the newsletter of
LOS ANGELES & SAN GABRIEL RIVERS
WATERSHED COUNCIL

WATERSHED WISE

The Fires This Time: Post-Fire Recovery Best Practices

Fall 2007

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THE LOS ANGELES & SAN GABRIEL RIVERS WATERSHED COUNCIL

To facilitate an inclusive consensus process to preserve, restore, and enhance the economic, social, and ecological health of the Los Angeles and San Gabriel Rivers watershed through education, research, and planning.

Letter from the Editor

By Drew Ready - LASGRWC
Sustainable Landscape Program / Watershed Coordinator

For most of May 8th I was glued to the images of Griffith Park ablaze. KTLA was covering the fire from the air with a high-definition, gyro-stabilized camera, the type usually used for capturing sweeping landscapes in big budget movies. The pictures were so clear I could tell a laurel sumac from a toyon. Invasive Eucalyptus were easily distinguished from exotic pines as their leaves and branches ignited, burst into flames, and shot glowing embers high into the air.

As the fires were extinguished at Griffith Park, Watershed Council staff envisioned a symposium that connected the region's ecological restoration experts with city engineers and environmental specialists. What negative effects will the fire and resulting sediment flows have in our watershed? Did city staff know about the irreversible damage hydroseeding can do to the chaparral? And what was the plan to control invasive weeds? We know city staff are capable, but were they up on the latest research and best practices? Were we?

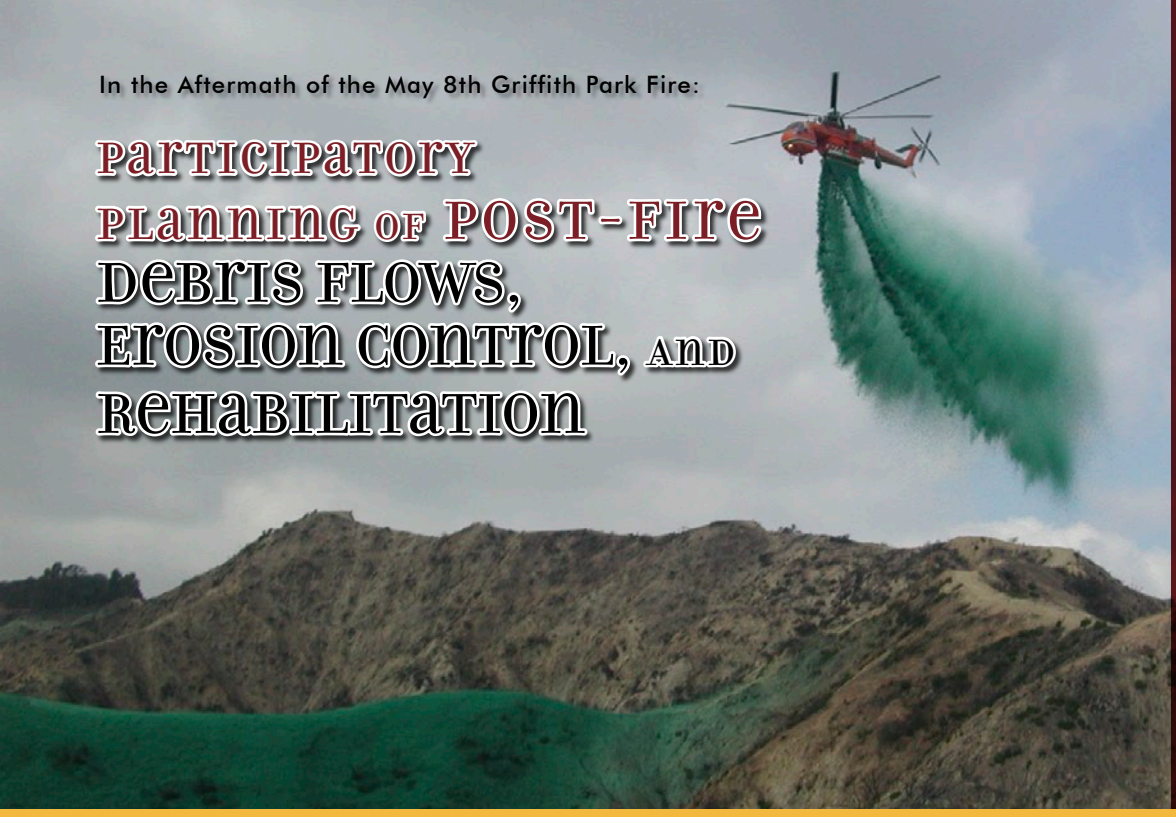
At our suggestion of a symposium to address these and many other questions, the City recommended a joint effort. We put together an indepth program and assembled a veritable dream-team of widely published and highly regarded experts from throughout the state. The resulting symposium and field trip were very well attended and judging from the enthusiastic feedback it was by all measures a success. Several on the panel even went on to contribute to the recovery plan, graciously lending the city their time and knowledge. Considerable credit goes to the Recreation and Parks Department staff Mike Shull, David Attaway, Peggy Nguyen and Paul Davis for their foresight and partnership.

The wildlands of Griffith Park have already begun to recover. Green stems and leaves are unfurling from the burnt branches and root burls of native plants. Fire scarred seeds are awaiting winter rains. With a recovery plan in place that protects area residents *and* the park's natural resources, we can look forward to the fire-following wildflower displays that will paint the hills next spring. Be sure to hit the trails and see them for yourself; the news coverage won't do them justice.

And from the Executive Director, Nancy L.C. Steele

The Symposium on which this newsletter is based took place before this fall's devastating wildfire storms. The Watershed Council hopes this issue of WatershedWise will contribute to the body of knowledge that guides the good work of municipalities and land management agencies as they plan their recovery efforts. Our hearts go out to those who lost their homes and loved ones.

Cover photo - Griffith Park Fire - Eric Castro



In the Aftermath of the May 8th Griffith Park Fire:

Participatory Planning of Post-Fire Debris Flows, Erosion Control, and Rehabilitation

Reported By:

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Mayor Antonia R. Villaraigosa

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Article photos provided by Craig Kunesh

I. INTRODUCTION

On May 8, 2007, a brush fire broke out in Griffith Park, and over the course of the next two days, consumed over 800 acres of park land. The fire caused significant damage in the canyons and peaks north and east of Mount Hollywood, and destroyed a number of hiking trails, overlooks, and view sheds. The majority of Mixed Chaparral and Mixed Shrub plant communities in the burn areas were destroyed with significant damage to the oaks, sycamores, and other woodland communities. The fire and its effects were declared a local emergency by Mayor Antonio Villaraigosa. While the damage to the existing ecosystem is critical, most of the Park's native trees and shrubs will recover naturally over the next 10-15 years. The Department of Recreation Parks (RAP) is currently developing and implementing the following action plan to provide temporary soil stabilization to allow for natural recovery as well as to protect property and public safety.

