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Fire Safe Landscaping

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Many wildland areas where fire is a natural and common event are now intermixed with homes, residential areas, and entire municipalities. Many foothill communities, once grasslands or sparsely vegetated, are now heavily planted with highly flammable, non-native species. Consequently, local fire protection agencies are hard pressed to protect the people, their property, and the surrounding natural resources. Additionally, years of fire suppression in these areas has resulted in the heavy accumulation of brush and other flammable woody material, often leading to devastating urban wildfires.

Defensible Space

Homeowners and landscape professionals can greatly reduce the risk of wildfire by creating 'defensible space' around structures to reduce the intensity of fire and give fire fighters a margin of safety. The relative fire safety of a home is determined in large measure by its placement relative to the terrain, slope, design, and flammability of building materials, landscaping, and surrounding vegetation. Landscape design, plant selections, and maintenance of landscaping immediately around a home are important considerations.

In California, provisions of the California Public Resource Code require clearing flammable vegetation within at least 30 feet of homes on land dominated by flammable vegetation, depending on local conditions. In areas of dense vegetation, at least 100 feet of clearance is needed. Greater clearance is advisable on hillsides, where fire spreads more rapidly and with greater intensity.

The term clearance as used above is intended to mean the reduction of 'fuel load' immediately around a structure. Fuels are defined as trees, shrubs, leaf litter, tall grasses, weeds, firewood piles, accumulations of wood debris, and other flammable materials. Fire requires fuel to burn so where fuel levels are reduced, fire intensity will be reduced accordingly. The more continuous the fuel layer, the more rapidly a fire can spread and the greater the potential for high intensity fires.

The demand for fire safety must be balanced with the need for privacy, shade (comfort and energy savings), property value, and aesthetics. Reducing fuel volume and eliminating highly flammable plants in the defensible space is key to providing moderate fire safety.

Defensible Space and Landscaping Decisions:

Tree and plant selection is only one element of 'firesafe' landscaping. Size, height, density of foliage (fuel volume), arrangement of plants, spacing, proximity to a structure, maintenance (irrigation frequency, pruning to keep plants compact and free of dead twigs and branches) and sanitation (elimination of tall grasses, weeds, and dead plant debris and other flammable materials), are equally important.

All plant material will burn under the right conditions, although certain plants are inherently more fire-resistant than others. Moisture content (succulence) fuel volume, compactness, height and content of volatile compounds, waxes, oils, etc., determine fire resistance. With careful selection, placement and maintenance, fire resistant plants can be used relatively safely immediately around homes within the 'green zone' (see below). The important concepts of 'firesafe' landscaping are to use fire resistant plants within 30 feet of the structure, plant low growing and compact forms, keep planting density low, separate groups of plants to break continuity, and maintain succulence, compactness, and cleanliness by regular irrigation, pruning and cleanup. Use plants as accents and plant smaller trees and large shrubs at least 10 feet from the home. Give larger growing trees more clearance and prune so that there is 6 to 10 feet of clearance above the ground or roof. Cover bare soil with mulch, lawn or low ground covers, gravel, pavers set in sand, etc. In some cases, existing vegetation, even highly

flammable trees, can be retained if adequately pruned to minimize hazard potential. Depending on slope, vegetation type and density, it may also be necessary to reduce the fuel volume outside the green zone.



Native vegetation can burn with great intensity.



Conifers are extremely flammable.

Landscape Design – The Zone Concept:

A practical approach to developing defensible space involves varying the level of fuel reduction, plant selection, and maintenance by zones concentrically arranged around the structure. Typically three to four zones are delineated. The innermost zone within 30 feet of a home is a critical buffer zone between the structure and the surrounding native vegetation. This area should be generally level and drain away from the home. The intent is to establish and maintain a green zone or ‘greenbelt’ of irrigated, low-growing and fire-resistant plants around the home. Group plants according to their irrigation needs and use an efficient irrigation system. Consider lawns, border plantings, rock gardens, flower and vegetable beds, etc. Year round maintenance is required. Regular irrigation, dead branch pruning, removal of accumulated leaf litter and other woody debris play an integral role in the effectiveness of this zone. Some ground cover plants gradually lose their fire-resistance as their lower, inner branches die. For this reason, it is advisable to mow or shear them periodically to encourage new, more succulent growth. Additional protection can be provided incorporating rock, brick or concrete pathways and patios, and masonry walls. Bare soil in the greenbelt can be mulched with 2-3 inches of clean wood chips, fir or redwood bark with little risk. This will help reduce erosion, conserve soil moisture, retard weed growth, and improve growing conditions. Be sure all leaves are removed from the roof and gutters before the fire season begins and remove tree limbs within 10 feet of chimneys and clear all vegetation within 10 feet of liquefied petroleum gas storage tanks.

The mid-zone, 30 to 70 feet from the house, is designed to provide maximum fire protection, it should contain mostly low-growing, fire-resistant plants. Some well-spaced, fire-resistant trees can be maintained. Plants in this area should be drought tolerant; however, periodic irrigation will increase their fire-resistance. More native vegetation can be maintained in the outermost zone, although dense brush must be cleared and crowded trees thinned (culled). Minimum spacing between tree crowns should be 10 feet. Add five additional feet for each 10 percent of slope. Ideally, trees within this zone should be spaced 20 to 30 feet apart to prevent lateral fire spread. Prune off all lower branches within about 8 feet of the ground at the trunk or branch from which they originate.

