AGU THRIVING EARTH EXCHANGE



Wildfires like the 2016 Soberanes Fire along the coastal ridge of Monterey County, are deadly, costly, and, in recent years, have become more frequent and intense. Acute risks include incineration and burns, but it's often the effects of smoke inhalation carried by wind to adjacent communities that cause lasting health risks for residents. Burnout operations depicted here on September 17, 2016, gradually brought the Soberanes Fire under control. Its suppression cost more than \$260 million, making it the costliest wildfire to fight in US history at the time. Image courtesy of US Department of Agriculture.

Empowering residents to take control in facing wildfire risk

Building a proactive, informed, and prepared community was the goal for mitigating and reducing wildfire risk in Carmel Valley

Monterey County, located in central California about 140 miles south of San Francisco, has twelve distinct areas that offer an array of diverse geographies. Big Sur's oceanside rocky cliffs, lush mountains, and coastal redwood forests make it hard to compete with Carmel-bythe-Sea's white sandy beaches. While Salinas provides a look into California's thriving agricultural industry nestled between mountains, Soledad offers sweeping vistas and hiking trails through Pinnacles National Park.

Go a little further inland, and you will find Carmel Valley which spans an area of approximately 189 square miles. With nearly 6,000 residents, the unincorporated community is situated in an area known as the wildland-urban interface, where single-family and multi-family homes coexist with California chaparral and oak woodland ecosystems. The area recently experienced a devastating wildfire, and residents now live in uncertainty (and occasionally fear) due to ongoing fire risks.

Even though the state of California devotes many resources, personnel, and programs to preventing wildfires, residents of Carmel Valley want to be more proactive about fostering a fire-resilient neighborhood.

The threat of annual wildfires is a persistent dimension of life in central California, exacerbated by its extensive grassy and wooded areas and low humidity. A small spark can quickly grow into a deadly and costly event. In recent years, extreme drought conditions and record-breaking heat have caused some of the largest and most destructive wildfires on record. Each year brings weeks and sometimes months of hazardous conditions that tempt, and often lead to, devastation.

Residents in Carmel Valley recognized an important opportunity to alert the public to wildfire risks and mitigation strategies by seeking support from the American Geophysical Union's Thriving Earth Exchange.



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"Everyone was very supportive of the project," said Katie Swensen, a doctoral candidate at Washington State University in Vancouver, Washington, studying wildfire ecohydrology and a research fellow with the AGU's Thriving Earth Exchange. "We even had our district's supervisor introduce the webinar series, so that endorsement was really helpful. Having the Fire Safe Council and state fire officials helped, too. This project wasn't about reinventing the wheel, it was about making sure that community members know where the right information is."

As a first step, the community made sure that every resident is informed about wildfire planning, the steps to take to lower their risk of a fire, and how to access resources before, during, and after a fire. In the past, the residents of Carmel Valley have banded together to share information and encourage action in the face of problems like the Covid-19 pandemic and wildfire evacuations in 2020. The residents were building on its history of group efforts to better prepare for and lessen the damage caused by future wildfires.

"This was purely a community-led project which I think is a great thing," said Jamie Tuitele-Lewis, the fire fuel mitigation program and forest health coordinator with the Resource Conservation District of Monterey County and an AGU Thriving Earth Exchange community leader. "I think had it been up to me or other people, it might have gone in a slightly different direction, but it worked out best in addressing specific community needs. That's what was needed to get it going."

In Carmel Valley, and in dozens of communities around the country, AGU's Thriving Earth Exchange serves as a connector and facilitator to bring together communities who have self-identified concerns, fellows who organize and administer community-based projects that address those concerns, and experts who can address the specific scientific issues that come to bear on the projects. The Thriving Earth Exchange trains and convenes fellows during the course of their projects, offers limited monetary support, and provides opportunities for community members to create awareness of the scientific challenges that projects raise and, ideally, help solve, as well as opportunities for fellows to share their work.

First step in lowering risk is education

The project was split into two parts to address the difficulties of wildfire mitigation and education. The first phase focused efforts on creating a community-wide understanding of the local wildfire landscape, resource availability, and best practices for surviving fire. The second phase, which has not begun yet, includes compiling the key takeaways from the webinar series and creating a series of short fact sheets on wildfires.

The five webinars featured brief presentations from a variety of wildfire authorities, such as local fire district chiefs, CalFire fuels specialists, grant coordinators, wildfire scientists, and invasive species specialists. Each webinar included a question-and-answer session to allow for residents to freely ask the expert questions and relay their concerns. With webinar attendees, the group hopes to begin defining the second part of the project's scope through community surveys to discover other wildfire-related community priorities might be addressed through a scientific partnership.

"We had homeowners, renters, people that were younger, older, and so many questions that we probably could have tripled the time for the Q&As," said Swensen. "I think we were able to capture a pretty good representation of the community, and we had a lot of positive responses."

Ultimately, the community's goal is centered around having a better understanding of the wildfire landscape and being aware of the preventative measures that can be taken will give residents more control, while lessening their fears.

