



Wildfire Threat Reduction Recommendations for Lake Tahoe Basin Homeowners — April 18, 2008

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Introduction

In 2002, University of Nevada Cooperative Extension and the Lake Tahoe Regional Fire Chiefs' Association (LTRFCA) initiated an effort to standardize wildfire threat reduction recommendations for Tahoe Basin homeowners used by federal, state, and local fire prevention organizations. The "Living With Fire — Wildfire Threat Reduction Recommendations for Lake Tahoe Basin Homeowners" is the result of this process. In July 2007, representatives from the Lake Tahoe Basin fire protection organizations, University of California Cooperative Extension, and University of Nevada Cooperative Extension met to update and revise these recommendations. See Appendix A for a list of participants. The recommendations were once again revised in April of 2008 to reflect changes in code, policies, and practices as a result of the California-Nevada Tahoe Basin Fire Commission recommendations, LTRFCA's "Nine Point Letter", and other factors. It is important to note: these are suggestions for Tahoe Basin homeowners endorsed by the program's sponsors and are not requirements. Local fire jurisdictions should be consulted regarding requirements. These recommendations are not intended to be in conflict with local ordinances, codes, or laws, and can be modified by the local fire protection districts or fire department.

Recommendations

1.0 Purpose

These are wildfire threat reduction recommendations for Tahoe Basin homeowners to implement on their properties. The recommendations are presented in three categories: Built Zone, Defensible Space Zone and Access Zone.

2.0 Built Zone

- 2.1 Objective:** Improve the ignition and ember resistance of the house and associated structures.

2.2 Definition: The Built Zone consists of the house, attached deck, and other structures within 30 feet that pose a fire hazard. Contact your local fire protection district or fire department for advice concerning the degree of hazard posed by other structures.

2.3 Roof

a. Roof Covering: Wood shake and shingle roofs should be replaced with a fire-resistant Class A roof covering, such as asphalt-impregnated fiberglass shingles (also called asphalt composition or three-tab shingles), clay tiles including “barrel” or “flat” styles, slate, and cement-containing shingles, which may or may not have some amount of wood fiber. Clay tiles and cement-containing roofing are often installed on thin slats, providing an inch or so separation between the bottom of the roofing and top of roof sheathing. This gap helps fire performance in materials such as these that can have a high material heat transfer rate, but also makes them more susceptible to breakage when walking on roofs to do routine maintenance. The heavier asphalt comp shingles, classified as “35-year” or “40-year” shingles, have a longer useful service life. Some roof covering materials have an “assembly” rating because of the need to include additional material underneath the covering to improve fire performance. **Check with your local fire protection district or fire department to determine if assembly rated Class A roofs are acceptable.**

b. Roof Openings: All roof openings, such as a space between the roof covering and the roof decking, should be plugged to prevent entry of embers or other small materials.

c. Roof Debris: The roof should be kept free of fallen needles, leaves, branches, and other debris.

2.4 Chimney: Every chimney should have an approved spark arrestor.

2.5 Eaves and Overhangs: The undersides of eaves and other overhangs should be covered with a noncombustible sheathing, such as fiber cement board, or at minimum, 5/8-inch thick plywood (higher grades of plywood are preferred). Because lap joints and butt joints are vulnerable areas, board materials are not preferred materials for covering the undersides of eaves. If board materials are used, those with shiplap, tongue-and-groove, and other similar type joints are better choices.

2.6 Rain Gutters: Rain gutters should be kept free of fallen leaves, needles, and other debris. Gutter covers can help, but still require routine maintenance. Consider removing gutters if roof drainage can be safely transported without damaging the exterior siding of the house, creating foundation problems, or causing accelerated erosion. This usually requires an adequate eave overhang

and gravel infiltration system around the base of the house. Rain gutter removal may require coordination with the best management practices. Contact Tahoe Regional Planning Agency (TRPA) prior to removal of rain gutters.