II. PLANNING WITH A MULTI-AGENCY TASK FORCE

A. The Three-Phase Plan

After the fire was contained, RAP staff met with Department of Public Works Bureau of Engineering (BOE) staff and other agency representatives to devise a Preliminary Fire Recovery Plan that was issued on May 11, 2007. It was a 3-phase plan for the fire recovery:

Phase 1: May – July 2007: Assessments/Emergency Debris Removal/Erosion Control Design

Phase 2: July - Dec 2007: Erosion and Debris Flow Control/Restoration Design

Phase 3: May 2007 – July 2010: Restoration

B. Bringing Together the Griffith Park Fire Recovery Team

As part of Phase I of the Recovery Plan, RAP emergency field crews began to work on clearing access roads in the burn area of debris and hazardous materials. As this field work continued, RAP staff assembled a team of technical experts to advise the Department on how to move forward with the critical work of erosion mitigation and burn area restoration. RAP staff contacted technical experts in a variety of fields to assist the Department in the development of this Fire Recovery Plan. Experts from a variety of federal, state, and local government agencies and from local community groups convened to discuss the Fire Recovery Plan, and to offer aid, and share resources and expert advice. It was determined during the first meeting that the goal of the Team was to develop a fire recovery plan for Griffith Park that is science- and data-based. It was also determined that the first step was to gather data before the evidence disappeared.

As a result, the first meetings and steps taken emphasized assessments and data-gathering. In order to accomplish this, the Team was initially

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divided up into four teams: Emergency Debris Removal, Watershed Hydrogeology and Infrastructure Assessment, Watershed Ecological Assessment and Restoration, and Public Outreach. The Emergency Debris Removal Group was tasked with emergency debris removal, hazard tree treatments, rock stabilization, clearing of streets and trails, cleaning out of existing storm drain system, utility pole assessment, and hazardous waste management. The Watershed Hydrogeology and Infrastructure Assessment Group was tasked with land surveys and mapping, property and public safety risk assessments, soil burn severity and fire intensity mapping, infrastructure damage assessments, and hydrogeological assessments of the burn area. The Watershed Ecological Assessment and Restoration Group quickly secured a pre-fire vegetation map from the National Park Service Santa Monica Mountains Recreation Area, and began to develop methodologies for vegetative burn severity and soil seed bank assessments. This group was also tasked with the identification of sensitive plant and wildlife species, development of restoration and recovery recommendations for vegetation and wildlife, monitoring of vegetative and wildlife recovery, survey and restoration design of cultural landmarks, environmental compliance for the work in the burn area, and watershed and ecological analysis of the burn area.. Finally, the Public Outreach Group was tasked with involving the community in the recovery efforts and informing them of fire-related issues such as fire ecology, erosion control, restoration theory and efforts, public safety, urban wildlife, and prevention of property damage. This group was also responsible for identifying community needs, forming implementation strategies and garnering material and human resources for recruiting and coordinating volunteers, soliciting donations as part of the outreach message, employing outreach and awareness campaigns, constructing and installing signs, and conducting tours of the burn area.

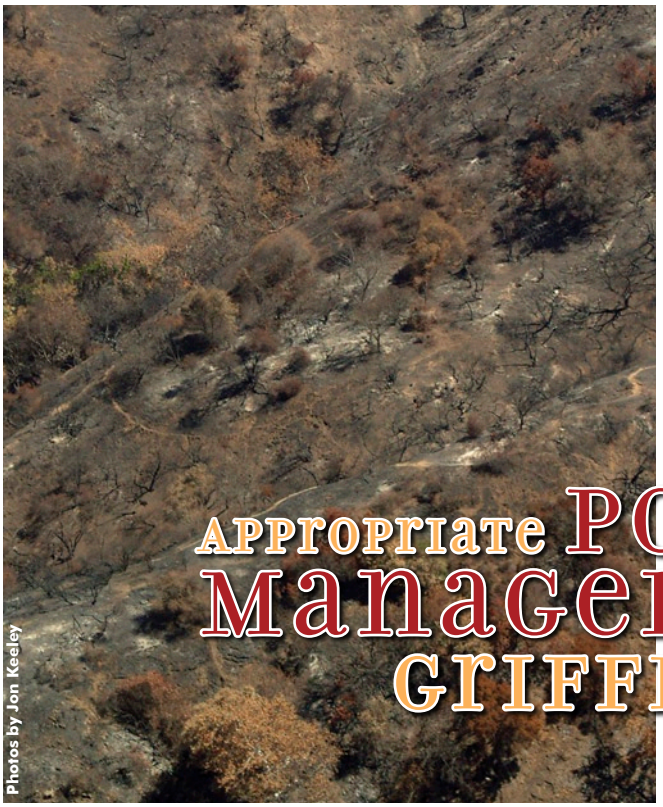
By May 30, aerial photos of the burn area had been taken and BOE and RAP staff with the assistance of the USDA Natural Resource Conservation Service had successfully collected field data to create a fire intensity map along with other data on the impacts of the fire on soil productivity, erosion potential, vegetation, soil seed banks, wildlife, and infrastructure. These data were analyzed by the Task Force and City staff and used to devise appropriate erosion control and restoration strategies that would take potential environmental and public safety issues into account. The recovery planning process has included soliciting advice and comments from the various parks advocacy groups, the local neighborhood associations and Neighborhood Councils.

