I. DEFINITION
Treating woody plant residues created during forestry, agroforestry and horticultural activities to achieve management objectives.

II. PURPOSES
- Reduce hazardous fuels and wildfire risk of harm to humans and livestock.
- Reduce the risk of harmful insects and disease.
- Protect/maintain air quality by reducing the risk of wildfire.
- Improve access to forage for grazing and browsing animals.
- Improve the soil organic matter and maintain or improve soil health and soil quality.
- Improve the site for natural or artificial regeneration.
- Enhance aesthetics.

II. WHERE USED
This practice applies on areas with quantities of woody slash and debris requiring treatment to meet objectives. The major locations in California where the practice is used are in conifer forests, mixed hardwood forests, rangelands with substantial woody shrubs, and agro forestry orchards settings.

IV. CONSERVATION MANAGEMENT SYSTEM
Woody Residue Treatment is a practice that is part of an overall conservation management system for forest lands or other lands that create woody debris from management actions or catastrophic natural events. If left alone, the debris creates a hazardous condition(s) that places the remaining trees and/or shrubs, ecosystem functions, and human life and assets at risk. Woody Residue Treatment in forest settings is often associated with tree or brush silvicultural cuttings or cleanup of excess woody debris from natural accumulations or catastrophic events such as wildfire, pests and wind. The most common use of Conservation Practice Standard (CPS) 384 in EQIP forestry projects is when CPS 666 Forest Stand Improvement is used for tree or shrub thinning.

Figure 1: Woody Residue Treatment reconfigures and often reduces the amount of forest slash.
In California’s forested setting, the practice is mainly used to “treat” excess woody plant material to reduce fuel loads/fire hazards to acceptable levels, aid in wildfire control, protect human infrastructure and prepare sites for desired regeneration. “Treat” or “Treatment” in this context means a purposeful action to modify debris quantity and arrangement or disposal of the vegetation from the location where it was generated.

IV. Planning and Specifications
Plans and specifications will be developed on each management unit where the practice will be applied. The Implementation Requirement (IR) sheet will state the objective, treatment method, timing, protection measures/Best Management Practices, and acceptable completion level.

Planning and inventories are required for determining need, condition and extent of woody debris treatment. Planning will lead to information on intensity, method, and timing of woody residue treatments. Timing of treatment coincides with achieving intended purposes and minimizing impact on other resources.

In planning for treatment, consideration should be given to leaving some debris for biological diversity (Figure 3). Consider retaining small vegetated areas that coincide with unique features such as wet areas, rocky or steep terrain, down logs and snags, or other valuable habitat elements.

Residual slash and debris left on the site after treatment will be in a condition and amount that will not present an unacceptable fire, safety, environmental, or pest hazard nor interfere with other on-going or planned management activities. A post-treatment assessment is usually needed to determine if desired conditions were achieved and if future treatment is needed.

V. WOODY DEBRIS TREATMENT ASSESSMENT
As part of the planning and specification process, an assessment must be made to determine the need, intensity and suitable methods of woody debris treatment. Consider the following information about existing conditions:

- **Soils and Appropriate Soils Interpretations:** Identify soil map unit descriptions, erosion hazards, suitability for mechanical equipment, soil compaction resistance and potential damage by fire. Choose the slash treatment method that is appropriate for the purpose, soil, volume of material to be treated, condition of the material, and site factors. For example: some soils have low suitability for equipment use or high soil compaction risk. For soils like these, the planner’s specifications will focus on hand treatments or mitigate for the use of equipment.

- **Fuel Load:** Estimating the amount of woody debris on the site contributes to determining need and type of treatment. A variety of methods and combination of methods are acceptable...
for estimation of residue quantity. These include USFS photo series\(^1\), down wood transects (GTR-INT-16, 1974, Brown), or for quick field estimations using Forestry Clipboard tables.\(^2\)

- Fuel loading estimation provides information on whether fuel treatment is necessary and the intensity of the level of treatment.
- Fuel loading as low as 2 bone dry tons (BDT) per acre can contribute to flame lengths and fireline heat intensity that diminishes wildfire suppression efforts.
- When the woody debris is less than 8-10 dry ton/acre and it is unevenly distributed and non-continuous, lop and scatter may be an appropriate method of treating this slash.
- In critical roadside areas, WUI areas, fuel breaks, or other fire suppression access areas, residual slash should be much lower, often less than 2 BDT/ acres and highly rearranged (e.g. chipped) to reduce fire behavior and spread to other vegetation.
- Steeper terrain will require more intense treatments.
- Past experience shows that typical overstocked second growth Sierra Mixed Conifer forests result in 20 to 30 BDTs/acre of slash following tree thinning.
- When high-levels of slash treatment are needed, chipping and masticating of thinned trees and shrubs is the preferred method for woody debris disposal when heavy ground equipment is suitable.

USFS Photo Series for Quantifying Forest Residues – Below are photo series from USDA-Forest Service General Technical Report PNW-52 1976. They show accumulated tonnage of slash. Tonnage computations are based on oven-dry weights and air-dry volume. Use these as ways to estimate the amount of woody debris that will result from a project.

