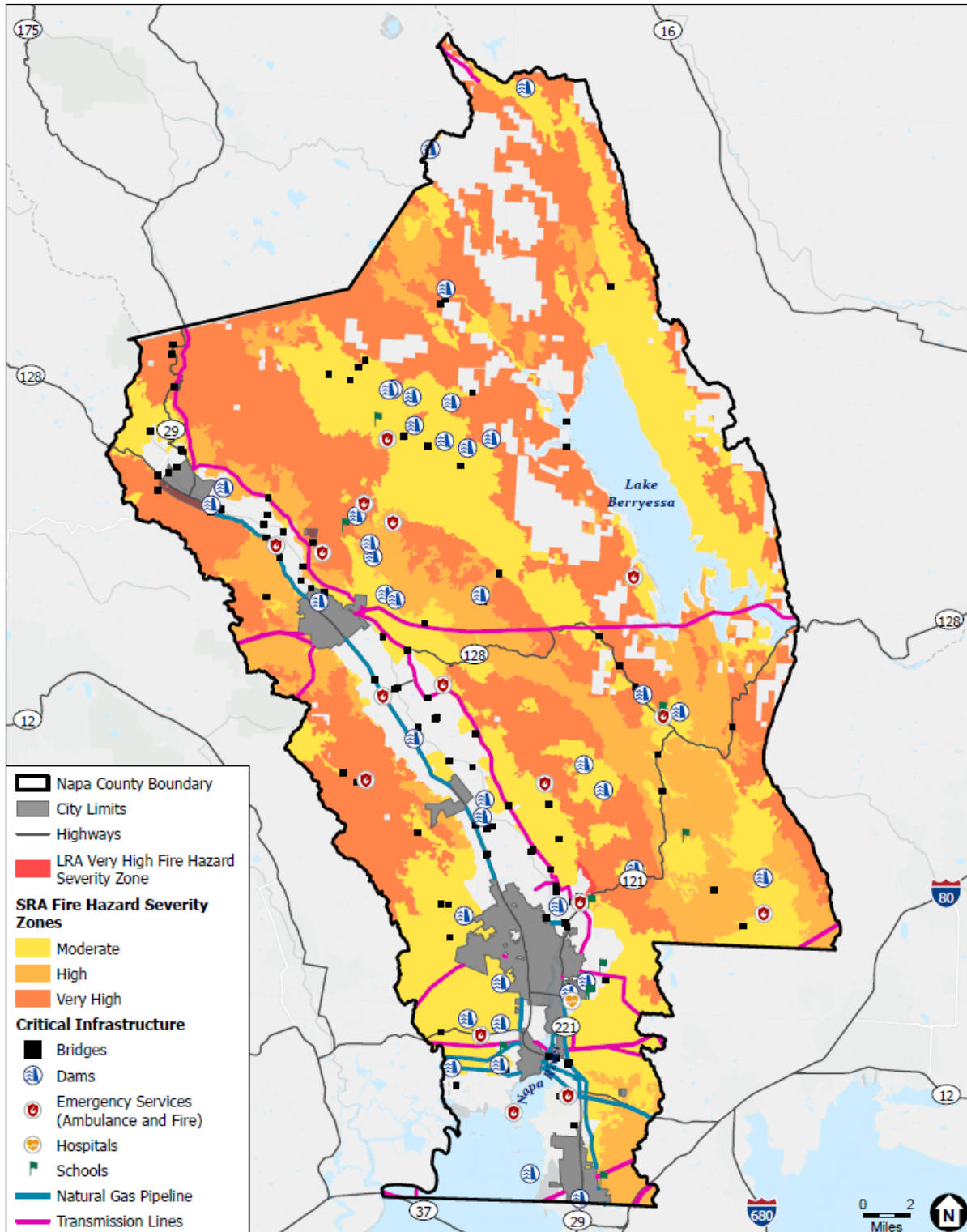


Figure 2.11-2. Napa County Vulnerable Development In Fire Hazard Severity Zones

MJHMP FIGURE 4-13 EXPOSURE WILDFIRE VULNERABILITY AND SNAPSHOT MAP

Plans, Policies, Programs, and Regulatory Environment

Wildfire Protection Responsibility in California

In California, local, state, tribal, and federal organizations all have legal and financial responsibility for wildfire protection. To address wildfire jurisdictional responsibilities, in 1981 the California State Legislature outlined various wildfire responsibility areas, described below, in Cal. Pub. Res. Code § 4291.5 and Cal. Health & Safety Code § 13108.5. In Napa County, the most prominent of these responsibility areas are State Responsibility Areas (SRAs) and Local Responsibility Area (LRAs) described below (Napa County Office of Emergency Services, 2020).

- **State Responsibility Areas (SRAs)**—SRAs are lands in California where the California Department of Forestry and Fire Protection (CAL FIRE) has legal and financial responsibility for wildfire protection and where CAL FIRE administers fire hazard classifications and building standard regulations. SRA boundaries are those adopted by the California Board of Forestry and Fire Protection and are reviewed and updated every 5 years. SRAs are defined as lands that:
 - Are County unincorporated areas,
 - Are not federally owned,
 - Have wildland vegetation cover rather than agricultural or ornamental plants,
 - Have row crops or seasonal crops, or
 - Have watershed, range, or forage values.

Where SRA's contain structures or development, the responsibility for fire protection falls to relevant local agencies.

- **Local Responsibility Areas (LRAs)** — LRAs include land in cities, cultivated agriculture lands, unincorporated non-flammable areas, and lands that do not meet the criteria for SRA or Federal Responsibility Areas (FRAs). There are no FRA's in Napa County. LRA fire protection is typically provided by city or county fire departments, fire protection districts, or by CAL FIRE under contract to local governments. LRAs may still include areas of flammable vegetation and WUI.

The SRA's and LRA's in Napa County are illustrated in **Figure 2.11-3** below.

California Fire Code (2019)

Napa County has adopted the 2019 Edition of the California Fire Code to safeguard the public health, safety, and general welfare from the hazards of fire, explosion, or dangerous conditions in new and existing buildings, structures, and premises, and to provide safety and assistance to fire fighters and emergency responders during emergency operations.

California Building Code (2019)

The 2019 California Building Code, adopted by the County, includes materials and construction methods for exterior wildfire exposure and standards of quality for fire-resistant buildings. See Cal. Building Codes, Chapter 7a (2019).

