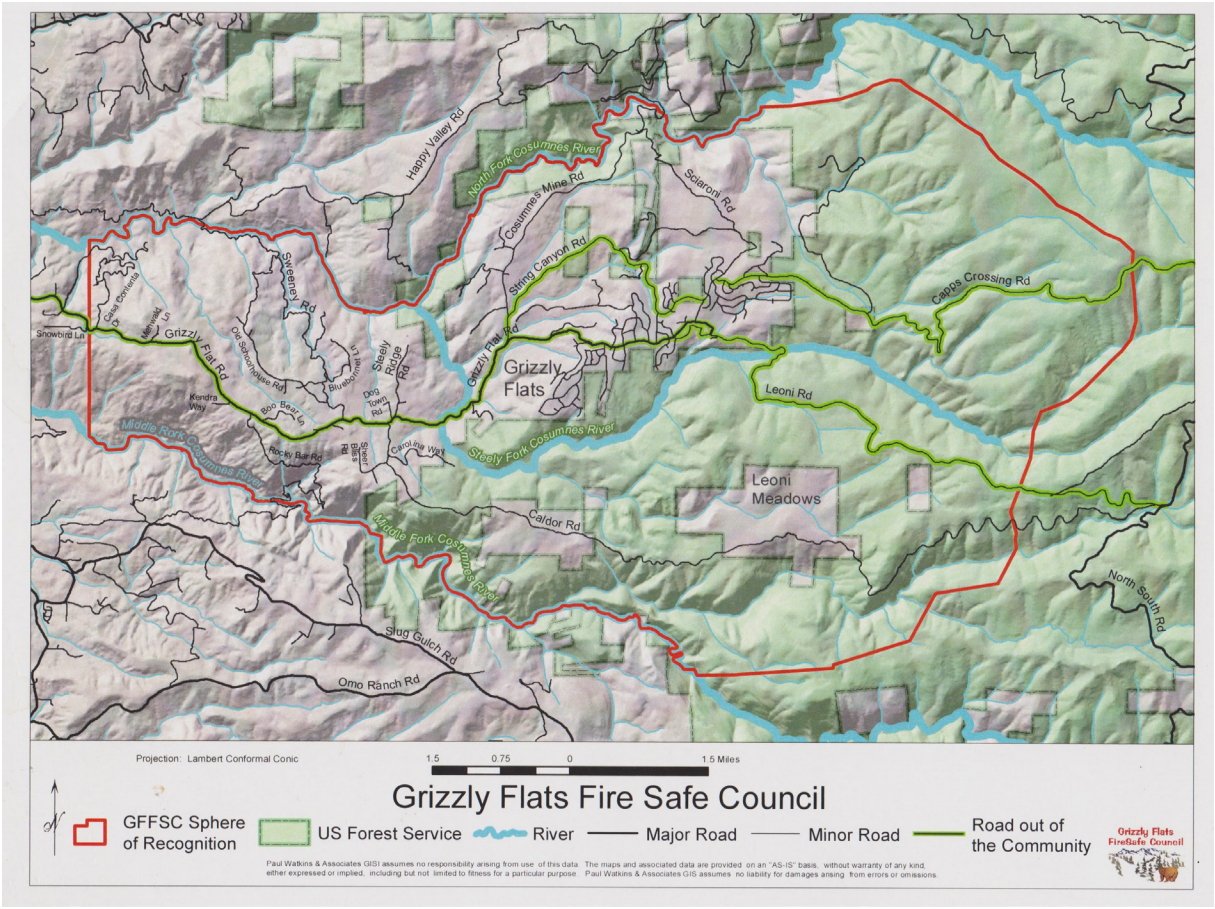
Grizzly Flats Homeowners Landscape Restoration Guidelines

Photo by Mark Almer June 20, 2022
Drone flight over part of Grizzly Flats Community **CALDOR FIRE** burned area

Grizzly Flats Fire Safe Council

Grizzly Flats, like other residential communities located in the interface with forestlands throughout California and the United States, are subject to megafires that can overwhelm the resources to contain them.
These guidelines were devised by the Grizzly Flats Fire Safe Council (GFFSC) specifically to help the residents of Grizzly Flats do as much as possible as a community to recover from the devastation of the 2021 Caldor Fire, and to create a landscape that will be more resistant to future fires and enhance our returning shared environment.



Role of Grizzly Flats Fire Safe Council

The mission of the **GFFSC** is to preserve Grizzly Flats' natural and manmade resources by informing, educating, and mobilizing all residents and landowners to make their homes, properties, neighborhoods, and the community fire safe, and to provide area-wide cooperation, innovation, and action in an effort to internally and externally buffer the GFFSC's Sphere of Recognition from catastrophic wildfire.

Members of the GFFSC provide an interface with federal, state, county, and the community members it serves in the long-term recovery of the community.

Fire Safe Council Sphere of Recognition

The Grizzly Flats community members recognized the need to work together and in partnership with federal, state and county agencies to protect the community from catastrophic wildfire and provide safe ingress and egress (evacuation) routes in case of a wildfire. Over time it was recognized that expanding the area of community influence with these agencies, a larger sphere of recognition was needed to incorporate Leoni Meadows, Seventh Day Adventist Conference Center and Camp, along with additional acreage to our west, Eldorado National Forest watersheds (the only water source for the community).

The Grizzly Flats Fire Safe Council Sphere of Recognition encompasses approximately 39 square miles, or 25,000 acres. It consists of 11 residential subdivisions with 1,600 parcels in sizes ranging from 1/4 to 1 acre.
The unincorporated Grizzly Flats community encompasses 10 of these subdivisions. Elevations range from 2,600 feet to 4,400 feet above sea level.

The topography within the community is relatively gentle, but String Canyon Creek carves into near the middle section. The Sphere of Recognition is bounded on the North and Steely Forks of the Cosumnes River, and on the southern and western boundaries by the Middle Fork of the Cosumnes River. These are steep canyons with heavy vegetative fuel loading. The vegetation forms a diverse landscape mosaic. It is created primarily by a second growth stand of mixed conifers with an understory that contains an excessive amount of ladder fuel.

Sierra Pacific Industries, the second-largest lumber producer in the United States, owns two parcels totaling approximately 945 acres north of String Canyon Road and Sciaroni Road, also within the Sphere of Recognition.
The Placerville Ranger District, one of four ranger districts in the Eldorado National Forest, borders 90 percent of the community boundary.

Multiple additional parcels of private land surround the Grizzly Flats community subdivisions. Larger forested properties varying from 5 to 100 acres adjoin the subdivided parcels in the community's core area.

Historical Influences

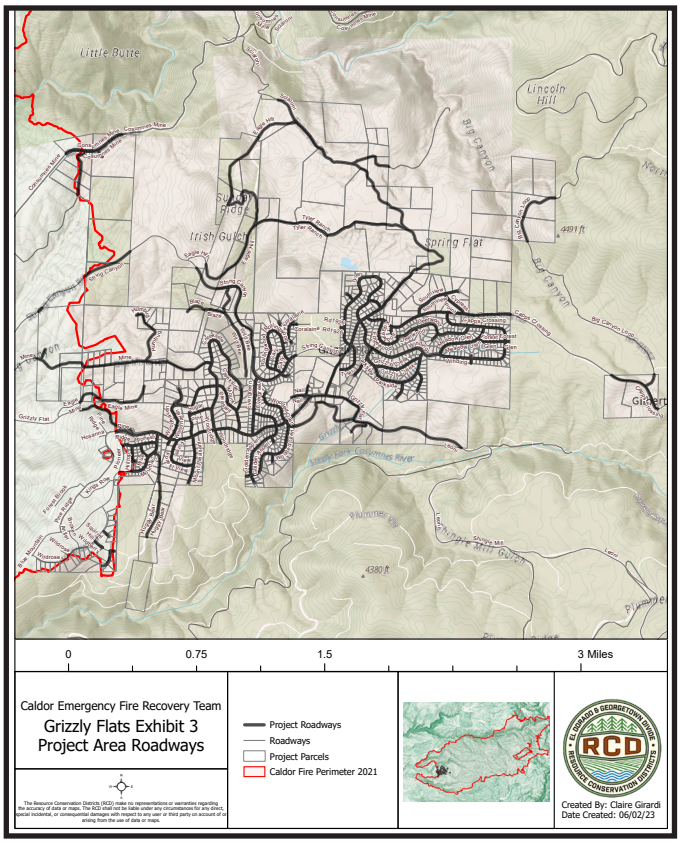
The Grizzly Flats community was established in the early 1850's as a Gold Rush town. During the early days, when hydraulic mining was permitted, parts of the landscape were changed by high pressure water volumes washing soil away down to bedrock, leaving deep gullies. The town was originally called Grizzly Flat, but later evolved into a community renamed Grizzly Flats around the timber industry in the 20th century.

The Caldor Fire

On August 14, 2021, the Caldor wildfire started in the Middle Fork of the Cosumnes River canyon, raced through US Forest Service, El Dorado National Forest, into Leoni Meadows and then entered the southern portion of the community.

Caldor burned area in the
Grizzly Flats community
(El Dorado Resource Conservation District)

Prior to the Caldor Fire there were an estimated 800 habitable developed residential homes on 1,600 parcels.
The 1,600 parcels are estimated to cover 6,200 acres of land.
During the Caldor fire in the Grizzly Flats community, 460 homes were damaged or destroyed.
About 300 survived.



After the Caldor Wildfire

Nature has drastically transformed the Grizzly Flats community. As shown here and on the cover photo, post-fire, the landscape is black and barren which causes extreme conditions for recovery and revegetation. Sites that were shaded are now exposed to full sun in most locations. In sloped areas, full sun, droughty soils, and loss of soil during debris removal and winter storms have produced very harsh dry sites, posing a challenge for revegetation. However, revegetation of these areas is very important to establish cover to reduce dust and minimize erosion that could impair downstream water quality.

Fires reduce or eliminate plant cover, burn off leaf/needle litter, change soil properties, and expose the soil to forces of rain drops splash, runoff, and wind.

Fire is a dynamic process that typically burns in a mosaic pattern with a broad range of fire severities. Fire severity is the magnitude of ecological change from pre-fire conditions, usually described in terms of amount of live biomass that was destroyed. In forests, fire severity is measured in terms of tree mortality, canopy loss, or bole and crown scorch. These measures of fire severity are often interpreted as surrogate measures of fire intensity (radiant energy release in the flaming front). The Grizzly Flats community experienced three severity levels of fire conditions as well as non-burned areas.

Low-severity fire burns primarily on the forest floor and causes very little overstory tree mortality.

Moderate-severity fire causes more variable effects and greater mortality. In these areas, the fire burns on the forest floor in much of the area, but it also burns into the canopy and kills more individual trees or clumps of trees.

High-severity fire is defined as having complete or near complete mortality occurring across a large, contiguous area (or patches).

LOW-SEVERITY

MODERATE-SEVERITY

HIGH-SEVERITY

Landscape Restoration Goals and Objectives

Homeowner landscape restoration goals and objectives should consider at least the following:

- **Design fire risk prevention vegetation**
- **Preserve visual quality**
- **Plan future vegetation mosaic emphasis incorporating native and cultivated nursery plants**
- **Eliminate or control invasive plants**

Community Agencies Restoration Efforts

The Grizzly Flats Community Services District, Pacific Gas & Electric (PG&E), and two cellphone tower companies, AT&T and Verizon, immediately undertook efforts to restore services.

Walt Tyler Elementary School, in Grizzly Flats, is in the Pioneer School District planning to rebuild. It has around 28 students in pre-school and grades 1 through 3. The U.S. Post Office and Grizzly Flats Community Church are planning to rebuild.

Pioneer Fire Protection District Station 35 in central Grizzly Flats was completely destroyed during the Caldor Fire. Station 35 (an unstaffed station) was staffed by fully trained Volunteer Fire Fighters/ Medical Response personnel, and housed a Fire Fighting Patrol Engine, and a Medical Response Utility. These vehicles now respond from 2 Volunteers' homes.

