

SUSTAINABLE AND FIRE-SAFE LANDSCAPES: ACHIEVING WILDFIRE RESISTANCE AND ENVIRONMENTAL HEALTH IN THE WILDLAND-URBAN INTERFACE

by Sabrina L. Drill

Invasive plants, those non-native species that cause ecological or economic harm, are one of the great threats to the health of Southern California's wildland-urban interface (WUI) areas. Fire is one of the greatest threats to the homeowners living in those areas. Unfortunately, for many years a false conflict was created between these two issues, when fire departments, nurseries, and others recommended invasive plants to homeowners as part of a fire-safe landscape.

The Natural Resources team at UC-Cooperative Extension (UCCE) in Los Angeles County created the Sustainable and Fire-Safe (SAFE) Landscapes program to increase fire safety and wildland health by showing homeowners how to create and maintain fire-safe landscapes without introducing invasive species.

Limiting the use of invasive species in highly fire-prone areas is particularly important for a number of reasons. First, both the fire risk and the risk of plant invasion are heightened by the geography. Homeowners in the WUI who use invasive plants are exacerbating both problems, often unwittingly, since their properties border our few remaining areas of natural habitat. In addition, several of the invasive species commonly planted in these areas possess weedy characteristics that make them highly flammable.

MYTHS ABOUT FIRE, RISK, AND SAFETY

There are several myths about fire and risk in Southern California areas. The first is that fire-safe land-

scapes require a lot of water and must be wet or damp throughout fire season, or that a landscaped area cannot be both fire-safe and drought tolerant. In fact, one of the features that can decrease the risk posed by a plant species is its ability to retain high moisture content in leaves and other tissues with very little water. From an invasive plant perspective, however, this means that the plants most likely to invade chaparral and coastal sage-dominated areas successfully may also be those exotics recommended as drought-tolerant.

Another myth is that most California native plants are intrinsically highly flammable, and that chaparral and coastal sage systems require frequent fire to be healthy. While several Southern California natives do possess characteristics that make

them fire-prone, many are actually highly resistant and tolerant of fire and recover quickly after a wildfire, making them excellent choices for a fire-safe landscape.

A final myth is that a green groundcover is intrinsically fire-resistant. While a low, prostrate growth form and high moisture content are fire-resistant traits, plants such as iceplant, ivy, and periwinkle (often referred to as vinca) can pose a fire risk. This is because under that deceptively healthy-looking green surface is often hiding a layer of dead, dry, entangled thatch. The healthy looking top layer tends to discourage proper landscaping maintenance, thereby contributing to its fire hazard.

Contrary to what many people think, it is not possible to make

In October 2003, numerous wildfires (indicated by red outlines) burned simultaneously throughout Southern California and northern Baja California, Mexico. Image captured by the Moderate Resolution Imaging Spectro-Radiometer (MODIS) on the Terra satellite on October 26, 2003.





Invasive plants including castor bean (*Ricinus communis*, foreground) and black mustard (*Brassica nigra*) invade a canyon in Griffith Park, Los Angeles, 10 months following the May 2007 fire that burned 800 acres. Photograph by the author.

broad statements about fire-risk and invasive plants, just as you cannot for native plants. Each species must be evaluated separately. Finally, it is impossible to discuss the fire risk potential of any plant without also taking into account its health at any given time. Any plant will burn under the right conditions, and the most “fire-resistant species” can become great fuel for a wildfire if it contains a lot of dead tissue due to a lack of proper maintenance.

FIRE AND INVASIVE PLANTS

Fire and plant invasions are related in several ways. In natural plant communities, the presence of invasive plants can increase the risk of wildfire. For example, in sparsely

vegetated areas, such as desert communities, invasive plants often occupy the space between the native desert scrub, thereby creating a continuous fuel load that more easily ignites and transmits fire (Klinger et al. 2006). In riparian areas, invasive plants like giant reed (*Arundo donax*), which produce a great deal of biomass and then become dormant and dry, can increase the intensity and severity of fire. Native riparian species generally do not burn easily, and fires in riparian areas are naturally rare and of low intensity. But with the introduction of invasive species like arundo, fire in riparian areas can occur in a wider range of climatic conditions, and easily spread from surface to crown fires (Bell et al., 2006). It can also inhibit fire recovery, and post-burn, arundo can resprout from rhizomes and colonize new downstream areas, inhibiting native regrowth.