2.7 Exterior Wall Covering: Exterior wall coverings consisting of wood shakes or shingles, boards, or panels and vinyl siding are poor choices. The use of wood shake or shingle siding may even be prohibited in some communities. Stucco, brick, metal, cement board and stone are usually more fire-resistant and better choices. Log wall construction that utilizes chinking can be used if the chinking material is fire rated and properly maintained. Log wall construction that utilizes “profiled” logs (such as tongue-and-groove, hewn, or notched designs) do not have the gaps that occur in chinked-style log homes and are a good choice. **Check with your local fire protection district or fire department for further information on allowable siding materials.**

2.8 Windows: Single-paned windows with annealed (plate) glass and larger windows are poor choices. Windows that are at least double-paned and contain tempered glass, especially on the exterior pane, are preferred. Since the 1980s some windows in homes have contained tempered glass for safety reasons. These have included windows in exterior doors, sliding glass doors, and windows that were located near the floor. Window frame material isn’t nearly as important as the type of glass. Even though homeowners can be almost indifferent, the same mechanism that makes aluminum a poorer choice from an energy perspective, that it is a thermally conductive material, makes it a slightly better choice than other types from a fire protection perspective. It maintains a smaller temperature difference between the protected and exposed glass. Horizontal and vertical separators in vinyl hung and casement windows should contain a metal reinforcement member. Closable, solid exterior shutters will provide additional protection. Metal screens will provide some protection against a radiant exposure, as they absorb energy and reduce the temperature difference between the protected glass and the exposed glass. However, these screens do not protect the window from flame impingement exposure.

2.9 Vents: All vent openings should be covered with ¼-inch or smaller noncorrosive metal mesh. Do not use fiberglass mesh. It is also a good idea to prepare wood covers to be attached prior to evacuation to stop entry of embers. Do not permanently close or remove vents, as they are critical to preventing wood rot in the house. Eave soffit vents are particularly vulnerable. Consider moving vents from eave soffits to the roof. Before moving vents to an alternative location on the roof, consult with local building officials for direction. Note: vents that have been designed to prevent entry of embers and flame are currently being developed and should be available in the near future.

2.10 Decks: Materials used as coverings on solid-surface decks, such as lightweight concrete and stone pavers, are noncombustible and usually good choices.

Most materials, however, used in the open-frame decks that use deck boards are combustible, including solid wood and wood-plastic composite decking products. For new decks constructed in California's wildfire-prone areas, deck boards will have to be approved for use and comply with a standard that sets a limit on the amount of heat that is released when ignited. Information on flame spread will also have to be provided. A WUI Products Handbook, available at <http://www.fire.ca.gov/wildland.php>, will list products that comply with provisions of the new code. Consider replacing existing combustible deck boards with the newer fire-resistant rated types. The undersides of low decks can be enclosed with ignition-resistant materials, such as those described in **2.7 Exterior Wall Covering**. If decks are enclosed, a provision should be made to vent the enclosed space to avoid moisture problems. To accomplish this, treat this enclosed space as a crawl space. Note: TRPA land coverage standards may apply and permits may be required. As an alternative, the undersides of low decks can be screened with ¼-inch or smaller wire mesh. This will keep debris from accumulating underneath the deck. The wire mesh screen should be cleaned regularly to allow for air flow. The ⅛-inch screen will plug-up more easily than the ¼-inch screen. The area underneath higher decks should be kept free of all easily combustible materials and maintained on a regular basis. Routinely remove debris that accumulates in the gap between combustible deck boards during fire season.

2.11 Flammable Items: Flammable items, such as paper, fallen leaves and needles, trash, firewood, and combustible decorations, should be removed from exposed locations, such as porches, steps, patios, and decks.

2.12 Wooden Fences: If a wooden fence is attached to the house, replace at least the first 5 feet nearest the house with a noncombustible section of fencing, such as masonry or metal, or a noncombustible gate.