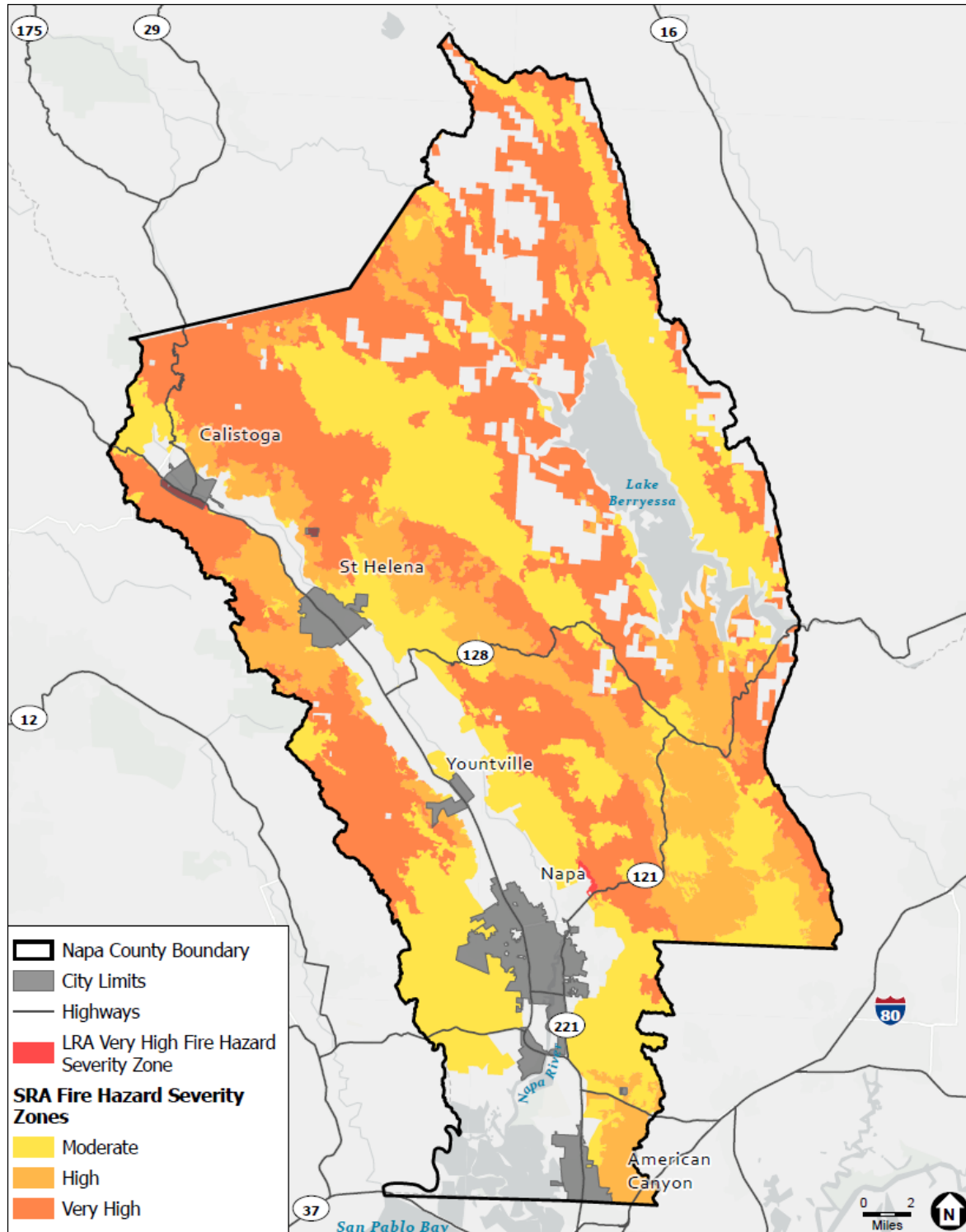


Figure 2.11-3. Napa County Wildfire Severity Zones

MJHMP FIGURE 4-12 WILDFIRE SEVERITY ZONES

CAL Fire Strategic Plan, Sonoma – Lake Napa Unit (2020)

The California Department of Forestry and Fire Protection (CAL FIRE), Sonoma-Lake-Napa Unit (LNU) serves the counties of Sonoma, Lake, Napa, Solano, Yolo, and Colusa. The LNU Strategic Fire Plan is a living document and outlines a comprehensive program designed to reduce total government costs and citizen losses from wildland fire in the Unit, including unit preparedness and firefighting capabilities, as well as pre fire management strategies and tactics. The LNU Strategic Fire Plan also strives to assist the public with assistance and education to create fire adapted communities that can more safely withstand a wildland fire.

Napa County Multi Jurisdictional Hazard Mitigation Plan (MJHMP)

The County's MJHMP provides for long-term mitigation planning by identifying goals, objectives, mitigation strategies and implementation methods that can be incorporated over the long term to reduce risk and future losses to wildfire events.

Napa County General Plan

The Napa County General Plan is an official policy document that serves to guide private and public development in Napa County. Within the County General Plan, the Safety Element contains specific goals and policies to mitigate the effects of wildfire and protect the safety and general welfare of residents and visitors in Napa County.

Residential Fire Protection (Napa County Code Section 8.36) and Napa County Hazard Abatement Ordinance

Napa County regulations require property owners to maintain a defensible space in accordance with the Defensible Space Guidelines. Failure to maintain defensible space, including the accumulation or storage of materials within established boundaries, is considered a nuisance and subject to County enforcement. Napa County Code § 8.36.60 (2019).

Updated and adopted in May 2021, the Napa County Defensible Space Guidelines define defensible space as the area around a structure with a minimum distance of a 100-foot radius or to the property line, whichever is less, in which combustible vegetation and other prohibited materials must be treated, cleared, or reduced to slow the spread of fire to and from the structure (Napa County Office of Emergency Services, 2020). The area is characterized by the establishment and maintenance of a buffer zone that is within 30 feet of any structure and a reduced fuel zone that extends to a minimum distance of 100 feet away from a structure or to the property line adjacent to the structure if less than 100 feet from the structure.

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APPENDIX B

NAPA COUNTY SAFETY ELEMENT

AB 747 EMERGENCY EVACUATION

ASSESSMENT

Draft Memorandum

Date: April 15, 2022

To: Hillary Gitelman, Mary Laux, and Jillian Feyk-Miney, Environmental Science Associates
Trevor Hawkes, County of Napa

From: Ian Barnes, Terence Zhao, and Grace Chen, Fehr & Peers

Subject: County of Napa AB 747 Emergency Evacuation Assessment

WC21-3826

Fehr & Peers has completed a general, programmatic assessment of emergency evacuation routes for the County of Napa. This assessment is consistent with Assembly Bill 747 (AB 747) and Senate Bill 99 (SB 99) requirements.

This document is intended to provide an assessment of roadway capacity under the described scenarios and should not be considered an evacuation plan. Please note that emergency evacuation can occur due to any number of events. Additionally, wildfire movement in particular is unpredictable as is individual behavior related to evacuation events. As such, this assessment is intended to provide the County with a broad “planning level” assessment of the capacity of the transportation system during an evacuation scenario; it does not provide guarantees as to the adequacy of the system nor can it guarantee that the findings are applicable to any or all situations.

Moreover, as emergency evacuation assessment is an emerging field, there is no established standard methodology. We have adopted existing methodologies in transportation planning that, in our knowledge and experience, we believe are the most appropriate. Nevertheless, such methodologies are necessarily also limited by the budgetary and time constraints in our scope of work, and by the current state of our knowledge.

The County should take care in planning and implementing any potential evacuation scenario and that this assessment should help the County better prepare for those events. We would be happy to conduct additional analyses in further detail, analyzing different scenarios, and employing other methodologies if desired. However, in no way can Fehr & Peers guarantee the efficacy of

any of the information used from this assessment as such would be beyond our professional duty and capability.

Background

The following are recent pieces of legislation related to emergency access that are addressed in this assessment.

- AB 747 requires that the safety element be reviewed and updated to identify evacuation routes and their capacity, safety, and viability under a range of emergency scenarios. This will be a requirement for all safety elements or updates to a Local Hazard Mitigation Plan (LMHP) completed after January of 2022.
- SB 99 requires review and update of the safety element to include information identifying residential developments in hazard areas that do not have at least two emergency evacuation routes.

