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A Model for Efficiently Allocating Resources to Mitigate Wildfire Risk along California Roadways

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Issue

A key function of a highway network is to maintain access during normal and emergency operations. During wildfire evacuations, first-responders and firefighters depend on highways and local roads for transporting heavy equipment to communities in need. The California Department of Transportation (Caltrans) is expanding vegetation management to begin establishing defensible space zones along California's nearly 16,000 miles of state highways and in about 230,000 acres of highway right-of-way. However, extended drought, a longer fire season, and higher temperatures brought on by climate change, along with the spread of invasive weeds and dense, dry vegetation, have created new challenges. From 2015-2020, more than 80 wildfires in California killed 206 people, injured and displaced

thousands, and caused over \$2 trillion in overall damages—\$520 million to state highways. Furthermore, differing vulnerabilities and needs across the state provide motivation to allocate resources in an efficient and targeted manner to reduce wildfire risk.

The California Department of Forestry and Fire Protection produced a Community Wildfire Prevention and Mitigation Report in 2019 with a methodology to assess wildfire risk. Caltrans and researchers at the University of California, Davis applied these methods to develop a highway-segment-specific prioritization model for vegetation management within highway rights-of-way. The model uses 21 spatial layers to rank wildfire vulnerability (Figure 1). The researchers also interviewed Caltrans staff about opportunities for and obstacles to increasing the pace and scale of vegetation treatments.

Group	Description (Criteria)	Weighting
Caltrans	Average Daily Traffic Numbers (AADT)	0.07
	Highway Class	0.07
	Emergency Evacuation Transportation Routes	0.14
Calfire	Fire Threat	0.08
	SRA / FHSZ	0.05
	Fire History	0.05
	Large Trees	0.05
Census	Families in Poverty	0.03
	People with Disabilities	0.03
	People that have Difficulty Speaking English	0.03
	People over 65	0.03
	People Under 5	0.03
	Households without a Car	0.03
	Housing Density	0.04
USDA	WUI	0.06
	FRID	0.06
	Carbon Storage	0.03
	Wildfire Threat to Water	0.03
	Surface Waters	0.03
	Site Quality	0.03
	Standing Timber	0.03

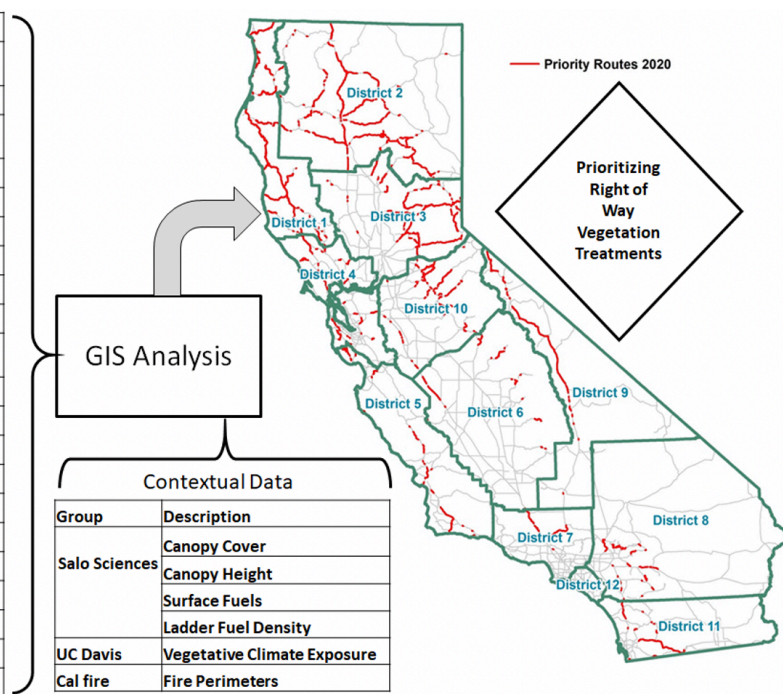


Figure 1. The spatial layers used for the priority road-segment model, contextual data used to supplement the model, and the 2020 California State Highway priority route output.

