

A photograph showing three firefighters in full protective gear, including helmets and heavy jackets, standing in a forest. They are facing a massive, intense wildfire that is consuming several large trees. The fire is bright orange and yellow, with thick smoke rising. The firefighters are positioned in the foreground, looking towards the burning trees. The scene is dramatic and highlights the scale of the wildfire.

A fierce California wildfire blazes through the forest, as brave firefighters battle to protect homes and wildlife.

FACED WITH WILDFIRE THREATS, A CALIFORNIA COMMUNITY GETS READY

EVACUATION PREPAREDNESS PLANNING CAN PROVIDE RESILIENCE IN THE FACE OF WILDFIRE HAZARDS

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The threat of wildfire looms large for communities in the West, [with fires growing in size and intensity due to factors such as drought, rising temperatures, and a history of fire suppression](#). These conditions amplify the risk of fast-moving, catastrophic blazes. Many communities are unprepared for this new normal, leading to tragic results. In 2023, Lahaina, Hawaii experienced [one of the five deadliest wildfires in U.S. history](#), causing 101 deaths and destroying the historic town. [California's deadliest fire — the Camp Fire](#), centered in the town of Paradise, occurred in 2018. [Eight of the state's ten largest wildfires have occurred since 2017](#), burning over 4 million acres of land.

An emerging area of planning—evacuation preparedness studies—offers hope for communities facing the growing threat of wildfires. These studies bring together multidisciplinary teams and community members to identify local risks, brainstorm mitigation strategies, and create a coordinated evacuation plan. The studies analyze every aspect of a community's wildfire response, including roadway capacity and redundancy, communications coordination, and the needs of vulnerable populations.

This thorough assessment provides the framework for actionable recommendations that communities can follow to prevent deaths and damage.

Recently, such work was completed in greater Placerville, California, under the Greater Placerville Wildfire Evacuation Preparedness, Community Safety, and Resiliency Study. This process, led by DKS Associates for the El Dorado County Transportation Commission (EDCTC), was completed in partnership with local agencies covering fire, traffic, and emergency services. It provides a model for fire-adapted communities, increasing community preparedness and better preparing public agencies for potential wildfire evacuations through infrastructure and operations planning.

This work also supported El Dorado County's update to its General Plan Safety Element by helping it comply with California state legislation AB 747, which requires communities to identify evacuation routes and assess their capacity, safety, and viability under a range of emergency scenarios.

A Critical Moment for Preparedness

Placerville is nestled on the western slope of the Sierra Nevada mountains, between Sacramento and Lake Tahoe. Like much of the West, it is known for cool, wet winters and hot, dry summers, but recently it has experienced hotter, drier summers and many years of drought.

The region's Gold Rush history and beloved apple orchards make it a draw for tourists from California and beyond. All year, and especially during fall's "Apple Hill season," people flock to El Dorado County to pick apples, taste wine, and experience the historic gold mines and Placerville's bustling downtown.

This autumn uptick in visitors coincides with the end of the dry season, meaning a higher risk of fire—and more people to evacuate. Combined with a transportation bottleneck in and out of Placerville and several vulnerable populations among year-round residents (about 25% of greater Placerville's residents are senior citizens), these factors create challenging potential evacuation conditions.

"El Dorado County sees a huge number of visitors during all seasons, and that compounds the challenges of getting those at risk from wildfire evacuated, due to the number of vehicles on the road, the road capacity, as well as alerting those visitors who are likely not signed up for El Dorado County Emergency Alerts," explains Lieutenant Morton, Emergency Services Manager with the El Dorado County Sheriff's Office of Emergency Services. "As local law enforcement, we are familiar with the bottlenecks and places we see as a challenge during evacuations. Having now seen the data during a scenario, it validates our concerns and demonstrates the need for early alerting and evacuations when possible in specific areas."

Dan Bolster, Senior Transportation Planner with EDCTC, agrees that the cross-agency planning was helpful. "From the beginning, the process was collaborative, and EDCTC, as a transportation planning agency, leaned on first responders like the County Office of Emergency Services and Cal Fire to help the project team understand evacuation timing and the best process to use for evacuating a community.

The 125-square-mile study area is no stranger to wildfires, as a significant portion of the greater Placerville region is in the state's [Very High Fire Hazard Severity Zone](#). Two of California's most catastrophic fires happened nearby: the Camp Fire in 2018, and the Caldor Fire, which burned more than 220,000 acres over two months in 2021.

Modeling Wildfire Risks and Responses

To prepare greater Placerville for a wildfire, DKS led an extensive community-wide planning process that brought together a wide range of affected groups. The goal was to understand the risks, develop real-world wildfire scenarios, simulate wildfire evacuations, and create data-driven evacuation strategies to save lives.



Randy Johnson facilitating the El Dorado Transportation Commission's virtual Incident Command Center.

Pictured Left to Right: Randy Johnson, Principal, DKS Associates; Jeff Hoag, Battalion Chief, Cal Fire; Braden Stirling, Fire Marshal Division Chief, El Dorado County Fire Protection District; Lt. Troy Morton, Emergency Services Manager, El Dorado County Sheriff Office of Emergency Services

Early on, DKS convened an advisory group that included emergency responders, transportation agencies, utilities, and local government. The advisory group compiled data on critical factors like terrain, vegetation, transportation, wind patterns, and the power grid. The group also assessed human geography, identifying equity issues such as where vulnerable populations are concentrated, and challenges such as communication and interagency coordination. This assessment revealed key risks, such as limited evacuation routes often constrained by the region's challenging topography and mix of urban and rural land uses.