3.0 Defensible Space Zone

3.1 Objective: Reduce the flammability of vegetation near the house.

3.2 Definition: Defensible space is that area between a house and an oncoming wildfire where the vegetation has been managed, by pruning, thinning, removing, or replacing it, to reduce the wildfire threat and allow firefighters to safely defend the house. In the event that firefighters are not available, this space also improves the likelihood of a home surviving without assistance. Defensible space can reduce the potential of an escaped structural fire from burning adjacent wildlands as well.

3.3 Defensible Space Zone Distances: The distance from the house in which defensible space practices should be implemented varies, depending on the

fuel type present and steepness of the property's slope. The recommended minimum distances are presented in **Table 3.3a**.

- 3.4 Defensible Space Zone Areas:** The Defensible Space Zone consists of three areas: the Noncombustible Zone; the Lean, Clean, and Green Zone; and the Wildland Fuel Reduction Zone. See **Figure 3.4**.

Table 3.3a
Recommended Defensible Space Zone Distances¹

Fuel Type (Fuel Models) ²	Percent Slope		
	0-20%	21- 40%	> 40%
Grass (1-3)	100 feet	100 feet	100 feet
Shrub (4-7)	100 feet	200 feet	200 feet
Timber ³ (8-13)	100 feet	100 feet	200 feet

¹ As measured from the footprint of the house.

² BEHAVE Fuel Models.

³ Use shrub recommendations if a substantial shrub understory is present.

- 3.5 Noncombustible Area:** This area lies immediately adjacent to the house and extends out from the footprint of the house for at least 5 feet. It consists of noncombustible landscaping materials and ignition-resistant, low fuel volume plant materials. The objective of this area is to prevent the ignition of a smoldering or flaming fire that could ignite the house. Of particular concern is the prevention of ignition from burning embers. Recommendations for the Noncombustible Area include:

- a. Remove Dead Plant Material:** All dead plant material, including dead shrubs and trees; fallen leaves and needles; bark and wood mulches; dried grass, flowers, and weeds; dead leaves, flowers and branches still attached to living plants; firewood; landscape timbers; and construction materials, should be removed from this area. Do not use combustible materials, such as wood boards for borders of infiltration systems located within 5 feet of the house. Stone, brick, and concrete curbing are better choices for infiltration system borders.
- b. Remove Flammable Living Plants:** Flammable native plants, such as big sagebrush, bitterbrush, rabbitbrush, greenleaf manzanita, huckleberry oak, snowbrush, and coniferous trees, should be removed from this area. See **Figure 3.5b**. Flammable ornamental plants, such as juniper, mugo pine, Austrian black pine, other coniferous shrubs and trees, large exotic grasses,

and Scotch broom, should be removed and should not be planted in this area. When removing shrubs and trees from this area, the root systems should be left in place to reduce the potential for erosion. Remove and do not place shrubs and trees in corners where exterior walls meet, under first-story windows and eave vents, or in front of foundation vents. TRPA ordinances may apply to tree removal. Contact your local fire district or department for tree removal recommendations, tree marking and permits.

- c. **Use Noncombustible Materials:** Consider the use of noncombustible materials, such as rock, gravel, brick, and concrete, in this area. Note: TRPA land coverage standards may apply and permits may be required.
- d. **Use Low-growing, Irrigated, Herbaceous Plants:** Consider the use of low-growing (less than 18 inches tall) herbaceous (nonwoody) plants, such as lawn, conservation grasses, clover, forbs, and succulents, that are kept green during the fire season with irrigation. See Appendix B for general characteristics of fire-resistive plants.
- e. **Use Deciduous Shrubs:** The use of low-growing (less than 18 inches tall) native and ornamental deciduous shrubs as individual specimens or in group plantings, except for those presented in **3.5b**, is acceptable so long as they are kept healthy and vigorous, the lower branches do not touch the ground, and branches are not in contact with the house.
- f. **TRPA Recommended Plant List:** In situations other than borders, entryways, flower beds, and similar locations, vegetation to be planted in this area should be selected from the TRPA Recommended Plant List.
- g. **Fire-resistant Trellises:** Use ignition-resistant materials for trellises.

