



Appendix C: Evacuation Study

~~-Public Revised~~ Draft -
~~February Summer~~ 2026

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Attachment C-1: Evacuation Routes, Locations, and Hazards Scenarios Memo

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INTRODUCTION

The Lake County Evacuation Study provides an assessment of potential evacuation routes and locations throughout Lake County. This study evaluates the capacity, safety, and viability of evacuation infrastructure under multiple hazard scenarios to identify areas of vulnerability and recommend improvements to strengthen evacuation resilience. By analyzing how the county's transportation network performs during evacuations, this study is a resource to support evacuation planning efforts and transportation infrastructure investments. The study fulfills requirements established in California Government Code Section 65302.15 (authorized by Assembly Bill 747 and Assembly Bill 1409), which requires the evaluation of evacuation routes and location capacity, safety, and viability under a range of hazard scenarios, and Section 65302(g)(5) (enacted through Senate Bill 99), which mandates evaluation of evacuation-constrained residential developments in hazard areas .

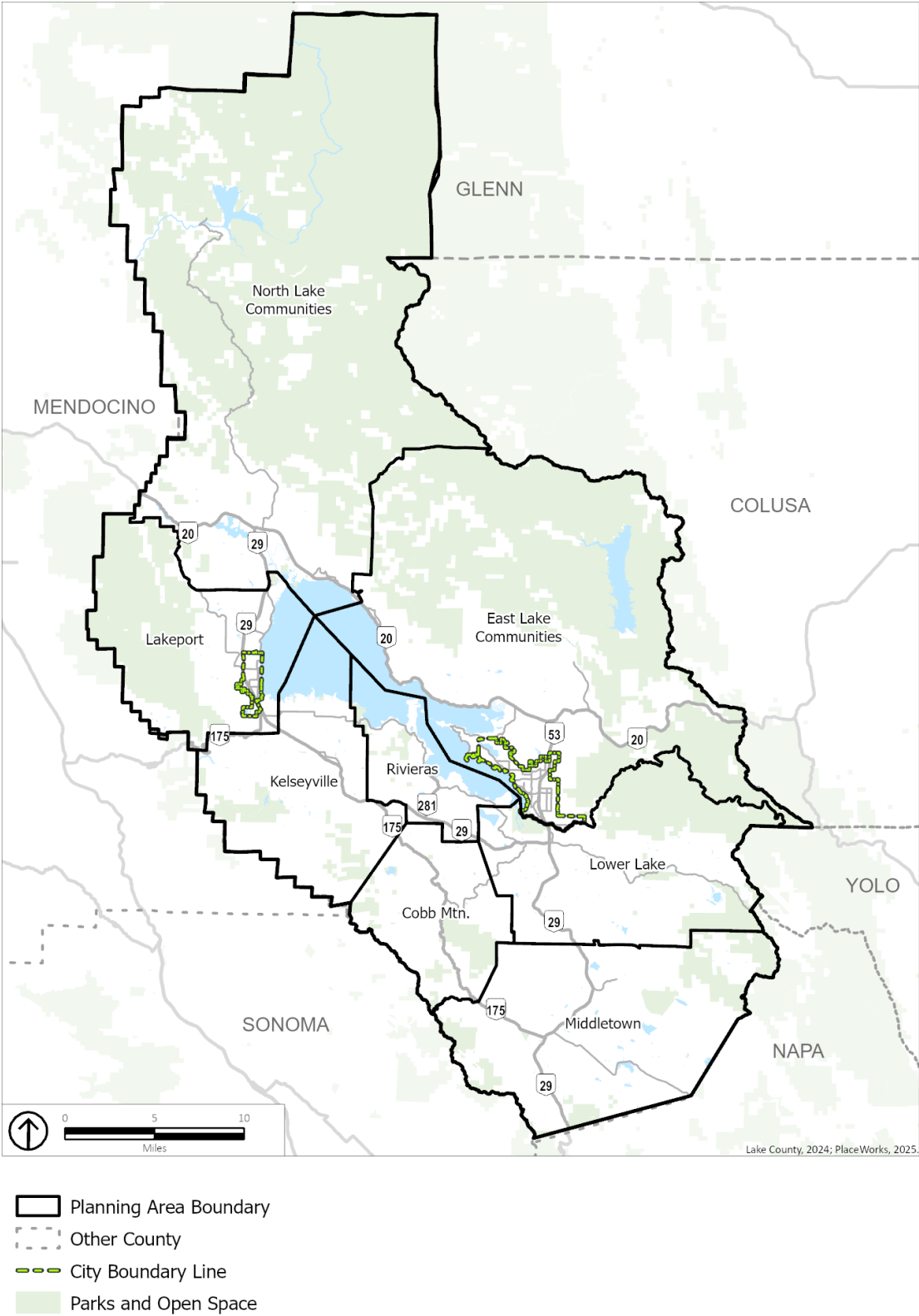
This report includes background information on Lake County's emergency evacuation history and planning area, the methodology used to evaluate evacuation constrained residential areas and evacuation capacity, safety, and viability, detailed findings for under five hazard scenarios, and policy recommendations for integrating strategies into the General Plan Health and Safety Element and ongoing emergency management efforts. This Evacuation Study builds on the Evacuation Routes, Locations, and Hazards Scenarios Memo prepared in October 2024 (Attachment C-1) and the Bandwidth Capacity Plot Memo prepared in November 2024 (Attachment C-2).

The Evacuation Study Area encompasses the unincorporated areas of Lake County and the incorporated cities of Clearlake and Lakeport. As shown on **Figure C-1**, the Lake County General Plan divides the county into eight Local Areas. The study examines potential evacuation routes and locations serving the county's approximately 68,000 residents.

Adaptation Planning Grant Program

The Lake County Evacuation Study was funded through the Governor's Office of Land Use and Climate Innovation's Adaptation Planning Grant Program, which provides communities with the resources to identify climate resilience priorities and supports the development of a pipeline of climate resilient infrastructure projects across the state.

Figure C-1 Lake County Evacuation Study Area and Local Areas



History of Emergency Evacuation in Lake County

Lake County experienced numerous emergency evacuations, primarily due to catastrophic wildfires that have burned approximately 70 percent of the county's landmass since 2015.¹ The county's geography, with Clear Lake at its center and steep mountainous terrain surrounding much of the populated areas, creates unique evacuation considerations when hazards occur.

Recent significant evacuation events include:

Rocky Fire/Jerusalem Fire (July to August 2015): The Rocky Fire started east of Clearlake from a faulty gas-powered water heater. It burned 69,438 acres and destroyed 43 homes after merging with the Jerusalem Fire that was burning at the same time.² Together, these fires prompted evacuations across the eastern Lake County communities of Lower Lake, Morgan Valley, Jerusalem Valley, and parts of Hidden Valley, with local high schools opening as evacuation shelters, including Middletown High School.³ Evacuees used State Route 29 and State Route 53 as primary evacuation routes, with many reporting significant congestion as multiple communities evacuated simultaneously.⁴ The complex geographical relationship between these two fires complicated evacuation efforts, because routes changed as the fire boundaries shifted and eventually merged.⁵

Valley Fire (September 2015): One of the most destructive wildfires in county history, the Valley Fire spread rapidly from Cobb Mountain to Middletown and Hidden Valley, burning 76,067 acres; destroying nearly 2,000 buildings, including 1,280 homes; and ultimately killing four people. The fire spread from 50 acres to over 10,000 acres within hours due to extreme fire conditions and high winds. Evacuations were hampered by limited notification time, congested roadways, and power outages affecting communications. However, evacuation shelters were established at Kelseyville Presbyterian Church and Napa County Fairgrounds in Calistoga.⁶ Major evacuation routes included State Route 29 through Middletown and State Route 175 from Cobb Mountain, which experienced significant congestion.⁷ Many residents reported dangerous travel conditions due to low visibility and approaching flames.⁸

Clayton Fire (August 2016): Starting in Lower Lake, this fire prompted widespread evacuations throughout the Lower Lake area and portions of the city of Clearlake and destroyed 189 homes. The arson-caused fire initially threatened the historic downtown area before spreading into residential neighborhoods. Evacuation orders affected approximately 4,000 residents, with emergency shelters established at Twin Pine Casino, Kelseyville High School, and Seventh Day Adventist Church in Lakeport. Roadways experienced heavy traffic during the evacuation, including State Route 53 north toward Clearlake and State Route 29 south toward Kelseyville.⁹

Mendocino Complex Fire (July to September 2018): The Ranch and River Fires, collectively known as the Mendocino Complex Fire, became the largest wildfire complex in California history at the time, burning 459,123 acres across four counties, including significant portions of Lake County. The fire prompted evacuations across multiple communities, including Upper Lake, Nice, Lucerne, the City of Lakeport, unincorporated North Lakeport, Scotts Valley, Kelseyville, Big Valley, and other portions of the East Lake Communities and north shore region. Evacuation shelters were established at Lower Lake High School, Twin Pine Casino, Middletown High School, Middletown Middle School, Mountain Vista Middle School, and Colusa County Veterans Hall.¹⁰ Many residents experienced multiple evacuations as the fire lines shifted

and expanded over several weeks, creating prolonged displacement for many community members. Evacuations were complicated by the fire's massive scale, which limited available evacuation routes as the fires surrounded communities from multiple directions.¹¹ The fires destroyed 157 homes in Lake County.

Cache Fire (August 2021): This fast-moving fire in the city of Clearlake prompted rapid evacuations of mobile home residents and nearby neighborhoods, with an estimated 1,600 residents evacuated. Some residents reported having only minutes to gather belongings before fleeing, and emergency shelters were established at Clearlake Senior Center and Kelseyville High School.¹² The Cache Fire destroyed 83 structures, including 56 homes and 26 outbuildings, many in the Cache Creek Mobile Home Park.

February 2017 Storms: Severe atmospheric river events in February 2017 caused extensive flooding throughout Lake County, with Clear Lake rising to flood stage and remaining there for a month. The prolonged flooding led to mandatory evacuations in parts of the City of Lakeport as lakefront properties became inundated. Multiple roadways were closed due to flooding, including Lakeshore Boulevard in Lakeport, Nice-Lucerne Cutoff, Keys Boulevard, St. Francis Drive, and Lands End Drive, limiting evacuation options for affected residents. Additional roads throughout the county were temporarily closed due to landslides, slip-outs, and debris, further constraining the transportation network during evacuation operations. The flooding caused an estimated \$5 million to \$7 million in damage to County-maintained roads alone, with total damages to the City of Lakeport reaching millions of dollars. No deaths or injuries were reported in Lake County.¹³

Based on these previous evacuation events, common challenges reported by residents during these evacuations included:

- Limited notification time during fast-moving events.
- Congestion on major evacuation routes.
- Uncertainty about evacuation routes and shelter locations.
- Challenges with evacuating pets and livestock.
- Communication difficulties during power outages.
- Hardships for older adults, those with disabilities, and those lacking accessible transportation options.

Lake Area Planning Council conducted a countywide survey from August 2024 through January 2025 to support the Lake Area Planning Council's Wildfire Evacuation and Preparedness Plan. The survey collected responses from 304 participants across Lake County communities. Key feedback from residents regarding evacuation experiences and concerns included:

- Most respondents (60.9 percent) rated their personal preparedness for wildfire evacuation as "Good" or "Excellent," while 39.1 percent acknowledged their preparedness as "Fair" or "Needs Improvement."
- A significant majority (90 percent) of respondents indicated they would rely on personal vehicles for evacuation, with only 2 percent planning to use public transit and 2 percent requiring assistance.
- When asked about evacuation support and resources needed, respondents prioritized emergency alerts and warnings as their top concern, followed by shelter/housing assistance, pet accommodations, and assistance for the elderly.

-
- Common evacuation route concerns identified by respondents included traffic bottlenecks at key intersections (particularly along State Routes 20, 29, and 53), narrow roads unable to accommodate two-way traffic during emergencies, and one-way-in/one-way-out neighborhoods with limited egress options.
 - Respondents highlighted several specific evacuation challenges, including poorly maintained roads, lack of notification systems in areas with limited cell service, and limited route alternatives when primary evacuation corridors become congested or blocked.

This community feedback provides valuable insight into the lived experience of Lake County residents during evacuations and helps identify specific areas for improvement in evacuation planning and infrastructure.

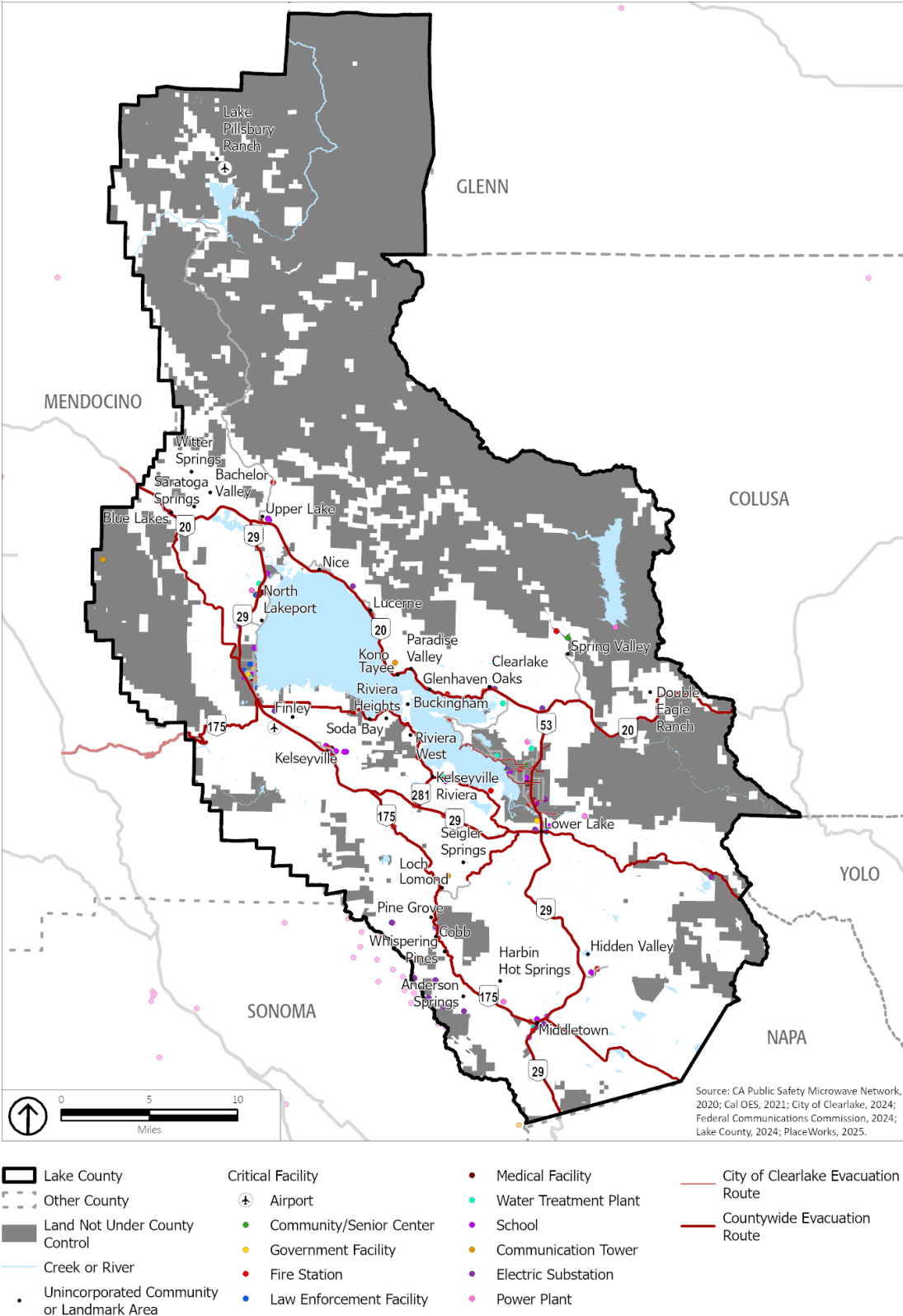
Lake County Evacuation Network

Lake County's evacuation network relies primarily on the state highway system, with four main corridors serving as potential evacuation routes, as shown on **Figure C-2**, although the recommended evacuation routes in any given situation will depend on the specifics of the emergency and be determined at the time of the emergency event by incident command.

- **State Route 20** traverses east-west through the county, connecting to Highway 101 in the west and State Route 16 and Interstate 5 to the east, and provides the main route along Clear Lake's northern shore between Colusa County and Mendocino County, traveling through Clearlake Oaks, Lucerne, Nice, and North Lake communities.
- **State Route 29** runs north-south through the county on the west side of Clear Lake, connecting southern communities like Hidden Valley Lake and Lower Lake to Kelseyville, Lakeport, and Upper Lake, where it merges with State Route 20.
- **State Route 53** connects Clearlake to Lower Lake and provides access to State Route 29 west and south and State Route 20 to the north.
- **State Route 175** connects Middletown to Cobb Mountain and north to Lakeport, then traverses west to Mendocino County, where it connects to Highway 101.
- **State Route 281** runs along Soda Bay Road from near the southern shore of Clear Lake to State Route 29 in Glenview.
- Several county roads also serve as critical evacuation routes, including Scotts Valley Road, Butts Canyon Road, Morgan Valley Road, Seigler Canyon Road, Soda Bay Road, and Spring Valley Road.

The county's geography creates natural constraints for evacuation; Clear Lake occupies the central portion of the county, limiting east-west travel to routes around its northern and southern shores. As shown on **Figure C-2**, there are only four state route access points connecting the county to the surrounding region—State Route 20 east to Colusa County, State Route 29 south to Napa County, and State Route 20 and State Route 175 west to Mendocino County. Additionally, the mountainous terrain throughout much of the county limits alternative routes in many areas.

Figure C-2 Potential Evacuation Routes in Lake County

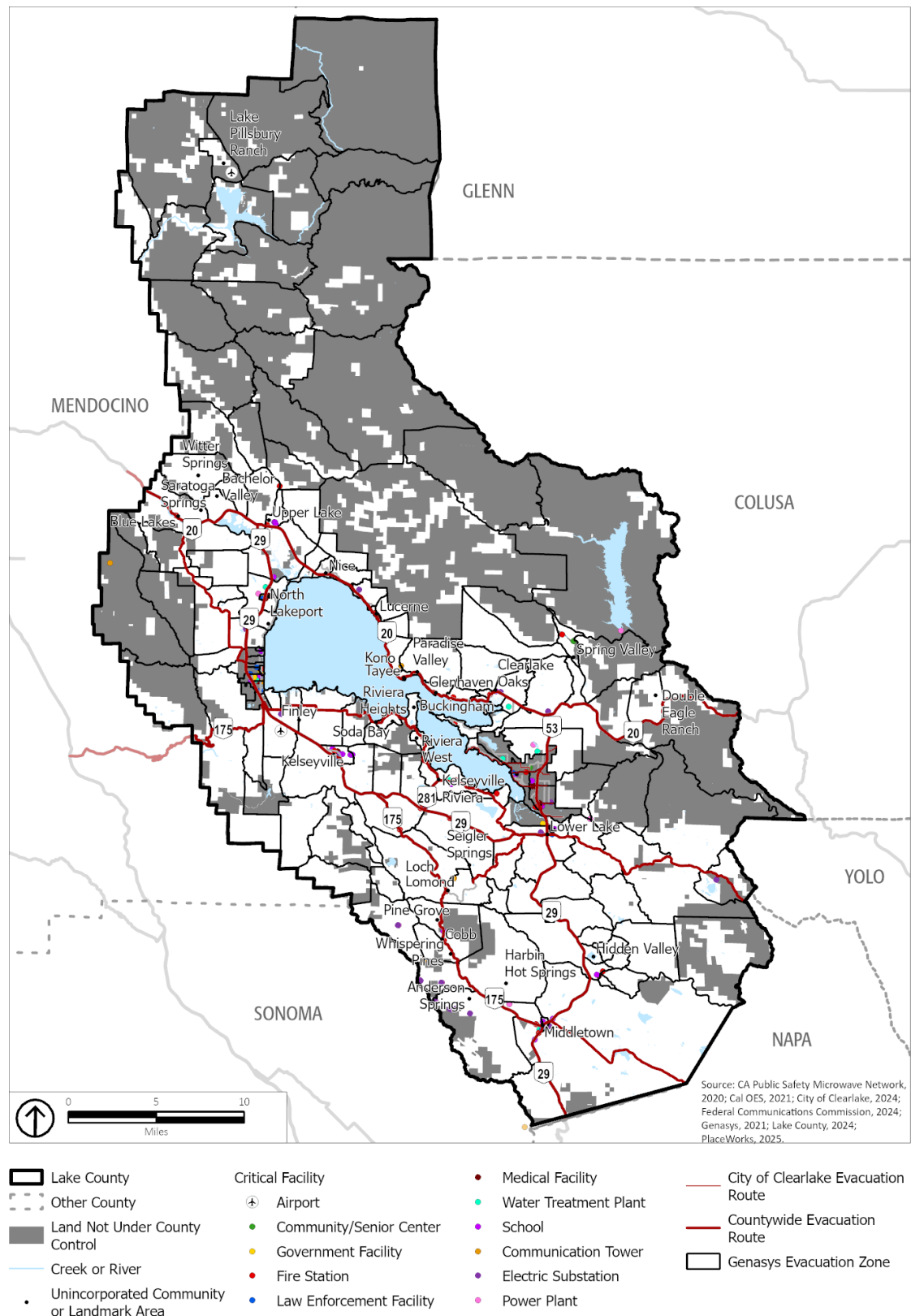


Lake County's population includes several demographic groups that may face greater challenges during evacuation scenarios. According to American Community Survey data, approximately 25 percent of the county's population is 65 years or older, 21 percent of residents have a disability, and 9 percent of households lack access to a vehicle.¹⁴ These and other vulnerable populations may require additional assistance or accommodations during evacuation events. The county also experiences significant seasonal population fluctuations due to tourism, particularly during summer months, and visitors may be unfamiliar with local evacuation protocols and routes.