After a fire, disturbed areas are highly prone to invasion by weedy pioneers such as annual grasses. Vegetation types that may have been fire tolerant and recovered well under natural conditions may now be subject to *type conversion*. Type conversion is a process by which after disturbance, one type of plant community replaces the one that had originally been there. Frequent fires may cause replacement of chaparral by non-native grasslands. There is a feedback loop—exotic grasses invade a natural area, leaving the area more fire prone, then they recover faster than the native plants. Hence, the progression is from a native community, to a native community with some invasive plants, to a community dominated by invasive plants.

This can occur even faster when areas are not only more fire prone, but when frequent fires are also promoted by fire starts due to human activities (campfires, disposal of flaming trash (e.g., cigarette butts), sparks from cars and other motors, downed power lines, etc.) (Keeley

et al. 2006a). This process may have been exacerbated even further by human activities such as post-fire seeding, which in the past actively introduced invasive species such as wild oat (*Avena* spp.) and rye (*Lolium* spp.). Previously, this was thought to be a useful tool for erosion prevention. Several studies, however, have found it to be of very limited utility (Keeley, et al. 2006b).

THE SAFE LANDSCAPES PROGRAM

As described above, the SAFE Landscapes program was designed to deal with a specific issue involving invasive plants and fire, namely the fact that certain invasive species have been recommended for planting in the wildland/urban interface. To develop the program, we first convened a steering committee that included fire agencies, public and private land managers, environmental groups, and representatives from the nursery and landscape industry. Steering committee meetings were themselves educational forums, as they were an opportunity for members to learn from each other.

Our first step was to collect and review the recommendations for fire safe landscaping being promoted and disseminated by various groups in Southern California. We reviewed over 100 planting guides to identify those that recommended the use of invasive plants in fire-safe or water-conserving gardens. We used the current list of invasive plant species of Southern California developed by the California Invasive Plant Council as a reference. We found 34 lists that included invasive plants among their recommendations, and the agencies and organizations sponsoring those lists were sent letters identifying the invasive plants they recommended and asking them to remove those species. Some of these larger organizations that have revised or are in the process of revis-

ing their planting guides include Lowe's, Monrovia Nursery, the Natural Resources Conservation Service, Los Angeles County Fire Department, Beverly Hills Fire Department, the City of Santa Clarita, and Cuyamaca College.

PRINCIPLES OF FIRE-SAFE LANDSCAPING

While we identified, reviewed, and made recommendations to improve existing plant lists, for our own program we have avoided distributing a list. This is because we feel that plant lists can be misleading, giving the homeowner or landscape designer the impression that fire-safe landscaping is just about choosing the right species and avoiding the wrong ones. Because any plant species can burn, we focus instead on the underlying principles behind designing a fire-safe home and landscape, and on maintaining structures and plants properly.

First, we begin by working from the structure out, rather than from the wildlands in. Homeowners often spend far more effort “clearing brush”—removing native vegetation that is 100 or more feet from

QUALITIES OF FIRE-RESISTANT VS. HIGHLY FLAMMABLE PLANTS

While we avoid recommending particular plant species, we do focus on characteristics that make plants more or less fire-resistant.