Shrubs planted under trees should not exceed 24 inches in height. The removal of dead branches and trunk sprouts in the lower crown is also desirable. Separate shrubs by at least 2 times their height. Small groupings, however, can be maintained. Stagger tree placement and space irregularly to avoid alignment, resulting in a continuous fuel supply.

Plants of Concern:

Most conifers are quite flammable, however some like pine, incense cedar and juniper are extremely flammable. Many species of eucalyptus and acacia are quite flammable as well, due to in large measure to the excessive debris that builds up under their canopies and to volatile oils and resins in their leaves. Species with shedding bark and heavy litter drop e.g., blue gum (*Eucalyptus globulus*), are particularly hazardous because fire can spread more readily upward into the tree. Other species of eucalyptus that are relatively clean are not as problematic. Plants considered to be highly flammable must be kept pruned-up, thinned-out, free of litter and peeling, loose bark, well-irrigated, and at least 10 feet from any structure. Better yet, remove them. Many native and Mediterranean plants are well suited for fire safe landscaping and are adapted to winter rain and dry summers. Base selections on slope, exposure, available space, and tolerance to shade, full sun, wind, and drought. The oil or resin content, water and mineral level, and production of fine fuels (large surface area per unit volume) determine the degree of fire resistance. Local fire agencies can provide fire resistant plant recommendations and other fire safe literature.

Trees planted in defensible spaces should be far enough apart that a fire cannot travel across tree canopies. This separation is especially important around structures like houses. In addition to horizontal continuity, vertical fuel ladders are another concern. Layers of flammable material that allow a fire to move from the ground to the tree canopy create fuel ladders. For example, heavy accumulations of pine needles on the ground can ignite and burn shrubs, which in turn ignite tree limbs or leaves. Fuel ladders are a major cause of high intensity crown fires.

Tips for landscape professionals to develop defensible space:

- Build with non-combustible or fire-resistant materials. Replace shake or shingle roofs.
- Create fuelbreaks (vegetation-free strips).
- Eliminate tall grass, weeds and dense brush, and other highly flammable plants around structures.
- Remove accumulations of woody debris, dry weeds, and pine needles.
- Eliminate 'fire ladders,' e.g. tall shrubs growing under trees and vines growing into trees that can carry fire into tree's canopy.
- A 2 to 3 inch layer of coarse, wood chip mulch can be left to protect the soil with little risk. Although such material can burn, it does so with low flame heights and low intensity.
- Replace highly flammable plants within the defensible space with fire-resistant species, or carefully manage them to reduce their flammability.
- Select plant species and cultivars that are:
 - recognized as fire-resistant.
 - adaptable to the local conditions.
 - low in fuel volume (low growing, limited spreading habit, minimal litter).
- Don't crowd plants – allow space for growth (this will avoid competition and over crowding).
- Use plants as accents, interplant with annuals, rocks, pathways, and mulched areas, etc.
- Remove highly flammable trees within 10 feet of structures.
- Prune fire resistant trees for adequate clearance over buildings.
- Prune branches that overhang roofs especially chimneys or raise the lower canopy of large, specimen trees to provide at least 10 feet of clearance between the roof, chimney and the tree's foliage.
- Eliminate understory vegetation capable of carrying fire into the tree's canopy (ladder fuels).
- Remove the lower branches of large trees to a height of about 8 feet, or maintain a vegetation-free zone beneath the tree's dripline and 10 feet beyond by mowing or with herbicides or use a non-combustible mulch.
- Selectively remove trees/shrubs to improve spatial separation and reduce fuel loads.
- Remove unhealthy, stagnating and dead plants.
- Prune dead branches within the canopy of trees/shrubs to reduce the fuel load. Thin out dense shrubs to reduce fuel load.
- Irrigate plants to maintain greater fire-resistance.
- Oaks will benefit from 2 to 3 summer irrigations, but keep water away from the their trunks. More frequent irrigations can be harmful.
- Enclose decking with non-combustible sheathing, at the very least remove vegetation under decks.



Landscaping decisions, e.g., tree and plant selection, arrangement and density and maintenance are critical to developing and maintaining a defensible space.

The arrangement of fuels:

- ‘Fuel’ are trees, shrubs, leaf litter, houses, and other flammable materials. Fire requires fuel to burn, so where the fuels are reduced, fire intensity will be reduced accordingly. The more continuous the fuel layer, the more rapidly a fire can spread and the greater the potential for high intensity fires.
- Shrubs in the defensible space should be planted in (or thinned into) clumps, or islands, with open space between each. Some landscapes are designed with areas of walkways, driveways, patios, and other ‘hardscaping’ to provide aesthetically pleasing fuelbreaks.
- Pruning branches of trees or removing shrubs can often remove fuel ladders. A rule of thumb is that, within the defensible space area, vertical separation between fuel layers should be at least two times the height of the lower fuel layer. Following that formula, a 4’ shrub growing next to an incense cedar should be separated by 12 vertical feet (4’ x 3’). This could be accomplished by removing the lower tree branches, reducing the height of the shrub, or both.
- Trees planted in defensible spaces should be far enough apart that a fire cannot travel across tree canopies. This separation is especially important around structures like houses.

Adapted from Wildland Home Fire Risk Meter, Simmerman and Fischer, 1990 by The Defensible Space and Healthy Forest Handbook, 1997. Bruce W. Hagen is an Urban Forester with the California Department of Forestry in Santa Rosa and teaches Arboriculture classes at Santa Rosa Junior College.

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