USGS science for a changing world

USGS Western Ecological Research Center

Research Profile

Southern California Wildfire Risk Scenario Project

Bob Carey/American Red Cross

What are the driving factors of home loss and habitat loss from southern California's perennial wildfires?

Since the mid-20th century, Southern California has seen one or more massive wildfires each decade, with an average of 500 homes destroyed per year. Despite increased funding for fire suppression and vegetation modification activities, fire impacts are becoming worse with each successive decade. Economic losses continue.

The **USGS Southern California Wildfire Risk Scenario Project** is studying the wildfires that devastate this important region. Southern California's fire ecology is unlike that of anywhere else in the United States. Fire control strategies developed for mountain forests don't have the same results here. So can science help uncover new answers to help Southern California communities manage and live with wildfires?

Led by the **USGS Western Ecological Research Center**, the team is analyzing housing, powerline, vegetation, topographic and wind patterns along the **wildland-urban interface (WUI)**, pinpointing the factors that dictate community hazard risks and discovering how the native chaparral ecosystem can inform fire management strategies.

A decision model built from this data will allow users to evaluate wildland management and residential land use planning options, and to forecast scenarios that best minimize fire risk while maintaining biodiversity. The models and findings will support agencies on the frontlines of fire management, and help citizens understand the factors and actions that can minimize fire hazard risk to their communities and wilderness areas.

Like earthquakes, southern California wildfires can't be prevented — but the risks they pose to our communities and landscapes can be managed. USGS natural hazards and ecosystems science can assist managers and planners in finding solutions to reduce the risk of home and habitat loss — and help southern California truly learn to live with fire.

RESEARCH CONTACTS

Jon E. Keeley
Principal Investigator
http://www.werc.usgs.gov/keeley
jon_keeley@usgs.gov

Robert Fisher
Principal Investigator
http://www.werc.usgs.gov/fisher
rfisher@usgs.gov

Alexandra Syphard
Principal Investigator
http://consbio.org/people/staff/alexandra-syphard
asyphard@consbio.org

Ross Bradstock
Principal Investigator
http://smah.uow.edu.au/biol/biolschoolstaff/UOW057162.html
rossb@uow.edu.au

Main Research Page
http://www.werc.usgs.gov/socalfirerisk

Film: "Living with Fire"
http://gallery.usgs.gov/videos/620

Project Components

KEY CONCEPT: FIRES AS UNPREVENTABLE DISASTERS

In Southern California, fires are traditionally thought of as preventable disasters that can be controlled through fuel treatments such as fuel breaks and prescribed burns, as well as vigorous fire suppression.

But research suggests that fire risk **cannot** be completely eliminated. Living with fire by planning fire-adapted communities and managing and minimizing fire risk may be more effective.

Therefore, the aims of the Wildfire Risk Scenario project are based on the following foundational concepts:

- Wildfires are natural phenomena in chaparral landscapes throughout Southern California counties, yet fire impacts are worsening with each decade. Meanwhile, housing development continues at the **wildland-urban interface (WUI)**.
- Climate change and other factors may also be increasing fire probability, so policy makers and citizens need to **adopt a mentality of fire risk management instead of fire elimination**; that is, preparing and managing for fires as you would for earthquakes, floods and other inevitable disasters.
- Wildfire spread to housing areas **often depend on controllable factors**, such as presence of fire-prone landscaping, poor powerline siting and maintenance, and the location/arrangement of housing.
- So while wildfire risks cannot be eliminated, **they can be managed**. Managers can be proactive in addressing community vulnerability problems, such as altering local planning practices, and improved oversight of urban landscaping and housing design.

PROJECT GOALS

The overall goal of the Wildfire Risk Scenario Project is to inform the balanced management of fire hazards and natural resources. To do so, project researchers are studying several components of a wildfire's path towards landscape damage and destruction:

- **What factors determine when and where fires start?**
- **How do fires reach housing from the wildland?**
- **What factors lead to home and structure loss once fires reach an urban area?**
- **What fire management and wildfire factors lead to biodiversity change and natural resource impact?**

To understand and model this hazardous equation and to share these findings, the team is making the following efforts:

ASSESSING WILDFIRE DAMAGE THROUGH SATELLITE IMAGERY

Aerial photos and public records provide key data on human structures pre- and post-fires, such as housing arrangement/density, landscaping, proximity to wildlands, wind direction. Using satellite images and remote sensing data, the team has digitized data on >36,000 homes and structures in Santa Monica Mountains and >687,000 in San Diego County and identified structures damaged or destroyed since 2001.

IDENTIFYING LANDSCAPE FACTORS CONTRIBUTING TO WILDFIRE RISK

Published findings suggest loss of human structures is related to housing density/arrangement, historic fire frequency and location on the landscape. Researchers are examining additional factors such as presence of powerlines, hill slope, and topographic relationship to ridgelines, creeks/drainages and Santa Ana winds.

IDENTIFYING HOME FACTORS LEADING TO WILDFIRE DAMAGE

Southern CA fires are mainly spread by wind-blown embers, and ornamental trees and other landscaping may be key conduits for fire spread even across disconnected neighborhoods. The team is also examining variables such as home structures, home age, duration of ownership, plot size and local roads access.

DISSECTING THE EFFICACY OF TRADITIONAL FIRE SUPPRESSION

How well do existing fire management instruments work? The team is analyzing traditional concepts such as fire breaks, wildland fuels management and defensible space to assess each method and whether it minimizes fire risk to communities.

MEASURING IMPACT ON BIODIVERSITY AND HABITATS

Altered fire regimes also impact the ecosystem. The team is measuring the changes in species diversity and vegetative habitat types after repeat fires, and examining whether fire suppression treatments themselves may impact wildlife and habitat connectivity.

PUBLIC OUTREACH OF WILDFIRE RISK FACTORS

Throughout the course of the project, new findings, maps and other products will be shared with managers at state, local and federal offices as well as public and private stakeholders.

WERC partners for the Wildfire Risk Scenario Project include: Conejo Valley Community Planning Santa • Monica Mountains Fire Safe Alliance • Los Angeles County Board of Supervisors - 3rd District • Los Angeles County Fire Department - Forestry Division • Orange County Fire Authority • CAL FIRE • U.S. Forest Service • National Park Service • Santa Monica Mountains National Recreation Area • U.S. Joint Fire Science Program • San Diego Gas & Electric

The USGS Western Ecological Research Center (WERC) is an Ecosystems mission science center of the U.S. Geological Survey serving California, Nevada and the greater Pacific West. Online at www.werc.usgs.gov