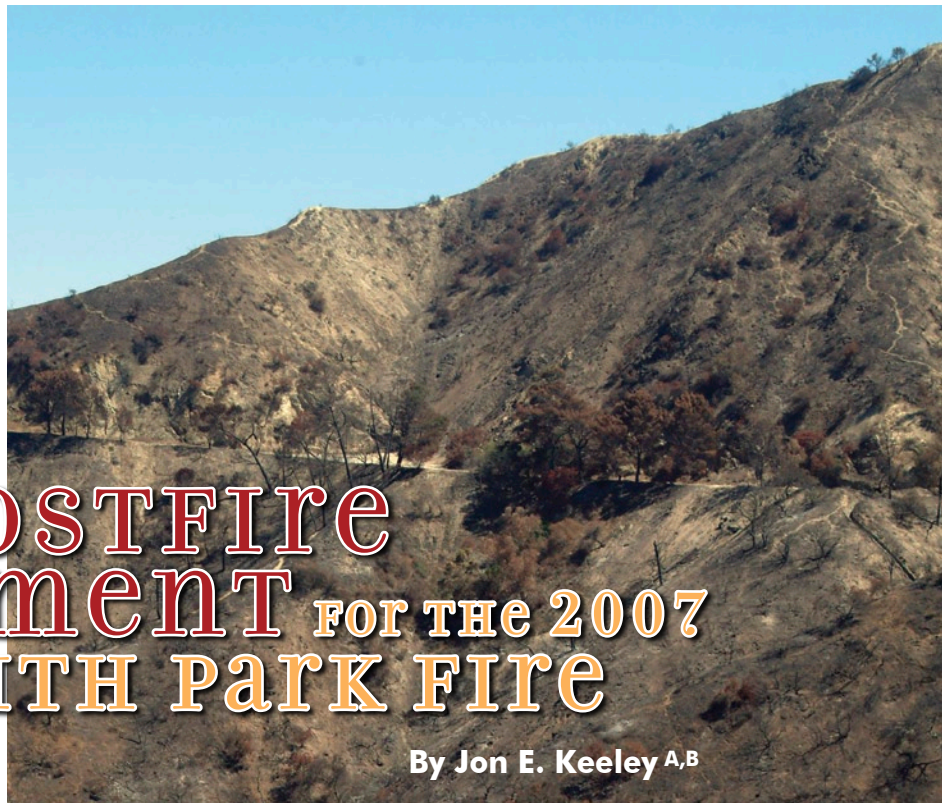
C. Erosion and Debris Control Plan

As part of the erosion and debris control plan developed by the Recovery Team, RAP is implementing a hydromulching project to provide temporary soil stabilization. During the second week of October, RAP began applying hydromulch to slopes that have a moderate to high soil erosion potential. The hydromulch will form an absorbent and protective layer over the soil, much like the plants and leaf litter that was present before the fire. This will reduce soil erosion as much as 70-85%, and help protect against damage to public and private property during heavy rainstorms that carry the soil and other debris down the canyons into local neighborhoods and streets. RAP is also placing k-rails on roads to divert potential debris flows away from important assets. Temporary debris barriers and sediment catch basins are also being installed and/or constructed to prevent unchecked sediment flows that may potentially harm valuable property and lives.

With this erosion and debris control plan in place, RAP will now focus its efforts on restoration, recovery monitoring, and public outreach.

RIGHT: Hydromulch on top of bare soil.





Photos by Jon Keeley

Appropriate Postfire Management for the 2007 Griffith Park Fire

By Jon E. Keeley [A,B]

Fires and floods are a common sequence on many western US landscapes. Understanding how to best manage burned landscapes to disrupt this cycle is very important to successful resource management. Resource managers are constantly challenged by the fact that every burned landscape is different and the science behind best management practices is often changing at rapid pace. Communicating these changes by scientists is critical to good management, but not often done in a timely fashion. The Griffith Park Postfire Symposium held at the Gene Autry Museum on 20 June 2007 was an excellent opportunity for sharing information that hopefully will be put to good use in the emergency response to this recent fire.

Terminology

Due to variations in fuels, climate, weather and topography, fires vary in their energy output or fire intensity. Fire fighters must be keenly aware of fire intensity as it is directly associated with flame length and the ability to directly affects their strategy of deployment. After the fire is out, resource managers also are concerned with the potential impacts of different fire intensities on watershed hydrology. However, fire intensity is a parameter that needs to be determined directly during a fire and thus managers typically deal with postfire patterns of fire severity *(Fig. 1)*. Books often define fire severity rather broadly as "impacts on the ecosystem." Studies of fire severity have generally focused on the loss of organic matter, both aboveground by mortality and canopy scorch, as well as belowground measures of ash deposition and loss of soil organic matter and alterations in chemical structure of the substrate.

It is of great interest that so much work goes into the documentation of fire severity after fire because often times fire severity per se is not the parameter of most interest to managers. Rather, it is the ecosystem impacts of different severity fires on responses such as erosion and vegetative recovery *(Fig. 1)*. Because chaparral shrublands are highly resilient to high intensity fires, it is apparent from a number of studies that high severity fires have relatively little immediate impact on vegetative recovery and no discernable lasting effects.

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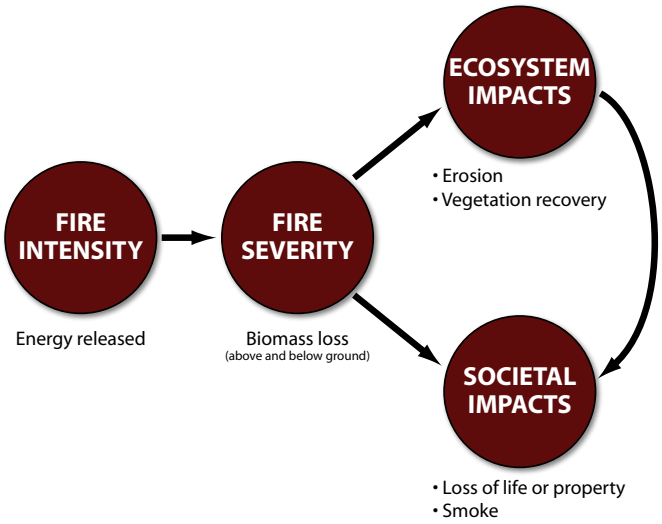

FIGURE 1. Fire impacts on natural ecosystems and human infrastructure.

What is the relationship between fire severity and erosion and other watershed processes? There is relatively widespread agreement that fire, through its removal of the standing vegetation, has major impacts on hydrological processes. However, there is far less agreement among studies that fire severity plays a critical role. Predicting changes in watershed processes requires models that include many parameters, e.g., sediment type, topography, subsequent rainfall patterns, length of inter-fire interval, and it appears in some cases at least that the "severity" of the fire is not a major factor in the postfire predictions. In short, when it comes to postfire management we need to be aware of where burned landscapes occur relative to values at risk, but factors such as slope steepness, sediment type and level of winter rainfall are often far more critical factors than fire severity.

