

## INTEGRATED MODEL OF FIRE, COMMUNICATIONS, AND TRAFFIC FOR WILDFIRE EVACUATION IN MARIN COUNTY

In this study, we address possible factors that might affect wildfire evacuation within Marin County, California. Such risk factors are incorporated within an integrated model involving fire, communications, and traffic. Five communities within Marin County were selected as case study areas to facilitate understanding about specific risks that communities might encounter: Fairfax, Novato, San Rafael, Tamalpais, and Inverness.

First, at the macro level, Marin County takes the responsibility to identify risks for the whole county. Marin Wildfire Prevention Authority (MWPA), an organization that provides resources and best practices to reduce wildfire risk, identifies wildfire threats county-wide as well as risks for specific communities. Second, meso level problems are observed at local levels where five communities that present specific risks for evacuation were selected. For example, populations who need special assistance, like school children and senior citizens, are considered. School parents and elderly care facilities within and near areas at risk of wildfire are identified and incorporated into the models. Third, at the micro level, selected agents that create bottlenecks for each study area are analyzed. This agent-based approach tracks the trajectory of agents who take the longest evacuation times. By doing so, the most detailed level of analysis is achieved by assessing the patterns of the agents' movement measured by time.

Using this integrated model of fire, communications, and traffic, Meso-level study found that in communities like Fairfax, Novato, and San Rafael, planning is required to distribute limited resources between noon to 2pm. Such a finding was based on the result that the number of 911 calls analysis was concentrated around that time range. Therefore, sharing resources by creating inter-community networks is suggested.

Micro-analysis presented agent level evacuation paths by time, showing where the most congested areas were and at what times. The time and areas of congestion varied across communities. However, some similarities are also observed. Fairfax, San Rafael and Tamalpais commonly had evacuees with relatively longer evacuation times concentrated around nearby areas rather than being distributed throughout the community. But the locations of the agents' congestions – between origin and destination – differed, requiring further study on specific risk factors other than communications and traffic that might affect each community.

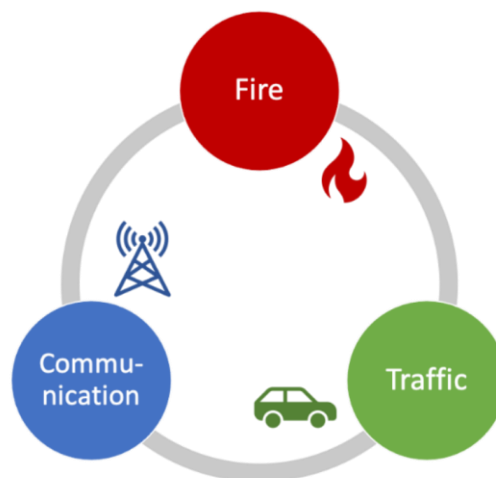


Figure 1. Integrated Model of Wildfire Evacuation

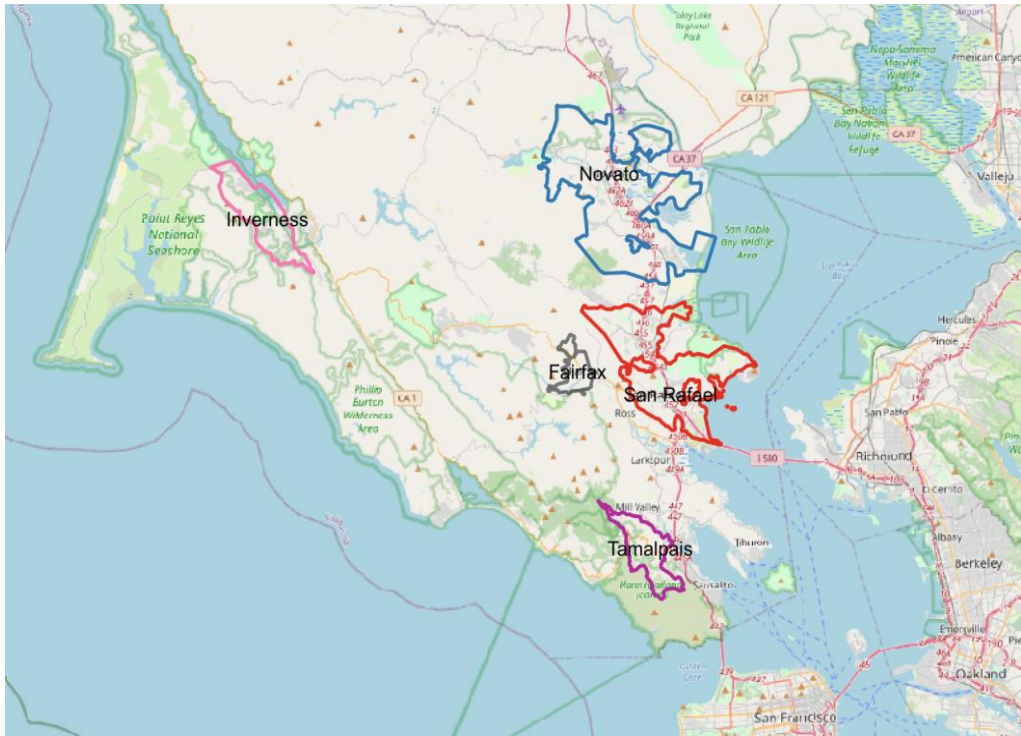


Figure 2. Map of Test Areas

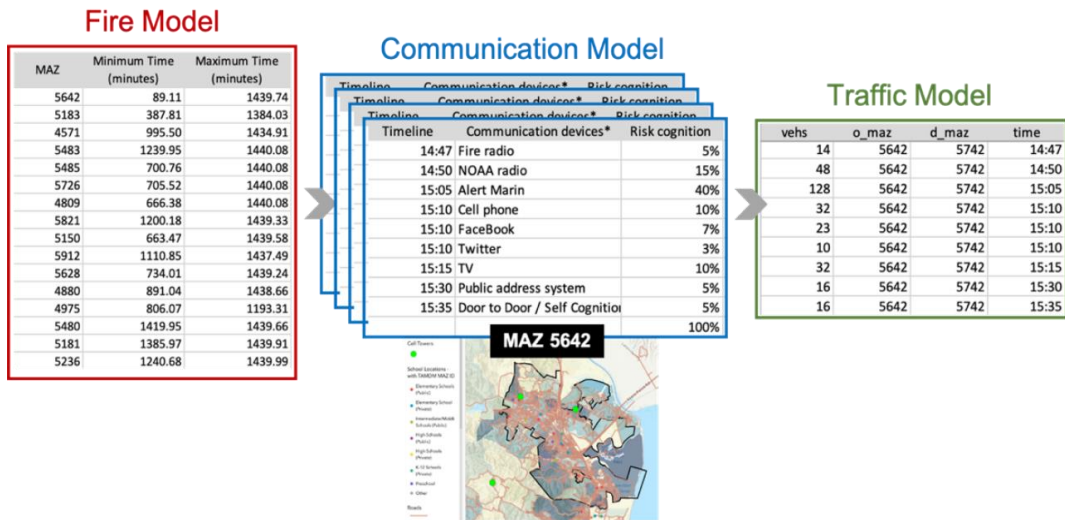


Figure 3. Sequence of Inputs to the Traffic Model