3.6 Lean, Clean, and Green Area: This area often serves as the transition between wildland vegetation and the house and is usually where the irrigated, residential landscape is situated. It extends out for at least 30 feet from the footprint of the house. See **Figure 3.4**. The objectives for this area are to: 1) manage the vegetation so that the fuels present would be unable to generate enough heat for a long enough time to ignite the house, 2) not provide a means of rapidly transmitting fire across this area from wildlands to the structure or vice-versa and 3) provide a safe and effective area for firefighters, if present, to defend the house. During fire season, this area should entirely or predominately consist of non-combustible materials. Recommendations for the Lean, Clean, and Green Area include:

- a. **Dead Plant Material:** No dead vegetation or dead vegetative ground cover should be present in this zone, including standing dead trees and shrubs; recently fallen trees; dead branches that have fallen or that are still attached to living plants to height of 15 feet aboveground; dried grass, flowers, and

weeds; fallen needles and leaves (except as noted below), dead leaves and needles that are still attached to living plants to a height of 15 feet; firewood; wood mulches (except as noted below), and wood scraps or debris. Firewood should be located at least 30 feet uphill from the house. Fallen needles and leaves should be raked and removed annually in the spring prior to fire season. Bare ground or duff may be present in these areas after the needles are raked. Subsequent needle and leaf fall may be allowed to accumulate till the next spring removal period so long as it does not create a fire hazard. Wood and bark mulches shall not be used in a widespread manner within 5 to 30 feet of the structure. Limited areas of wood and bark mulches are permissible so long as they are separated by non-combustible materials and they would not constitute a means of rapidly transmitting fire across the Lean, Clean, and Green Area. Composted materials can be used in this area.

- b. Flammable Living Shrubs:** For the most part, the presence of flammable living shrubs as listed in **3.5b** should be substantially reduced in this area and replaced with less flammable species. Individual specimens or small group plantings of these species may be retained, so long as they are kept healthy and vigorous; are pruned to reduce height and fuel load; and cannot convey a fire burning in adjacent wildlands to the house. Sufficient quantities of residual vegetation should remain in this area to stabilize the soil and prevent erosion. When removing shrubs from this area, the root systems should be left in place to reduce the potential for erosion.
- c. Native Live Trees:** Native live trees should be thinned to provide a separation of 10 to 30 feet between crowns. See **Figure 3.5b**. TRPA ordinances may apply to tree removal. Contact your local fire prevention district or department for tree removal recommendations, marking and permits. If feasible, rarer tree species, such as incense cedar, sugar pine, Western white pine, mountain hemlock, whitebark pine, and Western juniper, should be retained; and more common tree species, such as white fir and lodgepole, should be removed. Property owners are encouraged to implement other Lean, Clean, and Green recommendations prior to tree thinning.
- d. Retain Low-growing Native Plants:** Low-growing (less than 18 inches tall) native plants, such as Mahala mat, pinemat manzanita, phlox, and sulfur flower buckwheat, can be retained, so long as they are kept healthy and vigorous.
- e. Use Noncombustible Materials:** See **3.5c**.
- f. Use Low-growing, Irrigated, and Herbaceous Plants:** See **3.5d**.