Approach

As part of previous SB 99 work, parcels with only one access route in or out are identified and mapped in **Figures 1A, 1B, and 1C**. Also as part of previous SB 99 work, evacuation access County-wide was assessed by reviewing the distance evacuees must travel during an evacuation event based on information provided by Napa County staff. This assessment is a proxy for accessibility and can assist in identifying potentially vulnerable communities during an evacuation event by identifying areas of the County that need to travel the furthest and thus are potentially the most vulnerable in an evacuation event. We approached this assessment by measuring distances from each point along the County roadway network to designated evacuation zones in each of three scenarios, mapped in **Figures 2A, 2B, and 2C**, respectively. The three scenarios differ based on the extent of evacuations:

- Scenario A assumes that Calistoga, Saint Helena, Yountville, and the City of Napa are evacuation destinations.
- Scenario B assumes that Yountville and the City of Napa are evacuation destinations, and that Calistoga, and Saint Helena are also evacuating to these destinations.
- Scenario C assumes that only the City of Napa is an evacuation destination, and that Calistoga, Saint Helena, and Yountville are all evacuating there.

For the AB 747 Capacity Assessment, Fehr & Peers and County of Napa staff worked together to identify seven critical evacuation zones of the highest concern for further analysis. These were

chosen with consideration of fire history, as well access limitations identified from the as results from SB 99 analysis. These zones are:

- The community of Angwin
- The community of Berryessa Highlands, located on the south shore of Lake Berryessa and accessible via Steele Canyon Road
- The community of Berryessa Estates, located on the northern fork of Lake Berryessa formed by Putah Creek and accessible via Stagecoach Canyon Road
- The Calistoga area
- The Saint Helena area
- The Yountville area
- The areas on the western shore of Lake Berryessa, including Spanish Flat

Evacuation Capacity Assessment

Consistent with the requirements of AB 747, we reviewed the capacity of the transportation system during an evacuation event for each of the seven identified zones listed previously. This assessment makes the following assumptions:

- The need for evacuation is assumed to be a wildland fire.
- No “shelter in place” is assumed – all residents, employees and visitors are assumed to evacuate from these zones.
- 100 percent occupancy of households is assumed. This assumption is discussed further in latter parts of this section and in Table 2.
- It is assumed that adequate staff would be available to control traffic at key intersections and prohibit through traffic from entering the evacuation zones.

Based on these preconditions, we developed three evacuation scenarios that correspond to Scenarios A, B, and C mentioned previously. Scenario 3 was separated into three sub-scenarios, which assume Geyserville / northern Sonoma County as a potential evacuation destination for none, some, and all Calistoga residents, respectively.

- *Scenario 1 (4 out of 7 zones identified need to evacuate)*
This scenario assumes that only communities in the hills (that is, Angwin, Berryessa Highlands, Berryessa Estates, and the western shore of Lake Berryessa / the Spanish Flat area) need to evacuate.
- *Scenario 2 (6 out of 7 zones identified need to evacuate)*
This scenario assumes that communities in the hills, as well as Saint Helena and Calistoga on the valley floor, need to evacuate to at least as far south as Yountville, but that

Yountville and points south are safe.

- *Scenario 3.1 (all 7 zones identified need to evacuate)*

This scenario assumes communities in the hills, as well as Saint Helena, Calistoga, and Yountville on the valley floor, need to evacuate, all to the City of Napa.

- *Scenario 3.2 (all 7 zones identified need to evacuate)*

This scenario assumes communities in the hills, as well as Saint Helena, Calistoga, and Yountville on the valley floor, need to evacuate, all to the City of Napa except for half of Calistoga evacuating to Geyserville.

- *Scenario 3.3 (all 7 zones identified need to evacuate)*

This scenario assumes communities in the hills, as well as Saint Helena, Calistoga, and Yountville on the valley floor, need to evacuate, all to the City of Napa except for Calistoga evacuating to Geyserville.

The evacuation routes for each of these scenarios are discussed further in the subsequent sections and evacuation destinations are shown in **Table 4**. For all communities in scenarios 1 and 2, as well as for all communities except for Calistoga in scenario 3 (as noted above), a location in Napa County is presumed to be the evacuation destination due to shorter evacuation distances and the relatively higher capacity of the routes.

The number of residents, anticipated vehicle ownership per household, and employees in the area were referenced to estimate the number of vehicles that would need to evacuate. **Table 1** summarizes land use information and vehicle ownership data for the evacuation zones.

Table 1: Land Use and Evacuation Demand of Evacuation Zones

Evacuation Zone	Households	Population	Employment	Household Vehicle Ownership					Estimated Evacuation Demand*	Evacuating?		
				0	1	2	3	4+		Scenario 1	Scenario 2	Scenario 3
Angwin	1,139	3,716	683	32	290	432	205	180	2,877	Yes	Yes	Yes
Berryessa Estates	280	723	256	7	75	100	74	25	780	Yes	Yes	Yes
Western shore of Lake Berryessa, including Spanish Flat	132	341	56	3	35	47	35	12	307	Yes	Yes	Yes
Berryessa Highlands	372	962	91	9	99	132	98	33	803	Yes	Yes	Yes
Calistoga area	2,096	5,564	2,362	170	848	595	352	131	5,694	No	Yes	Yes
Saint Helena area	2,865	7,203	7,119	192	1,039	1,093	497	43	11,457	No	Yes	Yes
Yountville area	1,169	3,662	3,178	157	551	368	72	21	4,663	No	No	Yes
Total	8,053	22,171	13,745	570	2,937	2,768	1,333	445	26,581	4,767	21,918	26,581

Source: Sonoma-Napa Activity-Based Model 2040, American Community Survey 2015-19

*Assumption of number of vehicles that will evacuate: zero-vehicle household: 1 vehicle; one-vehicle household: 1 vehicle; two-vehicle household: 2 vehicles; three-vehicle household: 2.5 vehicles; four-or-more-vehicle household: 3 vehicles; employee: 0.93 vehicle (there are 7% zero-vehicle households in evacuation zones).

The number of households in the area that would potentially have mobility constraints due to the lack of a personal vehicle during an evacuation event is summarized in **Table 2**. As shown, approximately seven percent of households across the seven zones do not have access to a vehicle. It should be noted that this information does not constitute a specific analysis of households with mobility challenges as it does not specifically account for people who have mobility impairments that preclude them from using a vehicle; it also does not specifically account for households that own one or more vehicles, but where not all members of the household may necessarily have access to them at all times (for example, a household with one vehicle which a household member drives to work, leaving other members of the household staying at home with no available vehicle).

Table 2: Zero-Vehicle Households

Evacuation Zone	Households	Zero-Vehicle Households	Percent Zero-Vehicle Households
Angwin	1,139	32	3%
Berryessa Estates	280	7	2%
Western shore of Lake Berryessa, including Spanish Flat	132	3	2%
Berryessa Highlands	372	9	2%
Calistoga area	2,096	170	8%
Saint Helena area	2,865	192	7%
Yountville area	1,169	157	13%
Total	8,053	570	7%

Source: Sonoma-Napa Activity-Based Model 2040, American Community Survey 2015-19.