Grizzly Flats has a 30-minute plus response time from PFPD Station 38, which is the closest 24-hour staffed Fire/Medical Unit.

It is hoped that in the future Station 35 can be rebuilt. In the meantime, a small grant received by PFPD will be used to upgrade Station 31 (another unstaffed station, located between 35 and 38) to house a small crew for hopefully 24-hour coverage.

Grizzly Flats Community in a Montane (or Mountainous) Mixed Evergreen Forest

Elevation of the Grizzly Flats community ranges from 3600 to 4200 feet. It is classified as a Montane Mixed Evergreen Forest. Mixed means that tree species stands vary in dominance at different elevations.

California's mixed conifer forest in the Grizzly Flats area is characterized by five primary species: Ponderosa pine, Douglas-fir, incense cedar, sugar pine, and white fir.
Beneath the mixed conifer canopy is an open sub-canopy of hardwoods: black and live oaks, toyon, madrone, and dogwood.
Next is a layer of evergreen shrubs: manzanita, deer brush, and others.
At the ground level, short shrubs like mountain misery (kit-kat dizze) and perennial grasses and forbs (herbs other than grass).

Grizzly Flats residents face a major constraint on their landscaping choices posed by the climate at the foothill elevation range, which includes a short growing season and snowstorms. Most precipitation occurs between November and April although rainstorms occasionally occur during the spring, summer, and fall. Annual rainfall averages of about 70 inches. Inches of snow typically cover the area for one or more days from December or January through March.

Starting Over without Planned Intervention ("Return to Nature")

High-severity fires, which kill most adult trees and understory vegetation, will result in areas of the fire footprint reverting to shrubland. Guidance on return to nature:

1. Avoid scraping or disturbing the blackened ground, as it can damage the existing seed bank, and consider biological soil crusts (includes microorganisms, and various small animals) that stabilized soils and support plant growth. However, where intense fire burned sufficiently hot to create hydrophobic soils, breaking up the soil crust is necessary to allow precipitation to soak into the soil and reduce erosion and runoff. In doing so, scrape the soil across (perpendicular to) the slope, creating gentle terraces to trap water and reduce opportunities for water to run downhill.
2. Be patient and watch what returns, see how hardwood burned trunks resprout.
3. Observe what seeds germinate.
4. Remove and manage known invasive weeds which can be especially aggressive following fire (suppressing desirable growth) and contribute to further fires.
5. Consider defensible space requirements around structures or future construction project areas.
6. Landscape upkeep should take into consideration minimizing the chance of fire jumping from plant to plant by separation of shrubs ("islands").

Once human-made debris is removed, the land will heal on its own in most cases.

Invasive Plants

Conditions following a fire can favor invasive plants, that spread rapidly and grow so dominant that they change the local landscape. Common post-fire plant invaders which may be found in the Grizzly Flats area are listed with identifying photographs in **Appendix A, pages 23 - 25**. It is important to protect and encourage local non-invasive native plant populations and refrain from seeding or spreading invasive grasses and plants that could cause other negative impacts in the future.

Recovering Existing Plants

In low and moderately burned severity zones, many trees and shrubs will recover on their own. Prune back and give fire-damaged vegetation time to recover, including oak trees.

Conifer Trees: such as Ponderosa pine, sugar pine, incense cedar, white fir, and Douglas-fir. Surviving trees have been stressed by drought years and are extremely vulnerable to insect and disease attack. If trees have not been killed outright by the fire, they now have added stress (needles likely suffered heat damage and can't feed the roots through photosynthesis). Not all trees die in the first year, and fire-related mortality can continue for two to six years following fire.

Hardwood Trees: black oak, madrone, dogwood, and big leaf maple. These trees will generally sprout back from the stump after a fire unless the root structure has been completely consumed by burning.

Shrubs: manzanita, deer brush, live (scrub) oak, and holly. These shrub species will readily occupy the landscape following a fire. Many can sprout after fire, and many have long-lived seeds in the soil; some seeds are stimulated by temperature. One benefit of the fire is that the shrubs are reduced or eliminated from the property, and now the challenge will be to keep regrowth at a manageable level. The shrub component is important to have in the landscape as it creates habitat for birds and is an important food source for deer and other wildlife. However, it is best to have islands of shrubs across the landscape and to prevent dense stands. Thick growth of these shrubs after a severe fire can promote another high-severity fire in the future.

Understory Plants: There are several ground covers and smaller shrubs that are appropriate for landscaping around homes in a fire prone area. Many damaged and scorched native plants will resprout and come back, if invasive species do not get a foothold first, providing competition that will limit or restrict the more desirable growth.

Natural Seedbanks

Low to moderate severity burned areas could revegetate naturally on their own within a couple of years. Many flowering plants and grasses have long-lived seed banks in the soil or regeneration capabilities that enable them to sprout from the roots after fire. New plants can emerge from the seedbank in the soil during winter and spring.

Seeding with local native species may be effective in reducing post-fire erosion from severely disturbed soils, or to "speed-up" restoration. For seeding to stabilize soil, seeds need to germinate early in the fall, and plants must develop sufficiently to provide cover and root mass before major winter storms.

Where oaks do germinate or survive, seedlings and tree sprouts should be fenced to help protect them from browsing by wildlife.

Seeding is ineffective on steep slopes (greater than 33%) because the steeper the slope the less likely seeds are to stay in place and germinate successfully.

Landscape Planned Recovery ("Re-seed & Re-plant")

These guidelines focus on the use of native and cultivated nursery seeds and plants for revegetation. Native plants generally have higher survival rates than non-natives since they have evolved for many years to meet the Grizzly Flats community climate and soil conditions. They also require less water and maintenance to establish. Many native seeds and plants can be purchased from nurseries and provide color, texture, and interest to residential landscapes.

Avoid planting seeds or seedlings of non-native, invasive plants, or grasses - **Appendix A,** which can outcompete desirable species and aggressively spread into the broader landscape.

BE PATIENT planting shrubs and trees as a rule of thumb:
Year 1 sleeps, Year 2 creeps, and Year 3 or longer they leap.

Landscape and topography design factors:

- North or south facing slope, steep slope terrain
- Dry arid (xeriscape) no shade
- Summer irrigation requirements
- Deer resistance
- Runoff and soil erosion control, creek bank protection
- Plant arrangement, spacing, and maintenance are just as important as plant type when considering defensible space fire safety
- Mature plant's root can potentially cause damage (structure foundation, sidewalk, and hardscape)

Utility and Infrastructure that could Impact Landscape

refer to page 17 for more information

- Underground electrical & transformer boxes
- Overhead utility line
- Water meters & homeowner service lines
- Septic leach field areas
- Standalone or roof solar systems
- Liquid Propane Gas storage tank or stove oil tank
- Windbreaks
- County road right of way or easements

Defensible Space Landscape Designing

All landscaping should conform to defensible space requirements in California Public Resource Code 4291 and El Dorado Vegetation Management Ordinance 5101.
Defensible space is required space between a structure and the wildland area that, under normal conditions, creates a sufficient buffer to slow or halt the spread of wildfire to a structure. By limiting the level of flammable vegetation surrounding a structure, the structure is protected from igniting due to direct flames burning near the structure or radiant heat.
The most effective and efficient way to protect lives and property is from "the structure outward" rather than from the wildlands toward the structure. The landscape spacing needed is determined by the type and size of shrubs and trees, as well as the slope of the land. The three zones provide a defensible space progression from a structure through an ember resistant noncombustible area, into an area that will not readily transmit fire, to an outer area with reduced vegetation that would not spread a fire toward a structure. The guidelines for the three zones are important concepts in creating a fire safe landscape that will develop into a healthy landscape over time.

1. **Zone 0** – Ember Resistant Zone, 0 to 5 feet from a structure. If it is attached to or touching the house, it is part of the house. This includes the area under and around all attached decks, porches, stairways, etc. This zone should be free from flammable weeds and shrubs and include only irrigated herbaceous plants with low combustibility or non-combustible mulches to minimize potential for ignition from flying embers during wildfire. When appropriate, bare mineral soil, rock, and/or concrete or other types of hardscapes would be preferable in this zone. No branches shall be within 10 feet of any chimney or stovepipe outlet.

2. **Zone 1** – Lean, Clean and Green/Defensible Space Zone, 5 to 30 feet from the structure. This landscape zone will not readily transmit fire to the structure. This zone should contain healthy green plants with high moisture content to minimize the ability of a passing ground fire to be spread to the structure. Plants should not be placed in clusters or densities that would carry a fire to the structure. Vegetation should be grouped in discontinuous islands. Trees should be spaced apart so that their mature canopies do not touch. Mature tree canopies should be a minimum of 10 feet from the structure and 10 feet between trees canopies. Guidelines may require trimming tree canopies regularly to keep their branches a minimum of 10 feet from other trees. Landscape design should create a vertical separation of at least three times height between low-level vegetation and low hanging tree branches.

3. **Zone 2** – Reduced Fuel Zone, 30 to 100 feet or more from a structure. This area usually lies beyond the residential landscaped area. It typically consists of vegetation that has been modified so that dead material can be removed, and dense shrub stands have 3-feet spacing. Leave 30 feet between clusters of two to three trees, or 10 feet between individual trees.

Shrubs are a huge contributor to fuel loading as they carry a fire from the ground into the tree canopy. Landscape design should take into consideration minimizing the chance of fire jumping from plant to plant by separating discontinuous islands of shrubs.

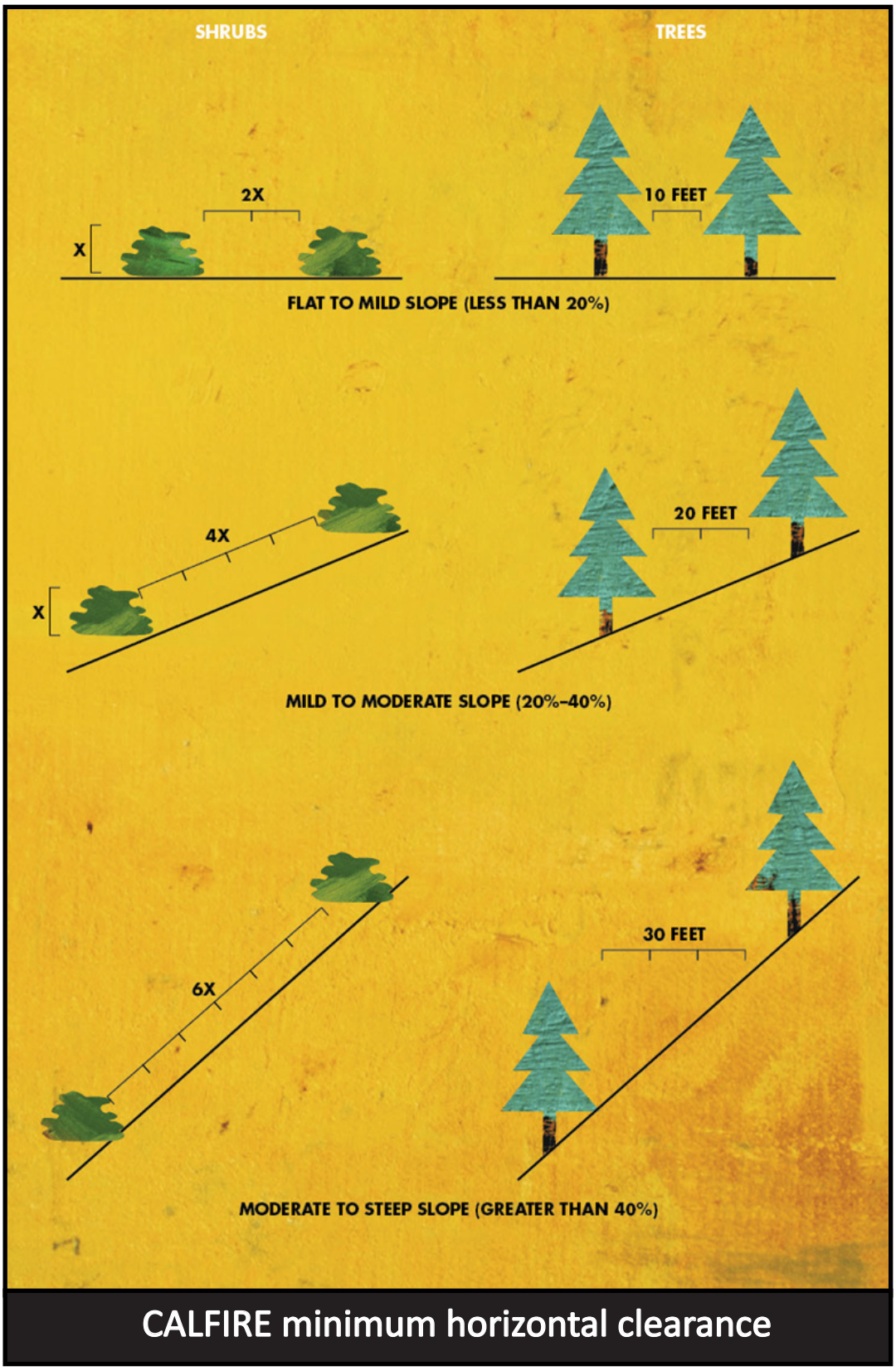
Grouping plants of similar height and with similar water requirements will create a landscape mosaic that uses water more efficiently and is more likely to slow the spread of fire.