- g. Use Deciduous Trees and Shrubs:** Deciduous trees and shrubs can be used if they are kept healthy, vigorous, irrigated, free of dead leaves and wood, and are arranged so that a fire burning in the adjacent wildland vegetation cannot be conveyed through them to the house or into tree canopies. Deciduous trees should be placed so that the mature canopy can be easily maintained at a distance of at least 10 feet from the house. Shorter deciduous shrubs (less than 18 inches tall) are preferred.
- h. TRPA Recommended Plant List:** In situations other than borders, entryways, flower beds, and similar locations, vegetation to be planted in this area should be selected from the TRPA Recommended Plant List.
- i. Ladder Fuels:** Tree canopies should be raised by removing low branches to a height of at least 10 feet. Native shrubs and trees should be removed from under the tree drip line. Irrigated lawn and flowerbeds, as well as low-growing native ground covers, can be used under the drip line of trees so long as they cannot readily convey a surface fire into the tree canopy. See **Figure 3.6i**. Removal of lower branches should not exceed one-third of the total tree height.
- j. Problem Tree Branches:** Trees shall be maintained so that there is a minimum of 10 feet of separation between branches and the chimney, no branch encroachment on power lines, no overhanging branches within 10 feet of the roof, and no branches within 10 feet of the side of the house. See **Figure 3.5b**.

3.7 Wildland Fuel Reduction Area: This area extends out from the Lean, Clean, and Green Zone to the appropriate Defensible Space Zone Distance presented in **Table 3.3a**. This area often consists of wildland vegetation, such as greenleaf manzanita brushfields and mixed-conifer forests, but may also include other types of vegetation. The objective for this area is to reduce the intensity and duration of a wildfire burning more than 30 feet from the house. When the Wildland Fuel Reduction Area is situated on TRPA- designated "Sensitive Lands," including Stream Environment Zones, Shoreline Zones, Scenic Areas, and Conservation/Recreation Areas, the following recommendations still apply, but TRPA rules may affect removal methods. Recommendations for the Wildland Fuel Reduction Area include:

- a. Dead Plant Material:** Remove standing dead trees and shrubs; recently fallen trees; dead branches on the ground or still attached to living plants to height of 15 feet aboveground; dried grass, flowers, and weeds; and dead leaves and needles attached to living plants to a height of 15 feet. Fallen dead trees that are embedded into the soil can be left in place, so long as all exposed branches are removed. Needle and leaf litter is allowed to a depth of 3 inches or less in this area.

- b. Reduce Horizontal Continuity of Native Shrubs:** For individual or small groups of native shrubs growing on flat to gently sloping terrain (less than 20% slopes), create a horizontal separation between their canopies that is at least twice their height. See **Figure 3.7b**. On steeper terrain (greater than 20% slope), this separation distance should be greater than twice their height. The recommended separation distance can be created through shrub removal and/or pruning to reduce the height and/or diameter of the shrub. When removing shrubs from this area, the root systems should be left in place to reduce the potential for erosion.
- c. Native Live Trees:** The recommended minimum separation distance between the canopies of live trees growing on slopes less than 20% is 10 feet. See **Figure 3.5b**. For trees growing on steeper slopes, the separation distance should be greater. In some cases, islands or small groups of trees are acceptable based upon the recommendations of the local fire district or department. TRPA ordinances may apply to tree removal. Contact your local fire district or department for tree removal recommendations, tree marking and permits. If feasible, rarer tree species, such as incense cedar, sugar pine, Western white pine, mountain hemlock, Western juniper, and whitebark pine should be retained, and more common tree species – such as white fir and lodgepole, should be removed.
- d. Remove Ladder Fuels:** Tree canopies should be raised by removing low branches to a height of at least 10 feet. Native shrubs and trees should be removed from under the tree drip line. Irrigated lawn and flower beds, as well as low-growing native ground covers can be used under the drip line of trees, so long as they cannot readily convey a surface fire into the tree canopy. See **Figure 3.6i**. Removal of lower branches should not exceed one-third of the total tree height.
- e. TRPA Recommended Plant List:** In situations other than borders, entryways, flower beds, and similar locations, vegetation to be planted in this area should be selected from the TRPA Recommended Plant List.

3.8 Lot Size: The recommended defensible space distance may exceed the property boundaries. In these instances, property owners should not implement defensible space recommendations on someone else's property without first securing proper permission. Contact the local fire district or department for information regarding adjacent lot ownership.