A worst-case condition was estimated where all employees and residents in the evacuation area would need to be evacuated according to **Table 1**. In the absence of detailed data for the evacuation zones, this assessment uses zero-vehicle households as a proxy to provide an estimate of persons with mobility constraints that may need evacuation assistance the zero-vehicle households would require outside assistance, and although outside the scope of this assessment, the County may want to consider a program that ensures a more accurate accounting of households needing assistance, and that evacuation of these households is achievable via public transit, special shuttle vehicles sent during evacuations, or other neighborhood programs that promotes advanced coordination of ridesharing during evacuations between neighbors. This estimate also assumes that employment centers would provide evacuation assistance to employees without access to a vehicle. Additionally, it was assumed that some households with more than two vehicles likely would not be able to utilize all of their vehicles during an evacuation event (e.g. homes with three or four vehicles but with only two licensed drivers).

Evacuation Routes and Gateways

Roadways with Capacity Constraints

As part of our conversations, Fehr & Peers and County staff also identified the following roadways to be unsuitable for general evacuation planning purposes:

- Berryessa-Knoxville Road / Morgan Valley Road
- Dry Creek Road / Trinity Road
- Oakville Grade
- Spring Mountain Road / Saint Helena Road
- Duhig Road / Ramal Road

These roadways were not considered as potential gateway links or routes for general evacuation in the AB 747 analysis.

Moreover, this analysis assumes that in scenarios 2 and 3, where residents from northern parts of the County must evacuate south to either Yountville or the City of Napa, State Route 29 will be the only available north-south route on the valley floor. Silverado Trail is situated close to the foothills and lies in a historic fire zone. In a historic fire scenario as represented in scenario 2 and 3, it is likely to be closed and unavailable for evacuation use due to fire conditions. Should Silverado Trail remain open during an evacuation event, it can supplement State Route 29 to provide additional north-south capacity.

Evacuation Routes and Gateways

A critical factor in the success of an evacuation is how long it takes all evacuees to clear an area under threat. Conceptually, the time it takes to evacuate a given area is fundamentally constrained by key capacity constraints along the roadway system, otherwise known as "bottlenecks". Note that multiple bottlenecks may be present over the course of an evacuation route, and the high-level programmatic analysis in this assessment only considers a limited number of regional bottlenecks, which are selected after the segments noted above were excluded.

Routes to their respective evacuation destinations were identified for each of the seven evacuation zones being analyzed. For each zone, a roadway link from the Solano Napa Activity-Based Model (SNABM) that represents the bottleneck segment on its evacuation route was identified as its "evacuation gateway." For example, in scenario 1, Deer Park Road between Angwin and State Route 29 is considered the evacuation gateway for Angwin, as it is the sole egress for all evacuees from Angwin heading to Saint Helena. The list of evacuation gateways and their capacities are shown in **Table 3**.

The roadway capacities presented in **Table 3** and used by this analysis are based on those found in the Solano Napa Activity-Based Model (SNABM), with some modifications made to account for perceived discrepancies with current real-world conditions under normal operating conditions. This assessment conservatively assumes that roadway capacities during evacuation events will be as they are in normal conditions, and not be increased by measures such as the implementation of contraflow lanes.

Table 3: Total Outbound Capacity of Evacuation Gateway Links

Roadway Name	Outbound Lanes	Total Outbound Capacity (vehicles per hour)
1. Deer Park Road (between Angwin and State Route 29 at Saint Helena)	1	900
2. State Route 29 (between Saint Helena and Yountville)	1	1,600
3. State Route 29 (between Yountville and Salvador)	2	2,800
4. Snell Valley Road/Butts Canyon Road/Pope Valley Road (between Berryessa Estates and Howell Mountain Road)	1	900
5. Howell Mountain Road (between Snell Valley Road and Angwin)	1	900
6. Berryessa Knoxville Road (between Spanish Flat and State Route 128)	1	900
7. State Route 128 (between Berryessa Knoxville Road and State Route 121)	1	900
8. State Route 121 (between Berryessa Highlands and Wooden Valley Road)	1	1,600
9. State Route 128 (between Calistoga and Napa County Line)	1	1,600
10. State Route 128 (between Napa County Line and Geyserville)	1	1,050

Source: Sonoma-Napa Activity-Based Model 2040, American Community Survey 2015-19

Table 4 presents the evacuation gateway links and the zones each gateway is associated with for each scenario – note that evacuation gateways can be associated with multiple zones that must use it to evacuate; similarly, depending on the evacuation scenario, an evacuation zone can be associated with multiple evacuation gateways if the evacuation route from that zone passes through multiple gateways to reach its evacuation destination. The table also shows the combined number of households and vehicle demand for all zones associated with each evacuation gateway.

Each evacuation gateway has a fixed capacity (usually noted in vehicles per hour), and dividing the gateway capacity into the total evacuation vehicle demand yields the time it takes for all vehicles to pass through the gateway from the evacuation zone. Using the estimated vehicle demand at each gateway and dividing by the estimated hourly outbound capacity for that

gateway, **Table 4** also presents an estimated time required to clear all vehicles at the gateway. Note that this time estimate is not an estimated average travel time for evacuees traveling from the evacuation zone to the evacuation destination, nor is it the estimated travel time through the roadway link segment that makes up the gateway. Instead, it reflects the comparison between the evacuation demand of the zones served by that gateway, and provides a rough estimate for the time it would take for the specified number of vehicles to pass through the gateway given its roadway capacity. Moreover, this assessment only takes into account the vehicle demand from the seven evacuation zones, and not any other traffic that may be present.

As shown, the total vehicle demand at many of the evacuation gateways significantly exceed their respective hourly outbound capacities. **Table 4** also presents an alternative scenario, in which the vehicle demand is equivalent to an average of one vehicle per household, which produces much shorter and more manageable time estimates for clearing the gateways.

Table 4: Evacuation Time Required Under Each Evacuation Scenario

Evacuation Zone	Evacuation Gateway Link	Evacuation Destination	Estimated Evacuation Demand	Number of Households	Total Outbound Capacity (vehicles per hour)	Time Required for Vehicles to Pass Through at Gateway (hours)	
						Total Vehicle Demand	One Vehicle per Household
Scenario 1 - Only communities in the hills need to evacuate							
Angwin and Berryessa Estates	Deer Park Road	Saint Helena	3,657	1,419	900	4.06	1.58
Spanish Flat and Berryessa Highlands	State Route 121	City of Napa	1,110	504	1,600	0.69	0.32
Scenario 2 - Communities in the hills, as well as Saint Helena and Calistoga on the valley floor, need to evacuate to at least as far south as Yountville							
Angwin and Berryessa Estates	Deer Park Road	Saint Helena	3,657	1,419	900	4.06	1.58
Angwin, Berryessa Estates, Calistoga, and Saint Helena	State Route 29	Yountville	20,808	6,380	1,600	13.00	4.00
Spanish Flat and Berryessa Highlands	State Route 121	City of Napa	1,110	504	1,600	0.69	0.32
Scenario 3.1 - Communities in the hills, as well as Saint Helena, Calistoga, and Yountville on the valley floor, need to evacuate to the City of Napa							
Angwin and Berryessa Estates	Deer Park Road	Saint Helena	3,657	1,419	900	4.06	1.58
Angwin, Berryessa Estates, Calistoga, and Saint Helena	State Route 29	Yountville	20,808	6,380	1,600	13.00	3.99
Angwin, Berryessa Estates, Calistoga, Saint Helena, and Yountville	State Route 29	City of Napa	25,471	7,549	2,800	9.10	2.70
Spanish Flat and Berryessa Highlands	State Route 121	City of Napa	1,110	504	1,600	0.69	0.32
Scenario 3.2 - Communities in the hills, as well as Saint Helena, Calistoga, and Yountville on the valley floor, need to evacuate - all communities to the City of Napa, except for half of Calistoga evacuating to Geyserville							
Angwin and Berryessa Estates	Deer Park Road	Saint Helena	3,657	1,419	900	4.06	1.58
Angwin, Berryessa Estates, Calistoga (50%), and Saint Helena	State Route 29	Yountville	17,961	5,332	1,600	11.23	3.33
Angwin, Berryessa Estates, Calistoga (50%), Saint Helena, and Yountville	State Route 29	City of Napa	22,624	6,501	2,800	8.08	2.32
Spanish Flat and Berryessa Highlands	State Route 121	City of Napa	1,110	504	1,600	0.69	0.32
Calistoga (50%)	State Route 128	Geyserville	2,847	1,048	1,050	2.71	1.00