![Figure 4, Complete stand removal](image.png)

**Figure 4, Complete stand removal** - Total slash accumulation after a block harvest is 38.2 tons/acre (8.1 tons/acre for size class 1.1-3.0 inches in diameter; 6.3 tons/acre for 3.1-9.0 inches; 17.2 tons/acre for 9.1-20.0 inches and 6.6 tons/acre for 20.1+ inches). Slash treatment could involve piling and burning, broadcast burning, and/or chipping followed by removal, or removal. To achieve a 9 ton/acre criterion, approximately 30 tons/acre of slash is considered excess.

\(^1\) Photo series examples are PNW-GTR-51, 52, 95, 105, 231, 258), fuel hazard estimator for post-Pre commercial thinning (PNW-57, 1968, Fahnstock.

\(^2\) See NRCS-WA 384 Practice spec

Figure 5, Heavy fuel load PCT: - Total slash accumulation after a precommercial thinning (PCT) is 23.0 tons/acre (6.7 tons/acre for size class 1.1-3.0 inches in diameter; 12.8 tons/acre for 3.1-9.0 inches; and 3.5 tons/acre for 20.1+ inches). Slash treatment could involve piling and burning, and/or chipping followed by removal, or removal. To achieve a 9 ton/acre criterion, approximately 14 tons/acre of slash is considered excess.

Figure 6, Light Thinning - Total slash accumulation after a partial harvest is 6.3 tons/acre (3.4 tons/acre for size class 1.1-3.0 inches in diameter; 2.9 tons/acre for 3.1-9.0 inches). Because slash is less than the 9 tons/acre criteria and inconsistently distributed, slash treatment could consist of lopping and scattering to meet the less than 18” to 30” height criteria.
Figure 7, Moderate fuel load thinning - Total slash accumulation after a precommercial thinning is 7.8 tons/acre (5.5 tons/acre for size class 1.1-3.0 inches in diameter; 2.3 tons/acre for 3.1-9.0 inches). Although slash is less than the 9 tons/acre criteria, lop and scattering of slash is not recommended due to the consistent distribution of the slash.

- **Site Factors** - Site factors are physical, climatic, or regulatory circumstances in the forest that may affect equipment, treatment method choice, and/or timing of treatment. Examples of site factors are steep slopes, average annual precipitation, rock outcrops, sensitive areas, broken terrain, condition and quantity of fuel on adjacent stands, and state or local regulations and required permits.

- **High Fire Hazard Areas and Public Roads and Building** - When fuels reduction/wildfire risk reduction is the purpose, focus on treatment methods that result in intense treatment or removal/disposal from site of woody debris. These areas are the most common/frequent locations where NRCS-CA EQIP forestry projects occur:
  1) high to extreme fire hazard areas;
  2) high to extreme fire hazard areas;
  3) Wildland Urban Interface Communities at risk.
  4) areas within 100’ of a publicly used road; ii) areas within 200-500’ of buildings belonging to neighbors; iii) or within 200-500’ of public use areas.
  5) Tier I Tree Mortality areas as designated by the Governor’s Tree Mortality Task Force; and
  6) low precipitation zones of less than 36” per year.

- **Safety and Aesthetics** - Finally, remind the participant of the safety and aesthetics considerations for the selected methods. Mechanical slash treatment can be very disturbing and highly change the forest conditions. Landowners may not be familiar with this type of action. But treatment conditions are not long lasting and disturbed soil and surface slash should be restored to more natural conditions in a few years.
VI. SLASH TREATMENT METHODS AND TREATMENT SPECIFICATIONS

Slash treatment methods used in NRCS-CA consist of the following:

<table>
<thead>
<tr>
<th>Treatment Method</th>
<th>Uses and Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lop and Scatter</td>
<td>Suited to areas with lower slash accumulations; low cost; labor intensive; residual debris after Lop/Scat can be a fire hazard concerns.</td>
</tr>
<tr>
<td>Hand and Tractor Piling and Burning</td>
<td>Suited to areas with heavy slash accumulations; hand piling is used in steeper, inaccessible areas. Tractor piling very commonly used; very thorough treatment method but can have substantial impacts on soil health. Pile burning presents air quality and GHG emissions issues.</td>
</tr>
<tr>
<td>Chipping/Mastication</td>
<td>Preferred method for treating slash and thinning vegetation; thorough treatment; limited to &lt;35% slopes; costly.</td>
</tr>
<tr>
<td>Windrows</td>
<td>Not used much in forested settings. Similar concerns as tractor piling.</td>
</tr>
<tr>
<td>Crushing</td>
<td>Limited use; for situations with low fuel volumes.</td>
</tr>
<tr>
<td>Prescribed Fire</td>
<td>Limited use in NRCS-CA. Effective in reducing low to moderate fuel loads with well configured slash; useful in areas where other treatments are impractical; relatively inexpensive; associated with risk of fire escape and smoke emissions; Fire Plan required and should be prepared by National Wildfire Coordinating Group (NWCG) qualified burn boss personnel or CAL FIRE, or consistent with amendments to NRCS Prescribed Burn policy.</td>
</tr>
<tr>
<td>Air Curtain Burner (ACB)</td>
<td>An alternative to open pile burning. Requires special (ABC) equipment. Benefit is lower smoke emissions. Limited number of equipment available.</td>
</tr>
<tr>
<td>Removal</td>
<td>Most thorough level of slash treatment; requires specialized equipment; expensive; when slash is utilized at a biomass plant, permits required.</td>
</tr>
</tbody>
</table>
A. Lop and Scatter

Lopping is the cutting of limbs, branches, treetops, small diameter trees, or other woody plant residue into lengths so that the remaining slash will lie close to the ground. Scattering is the spreading of lopped slash evenly over the ground so that the remaining slash will lie close to the ground. This method is suited to areas with lower slash accumulations or steep areas where equipment cannot treat slash more thoroughly.