4.0 Access Zone

4.1 Objective: Improve the ability of firefighters to locate and arrive at a house threatened by wildfire in a timely manner.

- 4.2 Definition:** The Access Zone consists of driveways and signage associated with the house.
- 4.3 Address:** The home address sign should be readily visible from the street; have characters that are at least 4 inches high; and be constructed of fire-resistant, reflective material of contrasting color.
- 4.4 Street Signs:** Street signs should be at every intersection leading to a house; have characters that are at least 6 inches high; and be made of reflective, noncombustible material.
- 4.5 Driveways and Clearance:** Flammable vegetation should be cleared for at least 10 feet on both sides of the driveway. Overhead obstructions, such as branches, should be cleared for at least a 15-foot vertical clearance.
- 4.6 Driveway Characteristics:** Houses at the end of long driveways (greater than 150 feet) should have turnaround areas suitable for fire equipment. Check with your local fire district or department for local requirements.
- 4.7 Gated Driveways:** Electronically operated driveway gates require key access for local fire districts and departments.

Literature Review

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Appendix A
Participants in the July 2007
Review of Living With Fire Recommendations
for the Lake Tahoe Basin

Chris Anthony	Cal Fire
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Beth Brady	Lake Tahoe Basin Management Unit, USDA Forest Service
Mary Huggins	Cal Fire
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Susie Kocher	University of California Cooperative Extension
Peter Mulvihill	North Lake Tahoe Fire Protection District
Rick Nicholson	Tahoe-Douglas Fire Protection District
Mark Novak	Tahoe-Douglas Fire Protection District
John Pang	Meeks Bay Fire Protection District
John Pickett	Nevada Fire Safe Council
Steve Quarles	University of California Cooperative Extension
Chris Sauer	Fallen Leaf Lake Fire Protection District
Sonya Sistare	University of Nevada Cooperative Extension
Ed Smith	University of Nevada Cooperative Extension
Tom Smith	North Lake Tahoe Fire Protection District
Ray Zachau	City of South Lake Tahoe Fire Department

Appendix B
Characteristics of Fire-Resistive Vegetation
(Reprinted from 2006 International Wildland-Urban Interface Code
International Code Council)

All plants will burn under extreme fire weather conditions such as drought. However, plants burn at different intensities and rates of consumption. Fire-resistive plants burn at a relatively low intensity, slow rates of spread and with short flame lengths. The following are characteristics of fire-resistive vegetation:

1. Growth with little or no accumulation of dead vegetation (either on the ground or standing upright).
2. Nonresinous plants (willow, poplar or tulip trees).
3. Low volume of total vegetation (for example, a grass area as opposed to a forest or shrub-covered land).
4. Plants with high live fuel moisture (plants that contain a large amount of water in comparison to their dry weight).
5. Drought tolerant plants (deeply rooted plants with thick, heavy leaves).
6. Stands without ladder fuels (plants without small, fine branches and limbs between the ground and the canopy of overtopping shrubs and trees).
7. Plants requiring little maintenance (slow-growing plants that, when maintained, require little care).
8. Plants with woody stems and branches that require prolonged heating to ignite.