Griffith Park Response

Griffith Park is the second largest urban park in the country and as a consequence fire management is potentially more complicated than in wildland burned landscapes. Postfire management needs to take a more active role on those portions of the burned landscape where steep slopes are juxtaposed with values at risk, such as roads and buildings or are immediately upstream of such values. However, much of the burned landscape does not pose an immediate threat and is perhaps best treated with passive management. On these landscapes one can recognize both cultural landscapes, where exotic plantings were commonplace, and natural heritage lands, where natural ecosystems are being retained as part of our natural heritage. Where exotic plantings have been burned it would be useful to use this fire as an opportunity to reevaluate the extent to which such sites truly represent cultural landscapes worthy of restoration, or whether they might best be allowed to recover naturally, as will most of these chaparral landscapes.

The value of the natural heritiage lands within Griffith Park can not be emphasized enough. When the park was first set aside, these landscapes were widely represented throughout the Los Angeles Basin. But 100 years later, when most natural ecosystems have been replaced with human infrastructure, these wildland areas within the city limits are a valuable natural treasure for the citizens of Los Angeles. The ecological successional events that will unfold over the coming winter and spring months will provide a natural laboratory for many students in the city to experience first hand the story of fire adaptations in this fire-prone ecosystem.

Is Postfire Seeding Appropriate for the Griffith Park Fire?

Postfire aerial seeding as a management practice has its roots in southern California as a flood control measure. This was partly due to an incomplete understanding of the natural capacity for rapid recovery in chaparral ecosystems. For example, one document *(Los Angeles River Watershed, 1941)* stated "Severe burning so depletes the chaparral cover that artificial measures are necessary to hasten its re-establishment." We know from countless studies over the past 50 years that this is simply not true; chaparral possess an extraordinary capacity for regeneration from resprouting of rootstocks and dormant seed banks. In addition, many studies over this time have also shown that seeding of both exotic and native species is a precarious undertaking that fails more

often than not *(Fig 2)*. There are several reasons for why seeding is not practical on our southern California landscapes, but the primary one is that these seeds require gentle and continuous autumn rains to establish root systems capable of holding soil back from winter rains. However, commonly our first rains occur in late autumn and winter as intense torrents that wash the seeds off the surface of steep slopes before they have had an opportunity to establish. Such is not the fate of native seeds that are buried and better protected from being swept away in these rains. Perhaps a more important reason for not depending upon seeding is that there are better methods for reducing slope erosion, such as mulch or hay bales, which have proven to be more effective and far more predictable than seeding.

In terms of conserving naturally functioning chaparral ecosystems, seeding also has the potential for negative impacts. On those occasions where the rains do cooperate and exotic seeded species establish they have the potential for out-competing the native species and altering the natural balance of nature. In addition, they sometimes escape and become aggressive invasive species, such as black mustard, which was the favored exotic species used to seed after fires in southern California during the first half of the 20th century. Today this invasive is a widespread pest throughout the region. Physical barriers created by mulch and hay bales also have the potential for introducing exotic species and as a consequence more and more such projects are requiring "weed-free" hay.

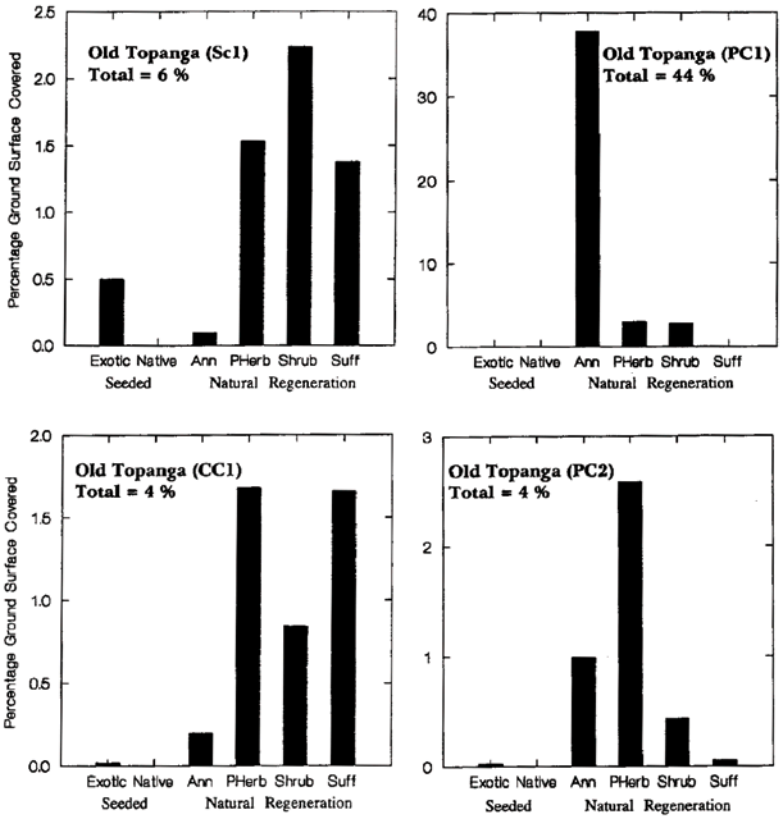

FIGURE 2. Postfire regeneration of artificial seeded species and native species in the first spring following the 1993 Old Topanga Fire.

Conclusions

Southern Californians are lucky to have such a resource as Griffith Park. In addition to the diverse recreational opportunities it provides, it also has huge benefits as a natural laboratory for the students of Los Angeles. Providing for the maintenance of the naturally functioning chaparral ecosystems is an important goal for the stewards of this unique resource. It is important to recognize that sometimes the best management practices are those that are passive and allow nature to follow its own course.

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Taking Care of Los Angeles' Chaparral Island in the Sky: Griffith Park

By Richard W. Halsey | The California Chaparral Institute

Old growth chaparral photos by Richard Halsey

Bordering the peaceful trails and blanketing the steep hillsides of Griffith Park is a remarkable abundance of life many in Los Angeles have come to love; the chaparral, a unique association of hardy plants and animals shaped by summer drought, winter rain and, as recent events have demonstrated, an extremely fragile relationship with fire.

The Griffith Park fire has attracted new attention and friends to the city's largest protected natural landscape, but it has also revealed the need for an updated discussion about chaparral and wildland fire in Southern California.

Unfortunately, because of the wildfire risk it can pose, chaparral is unfairly demonized. Beautiful, old-growth chaparral stands are referred to as "decadent" or "scrub-infested" savannas that need to be burned or cleared. Canyons and hillsides are said to be "choked" with dangerous "brush." Native plants are often seen only as "weeds." Firefighters are blamed for allowing "unnatural" levels of vegetation to build up because of fire suppression efforts. These perceptions are not only inaccurate, but can lead to damaging land management practices.