Table 4: Evacuation Time Required Under Each Evacuation Scenario

Evacuation Zone	Evacuation Gateway Link	Evacuation Destination	Estimated Evacuation Demand	Number of Households	Total Outbound Capacity (vehicles per hour)	Time Required for Vehicles to Pass Through at Gateway (hours)	
						Total Vehicle Demand	One Vehicle per Household
Scenario 3.3 - Communities in the hills, as well as Saint Helena, Calistoga, and Yountville on the valley floor, need to evacuate. All communities to the City of Napa, except Calistoga evacuating to Geyserville							
Angwin and Berryessa Estates	Deer Park Road	Saint Helena	3,657	1,419	900	4.06	1.58
Angwin, Berryessa Estates, and Saint Helena	State Route 29	Yountville	15,114	4,284	1,600	9.45	2.68
Angwin, Berryessa Estates, Saint Helena, and Yountville	State Route 29	City of Napa	19,777	5,453	2,800	7.06	1.95
Spanish Flat and Berryessa Highlands	State Route 121	City of Napa	1,110	504	1,600	0.69	0.32
Calistoga	State Route 128	Geyserville	5,694	2,096	1,050	5.42	2.00

It is also important to note that emergency scenarios are often unpredictable and driver behavior can be disorderly. Additionally, evacuation events are not linear in nature (e.g. even distribution during the evacuation time period) and it is anticipated that evacuees would vacate at a rate that more closely resembles a bell curve from the time that the evacuation order is issued. These are conditions which would affect the total evacuation time estimated in our assessment that are beyond the scope and budget of our assessment. There is also general unpredictability in operational issues, such as power issues that would trigger traffic signals to operate in “red flash mode” in which traffic would need to proceed through intersections in an all-way stop configuration.

Project Impacts

The only Housing Inventory Site location identified as part of the Housing Element process that falls into one of the seven zones is Spanish Flat, with the addition of 100 housing units. This analysis assumes that this will result in 100 additional households in the area with similar characteristics as the existing households. **Table 5** summarizes the changes to the number of households and vehicles in the zone with project, and **Table 6** shows the resulting changes in estimated evacuation times. As shown, the additional household would result in a 22% increase in evacuation times assuming full evacuation demand, or a 19% increase in evacuation times assuming only one vehicle per household evacuates. In either case, however, total evacuation times remain well under one hour.

Table 5: Evacuation Demand of Spanish Flat, with Project

Evacuation Zone	Households	Household Vehicle Ownership					Estimated Evacuation Demand*
		0	1	2	3	4+	
Western shore of Lake Berryessa, including Spanish Flat, existing	132	3	35	47	35	12	307
Western shore of Lake Berryessa, including Spanish Flat, with project	232	6	62	82	61	21	540

Table 6: Evacuation Time Required for the Spanish Flat Area, with Project

Evacuation Zone	Evacuation Gateway Link	Evacuation Destination	Estimated Evacuation Demand	Number of Households	Total Capacity (vehicles per hour)	Time Required on the Gateway Link to Evacuate (hours)	
						Total Vehicle Demand	One Vehicle per Household
Scenario 1 - Only communities in the hills need to evacuate							
Spanish Flat and Berryessa Highlands, existing	State Route 121	City of Napa	1,110	504	1,600	0.69	0.32
Spanish Flat and Berryessa Highlands, with project	State Route 121	City of Napa	1,343	604	1,600	0.84	0.38
change with project			233	100		0.15	0.06

Next Steps

As a target for further investigation and study, the following lists provide potential measures that can enhance the evacuation process through both the supply side (increasing evacuation capacity) and demand side (managing evacuation volumes).

Supply-side Strategies

- Increasing capacity through the use of contraflow lanes or shoulders
- Managed traffic control, including turn restrictions and route or ramp closures, to maximize outflows from evacuation areas
- Faster clearing of fire-induced road closures
- Street parking management on high hazard days.

Demand-side and Information-Side Strategies

- Communication systems and strategies that improve disaster alerts
- Dynamic route guidance and monitoring
- Phased evacuations
- Reducing vehicle volumes during evacuations, such as by requiring households to evacuate in as few vehicles as possible.