Lake County uses the Genasys Protect platform (formerly Zonehaven) to manage evacuations during emergencies. The system divides the county into pre-established zones to enable targeted LakeCoAlerts and provide clear geographic boundaries for emergency communications. This approach represents a shift toward more dynamic evacuation management that can respond to real-time conditions rather than relying solely on predetermined evacuation routes and assembly points. During an emergency, officials can issue LakeCoAlerts by zone, and residents can view real-time evacuation status information for their zone through the platform's public interface. As shown on **Figure C-3**, the Genasys Protect zones are based on a combination of factors, including geographic features, road networks, natural hazard risks, community layout, and population size, with the more populated areas of Lakeport and Clearlake having smaller zones than rural areas like Middletown, Lucerne, or North Lake communities. Genasys Protect is free to access by any member of the public through the Know Your Zone platform (<https://protect.genasys.com/location?search=true&z=9.35563161491424&latlon=39.075169311905995%2C-122.53275822930397>). There is no requirement to sign up or log in; however, access to the internet is required.

Lake County has also implemented several programs to enhance evacuation readiness and response. The Lake County Sheriff's Office maintains LakeCoAlerts (Everbridge) as the primary emergency alert notification system that can send alerts via text message, phone call, and email to registered residents. The cities of Clearlake and Lakeport coordinate similar emergency alert systems. These systems use the Genasys Protect zones to target geographic areas for evacuation notices and provide critical safety information during emergencies. The County also delivers emergency alerts via the Integrated Public Alert and Warning System or iPAWS—messages that reach cell phones based on location during both weather and non-weather emergencies. Through this system, alerts may also be disseminated via the Emergency Alert System, reaching AM/FM radio, broadcast TV, and cable systems in coordination with federal and State partners. Additionally, the County maintains Ready.LakeCountyCA.gov as a comprehensive online readiness platform that encourages simple steps to prepare for all hazards and is used by multiple agencies in social media campaigns and other outreach efforts.

Figure C-3 Genasys Zones



Regulatory Framework

This Evacuation Study is intended to comply with two State regulations, California Government Code Section 65302.15 and Section 65302(g)(5), that mandate local general plan safety element updates to evaluate potential evacuation routes and evacuation-constrained residential areas. Together, these regulatory requirements create a robust framework for assessing evacuation challenges and developing policies to enhance community safety during emergency events.

Assembly Bill 747 (2019), codified in California Government Code Section 65302.15, requires the safety element to identify evacuation routes and evaluate their capacity, safety, and viability under a range of emergency scenarios. This law took effect on January 1, 2020, and requires local governments to address evacuation planning during the next revision of their local hazard mitigation plan after January 1, 2022. The law specifically requires consideration of scenarios that are most likely to trigger an evacuation and those that may cause an evacuation of the greatest number of people. Further amendments through Assembly Bill 1409 (2021) expanded these requirements to include assessment of evacuation locations in addition to evacuation routes.¹⁵

Senate Bill 99 (2019), codified in Government Code Section 65302(g)(5), established requirements for identifying residential developments in hazard areas that lack adequate evacuation access. This provision requires that upon each revision of the housing element, the safety element shall be reviewed and updated to identify residential developments in any hazard area that do not have at least two emergency evacuation routes.¹⁶ This requirement aligns with similar provisions in Public Resources Code Section 4290.5, which directs the Board of Forestry and Fire Protection to identify existing subdivisions in wildfire-prone areas that lack secondary egress routes.

Evacuation Planning in Lake County

This Evacuation Study builds upon and complements several recent and ongoing evacuation planning efforts in Lake County.

The **Soda Bay Corridor Evacuation Plan**, prepared in 2024 by the County of Lake and the Konocti Fire Safe Council, presents evacuation procedures and recommendations for the Soda Bay Corridor, including the communities of Finley, Soda Bay, Riviera Heights, Buckingham, Riviera West, and Kelseyville Riviera. This plan focuses on short-term disaster preparedness and outlines improvements for future evacuation needs, including roadway evaluations, emergency communications, and vulnerable population considerations. The plan includes assessment of the roadway network, primary and secondary routes, potential pinch points, single-access areas, and mitigation strategies. The Soda Bay Corridor Evacuation Plan provides detailed, neighborhood-level analysis for a specific high-risk area.¹⁷

The Lake Area Planning Council is leading the development of a comprehensive **Wildfire Evacuation and Preparedness Plan** with an anticipated completion date in October 2025. This plan includes coordination with project partners and public outreach to support preparation of a fire vulnerability assessment, evacuation and preparedness analyses, and an evacuation plan. The planning process includes extensive community engagement through a Technical Advisory Group, public workshops, and key agency interviews. The Wildfire Evacuation and Preparedness Plan will provide more detailed operational

guidance for implementing evacuations during wildfire emergencies; this Evacuation Study primarily assesses physical infrastructure capacity and safety for multiple hazards.¹⁸

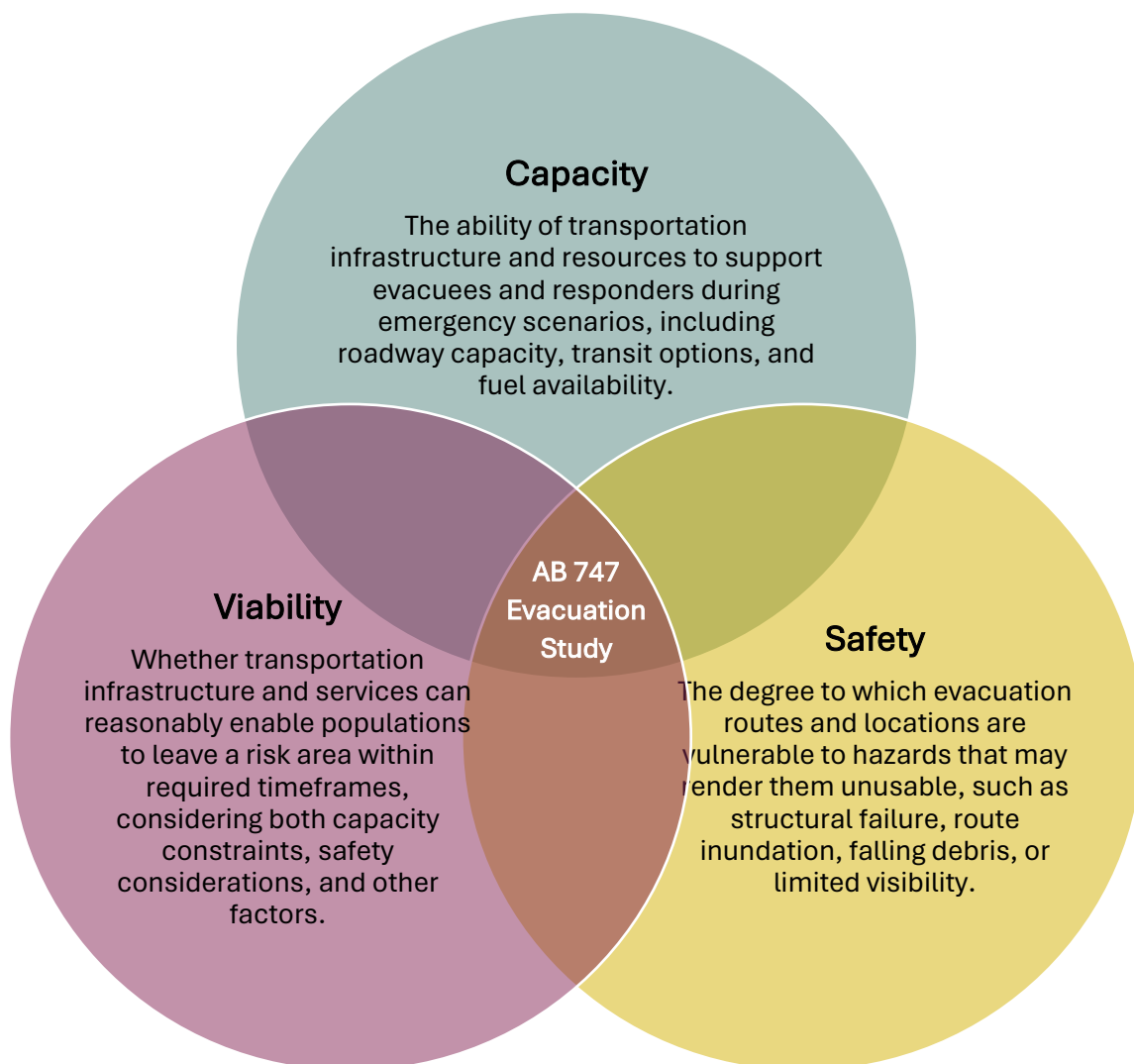
Several large development projects in Lake County, including the Guenoc Valley Mixed-Use Planned Development Project, have conducted project-specific evacuation assessments to analyze evacuation capabilities and needs for new development.¹⁹ These project-level assessments include detailed evacuation time estimates, analyzing how long it would take residents to evacuate under various emergency conditions. The Guenoc Valley assessment included development of a third evacuation route, revised roadway plans eliminating dead-end segments over one mile, and designation of five temporary refuge areas with an on-site Emergency Response Center staffed by wildfire experts. These studies focus on the specific project area and immediate surroundings, evaluating how the proposed development would affect local evacuation capacity and identifying necessary improvements. The detailed evacuation timing analysis at the project level provides specific quantitative data for development review, and this countywide Evacuation Study provides a broader context for understanding how these project areas fit into the larger evacuation network.

The County's **Emergency Operations Plan** contains specific annexes for various hazards, including wildfires, floods, and severe weather events. These annexes outline agency roles and responsibilities during evacuation operations and establish coordination mechanisms for multi-agency response. The plan establishes priorities, responsibilities, and coordinated response operations for major incidents, including those requiring evacuation.²⁰

This Evacuation Study will build upon these existing efforts by providing a countywide assessment of evacuation infrastructure capacity, safety, and viability under multiple hazard scenarios. The findings will more immediately inform the County's update of the Health and Safety Element and can be incorporated into ongoing operational evacuation planning by County agencies and community organizations and future Safety Element Updates for the City of Lakeport and the City of Clearlake.

METHODOLOGY

This section describes the methods used to conduct the Evacuation Study, including data collection; the analysis of evacuation-constrained residential parcels; and the evaluation of routes' capacity, safety, and viability under five emergency scenarios. The methodology follows guidance provided in the Draft Evacuation Planning Technical Advisory (2023) prepared by the California Governor's Office of Land Use and Climate Innovation (formerly Office of Planning and Research). This advisory document provides guidance to local governments on how to analyze evacuation infrastructure and meet Government Code requirements. The Technical Advisory outlines three key criteria for evaluating evacuation routes and locations to meet Assembly Bill 747 requirements: capacity, safety, and viability.



Evacuation-Constrained Residential Parcels Analysis

To identify evacuation-constrained residential parcels per Government Code Section 65302(g)(5), a comprehensive geospatial analysis examined all residential parcels in the unincorporated county and the cities of Clearlake and Lakeport. The analysis focused on identifying residential developments that do not have access to at least two emergency evacuation routes or are farther than one mile from a potential evacuation route, particularly those in designated hazard areas.

First, the project team confirmed potential major evacuation routes throughout the county using county, city, and State transportation data. These routes include State Route 20, State Route 29, State Route 53, and State Route 175 as well as major County and City roads that could serve as primary evacuation routes during an emergency. The team developed this designation of evacuation routes through analysis of roadway capacity data and consultation with local emergency management officials and transportation planners.

Next, the team identified all residential parcels using existing land use information from County, City of Clearlake, and City of Lakeport's general plan land use maps. Parcels designated to allow for residential uses in the land use maps were included in the analysis, regardless of whether they were currently developed or vacant.

The project team then included a "closest facility relationship" between the intersections of the evacuation routes and all residential parcels. This geospatial analysis measured the distance from each residential parcel to the nearest intersection with an evacuation route, providing a quantitative assessment of evacuation access.

Using this data, the project team identified all residential parcels that are either:

1. More than one mile from an intersection with a potential evacuation route, or
2. On a single-access road with only one ingress and egress point, regardless of their distance to an evacuation route.

The team selected the one-mile threshold based on the rural nature of the county and reasonable travel distances during evacuation events, particularly for vulnerable populations who may have limited mobility or transportation options. To identify parcels on single-access roads, the project team examined road network connectivity and identified dead-end streets, cul-de-sacs, and neighborhoods served by only one access point.

Finally, the project team overlaid mapping data of evacuation-constrained residential parcels with wildfire, flooding, and landslide hazard data to identify which constrained parcels are within designated hazard zones. Hazard data included Fire Hazard Severity Zones designated by CAL FIRE (Very High, High, and Moderate zones in both State Responsibility Areas and Local Responsibility Areas), 100-year and 500-year flood zones as designated by the Federal Emergency Management Agency and the California Department of Water Resources, and landslide hazard areas with California Geological Survey Landslide Susceptibility Classes of seven or higher in both the unincorporated Lake County and Cities of Clearlake and Lakeport.

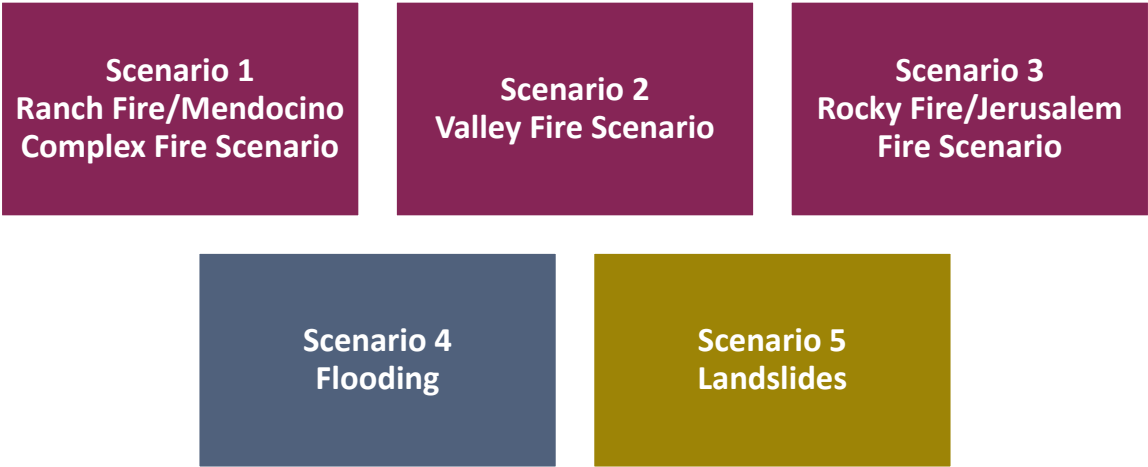
The resulting maps in the Results and Key Findings, Evacuation-Constrained Residential Parcels section identify evacuation-constrained residential parcels throughout the Evacuation Study Area, highlighting areas where evacuation challenges may be particularly acute due to limited access and hazard exposure.

AB 747 Evacuation Analysis

The Evacuation Study considers five hazard scenarios, three covering wildfire and one each for flooding and landslides. These hazard scenarios have different likelihoods and potential movement, affecting different areas of the county. Staff from the County’s Community Development Department and the Sheriff’s Office of Emergency Services confirmed the five hazard scenarios in coordination with the County’s consultants for the General Plan update. These scenarios are presented on **Figure C-4** and described in this section.

This evacuation analysis is primarily qualitative in nature and evaluates the capacity, safety, and viability of potential evacuation routes and locations under each scenario. The assessment uses geospatial analysis to overlay hazard data with evacuation infrastructure, identifies potential bottlenecks through existing traffic volume-to-capacity ratios, and examines how different emergency scenarios could affect evacuation operations. The results provide insight into which evacuation routes and locations may be compromised under specific hazard conditions and identify areas where improvements may be needed to enhance evacuation outcomes.

Figure C-4 Evacuation Scenarios



Scenario 1: Wildfire (Ranch Fire/Mendocino Complex Fire Scenario)

Scenario 1 assumes that communities in the wildfire perimeter of the Ranch Fire/Mendocino Complex Fire need to evacuate, as shown on **Figure C-5**. The fire would start west of Upper Lake and move northeast and southeast. This scenario will evaluate the potential evacuation routes and shelters within this historic wildfire perimeter.

Scenario 2: Wildfire (Valley Fire Scenario)

Scenario 2 assumes that communities in the wildfire perimeter of the Valley Fire need to evacuate, as shown on **Figure C-5**. The fire would start near the community of Cobb and spread through Middletown and Whispering Pines and areas in the south end of Hidden Valley Lake. This scenario will evaluate the evacuation areas in these wildfire hazard areas and the evacuation routes.

Scenario 3: Wildfire (Rocky Fire/Jerusalem Fire Scenario)

Scenario 3 assumes that communities in the wildfire perimeter of the Rocky Fire/Jerusalem Fire need to evacuate, as shown on **Figure C-5**. The fire would start on Morgan Valley Road and move northwest, west, and southwest toward Clear Lake. This scenario will evaluate the evacuation areas in these wildfire hazard areas and the evacuation routes.

Scenario 4: Flooding (Floodplains)

Scenario 4 assumes that floods are localized and may occur anywhere within floodplains in the county. It also assumes the network of all potential evacuation routes in floodplains of the county may be at risk. The hazard areas for a flooding scenario will be informed by both 100-year and 500-year floodplains, as mapped by the Federal Emergency Management Agency and California Department of Water Resources. Flood hazards in Lake County are attributable to three sources: creeks, lakes, and dam failures. The floodplain is the most extensive along Scotts, Cache, Adobe, Putah, Cole, Middle, Copsey, and Kelsey Creeks. Lake flooding poses the greatest threat to the lakeshore communities around Clear Lake, Lake Pillsbury, Blue Lakes, and the area near Indian Valley Reservoir. The county has experienced several floods along the shorelines of Clear Lake due to the slow drainage capacity of Cache Creek. **Figure C-6** shows the 100- and 500-year flood zones in Lake County.

Scenario 5: Landslides

Scenario 5 assumes that landslides are localized in nature and may occur anywhere within landslide susceptibility areas in the county. It also assumes the network of all potential evacuation routes in landslide susceptibility areas of the county may be at risk. The hazard area for the landslide scenario is informed by landslide susceptibility classes as mapped by the California Geological Survey, with a focus on areas Class 7 or above for landslide susceptibility. The California Geological Survey uses a classification system ranging from Class 1 (lowest susceptibility) to Class 10 (highest susceptibility) to indicate the relative likelihood of landslide occurrence. Class 7 and higher classifications represent areas with high to very high landslide susceptibility, where slope instability and earth movement are most likely to occur. **Figure C-7** illustrates areas in the county that are most susceptible to landslides.

The evacuation analysis method for wildfire is different from the method used for flooding and landslides. This difference is primarily because the geographic spread of impacts and the associated number of people who would need to evacuate immediately during a wildfire could be much larger than during a landslide or flood event. Because of the more localized nature of landslides and floods compared to wildfires in California, the possible evacuation "network" for a landslide or flood event is specific to its local area, and recommendations for evacuation in one local area or community are not necessarily relevant for other areas or communities.