The treatment can result in reduced fire behavior due to decreasing vertical ladder fuels and increasing the space between surface fuels and live crown base. It also improves aesthetics and distributes material more uniformly and closer to the forest floor for faster decomposition.

1. Maximum Allowable Height from Soil Surface: 30 inches (18 inches in high fire hazard areas) (80% of material is 30”/18” or less from the ground.)

2. Maximum Allowable Residue Lengths: 30 inches (80% of material is 30 inches or less in length.)

3. Ground Contact Optimized: 80% of material is in contact with the ground.

4. Special Protection Measures/Requirements: include in IR all that apply:

   Any slash generated within 200 ft. of habitable structures or roads will be hauled away, chipped, or piled and burned.

   Watercourses present - Do not place any slash in any watercourse channel, seasonal stream, or riparian buffer zone.

   Steep slopes with large woody debris - Large tree boles/logs greater than 6 inches diameter of any length may decked or left in place when in contact with the ground. Cutting of boles to ensure ground contact may be needed.

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Figure 8, Lop and scattering - Lop and scattering cuts slash and spreads it evenly across the ground. Untreated vegetative debris creates a fire hazard, pest breeding habitat, and impediments to revegetation and grazing.
B. Chipping/Shredding

Chipping/Shredding (aka mastication) is the processing of slash through a mobile mechanical chipper to produce chipped or shredded material that is distributed on site or utilized offsite as landscape mulch or biomass energy. For safety purposes, humans and animals must be excluded from areas being treated by equipment that flails and throws chips and chunks. Care must be taken to operate the machinery to minimize bark damage to the residual trees.

Mastication is the preferred woody residue treatment method because it highly reconfigures slash into a minimum fire hazard condition; adds organic material to the soil to improve soil health; cushions heavy equipment movement over the soil; and provides GHG emission reduction benefits by avoiding pile burning of slash. It is also very “selective”, in that a skilled operator can select each individual tree/shrub to treat and highly customize the post-treatment forest condition.

There are a variety of mastication equipment configuration. Shown above in Figure 9 is equipment with from mounted rotating drum with cutting blades. Other equipment uses a mechanical arm (see page 1) with rotating heads that can stay stationary and reach a shrub or tree to chip. This results in the ability to highly select a piece of vegetation to be treated and reduce the “footprint” of the equipment on the forest floor.

The method has limitations. The equipment can typically not be used on slopes over 35%. It can only treat woody debris that is a maximum diameter size of 10-12 inches diameter. In projects with large sized logs resulting bark beetle or catastrophic fire damage, other logging equipment must be used. The treatment is very expensive ranging $1,000 to over $2,000 per acre. Contractors are in high demand and it is often difficult to implement treatments in a timely manner. As with all heavy equipment in forest operations, heavy equipment cannot be used during wet/saturated soils periods to avoid erosion and soil compaction.

1. **Maximum Allowable Mulch Depth:** 4 inches (80% of mulched areas are 4” deep or less) or 6 inches depth when chipped/masticated material is placed in an isolated cleared area such as a landing.

2. **Maximum Allowable Residue Lengths:** Mastication operations will leave residues where 80% are less than 18 inches in length, 60% are less than 12 inches in length, and 40% are less than 8 inches in length. 20% of the material may be longer lengths.

3. **Special Protection Measures/Requirements:**

   Chips will not be applied or distributed to areas where migration to surface waters is likely in high precipitation events. Spread chips evenly away from the base of any crop tree.

   Materials for chipping or shredding are free of chemically treated wood and other contaminates.

   Large logs (e.g. greater than 10 inches DBH deteriorated material often resulting from wildfire or bark beetles), may be decked on site. All limbs and all tops to a 10-inch diameter will be chipped, shredded, or burned to reduce fuel accumulations. Logs will...
be decked in isolated areas where they will not create fuel hazards or other environmental resource concerns, such as impacts to water or soil quality.

Do not damage boles (remove bark) of live, standing, residual trees during equipment operations.

No new tractor trails or heavy equipment operations on slopes greater than 35%, except for limited distances on up to 45% slopes.

Operations with heavy equipment shall not occur during periods of wet weather with saturated soil conditions as defined by the California Forest Practice Rules.

C. Pile and Burn

Piling is placing, laying, heaping or stacking of slash into piles which may or may not be burned. Burning is igniting piled slash under prescribed conditions to reduce the amount and continuity of fuels. These methods are suited to areas with adequate spacing between residual trees or areas with few or no residual trees.

1. General requirements for all piling and burning

When slash and other debris will be burned onsite use NRCS CPS Code 338, Prescribed Burning (when CPS 338 pile burning scenarios are available).

Landowner is responsible for obtaining and possessing, prior to ignition, a valid burn permit from a fire protection and/or an air quality agency having the authority for issuing burn permits. The landowner is responsible for following all conditions on the burn permit and applying appropriate smoke management practices to minimize air pollution impacts on the public. Follow any burn plan written specifically written for pile burning.