Chips, bark and mulch can be left in place to a depth of 3 inches.

Trees

Tree planting on larger parcels should use about 40 to 60 trees per acre (about 20-foot spacing between trees) as a rule of thumb for healthy future growth.

Trees can be planted in a random pattern or in clusters.
When considering the total number of trees per acre, this number will need to be reduced if it is a developed parcel (with structures) to assure proper clearance to structures per state and county ordinances.



CALFIRE minimum horizontal clearance

Trees

Design the landscape around mature trees on slopes.

CALFIRE provides a rule of thumb for tree spacing on slopes:

- Slopes that are less than 20 percent, space trees so that mature trees are 10 feet of space between the tips of their limbs.
- Slope 20 to 40 percent increase the space to 20 feet.
- Slope over 40 percent, 30 feet of spacing is needed.

Shrubs

Due to flammability, shrubs should not be used as a visual screen for propane tanks; 10 feet of bare soil or rock around a tank is appropriate. To reduce the fire-spreading potential of shrubs, plant varieties that are widely separated, low growing, deciduous, and non-resinous. These can be planted individually or in small clumps. The spacing between plants depends on the slope of property.

CALFIRE provides a rule of thumb for shrub spacing on slopes:

- Slope to 20 percent spacing should be two times the height of the mature shrub.
- Slope between 20 and 40 percent spacing should be four times the height of the mature shrub.
- Slope greater than 40 percent spacing should be six times the height of the mature shrub.

Landscape design should take into consideration trees and plants along driveways and access roads. Ensure access to the structure which complies with local fire codes to allow fire and emergency vehicles to reach the structure. Fire departments require a vertical clearance of at least 15 feet and horizontal width clearance of 12 feet.

Privacy Screened Space

Creating a fire safe landscape does not have to reduce one's privacy. If possible, maintain a visual screen in the Reduced Fuel Zone (30 to 100 feet) from a structure. Within this zone, arrange vegetation in small, well-spaced groups that can still provide a visual screen, while breaking up the horizontal fuel continuity and thereby protecting the structure from fire.

Beyond 100 feet Reduced Fuel Zone to the Property Line

If possible, reducing fuel load should be extended to 200 feet or more beyond a structure. This extended reduced fuel vegetation could save the structure. Create horizontal and vertical space throughout the vegetation.

Fire Resistant Landscaping

Examples and photos in appendices

Plant arrangement, spacing, and maintenance are as important as plant type when considering fire safety. While all plants can burn under the right conditions, low growing, open structured, and less resinous plants are best; all plants can burn regardless of how they are classified. Even some flammable (pyrophytic) species can be quite fire resistant with proper care. Plants with open growth forms, dead wood pruning, and well-watered are much less likely to burn. Landscapes with plants arranged and spaced to prohibit large amounts of fuel from accumulating in proximity will greatly reduce the fire hazard.

In general, fire-resistant plants have the following characteristics:

- Have a low sap or resin content. Junipers, incense cedar, pines, and firs are resinous and highly flammable.
- Grow little or no seasonal accumulation of dead branches, needles, leaves, thatch or litter.
- Grow low to the ground.
- Have low biomass or low density and open structure and fewer total branches (as they provide less fuel for fire).
- Have large and/or thick leaves with high moisture content that don't ignite quickly.

Broad paved or gravel paths can function as a firebreak, reducing the likelihood of ground fire migration.
A continuous 4-feet wide path around a structure provides a safe place for firefighters to defend a structure and other emergency responders.

Soil

Less disturbance to soil and slopes after fire is better. Water repellent soil can occur when a fire heats and melts waxes and resins found naturally in plants and organic material. Patches of hydrophobic (water repellent) soils may develop beneath the ground surface. This is a temporary condition that will be relieved once wet, or within a year unless it is prolonged by drought.

For larger properties planned for replanting, it is advisable to break up soils whether they are hydrophobic or not, especially on slopes prone to debris flows or landslides.

Low to moderate intensity fire can have a positive benefit by increasing soil formation and fertility, removing thatch and litter, and returning nutrients to the soil with the ash. Ash contains various chemicals compounds, depending on what the fire burned and its temperature. Sierra Nevada soil in the Grizzly Flats area generally does not need additional fertilizer during planting.

Erosion Control

Erosion is one of the most critical issues to address following fire. Physical changes to the soil and the loss of understory vegetation cover can lead to significant soil erosion, increased runoff, mudflows, and life-threatening debris flows. In general, the first winter is the most critical time to be aware of these conditions. Erosion potential is highest on steep slopes, long hillslope flow paths, and roadside banks. Soil needs protection from rain and wind. **Appendix B** provides guidelines for erosion control on slopes.

Ensure excess storm flow is properly diverted away from important property improvements or unstable slopes. Slow water from channeling on slopes; instead allow water to dissipate across the soil, especially onto well-vegetated areas. Well-placed and properly installed wattles, mulch, rocks, branches, and downed logs can act as velocity dissipators, filter out sediment, slow debris mobilization from burned area, and provide water a chance to seep down into the soil.

Straw mulching when done correctly with the right product (such as sterile wheat or barley) can be one of the most effective measures. Mulching is best used around the structure and developed sites, above watercourses (but not on streambanks), alongside roads and water bodies. Straw mulch should be used in loose form. Straw bale form should be used according to a design prepared by a certified erosion control specialist. In low intensity fire areas, often pine needles and oak leaves will fall and provide some soil cover.
Mulching is not needed in areas where leaf/needle drop has accumulated to a depth of 2 to 3 inches.

CALFIRE dozer line during Caldor Fire Sept 2021

Two lines of wattles installed on fire dozer line November 2021

Some wattles, mulch, straw, and straw bales may contain invasive weed seeds. Continued vigilance may be required to determine if invasive weeds start to grow in the area.

Ash, vegetation debris, fallen heat or smoke-damaged leaves, and even rocks on a fire-impacted site provide much needed soil protection. Charred remains of plant material and vegetative litter less than 3 inches in depth, and garden features, such as paved or gravel paths, retaining walls and rocks) protect the landscape from wind and water erosion.

Photo by afterwildfirenm.org

Contour log felling or placing is the practice of cutting dead trees and placing them on the contour of the slope, with a reservoir area on the uphill side to catch eroding soil. They should be long enough (15 to 20 feet long), accurately placed along the contour, and installed in large enough numbers to effectively slow down the water flow. The purpose of this method is to slow runoff, cause localized ponding, and capture and store eroded sediment. Improperly placed structures may increase erosion, so the importance of proper installation is critical.

In extremely impacted burned areas, such as those disturbed by equipment (dozers, front end loaders, trucks, etc.), some mulching or chipping of slash may be necessary, if vegetation cover does not establish naturally. Some equipment may have brought in invasive weeds. Follow-up observation may be required to determine if invasive weeds start to grow in the area.

To allow water to drain, prior to storms, check and clear out road drainage systems and culvert inlets and outlets for blockage from wood debris and rocks. Controlling erosion, sediment, and runoff may be necessary to keep contaminants out of creeks and riparian areas.

During heavy downpour, large rocks that may be released from slopes may be a concern. Slopes over 50 percent will require structures or special techniques for stabilization. Soil retaining techniques for steep slopes include preservative treated wood walls, interlocking concrete blocks, or rock or riprap (loose rock walls) to create terraces. Terraces and retaining walls require approval by El Dorado County Ordinance Code: "Fences, Walls and Retaining Walls," Sec. 1300.30.070.

Prevent erosion according to type of slope. **See Appendix B**.

Some of these techniques can create a more serious erosion problem if not done correctly.

Underground Electrical and Transformer Boxes

The following guidelines were adapted from PG&E Small Trees for Northern California brochure.

Plant trees and other shrubs 2 feet to the side and rear and 8 feet from the front of the transformer vault. These clearance distances allow PG&E crews access for emergency repairs.

Underground utility zone, 5 feet on both sides of the buried utility line, recommendations include lawns, flowers, low-profile grasses, and low-growing herbaceous plants.

Border zone, 5 to 10 feet from the buried utility line, recommendations include small to medium shrubs with trunk or main branch less than 8 inch in diameter at maturity. Diameter is measured at chest height.

Outer zone, 10 to 14 feet from the buried utility line, recommendations include large shrubs and small trees with a trunk less than 36 inches in diameter measured at chest height at full maturity are permitted within this zone. However, if space allows, utility company recommend planting trees at an even greater distance from the underground utility.

Overhead Utility Lines

The following guidance was adapted from PG&E "Guide to Small Trees." Trees should be planted at least 10 feet from utility lines. Trees planted too close to power lines will eventually need to be trimmed or topped (PRC 4292 & 4293).

Water Meters and Service Lines

Planting any type of plant near the water meter and customer service valve box is discouraged. In Grizzly Flats Community Service District Ordinance 88-1, customers are required to make sure the meter is always clear and accessible. Meter readers need easy access. Winterizing the pipe serving a structure may require draining by turn-off valve and draining on the customer side of the service line.

Photo by Mark Almer
Stand-alone solar system

Standalone or Roof Solar Systems

Placement of large trees should take into consideration sunlight available to solar panels. For solar systems, it is necessary to plan landscaping so that maturing trees will not block the sun from reaching solar panel windows. Individual deciduous trees, which lose their leaves in the winter, will not completely block solar rays access to panel windows, although they may be a problem for active solar systems.

Septic Leach Field Areas

Because plants and tree roots can interfere with leach field (septic drain field) pipes, when plants mature, they may impact the leach field. Trees should not be planted around the field. If landscape over a leach field is planned for recovery, use plants that grow quickly and do not spread. They should not need any care, fertilizer, or watering. Gardening tools, fertilizers, and deep-rooted plants cause problems in leach fields. Ensure the septic tank system inspection pipes and manhole cover are accessible for service.

Liquid Propane Gas Storage Tank or Stove Oil Tank

Liquid Propane Gas (LPG) storage tanks and stove oil tanks require a 10-foot clearance to bare mineral soil. No flammable vegetation is allowed 10 feet around their exterior, vertically and horizontally. These 10-feet clearance areas apply to buildings, public way, and lot lines of adjoining property that can be built on (CFC 3804.3).

Liquid Propane Gas (LPG) storage tank

Windbreaks

Establishment of wind breaks should be considered slow winds that are no longer blocked by a mature forest or large number of structures. The Grizzly Flats community forest zone will eventually function as a windbreak for residences, although not for several years. This is because the effectiveness of a windbreak is largely a function of the height of the vegetation present, along with vegetation type and density. Native conifers planted in the Grizzly Flats community can be expected to grow from 6 to 12 inches per year depending on site conditions, and so require time to grow to a size sufficient to act as a wind break. In the meantime, the most efficient windbreaks in the community will be the existing and newly constructed homes.