Figure C-5 Historic Wildfire Perimeters in Lake County

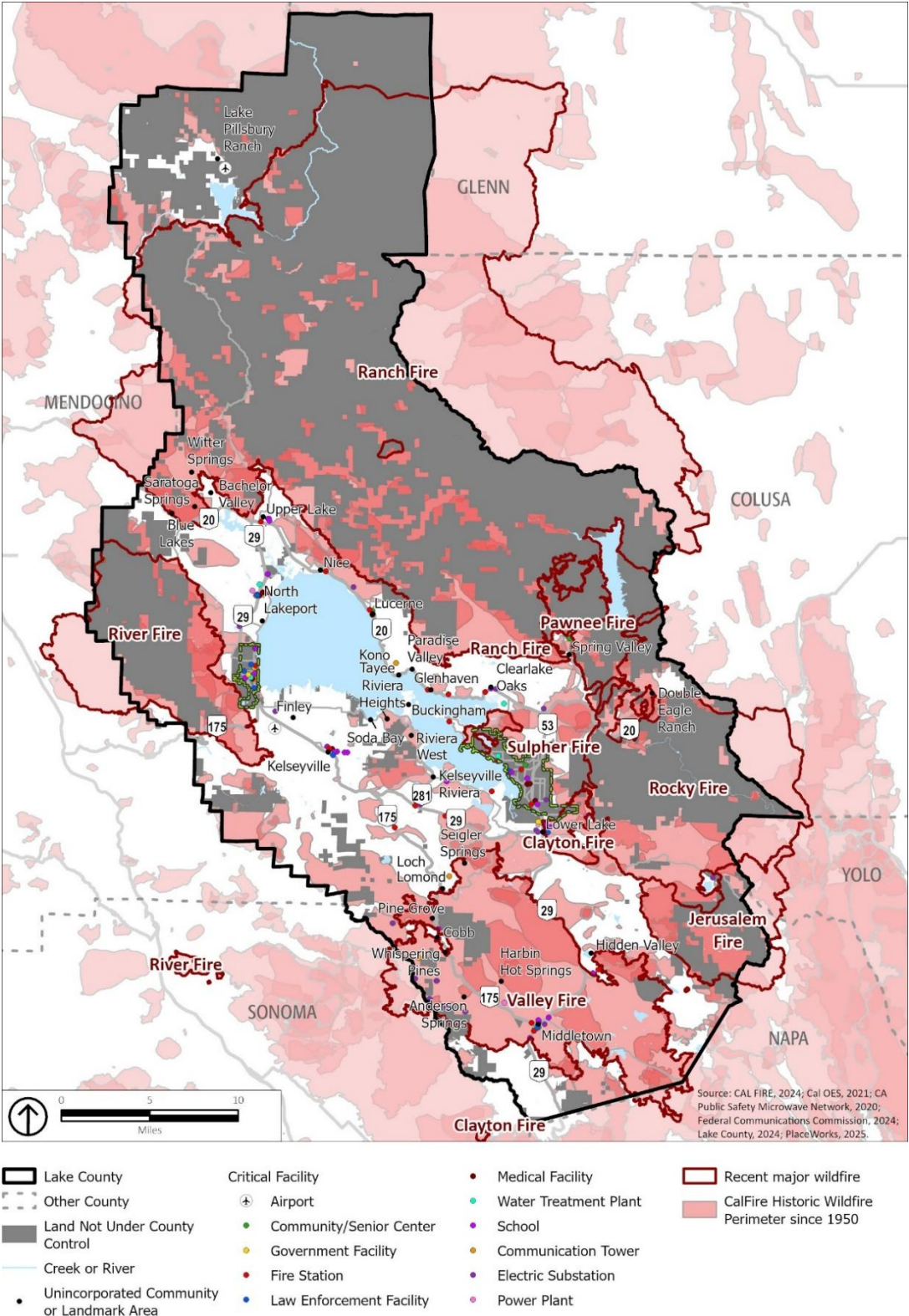
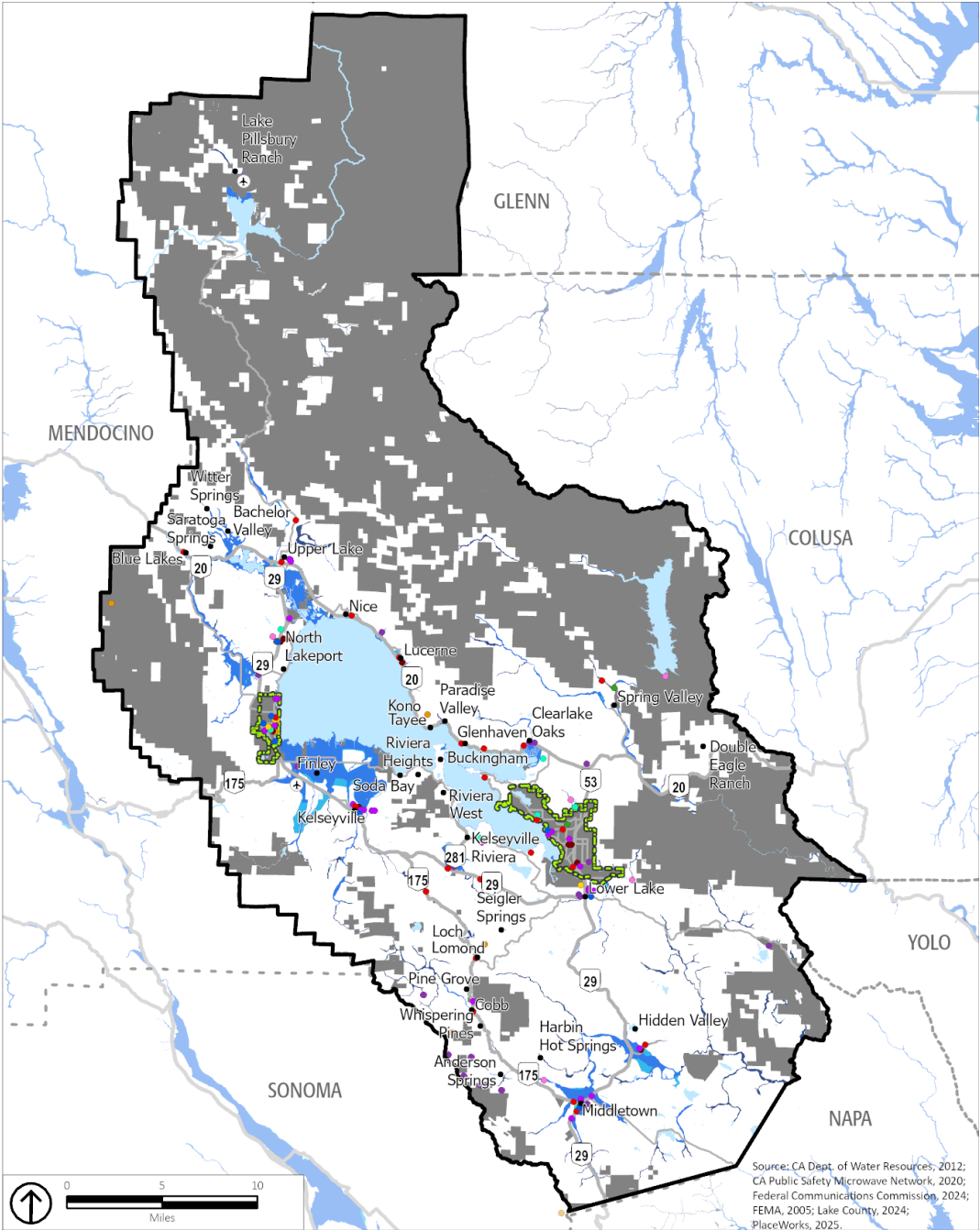
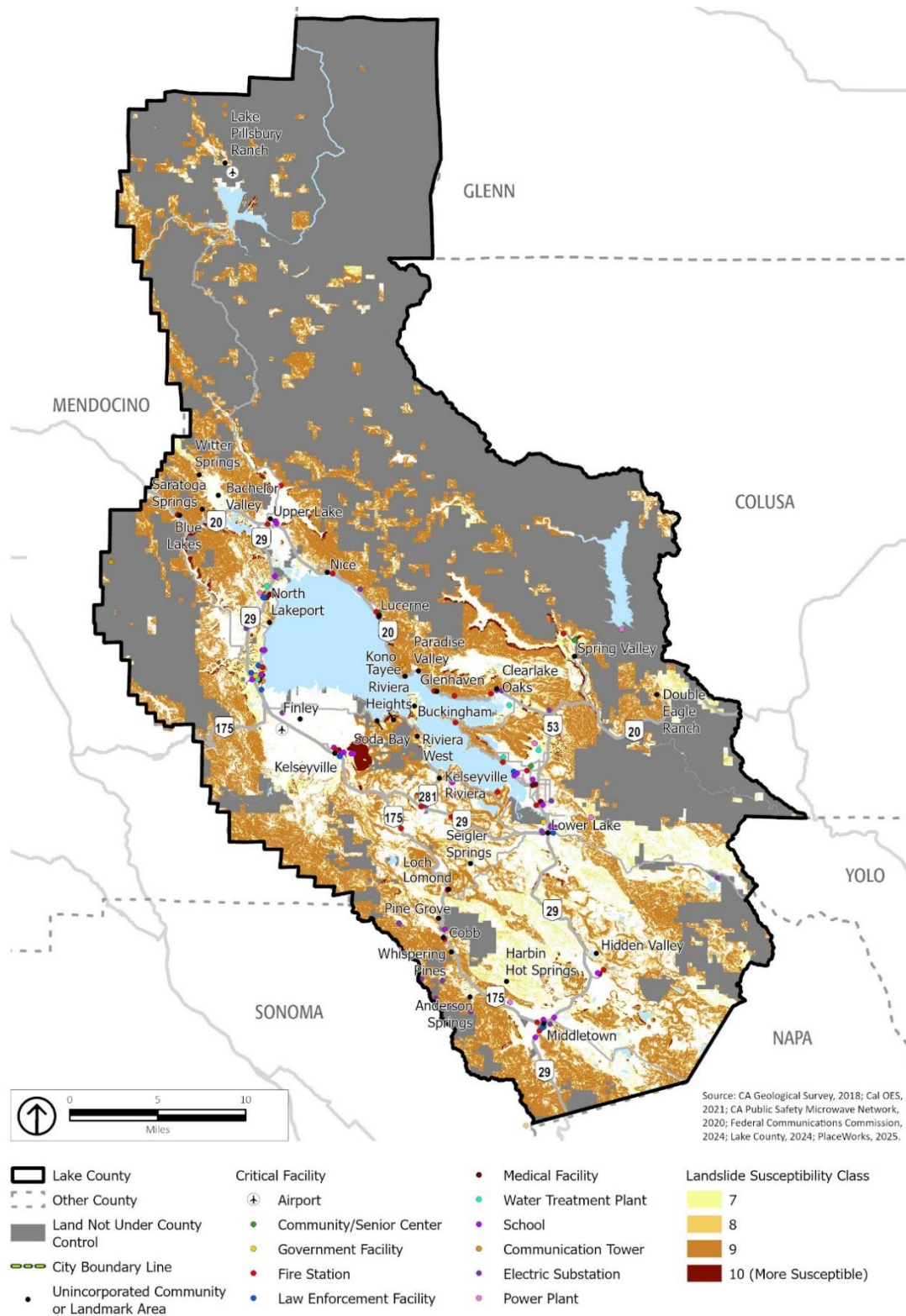


Figure C-6 Flood Hazard Zones in Lake County



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|---|--|--|---|
| <ul style="list-style-type: none"> Lake County Other County Land Not Under County Control City Boundary Line Creek or River Unincorporated Community or Landmark Area | Critical Facility <ul style="list-style-type: none"> Airport Community/Senior Center Government Facility Fire Station Law Enforcement Facility | <ul style="list-style-type: none"> Medical Facility Water Treatment Plant School Communication Tower Electric Substation Power Plant | <ul style="list-style-type: none"> DWR Awareness 100 Year Flood Zone FEMA 100 Year Flood Zone FEMA 500 Year Flood Zone |
|---|--|--|---|

Figure C-7 Landslide Susceptibility Areas in Lake County



Evaluating Capacity

The capacity assessment focused on evaluating the ability of transportation infrastructure and resources to support evacuees and responders during emergency scenarios, including roadway capacity for personal vehicles, emergency vehicles, and transit.

The capacity evaluation was supported by the Bandwidth Capacity Plot Memo (Attachment C-2), prepared by Fehr & Peers in November 2024. The assessment used the Lake-Mendocino Travel Demand Model (or travel demand model), released in late 2023, to generate “bandwidth” plots that represent the ratio of traffic volume to capacity under base year (2019) conditions.

The project team identified roadway segments with typical weekday morning (AM) peak hour and afternoon/evening (PM) peak hour volume-to-capacity (V/C) ratios between 0.8 and 2.0. These segments represent potential bottlenecks that could impede evacuation operations when traffic volumes increase during emergency events.

The capacity assessment categorized roadway segments into four classifications based on their V/C ratios, shown in **Table C-1**. The capacity assessment evaluated local arterial roads, local collector roads, and State highways, as these roadways serve as the primary evacuation routes during an emergency. Local roads were generally excluded from the analysis except when they provide primary access to an area with limited egress options.

Table C-1 Volume-to-Capacity Classification

Volume-to-Capacity Ratio		Description
V/C ratio less than 0.8	Below capacity	Speeds at or near posted limits
V/C ratio between 0.8 and 1.0	Near capacity	Speeds may drop below posted limits during peak hours
V/C ratio between 1.0 and 1.2	At or just over capacity	Speeds drop below posted limits and delays may be severe
V/C ratio between 1.2 and 2.0	Well over capacity	Speeds drop substantially below posted limits and delays create unreliable travel times)

For each of the five emergency scenarios, the capacity assessment identified roadway segments that could be potential bottlenecks or cause delays in evacuation. The assessment examined how normal traffic patterns and roadway capacity would be affected by evacuation traffic under different hazard conditions. This included analyzing how factors such as number of lanes, roadway alignment, weather conditions, and bottlenecks would influence evacuation operations. The project team evaluated fuel availability by identifying existing fuel stations along evacuation routes and near critical facilities. The assessment considered the availability of both conventional fuels and electric vehicle charging infrastructure at these locations.

This classification system allows for qualitative assessment of how roadway performance would impact evacuation operations. The analysis specifically notes that segments with a V/C ratio of 1.0 or higher represent locations of concern where the potential addition of evacuation traffic could exacerbate delays and slow speeds. Additionally, the capacity assessment cross-references capacity-constrained segments with designated evacuation routes.

Throughout the capacity assessment, the project team documented areas where potential evacuation routes might be congested or over capacity during different emergency scenarios, creating a comprehensive understanding of capacity to inform the viability assessment.

Evaluating Safety

In this study, safety refers to the degree to which potential evacuation routes are at risk from hazards that may make them unusable or dangerous during an emergency. The safety assessment focused on identifying potential natural hazards that could compromise evacuation routes and locations under the five scenarios.

The evaluation of safety relied on geospatial analysis using Geographic Information Systems (GIS) to overlay hazard data with evacuation infrastructure. This approach allowed for the identification of specific points along potential evacuation routes that might be subject to structural failure, route inundation, falling debris, or limited visibility during emergency events. The GIS analysis provided the following information for the study:

- Mileage of potential evacuation routes in hazard zones under each scenario.
- List of critical facilities in hazard zones under each scenario.
- A set of figures overlaying evacuation routes and critical facilities with each hazard scenario.

The project team evaluated evacuation route inundation risks by overlaying FEMA flood hazard data with the county's transportation network to identify road segments susceptible to flooding. The evaluation looked closely at low water crossings and areas with a history of flood-related closures. The analysis considered the 100-year flood zones to identify evacuation routes that might be compromised during flood events.

To assess landslide risks, the evaluation used the California Geological Survey landslide susceptibility data to identify evacuation routes in areas prone to earth movement. Class 7 and above landslide susceptibility indicated areas with the highest landslide risk.

The project team assessed wildfire exposure by examining potential evacuation routes relative to historic wildfire perimeters under the three wildfire scenarios. Using previous wildfire scenarios, rather than other fire hazard zones, allowed for insight into the movement of a potential fire in the area and how evacuations may occur. Future wildfires would likely move in a similar pattern and direction. The project team identified road segments passing through these fire perimeters as vulnerable under the wildfire scenarios. The team identified limited visibility hazards based on areas prone to wildfire smoke conditions or other environmental factors that might reduce driver visibility during evacuations.

The safety assessment evaluated whether evacuation shelters and supporting critical facilities were in the scenario hazard zones and vulnerable to service disruptions based on location. Throughout the safety assessment, the project team documented areas where potential evacuation routes might be compromised under different emergency scenarios, creating a comprehensive understanding of safety risks that informed the subsequent viability assessment. The results of the safety evaluation is a list of routes and critical facilities deemed “unsafe” due to their location within or proximity to the hazard scenario boundary.

Evaluating Viability

In this study, viability refers to whether transportation infrastructure and services can reasonably enable populations to evacuate during an emergency. The viability assessment methodology integrated findings from the capacity and safety evaluations with considerations of population needs and characteristics to determine the practical usability of evacuation routes and locations under the five evacuation scenarios.

The viability assessment used the capacity and safety findings to determine evacuation route reliability. Routes identified as having capacity constraints (V/C ratios above 1.0) or safety concerns (located within or near hazard zones) were flagged as unreliable for evacuation use under specific scenarios. For each emergency scenario, the assessment examined whether potential evacuation routes would remain functional throughout the evacuation process by combining traffic flow limitations with hazard exposure. Routes with both capacity and safety vulnerabilities were identified as particularly unviable, while routes with adequate capacity and minimal hazard exposure were deemed more viable. The viability evaluation was qualitative in nature and does not include metrics such as evacuation times or distances.

The assessment incorporated community feedback gathered through the Lake Area Planning Council's Wildfire Preparedness Plan to understand public perceptions of evacuation challenges and needs. This qualitative information complemented the analysis and provided insights into evacuation behaviors and concerns not captured by technical data alone.

The assessment also considered the needs of vulnerable populations, including elderly residents, individuals with disabilities, Equity Priority Communities, households without vehicles, and others who might face challenges during evacuation. The Healthy Places Index and Lake County Climate Change Vulnerability Assessment were used to identify areas with higher concentrations of vulnerable populations that might require additional evacuation support.

What are Equity Priority Communities?

Equity Priority Communities are geographic areas that identified as experiencing disproportionate social, economic, and environmental burdens that may limit residents' ability to prepare for, respond to, and recover from emergency events. In the context of evacuation planning, Equity Priority Communities may face additional challenges during emergency events, including limited vehicle access, language barriers to receiving emergency alerts, and reduced capacity to evacuate quickly or self-evacuate. Identifying these communities helps ensure that evacuation planning addresses the specific needs and barriers faced by the most vulnerable residents.

The viability assessment methodology used a holistic approach that considered three key dimensions: physical infrastructure capabilities, hazard contexts, and population characteristics. For each evacuation scenario, the assessment examined whether potential evacuation routes and locations could effectively serve their intended function given the specific characteristics of the hazard and the affected populations. Routes identified as having capacity constraints or safety concerns were identified as unreliable to be used under the specific hazard scenario.

The methodology also assessed the viability of critical facilities, considering their capacity, safety, and accessibility under different emergency conditions. This included their capacity to accommodate anticipated evacuee populations and their ability to provide necessary services during prolonged emergency events.

The viability assessment produced scenario-specific determinations that classified evacuation infrastructure as viable or not viable based on reliability and usability under each scenario. The assessment also produced qualitative determinations and recommendations for each scenario, describing route-specific limitations and conditions under which routes might become compromised, population-specific access challenges for vulnerable groups (older adults, those with disabilities, transit-dependent residents), and facility-specific capacity assessments determining whether critical facilities would remain online under each scenario. The viability assessment provided insight into Lake County's evacuation capabilities across the five hazard scenarios, highlighting areas where improvements might be needed to enhance evacuation outcomes.

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RESULTS AND KEY FINDINGS

This section presents the findings from the evacuation analysis, examining both evacuation-constrained residential areas and the capacity, safety, and viability of potential evacuation routes under five emergency scenarios. The following sections provide findings from this analysis for each city and the unincorporated areas of Lake County.

Across the five emergency scenarios examined, the study uncovers significant challenges in evacuation route capacity, safety, and overall viability. This includes substantial bottlenecks in the county's transportation network and areas with limited alternative roadways, with certain segments of routes showing limited ability to support rapid, large-scale evacuations.

Evacuation-Constrained Residential Parcels

The analysis of evacuation-constrained residential parcels identifies areas throughout Lake County, including the cities of Clearlake and Lakeport, where residents may face significant challenges during evacuation events due to limited access. These areas include residential parcels more than one mile from an intersection with a potential evacuation route, and parcels on roads with only a single point of ingress and egress. These constraints are often due to the county's challenging topography, with Clear Lake at its center and mountainous terrain creating natural limitations for roadway connectivity. The mapping of evacuation-constrained areas with hazards provides an understanding of where residential areas with evacuation constraints intersect with potential hazards.

Unincorporated Lake County

As shown on **Figure C-8**, evacuation-constrained residential parcels are distributed throughout Lake County. The Spring Valley area east of Clearlake Oaks shows significant constraints, as do portions of Cobb, the Anderson Springs community, areas along the eastern shore of Clear Lake, and the western shore of Clear Lake, particularly in the Rivas areas along Soda Bay Road. Remote communities, such as Lake Pillsbury in the northern part of the county and residential developments near Middletown, show evacuation constraints due to their distance from major evacuation routes and limited roadway networks.

Important Evacuation Considerations

This study evaluates the capacity, safety, and viability of evacuation routes and critical facilities under potential hazard scenarios based on past events. However, future emergencies will be dynamic and may differ from the scenarios evaluated in this study. It is important to remain aware of your surroundings, monitor official alerts, and be prepared to adapt quickly. Websites and maps are useful for planning ahead, but they may not reflect real-time hazards or road closures—situational awareness and ability to respond to changing conditions are critical.

Community members should prepare for emergencies by:

- Registering for LakeCoAlerts emergency notifications in advance.
- Looking up your evacuation zone information ahead of time.
- Visiting <https://Ready.LakeCountyCA.gov> for alert registration, zone lookup, and emergency response information.

During an emergency, follow official evacuation orders and warnings, stay alert to changing conditions, and be prepared to adapt your evacuation route based on real-time hazards or road closures.

Many of these areas have steep, mountainous terrain with winding roads that follow topographical features, creating natural bottlenecks and limited alternate routes.

City of Clearlake

Within the city of Clearlake, evacuation-constrained residential parcels are concentrated in neighborhoods with dead-end streets, cul-de-sacs, and areas with limited connectivity to the city's main transportation network, as shown on **Figure C-9**. Notable neighborhoods include the northern portions of the city, where development patterns have created pockets of residential areas with single points of access. Several residential areas near the lake shoreline show significant evacuation constraints, where topography and the lake itself limit potential evacuation routes. There are also several small parcels with limited ingress and egress scattered along the city's perimeter, west of State Route 53.

City of Lakeport

Lakeport's evacuation-constrained residential parcels, as shown on **Figure C-10**, are mostly in the northern and western portions of the city, where hillside development has resulted in neighborhoods with limited access options. Single-access roads that wind through the hills serve several residential areas west of Main Street but still within city limits, creating potential evacuation challenges during emergency events. The southern lakeshore of the city also has evacuation-constrained areas where development patterns have limited connectivity to the main transportation network. Most parcels constrained by distance are one to two miles away from the nearest intersection with an evacuation route, with only one small parcel at the northern edge of the city, just west of Lakeshore Boulevard, two to three miles away.