Key Research Findings

The new model demonstrates the utility of using holistic spatial modeling to assess wildfire vulnerability. The model allows practitioners to consider environmental and social risk factors and road conditions collectively. Its data layers capture fire ignition risk and potential severity, data on community vulnerabilities, and information on which roadways are important for facilitating evacuations.

The model can be used to prioritize areas for vegetation treatment and to engage local governments and wildfire-fighting units to coordinate landscape fire risk reductions (Figure 2). Each Caltrans district can use this model to select the highest priority road segments for wildfire risk abatement and discuss these with local fire departments and other stakeholders.

Resource constraints limit vegetation control strategies. Caltrans vegetation management typically consists of herbicide application and brush removal along a 4- to 10-foot strip on each side of the highway. However, the Caltrans right-of-way often extends further. Interviews identified operational and budget constraints that limit the vegetation management zone.

Policy Implications

The recently formed Caltrans Office of Vegetation and Wildfire Management has incorporated the prioritized highway segment model into the Caltrans Vegetation and Wildfire Management Map Viewer¹ to support effective vegetation control, defensible space creation, and wildfire risk abatement within and beyond the right-of-way. Model outputs have

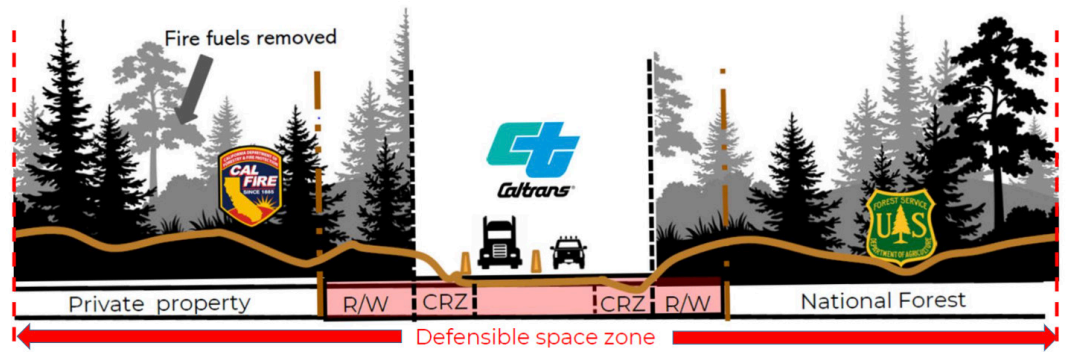


Figure 2. Caltrans' control zones (CRZ) and rights-of-way (R/W) about private and federal lands that also require wildfire risk reduction. The gray trees represent vegetation to be removed to decrease density and reduce fire risk.

served as the basis for 12 district-level workshops with community partners and stakeholders to further identify the highest priority right-of-way areas for vegetation treatment and wildfire risk abatement. The outcomes of these meetings will inform the development of district strategic plans.

More Information

This policy brief is drawn from “2020 Critical Update to Caltrans Wildfire Vulnerability Analysis,” a report from the National Center for Sustainable Transportation, authored by James H. Thorne, Ryan M. Boynton, Allan D. Hollander, Jason P. Whitney, and Kristen D. Shapiro of the University of California, Davis. The full report can be found on the NCST website at <https://ncst.ucdavis.edu/research-product/2020-critical-update-caltrans-wildfire-vulnerability-analysis>.

For more information about the findings presented in this brief, contact James Thorne at jhthorne@ucdavis.edu or Jason Whitney at jpwhitney@ucdavis.edu.

¹ <https://caltrans.maps.arcgis.com/apps/webappviewer/index.html?id=b824c2b040c0475fb207df0c432cbf1d>

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