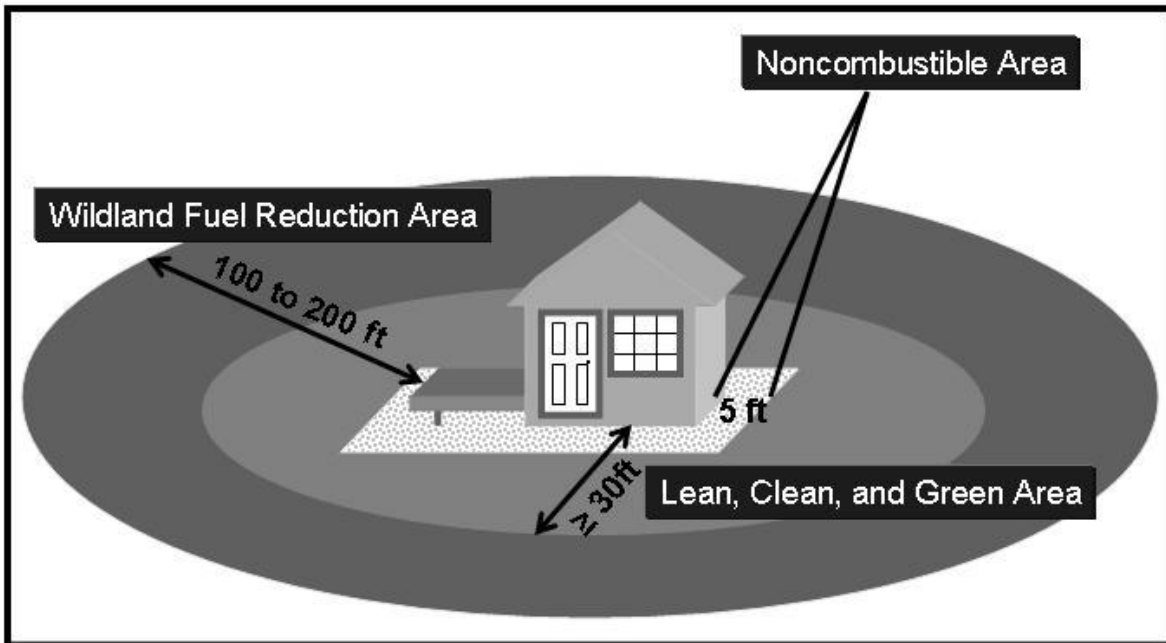


Figure 3.4: Defensible Space Zone areas and recommended distances.

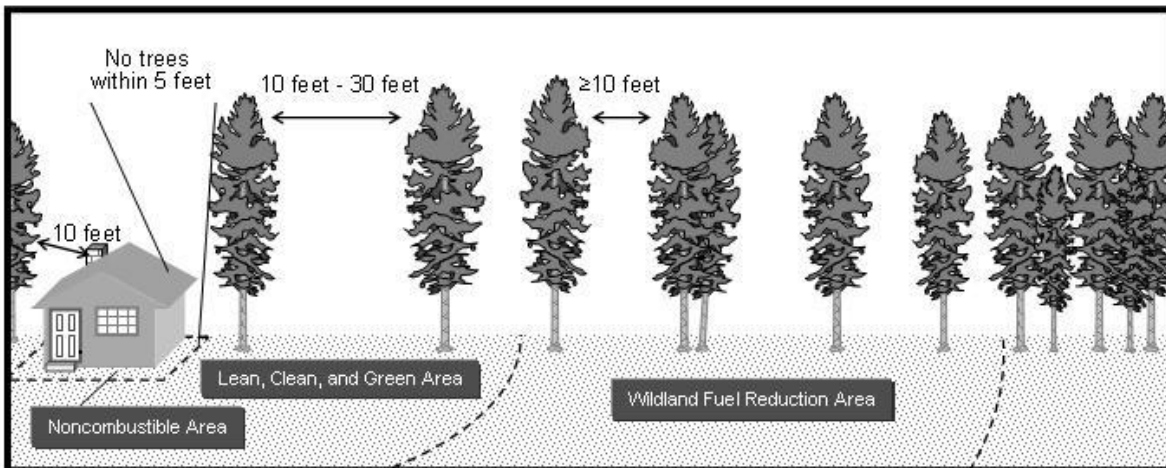


Figure 3.5b: There should be no trees within the Noncombustible Area, 0 to 5 feet from the house. Within the Lean, Clean, and Green Area, 5 to ≥ 30 feet from the house, native live trees should be thinned to provide a separation of 10 to 30 feet between crowns. The minimum crown separation distance should be 10 feet on 0-20% slopes within the Wildland Fuel Reduction Area. The crown separation distance within the Wildland Fuel Reduction Area should be greater on steeper terrain. Tree branches within 10 feet of a chimney, overhanging the roof by 10 feet or less, or touching the house should be removed.