Figure C-8 Evacuation-Constrained Residential Parcels in Lake County

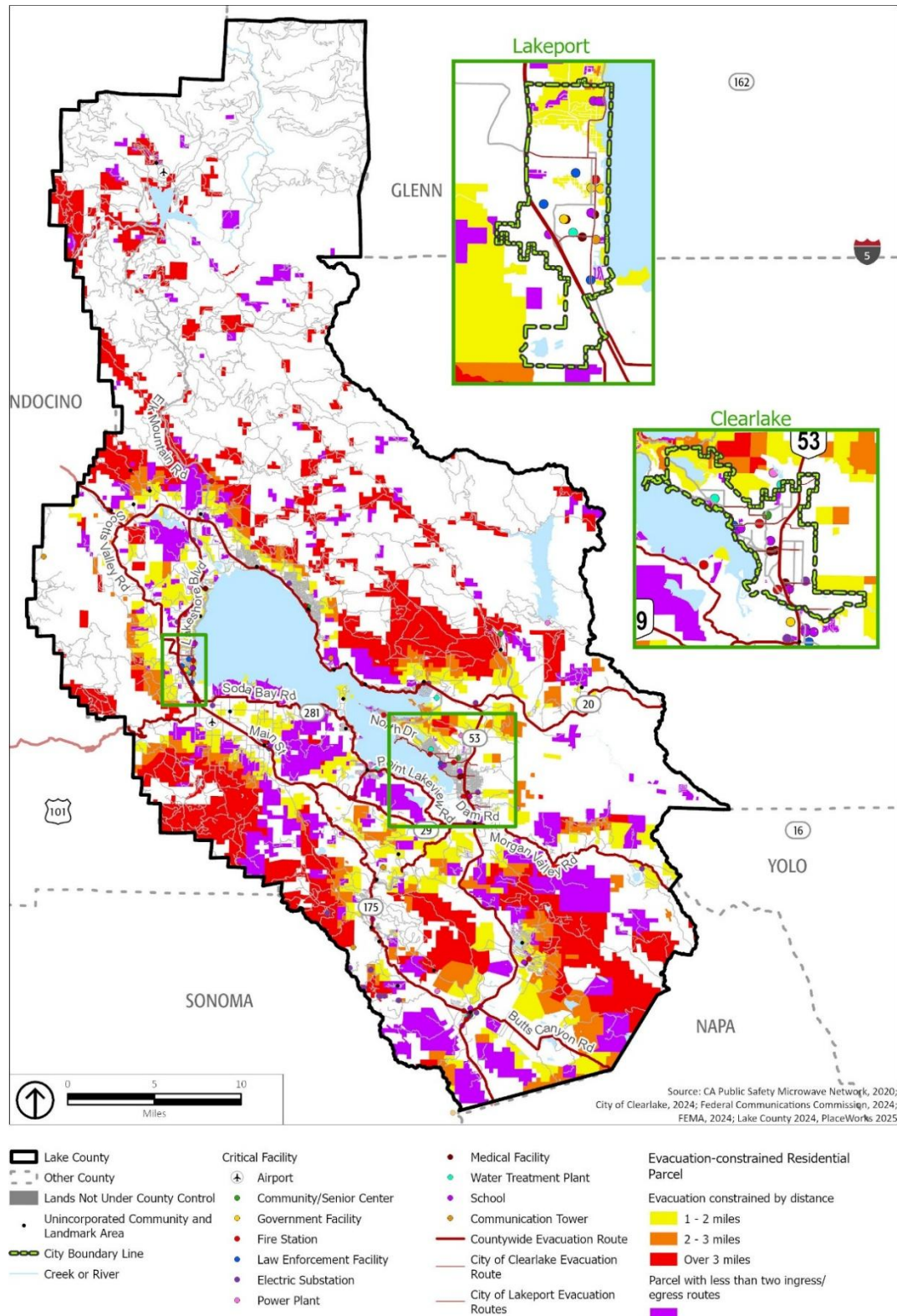


Figure C-9 Evacuation-Constrained Residential Parcels in Clearlake

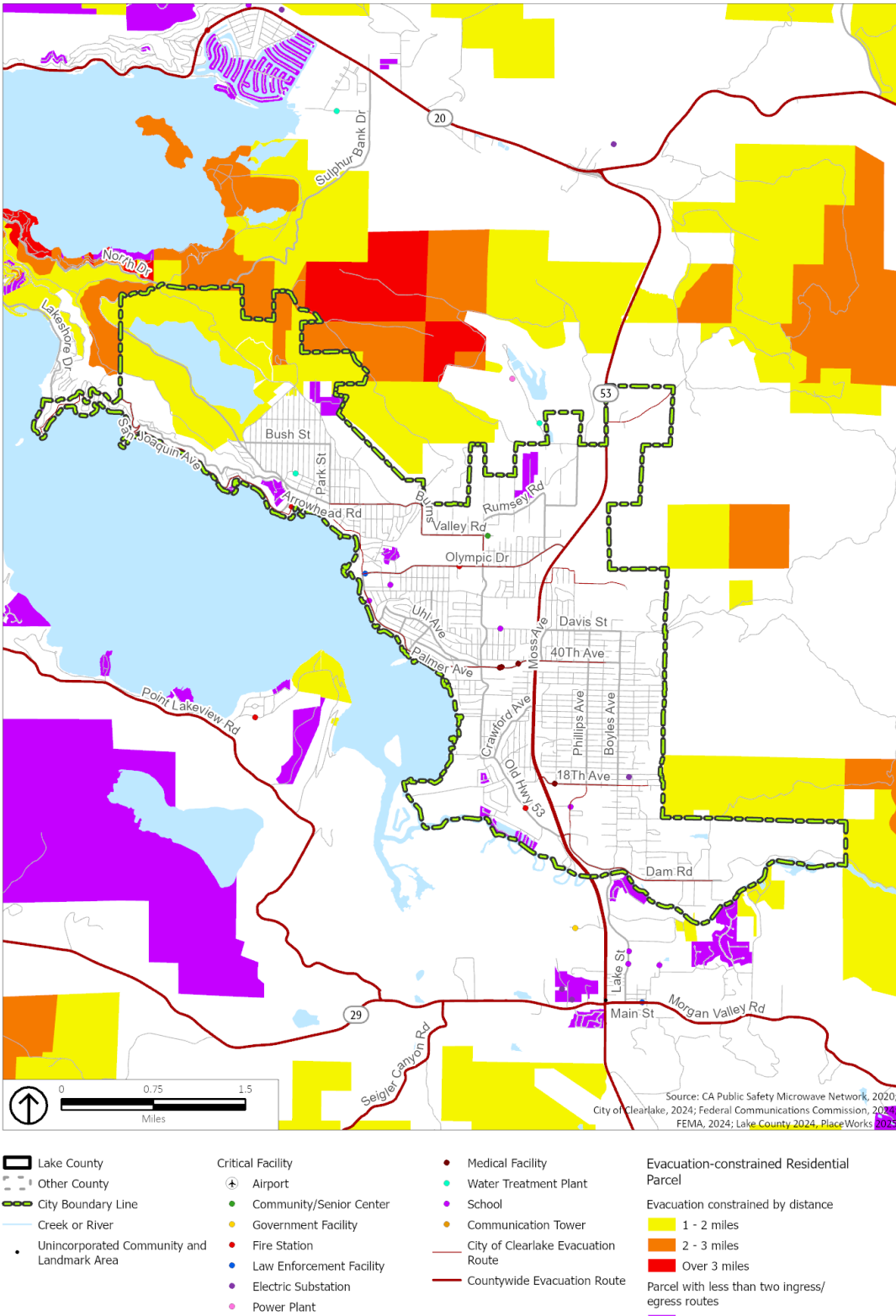
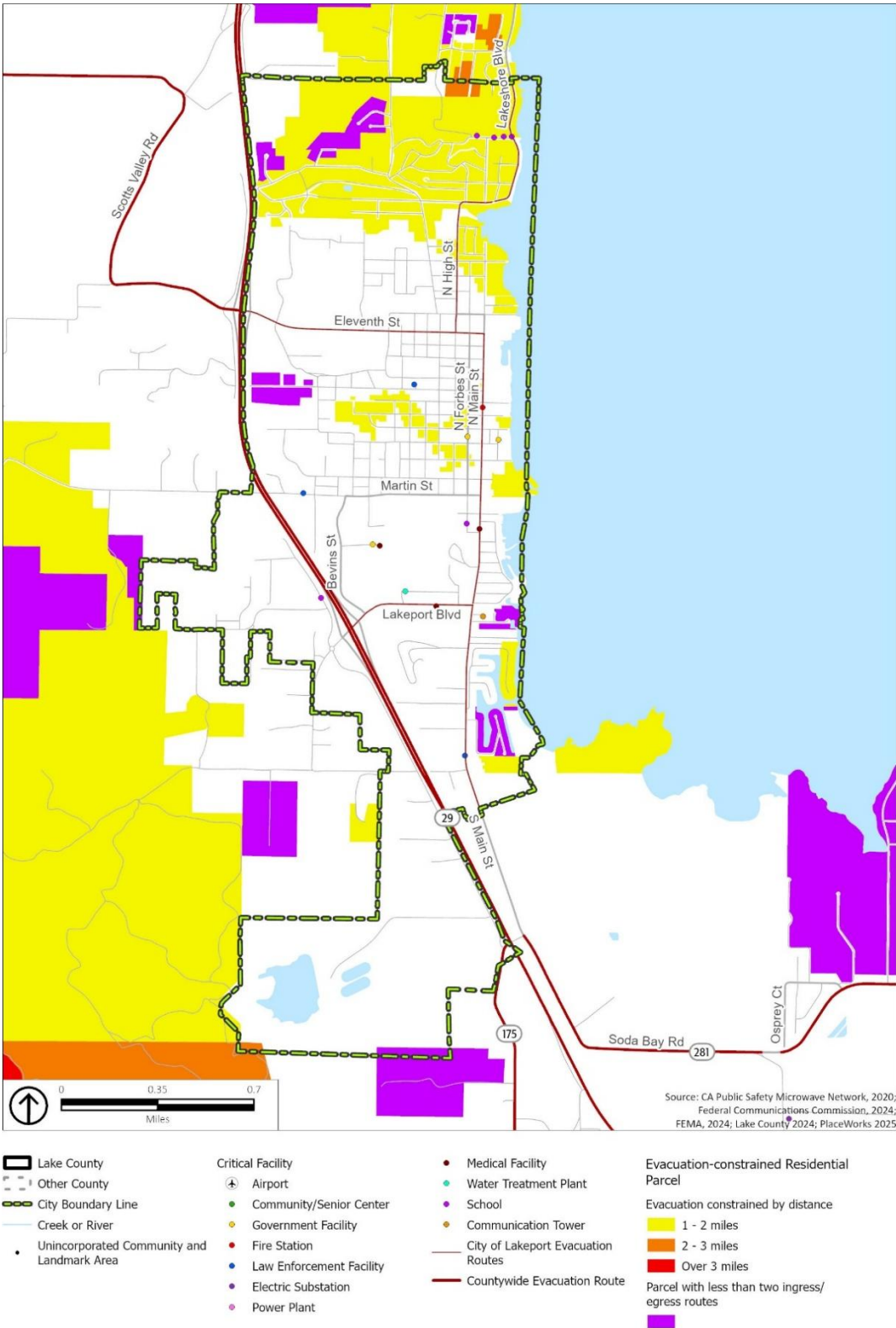


Figure C-10 Evacuation-Constrained Residential Parcels in Lakeport



Overlapping Hazard Zones

The analysis further examines the relationship between evacuation-constrained residential parcels and designated wildfire, flooding, and landslide hazard zones, identifying areas where evacuation challenges coincide with elevated hazard exposure.

Wildfire Hazards

As shown on **Figure C-11**, a significant portion of evacuation-constrained residential parcels throughout unincorporated Lake County are in CAL FIRE designated Fire Hazard Severity Zones. The Cobb Mountain area, Anderson Springs, and communities along the western and eastern shores of Clear Lake show overlap between evacuation constraints and Very High Fire Hazard Severity Zones.

The mountainous areas surrounding the Clear Lake basin, including communities in the Jerusalem Valley, Morgan Valley, and Riviera Heights, already face evacuation challenges due to limited road networks and difficult terrain, and largely fall within High and Very High Fire Hazard Severity Zones.

As shown in **Figure C-12**, evacuation constrained residential parcels surrounding Borax Lake, along Arrowhead Road and Rumsey Road in northern Clearlake, and along Harbor Lane and Highlands Harbor Drive in southern Clearlake overlap with Very High Fire Hazard Severity Zones. Limited evacuation access and elevated wildfire hazards create areas of heightened risk during wildfire events.

No corresponding Very High Fire Hazard Severity Zones and evacuation-constrained residential areas were identified in Lakeport.

Flood Hazards

Figure C-13 shows the overlap between evacuation-constrained residential parcels and flood hazard zones in unincorporated Lake County. Communities along the shoreline of Clear Lake, including portions of Nice, Lucerne, and Clearlake Oaks, show evacuation-constrained parcels within the 100-year and 500-year floodplains. These areas face compound vulnerabilities during flood events, as rising water levels can not only threaten structures but also compromise potential evacuation routes.

In Lakeport (**Figure C-14**), evacuation-constrained residential parcels in the eastern part of the city overlap with flood hazard zones along the western shore of Clear Lake. This area is particularly vulnerable during high water events when lakefront flooding can affect both residences and critical evacuation routes, isolating neighborhoods with already limited access options. However, local roads in the Terraces neighborhood, such as Giselman and Hartley, may provide alternative evacuation routes for some residents if Lakeshore Boulevard becomes impassable due to flooding.

No evacuation-constrained parcels within the City of Clearlake overlap with designated flood hazard zones.

Figure C-11 Evacuation-Constrained Residential Parcels in Fire Hazard Zones in Lake County

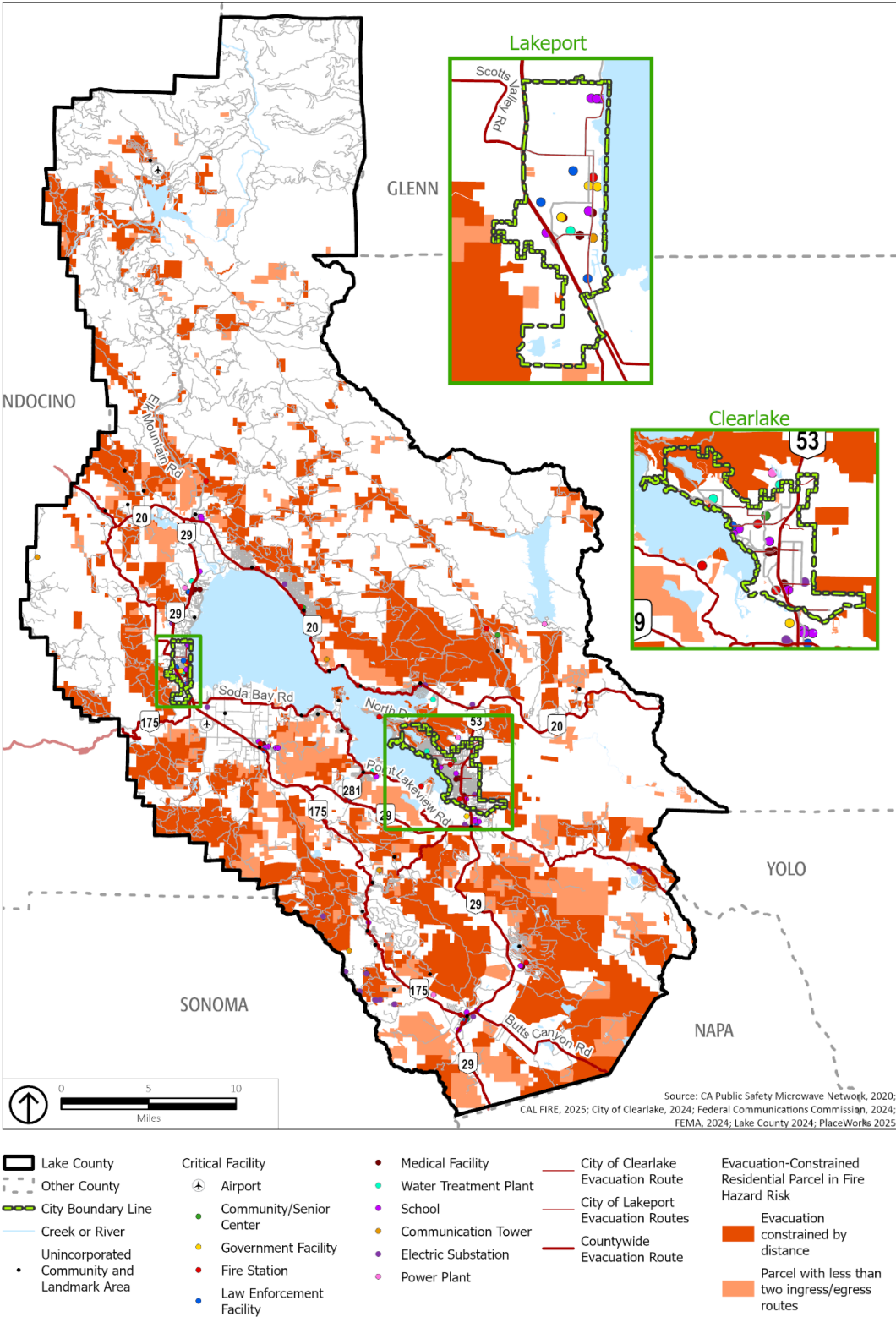


Figure C-12 Evacuation-Constrained Residential Parcels in Fire Hazard Zones in Clearlake

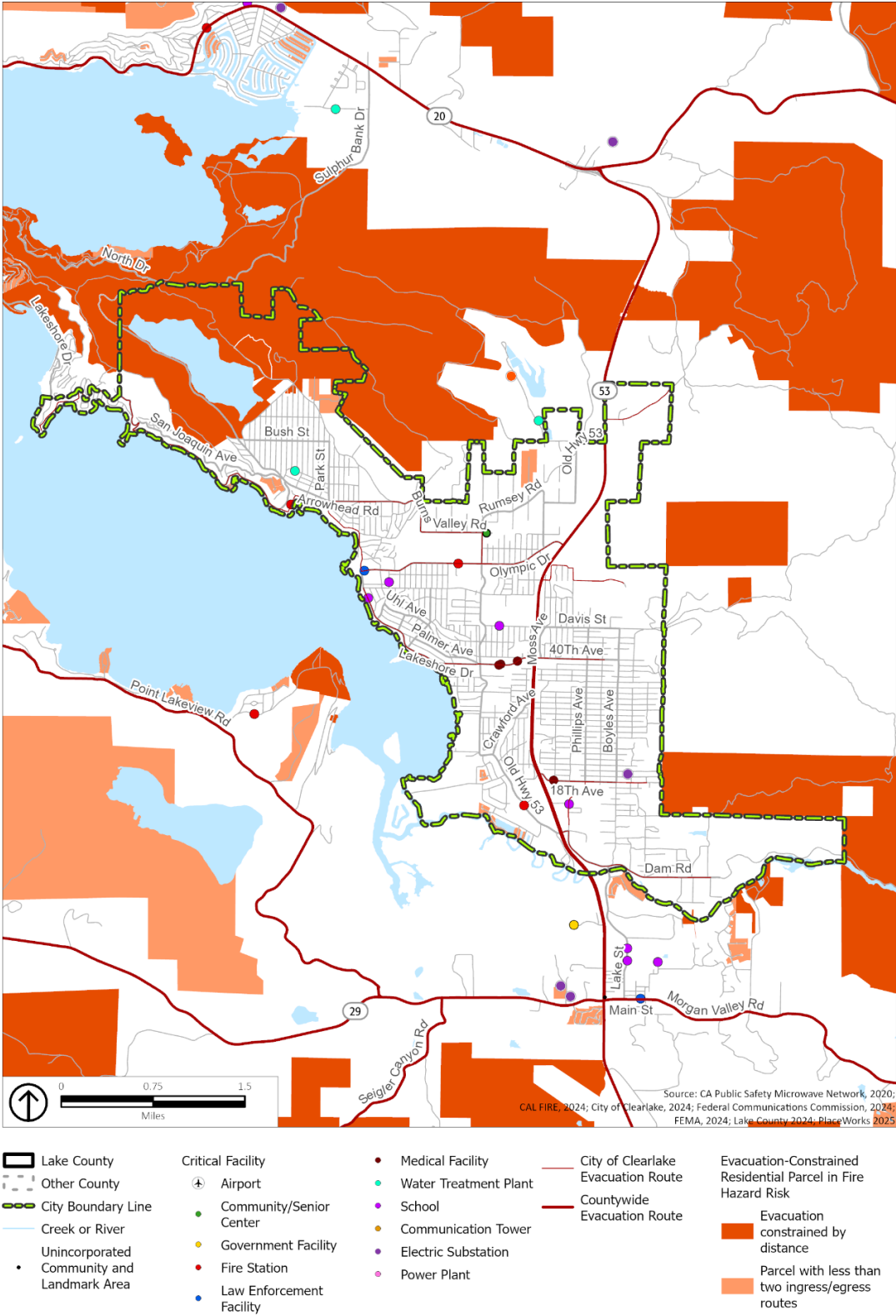


Figure C-13 Evacuation-Constrained Residential Parcels in Flood Hazard Zones in Lake County