Griffith Park's chaparral shrubland habitat is a beautiful, natural system, especially adapted to our region's Mediterranean-type climate. However, it is not adapted to fire in the general sense, but rather particular fire patterns. This means that too much fire, or fire at the wrong time of year, can completely destroy the system, allowing it to be replaced by weedy, non-native grasses. These grasses dry out quickly and increase the chance of fire, guaranteeing their dominance and the destruction of most native vegetation. This has unfortunately occurred in many areas of the Southland, especially along the front country of the Angeles and San Bernardino National Forests.

Old-growth chaparral is a productive, dynamic ecosystem. There is no evidence to support the notion that our region's native shrublands have become "decadent" or unhealthy due to overgrowth. In fact, seeds of many chaparral plants actually require 30 years or more worth of accumulated leaf litter before they will successfully germinate. Yes, many chaparral plant species require some fire cue for germination, but their seeds will survive in the soil until the next blaze, be it 30 years or centuries from now.

The idea that "chaparral-choked areas" are responsible for causing large fires is related to one of the most repeated misconceptions regarding the system: past fire suppression efforts in Southern California have allowed an overgrowth of shrubland vegetation to occur. The first thing to consider is that the amount of acreage burned per decade in our region has remained relatively unchanged over the past century despite the heroic efforts of our region's firefighters. The main driver of large fires is extreme weather: high temperatures, low humidity, and Santa Ana winds. Wildland fires under such conditions are impossible to stop and can burn through nearly every vegetation type, regardless of age. Firefighters are not responsible for the weather, only to help citizens get out of the way of the flames and try to save structures when it is safe to do so.

Map of burn area courtesy of Cartifact, Inc.

Wrentit photo by Ashok Khosla

Secondly, the accumulation of dead and living plant material varies significantly between each of the various types of chaparral found throughout Los Angeles County. Mixed chaparral on north facing slopes can accumulate more plant mass in 10 years than a stand of chamise chaparral will on drier, south-facing slopes in 80 years. Shrubs grow. It is a natural process. Those that die are replaced by others. Fire suppression is not responsible for this pattern.

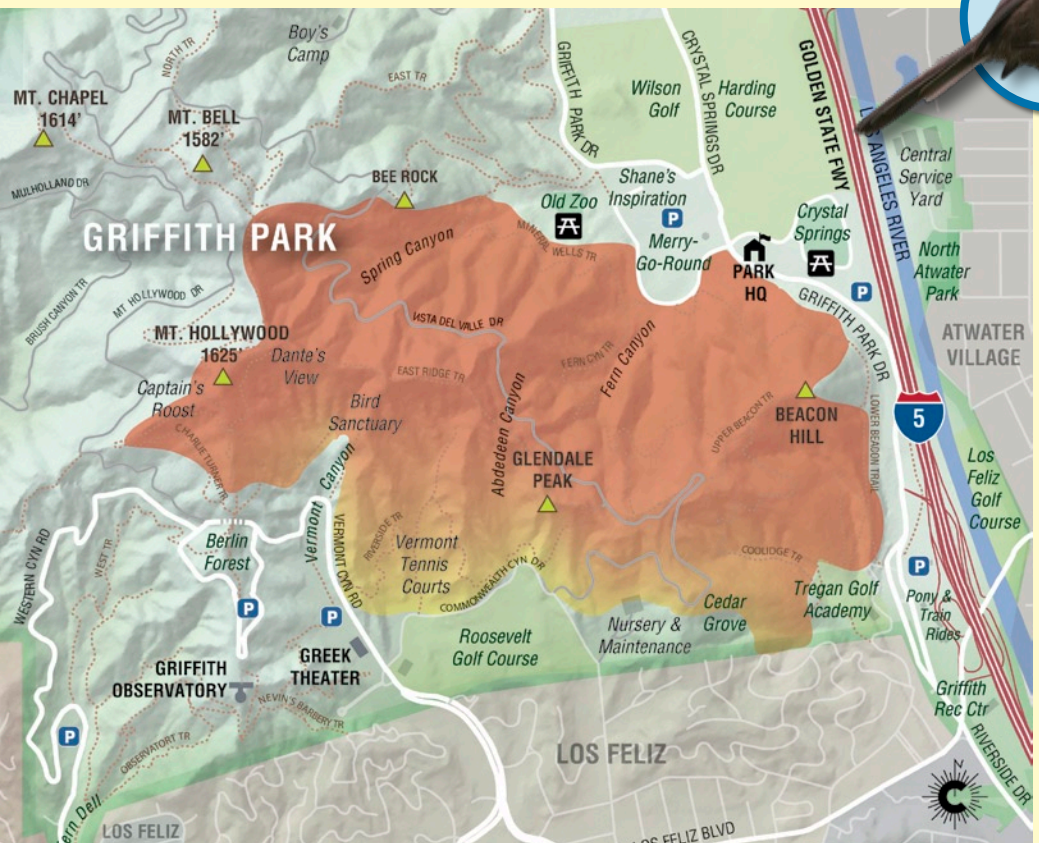
What has changed over the past one hundred years is fire frequency. It has increased in lock step with population growth. Areas that in the past that may not have burned for a century or more are now burning several times per decade. Contrary to conventional thinking, rather than not enough fires, our region suffers from too many. Continued drought conditions, likely the consequence of ongoing global climate change, will create additional fire risk by causing record low vegetation moisture levels and greater amounts of dead vegetation due to desiccation.

There is no question chaparral is extremely flammable. However, the wildfire discussion needs to be refocused. We must begin to embrace the fact that we are part of nature. Our homes burn mostly because we've allowed ourselves to forget our connection to the natural world. The chaparral is seen as the enemy when in fact it remains our last chance to reclaim Southern California's wildness and preserve the quality of life made possible by the region's natural, open spaces.

The best strategy to protect communities from wildfire is to start from the house out rather than from the wildland in. This means the first and most important task is to concentrate on making structures themselves fire safe, then move outward to create properly thinned vegetation management zones. Most homes burn due embers landing on flammable building materials, not heat radiation from the moving fire front. Creating fire safe environments from the house out will allow the natural environment to operate with minimal disturbance and permit our families to remain connected to the natural world.