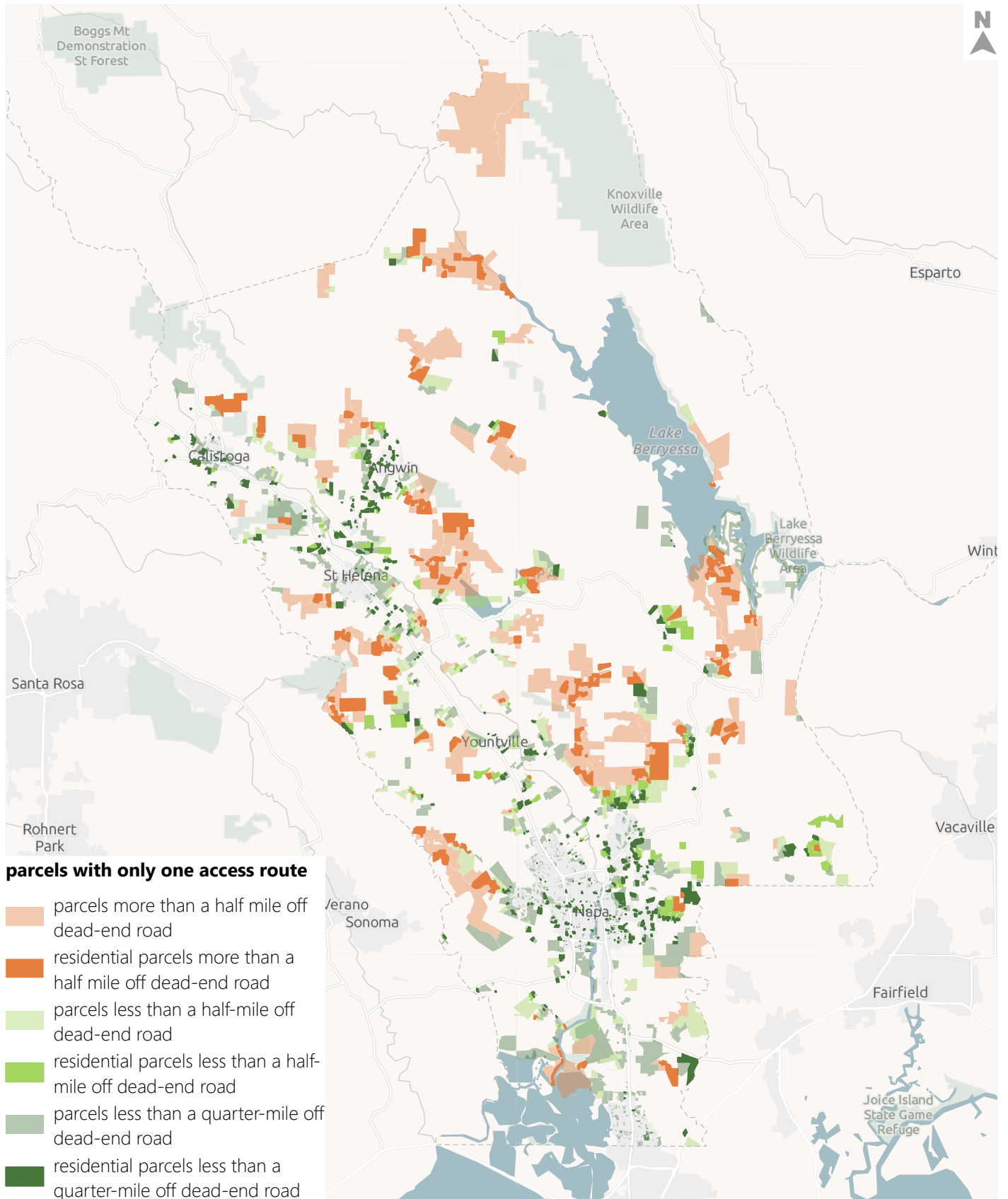


Figure 1A
SB 99 - Parcels With Only One Access Route

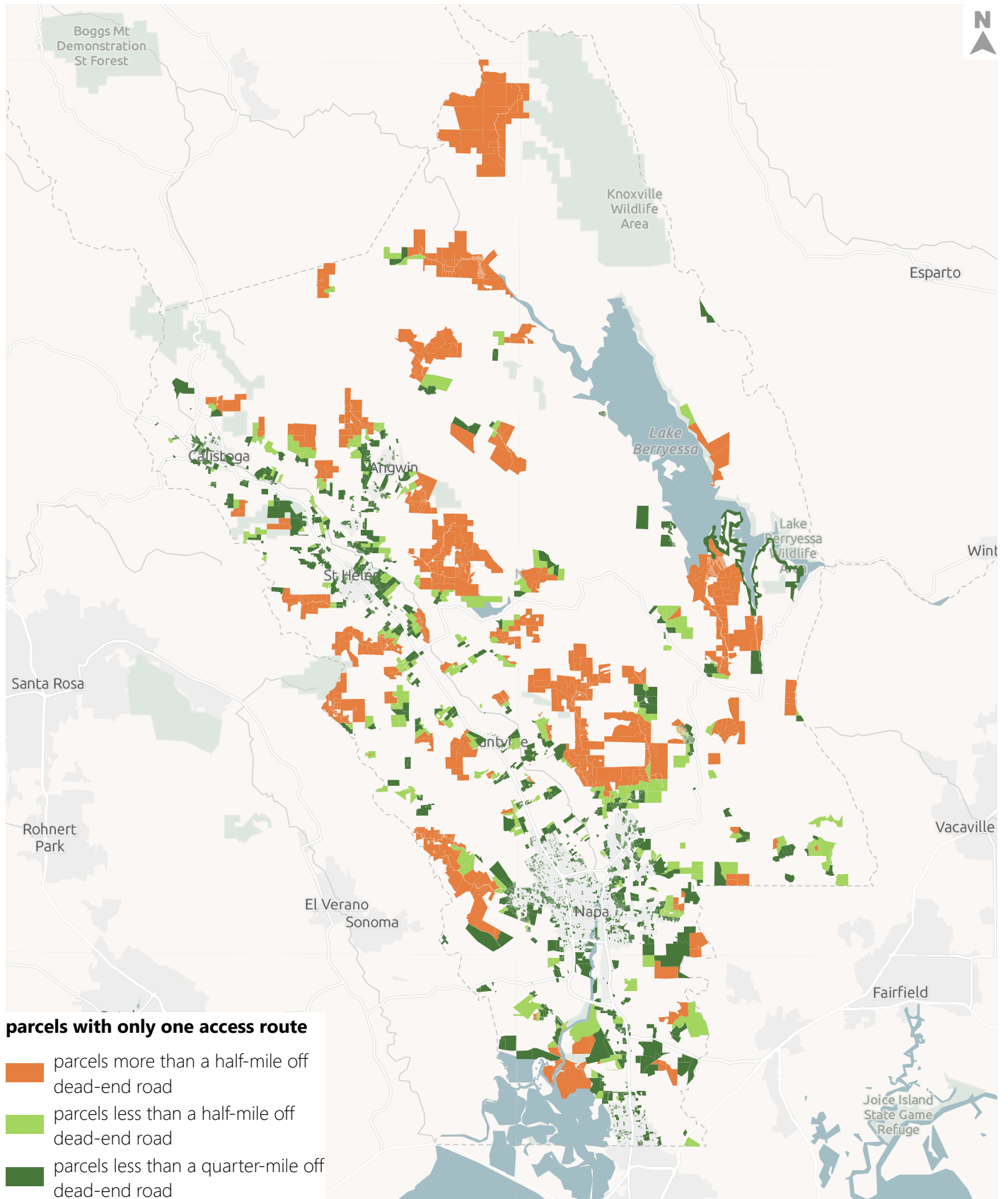


Figure 1B
SB 99 - Parcels With Only One Access Route