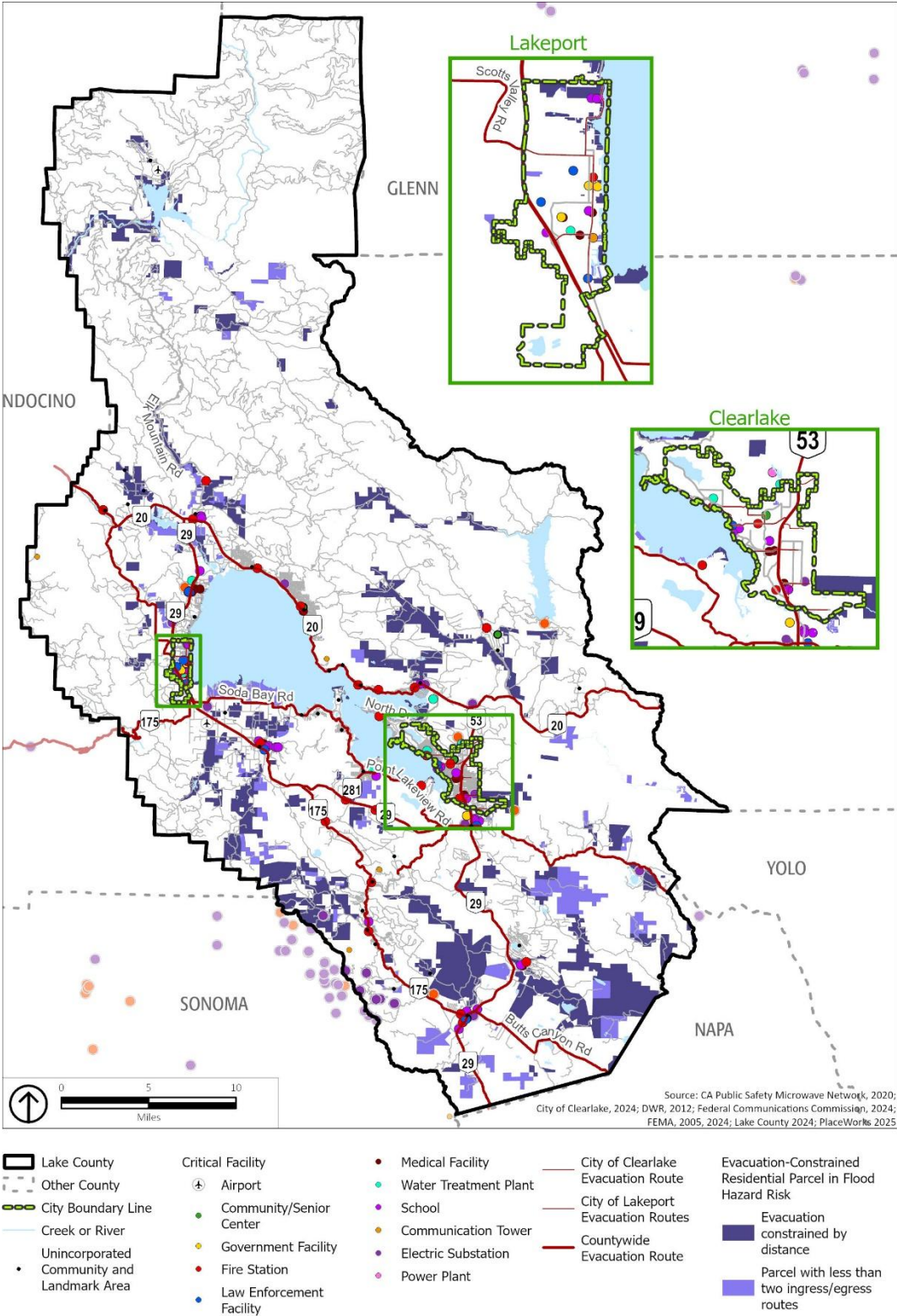
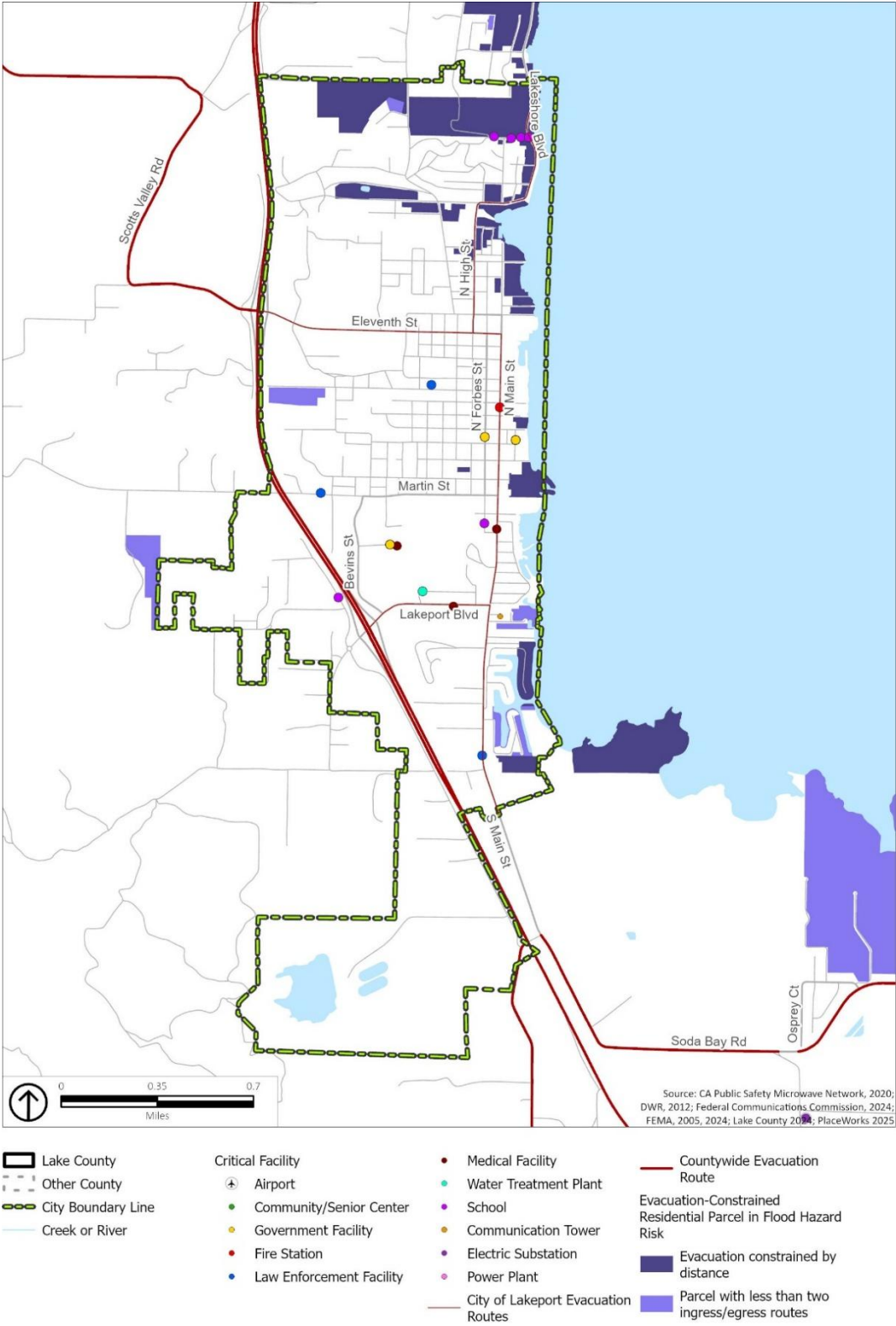


Figure C-14 Evacuation-Constrained Residential Parcels in Flood Hazard Zones in Lakeport



Landslide Hazards

Figure C-15 through **Figure C-17** display the overlap of evacuation-constrained residential parcels and landslide susceptibility zones. Throughout the unincorporated county (**Figure C-15**), significant overlap exists between areas of high landslide susceptibility and evacuation-constrained parcels, particularly in the mountainous regions surrounding Clear Lake. The Cobb Mountain area, portions of the North Lake communities, and areas along the western shore of Clear Lake show a large coincidence of limited evacuation routes and elevated landslide risk.

In Lakeport (**Figure C-16**), evacuation-constrained residential parcels in the northern and western hillside areas of the city fall within zones of higher landslide susceptibility, creating scenarios where landslides could further compromise already limited evacuation routes.

In Clearlake (**Figure C-17**), evacuation-constrained parcels in the northeastern portions of the city show overlap with areas of elevated landslide risk. These areas, characterized by more varied topography than the central parts of the city, face compound vulnerability from both limited evacuation options and landslide hazards.

Figure C-15 Evacuation-Constrained Residential Parcels in Landslide Hazard Zones in Lake County

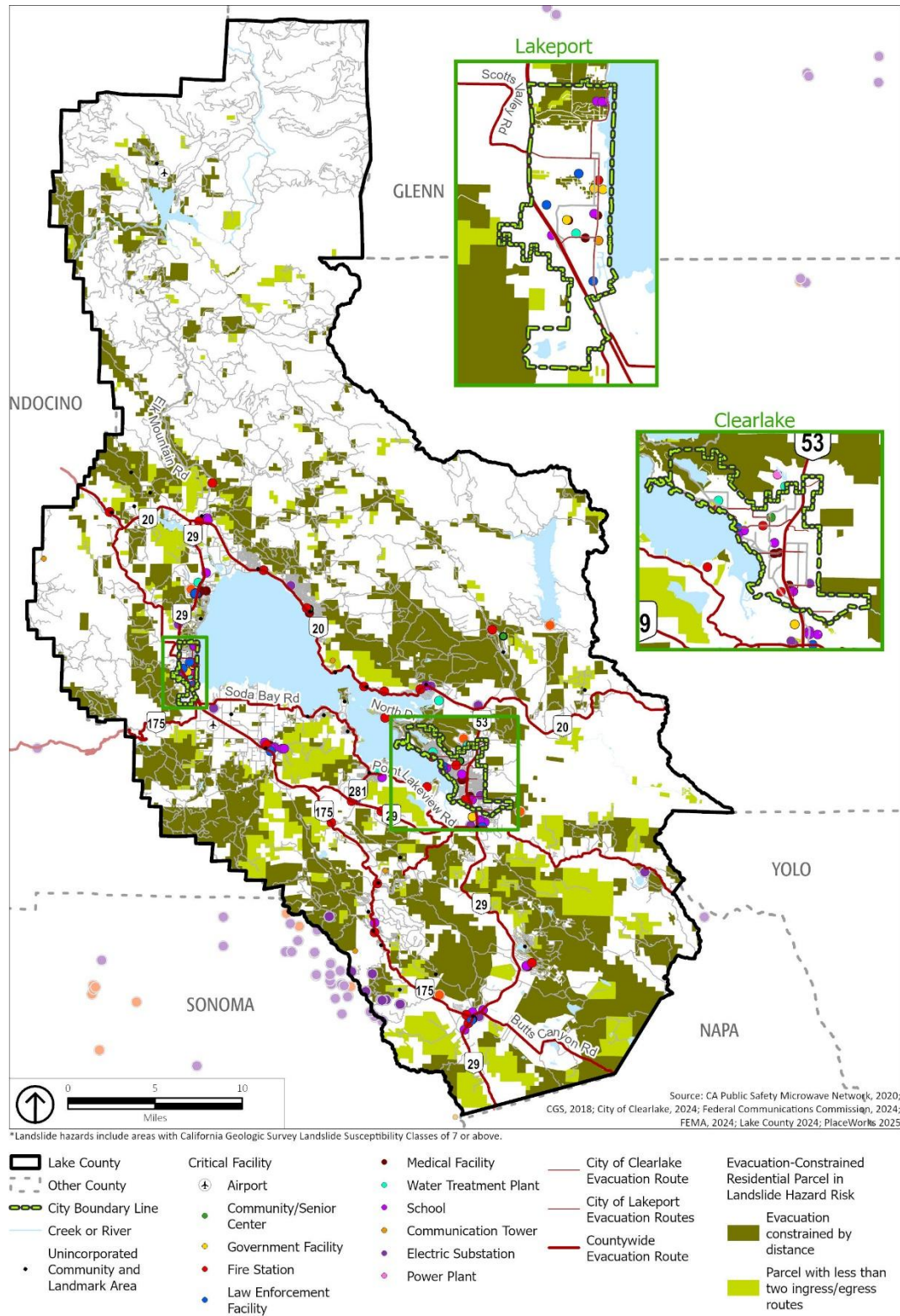


Figure C-16 Evacuation-Constrained Residential Parcels in Landslide Hazard Zones in Lakeport

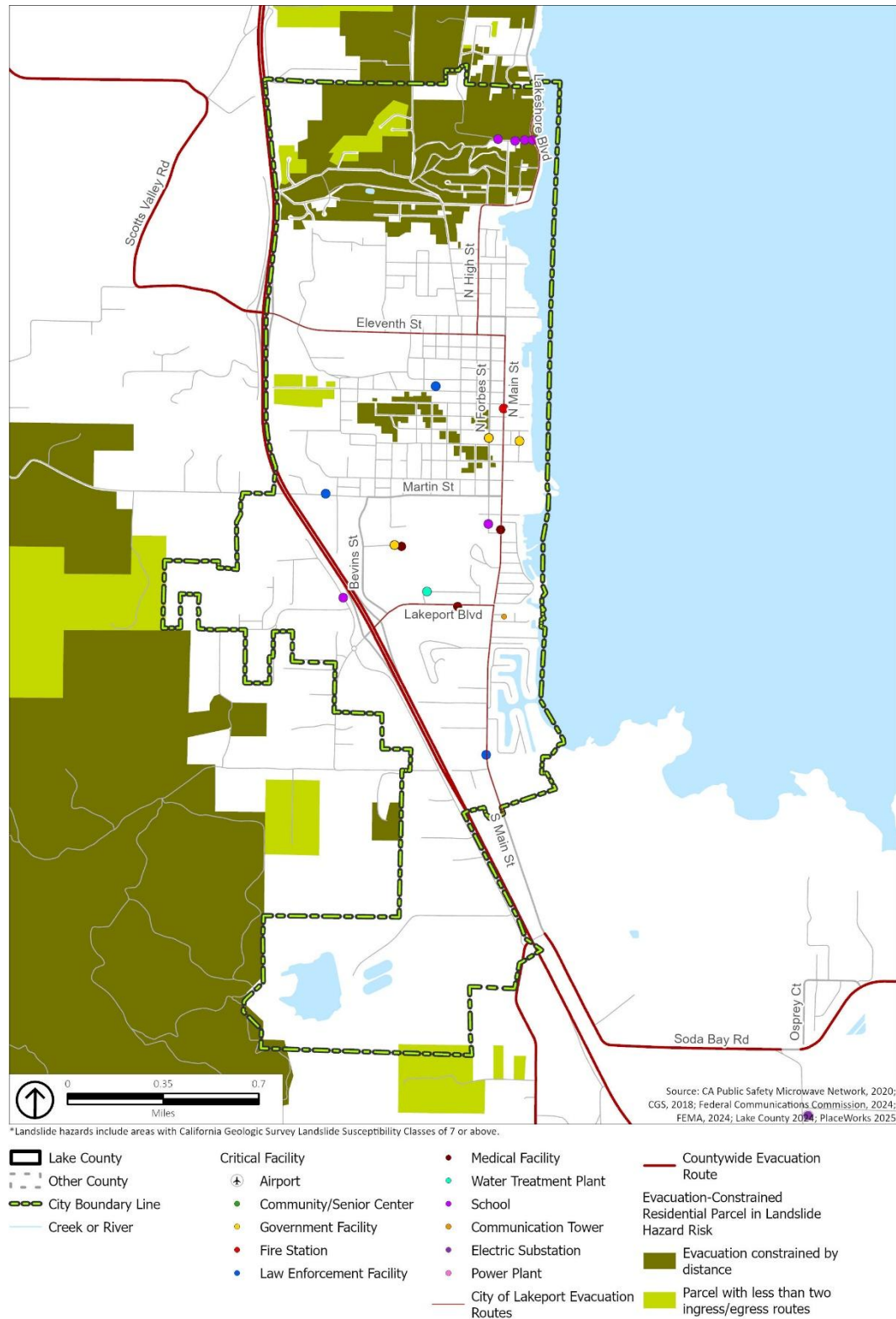
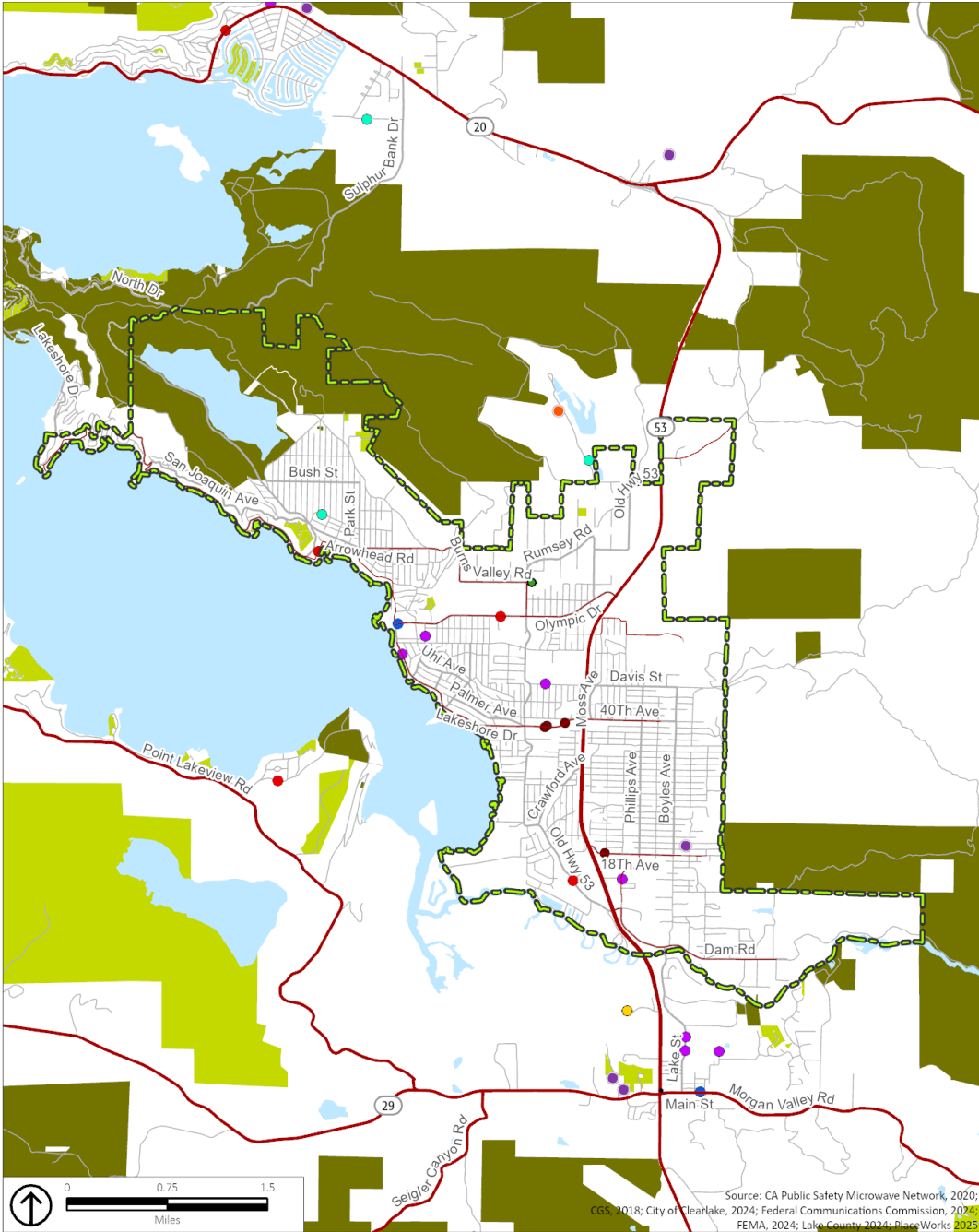


Figure C-17 Evacuation-Constrained Residential Parcels in Landslide Hazard Zones in Clearlake



*Landslide hazards include areas with California Geologic Survey Landslide Susceptibility Classes of 7 or above.

- | | | | | |
|--|--------------------------|-----------------------|------------------------------------|--|
| Lake County | Critical Facility | Medical Facility | City of Clearlake Evacuation Route | Evacuation-Constrained Residential Parcel in Landslide Hazard Risk |
| Other County | Airport | Water Treatment Plant | Countywide Evacuation Route | |
| City Boundary Line | Community/Senior Center | School | | Evacuation constrained by distance |
| Creek or River | Government Facility | Communication Tower | | Parcel with less than two ingress/egress routes |
| Unincorporated Community and Landmark Area | Fire Station | Electric Substation | | |
| | Law Enforcement Facility | Power Plant | | |

Scenario 1: Wildfire (Ranch Fire/Mendocino Complex Fire Scenario)

The Ranch Fire/Mendocino Complex Fire scenario encompasses the northern portion of Lake County, primarily affecting the communities of Upper Lake, Nice, Lucerne, and areas along the northern shore of Clear Lake. This historic fire perimeter, which burned over 410,000 acres across multiple counties, would require evacuation of residents in these northern communities as the fire moves northeast and southeast from its starting point west of Upper Lake. This evacuation area includes a population of approximately 9,500 residents.

Capacity

The primary potential evacuation routes for this scenario would be State Route 20 east toward Colusa County and south along State Route 29 toward Lakeport. State Route 53 provides an additional connection between SR-20 and SR-29, allowing evacuees to travel towards the City of Clearlake and southern Lake County. However, the southern route along State Route 29 could experience significant congestion as evacuees from multiple communities converge on this corridor, particularly if residents from Upper Lake, Nice, and Lucerne areas evacuate simultaneously.

Based on the bandwidth plots generated using the travel demand model, several roadway segments within or near the Ranch Fire/Mendocino Complex Fire perimeter have existing capacity constraints during both AM and PM peak-hour traffic. Specifically, segments of State Route 20 between Nice-Lucerne Cutoff and Burpee Drive in Nice and between Ridge Arbor North and Mendenhall Avenue in North Lake communities display volume-to-capacity (V/C) ratios between 0.8 and 1.0, indicating these roadways are operating near capacity even under typical weekday conditions. An evacuation event would worsen these capacity constraints as residents from North Lake communities, Nice, Lucerne, and surrounding areas attempt to evacuate simultaneously.

However, most segments of State Route 29 south of Upper Lake and State Route 20 east toward Colusa County have adequate capacity (V/C ratios below 0.8) under existing conditions and could likely serve as the primary evacuation corridors under this scenario. Additionally, Scotts Valley Road, connecting Upper Lake to Lakeport, provides an alternative route with sufficient capacity for evacuation traffic.

The evacuation capacity of these routes is further complicated by the rural nature and topographical constraints of the area. State Route 20 along the northern shore of Clear Lake has limited alternative routes, creating potential bottlenecks during mass evacuation. Additionally, many local roads connecting to primary evacuation routes are narrow with limited lane capacity, which restricts the flow of evacuation traffic from arterials to primary evacuation routes. The Lake Pillsbury community faces particularly severe constraints, with access limited to dirt roads and a small airport, making evacuation challenging for this isolated community.

Lake Transit Authority provides public transportation services throughout Lake County, but it has a finite number of vehicles available for emergency evacuation, making transit capacity limited during evacuations. Residents without personal vehicles, estimated at approximately 9 percent of households in the county, would be particularly vulnerable during this evacuation scenario, and would require assistance from emergency responders or neighbors.