Compliance with State fire protection statutes (Public Resource Code 4427) is required regarding equipment needed during open burning (sharp point shovel and fire extinguisher etc.) and fire suppression tools when operating internal combustion engine equipment (Public Resource Code 4428).
Use appropriate control measures to ensure fire is contained within piles. Measures include bare mineral soil clearing around piles, on-site presence of appropriate suppression tools (shovels, McCloud, rake, etc.), trenching to catch rolling debris, and water to extinguish fire escapes.

Do not place piles on top of large rocks, logs, stumps, or within watercourses, dry seasonal watercourse swales, ditches, and roads subject to vehicular traffic.

Burning should be performed under low risk weather conditions, preferably in winter months, during rain or snow or when fuels and vegetation are wet, relative humidity is high, and winds are light.

Piles that will be burned later may be “teepeed” to shed water or, if small, temporarily covered with water-resistant paper or plastic to allow material beneath to dry.

Synthetic materials (e.g. old tires, petroleum products) will not be incorporated in piles.

Slash will not be piled or burned in any watercourse channel, buffer zone, or ephemeral drainage carrying seasonal runoff.

Any slash generated within 200 ft. of habitable structures or roads will be hauled away, chipped, or piled and burned.

2. Handpile-Burning

Maximum Allowable Pile Height: 4 ft.
Maximum Allowable Pile Diameter: 4 ft.
Maximum Density Per Acre: 100 piles or less per acre.
Special Hand Piling Protection Measures/Requirements:

Handpiles have a minimum 10-foot width of clearing to mineral soil around the pile.

Construct piles slash/woody debris at least 15 feet from retained trees.

Note: Size and density per acre of hand piles are not critical factors for many situations and can vary from the above specifications. Piles size can often be increased where there is suitable space for burning. Suitable piling burning space includes locations which avoid tree scorching, live tree basal cambium intense heat exposure, and ignition of other flammable vegetation.
3. Tractor Piling-Burning

Maximum Allowable Pile Height: 10 ft

Maximum Allowable Pile Diameter: 30 ft

Maximum Density Per Acre: 30, or less as needed to avoid residual tree scorching.

Maximum Slash Length: 8-foot sections or less with occasion longer lengths.

Figure 12, Tractor pile - Tractor piling and burning is useful where there are large amounts of slash and adequate space to pile slash and burn piles. Insect tree mortality projects typically use tractor piling and burn.

Tractor Piling Special Protection Measures/Requirements

Tractor piling equipment may be used on slopes greater than 35%, except for limited distances on up to 45% slopes.

Construct piles of slash/woody debris a sufficient distance from retained trees to avoid fire or heat scorch to residual tree.

Piles shall be in openings outside, drainages riparian buffers, and at least 30 feet from snags.

Areas of uncleared live and dead grass/forbs, shrubs, and trees are recommended to be retained on the site for biodiversity and erosion control purposes. When size of an individual untreated areas exceeds 2% of the size of the treatment area, it is excluded from payment.

Do not damage boles (remove bark) of live, standing, residual trees during piling. Slash and vegetation may be left in place where vegetation is so close to leave trees that the removal of the vegetation would cause damage to the leave trees. Leave trees and vegetation not specified to be treated shall be left undisturbed.

Materials which are less than 3 inches in diameter and less than 24 inches in length may be left for ground cover. If the slash cover exceeds 50%, pile the smaller fuels to meet the slash piling requirements.

Large logs (e.g. greater than 10 inches DBH, deteriorated material often resulting from wildfire or bark beetles), may be decked on site. All limbs and all tops to a 10-inch diameter will be chipped, shredded, or burned to reduce fuel accumulations. Logs will be decked in isolated areas where they will not create fuel hazards or other environmental resource concerns, such as impacts to water or soil quality.

Piles shall be compact and be as free of dirt as possible. When machine piling or windrowing, a “brush rake” (blade with tines) or grapples will minimize pushing surface soil into slash accumulations. Use of piling equipment with brush rakes or grapple tools are preferred instead of straight dozer blades.
Avoid to the greatest extent possible actions which remove duff layer from soil and create bare mineral soil (except for fire breaks around piles).

In areas where no remaining trees are live, use fewer and larger piles to facilitate burning.

All materials partially pushed over, hung up, left in an unsafe position, shall be either reworked with the tractor or felled by hand.

Operations will occur during dry soil conditions to the greatest extent possible. Soils will not rut greater than 6 inches in depth over distances greater than 25 feet. Displacement will not affect more than 10% of any acre.

Soil disturbance caused by the operations which may cause erosion shall be cross raked on the contour or mitigated with waterbars.

The dozer line for fire control around the tractor piles shall be "one blade wide" (approx. 10 feet). It shall be cleared to mineral soil. Waterbars are to be constructed as needed and completed before rain events. When possible, roads and other natural barriers may be incorporated with the line.

Grapple piling shall adhere to the same specifications as stated for tractor piles.

Consideration for nearby Pine Beetle Infestations - In areas with pine bark beetles, piles containing green material will be burned within two months if conditions permit. If residues are green and cannot be burned within two months of pile creation, it will remain scattered on the ground until a burn window is available. Slash must be piled or chipped before practice can be certified.