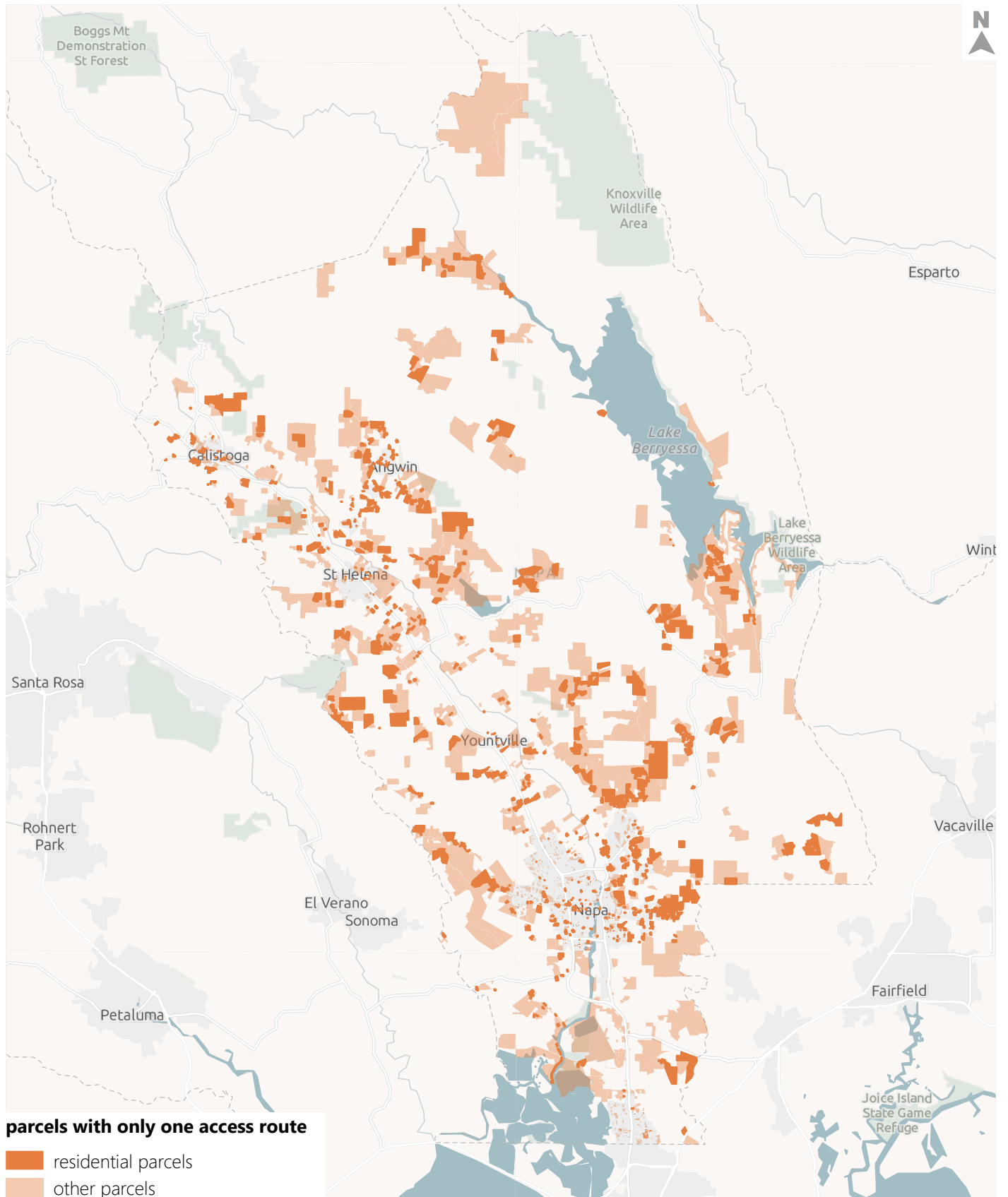


Figure 1C
SB 99 - Parcels With Only One Access Route

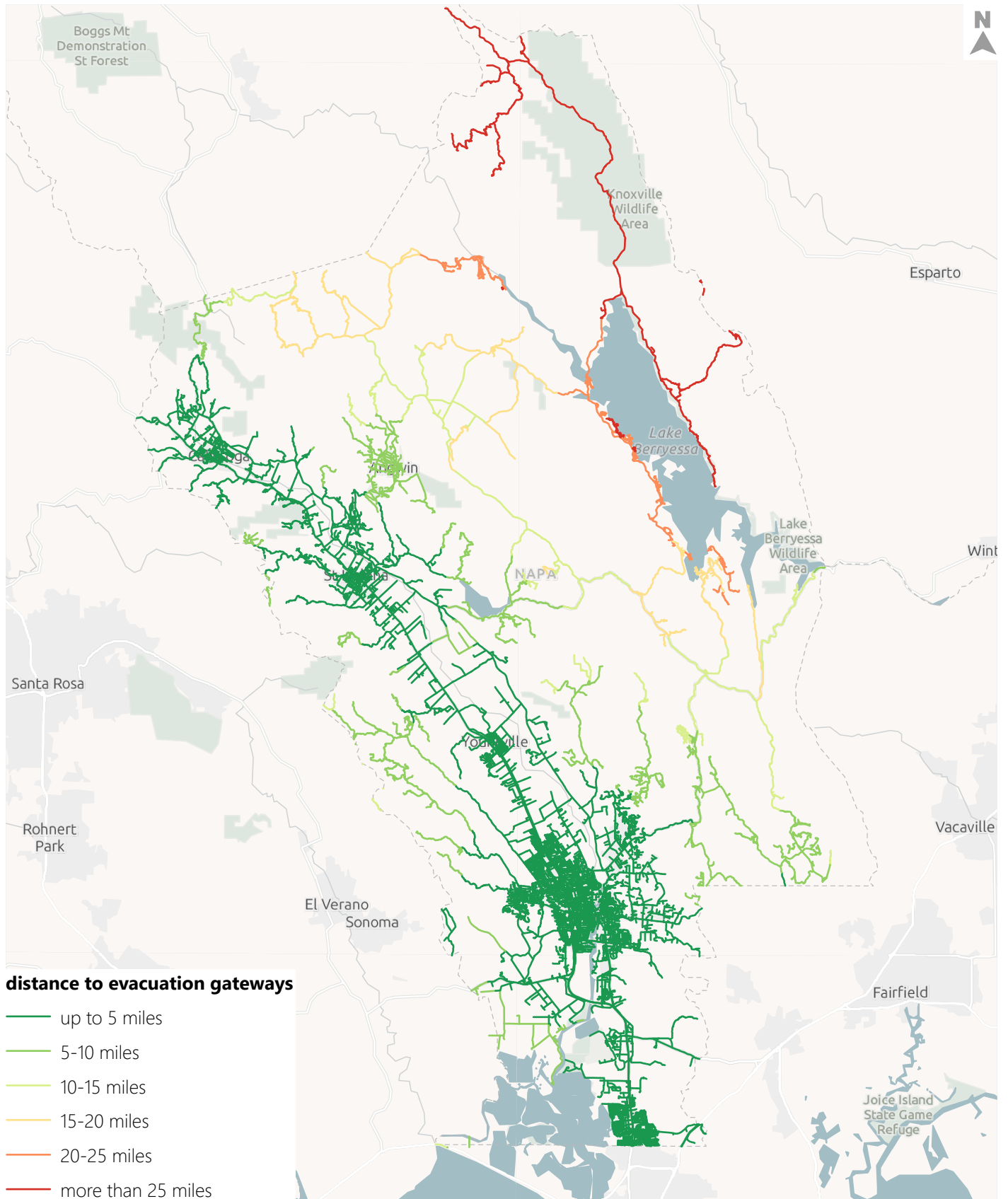


Figure 2A

SB 99 - Distances to Evacuation Gateways
(All Valley Floor Communities Safe)