Critical facilities within the Ranch Fire/Mendocino Complex Fire perimeter that could support evacuation operations include the North Shore Fire Protection District stations in Upper Lake (Station 90) and Nice (Station 85), as well as at Upper Lake High School and other public facilities outside the immediate fire zone. However, these facilities cannot accommodate large numbers of evacuees, and many evacuees would likely need to travel to larger facilities in Clearlake or south of Kelseyville if directed by the County Office of Emergency Services during an emergency. Facilities outside the fire perimeter that could accommodate evacuees include the Konocti Education Center in Clearlake Oaks, the Clearlake Senior Community Center, and Kelseyville High School, which have previously served as evacuation centers during wildfire events. The selection and activation of evacuation centers during an emergency is determined by emergency management officials based on current conditions and facility availability.

While existing transportation infrastructure could accommodate evacuation traffic, several key roadway segments are already operating near capacity during normal conditions. This suggests that without strategic traffic management and phased evacuation orders, the roadway network, transit network, and critical facilities could be constrained during an emergency evacuation.

Safety

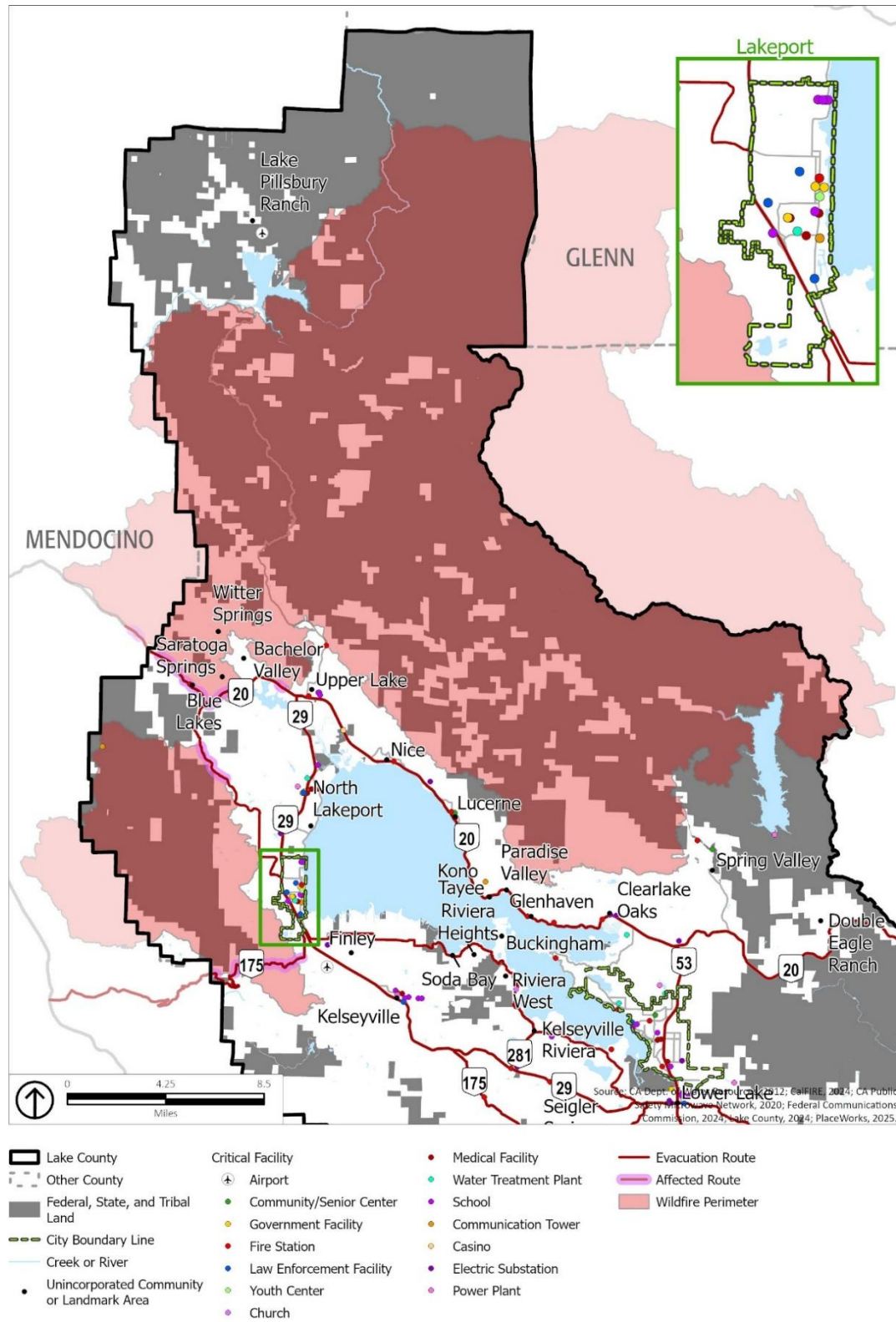
The Ranch Fire/Mendocino Complex Fire scenario identifies significant safety risks to evacuation routes and critical facilities in the northern and northeastern portions of Lake County. Based on analysis of the historic fire perimeter, approximately 7.7 miles of evacuation routes would be in the path of the fire, primarily in the North Lake Communities Local Area.

As shown on **Figure C-18**, State Route 20, a critical east-west evacuation corridor, has approximately 3.1 miles of roadway within the fire perimeter. Additionally, State Route 175 in the Kelseyville and Lakeport Local Areas has approximately 3.8 miles of roadway segments in the fire perimeter. Under this scenario, Scotts Valley Road has approximately 0.8 miles within the fire perimeter. This could create significant safety concerns when evacuating, such as reduced visibility from wildfire smoke, falling trees and debris, encroaching flames, and road damage for communities in Upper Lake, Nice, Lucerne, North Lakeport, the City of Lakeport, and surrounding areas that rely on these routes as primary evacuation pathways.

There are no critical facilities that fall directly within the Ranch Fire/Mendocino Complex Fire perimeter in this scenario. However, nearby facilities—including the Northshore Fire Protection District Station 90 and Station 91, Upper Lake High School, and Sutter Lakeside Hospital—could face indirect impacts from wildfire smoke; limited access routes; or other secondary effects like power outages, communications disruptions, and water supply concerns should a similar fire occur in the future. The nearby facilities that serve communities in the North Lake communities Local Area, including schools, fire stations, and medical facilities, are essential for supporting evacuation operations and emergency response. While not within the fire perimeter itself, these facilities may experience operational challenges due to proximity to evacuation areas or firefighting operations.

Routes crossing the wildfire perimeter would face reduced visibility due to wildfire smoke conditions, creating dangerous driving conditions for evacuees. The hilly terrain in the northern part of the county further complicates evacuation safety, as winding mountain roads with limited alternative routes could become impassable due to fire activity, fallen trees, or emergency response operations.

Figure C-18 Evacuation Routes and Critical Facilities Affected by Wildfire Scenario 1



For vulnerable populations in the affected areas, these safety challenges are particularly acute. The North Lake communities Local Area has higher percentages of vulnerable residents compared to county averages, with approximately 30 percent of residents aged 65 and older (compared to 25 percent countywide) and a high percentage of persons with chronic conditions such as asthma and cardiovascular disease.²¹ Additionally, residents that lack access to a vehicle, approximately 3 to 4 percent of residents in Nice and Lucerne, would face significant evacuation challenges if State Route 20 becomes compromised.²² Limited evacuation route options and compromised critical facilities could disproportionately impact these residents, who may require additional assistance and time during evacuation operations. The Ranch Fire/Mendocino Complex Fire scenario would also pose challenges for limited-English proficiency households, primarily Spanish-speaking, in the North Lake communities Local Area, as approximately 2 to 4 percent of households in this area do not speak English well.²³ While Lake County alerts are sent in both English and Spanish as of January 2025, these households may still face communication barriers when receiving information from unofficial sources or communicating with emergency responders during evacuation operations. The approximately 11 percent of school-aged children (age 10 or less) would be affected in this scenario, with Upper Lake High School and nearby educational facilities potentially needing to coordinate evacuation or shelter-in-place procedures. Several mobile home parks are along the north shore of Clear Lake, including in Nice and Lucerne, whose residents may face heightened vulnerability due to housing structural concerns and location in areas with limited evacuation options.

Viability

Based on the historic fire perimeter for this scenario, westbound State Route 20 toward Mendocino County likely would not be viable as a primary evacuation route, with approximately 3.4 miles of the northwestern part of State Route 20 within the fire perimeter. For communities on the western side of the lake, such as North Lakeport and the City of Lakeport, southbound State Route 29 would be a more viable route than northbound State Route 29 or Scotts Valley Road toward State Route 20. For communities east of the State Route 20/State Route 29 intersection, including Nice and Lucerne, evacuation would be more reliable using southbound routes on State Route 20 toward the city of Clearlake, which falls outside the fire perimeter. However, as noted in the capacity assessment, segments of State Route 20 between Nice-Lucerne Cutoff and Burpee Drive experience capacity constraints under everyday conditions, suggesting that there would likely be congestion and delays during mass evacuation.

A northern segment of Scotts Valley Road near Blue Lakes is within the fire perimeter, so this road would not be a viable evacuation route in this scenario. In the case of the River Fire portion of the Mendocino Complex Fire, this segment of Scotts Valley Road was burned toward the later part of the fire, so this roadway could have been used early in the fire progression for phased evacuation.

Critical facilities outside the fire perimeter could support evacuation operations while remaining viable during this scenario. While portions of the City of Lakeport were in the path of the River Fire portion of the Mendocino Complex, facilities in eastern and southern Lakeport that remain outside both fire perimeters could serve as evacuation centers for displaced residents from the northern communities. However, their viability would depend on maintaining open transportation corridors between the fire perimeter and these facilities, and movement of the fire perimeter.

For vulnerable populations in communities evacuated under this scenario, including approximately 25 percent of residents who are 65 years or older and the 9 percent of households without vehicle access, evacuation time and access would likely depend on early notification systems and coordinated transportation assistance.^{24, 25} During the 2018 Mendocino Complex Fire, the large scale of the fire affected broad areas of Lake County, with nearly the entire county under evacuation orders at certain times, highlighting the importance of maintaining multiple evacuation options during large-scale emergency events that can affect extensive geographic areas simultaneously.

State Route 20 east toward Colusa County remains viable in this scenario as it is outside the fire perimeter. State Route 29 south toward Kelseyville and the City of Lakeport is viable for communities on the western side of Clear Lake, including North Lakeport and the City of Lakeport. For communities on the eastern and northern shores of Clear Lake, including Nice, Lucerne, and Clearlake Oaks, State Route 20 south and east provide viable evacuation routes outside the fire perimeter. Local roads connecting to these highways will serve as important feeder routes, though many have limited capacity for large volumes of vehicles, particularly in the North Lake communities Local Area. County Road 301 (Potter Valley Road) and County Road 240 near Upper Lake connecting to the Lake Pillsbury Recreation Area would likely become compromised by fire activity, and their narrow, winding, and unpaved nature makes them unsuitable for public evacuation.

Scenario 2: Wildfire (Valley Fire)

The Valley Fire scenario encompasses the southern portion of Lake County, primarily affecting the communities of Cobb, Middletown, Hidden Valley Lake, and Whispering Pines. This historic fire perimeter represents one of the most destructive wildfires in county history, having burned 76,067 acres and destroyed nearly 2,000 buildings, including 1,280 homes. In this scenario, the fire would start near the community of Cobb and spread rapidly through Middletown, Whispering Pines, and areas in the southern end of Hidden Valley Lake. This evacuation area includes populated residential areas of approximately 7,000 residents and small hotels/lodges and would require coordinated evacuation of multiple communities in the southern region of the county.

Capacity

Immediate evacuation under this scenario would likely use State Route 175 north toward Kelseyville and Lakeport and south toward Middletown. The primary potential evacuation routes outside of the immediate fire perimeter for this scenario would be State Route 29 south toward Napa County and north toward Lower Lake. The fire would likely compromise State Route 175 under this scenario, further limiting evacuation options.

The bandwidth plots generated using the travel demand model reveal several roadway segments within or near the Valley Fire perimeter that exhibit capacity constraints during normal operations. Of particular significance are segments of State Route 29 in Middletown, where the analysis shows multiple sections operating at or approaching capacity during typical weekday conditions. Specifically, segments operating near capacity (V/C ratios between 0.8 and 1.0) include State Route 29 between Central Park Road and Lake Street and between Hill Avenue and Callayomi Street. Segments at capacity (V/C ratios between 1.0 and

1.2) include State Route 29 between Wardlaw Street and St. Helena Creek Road. No roadway segments in the scenario area were identified as operating over capacity during normal conditions.

During an evacuation scenario, these capacity limitations would be met or exceeded as residents evacuated. Evacuation would likely occur in a phased pattern based on fire progression, with Cobb Mountain Local Area communities evacuating first, followed by Middletown, and then Hidden Valley Lake as the fire spread. Bottle Rock Road, which connects Cobb to State Route 29, shows V/C ratios near 1.0 during normal operations, meaning the road is operating at its capacity limit under typical conditions. Since this intersection is at capacity under normal conditions, this alternative route could experience significant congestion during evacuation, especially considering its winding, rural nature.

Transit capacity in this scenario is extremely limited. While Lake Transit Authority serves the Cobb and Middletown Local Areas, the rural nature of the area and limited number of transit vehicles available would make large-scale evacuation via public transit challenging. While nearly everyone has access to a vehicle in the Cobb Local Area, 2.5 percent of people in the Middletown Local Area do not have access to a vehicle and would need transit or emergency service assistance to evacuate.

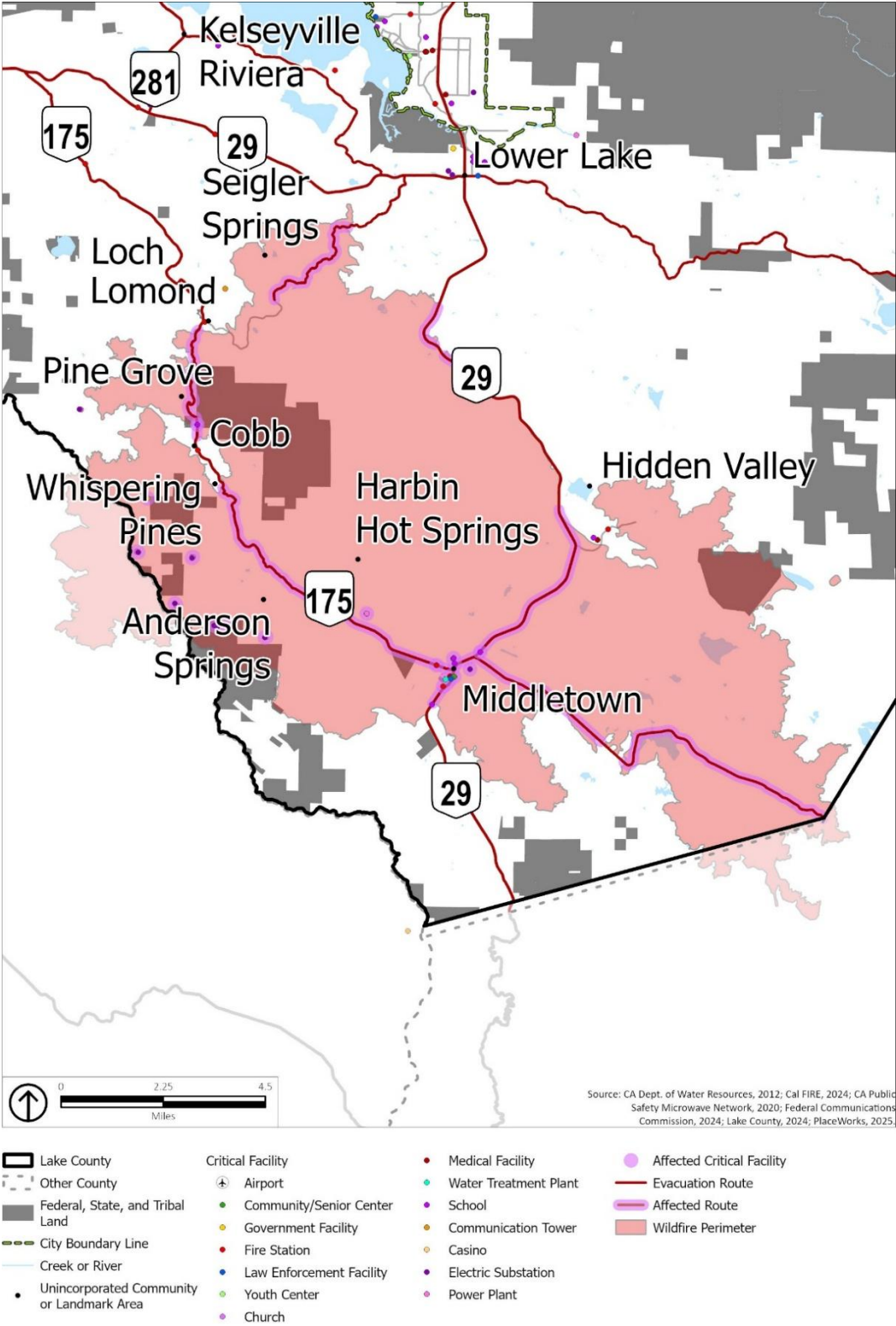
Critical facilities within the Valley Fire perimeter that could support evacuation operations include fire stations in Middletown and Hidden Valley Lake as well as potential temporary evacuation points at Middletown High School. However, fire could threaten these facilities, as it did during the 2015 Valley Fire. During that fire, Lake County Office of Emergency Services established evacuation shelters in Kelseyville to the north and Calistoga (Napa County) to the south, indicating that evacuation destinations outside the immediate fire zone would be necessary.

Safety

As shown on **Figure C-19**, The Valley Fire scenario exemplifies substantial safety concerns to evacuation routes and critical facilities in the southwestern region of Lake County. Approximately 28.6 miles of potential evacuation routes are within the fire perimeter, with large segments within the fire perimeter in the Middletown Local Area (19.1 miles) and Cobb Mountain Local Area (7.0 miles).

State Route 175, which serves as a primary evacuation corridor for communities in the southwestern portion of the county, including Middletown, Hidden Valley, Cobb, and the surrounding rural areas, would be directly affected by this fire scenario. During the 2015 Valley Fire, State Route 175 through Cobb Mountain became impassable in many sections due to flames crossing the roadway, fallen trees, and heavy smoke conditions that severely limited visibility. The affected road segments include those traversing mountainous terrain with limited alternative routes, creating significant safety concerns for evacuees, including reduced visibility from wildfire smoke, falling debris, approaching flames, and roadway damage from intense heat. State Route 29 through the Middletown Local Area, connecting Middletown, Hidden Valley, and Lower Lake, as well as Lake County to Napa County, would also be compromised under this scenario, as fire activity could cut off large segments in the Cobb Mountain Local Area and Middletown Local Area.

Figure C-19 Evacuation Routes and Critical Facilities Affected by Wildfire Scenario 2



Under this scenario several critical facilities essential for emergency response and community support would be in the fire perimeter, including:

- Five schools in the Middletown and Cobb Local Areas (Cobb Mountain Elementary School, Middletown Christian School, Middletown High School, Middletown Middle School, and Minnie Cannon Elementary School)
- Southlake Fire Department Station 60
- Eight electric substations in the Cobb Mountain and Middletown areas
- Six power plants in the Cobb Mountain and Middletown areas
- Two water treatment plants in Middletown and Cobb (Callayomi County Water District Office and Treatment Plant and Cobb Area Water)
- One communication tower in Cobb Mountain and several towers in the Loch Lomond area.
- St. Helena Family Health Center in Middletown
- Middletown Senior Center
- One law enforcement facility (Middletown Sheriff Substation)

These facilities could be damaged or destroyed in this scenario, affecting emergency shelter options; emergency response capabilities; and critical electricity, communication, and water supply services for the Middletown and Cobb Local Areas.

Critical facilities outside the fire perimeter that would remain accessible include schools and community centers in Kelseyville and Lower Lake, which could serve as evacuation centers. Fire stations in Kelseyville and Lower Lake would remain operational to support response efforts along the perimeter of the fire.

Evacuation routes within the wildfire perimeter would experience wind-blown embers and significantly reduced visibility due to wildfire smoke conditions, creating dangerous driving conditions. The mountainous topography of the Cobb and Middletown Local Areas presents additional travel safety concerns, with steep, winding roads that could become impassable due to fire activity, fallen debris, or emergency response operations. Many local roads in this area are narrow mountain roads with limited passing opportunities, which could restrict the flow of evacuation traffic from residential areas to main arterials. In the 2015 Valley Fire, many residents reported dangerous travel conditions due to low visibility and approaching flames, with some evacuees having to abandon vehicles and continue on foot to safety.²⁶

For vulnerable populations in this area of the county, particularly the elderly, individuals with disabilities, and households without vehicles, these safety challenges are especially severe. Approximately 25 percent of residents in the Middletown and Cobb Mountain Local Areas are aged 65 and older. These areas also show higher rates of cardiovascular disease and asthma, conditions that can be exacerbated by wildfire smoke exposure during evacuations.²⁷ Vehicle access is generally high in the Cobb area, but approximately 2.5 percent of Middletown area residents lack access to vehicles.²⁸ Safety concerns include evacuation speed due to persons with limited mobility, difficulty in preparing for and responding to evacuation notices, challenges in driving during emergency conditions, and decreased ability to receive or respond to emergency alerts. The rapid spread of the historic Valley Fire (from 50 acres to over 10,000 acres within hours) demonstrates how quickly conditions can deteriorate in this area and how the size of evacuated areas can escalate, which leaves limited time for evacuation, especially for those requiring additional assistance.²⁹

Of particular concern in this scenario are the six schools directly in the fire perimeter—Cobb Mountain Elementary School, Middletown Christian School, Middletown High School, Middletown Middle School, STEM Academy Charter, and Minnie Cannon Elementary School. These schools serve approximately 1,400 students who would need coordinated evacuation procedures or shelter-in-place protocols if a wildfire occurred during normal school operations.³⁰ The Middletown Rancheria of Pomo Indians, Habematotel Pomo of Upper Lake, and Robinson Rancheria Tribes would also face challenges, as Tribal lands and facilities could be directly affected, requiring coordinated evacuation procedures.