When pine beetle activity is low (normal), a limited number of deck logs and slash piles isolated from other slash or live vegetation may be left (up to 10% of piles) unburned for wildlife habitat.

D. Air Curtain Burning

An alternative to pile burning is use of “air curtain burning” equipment. ACB machines operate by blocking various air pollutant emissions including greenhouse gases and PM by using a high velocity airflow from the air blower part which is referred to as “air curtain”. ACBs are divided into two main types, stationary (positioned at the centralized landing area) and mobile applications (half-ton pick-up truck mounted system).

Past studies show that ACBs can reduce CO2 and PM emission by 80% compared to open pile burning and reduce smoke opacity. In additional it also minimizes escaping ember, soil damage and burn scars by creating the air curtain across the box. This residue treatment method is considered a clean air pollution control burning method to dispose of forest residue. Burning consumption rates, availability of equipment, and operating cost of disposals vary among ACB systems. CAL FIRE has purchased in 2018 10 ACBs and experience will be gained from their use.

![Figure 13 Air curtain burners treating forest slash on a landing.](image)
E. Crushing

Crushing breaks and presses slash on or into the ground surface. This occurs when harvest or thinning equipment drives over slash created during the operation. This method involves the use of heavy ground-based equipment that crush slash to a depth not exceeding 2 feet. The closer crushed material is to the forest floor, the quicker decomposition occurs and the less chance of fire reaching into the above canopy layers.

1. **Maximum Allowable Height from Soil Surface**: 2 feet (80% of material shall be 2 feet or less).

2. **Maximum Allowable Residue Lengths**: 48 inches

3. **Ground Contact Optimized**: Maximize material contact with soil for rapid breakdown.

4. **Special Protection Measures/Requirements; include in IR all that apply**:
   - With-in 200 Feet of Public Roads and Structures - Any slash generated within 200 ft. of the habitable structure or roads will be hauled away, chipped or piled and burned.
   - Potential for Watercourse Delivery - Do not place any slash generated in any watercourse or seasonal stream.

E. Windrows

Windrowig is piling slash on the contour of the terrain using equipment. It used very little in forest settings and is typically associated with forest restoration projects where brush is being removed to reforest.

1. **Maximum height of pile**: 4 feet

2. **Maximum width of windrow**: 10 feet

3. Windrows longer than 200 feet will have wildlife openings.

4. Windrows will be placed on the contour (perpendicular to the slope).

5. Windrows will be placed far enough apart as to not interfere with required planting density.

6. Windrows shall not create a fire hazard and be isolated from live or dead vegetation.
G. Prescribed (Broadcast) Burning

This method consumes and alters slash by prescribed fire minimizing the risk of wildfire. It is suited to areas with low to moderate fuel loads, reliable fire control lines, and locations where smoke emissions are not a significant factor to nearby receptors. The practice is typically called broadcast burning as fire is intentionally set to burn throughout a secured area. Smoke management, production of air pollutants, and risk of fire escape are concern with this method.

Treatments of excess woody debris using prescribed burning will be implemented using CPS 338 Prescribed Burning. CPS 384 may not be needed when slash is treated using prescribed burning. In some cases, CPS 384 may be a facilitating practice for CPS 338.

All prescribed burning will comply with CPS 338 Prescribed Burning, NRCS National Prescribed Burning policy, and NRCS-CA Technical Guidance. Foremost among these is the need to have a prescribed burn which covers specific items and is written by a qualified person. For NRCS-CA, it is recommended that burn plans and burning implementation be conducted by National Wildfire Coordinating Group (NWCG) certified persons or CAL FIRE. The practice is not widely used in NRCS-CA and must involve conservation planning by persons with 338 Job Approval Authority and review of all plans from a NRCS State Office Team consisting of the State Forester, State Range Conservationist, and other State Office specialists and Area Foresters with CPS 338 JAA.

Other facilitating practices for CPS 338, in additional to CPS 384, may be used for preparing fuels for burning and creating fire control lines (CAP 112 Prescribed Burn Plan, CPS 666 Forest Stand Improvement, 660 Pruning and CPS 394 Firebreak).

H. Removal

Slash is removed from the site. This method is suited to areas with higher accumulations of slash where other methods do not sufficiently reduce undesired materials. It is suited to locations where commercial biomass utilization is economically feasible or where there is a local county disposal site. The practice often involves logging equipment such skidders, high powered chipper, and chip vans. Road access with wide radius curves and large chip processing landings are critical factors necessary for this treatment.

In some tree mortality situations, high levels of large dead logs require removal from the property to meet resources concerns. Leaving these levels of large logs creates fire hazard or access barriers if left on site. Use CPS Practice 384 Log Disposal when...
planning indicates removal of large logs will be needed. CPS 500 Obstruction Removal can be used when logs have already been decked (e.g. post fire utility line clearing) and solely need removal from the site. (Consult with your engineering staff regarding use this practice.) Use these practices only when there is a demonstrated environment benefit or resource concern to be accomplished for off-site to disposal.