County Road Right of Way or Easement

Trees should not be planted within the county road right-of-way so there is no interference with snow clearance, maintenance, or construction projects.

Grizzly Flats 1950s-1960s Orchards and Gardens
Stone fruits, such as plum, apple, and cherry trees, as well as grape vines, were grown in the community when the mixed-conifer forest was thin or nonexistent around homes.
Appendix C insert and D on page 27 list plants that are commonly found in local nurseries. Plants are listed by both their common and scientific names.
Common Name: This is the name commonly used for this plant in our location. Often, more than one common name is in use for any one plant.
Scientific Name: This is the plant's official name including the genus and species. Some genus names have changed over time.
It is not recommended to use non-native seed mixes. Some non-native plants produce flashy fire fuels and continued fire risk.

Native and Cultivated Plant Selection

Suggested native plants (trees, shrubs, vines, herbs, and grasses) and nursery stock for landscaping and revegetation are found in **Appendix C and D**. When selecting revegetation plants take into consideration the following: available planting area, full sun (no partial shade areas), water-wise requirements, low-combustible plants, fire resistance, and defensible space distances requirements.

When selecting tree revegetation, take into consideration the overall esthetics throughout the year and maximum size at maturity. Consider the tree's crown shape, leaf color, flower color, and bark texture and color.

Other tree selection considerations include root damage potential (i.e., structure foundation, hard scape, sidewalks) and property utility impacts (i.e., electrical power, telephone, septic system).

Non-native, Non-invasive and Fire-Resistant Landscaping Plants for Around Homes

A list of non-natives, non-invasive, fire-resistant landscape plants is found in **Appendix D**. The plants listed are not for use in wildlands, riparian/wetlands or other natural areas. Consider these plants for use only around homes and where regular maintenance can be performed. The listed plants have soil erosion and protection qualities. Many of the listed plants are also drought tolerant but may require some supplemental irrigation for their establishment. Several of the plants listed also have deer resistant qualities including lavender, Lily of Nile, and rosemary.

Planting

Spacing between plants as they mature is also a critical factor in long term defensible space development and aesthetic quality. Space plants so there is horizontal and vertical discontinuity. This will decrease the likelihood of the fire spreading to tree canopies and other plants.
The Sunset Western Garden Book describes the Grizzly Flats community as being on the border between Zone 1A (where snow falls and stays on the ground for a day, a week, or longer) and Zone 7 (middle elevation of the high mountains with hot summers and pronounced winters). Super cold-hardy plants for Sunset Zone 1A will also do well in warmer climates (i.e., Zone 7) with proper care. Important local terrain planting guidance

to consider is south-facing slops get more solar heat than flat land; north-facing slopes get less. Hillsides are never as cold in winter as the hilltops above them or the lower ground around them. In the Sierra Nevada foothills, the native tree and shrub species are adapted to survive in a climate that has long, dry periods from June through October. Late fall and early winter are the ideal time to plant perennials so they will benefit from the seasonal rains when they finally return in the spring. Start by first protecting any existing plant cover and establish vegetative cover on bare or disturbed soil and slopes on the property before the winter rains. Plant materials and different types of mulches can be used to protect soil and slopes from the impact of falling rain and storm water runoff. Seeding by itself is often not an effective erosion control strategy. Seeding can be used to help establish ground cover or to improve plant biodiversity, habitat, or improve feed for wildlife, but generally it will not prevent soil erosion during the first heavy rains.

Conifer Trees: ponderosa pine, sugar pine, incense cedar, white fir, and Douglas fir. These trees are established best in full sunlight with lots of growing space. The firs prefer to be on cooler sites, shaded by other trees or original intact forest stands, and can grow in denser conditions. Properly located ponderosa pine, Douglas-fir and incense cedar seedlings usually have very high survival rates.

Hardwood Trees: black oak, madrone, dogwood, big leaf maple. These trees will generally sprout back from the stump after a fire unless the root structure has been completely consumed by burning. These trees, like conifers, can be replanted.

Shrubs: manzanita, der brush and live (scrub) oak. These shrub plants will readily occupy the lanscape following a fire. The shrub component is important to have in the landscape as it creates habitat for birds and is an important food source for deer and other wildlife. It is best to have islands of shrubs across the landscape and to prevent dense stands.

Understory Plants: There are several ground covers and smaller shrubs that are appropriate for landscaping around structures in a fire prone area. Use only plants appropriate for the site, considering slope, aspect (ex. south facing slopes) and nearby tree cover.

Generally, plants of similar watering requirements should be clustered together to simplify watering and minimize water use.
Vegetation that has been planted or seeded using proper techniques has an increased chance of survival.
Seedlings are vulnerable to grasshoppers, weevils, gophers, mice, and deer. Management of the competing vegetation may be necessary to support seedling survival. Weed control gives tree seedlings a few years' advantage over competing vegetation.
Browsing deer are numerous in the Grizzly Flats area. Protect seedlings, young shrubs, and trunks of shrubs and trees. Bears have been reported to break down fruit trees.
Appendix E provides guidance on 13 plants not to buy. The list of 13 is the most commonly sold invasive species which could possibly grow in Zone 7.
Appendix F provides CAL FIRE standards and specifications for purchasing, planting, and maintaining trees. The guideline is for shade trees and is applicable to homeowners buying nursery stock.

Fire-Safe Landscape Maintenance

As the landscape recovers and plants grow, it will be necessary to keep the area fire safe particularly in proximity to a structure. Create and maintain proper spacing between plants and a structure. Maintain the yard through pruning shrubs and trees as needed, removing dry or dead material to reduce flammability of individual plants. Vegetation that can carry a fire from low growing plants to taller plants is called ladder fuel. Lower tree branches should be removed to a height of at least 10 feet up to 15 feet. For younger trees remove limbs from the lower third of the tree, pruning higher as the tree grows. Limb hardwoods up to 6 feet above understory shrubs and plants or ground fuels.

Steeper slopes need greater fuel reduction distances between mature trees. Clean up fallen leaves and pine needles as well but retain the layer of duff (decomposing leaf litter) to protect and cool the soil surface. Irrigate as required to maintain healthy plants.

Unwanted shrubs can be controlled by manual grubbing (hand pulling), piling and burning, or using herbicides. For most landowners, the easiest method is the herbicide treatment, using products designed for the type of vegetation needing to be controlled. When any infestation of invasive weeds becomes large, herbicides can be an important option.

Annually check and prune trees and shrubs to maintain the recommended distance between plants. There should be no tree limbs hanging within 10 feet over a LPG propane tank. Yard waste from landscape maintenance should be promptly and legally disposed to provide a clean and fire safe landscape.

During times of drought when green landscaping cannot be achieved due to water restrictions remove all dead or dying material.

Invasive weeds removal and treatment information for specific weeds is available on the Cal-IPC website (https://www.cal-ipc.org/). Weed Management Notes on the website provide information on various chemical and non-chemical control methods. Continued vigilance is required. Even after removing invasives, monitor for seedbank germination, sprouts and regrowth. Revegetate the land with non-invasive plants so the invasive plants have some competition.

WARNING ON THE USE OF CHEMICALS

Herbicides are poisonous. Always read and carefully follow all precautions and safety recommendations given on the container label. Store all chemicals in the original, labeled containers in a locked cabinet or shed, away from food, and out of the reach of children, unauthorized persons, and pets. Herbicides applied in the landscape can move and contaminate waterways. Confine chemicals to the property being treated. Avoid drifting onto neighboring properties, especially gardens containing fruits or vegetables ready to be picked. Do not place containers containing herbicides in the trash or pour herbicides down the sink or toilet. Either dispose of the herbicides according to the label directions or take unwanted herbicides to a Household Hazardous Waste Collection site. Contact El Dorado Disposal Service for additional information on safe container disposal. Never reuse or burn the containers or dispose of them in such a manner that they may contaminate waterways.

Acknowledgments

The writer acknowledges many sources and publications in preparing the Homeowner Landscape Restoration Guidelines. This booklet has been adapted from the California Native Plant Society Fire Recovery Guide, Voluntary Revegetation Guidelines for Private Parcels in the Angora burn area of South Lake Tahoe, CA, Pacific Gas & Electric Company, Univ. Calif. Agriculture and Natural Resources (ANR), National Resource Conservation Service (NRCS), CALFIRE READY, SET GO! brochure, Sunset Western Garden Book, El Dorado Native Plant Society Chapter, and El Dorado and Amador Counties Master Gardeners members, and many other resources.

Useful Publications and Websites

- California Native Plant Society, Master Gardener, University of California Cooperative Extension (UCCE) & UC Agriculture and Natural Resource (ANR)
- California Native Plant Society Fire Recovery Guide, www.cnps.org or eldoradocnps.org/gardening
- Voluntary Revegetation Guidelines for Private Parcels in the Angora burn area of South Lake Tahoe, CA, May 2009
- Landscape Restoration in the Angora burned area, University of California Cooperative Extension – El Dorado County
- Fire Resistant Landscaping Plants for the Grizzly Flats Area, Bill Frost, Area Natural Resource Advisor UCCE, June 1998
- All Plants Native to California (Grizzly Flats area) https://calscape.org/loc-grizzly%20flat,%20california/cat-all-plants/ord-popular or //calscape.org/qrcode/https://calscape.org/loc-grizzly flat, california/cat-all-plants/ord-popular
- The California Native Plant Society maintains a list of Native Plant Nurseries in California. http://www.cnps.org/cnps/grownative/nurseries.php. Useful Publications & Websites
- Rebuilding a Green Landscape After Wildfire: Tips for Landowners, Jan Bray, RPF, & Anne Heissenbuttel, RPF and University of California Cooperative Extension Master Gardener of Amador County – October, 2015
- UCCE Central Sierra Butte Fire Recovery Information http://ucanr.edu/Buttefire
- Planting a Tree – Tree Owner Information from the International Society of Arboriculture: http://www.treesaregood.com/treeowner/plantingatree.aspx UCCE Master Gardeners of Amador County – Oct, 2015
- Home Landscaping for Fire, UC Agriculture and Natural Resource ANR Publication 8228
- Recovering from Wildfire: A Guide for California's Forest Landowners, ANR Pub. 8386, July 2017 http://anr-catalog.ucanr.edu
- The California Native Plant Society maintains a list of Native Plant Nurseries in California. http://www.cnps.org/cnps/grownative/nurseries.php.
- Plant List by Community- El Dorado County Natives, Alice Cantelow and Lester Lubetkin, El Dorado Chapter CNPS
- Fire Resistant Landscaping Plants for the Grizzly Flats Area, Bill Frost, Area Natural Resource Advisor, UCCE, June 1998
- Gardening In El Dorado County: Top Ten Native Plants, Rosemary Carey, El Dorado Chapter CNPS April 2011
- Home Landscaping For Fire, Gleen Nader, et.al. UC Pub.8228
- http://arboretum.usdavis.edu/plant_search.aspx
- Field Guide, Weeds, Forages and Natives of the Central Sierra Nevada, UCCE, Jan 2019 wric.ucdavis.edu
- California Invasive Plant Council web site: Cal-ipc.org

National Resource Conservation Service

- NRCS Fact Sheets: http://amadorrcd.org follow link to 'After Fire' Resources. Subjects include: 'Preparing for winter following a fire'; 'Prevent soil erosion on your property'; 'Reseeding burned areas for Homeowners'
- Straw Mulching for Erosion Control Following Wildfire, Rich Casale, USDA NRCS
- Non-native, Non-invasive and Fire-Resistant Landscaping Plants for Around Homes, Danny Marquis, District Conservationist, USDA-NRCS

Pacific Gas & Electric Company

- PG&E Community Gas Safety Guide to Safe Landscaping Near Gas Pipelines
- PG&E A Guide to Landscaping for Pollinators and Wildlife within and along Electric Transmission Corridors, RightTreeRightPlace@pge.com
- Guide to Small Trees for Northern California

Other Sources

- CALFIRE READY, SET, GO!
- Sunset Western Garden Book
- Calaveras County Public Works: Soil Erosion Control After Wildfire http://publicworks.calaverasgov.us/portals/publicworks/Docs/Grading/Soil%20Erosion%20Control%20Aft er%20Wildfire.pdf
- Planting a Tree – Tree Owner Information from the International Society of Arboriculture: http://www.treesaregood.com/treeowner/plantingatree.aspx
- A Land Manager's Guide for Creating Fire-Resistant Forests, Stephen Fitzgerald, Max Bennett, Oregon State Univ. Extension Service EM9087, Sept 2013
- Firewise Guide to Landscape and Construction www.firewise.org

APPENDIX A
POST-FIRE INVASIVE PLANTS

Invasive plants are those species that spread rapidly and grow so dominant that they change the landscape. Data provided by El Dorado Native Plant Society and Master Gardeners.