Although calls for goats, seeding, and massive re-plantings after the fire came from many who love the Park, the best thing to do in the majority of the burned area is allow nature to recover on its own. Goats would cause increased erosion and encourage the spread of weeds, seeding would introduce damaging competition to native plants, and re-plantings are unnecessary except in those areas where special gardens have been created.

Griffith Park is truly a special place. It provides a way for the citizens of Los Angles to not only touch a part of wild California within the city limits, but a place to reconnect with the natural world. As the chaparral shrublands recover from the fire over time, take a few walks along the Park's trails. Make a few new friends, both human and non-human. If you are patient, off in the distance you will likely hear, hidden within the recovering shrubbery, a secretive little bird with a long tail and an alert set of yellow eyes introducing itself; the diminutive wrentit.



Richard Halsey is the director of the California Chaparral Institute and publishes the quarterly newsletter, "The Chaparralian." His most recent book is "Fire, Chaparral, and Survival in Southern California."

Post-fire Emergency Rehabilitation Treatments for Erosion Control

By Peter M. Wohlgemuth | USDA Forest Service, Pacific Southwest Research Station, Riverside Forest Fire Laboratory[1]

Photo by David McShane

Wildfires in southern California render the landscape susceptible to flooding and accelerated erosion, threatening both natural resources within the burned area and human communities downstream. In efforts to prevent these negative post-fire consequences, various hillside and stream channel mitigation treatments have been devised for erosion control. These mitigation measures seek to reduce and delay the production of water and sediment from the burned landscapes until the watersheds can function normally again. This overview provides information about southern California post-fire erosion, the intent of mitigation practices, specific erosion control techniques, and how this relates to the Griffith Park Fire of May 2007.

Post-fire Erosion in Southern California

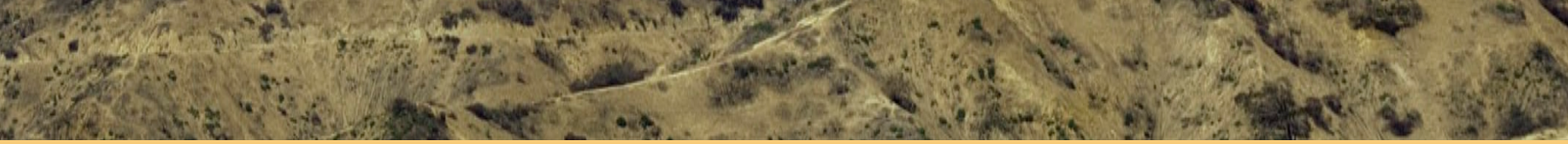
Erosion is the inevitable stripping of rock and soil material off the upland areas and the transport and deposition of this sediment to the lowlands. Post-burn erosion can often be one hundred times greater than normal levels, as fires remove the protective vegetation cover, exposing bare soil to the agents of erosion – primarily gravity and running water. Erosion potential is greatest immediately after the fire, and this potential declines over time as the vegetation re-grows and the landscape recovers. Post-fire erosion actually begins during the burn itself, as loose rock and soil trapped behind the vegetation is liberated as the organic material is consumed. This soil material cascades down the steep hillsides in a process known as dry ravel, often coming to rest in the dry headwater tributary channels of the stream networks. This pulse of dry season erosion is followed by wet season erosion with the onset of the winter rains. Even more material is stripped off the denuded hillsides and transported to the channels below. Moreover, with the production of water repellency in the soils, the rain is unable to soak into the ground, instead running off over the surface of the land. Once it reaches the stream channels, this extra water combines with the sediment deposited during the dry season to create debris flows with tremendous erosive power.

Mitigation

Although post-fire erosion is natural in southern California, to the human communities that now cover the region, it can range from inconvenient to detrimental. Post-fire flooding and accelerated erosion can threaten lives, destroy property, and disrupt infrastructure (roads, bridges, utility lines, pipelines) at the wildland/urban interface. Debris flows along sensitive riparian corridors can also destroy the habitats of threatened and endangered species. To prevent these negative impacts to natural and human communities, a variety of mitigation measures have been developed for erosion control on both hillsides and in stream channels. These management treatments attempt to minimize the impacts of post-fire flooding and erosion, while at the same time being cost-effective and environmentally benign. Although philosophical questions surround the use of these rehabilitation techniques (Do we need it? When do we use it? How much is enough? What are the side effects? Who pays for it?), the general view is that some action is necessary when critical values – life, property, infrastructure, site productivity, endangered species and their habitats – are at risk from post-fire flooding and erosion.

Erosion Control Treatments

Hillslope treatments attempt to control runoff and erosion on the hillside slopes. Ground covers try to establish a protective cover on the bare hillsides prior to the first post-fire rains. This cover may be achieved by seeding quick-growing grasses, by spreading or spraying straw or other mulch material, or by installing nets or blankets of either natural or synthetic fibers. Mechanical barriers attempt to trap and hold the soil on the hillside slopes. These



barriers may consist of contour-felled logs, fiber rolls (straw-filled nylon mesh tubes), or terraces/trenches carved into the hillsides with heavy equipment. Chemical sprays try to alter the hydrologic properties of the soil. Wetting agents break down the soil water repellency, allowing the water to again soak into the ground. Soil flocculants bind smaller particles into larger aggregates, which should also promote the infiltration of water. Hillslope treatments can vary radically in terms of their degree of difficulty to establish, their relative cost, the amount of ground disturbance associated with their installation, and their overall effectiveness at reducing post-fire erosion. A comparison of the performance of selected hillslope erosion control treatments is shown in *Figure 1*.

Stream channel treatments attempt to control the scour of the stream bed and banks and to trap sediment within the channels before it can be transported to some downstream location. Channel treatments almost always consist of mechanical barriers, ranging in size from hay bales and logs to massive concrete dams. Check dams are a series of low barrier structures made of hay bales, logs, or rocks. These check dams can trap small wedges of sediment and reduce the scour through steep sections of the stream channel. Grade control structures, usually formed of rock or concrete, attempt to stabilize the stream bed to prevent channel incision that would in turn cause the banks to collapse. Large dams and debris basins can also be constructed to impound all the water and sediment coming out of a watershed until it can be safely released. These larger structures would necessarily be permanent features, requiring regular maintenance into the future. The smaller barriers would eventually be abandoned, and would disintegrate or be breached over time.