With this information in hand, DKS and the advisory group formed a Virtual Incident Command Center to develop wildfire scenarios that presented a real threat and raised the greatest concern for emergency responders. Just as in a real wildfire situation, personnel from the state's Cal Fire (the California Department of Forestry and Fire Protection) and El Dorado County Fire provided detailed scenario parameters. The El Dorado County Sheriff's Office of Emergency Services then guided the team in developing evacuation order parameters, such as evacuation and warning zone boundaries, road closures, timing, and evacuation destinations.

These real-world fire and evacuation parameters shaped the model to ensure a realistic evacuation assessment. DKS modeled four fires in the highest-risk seasons, times of day, and weather conditions. The team relied on multiple data sources—including census household data, replica data, and estimated visitor and worker populations during peak tourist season—to understand the evacuation demand for a fire scenario impacting the region's Camino area. State transportation data was used to estimate background traffic conditions that would be present at the time of the evacuation. Each wildfire evacuation scenario was modeled using a simulation-based Dynamic Traffic Assignment (DTA) model to capture the unique time dynamics of the evacuation demand and how the system capacity influences route choice and congestion bottleneck patterns.

The result of this analysis was a detailed understanding of evacuation time estimates and how the local roadway network could accommodate a particular evacuation scenario. This allowed the team to identify critical bottleneck locations and develop operational strategies, such as directional road closures, manual flagging of traffic, or infrastructure improvements that can help traffic flow better during an evacuation, reducing the amount of staffing resources necessary to control traffic.

"In confronting El Dorado County's wildfire threats, coordinated planning is our first line of defense," said Jeff Hoag, Battalion Chief with the Amador El Dorado Unit. "By optimizing evacuation routes, improving infrastructure, and fostering collaboration, we not only safeguard lives but also enable fire resources to respond more effectively. With streamlined evacuations, we enable firefighting efforts to focus on suppression, minimizing the impact of these destructive wildfires on our communities."

A major challenge identified by the model was the development of significant congestion downstream as most traffic funneled toward nearby highway U.S. Route 50. To mitigate this, an "EvacuLane" was proposed, allowing the shoulder to serve as an additional lane of traffic during an emergency, while avoiding the increased vehicle traffic that would be induced by a permanent widening of the highway.

Other infrastructure improvements identified to smooth traffic flow during evacuations included converting stop-controlled intersections to roundabouts, expanding traffic signal battery backup systems with central system communications (which remotely adjust and monitor signal timing), and installing Intelligent Transportation System (ITS) stations with remote cameras and weather stations to provide the ability to monitor fire, weather, and traffic conditions at key evacuation route junctions.

More than 37 infrastructure improvements and operational strategies were identified as mitigation strategies to improve evacuation times, each with cost estimates and potential funding sources to support the region's agencies with an implementation plan.

A Focus on Equity and Public Engagement

DKS and the advisory group made equity and public engagement central to the planning process. Their goals included building awareness, learning about community concerns, and addressing the needs of vulnerable populations in the evacuation plan.

At a series of community workshops, team members shared an existing conditions report and sought to authentically understand people's worries. They developed a Social Pinpoint map, which provides an interactive visual format for sharing plans and options, and a website that allowed community members to place pins and provide individual comments and ideas.

The whole community has been very engaged and motivated," said Randy Johnson, DKS Principal and Project Manager for the Placerville study. "The folks who are engaged want to help, want to prepare, and want to make the changes necessary to protect their community. Several of the strategies used in the evacuation modeling came directly from the Social Pinpoint suggestions, and our modeling showed those were valuable strategies."

To ensure equity, the team analyzed demographics to identify those who would be disproportionately

impacted by wildfires and face increased challenges during evacuation. Senior citizens, who comprise about 25% of the study area population and many of whom live in retirement homes, were a key focus. Hospitals, needing to evacuate both staff and patients, were also considered vulnerable. The plan also needed to account for visitors to the area, who are less likely to be aware of wildfire risks and know where to go or how to receive emergency communications.

Additionally, greater Placerville is home to people with less access to resources, such as low-income households, geographically isolated households, and households without access to a vehicle. Residents facing societal barriers, such as people of color and non-English-speaking individuals, face specific challenges during evacuations as well.

In addition to online workshops and information via the project website, the DKS Public Outreach team shared information about the project and how individuals could provide valuable feedback at community pop-up events, such as a booth at a local Farmers Market, presentations at Fire Safe Council meetings, and a project-specific workshop.

The public process built widespread awareness and ensured residents' voices would influence recommendations around public outreach, wildfire preparedness, infrastructure improvements, and more.

Working Toward a Fire-Adapted Community

This thorough planning process concluded in June 2024 when the El Dorado County Transportation Commission Board officially adopted the Greater Placerville Wildfire Evacuation Preparedness, Community Safety, and Resiliency Study. The plan outlines tangible investments such as infrastructure upgrades, emergency resources, and communication systems to be implemented in the coming years. With identified funding sources, local agencies are now equipped to seek grant funding opportunities to finance these improvements. Through community-wide engagement, equitable solutions, and data-driven decision-making, the greater Placerville region now has a roadmap to become a fire-adapted community prepared for wildfires and capable of protecting lives.

The Placerville region's approach, led by DKS Associates, provides a valuable model for other at-risk communities to protect themselves before disaster strikes.

Randy Johnson is a Principal at DKS Associates with over 15 years of experience in traffic engineering and transportation planning. He specializes in dynamic traffic assignment, capacity assessment, roundabout analysis, multi-modal modeling, and traffic impact studies. Randy is also an expert in microscopic simulation for all modes and travel demand modeling. He has worked with local agencies and departments of transportation on projects throughout North America.

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