A wildfire's overall economic effects extend past building structures and include health expenses, losses from power outages, business closures, travel cancellations, and supply chain disruptions, among other expenses. Recent years have seen a sharp rise in the amount of acres burned by wildfires, which has led to more destructive wildfires and greater economic losses. Furthermore, eight of the state's largest wildfires by recorded area occurred after 2017, with the Dixie Fire from 2021 recently added to the list.

According to the Bay Area Council Economic Institute, "when counting insured losses, the 2020 wildfire season is estimated to have produced between \$5 billion and \$9 billion in destruction, and this comes after wildfire seasons in 2017 and 2018 that each produced more than \$10 billion in insured losses."

According to the U.S. Census Bureau, the median age in Carmel Valley is 58.8 years, which presents another level of complexity. Since half the population is older than 58.8, mobility issues make evacuation challenging. In a crisis, without access to their regular doctors, elderly residents and their caretakers could find themselves in difficult situations when they need to make a decision swiftly about care or medication. The project team took this into consideration when developing the programs and finding the speakers.



Half the population of Monterey County is older than 58.8, making mobility issues more acute during wildfire evacuations. In a crisis, without access to their regular doctors, elderly residents and their caretakers could find themselves in difficult situations when they need to make swift decisions about care or medication. Between 2010 and 2060, the number of residents over the age of 60 is expected to increase by a minimum of 150% in Monterey County and over 200% in the neighboring counties of San Benito and Santa Clara. Map courtesy California Department of Aging.

"We were inclusive in the way we operated where every viewpoint was considered and taken in," said Tuitele-Lewis. "The demographics in Carmel Valley skew towards higher-income and white residents, so that's the primary audience. A lot of the local organizations also reflect that, as well."

The 2020 wildfire season also brought an extended period of unhealthy air quality in the area. The monthly maximum air quality index (AQI) score was above 100 for three consecutive months, which is considered unhealthy for sensitive groups. Upticks in hospital admis-sions for burns, as well as smoke inhalation, lung tissue damage, lung inflammation, and other respiratory issues can tax any health system no matter how well equipped it is. The health impact can be devastating to not just the patients, but the entire region. More sick people and hos-pital admissions means more children not in school and more adults unable to work.

What it takes to be prepared for wildfires

Much of what's involved in preparing for wildfires can be done well in-advance of wildfire season. The project



In 2020, the River (top), Carmel (middle) and Dolan (bottom) Fires swept through Monterey County, together burning more than 179,000 acres between August and October. That wildfire season also brought an extended period of unhealthy air quality in the area, raising the air quality index score above 100 for three consecutive months, which is considered acutely unhealthy for sensitive groups, and generally unhealthy for everyone else. Map courtesy Bay Area Newsgroup / Mercury News.



Carmel Valley spans an area of approximately 189 square miles halfway up the California coastline and an easy drive from San Francisco and San Jose. With nearly 6,000 residents, the unincorporated community is situated in an area known as the wildland-urban interface, where singlefamily and multi-family homes coexist with California chaparral and oak woodland eco-systems.

team, in partnership with Monterey County Fire Safe Council, structured the five webinars around the varying specifics of preparedness strategies.

Staying connected and alert is the foundation for preparedness and action. Signing up for Monterey County's emergency text-alert system is vital to understanding the severity and proximity of wildfires. Learning and practicing evacuation routes, gathering evacuation supplies, like water and non-perishable food, flashlight, N95 masks. The project team also encouraged residents to check to make sure insurance policies and personal documents are up to date and kept in one place to swiftly grab in the event of an evacuation.

Creating a defensible space around your home is the first physical line of defense against raging fires. A defensible space is the barrier between a structure on your property and the grass, trees, shrubs, or any nearby wildland. In addition to helping to prevent your home from catching fire from radiant heat, embers, or direct flame contact, this area is necessary to slow or stop the spread of wildfire. Additionally, firefighters have a safe area to work in which they can defend your home when there is adequate space.

Harden your home is the second physical defense, which address the three ways homes catch fire: Flames from a nearby wildfire or a burning home, radiant heat from nearby burning plants or structures, or flying embers. Interestingly, the majority of homes during a wildfire are destroyed by flying embers from the fire, which can burn structures up to a mile away. When a wildfire threatens, taking the necessary steps to harden (prepare) your home can help increase its chance of survival. For instance, deck surfaces within 10 feet of a building should be built with ignition-resistant, noncombustible, or other approved materials. Covering your chimney and stovepipe outlets with a non-flammable screen is another example. Building or replacing the roof with materials such as composition, metal, clay or tile. Remove accumulated vegetative debris from the roof.

While wildfires are a way of life in California, building a more fire-resilient community can lessen the impacts of physical, health, economic, and environmental damage. Carmel Valley residents recognized that preparedness isn't just about anticipating danger, but also coordinating amongst each other as a public education strategy to protect life, limb, and the valuable investments they've made in their communities.

"Curating wildfire knowledge, resources, and best practices for residents living with wildfire in Carmel Valley" is a project of AGU's Thriving Earth Exchange, which advances community solutions to some of the most vexing environmental challenges. Thriving Earth Exchange helps scientists, community leads and sponsors work together to conserve natural resources, mitigate climate change and create awareness of natural hazards and their impacts on communities.

Learn more at thrivingearthexchange.org.