

**Western Ecological Research Center** <http://www.werc.usgs.gov>

## Fire Ecology Studies in the Pacific Southwest

Wildland fires are an important ecosystem process throughout the western U.S. Coniferous forests have long been subject to frequent low-intensity fires, which play an important role in reducing hazardous fuels and in rejuvenating the forests. In California chaparral shrublands, high-intensity crown fires have guided the evolution of plant life and regulated ecological communities. In many desert habitats, fires have been far less frequent, and often are a more severe disturbance. Today the natural role of fire in these ecosystems is complicated by the fact that fire potentially favors plant invasions and these aliens in turn may alter fire regimes.

To restore more normal fire dynamics to a particular region, managers need to know how fire has historically affected the local system, and how it functions today. Researchers at the Western Ecological Research Center (WERC) are making contributions to this effort through detailed studies of fire history and fire ecology in the Sierra Nevada forests, the California shrublands, and the Mojave and Sonoran deserts. Knowledge from these studies is forming the basis for new policies aimed at restoring fire cycles that will present a lower risk to human life and property, and help safeguard the stability and diversity of Pacific Southwest ecosystems.

WERC scientists in the Sierra Nevada national parks have contributed to understanding what controls the behavior of forest fires, and how natural and prescribed fires can best be managed to reduce understory fuel loads and restore normal ecosystem dynamics. They have developed a high-resolution fuels map that couples with a computer model for long-term and real-time predicting exactly where and how fast a given fire may spread. They are also assessing fuel-reducing treatments to determine an appropriate balance of cuttings, mechanical fuel treatments, and prescribed fire, and are evaluating the mechanisms of postfire invasions by alien annual grasses.

In the Sierra Nevada global change program, scientists from several research institutions are collaborating with WERC scientists to explore the fundamental character and significance of forest changes driven by climate and fire. They have documented the longest and most

### Research is still needed on:

- Interrelationships between invasive plants and fire
- Historic role of fire and means for reintroducing fire
- Roles of fire in different ecosystems and the value of prescribed burning in reducing fire hazard
- Fire history/ecology of less-studied vegetation types

detailed fire histories anywhere based on fire scars in the annual growth rings of giant sequoias, which can live more than 3,000 years. The records have also aided the researchers in understanding fire's role in the regeneration of giant sequoias.

California chaparral ecosystems burn in large landscape-scale crown fires that are necessary for the ecology of these systems but pose a threat to human populations. WERC research has shown that many species in these systems are highly dependent upon recurrent fire since seeds require smoke to induce germination. Unlike western forests where a century of fire suppression has led to fuel buildup and a risk of catastrophic wildfires, WERC research has shown that large, intense fires in chaparral ecosystems do not appear to be the result of fuels buildup. They occur, in league with powerful Santa Ana winds, as frequently today as before widespread fire management aimed at fire suppression.

Alien grasses have invaded the Mojave and Sonoran deserts, bringing rapid fire cycles with them to communities of plants and animals that often have few evolved defenses against such disturbances and are unable to survive successive burns. WERC researchers are conducting detailed studies to better understand how increased fire size and frequency affect desert ecosystems, how fire changes nutrients in the soil, the relationships between invasive plants and fire, and how to protect native plants and animals.

### For more information, contact:

USGS Western Ecological Research Center  
7801 Folsom Blvd., Suite 101  
Sacramento, CA 95826  
Phone: 916.379.3740 Fax: 916.379.3765