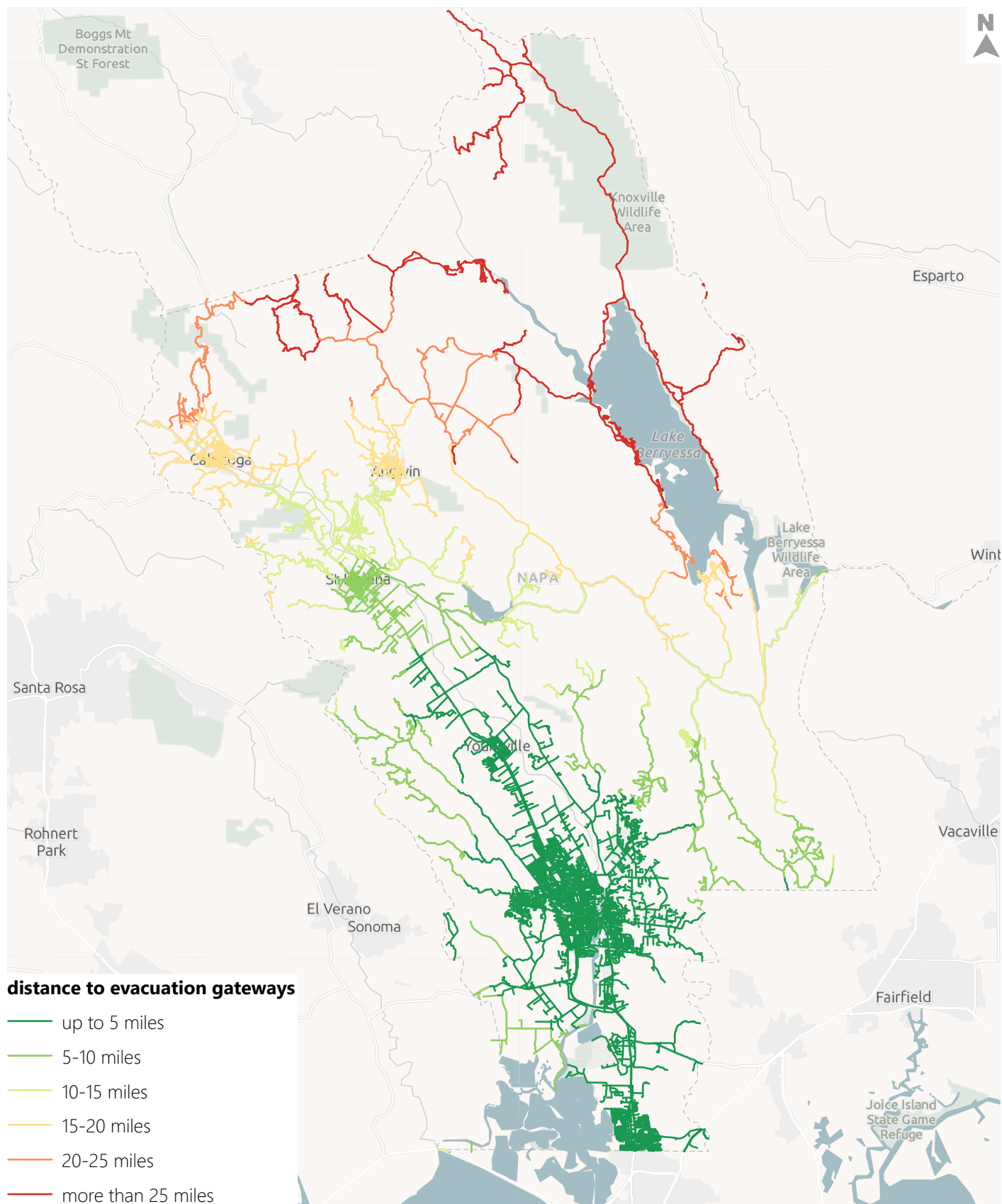


Figure 2B

SB 99 - Distances to Evacuation Gateways
(Calistoga and St. Helena Also Evacuating)



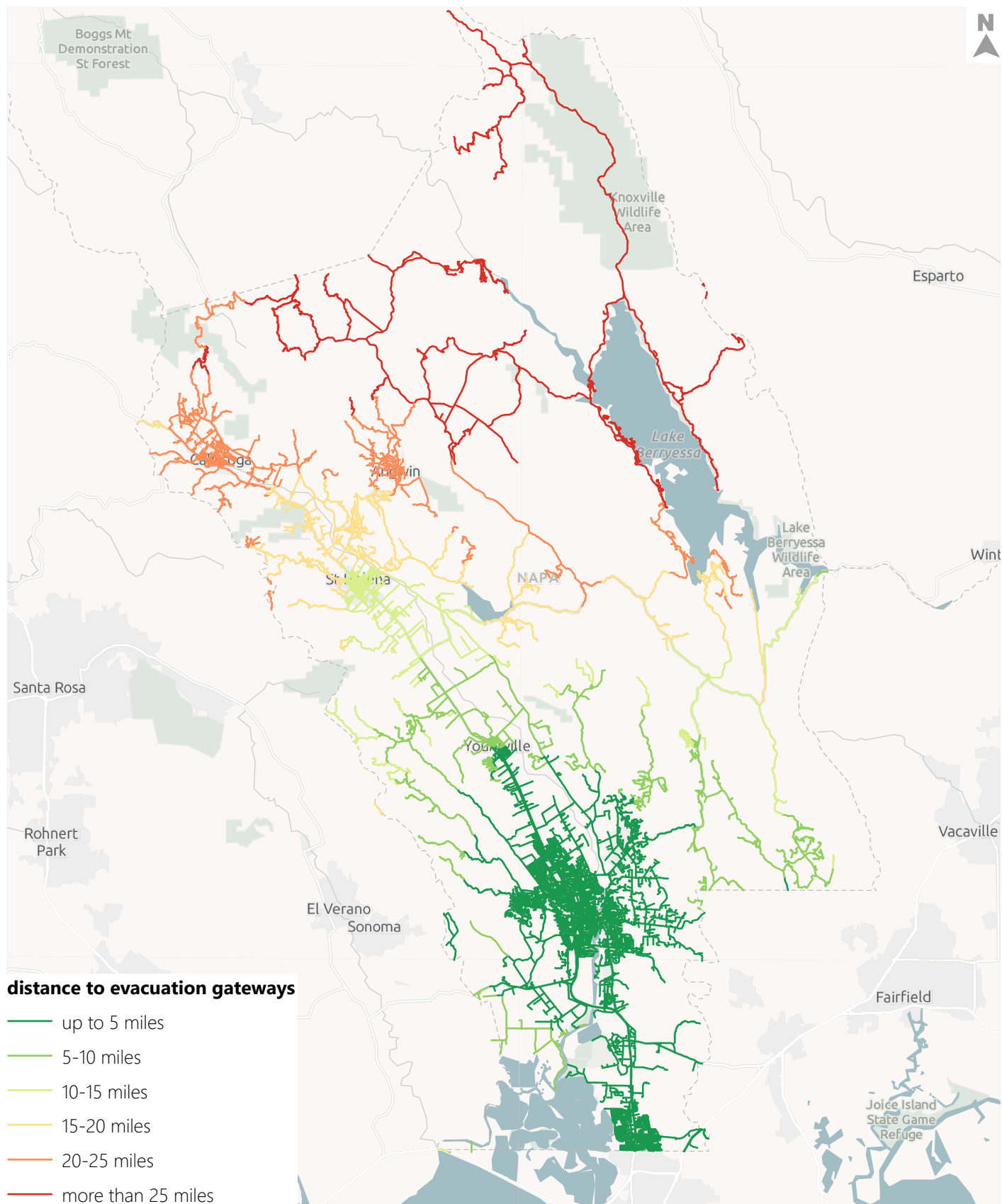


Figure 2C

SB 99 - Distances to Evacuation Gateways
(Calistoga, St. Helena, and Yountville Also Evacuating)