Erosion Control After The Griffith Park Fire

Griffith Park, at the east end of the Santa Monica Mountains, is typical of the uplands in southern California. The fire of May 2007 burned primarily in older chaparral brushfields with relatively high severity. In the aftermath, bare soil was exposed on most of the hillsides and many of the small headwater tributary stream channels were filled with sediment from dry ravel. An assessment team identified many values at risk in the human communities downstream of the fire once the winter rains commence. A determination was made to treat some of the burned hillslopes with an application of aerial hydromulch and to construct barrier structures in several of the stream channels. In light of the foregoing discussion, these seem to be reasonable mitigation choices. Although the hydromulch is difficult to apply (requiring a helicopter) and relatively expensive, the amount of ground disturbance is minimal and its effectiveness has been demonstrated in other field studies *(Figure 1)*. Given that most of the downstream damage would occur from debris flows created by the flushing of sediment from the stream channels, and that the upper channels are already filled with sediment, it is unclear how much impact any hillslope treatment would have on reducing these destructive events. However, mulches, with their ability to absorb water, could also be effective in reducing the runoff that would generate the debris flows in the first place. Certainly some channel treatments are necessary to trap sediment and slow the impending floods. It remains to be seen if the proposed plank and rail structures will be sufficient to protect the human developments downstream. Time (and the nature of the winter rains) will tell.

Comparison of Hillslope Treatments

	Degree of Difficulty	Relative Cost	Ground Disturbance	Effectiveness
Seeding	H	L	L	L
Straw Mulch	L/H	M	L	H
Hydromulch	H	H	L	H
Erosion Fabrics	L	VH	L	H
LEBs	H	M	H	M
Fiber Rolls	L	M	M	M
Terracing	H	H	VH	H/L
Chemical Sprays	H	H	L	L

FIGURE 1. A comparison of various aspects of selected hillslope erosion control treatments.
Key: L=Low; M=Medium; H=High; VH= Very High

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Wildlife response to Griffith Park Fire

By **Daniel S. Cooper | Cooper Ecological Monitoring, Inc.**[1]

Photos from left to right: Horned Lizard by Drew Ready; Ash-throated Flycatcher by Dale Hameister; Arboreal Salamander by Michael Ready

Back in March, I was asked by some community groups in the Los Feliz area of Los Angeles to research and prepare wildlife species lists for Griffith Park - basically to dig up and organize observations of anyone who had visited the park and taken notes on the species. It seemed straightforward, and I figured I'd be inundated with peoples' data and recollections. Asking around, the reactions I got from my biologist friends were either confused looks, or vague mentions of the common species we see every day in the hills around town, like deer, coyotes, red-tailed hawks and western fence-lizards. Records of the more localized species that would depend on a large block of open space like the Santa Monica Mtns., such as horned lizard, roadrunner, or western gray squirrel, were virtually non-existent.

With a little funding from locals and some trail maps, I organized some brief bird and wildlife surveys in the park in April, as well as a more intensive large mammal tracking study by a pair of local mammalogists later in the summer. Rick Fisher of the City of Los Angeles and I started work on a flora of the park, trying to match historical collections of plants with their current distribution.

Then in May, the inevitable happened - Griffith Park was hit with a fire. But unlikely previous fires that are surrounded and out within an hour or so, this one spread quickly in multiple directions, owing to unusually strong and dry winds, eventually burning about a fifth of the habitat in the 4000-acre park. Fortunately, the fire did no major damage to people or structures, and was kept from rushing downslope toward the multi-million-dollar homes that encircle the park.

However, the fire shocked the city, whose residents are apparently more used to seeing wildfires sweeping through distant lands like Malibu or Hemet, rather than blazing out of control at the top of Vermont Blvd. The Department of Recreation and Parks quickly swung into action, appointing a fire recovery team and an advisory task force to coordinate a response. As the wildlife specialist on this task force, my job in gathering ecological and species distribution information suddenly became a little more urgent.

So what natural phenomena were disrupted? Of course, this is a difficult question to answer with virtually no baseline information on what was there before the fire. Since neither Griffith Park nor any city park in Los Angeles has ever had a staff ecologist or a habitat management plan, we have little information on where threatened or sensitive species may occur, or even a general idea of what species - other than

the most conspicuous ones - comprise the "normal" wildlife community of Griffith Park.

So, we can only guess whether the oak woodland that burned supported the rare Arboreal Salamander *(Aneides lugubris)*, which has been collected historically in the park, or whether this animal persists in some of the oak-covered slopes that were spared. The western gray squirrel *(Sciurus griseus)* occurs in a handful of drainages in the park and in planted pines along roads (and not in the surrounding city), but most of these areas were spared the fire. Of greater concern is the status of taxa like the dusky-footed woodrat *(Neotoma fusciceps)*; I know from personal fieldwork that this species has been largely extirpated from the lower Arroyo Seco in nearby South Pasadena/northeast Los Angeles, and I've only seen a handful of their nests in what looks like much suitable habitat in Griffith Park. It is possible that the dense sumac scrub along the southeastern edge of the park was a locally important habitat for this west coast endemic, but we'll probably never know. This is an example of a species that could quietly vanish from the park without anyone noticing, in the same way that the once common black-tailed jackrabbit *(Lepus californicus bennettii)* is now gone from nearly all of the entire Los Angeles/Orange County area.

We do know that several interesting species persist in the park, and though their habitat was temporarily reduced in extent by the fire, large areas where they do occur were left unburned. These include the coastal western whiptail *(Cnemidophorus tigris multiscutatus)*, a large, checkered lizard that depends on loose soil and arid scrub in the park (and is absent from small habitat patches around the Los Angeles Basin). The western ratttlesnake *(Crotalus viridus)* is still common in the park - a healthy individual was discovered curled up under some charred boughs by one of the mammalogists back in June working near the edge of the Roosevelt Golf Course. Bobcat *(Lynx rufus)* and gray fox *(Urocyon cinereoargenteus)* prints were noted at several of their tracking stations as well in various areas of the park. Several scarce plants, including Humboldt lily *(Lilium humboldtii)* are present in the park and were not affected at all by the fire (but are seriously threatened by non-native weeds and by human recreational use, particularly off-leash dogs).

Whatever changes the May fire brings, large areas of Griffith Park will be altered for several years, regardless of whether seed is dropped from helicopters or if hydromulch is sprayed onto hillsides. Bird species that require cavities for nesting, such as the ash-throated flycather *(Myiarchus cinerascens)* and those that favor grassy patches within chaparral, such as the Southern California rufous-crowned sparrow *(Aimophila ruficeps canescens)*, a California bird species of special concern, will probably see their numbers tick upward. Species that require patches of bare ground (and that have become rare in recent years) like the side-blotched lizard *(Uta stansburiana)* which may be nearing extinction in the park, may get a boost, but perhaps only temporarily if non-native grasses and weeds crowd them out.