When slash or large dead trees are removed for commercial utilization ("biomass"), add the Biomass Removal Checklist into the IR:

**Biomass Removal Checklist:**

- [ ] Project will dispose of biomass from soils capable of growing commercial tree species (A or B list species) at a utilization facility.
- [ ] Appropriate CAL FIRE forest practice permit (e.g. permits per 14 CCR 1038 Exemptions or 1052 Emergency Notice) of the Forest Practice Rules has been filed with CAL FIRE by a Registered Professional Forester or Licensed Timber Operator as applicable.
- [ ] Appropriate landing and skid trail, spacing, construction, and closure requirements are provided and implemented consistent with standards in CPS 655-Forest Trails and Landings.
- [ ] Project will utilize the biomass material as feedstock for:
  - [ ] Fuel to generate renewable electricity at a biomass-fueled power plant
  - [ ] Renewable fuel production (e.g. renewable diesel or syngas)
  - [ ] Mulch
  - [ ] Animal Bedding
  - [ ] Biochar
  - [ ] Treating unpaved roads and surfaces as a dust suppressant
- [ ] Other:

**VII. FACILITATING PRACTICES**

Woody Residue Treatment is commonly used with other practices to effectively and economically achieve silvicultural objective. Facilitating practices include Forest Stand Improvement (666), Tree and Shrub Pruning (660), Tree and Shrub Establishment (612), Tree Shrub Site Preparation (490), Windbreak and Shelterbelt Renovation (650), Prescribed Grazing (528), Fuel Break (383), Prescribed Burning (338), Critical Area Planting (342), and Obstruction Removal (500).

**VIII. SPECIAL REQUIREMENTS**

**Permitting and Environmental Compliance**

All activities associated with applying this practice shall comply with federal, state, tribal and local forestry and related laws and regulations. It is the landowner’s responsibility to obtain appropriate permits and/or applications prior to commencing an activity. Typical permits that may be needed include slash burning from an air quality control district, commercial harvesting permit from CAL FIRE when vegetation is used for commercial purposes, Pesticide Control Advisors Report when herbicides are applied, archeological protection review by NRCS, TES protections, and stream bed alteration permits.

Compliance with State fire protection statutes (Public Resource Code 4427) is required regarding equipment needed during open burning (sharp point shovel and fire extinguisher etc.) and fire
suppression tools when operating internal combustion (Public Resource Code 4428). Advise clients to contact local CAL FIRE Office for information. Also, CAL FIRE will advise on periods of no/curtailed operations of equipment use and post operations fire patrols during extreme fire conditions such as Red Flag Warnings or Fire Weather Watch when issued by the National Weather Service.

Watercourse and Meadow Protection Standards

- The IR shall include information on watercourses, riparian areas, wetlands, including a map, in the project area.

Protection measures/treatment limitations must be provided when the project affects any Class I or II perennial watercourses, or Class III seasonal/intermittent watercourses. Refer to the Table 1 below for watercourse protection zones in non-anadromous water bodies. If slopes are greater than 40%, the buffer will extend to the topographic break above the stream. All watercourse riparian stream buffer areas exclude entry by heavy equipment, except at existing crossing or designated locations.

Vegetation treatment and heavy equipment is generally excluded in watercourse buffer zones, particularly in remote areas that are not associated with WUI areas or presence of public safety infrastructure. These exclusions are needed to continue large snag/wood recruitment and avoid impacts to species that utilize aquatic and riparian areas such as fish, red-legged and yellow-legged frogs, Pacific fisher, and great gray owl.

Table 1 – Protection measures/treatment limitations for watercourse protection zones (Buffer Zones)

<table>
<thead>
<tr>
<th>Class</th>
<th>Wet meadow</th>
<th>Wet meadow</th>
<th>Wet meadow</th>
<th>Wet meadow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class I wet</td>
<td>25 ft.</td>
<td>25 ft.</td>
<td>None</td>
<td>25 ft.</td>
</tr>
<tr>
<td>Class II wet</td>
<td>25 ft.</td>
<td>25 ft.</td>
<td>25 ft.</td>
<td>25 ft.</td>
</tr>
<tr>
<td>Class III dry</td>
<td>75 ft.</td>
<td>25 ft.</td>
<td>25 ft.</td>
<td>25 ft.</td>
</tr>
<tr>
<td>Class III wet</td>
<td>100 ft.</td>
<td>50 ft.</td>
<td>25 ft.</td>
<td>50 ft.</td>
</tr>
</tbody>
</table>

Vegetative treatments and equipment entry within watercourse buffer zones can be included when an assessment is made that the buffer treatment is needed to protect human life, structures Protection measures/treatment limitations, or public safety or commercial infrastructure assets that are at risk to damage from wildfires. Vegetative treatments and equipment entry to address post wildfire and insect mortality resource concerns can also be included following an assessment and consultation with a NRCS biologist. Contact a NRCS biologist early in the planning process if working in the buffer zones. Consultations may be required with USFWS, NOAA Fisheries, or other state or federal regulatory agencies (i.e. Lake, Streambed Alteration Permit, 401 Water Quality Certification, 404 Clean Water Act.)

Forest management operations outside the watercourse buffer zones will ensure tree falling and other operations will not fell trees into buffer zones so that no part of the tree enters buffer. Slash will not be placed, piled or burned in any watercourse channel, buffer zone, or ephemeral drainage carrying seasonal runoff. Additional operating restrictions around ponds will apply, contact below NRCS Biologist for specification.