Concern

- Their ability to aggressively reproduce, spread, and out-compete cultivated or native plants.
- Thrive and well-adapted to disturbed soil and they come from fire-adapted climates.
- Seeds often last 5 to 50 years in the soil and pieces of root fragment as small as ½ inch can start a new plant and a new infestation.

Interact With Wildfires

- Some facilitate the spread and/or severity of wildfires.
- They become much more vulnerable to fire, and some are highly flammable.
- They act as ladder fuel into tree canopy.

Take Advantage of Disturbance

- Invasive plants spread across larger areas and in higher densities.
- Their vigorous growth is due to more open-area sunlight, less thatch (dense biomass), and fewer competitors.

Manage their Spread

- Time is limited to start control (cut, pull, herbicide) and support cultivated and native species return.
- Avoid disturbing the soil as much as possible.
- May require eradication during several growing seasons.

Common Post-fire Invasive Plants	
Tree, Shrubs, Perennials, & Annuals	Annual Grasses
French Broom	Barbed Goat Grass
Italian Thistle	Cheatgrass
Perennial Field Pea	Italian Ryegrass
Rush Skeletonweed	Johnson Grass
Scotch Broom	Medusahead
Stinkwort	Wild Oats
Tall Whitetop	
Torilis – Hedgeparsley	
White Sweetclover	
Yellow Starthistle	
Tree of Heaven	
Oblong spurge	
Puncturevine	

Common Post-fire Invader Plants

Italian Thistle

Perennial Field Pea

Rush Skeletonweed

Scotch Broom

White Sweetclover

Stinkwort

Tall Whitetop

Torilis - Hedgeparsley

Puncturevine

Yellow Starthistle

Common Post-fire Grasses

Barbed Goat Grass

Cheatgrass

Italian Ryegrass

Johnson Grass

Medusahead

Wild Oats

APPENDIX B

Preventing Erosion According to Slope

Percent Slope	Revegetation	Erosion Control	Comments
Less than 25%	Very Good	Straw Mulches, Rock, Bark, Grasses, Shrubs	Moderate slopes (less than 33%) have a good chance of success at controlling runoff using plant material and mulch. Cover bare soils with mulch of bark chips, pine needles, wood chips and even stones or creek rock. Up to two to three inches of chips or pine needles will not create a fire hazard.
25%	Success Good	Straw Mulches, Rock, Bark, Grasses, Shrubs	
33% (3:1)	Success Fair	Straw Mulches, Rock, Bark, Grasses, Shrubs	
50% (2:1)	Success Poor	Fiber Netting & Mat, Riprap (loose rock)	Slope between 33% and 50% - Plant on slopes that are this steep, but be aware you may need to use an erosion control blanket, mats of coconut fiber, or jute netting to hold slopes in place until plants can become established. The roots of the plants will knit together to hold soils in place. Limbs, leaves, and branches will diffuse the force of rain and wind.
Greater Than 50%	Improble		Slopes over 50% - Techniques for steep slopes include preservative treated wood retaining walls, interlocking concrete blocks, rock retaining walls or riprap (loose rock) areas, and terracing. Terraces and wood retaining walls require to be contracted according to County Sec. 130.30.070 Fences, Walls and Retaining Walls.

APPENDIX C

Grizzly Flats (Elevation Above 3000ft) Native & Cultivated Plant List									
Selection List By Ray Griffit, El Dorado County Fire-Safe Vegetation List, Version 1.0 May 2004									
All Native Plants California									
El Dorado County Chapter Calif. Native Plant Society And Master Gardeners Members									
Common Name (May Have More Than One Name)	Botanical Name (Other Name)	Height	Width	Growth Rate	Fire	Drought	Deer	Shade	Wildlife Value
	Ln = Line In All Native Plant Calif. List			S=Slow*	1= Resistant*	1=Tolerant*	1=Resistant*	1=Tolerant*	1=High*
				M=Moderate*	10=Flammable*	10=Moisture*	10=Browsed*	10=Full Sun*	10=Low*
				F=Fast*					
NATIVE TREES									
White Fir or Balsam Fir	Abies concolor Ln 430	82-200ft		S	10	3	3	2	3
White Alder	Alnus rhombifolia Ln 100	49-82ft	35ft	F	1	10	7	9	4
Pacific Madrone	Arbutus menziesii Ln 104	15-10 ft	5-25ft	S	2	3	6	3	2
Incense Cedar	Calocedrus decurrens Ln 238	12-196ft	50ft	M,S	1	3	2	2	3
Pacific or Mountain Dogwood	Cornus nuttallii Ln 451	12-65ft	6-30ft	M	2	8	4	2	3
Sugar Pine	Pinus lambertiania Ln 640	40-230ft		F	2	3	3	4	4
Ponderosa Pine	Pinus ponderosa Ln 582	40-223ft	7ft	F,M	2	2	2	9	3
Quaking Aspen	Populus tremuloides Ln 216	40-82ft		F	1	9	10	9	2
Douglas-Fir	Pseudotsuga menziesii Ln 379	40-246ft		M	2	4	4	6	3
Canyon Live Oak	Quercus chrysolepis Ln 260	30-90ft	30-60ft	M,S	3	2	3	3	3
Black or Calif. Oak	Quercus kelloggi Ln 31	20-120ft	35ft	M,S	3	3	9	4	2
Shining or Black Willow	Salix lucida spp (lasiandra Ln 577)	3-33ft			1	10	10	8	1
Red Willow	Salix laevigata Ln 146	30-50ft	30-50ft	F					
Goodding's Black Willow	Salix gooddingi Ln 255	15-40ft	25ft	M,F					
Big Tree, Sierra Redwood or Giant Sequoia	Sequoiadendron giganteum Ln 55	325ft	30ft	S	1	5	4	8	4
Calif. or Bay Laurel	Umbellularia californica Ln 243	6-80ft	3-30ft	M	3	3	5	3	5
Big Leaf Maple	Acer macrophyllum Ln 82	30-114ft	65ft	F					
NATIVE SHRUBS									
Common Manzanita	Arctostaphylos manzanita Ln 18	6-20ft	10ft	F		2			
Oregon Grape	Berberis spp (nervosa Ln 240)	3-7ft	6ft	M	6	4	2	9	4
Greenback Ceanothus	Ceanothus spp (spinosus Ln 246)	10-20ft	10ft				2		
Deerbrush or Mountain Lilac	Ceanothus integerrimus Ln 73	3-13ft	7ft	M	5	5	10	9	1

APPENDIX C

Common Name (May Have More Than One Name)	Botanical Name (Other Name)	Height	Width	Growth Rate	Fire	Drought	Deer	Shade	Wildlife Value
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				M=Moderate*	10=Flammable*	10=Moisture*	10=Browsed*	10=Full Sun*	10=Low*
				F=Fast*					
Buck Brush or Wild lilac	Ceanothus cuneatus Ln 120	5-12 ft	5-12 ft	F, M		5	2		
Mountain Misery or Bear Clover	Chamaebatia foliolosa (Ln ?)				10	2	2	2	8
Beaked, Calif. or Western Hazelnut	Corylus cornuta spp (californica Ln 473)	5-12ft			3	6	5	2	3
Fremont Silktassel	Garrya fremontii (Ln ?)	48ft			3	4	7	3	3
Chokecherry	Prunus virginiana Ln 478	15-25ft	1-20ft	F	2	5	3	6	2
Hoary or Calif. Coffeeberry	Frangula californica spp (tomentella Ln 690)	20ft			3	3	8	3	3
Sierra Currant	Ribes nevadense Ln 508	6ft	3ft		5	4	3	3	2
Sierra Gooseberry	Ribes roezlii Ln 668	5ft		M	5	4	3	3	2
Western Thimbleberry	Rubus parviflorus Ln 165	4-8ft		M, F	2	7	3	2	3
Common Snowberry or Coralberry	Symphoricarpos albus Ln 455	2-6ft			4	3	3	3	7
Toyon or Calif. Holly	Heteromeles arbutifolia Ln 27	6-30ft	10-15ft	M		2	2		
Mock Orange	Philadelphus lewisii Ln 84	5-12ft	6ft	M					
Scrub Oak	Quercus berberidifolia Ln 116	15-19.7 ft	15 ft	S					
California Wildrose	Rosa californica Ln 179	8 - 10 ft	10 ft	M,F					
Hollyleaf Redberry	Rhamnus ilicifolia Ln 97	1-9 ft	3-9 ft						
Spiny Redberry	Rhamnus crocea Ln 190	3.3-7ft	7ft						
Western Redbud	Cercis occidentalis Ln 8	10-20ft	10-15ft			2	2		
Coyote Brush	Baccharis pilularis Ln 80	1.5-10ft	12ft						
Oregon Hollygrape or Dwarf Mahonia	Berberis aquifolium Ln 208	2-5ft				2	2		
Navin's Barberry	Bereris nevinii Ln 13	3.2-7ft	6-12ft						
Coast Barberry	Bereris pinnata Ln 155	3-5ft	5ft						
Pinemat	Ceanothus prostratus Ln 128	3.6-7in		F, S					
Whiteleaf Manzanita	Arctostaphylos viscida Ln 261	8-16ft	12ft						
NATIVE VINES, HERBS & GRASSES									
Needle or Feather Grass	Stipa cernua Ln 480, 150+ spp	2-3ft	2ft	F	8	2	2	8	4
Common Yarrow	Achillea millefolium Ln 209	1-3ft	0.5-1.5f	F,M	1	3	1	9	7
Golden Yarrow	Eriophyllum confertiflorum Ln 184	8-24in	1.5ft		1	2	2	10	2
Wild Onion	Allium 500+ spp (Ln ?)				2	3	4	8	5
Western Columbine	Aquilegia formosa Ln 30	1-3ft	1ft	F	2	8	1	4	3