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Lessons from Catalina Island: Managing Invasive Plants Before and After a Fire

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Photo by Ron Serabia

Establishment of invasive plant species in wildlands can often reinforce a positive invasive plant/fire feedback loop, a cyclical cycle of one factor reinforcing another, leading to alterations in fire frequency and intensity, vegetation community diversity, structure and function, and loss of native species. It is important to understand and manage this process in areas prone to wildfire, such as in Southern California. The KBRT Fire that started May 10, 2007 on Catalina Island (Catalina) burned nearly 10% of the island (4,750 acres) and has presented a series of long-term ecosystem management challenges and potential opportunities.

Catalina Island, the third largest (48,000 acres) of the eight California Channel Islands, has endured a long history of overgrazing, disturbance, and landscaping which has contributed to the establishment and spread of over 240 non-native plant species (36% of the Island's flora). These include 76 invasive plant species that now threaten the Island's 422 native plant and 56 wildlife species (including 39 endemic taxa) and its unique habitats. Nearly 100 endangered, threatened or species of special concern listed by either the Federal or State of California governments and/or NatureServe, as well as four Federal Trust habitats, are impacted to differing degrees by invasive plants on Catalina. After habitat loss, invasive species have been identified as the second greatest threat to the preservation of biodiversity worldwide and are likely to be the greatest contributor to species extinctions in island ecosystems. Establishment of "fire-loving" invasive plant species, those species that benefit from fire, can exasperate the risks to native species survival and to ecosystem health.

The Catalina Island Conservancy (Conservancy), a non-profit 501 (c) (3) organization, which owns and manages 88% of Catalina, has as its mission "to be a responsible steward of its land through a balance of conservation, education, and recreation." To meet its goals, the Conservancy has developed a comprehensive and holistic management program to protect the Island's Federal Trust species and habitats from the threat of invasive plants.

One highly invasive plant species that poses significant risk to the island, *Genista linifolia* (flax-leafed broom), a native to the Canary Islands and the western Mediterranean, can form large single species stands, alter soil chemistry, decrease biodiversity, and alter fire frequency. Nearly 65 acres containing dense stands of this species were burned in the recent fire, and although this would appear to be favorable, wildfire is known to trigger the soil seed

bank, seed lying dormant in the soil, thus increasing the problem. If left unmanaged, these infestations could form even larger single species stands of the same age. As these same-aged infestations begin to senesce and die, the fire regime will be more prone to fire due to the large contiguous dry fuel loads present, thus creating a feedback loop of broom, fire, more broom, and then more fire, and so on.

Photo by Carlos De La Rosa

Flaxed-leaf broom, as with other broom species, has very long-lived soil seed banks, in excess of 50 years. Land managers are often forced to manage these seed banks for decades waiting for seed to germinate. With enough funding and support an opportunity does exist to manage the fire-stimulated seed bank all at once—instead of working on it over 50 years—by treating the flush of seedlings following the fire. However, the Conservancy has not been able to acquire the needed funding and support to tackle this challenge.

Invasive plant species planning efforts are often underestimated. When ecological emergencies like the recent fire occur, planning is key to address the issue systematically and effectively. Knowing which species are present, where they are located, how much there is, how they respond to fire, and what they threaten is vital to make well-informed management decisions. Since 2002, the Conservancy has invested a significant amount of time and resources into planning efforts to guide management of this long-term conservation challenge.

Photo by Denise Knapp

Once a fire has occurred, it is also important to stem the tide of invasion into the burn by implementing "best management practices." Examples of these practices include cleaning the underside of vehicles and equipment—and even the workers themselves—of invasive plant seed, parts and mud. These can act as a medium of dispersal, and watching for them is one easy step in preventing the introduction of invasive plant into an open nutrient-rich environment. Increasing the awareness and understanding about invasive plant impacts and dispersal among park and preserve visitors is crucial in ensuring recovery following a wildfire. Recreationalists can play an active role it protecting what they enjoy by reducing the introduction and spread of invasive plant species, and refraining from planting potentially invasive plants into the charred landscape.

Managing the invasive plant/fire feed back loop can occur at anytime and does not have to occur only after a fire has happened. Unfortunately, the drama surrounding a fire is often needed to emphasize the urgency for invasive plant management. Plant invasions do not produce columns of smoke or the glow of fire that attract immediate attention. However, invasive plants do have the ability to threaten biodiversity, ecosystem functioning, and recreation. Often, with the invasive plant/fire feedback loop, the squeaky wheel (fire) does get the grease (intervention), but it is the non-squeaky wheel (invasive plants) that can lead to the squeaky wheel squeaking initially. The Conservancy has been working proactively for several years throughout the island to reduce invasive plant impacts and increase invasive species awareness, thus giving them the "grease" they are due.

Sustainable and Fire-Safe Landscapes

Dr. Sabrina Drill | Natural Resources Advisor, UCCE-LA County

The wildland urban interface (WUI) is where urban and suburban development interdigitates with wildlands. At this edge of development, humans and nature live together in varying degrees of harmony. As we move into these landscapes, how can we deal with the competing needs to keep homes and property safe while being good stewards? In 2005, we began working on one particular intersection of issues: how can WUI homeowners protect themselves from wildfire while protecting wildlands from plant invasions?

Fire is a part of the natural environment in Southern California. There is no way to ensure that homes will not be exposed to wildfire, but a well maintained fire resistant landscape can reduce the risk while still providing ecological and aesthetic benefits. Fire safe landscapes rely on the proper spacing and maintenance of native and exotic fire resistant vegetation. They do **NOT** need to include invasive species, or be bare earth.

With support from the National Fish and Wildlife Foundation, and in collaboration with LASGRWC, Los Angeles County Fire, the California Fire Safe Council, National Park Service, the California Nursery Growers Association, and numerous others, we developed the SAFE (Sustainable and Fire SafE) Program.

Our 2008 SAFE Landscapes Calendar and Guidebook, along with our Fact Sheets, provides guidelines for creating and maintaining fire-safe, environmentally-friendly landscapes in the wildland-urban interface that minimize the use and spread of invasive plants. We are holding workshops in the WUI areas LA County for land owners and landscape professionals. For more about SAFE Landscapes, visit our web site at:
http://ucanr.org/safelandscapes

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