Fire-resistant plants:

- store water in leaves or stems
- produce very little dead or fine material
- possess extensive, deep root systems for controlling erosion
- maintain high moisture content with limited watering
- grow slowly and need little maintenance
- are low-growing in form
- contain low levels of volatile oils or resins
- have an open, loose branching habit with a low volume of total vegetation

Highly flammable plants:

- Retain large amounts of dead material within the plant
- Produce a large volume of litter
- Contain volatile substances such as oils, resins, wax, or pitch

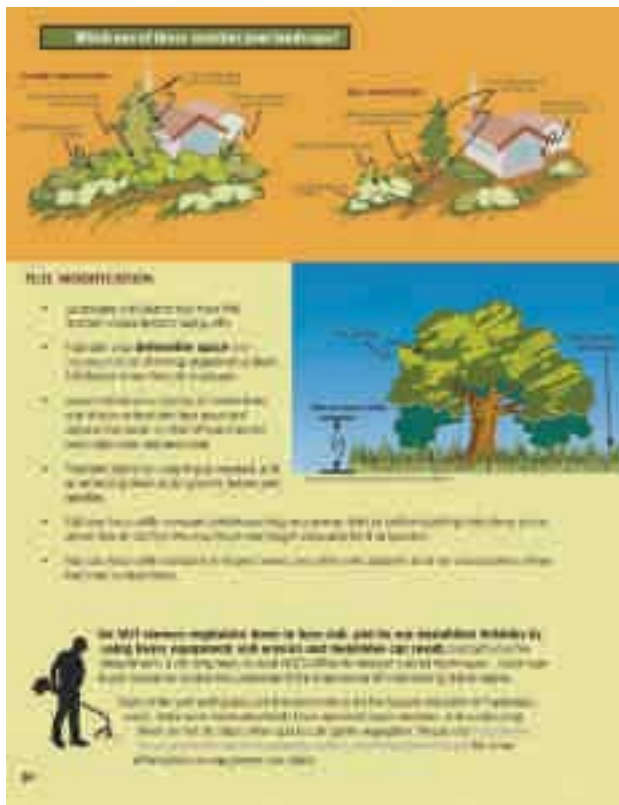
around their homes—rather than on changes they can make to the structure itself or within the first 30 feet. In ember-driven wildfires, it can be far more effective to protect property by making sure that embers cannot enter the home through doors, windows, vents, or other gaps, than on any actions focused on the surrounding plants. We advise the homeowner to make sure that flam-

mable materials such as firewood, fuel canisters, and even fences and trellises can't provide a conduit for fire to reach the house, and that embers cannot collect under decks or eaves.

Of course we also recommend choosing burn-resistant building materials for roofs, siding, and decks. UCCE research on fire-resistant materials and construction methods

A landscape in the Altadena area after appropriate fire hazard reduction. Vertical and horizontal space was created by pruning and selectively removing vegetation between native shrubs, reducing the continuity of fuel without removing more vegetation than necessary. Photograph by J. Lopez, Los Angeles County Fire Department.





Pages from the SAFE Landscapes Southern California Guidebook to Sustainable and Fire-Safe Landscapes in the Urban Wildland Interface. Graphic design by V. Borel, UC Cooperative Extension.

helped drive the creation of new building codes for WUI areas. These were adopted by the State of California in 2007 and apply to any new construction. For more information about making structures more resistant to wildfire, see the fire resistant building page of our website, <http://ucanr.org/safelandscapes>.

Beyond the building, the major principles to follow include thinking about the defensibility of the landscape—creating a space where firefighters can safely defend the structure from wildfire. This involves making sure to achieve a vertical and/or horizontal separation among plants so that a ground fire cannot move upward into tree crowns, becoming a high ember-producing fire. We advise homeowners to remove any dead plant material from roofs and anywhere it can collect, including keeping plants pruned and trimmed to remove thatch build-up. We also advise the use of proper irrigation to keep plants healthy. A healthy plant is usually a fire-resistant plant.

INFORMATION DELIVERY

One of the difficulties in educating the public about fire safety is that people generally disregard the issue until a large fire occurs. Then there is a sudden surge of interest in the topic that wanes rapidly once the emergency has passed. However, another good time to target homeowners is in the spring when they receive fuel management notifications from local fire agencies. At UCCE we wanted to reinforce the idea that fire preparedness and landscape maintenance were year-round tasks, so we decided to deliver that information in a calendar.