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				M=Moderate*	10=Flammable*	10=Moisture*	10=Browsed*	10=Full Sun*	10=Low*
				F=Fast*					
Wild Ginger	Asarum caudatum Ln 225	1ft			2	7	2	1	8
Narrow Leaf Milkweed	Aselepias spp (fascicularis Ln 207)	1-3ft	1ft		2	5	1	7	3
California Aster	Symphyotrichum chilense Ln 358	1-3ft	3ft	F	3	5	4	3	3
Firecracker Brodiaea	Dichelostemma ida-maia Ln 229	1ft	0.5in	F	2	3	6	4	4
Elegant Clarkia	Clarkia unguiculata Ln 228	1-4ft	3in	F	2	3	3	4	5
California Oatgrass	Danthonia californica Ln 632	2-3ft		M	3	8	7	8	2
Western Bleeding Heart	Dicentra formosa Ln 254	1ft	3ft	F	2	8	1	1	7
Shooting Star	Primula clevelandii (var. insularis Ln 981)				3	3	5	2	5
California Fuschia or "Hummingbird Plant?"	Epilobium canum Ln 17 (Zauschneria californica)	.3-1.5ft	2-3ft	F	2	5	2	4	2
Fireweed	Chamerion (Epilobium) angustifolium Ln 630	1 ft	1ft	F	3	8	4	4	5
Farewell to Spring	Clarkia (Epilobium) amoena Ln 60	1.5-3ft		F	3	3	5	8	3
Scouringrush Horsetail	Equisetum hyemale Ln 464	3ft			1	9	1	3	9
California Poppy	Eschscholzia californica Ln 151	0.2 -2ft	1 - 2ft	F,M	2	2	2	9	5
Woodland Strawberry	Fragaria vesca Ln 355	0.1-1ft	3ft		3	8	5	1	5
Pink Alumroot	Heuchera rubescens Ln 317	3-6in	0.5ft		3	7	3	2	3
Crevice Alumroot	Heuchera micrantha Ln 257	1-3ft	1ft	F					
Wild Iris	Iris spp (Ln ?)				3	3	1	3	5
Poverty Rush	Juncus tenuis Ln 611				1	9	3	4	6
Slender Rush	Juncus occidentalis Ln 825				1	9	3	4	6
Scarlet Monkey Flower	Mimulus cardinalis Ln 65	1.5-3ft	3ft	F,M	2	8	5	5	4
Seep or Yellow Monkey Flower	Mimulus guttatus Ln 226								
Lewis Monkey Flower	Mimulus lewisii Ln 427			M, F		2			
Red Bush Monkey Flower	Mimulus aurantiacus (var, puniceus) Ln 148					2			
Coyote Mint	Monardella villosa Ln 462	2 ft	3ft	M	3	3	1	6	3
Hooker's Evening Primrose	Oenothera elata Ln 297	5 ft	3ft	F,M	4	3	3	3	3
Climbing Penstemon	Keckiella cordifolia Ln 108	3-6ft	3-6ft	F	3	3	2	4	3
Palmer's Penstemon	Penstermon palmeri Ln 286	3-6ft	3-6ft	F	3	3	2	4	3
Yellow Bush Penstemon	Keckiella antirrhinoides Ln 112	3-6ft	3-6ft	F	3	3	2	4	3
Sticky Cinquefoil	Drymocallis glandulosa Ln 570				3	5	6	6	6

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				F=Fast*					
Yellow Stonecrop	Sedun spathulifolium Ln 197	1-8in	1-3ft	M	2	1	3	10	5
Oregon or Checker Mallow	Sidalcea oregana Ln 893	2.5-5ft		M	3	4	7	3	3
Mules Ears	Wyethia mollis Ln 273	2.5ft	3ft	S	3	3	3	7	3
Narrow Leaf Mules Ears	Wyethia angustifolia Ln 416	3ft	3ft		3	3	3	7	3
Butterfly Mariposa	Calochortus venustus Ln 203	0.33-2 ft	0.5 ft					7	
Miner's Lettuce	Claytonia perfoliata Ln 316	1-1.3 ft	1 ft	F		7		5	
Pacific or Calif. Blackberry	Rubus ursinus Ln 454	2-6ft	6ft	F		7		10	
Western Trillium	Trillium ovatum (californicum) Ln 998	2.3 ft				7		5	
Calif. Buttercup	Ranunculus californicus Ln 486	.6-2.3ft	6in			7		5	
Deergrass	Muhlenbergia rigens Ln 21	4-5ft				2		10	
Pacific Fescue	Festuca microstachys Ln 977	2.5ft				2		10	
Red Fescue, Creeping	Festuca rubra Ln 340	2in			1	2	2	10	2
	Other Possible Plants								
Sky Lupine	Lupinus nanus Ln 251	0.33-2 ft	1 ft	F		2		10	2
Stinging Lupine	Lupinus hirsutissimus Ln 259	0.7-3.3 ft	1 ft			2		10	
Meadow Lupine	Lupinus polyphyllus Ln 318	0.7-5 ft	3 ft			8	1	10	2
Collared Annual Lupine	Lupinus truncatus Ln 320	1-1.6 ft	1 ft			2		10	2
Coulter's Lupine	Lupinus sparsiflorus Ln 408	0.7-1.3 ft	1 ft			2		10	2
Elegant Lupine	Lupinus concinnus Ln 441	0.33-1 ft				2		10	2
Riverbank Lupin	Lupinus latifolius Ln 572	1-7ft		M		8		10	2
Miniarure Lupin	Lupinus bicolor Ln 388	.2-3ft	1ft			2		10	1
Tiger Lily	Lilium pardalinum Ln 285	6.6-8.3 ft	0.5 ft						
Common Juniper	Juniperus communis Ln 363	5-32.8 ft	8 ft		10	2	2	5	
Columbia Lily	Lilium columbianum Ln 437	2-3.9 ft				2	1	2	2
Baldhip or Dwarf Rose	Rosa gymnocarpa Ln 167	3-6ft	6-9ft	F,M		2	1	10	2
Showy Milkweed	Asciepia speciosa (Ln?)								
Checkerbloom	Sidaicea malviflora (Ln?)								
Gray's Lupine	Lupinus grayi (Ln?)								
Giant Clover	Hoita orbicularis (Ln?)								

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Common Name (May Have More Than One Name)	Botanical Name (Other Name)	Height	Width	Growth Rate	Fire	Drought	Deer	Shade	Wildlife Value
	Ln = Line In All Native Plant Calif. List			S=Slow*	1= Resistant*	1=Tolerant*	1=Resistant*	1=Tolerant*	1=High*
				M=Moderate*	10=Flammable*	10=Moisture*	10=Browsed*	10=Full Sun*	10=Low*
				F=Fast*					
Fire Resistant (Non-Native) Plants For The Grizzly Flats Area, Bill Frost, 1998									
Wooly Yarrow	Achillea tomentosa	6-10in			1	2		10	
Carpet bugle	Ajuga reptans	6in			1	5		10	
Common Thrift	Armeria maritima	6-10in			1	2		10	
Silver Spreader	Artemisia caucasica	3-6in			1	5		10	
Snow in Summer	Cerastium tomentosum	6-8in			1	2		10	
Bearberry Contoneaster	Cotoneaster dammeri	6in			1	2		10	
Indian Mock Strawberry	Duchesnea indica	2-4in			1	1		10	
Evergreen Candytuft	Iberis sempervirens	8-10in			1	5		10	
Hall's or Japanese Honeysuckle	Lonicera japonica	2-6in			1	2		10	
Mexican Evening Primrose	Oenothera berlandieri	10-12in			1	2		10	
Spring Cinquefoil	Potentilla tabernaemontanii	2-6in			1	2		10	
Green Stonecrop	Sedum album	2-6in			1	2		10	
Creeping or Mother of Thyme	Thymus praecox	2-6in			1	3		10	
Wooly Thyme	Thymus pseudolanuginosus	2-6in			1	3		10	
Dwarf Periwinkle Myrtle	Vinca minor	12in			1	2		10	
Sandhill Sage	Artemisia pycnocephala	1-2ft			1	2		10	
Trailing Gazania	Gazania ringens	16in			1	4		10	
Daylily	Hemerocallis spp	1-6ft			1	4		10	
Red Hot Poker	Kniphofia (Tritoma) uvaria	3-6ft			1	2		10	
Creeping Mahonia	Mahonia repens	3ft			1	4	2	10	
Common Trumpet Vine Creeper	Campsis radicans	40ft			1	3		10	
Blueblossom	Ceanothus thyrsiflorus	6-20ft			1	2		10	
Gray Lavender, Lavender-Cotton	Santolina chamaecyparissus	2ft			1	2	1	10	

*** Estimated Conditions/Rankings**

Note: Many factors go into planting success and survival.
This information is in no way a guarantee of plant survival.

APPENDIX D

Non-native, Non-invasive and Fire-Resistant Landscaping Plants for Around Homes

Danny Marquis, District Conservationist, USDA-NRCS

Using Sunset Western Graden Book 1995 Zoons

Grizzly Flats Community Border Between Zones 1A and 7 Classification

Common Name	Genera & Speices	Zones	Comments
TREES			
Strawberry Tree	Arbutus unedo	four to seven	worth risk of winter damage
Catalina Cherry	Prunus lyonii	four to nine	
Stone Fruits	Prunus species	all zones except 1	vary by species
SHRUBS			
Escallonia	Escallonia species	four to nine	
Indian Hawthorn	Raphiolepis species	four to seven	worth risk of winter damage
Rockrose	Cistus incanus (C. villosus)	seven to nine	
Rockrose Orchid	Cistus purpureus	seven to nine	
Sageleaf Rockrose	Cistus salviifolius	seven to nine	
Lavendar Cotton	Santolina chamaecyparissus	all zones	
Snow in Summer	Cerastium tomentosum	all zones	
GROUNDCOVER, VINES & PERRENIALS			
Wild Strawberry	Fragaria chiloensis	four to twentyfour	
Woolly Yarrow	Ahillea tomentosa	all zones	
Evergreen Candytuft	Iberis sempervirens	all zones	
Daylily	Hemerocallis species	all zones	
Red Hot Poker	Kniphofia uvaria	one to nine	
Lamb's Ear	Stachys byzantina	all zones	
Chives	Allium schoenoprasum	all zones	
Creeping Thyme	Thymus praecox	all zones	
Sonoma Sage	Salvia sonomensis	seven	

APPENDIX E

13 Invasive Species Sold at Garden Centers You Should Never Buy by Kevin Espiritu, RealSimple.com

13 of the most commonly sold invasive species that could possibly grow in Zone 7.

Wisteria sinensis (Chinese wisteria) was introduced from China to Europe and North America in 1816 and has become one of the most popular flowering vines for home gardens. It has become an invasive species in some areas of the eastern United States. It can displace native species. Sizable trees have been killed by vining wisteria. When these large trees are killed, it opens the forest floor to sunlight, which allows seedlings to grow and flourish.

Phyllostachys spp. (Bamboo) is technically a giant grass, and one of the world's most invasive plants. Once established, it is literally next to impossible to control. The sprouts that shoot up from the ground each spring can grow 12 inches a day! The underground roots of common running "fishpole" bamboo, which can easily reach 15 feet tall, can travel as far as 20 feet or more from the original clump. Bamboo makes a pretty exotic screen and with its slender form, it seems ideal for tight urban spaces. Yet, new shoots will soon spread, creating a maintenance nightmare.

Euonymus fortunei (Winter creeper/Creeping euonymus) is a shade tolerant plant that forms in dense mats, depriving native species of space and sunlight. Winter creeper will also deplete soil nutrients and moisture from nearby plants, making growth and regeneration harder on the native species. This invasive plant colonizes by vine growth and its pink-capsulated seeds spread by birds, small mammals, and water. If allowed to grow out of hand, the vine will spread over anything in its way, even overtopping trees. The winter creeper's rapid growth, evergreen nature and tolerance of harsh conditions allows it to easily escape cultivation and quickly spread to forests in every county of the state.

Hedera helix (English ivy) is a vigorous growing vine that impacts all levels of disturbed and undisturbed forested areas, growing both as a ground cover and a climbing vine. As the ivy climbs in search of increased light, it engulfs and kills branches by blocking light from reaching the host tree's leaves. Branch dieback proceeds from the lower to upper branches, often leaving the tree with just a small green "broccoli head." The host tree eventually succumbs entirely from this steady weakening. The added weight of the vines makes infested trees much more susceptible to blow-over during high rain and wind events and heavy snowfalls.

Lonicera japonica (Japanese Honeysuckle vine) has few natural enemies In North America, which allows it to spread widely and out-compete native plant species. Its evergreen to semi-evergreen nature gives it an added advantage over native species in many areas. Shrubs and young trees can be killed by girdling when vines twist tightly around stems and trunks, cutting off the flow of water through the plant.
Dense growths of honeysuckle covering vegetation can gradually kill plants by blocking sunlight from reaching their leaves. Vigorous root competition also helps Japanese honeysuckle spread and displace neighboring native vegetation.

Vinca minor (Common periwinkle/Vinca) grows vigorously and forms dense and extensive mats along the forest floor, displacing native herbaceous and woody plant species.

Euonymus alatus (Winged Burning Bush) threatens a variety of habitats including forests where it forms dense thickets, displacing many native woody and herbaceous plant species. Hundreds of seedlings are often found below the parent plant in what is termed a "seed shadow."
There are two types available, the "old fashioned" or winged variety and the newer variety, Euonymus alatus compacta. The latter one is sold in nurseries and garden centers and does not spread and is not invasive. You can tell the difference between the two by looking at the stems. The older, invasive variety has "wings" on the stems, while the newer one does not. before buying these shrubs, check the stems to make sure of what you are buying.

