

Title: Leveraging Technologies to Manage Post-Wildfire Debris Flows

Overview: This program leveraged technologies to plan for and respond to life-threatening post-wildfire debris flows and share vital information with other agencies to improve real-time communication.

Challenge: Riverside County experienced widespread wildfires in summer 2018 which burned over 36,000 acres. This put the community at risk of flood, mud and/or debris flows which can be triggered by relatively small storms. To keep the community safe, the Riverside County Flood Control and Water Conservation District (District) needed to quickly set up technologies that allowed for real-time situational awareness during storms and would allow emergency personnel to stay informed and react efficiently when issues arose. The District was able to monitor the performance of flood control facilities to ensure the safety of the community.

Solution: Spurred by the numerous risks associated with post-wildfire storms, the District has been using various technologies to improve response to life-threatening flows. First, drone technology was used for hazard determination and evacuation mapping. The residents in and around high-risk areas were warned and able to prepare while flood control facilities were readied for debris flows. Real-time situational awareness downstream of the burn scar was achieved through the use of rainfall and depth monitoring gauges and cameras. All of the information that was gathered during storms was presented in a web-based dashboard. The dashboard displayed rainfall data from across the burn scar and used straightforward visual cues to alert users when rainfall intensities exceeded the predicted debris-producing thresholds. The database also provided live webcam feeds and time lapse images of high-risk areas. The dashboard became essential for decision making at various emergency command posts throughout the County. The District leveraged existing field communication tools (Google applications and Survey123) and implemented data collection technologies for vital real-time updates from field staff during storms. This information helped our Operations and Maintenance personnel prioritize facilities that needed attention. After the storm season, California Geological Survey (CGS) used the collected data to advance the science of post-wildfire response, with respect to debris flows by analyzing the information the District gathered on pre- and post-wildfire conditions to use throughout California.

Innovation: The District used innovative technology to better plan for and communicate evacuations, to document the impacts of storms in the burn area to further the understanding of risks for the future, to improve communication between field staff and managers at emergency command posts, and to enhance real-time situational awareness of flood control facilities during storms. Many different creative approaches and technologies were used to address problems. The multiple technologies that the District utilized allowed the County to better communicate internally and externally so that post-fire and post-storm issues could be addressed efficiently and cost-effectively.

Results: Information that the District was collecting was readily shared with other agencies, such as the California Department of Forestry and Fire Protection (CALFIRE), CGS, Riverside County Transportation, the Riverside County Emergency Management Department (EMD), the Riverside County Sheriff's Department, and local Cities. The effective gathering and coordination of information promoted intergovernmental collaboration while planning and preparing for floods and also addressed post-fire and post-storm hazards. Several burned watersheds experienced rainfall intensities that happen only once every 200 years. These 200-year storms on top of already unstable, charred slopes caused unprecedented debris flows through the downstream communities. The technologies that were used allowed Riverside County to conserve resources and make informed and efficient decisions that kept residents safe.

Replicability: Replication of the communication technologies used for this program can be done by other California counties that have been affected by wildfires and would allow them to benefit through more efficient communication. By utilizing available and free applications, the District was able to use cell phones as field data collection tools with little effort and cost. Installation of additional rain gauges and equipment require an already established rain gauge network. A similar notification and informational dashboard can be created by IT staff using non-proprietary standards utilized by modern web application development teams.

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