Each month's page includes a brief discussion of relevant issues regarding fire ecology and landscape preparedness, and highlights two or more invasive plant species to avoid. We also took advantage of the calendar format to include the start dates for major Southern California wildfires along with the number of structures lost and acres burned. In addition to highlighting the year-

round nature of the issue, by utilizing a calendar format we sought to get the information off the pile of "should-read" desk material, and onto the kitchen wall where it could be absorbed slowly.

With support from the National Fish and Wildlife Foundation, the Renewable Resources Extension Act, the California Community Foundation, the Los Angeles and San Gabriel Rivers Watershed Council, the National Park Service, and the Los Angeles and Ventura County Fire Departments, in 2007 and 2008 SAFE Landscapes Calendars were distributed to over 49,000 residents in the wildland/urban interface areas of Los Angeles and Ventura counties through direct mail and at events and workshops. Mail-in surveys were included.

Of 241 survey respondents, 80% found the calendar useful and 73% said the information was new to them. Also, 73% planned to save the calendar for future reference. Most importantly, 76% reported being more concerned about invasive



plants after reading the calendar, 81% said they had avoided buying invasive plants, 55% said they would change their landscape because of the calendar, and 51% specifically said they were removing these invasive species from their landscapes.

In addition to the calendar, UCCE created the SAFE Landscapes website, <http://ucanr.org/safelandscapes>, and a SAFE Guidebook that contains similar information to the calendar, but in a non-dated, non-year-specific format (so it can be used as an educational document for several years). We also held workshops in both 2007 and 2008 to provide more comprehensive information to homeowners as well as to landscape designers and architects.

In addition, we participated in numerous workshops and symposia of a more technical nature on fire ecology, fire preparation, and post-fire recovery in wildlands. We also provided extensive support to the City of Los Angeles following the Griffith Park fire, an 800-acre blaze that affected a large portion of that city park in May 2007. UCCE helped to develop the post-fire recovery

area as a source of risk, rather than see the benefits of natural plant communities. To solve it they may choose a “scorched earth” approach, meaning that they remove every bit of vegetation, leaving just dirt. As more properties are developed at the edge of wildlands, individual efforts to manage fuels can result in significant loss of native habitat. The removal of most or all of the vegetation in these areas can leave disturbed soils ripe for invasion by weedy species. Hence, the common practice of clearing all vegetation in early spring can lead to a build-up of invasive plants and fine fuels by the time fire season arrives. The replacement of deep-rooted native perennial vegetation by shallow-rooted weedy annuals can also create an erosion hazard, with or without a wildfire occurring.

The next step we hope to take in expanding our program will be to train homeowners as well as vegetation management contractors in methods for a “light-touch” approach to fuel reduction. This will focus on creating vertical and horizontal space, while retaining as much na-

strategy, which highlighted the need to control invasive plants and provided training to park maintenance staff to recognize and treat infestations.

THE FUTURE

Our work so far has focused on the landscaped area within the first 100 feet of a home. Beyond that, homeowners often look at the naturally vegetated

tive vegetation as possible to provide habitat and protect slopes. Creating this space—by selectively removing and pruning vegetation so that there is space between individual plants, rather than a continuous, connected mass of vegetation—means that fire cannot spread as easily.

The SAFE Landscapes program is only one of several statewide projects led by the University of California Cooperative Extension and the Division of Agriculture and Natural Resources. Similar projects that focus on different plant communities are taking place on the coast and mountains of Northern California, around Lake Tahoe, in San Diego, and in other areas. I encourage you to contact your local Cooperative Extension office to find out more.

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Sabrina L. Drill, UC Cooperative Extension, Los Angeles County, 4800 E. Cesar Chavez Avenue, Los Angeles, CA 90022, sldrill@ucdavis.edu