---

3 See California Forest Practices rules section 14 CCR 895.1
Migratory and TES Birds and Other Species

Project activities will not commence until a biologist concurrence is received.

**Migratory Birds:** Work will not occur during the migratory bird nesting season unless an assessment is conducted to determine active nesting or breeding behavior. Assessments will be completed by NRCS staff persons knowledge on migratory birds. Assessments shall be conducted within ten days prior to the start of work. The nesting season varies by region. Below are the nesting season dates by region. Refer to Technical Note TN-Biology-CA-23 for complete information on measures to minimize disturbance migratory birds.

Generally, projects less than 10 acres in size are not required to conduct migratory bird assessments, as well as projects implemented after July 15. These projects are not expected to have migratory bird population level adverse effects. Consider conducting surveys on <10-acre projects when they are adjacent to other areas planned for treatment in the same year.

**TES:** No known threatened, endemic, sensitive (TES) or rare plants or animals, including migratory birds, will be disturbed or harmed. Measures to avoid disturbance to TES may be required if known species are present or suitable habitat is found on-site in areas accessible to TES. In consultation with NRCS Biologist, develop a project alternative that avoids or minimizes these potential effects. Avoidance and/or minimization measures may include:

- Buffer zones around nests and dens,
- Limitations to types of equipment and/or times used,
- Limited operating periods,
  - TES monitoring prior to or during activities,
- Additional snag and downlog retention.
- Any requirements when provided from ESA consultation with USFWS, NOAA Fisheries, or requirements of a state or federal permit (i.e. Lake, Streambed Alteration Permit, 401 Water Quality Certification, 404 Clean Water Act.)

**Snags**

Projects shall be designed and implemented to retain standing dead and dying trees (snags) as wildlife trees. Snag shall be retained where they pose a minimal hazard to human safety and do not affect infrastructure such as roads, buildings, utilities or public safety or commercial features. Desirable wildlife trees/snags for retention include dead or dying trees and live “culls”; and larger trees with large forked or horizontal branches, broken tops, or existing cavities.

Snag requirements:

- Retain all snags >16” dbh and >24’ tall within Class I and II perennial watercourse protection zones and within 500’ of meadows.
- Retain an average of 1-2 snags per acre for all other areas.
- Exceptions to the above requirements:
  - Exception (a): Snags that can fall on roads and structures.
  - Exception (b): Where required for insect or disease control.
  - Exception (c): Where it is a threat to human health and safety (hazard).
  - Exception (d): When a biologist recommends a greater quantity for protection of TES habitat.
  - Exception (e): Fuelbreaks.
Exception (f): When the forester and biologist agree the quantities may be reduced, such as to address post wildfire or insect mortality excess biomass/wildfire hazard resource concern in buffer zones.

- Snags shall be designated prior to operations to ensure a sufficient number are retained, suitable snags are selected, and appropriate locations are sited.

**Large Down Wood**

Retain all pre-existing large wood on the forest floor, ≥ 18 inch dbh and 20’ length. Where debris is smaller diameter, retain at least six of the largest down logs per acre, with the following exceptions:

Exception (a): When it is serving as brood habitat for beetle infestation.
Exception (b): Where the density is such that it would contribute significantly to ground fuels.
Exception (d): When a biologist, in consultation with the forester recommends a certain quantity for protection of TES habitat.

**Biological diversity Retention areas**

Consideration should be given to leaving some debris for biological diversity. Consider retaining small vegetated areas that coincide with unique features such as wet areas, riparin buffer zones, rocky or steep terrain, down logs and snags, or other valuable habitat elements. Target retaining 15% of the vegetation in the project area.

**Archeology**

No operations may begin until archeological clearance is provided by NRCS. No operations will occur in known archeology or historical sites.

**Pest Control**

1. **Pine Beetle Infestations:** When feasible, delay cutting live trees until the end of the bark beetle breeding period is completed, typically late fall. Avoid long time delays (2 months during breeding season) between green vegetation piling and burning.

2. **Sudden Oak Death and Goldspotted Oak Borer** In areas with known infections of pathogen or insects, specific sanitation precaution will be implemented including no transport of woody outside the State designated Zone of Infestation, covering vegetative debris moved by vehicles, and equipment sanitization measures. Sanitation of equipment entering and leave these zones of infection is recommended.

Goldspotted Oak Borer: [http://ipm.ucanr.edu/PMG/PESTNOTES/pn74163.html](http://ipm.ucanr.edu/PMG/PESTNOTES/pn74163.html)

**Maintaining Soil Quality/Soil Health**

All operations will be planned and executed in a manner that maintains or improves soil quality. This includes using machinery that minimizes compaction, displacement, rutting and other disturbances to the forest floor. Surface organic material will be retained or improved throughout the treatment process.

Soils, site factors, and timing of application must be suitable for any ground-based equipment utilized for woody reside treatment to avoid excessive compaction, rutting, or damage to the soil surface layer.
Operations with heavy equipment shall not occur during periods of wet weather with saturated soil conditions as defined by the California Forest Practice Rules.

No new tractor trails or heavy equipment operations on slopes greater than 35%, except for limited distances on up to 45% slopes.