Viability

Based on the historic fire perimeter for this scenario, State Route 175 would not be viable as an evacuation route, with approximately 7.0 miles directly impacted by the wildfire in the Cobb Mountain Local Area. This route serves as a primary connector between Middletown, Cobb Mountain, and Lakeport, and if it became impassable due to capacity and safety concerns, it would substantially limit evacuation options for residents in the Cobb Mountain Local Area.

For communities in the Middletown Local Area, State Route 29 southbound toward Napa County would be the most viable evacuation route, particularly for the southern portions of Middletown. For residents in the Cobb Mountain Local Area, Bottle Rock Road connecting to Kelseyville could serve as an alternative evacuation route if conditions permit, though this route already faces congestion at certain intersections during normal operations, and its ability to serve as an evacuation route would depend on fire behavior and spread direction.

Other potential viable evacuation routes include:

- State Route 29 northbound toward Lower Lake for northern Middletown residents, provided residents evacuate early before fire progression cuts off this route.
- Butts Canyon Road for residents in the southern Hidden Valley Lake area, providing access toward Pope Valley and Napa County.
- Big Canyon Road connecting the Middletown area to Loch Lomond in Lake County, though this route is narrow and partially unpaved with limited capacity.

The viability of critical facilities is a key consideration in this scenario, as several facilities are within the fire perimeter, as described above. This scenario may force evacuees to travel to facilities in Kelseyville, City of Lakeport, or Napa County for safe evacuations. Critical facilities outside the fire perimeter that would maintain viability include Kelseyville High School and Lower Lake High School for evacuation shelters, South Lake County Fire Protection District stations in Hidden Valley Lake and Lower Lake for emergency response, and medical facilities in Clearlake and Lakeport.

For vulnerable populations, including older adults, persons with disabilities, and those with transportation constraints in the more isolated areas of Cobb Mountain Local Area, the Geysers, and surrounding areas, evacuation time and access would be challenged by the limited transportation network and rapid fire spread.

While State Route 29 southbound could provide evacuation options for Middletown Local Area residents, communities in the Cobb Mountain Local Area would face severely limited evacuation routes in this scenario, necessitating early evacuation or shelter-in-place options, depending on specific emergency conditions.

Scenario 3: Wildfire (Rocky Fire/Jerusalem Fire Scenario)

The Rocky Fire/Jerusalem Fire scenario affects the central and eastern portions of Lake County, with the fire starting on Morgan Valley Road east of the City of Clearlake and moving northwest, west, and southwest toward Clear Lake. This historic fire ultimately burned approximately 94,000 acres across multiple counties, with the Rocky Fire burning 69,000 acres and the Jerusalem Fire burning 25,000 acres before the two fires merged. The scenario would primarily impact communities in the City of Clearlake area, Lower Lake Local Area, Middletown Local Area, and surrounding unincorporated areas along the eastern and southern shores of Clear Lake. The area evacuated under this scenario includes both incorporated and unincorporated communities that would need to evacuate toward available routes away from the advancing fire. This evacuation area includes a population of approximately 3,000 residents.

Capacity

The primary potential evacuation routes for this scenario would be State Route 29 south toward Napa County, State Route 29 north toward Kelseyville and Lakeport, State Route 20 north toward Clearlake Oaks and Lucerne, and State Route 53 north toward Clearlake.

The bandwidth plots generated using the travel demand model indicate that several key roadway segments within or near the Rocky Fire/Jerusalem Fire perimeter show capacity constraints during normal operations. Most notably, segments of State Route 29 between Morgan Valley Road and Spruce Grove Road in Lower Lake and west of State Route 53 in Lower Lake display V/C ratios between 0.8 and 1.0, indicating these roadways are operating near capacity even under typical weekday conditions. Dam Road east of State Route 53 in Lower Lake shows V/C ratios exceeding 1.2 during PM peak hours, indicating it is already operating well over capacity under normal conditions. However, this segment is not designated as an evacuation route, though its congestion could affect access to primary evacuation routes. An evacuation for this fire perimeter would amplify these capacity constraints. The eastern part of Lake County has a more limited road network compared to other areas, with fewer alternative routes available when primary roads become congested.

The topography of the eastern Lake County region presents added challenges for evacuation capacity. The area affected by the Rocky Fire/Jerusalem Fire includes valleys, rolling hills, and some mountainous terrain, with many residential areas accessible only by narrow rural roads. These roads have limited lane capacity and often connect to main arterials at intersections that could become bottlenecks during mass evacuation, particularly where Morgan Valley Road meets State Route 29 in Lower Lake.

Transit capacity in this scenario is also limited. Lake Transit Authority provides public transportation services to Lower Lake and some eastern county areas but has insufficient vehicles for a large-scale evacuation. The approximately 6 percent of households in the Lower Lake and Middletown Local Area

without access to a vehicle would be particularly vulnerable during this evacuation scenario and would require assistance, particularly in the more remote areas of Morgan Valley and Jerusalem Valley.

Critical facilities within the Rocky Fire/Jerusalem Fire perimeter that could support evacuation operations include the South Lake County Fire Protection District station in Lower Lake and potential temporary evacuation points at Lower Lake High School. The capacity of these facilities is sufficient for initial evacuation support, but many evacuees would need to travel to larger facilities in the City of Clearlake, Kelseyville, or Middletown.

While the existing transportation infrastructure could accommodate evacuation traffic under ideal conditions, the limited number of evacuation routes from eastern Lake County combined with existing capacity constraints on key roadway segments would create significant bottlenecks.

Safety

As shown on **Figure C-20**, the Rocky Fire/Jerusalem Fire scenario presents safety challenges for evacuation routes and critical facilities in the eastern region of Lake County. Approximately 9.4 miles of evacuation routes lie within the historic fire perimeter, primarily in the Lower Lake Local Area (8.4 miles), with smaller impacts in areas beyond county boundaries (0.1 miles).

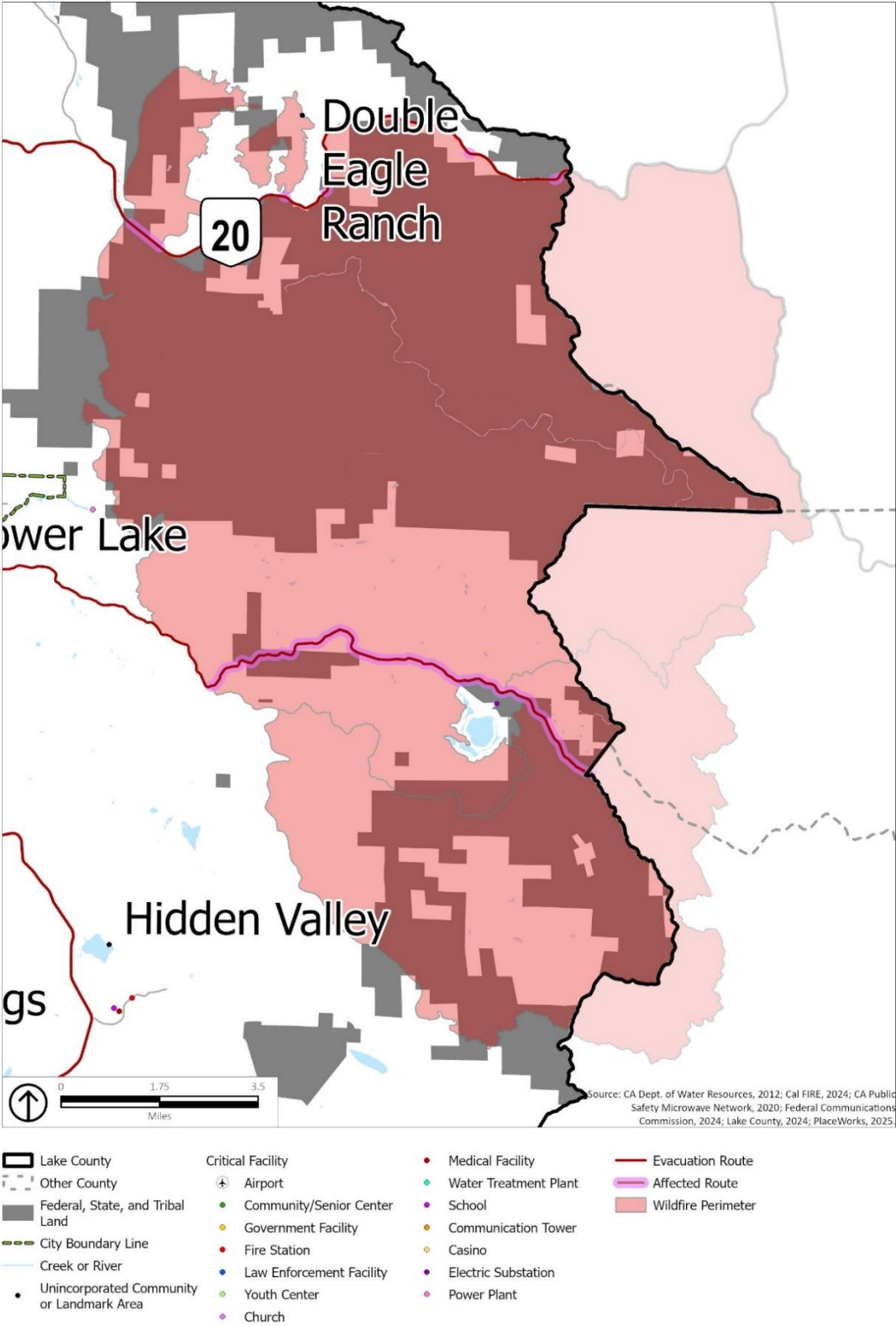
State Route 20 in the eastern part of the county, Morgan Valley Road east of Lower Lake, and Jerusalem Valley Road would all be within the fire perimeter. These routes serve as important evacuation corridors for communities in the southeastern part of the county, including Lower Lake, Morgan Valley, Jerusalem Valley, and parts of the East Lake Communities Local Area. Routes outside the fire perimeter that would remain safe for evacuation include State Route 29 north of Lower Lake toward Kelseyville, State Route 53 north toward Clearlake, and State Route 20 north toward Clearlake Oaks (east of the State Route 53 intersection).

While no critical facilities fall in the historic fire perimeter, several are found near the perimeter and could be affected by smoke, access limitations, or other secondary effects. These facilities include Lower Lake High School, South Lake County Fire Protection District Station in Lower Lake, Lower Lake Water Treatment Facility, and electrical infrastructure serving eastern Lake County. Communities within and near the historic fire perimeter should maintain awareness of nearby critical facilities that could be affected by similar fire events in the future.

The eastern part of Lake County has rugged terrain with limited alternative routes in some locations, which would complicate evacuation operations if primary routes became compromised. Morgan Valley and Jerusalem Valley include areas where single access roads could become cut off by fire activity.

For communities within the historic Rocky Fire/Jerusalem Fire perimeter area, evacuation safety considerations are particularly important for vulnerable populations. These populations include older adults, individuals with disabilities, and households without vehicles who may need additional assistance during evacuation events. Safety challenges for these populations include inability to evacuate quickly due to limited mobility, difficulty receiving and responding to evacuation notices, challenges navigating unfamiliar evacuation routes, and need for transportation assistance if primary caregivers are not present.

Figure C-20 Evacuation Routes and Critical Facilities Affected by Wildfire Scenario 3



Viability

Approximately 9.4 miles of evacuation routes would be affected by this wildfire scenario, with Lower Lake experiencing the most significant impacts (8.4 miles). Key segments of Morgan Valley Road, which connects Lower Lake to eastern county areas, could become impassable during this fire scenario, restricting evacuation options for residents in the eastern portions of the county.

For communities in the Lower Lake area, State Route 29 north toward Kelseyville and Lakeport could offer more viable evacuation options, as these routes largely fall outside the historic fire perimeter. Similarly, State Route 53 north toward Clearlake could serve as an evacuation route for affected communities. However, segments of State Route 29 between Morgan Valley Road and Spruce Grove Road in Lower Lake already operate near capacity during normal conditions, suggesting that traffic management would be essential to maintain viability during evacuation.

As described above, facilities in Lower Lake, such as the fire station, could support initial evacuation operations, though residents might ultimately need to travel to larger evacuation centers in Clearlake or Kelseyville, such as Galilee Lutheran Church, Kelseyville Presbyterian Church, or Clearlake Youth Center, depending on fire behavior.

For vulnerable populations in the affected communities, including the elderly, individuals with disabilities, and households without vehicles, evacuation viability would depend significantly on early notification and assistance. The rural nature of many communities in Middletown and Lower Lake Local Areas would need coordinated transportation support for those without personal vehicles. The Lower Lake and Middletown Local Areas also include several small, widely dispersed rural residential areas with limited road access, where isolation during a fire event could pose significant risks for residents with mobility limitations or health conditions requiring electricity-dependent medical equipment.

Northern evacuation routes via State Route 29 and State Route 53 could provide the most reliable options for residents in the Lower Lake area and eastern communities affected under this fire scenario. Local roads connected to these arterials would serve as important feeder routes, though their viability would depend on specific fire conditions and spread patterns at the time of an emergency.

Scenario 4: Flooding

The flooding scenario assumes localized flood events may occur anywhere within designated floodplains throughout Lake County, affecting evacuation routes and communities simultaneously across multiple areas. Flood hazards in Lake County and the cities of Clearlake and Lakeport result from creek flooding, lake flooding, and potential dam failures. The most extensive floodplains are along Scotts, Cache, Adobe, Putah, Cole, Middle, Copsey, and Kelsey Creeks. Lake flooding poses the greatest threat to lakeshore communities adjacent to Clear Lake, Lake Pillsbury, Blue Lakes, and areas near Indian Valley Reservoir. Dam failure scenarios could create sudden, large-scale flooding that differs from gradual creek or lake flooding patterns. The county has experienced significant floods along Clear Lake shorelines due to the slow drainage capacity of Cache Creek, high inflows from tributaries, and soil saturation, most notably during the February 2017 atmospheric river events that prompted evacuations in flood-prone areas. Unlike

wildfire scenarios, flooding events may simultaneously impact evacuation routes and communities across diverse geographic areas of the county simultaneously.

Capacity

Given that capacity is less critical in flooding scenarios than in wildfire events, this analysis focuses on key constraints that would affect evacuation. Unlike wildfires, floods typically develop more gradually, allowing people to either evacuate in a more phased manner or shelter in place on higher floors when appropriate. Based on the bandwidth plots generated using the travel demand model, several key roadway segments within the 100-year flood zones show capacity constraints during normal operations.

Roadway segments, including Lakeshore Drive west of State Route 53 in the city of Clearlake, West 40th Avenue west of State Route 53 in the city of Clearlake, and Olympic Drive west of State Route 53 in the city of Clearlake show V/C ratios between 0.8 and 1.0, indicating these roadways are operating near capacity even under typical weekday conditions. During an emergency evacuation scenario, residents from lakefront areas attempting to relocate to higher ground would exacerbate the existing capacity constraints without a phased evacuation approach.

State Route 20 between Oakgrove Avenue and Lakeland Street in Clearlake Oaks, between Sayre Avenue and Benton Avenue in Nice, and between Nice-Lucerne Cutoff and Butte Street in Nice all show V/C ratios near or exceeding 0.8 during PM peak hours, indicating potential congestion points. These segments could create bottlenecks for evacuating traffic due to flooding. Roadway segments maintaining adequate capacity (V/C ratios below 0.8) include most segments of State Route 29, portions of State Route 53 at higher elevations in Clearlake, and sections of State Route 20 away from the lakeshore.

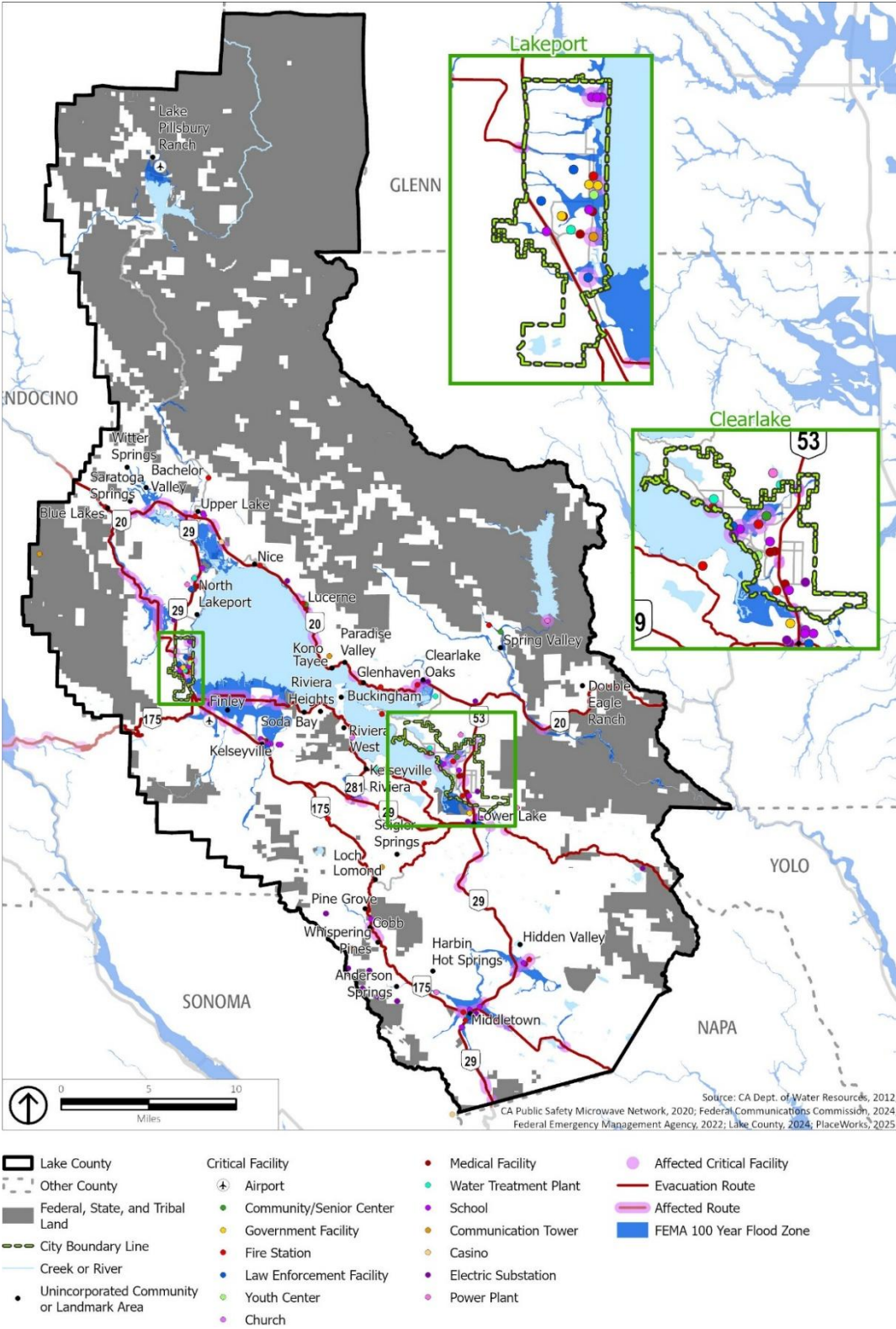
Transit capacity during flood evacuation scenarios is limited by the number of vehicles available for emergency transportation. The Lake Transit Authority maintains approximately 30 vehicles across its fleet, which would be insufficient to evacuate all transit-dependent residents simultaneously. In the cities, this challenge is particularly acute in Clearlake, where approximately 11 percent of households lack access to a vehicle, compared to 10 percent in Lakeport and 9 percent countywide.³¹

Critical facilities have varying capacities to accommodate evacuees. For example, the Clearlake Senior Center can accommodate approximately 100 people, while larger facilities like Kelseyville High School could shelter several hundred evacuees in an emergency. The challenge during prolonged flooding events is maintaining sufficient resources (food, water, sanitation, and medical supplies) for extended periods.

Safety

As shown on **Figure C-21**, the flooding scenario presents safety challenges for evacuation routes and critical facilities in 100-year flood zones throughout Lake County. Approximately 15.5 miles of evacuation routes throughout the county could be directly affected by flooding events, with impacts distributed across all Local Areas in the county.

Figure C-21 Evacuation Routes and Critical Facilities Affected by Flooding



Flood hazards affect evacuation routes in varying degrees across different regions of the county. The Lakeport Local Area has the most mileage of evacuation routes within a flood zone, with approximately 4.0 miles, followed by Kelseyville (3.4 miles), East Lake Communities Local Area (1.9 miles), Middletown Local Area (1.9 miles), North Lake communities Local Area (1.7 miles), Lower Lake Local Area (0.4 miles), Rivas Local Area (0.3 miles), and Cobb Mountain Local Area (0.2 miles). Major roadways at risk include State Route 20 along the northern shore of Clear Lake, State Route 29 in the City of Lakeport, and various County roads near water bodies that could be compromised during flooding events. Specific high-risk segments that could become inundated include portions of Lakeshore Boulevard in the City of Lakeport, Nice-Lucerne Cutoff, and several lakefront roads in North Lake communities.

Critical facilities serve essential functions during emergencies, including evacuation centers and electricity and communication services. Schools and community centers could serve as evacuation centers, and fire and police facilities are essential to emergency response operations. Within flood hazard zones there are 19 critical facilities that could be damaged or destroyed during flooding events or have access roads cut off by flooding.

- Five schools (Burns Valley Elementary School in Clearlake; Clear Lake High School, Lakeport Elementary School, and Terrace Middle School in Lakeport; and Coyote Valley Elementary School in Hidden Valley Lake)
- Five fire stations (Lakeshore FD Stations 70 and 72, Northshore FD Station 75, Hidden Valley FD Station 64, and Southlake FD Station 60)
- Highlands Senior Center in Clearlake
- Lampson Airport
- Lakeport Police Station
- Lakeport City Hall
- Silveira Community Center in Lakeport
- One communication tower in the Lakeport Local Area
- One electric substation in Kelseyville Local Area
- One power plant in East Lake Communities Local Area

Damage to these facilities could cause loss of power and communications, strain emergency and medical service capacity, limit water services temporarily, and limit areas of refuge for evacuating residents and visitors.