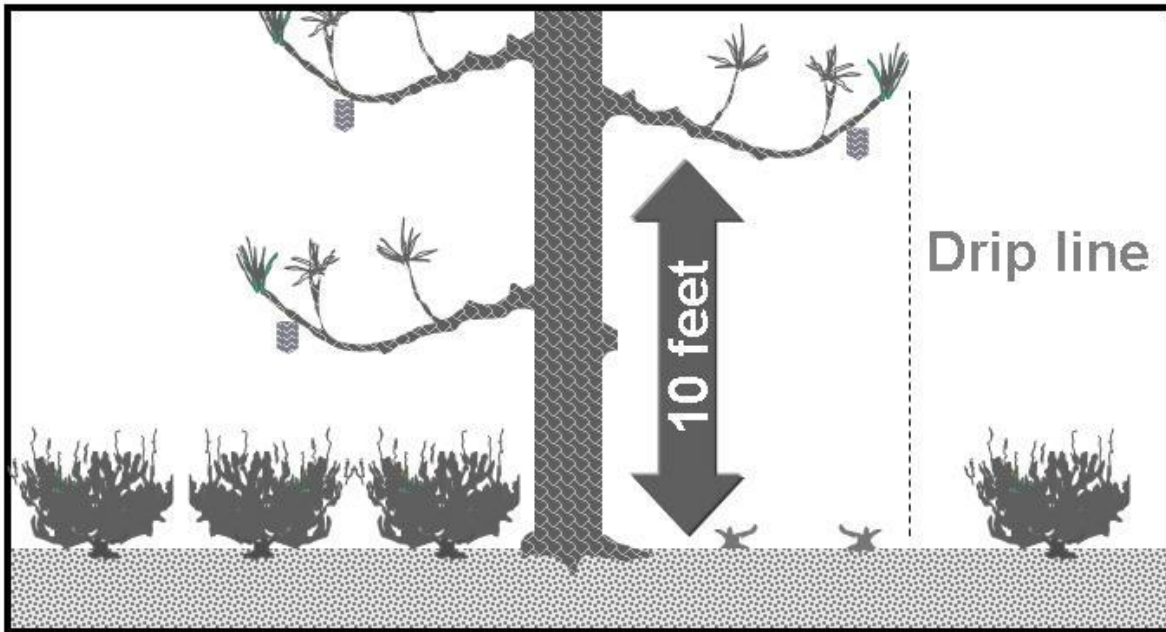


Figure 3.6i: Tree branches should be removed to a height of 10 feet above the ground, and shrubs should be removed from under the tree canopy out to the drip line.

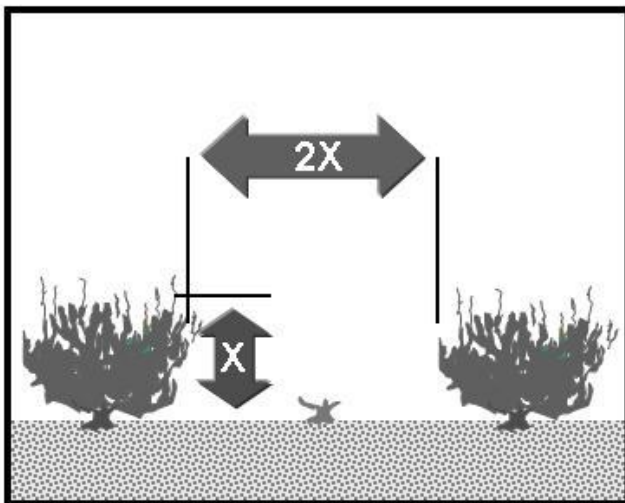


Figure 3.7b: Recommended separation distance between shrubs located on 0-20% slopes is twice the average shrub height.