Nandina domestica (Nandina/Sacred Bamboo) has naturalized and invaded habitats. It colonizes by spreading underground root sprouts and by animal-dispersed seeds. It can persist as a seedling for several years before maturing. It can displace native species and disrupt plant communities. Berries are can be toxic to cats and some grazing animals.

Ligustrum sinense (Chinese privet) forms dense thickets that shade out and take the place of native shrubs and herbaceous plants. The shady thickets make conditions unsuitable for native seedlings. Phenolic compounds in the leaves protect plants from leaf-feeding insects which include native herbivorous species.

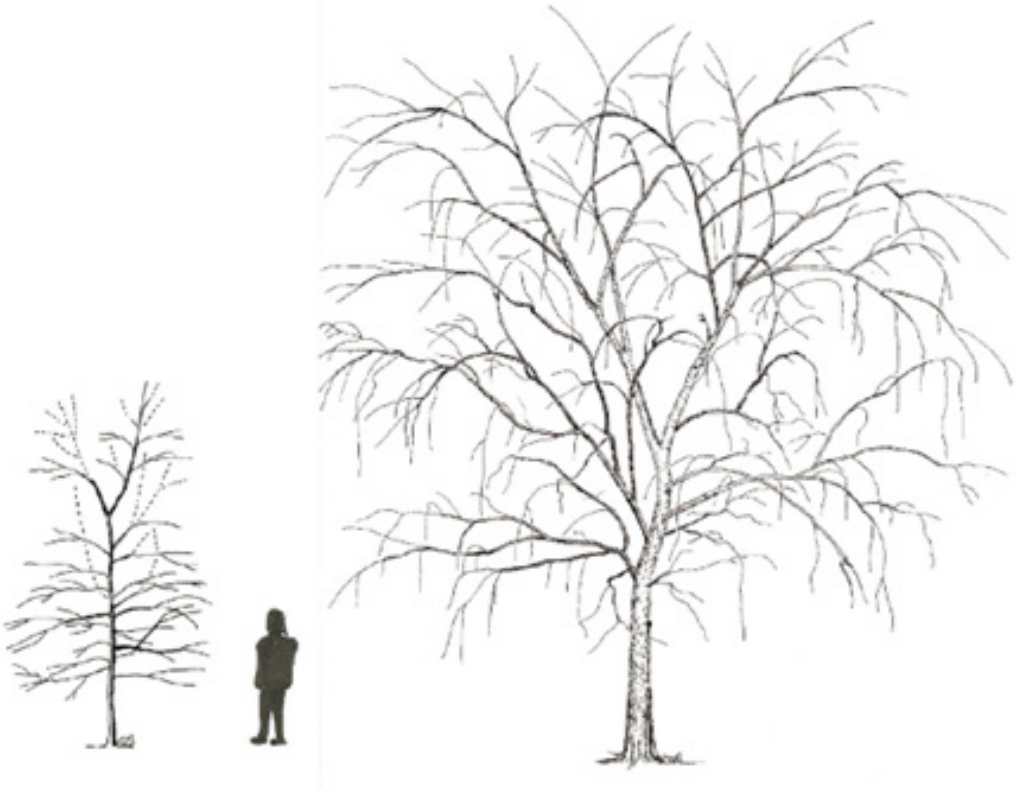
Pyrus calleryana (Callery/Bradford pear) is an invasive species in many areas of eastern North America, outcompeting many native plants and trees. In the northeastern United States, wild Callery pears sometimes form extensive, nearly pure stands in old fields, along roadsides, and in similar disturbed areas.

Berberis thunbergii (Japanese Barberry) forms dense stands in natural habitats including canopy forests, open woodlands, wetlands, pastures, and meadows and alters soil pH, nitrogen levels, and biological activity in the soil. Once established, barberry displaces native plants and reduces wildlife habitat and forage.

Paulownia tomentosa (Princess tree/Royal Paulownia) is an aggressive ornamental tree that grows rapidly in disturbed natural areas, including forests, streambanks, and steep rocky slopes. It can survive wildfire because the roots can regenerate new, very fast-growing stems. It is tolerant of pollution and it is not fussy about soil type. All of these characteristics make it is very noxious and aggressively invasive.

Spiraea japonica (Japanese spirea/Japanese Meadowsweet) can rapidly take over disturbed areas. Growing populations creep into meadows, forest openings, and other sites. Once established, spiraea grows rapidly and forms dense stands that outcompete much of the existing native herbs and shrubs. Seeds of Japanese spiraea last for many years in the soil, making its control and the restoration of native vegetation especially difficult.

APPENDIX F – CAL FIRE STANDARDS AND SPECIFICATIONS FOR PURCHASING, PLANTING, AND MAINTAINING TREES



This Appendix is a compilation of the *Guideline Specification for Nursery Tree Quality: Strategies for Growing a High-Quality Root System, Trunk, and Crown in a Container Nursery, and the Tree Care Cue Cards*. It has been prepared to instruct grantees on how to select, plant, and care for young trees.

Illustrations by Edward F. Gilman, Professor, Environmental Horticulture Department, IFAS, University of Florida; adaptions from Arboriculture: Integrated Management of Landscape Trees, Shrubs and Vines, 4th ed., by R. W. Harris, J. R. Clark, and N. P. Matheny (Prentice Hall, 2003).

Urban Tree Foundation

CAL FIRE

CALIFORNIA ReLEAF

WESTERN CHAPTER INTERNATIONAL SOCIETY OF ARBORICULTURE

Developed as a project of CAL FIRE, Western Chapter of International Society of Arboriculture, California ReLeaf, and the Urban Tree Foundation.

Nursery Tree Quality

I. GENERAL SPECIFICATIONS

Proper Identification: All trees shall be true to name as ordered or shown on planting plans and shall be labeled individually or in groups by species and cultivar (as appropriate).

Compliance: All trees shall comply with federal and state laws and regulations requiring inspection for plant disease, pests, and weeds. Inspection certificates required by law shall accompany each shipment of plants. Clearance from the local county agricultural commissioner, if required, shall be obtained before planting trees originating outside the county in which they are to be planted. Even though trees may conform to county, state, and federal laws, the buyer may impose additional requirements.

Inspection: The buyer reserves the right to reject trees that do not meet specifications as set forth in these guidelines or as adopted by the buyer. If a defect or substandard element can be corrected easily, appropriate remedies shall be applied. If destructive inspection of a root ball is to be done, the buyer and seller shall have a prior agreement as to the time and place of inspection, number of trees to be inspected, and financial responsibility for the inspected trees.

Delivery: The buyer shall stipulate how many days prior to delivery that delivery notification is needed. Buyer shall stipulate any special considerations to the nursery prior to shipment.

II. HEALTH AND STRUCTURE SPECIFICATIONS

These specifications apply to deciduous, broadleaf evergreen, and coniferous species. They do not apply to palms. Note that leaf characteristics will not be evident on deciduous trees during the dormant season.

Crown: The form and density of the crown shall be typical for a young specimen of the species or cultivar. The leader shall be intact to the very top of the tree.

Leaves: The size, color, and appearance of leaves shall be typical for the time of year and stage of growth of the species or cultivar. Trees shall not show signs of moisture stress as indicated by wilted, shriveled, or dead leaves.

Branches: Shoot growth (length and diameter) throughout the crown shall be appropriate for the age and size of the species or cultivar. Trees shall not have dead, diseased, broken, distorted, or otherwise injured branches.

Trunk: The tree trunk shall be relatively straight, vertical, and free of wounds (except properly made pruning cuts), sunburned areas, conks (fungal fruiting bodies), wood cracks, bleeding areas, signs of boring insects, cankers, girdling ties, or lesions (mechanical injury). The terminal bud on the leader shall be intact to the very top of the tree, and it shall be the highest point on the tree. A 15-gallon tree has a minimum caliper of 0.75 inches.

Roots: The root system shall be substantially free of injury from biotic (e.g., insects and pathogens) and abiotic (e.g., herbicide toxicity and salt injury) agents. Root distribution shall be uniform throughout the container substrate and shall be appropriate for the species or cultivar. At time of inspection and delivery, the root ball shall be moist throughout. Roots shall not show signs of excess soil moisture conditions as indicated by stunted, discolored, distorted, or dead roots.

Shade trees that grow to be large shall have one relatively straight central leader (Figure 1). Heading the tree is acceptable provided the central leader is reestablished in the nursery.

Figure 1.

Main branches (Figure 2) shall be well distributed along the central leader, not clustered together. They shall form a balanced crown appropriate for the cultivar or species.

Figure 2.

Desirable Not desirable

The diameter of branches (Figure 3) that grow from the central leader, or trunk, shall be no larger than two-thirds (one-half is preferred) the diameter of the trunk measured just above the branch.

Figure 3.

Desirable Not desirable

The largest branches shall be free of bark inclusions that extend into the branch union (Figure 4).

Figure 4.

Desirable Not desirable

Small-diameter branches (Figure 5), particularly on trees less than 1-inch caliper, should be present along the lower trunk below the lowest main branch. These branches shall be no larger than 3/8 inch in diameter.

Figure 5.

Desirable Not desirable

The trunk shall be free of wounds, sunburned areas, conks (fungal fruiting bodies), wood cracks, bleeding areas, signs of boring insects, cankers, or lesions. Properly made recent or closed pruning cuts are acceptable.

The trunk caliper (diameter) and taper (Figure 6) shall be sufficient so that the tree remains vertical without a stake.

Figure 6.

Desirable Not desirable

The root collar (the uppermost roots) (Figure 7) shall be within the upper 2 inches of the soil media (substrate). The root collar and the inside portion of the root ball shall be free of defects, including circling, kinked, and stem-girdling roots. Roots at the surface should grow mostly straight to the side of the container. You may need to remove soil near the root collar to inspect for root defects.

The tree shall be well rooted in the soil media. Roots shall be uniformly distributed throughout the container, meaning that roots should not be concentrated at the bottom of the root ball. Some roots should contact the container wall in the top half of the root ball (Figure 7). When the container is removed, the root ball shall remain intact. When the trunk is lifted, both the trunk and root system shall move as one. The imprint of the liner or smaller container shall not be visible (Figure 7).

Figure 7.

Desirable Not desirable

The root ball shall be moist throughout at the time of inspection and delivery. The roots shall show no signs of excess soil moisture as indicated by poor root growth, root discoloration, distortion, death, or foul odor. The crown shall show no signs of moisture stress as indicated by wilted, shriveled, or dead leaves or branch dieback.

Tree Planting

Selecting quality trees: Planting quality trees begins by selecting the right tree for the right location and choosing vigorous, structurally sound trees from the nursery.

Digging the hole: A firm, flat-bottomed hole will prevent trees from sinking. Dig the hole only deep enough to position the root collar even with the landscape soil surface (Figure 8). Use a rototiller or shovel to loosen soil in an area three times the size of the root ball. This loose soil promotes rapid root growth and quick establishment.

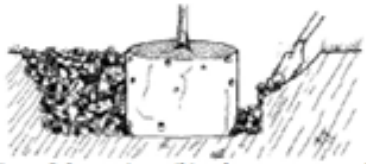


Figure 8. Loosening soil in a large area around the root ball allows for rapid root growth and quick establishment.

Installing the tree: Remove soil and roots from the top of the root ball to expose the root collar; cut away any roots that grow over the collar (Figure 9). Cut any roots that circle or mat along the sides and bottom of the root ball (Figure 10). The root collar shall be even with the landscape soil after planting (see Figure 9). Backfill with soil removed from the hole. Minimize air pockets by packing gently and applying water. Build a berm 4 inches tall around the root ball to help force water through the root ball. Enlarge the berm as the tree establishes.