Critical facilities outside flood zones that would remain operational include public buildings and community facilities at higher elevations in the Lakeport, Kelseyville, and Rivas Local Areas, which could serve as evacuation centers. Additionally, fire stations and emergency response facilities on higher ground would maintain their capability to assist flooded areas.

During flooding events, there can be rapid changes in water levels and road conditions. Evacuation routes crossing waterways or in low-lying areas could become inundated by floodwaters and unsafe for travel with relatively little warning. As little as 6 inches of standing water can be dangerous to walk through, and even 12 inches of rushing water can carry away vehicles.³² Two feet of rushing water can carry away most vehicles, including large vehicles and trucks.³³ Historical flooding events, such as the February 2017 storms, demonstrate how rising water levels can close multiple roadways simultaneously, including

Lakeshore Boulevard in Lakeport, Nice-Lucerne Cutoff, Keys Boulevard, St. Francis Drive, and Lands End Drive. This pattern of multiple simultaneous road closures significantly reduces overall network safety during flooding events, creating isolated pockets of communities with limited emergency access.

Communities along the shoreline of Clear Lake, including portions of Nice, Lucerne, Clearlake Oaks, City of Clearlake, and City of Lakeport, and communities near other lakes or streambeds in Middletown, Upper Lake, Hidden Valley, and Kelseyville contain significant populations that could face evacuation challenges if flooding affects primary transportation routes. One-quarter of residents in these areas are over age 65, 21 percent have disabilities, and 9 percent of households do not have access to a vehicle countywide.³⁴ In the city of Lakeport, 22 percent of residents are 65 and older, and 18 percent have a disability, and the city of Clearlake has a population of 17 percent over 65 and 23 percent with a disability. Additionally, residents living in mobile home parks in flood zones, particularly in North Lakeport and Nice, can face heightened vulnerability due to housing structural concerns and typically lower elevation locations that are more susceptible to flooding.

Vehicle access is a significant consideration, with census tract data showing approximately 6 to 12 percent of households in flood-prone areas lacking access to personal vehicles, with the highest percentages in Clearlake at up to 13 percent. Manufactured home communities in flood zones, including those in Clearlake, Nice, and Lucerne, face particular risk due to their susceptibility to water damage and typical lower elevation. These communities often have higher concentrations of economically disadvantaged residents, with limited resources for temporary relocation.

For families with children (children under 10 years of age are approximately 6 to 10 percent of the population in lakefront communities), flood evacuations present logistical challenges when schools are also in flood zones.³⁵ Five schools within flood hazard zones would require coordinated closure and potential evacuation procedures—Burns Valley Elementary School in Clearlake; Clear Lake High School, Lakeport Elementary School, and Terrace School in Lakeport; and Coyote Valley Elementary School in Hidden Valley Lake. Given that most flood events develop over hours to days, these schools would most likely be closed preventatively before flooding occurs, though coordination with families and transportation providers would still be necessary. These schools serve approximately 2,500 students who would need coordinated closure and potential evacuation procedures.³⁶

Lake Transit Authority transit routes follow many low-lying roads near the lakeshore that are susceptible to flooding, which could limit their ability to assist with evacuations. During past flood events, several transit routes were suspended due to inundated roadways, further isolating vulnerable populations dependent on public transportation.

Unlike wildfires, flooding hazards can typically be forecast hours or days in advance, allowing for more planned evacuation processes. However, flash flooding in creek areas following intense rainfall can develop rapidly, creating dangerous conditions with little warning. This combination of predictable lake flooding and less predictable creek flooding creates a complex safety environment that requires careful monitoring and response.

Viability

The viability of evacuation routes depends on elevation and proximity to Clear Lake and creek corridors. Routes perpendicular to the shoreline that lead to higher elevations offer more consistent evacuation options during flood events than those running parallel to the shoreline. In the city of Lakeport, Main Street, and portions of State Route 29 at higher elevations would remain viable evacuation routes during flooding, but Lakeshore Boulevard may become impassable, as it did during the February 2017 floods.

In the City of Clearlake, Lakeshore Drive west of State Route 53 and West 40th Avenue already experiences capacity constraints during normal conditions. Alternate routes via Olympic Drive and State Route 53 North at higher elevations would provide more reliable options for residents needing to evacuate from flood-prone areas along the lakeshore.

The viability of critical facilities is a key consideration in this scenario with 19 facilities in flood hazard zones. Evacuation centers outside flood zones, particularly in Kelseyville, Middletown, Upper Lake, and higher elevation areas of Lakeport and Clearlake would offer viable shelter options during significant flooding events. Specific facilities could include Kelseyville High School and Mountain Vista Middle School in the Kelseyville Local Area, Mendocino College in the City of Lakeport, and Clearlake City Hall and Woodland Community College in the City of Clearlake. However, there may be constraints in traveling to these facilities if roadways become impassable due to flooding.

For vulnerable populations in flood-prone areas, evacuation viability would depend on early warning systems and assistance programs. Unlike wildfire evacuation, flooding often provides more warning time for the hazard event and potential evacuations, allowing more orderly movement for those with limited mobility, lacking a vehicle, or older adults.

Routes leading away from the lakeshore to higher elevations would provide the most reliable evacuation options during flooding events. Additionally, the gradual nature of many flooding events allows for phased evacuations that could reduce congestion on routes with existing capacity constraints, though this advantage can be offset if multiple communities around the county need to evacuate simultaneously.

Scenario 5: Landslides

The landslide scenario assumes localized landslide events occurring anywhere within high landslide susceptibility areas throughout Lake County, with the potential to block or compromise evacuation routes and isolate communities. Due to the mountainous topography and geological conditions, landslides constitute the most widespread geologic hazard in Lake County. These high-risk areas are predominantly in the mountainous regions surrounding Clear Lake, including hillside communities and areas with steep terrain. Most landslide damage occurs within pre-existing landslide deposits, which can damage buildings and infrastructure and block routes needed to access critical facilities. Unlike other hazard scenarios, landslide events may create sudden, localized blockages that could trap residents or emergency responders on single-access roads or in areas with limited egress options.

Capacity

The bandwidth plots generated using the travel demand model reveal several roadway segments within high landslide susceptibility areas (Class 7 and above) that experience capacity constraints during normal conditions. The mountainous terrain throughout the county creates many areas where evacuation routes traverse slopes susceptible to landslides. While some landslide events would require sheltering in place and only temporary road closures, areas downslope from burn scars may be preemptively evacuated prior to heavy rainfall events to minimize loss of life in the event of a post-fire debris flow. These evacuations may also include neighborhoods or communities with single ingress/egress routes that may become isolated in the event of post-fire debris flow.

Segments of State Route 20 between Mendenhall Avenue and Bridge Arbor North in Upper Lake show V/C ratios between 0.8 and 1.0 during PM peak hours, indicating the road is operating at its designed capacity limit under typical conditions. Additionally, portions of State Route 29 between State Route 175 and Hill Avenue in Middletown and West 40th Avenue west of State Route 53 in the city of Clearlake—both in areas with moderate to high landslide susceptibility—are just under or nearing capacity during typical conditions. These existing capacity constraints could be magnified during a landslide evacuation scenario.

A critical consideration for landslide evacuation capacity is the distributed nature of the hazard. Unlike wildfire or flooding scenarios, which tend to affect contiguous areas, landslides can simultaneously occur at multiple locations throughout the county, severing evacuation routes at numerous points. This challenges the capacity of roadways outside of landslide-prone areas, significantly reducing network capacity and creating isolated communities with limited egress options.

The assessment of roadway capacity in landslide-prone areas is further complicated by the steep, winding nature of many mountain roads in Lake County. These roads, including portions of State Route 175 through Cobb Mountain, Bottle Rock Road, Scotts Valley Road, Seigler Canyon Road, Morgan Valley Road, roadways connected to Lake Pillsbury (an unpaved forest road), and numerous other County roads traversing high elevation changes, have limited lane width, few passing opportunities, and often lack shoulders or alternative routes. During landslide events, these capacity limitations are exacerbated by roadway blockages, reducing effective lane capacity even when roads remain partially passable.

Transit capacity during landslide scenarios is severely limited. Lake Transit Authority's routes follow many of the main arterials that are susceptible to landslides, and the agency has insufficient vehicles and alternative routing options to accommodate focused evacuations from multiple affected areas simultaneously. The approximately 9 percent of households in the county without personal vehicles would face particular challenges during a landslide evacuation, especially those in remote areas with limited access roads.

Landslides could also isolate critical facilities from residents if connecting roadways are compromised. This isolation is the primary consideration, as most landslides can be cleared within a few hours, though some major events like the Cache Creek slide could require days or weeks to clear and restore access. This scenario particularly affects communities in the Rivas Local Area, Cobb Mountain Local Area, and portions of the western and eastern shores of Clear Lake, where landslide susceptibility coincides with limited road networks.

This vulnerability suggests that evacuation planning for landslide events should focus not only on identifying alternative routes but on establishing local shelter-in-place options for communities that might become isolated if primary evacuation routes are compromised by landslides. Additionally, investment in roadway infrastructure improvements, particularly in high landslide susceptibility areas that show pre-existing capacity constraints, would enhance overall evacuation capacity during landslide events.

Safety

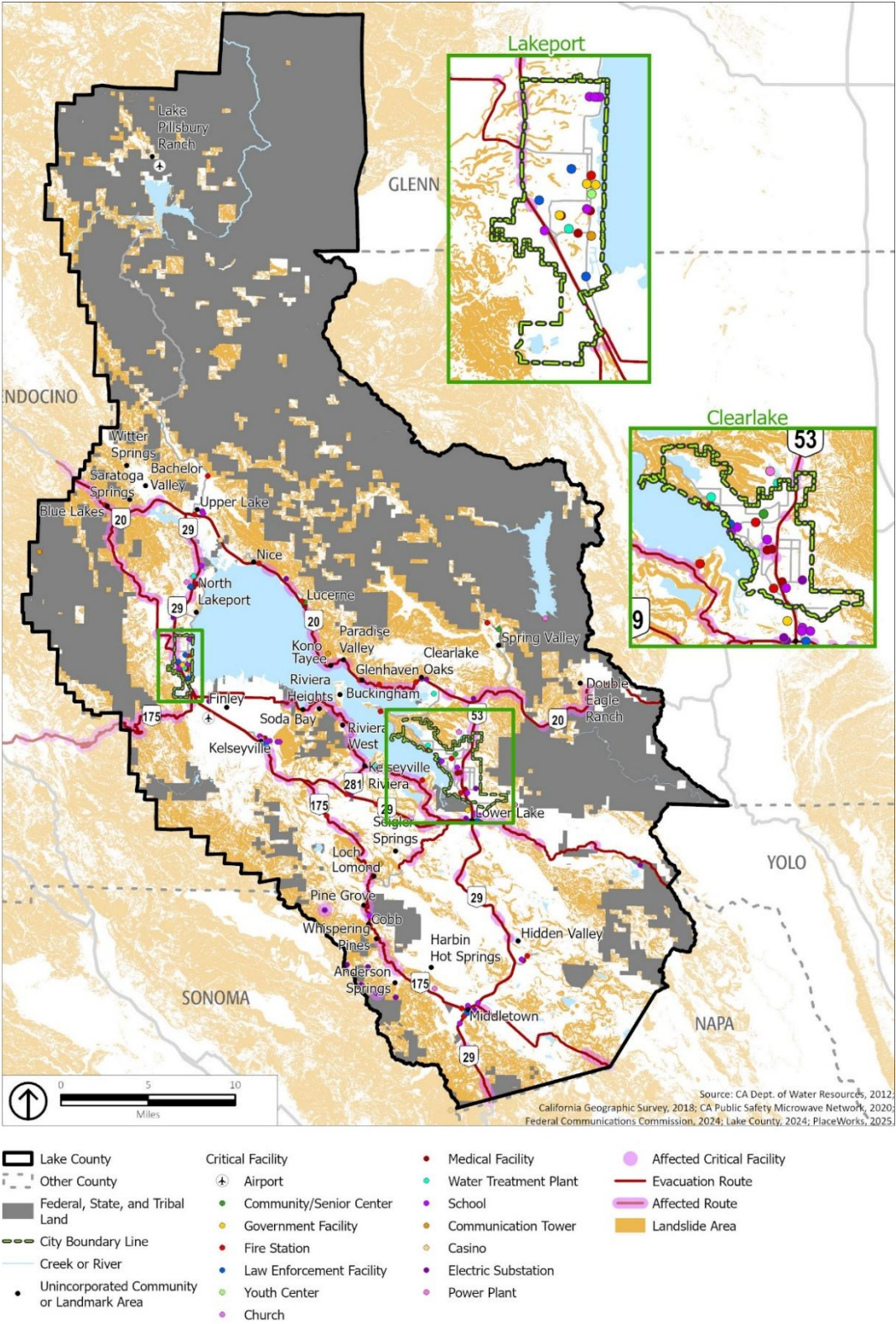
As shown on **Figure C-22**, approximately 30 miles of evacuation routes and several critical facilities are in areas of high landslide susceptibility throughout Lake County. East Lake Communities Local Area has the largest amount of evacuation routes in landslide hazards zone with 6.5 miles, followed by North Lake communities Local Area (3.4 miles), Rivas Local Area (5.7 miles), Lakeport Local Area (2.7 miles), Kelseyville Local Area (2.5 miles), Lower Lake Local Area (2.2 miles), Cobb Mountain Local Area (1.6 miles), and Middletown Local Area (1.2 miles).

Most of these miles include segments of State Route 20, State Route 29, State Route 53, and State Route 175, which serve as primary evacuation corridors across the county and have segments that pass through areas of elevated landslide risk. These routes could be compromised during or after heavy rainfall events or following wildfires that cause landslides, creating significant safety concerns for evacuation operations. Of particular note are burn scar areas where wildfires remove vegetation and destabilize slopes, significantly increasing landslide risk during subsequent rainfall events and requiring evacuation of downslope communities.

Several critical facilities are also in landslide susceptibility zones and could be damaged or destroyed by landslides, including the Bottle Rock Power plant in the Cobb Local Area, Golden State Water Co. in Lower Lake, two PG&E electric substations in Cobb and Middletown, two pump stations in Nice and Clearlake, and several water storage infrastructure facilities in Lucerne. These facilities serve essential functions during emergencies, including supporting communications, emergency medical response, and evacuation shelters. For example, damage to electrical infrastructure could cause power outages to communications systems, traffic signals, and other critical services needed during evacuation operations.

The landslide scenario presents unique safety challenges due to sudden road blockages with little or no warning. Routes traversing steep slopes or areas with a history of earth movement—such as Bottle Rock Road in the Cobb Mountain Local Area, Jerusalem Grade in the Lower Lake Local Area, and portions of State Route 175 through the Mayacamas Mountains—could become impassable due to debris flows covering roadways or slope failures undermining the foundations of roads. Areas with high landslide susceptibility that coincide with limited evacuation access, such as portions of the Rivas Local Area, Cobb Mountain Local Area, and communities along the western and eastern shores of Clear Lake, face particularly complex safety challenges, including potential roadway collapse, fallen trees and rocks blocking evacuation paths, and stranded residents.

Figure C-22 Evacuation Routes and Critical Facilities Affected by Landslide Scenarios



For vulnerable populations in landslide-prone areas, particularly older adults (25 percent of county residents), individuals with disabilities (21 percent of residents), and households without vehicles (9 percent of households), these safety challenges could be especially severe.³⁷ The isolation of communities by blocked access roads could complicate both evacuation and emergency response efforts, especially in more remote areas, like Lake Pillsbury or Spring Valley, with limited transportation alternatives. Manufactured home communities in landslide-susceptible areas, including those in Clearlake Riviera and scattered throughout hillside areas, face heightened risk due to their typically less secure foundations and their frequent location at the base of slopes. Children and schools present particular safety concerns during landslide events. Two schools are in areas with high landslide susceptibility, Cobb Mountain Elementary School and Riviera Elementary School. These schools serve approximately 750 students who would need coordinated evacuation planning between school districts and emergency services.

Viability

The distributed nature of landslide hazards creates unique evacuation challenges compared to wildfire or flooding scenarios. Unlike contiguous hazard areas, landslides can occur simultaneously at multiple discrete locations throughout the county, severing evacuation routes at numerous points. This creates isolated communities with limited egress options, making the evacuation network unviable.

For communities in areas with high landslide susceptibility, including portions of the Rivas Local Area, Cobb Mountain Local Area, and areas along the western and eastern shores of Clear Lake, the viability of evacuation routes depends on specific rainfall conditions, soil saturation, and recent wildfire history. Routes traversing flatter terrain offer more reliable evacuation options than those crossing steep slopes or areas with a documented history of earth movement.

Critical facilities in landslide susceptibility zones, including the Veteran's Administration Clinic in Clearlake, Bottle Rock Power plant in the Cobb Local Area, Crescent Bay Improvement Co. in Lower Lake, two PG&E electric substations in Cobb and Middletown, two pump stations in Nice and Clearlake, and several water storage infrastructure facilities in Lucerne, could face operational challenges after a landslide event. Damage to these facilities could disrupt both evacuation operations and emergency response capabilities, making them unusable for emergencies and evacuation shelters after a landslide event.

For vulnerable populations in landslide-prone areas, evacuation viability would be significantly affected by sudden road closures with limited warning. Unlike flooding or some wildfire scenarios, landslides often give minimal advance warning, particularly during intense rainfall events, limiting evacuation time frames for those with mobility challenges.

CONCLUSION

This Evacuation Study evaluates potential evacuation routes and critical facilities throughout Lake County and the cities of Clearlake and Lakeport, identifying their capacity, safety, and viability under multiple hazard scenarios. The analysis identifies significant evacuation challenges stemming from Lake County's unique geography, with Clear Lake at its center and mountainous terrain creating natural constraints on transportation infrastructure. Several key roadway segments already operate near or at capacity during normal peak hour travel conditions, highlighting potential bottlenecks during mass evacuation events. Additionally, many residential developments throughout the county have limited evacuation access due to single-point entries, distance from potential evacuation routes, or location in high-hazard zones.

The five hazard scenarios examined—three wildfire scenarios based on historic fire perimeters, a flooding scenario, and a landslide scenario—reveal how different hazards uniquely affect evacuation routes throughout the county. The wildfire scenarios highlight how fire can quickly compromise primary evacuation routes, particularly in the Middletown Local Area, Cobb Mountain Local Area, and communities along the northern shore of Clear Lake. The flooding scenario demonstrates vulnerabilities in lakefront communities and along creek corridors, and the landslide scenario reveals how geologic activity could simultaneously disrupt multiple evacuation routes throughout the county, potentially isolating communities.

This Evacuation Study will inform several critical planning processes in Lake County, including the Lake County 2050 General Plan Update and the Lake Area Planning Council's Wildfire Evacuation and Preparedness Plan.

Lake County's history of catastrophic wildfires and other hazards emphasizes the critical importance of effective evacuation planning. By addressing the challenges identified in this study, Lake County, the City of Clearlake, and the City of Lakeport can enhance evacuation readiness and build resilience to future emergency events, ultimately saving lives and protecting residents and visitors throughout the county.

GLOSSARY

Evacuation Capacity: The ability of transportation infrastructure and resources to support evacuees and responders during emergency scenarios.

Climate Change: A change in the state of the climate that can be identified by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer.

Climate-Vulnerable Communities: Communities that experience heightened risk and increased sensitivity to climate change and have less capacity and fewer resources to cope with, adapt to, or recover from climate impacts.

Emergency Operations Plan (EOP): An ongoing plan for responding to a wide variety of potential hazards. An EOP describes how people and property will be protected; details who is responsible for carrying out specific actions; identifies the personnel, equipment, facilities, supplies, and other resources available; and outlines how all actions will be coordinated.

Evacuation: The organized, phased, and supervised withdrawal, dispersal, or removal of civilians from dangerous or potentially dangerous areas and their reception and care in safe areas.

Evacuation Center: Interim spaces that enable evacuees to access basic services and information. Staff at these centers triage evacuee needs by helping them transfer to shelters, connect with reunification services, and access additional resources.

Evacuation Endpoints: Locations that provide a safe place for evacuees to shelter in the days and/or weeks following an emergency scenario.

Evacuation Route: A designated path or way that is identified for evacuees to escape from dangerous areas during an emergency. These routes may include highways, major roads, secondary roads, and other transportation infrastructure that facilitate egress from hazard areas.

Hazard: An event or physical condition that has the potential to cause fatalities, injuries, property damage, infrastructure damage, agricultural losses, damage to the environment, interruption of business, or other types of harm or loss.

Local Hazard Mitigation Plan (LHMP): Plans that reduce loss of life and property by minimizing the impact of disasters. LHMPs identify natural disaster risks and vulnerabilities common to the area and develop long-term strategies for protection.

Resilience (Community): The ability of communities to withstand, recover, and learn from past disasters to strengthen future response and recovery efforts.

Risk: The potential for damage or loss created by the interaction of hazards with assets such as buildings, infrastructure, or natural and cultural resources.

Evacuation Safety: For evacuation planning, the likelihood of evacuees or responders being harmed while using potential evacuation routes.

Secondary Egress: An adequate secondary egress route is a road, navigable by a passenger vehicle, of equal construction standard to the primary road that does not have locked gates or limited access and does not direct traffic to the same outlet road as the primary road.

Shelter-in-place: The use of a structure to temporarily separate individuals from a hazard or threat.

Temporary Areas of Refuge: Locations that are used by individuals when a hazard is imminent or occurs with no warning and are meant to provide temporary and limited protection as an incident occurs.

Evacuation Viability: The ability of transportation infrastructure and services to reasonably enable populations to leave an area at risk and/or reach temporary areas of refuge under a range of emergency scenarios, given the respective time constraints.

ENDNOTES

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