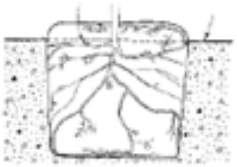


Figure 9. Remove soil and roots growing over the root collar (A) and place collar level with soil surface (B).

Figure 10. Cut roots at (A) to form new roots that grow away from the trunk. Do not cut roots at (B), since the root defects will regrow.

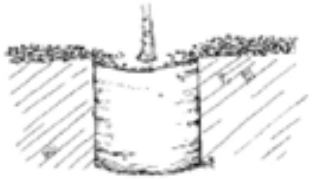


Figure 11. Mulch shall taper to a slightly thinner layer on top of the root-ball.

Mulching: A layer of organic mulch, such as leaf litter, shredded bark, or wood chips, helps protect tree roots from temperature extremes and conserves soil moisture. Mulch also helps prevent grass from competing with the tree for water and nutrients. The mulched area makes it easier to operate mowers and weed eaters without hitting the trunk and compacting soil. Apply mulch to a depth of 3 to 4 inches (slightly thinner on top of the root ball) (Figure 11). Mulch should be kept 4 inches away from the trunk to prevent disease.

Staking: The method of staking is dependent on a tree's ability to stand on its own and the location of the planting site. Staking is used to hold trees erect, allow the root ball to anchor, and protect the trunk from damage by equipment. Stakes should be removed when the tree can stand on its own and the root ball is anchored. Stakes should be positioned away from the tree and secured to the trunk at the point where the tree stands straight. Do not use wire or any strap that will girdle the tree or damage the bark. If a tree cannot stand straight on its own after staking, a splint stake tied directly to the trunk made of bamboo, spring steel, or a fiberglass rod may be used to straighten the upper trunk and/or leader. Avoid using square wood secondary stakes. Acceptable staking examples may be seen below (Figures 12, 13, and 14).

Figure 12. Double

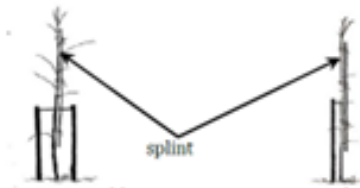


Figure 13. Double staked with splint stake.

Figure 14. Single staked with splint stake.

Tree Training at Planting and in the Early Years

Trees that grow to be large are more structurally sound and cost-effective to maintain when trained with a central dominant leader that extends 30 feet or more into the crown (Figure 15). Vigorous, upright branches and stems that compete with the central leader can become weakly attached (Figure 15).

Figure 15. Good tree structure (left); poor structure (right).

Trees with branches spaced along the central leader, or trunk (Figure 15) are stronger than trees with branches clustered together (Figure 15). Prune trees at planting to one central leader by removing or shortening (shown) competing stems (Figure 16). All branches and stems shall be considerably shorter than the central leader after pruning is completed (Figure 16).

Figure 16. Shorten competing stems to improve structure.

Reduction cuts can be used on trees at planting to subordinate branches that are codominant (Figure 20). Some upright stems and branches can be removed entirely back to the trunk. Heading cuts may have to be used occasionally.

Remove or shorten branches that are larger than half the trunk diameter at planting and every few years thereafter. Shorten them by cutting back to a live lateral branch (Figure 17). This lateral branch shall be pointed away from the trunk and it should not be growing upright. The central leader shall be more visible in the crown center after pruning. Only large-diameter branches need to be pruned because they compete with the leader and could be weakly attached (Figure 17, L). Small branches (Figure 17, S) do not need pruning because they will not compete with the leader.

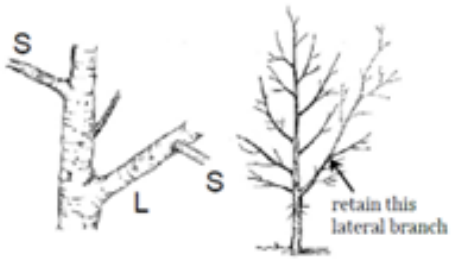


Figure 17. Only large branches need pruning (L). Small branches (S) do not need to be pruned.

The best way to shorten large or long stems and branches is to cut them back to a live lateral branch (Figure 19). This slows growth on the pruned parts and encourages growth in the dominant leader creating sound structure.

Remove larger branches by making three cuts. This prevents the bark from peeling or splitting off the trunk below the cut. Make the final cut back to the branch collar (enlarged area around union of branch where it joins the trunk).

Figure 18. Shortening larger low branches concentrates growth in the leader and improves tree structure.

Structural Pruning Checklist

1. Develop and maintain a central leader.
2. Identify the lowest branch in what will become the permanent crown.
3. Prevent branches below the permanent crown from growing larger than half the trunk diameter.
4. Space main branches along the central leader.
5. Reduce vigorous upright stems back to lateral branches or remove entirely (Figure 20, next page).

Figure 19. Reduce a stem back to a live lateral branch to slow its growth.

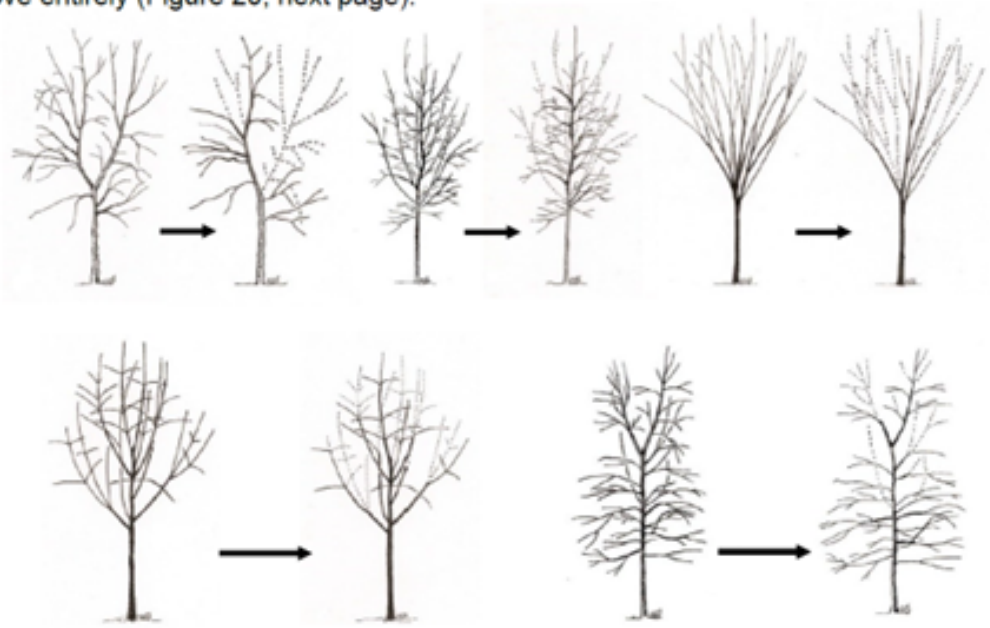


Figure 20. Before and after pruning at planting for

Irrigation

Consistent irrigation is critical for tree establishment.

- Apply about 3 gallons of water per inch of trunk diameter to the root ball 2 or 3 times per week for the first growing season.
- Increase volume and decrease frequency as the tree becomes established. Weekly irrigation during the second year and bimonthly irrigation during the third year should be sufficient for establishment.
- Once established, irrigation requirements depend on species, planting site, climate, and soil conditions.
- Irrigation devices should be regularly checked for breaks and leaks.
- Consider use of recycled water when available and where the species will tolerate it and the recycled water quality is adequate.

IMPORTANT NOTE: Tree species selected must be classified as very low, low, or moderate water use species in the WUCOLS IV or must be justified for the planting site(s) selected.

APPENDIX G
Post-fire ecosystem impacts on dead, dying, and surviving trees

Post-fire tree stress is a phenomenon that occurs after a fire has occurred and may last for years. This stress can cause a reduction in growth and an increase in mortality, even among the largest trees. The delayed post-fire tree mortality is a manifestation of a cascade of physiological stresses initiated by root and tree trunk living tissue damage that can also magnify the impact of other kinds of damage.

The two most likely reasons for a tree to become stressed and susceptible to bark beetle attack are drought and wildfire. For a number of years prior to the Caldor Fire, the trees have been under significant drought stress. After the Caldor Fire, the dying and surviving mixed-conifer forest trees were put under more significant weakened conditions.

Not all trees will die in the first year after a fire, and fire-related mortality can continue for 2 to 6 years. In a conifer forest, an individual tree with totally consumed needles (torched tree) or a tree with severe damage to the cambium (an inner layer of tissue between the bark and the wood) will die because it has lost its ability to photosynthesize and transport water and nutrients.

Completely scorched trees (trees that were damaged by heat and whose needles or leaves were not burned but are dead and brown) generally do not survive. It is also common for many trees to sustain intermediate levels of fire damage, where only part of the canopy is scorched or torched, or where the cambium has lower levels of damage. In these cases, survival and mortality are far less certain. Some will survive, but this type of damage can also weaken a tree and increase its susceptibility to later mortality from other stressors, including insect and pathogen attacks.

All sizes, ages, and species of trees are potentially susceptible, but bark beetles are most likely to infest trees that are weakened (stressed). After most low-severity fires, individual trees that were injured or stressed during the fire may be more likely to be attacked and die later from bark beetles or other stressors. Moderate-severity fire and small patches high-severity fire have an important ecological role, providing standing and fallen snags for wildlife habitat and nutrient inputs to the soil. Species such as the black-backed woodpecker require the blackened snag habitat created by severe fire.

Drought stress

Trees and shrubs in the Sierra have adapted to a dry season, but these longer dry periods stress vegetation productivity and survival. Drought can exacerbate the effects of other, naturally occurring stressors and disturbance, such as increased insect outbreaks and wildfire.

Bark Beetles

Insect infestation can start immediately after a fire passes through an area.

There are about 200 species of bark beetles found in California forest. These species are native to these ecosystems and normally provide an important function in maintaining forests.

Bark Beetles cont.

They are an essential food item for many species of wildlife, particularly woodpeckers. However, a few of these species can kill trees directly. The bark beetles that pose a threat are less than ¼-inch long and bore through the outer bark of trees to lay eggs in the inner bark.

Pitch tubes are globs of resin that seep from the pine's bark when it is damaged or stressed. They are a tree's defense mechanism against pine bark beetles. The released pitch keeps bark beetles from establishing in the trees living tissue. Pitch tubes emerging from the bark in a reddish color with boring dust suggest successful attacks. Amber or cream-colored pitch tubes may suggest unsuccessful attacks.

Mountain pine beetles produce "galleries" where the larvae chew the wood of the tree. A common sign of this type of attack is the presence of fine sawdust in the bark crevices along the trunk of the tree, an indicator of the beetle larvae feeding on the nutrient-rich tissue (phloem) of the tree. A tree's loss of nutrients causes needles to change color, fading to light green and yellow. Once a tree is fully infested by bark beetles there is no hope of saving it. If there are nearby trees in a stressed condition, the bark beetles will move to them.

Pathogens

A tree disease basically involves the relationship between a biological organism known as a host (tree), a biological organism known as a pathogen, and an environment where the pathogen thrives.
Forest pathogens (fungi, bacteria, viruses) can infect trees, causing disease and even death. When trees are under extreme stress the pathogens may overcome the trees' capability to ward off the pathogens.
Pathogens and the diseases they cause can affect roots, foliage, and the heartwood of a tree.
Symptoms may be found in a particular part of the tree or throughout the tree including :

- needle loss
- foliage color change
- decreased growth
- resin production
- decayed wood

As with the bark beetles, most pathogens found in the Sierra Nevada forests are indigenous and often have no large-scale impacts on forests.

Fungi attacking a tree producing pine canker

Grizzly Flats FireSafe Council

June 2023

Ernie Lory, Writer

Roberta Long, Editor

Contributors:

Anne Heissenbuttel,

RPF, Amador County Master Gardener

Mark Almer

Chair, Grizzly Flats Fire Safe Council

Photos provided by Ernie Lory except where noted by Mark Almer or from websites

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Facebook Grizzly Flats Fire Safe Council
or contact us at grizzlyflatsfsc@gmail.com