IX. BASIS OF ACCEPTANCE

Upon completion of the work conducted by the owner/client, a field inspection will be made to determine if at least 85 percent of the planned work as described within the IR has been satisfactorily completed. Individual untreated areas should not exceed 2% of the entire treatment unit. Untreated areas greater in size should be excluded from payment.

X. OPERATION AND MAINTENANCE

Once a year after the completion of the work, the owner/client will conduct a field inspection to determine if the area requires additional attention. Monitor damage to site resources by harmful pests and take controlling actions as necessary. Identify locations that need work to reduce soil erosion.

XI. REFERENCES


Bennett, Max; Fitzgerald, Stephen; Parker, Bob; Main, Marty; Perleberg, Andy; Schnepf, Chris; Mahoney, Ron. 2010. Reducing Fire Risk on Your Forest Property. PNW 618.


Fuelbreaks and Other Fuel Modification for Wildland Fire Control. USFS. 1977.


Winford, Eric M. California Fire Science Consortium; Stevens, Jens T, UC Davis; Safford Hugh D., U.S. Forest Service and UC Davis. 2015. Effects of fuel treatments on California mixed-conifer forests. http://calag.ucanr.edu/Archive/?article=ca_v069n03p150

End
IT SHALL BE THE RESPONSIBILITY OF THE OWNER TO OBTAIN ALL NECESSARY PERMITS AND/OR RIGHTS, AND TO COMPLY WITH ALL ORDINANCES AND LAWS PERTAINING TO THIS INSTALLATION.

Installation shall be in accordance with the drawings, specifications and special requirements shown below. NO CHANGES ARE TO BE MADE IN THE DRAWINGS OR SPECIFICATIONS WITHOUT PRIOR APPROVAL OF THE NRCS.

Description of Work: CPS 384 Scenario #6 Restoration conservation treatment following catastrophic event. Practice is intended to reduce quantity and arrangement excess dead and dying woody debris caused by bark beetle. The practice will reduce future wildfire hazards and improve forest health.

Dead and dying tree of all sizes (e.g. no Diameter Breast Height (DBH) limitations) may be treated under this practice. Practice treatment methods will include any combination of Lop and Scatter, mastication, chipping, dozer piling and burning of slash/ skidding large log debris to decking area, or Removal. Mastication is the preferred method and heavy equipment piling and burning should be minimized or avoided. Lop and scatter is applicable to CIN 10 only.

1. Drawings / Maps: Plan Map, Soils Map, Watercourse Map, attached
2. Practice Specifications: 384, attached
3. Acres to be treated: 40.1 acres (CIN 1, 20.0 ac.; CIN 2, 2.0 ac.; CIN 3, 6.0 ac.; CIN 4, .1 ac.; CIN 5 2.0; CIN 6 10.0)
4. Treatment Method: (Include all that apply to project)
   A. Lop and Scatter: X Applicable only in CIN 2
      1. Maximum Allowable Height from Soil Surface: 30 inches (18 inches in high fire hazard areas) (80% of material is 30”/18” or less from the ground.)
      2. Maximum Allowable Residue Lengths: 30 inches (80% of material is 30 inches or less in length.)
      3. Ground Contact Optimized: 80% of material is in contact with the ground.
      4. Special Protection Measures/Requirements: Any slash generated within 200 ft. of habitable structures or roads will be hauled away, chipped, or piled and burned.

      Watercourses present - Do not place any slash in any watercourse channel, seasonal stream, or riparian buffer zone.
Steep slopes with large woody debris - Large tree boles/logs greater than 6 inches diameter of any length may decked or left in place when in contact with the ground. Cutting of boles to ensure ground contact may be needed.

B. Mastication/Chipping/Shredding  X CIN 1, CIN 3, CIN 6

1. Maximum Allowable Depth: 4 inches (80% of mulched areas are 4” deep or less) or 6 inches depth when chipped/masticated material is placed in an isolated cleared area such as a landing.

2. Maximum Allowable Residue Lengths: 80% of residues are less than 18 inches in length, 60% are less than 12 inches in length, and 40% are less than 8 inches in length. 20% of the material may be longer lengths.

3. Special Protection Measures/ Requirements:

Masticated residue will not be applied or distributed to areas where migration to surface waters is likely in high precipitation events.

Spread chips evenly away from the base of any crop tree.

Masticated residues shall be free of chemically treated wood and other contaminates.

Large logs greater than 10 inches DBH may be decked on site. All limbs and all tops to a 10-inch diameter will be masticated to reduce fuel accumulations. Logs will be decked in isolated areas where they will not create fuel hazards or other environmental resource concerns, such as impacts to water or soil quality.

Do not damage boles (remove bark) of live, standing, residual trees during equipment operations.

No new tractor trails or heavy equipment operations on slopes greater than 35%, except for limited distances on up to 45% slopes.

Operations with heavy equipment shall not occur during periods of wet weather with saturated soil conditions as defined by the California Forest Practice Rules.

C. Hand or Tractor Pile and Burn  X CIN 5, CIN 5

Handpile and Burning

Maximum Allowable Pile Height: 4 ft.

Maximum Allowable Pile Diameter: 4 ft.

Maximum Density Per Acre: 100 piles or less per acre.

Special Hand Piling Protection Measures/Requirements:

Handpiles have a minimum 10-foot width of clearing to mineral soil around the pile.

Construct hand piles of slash/woody debris at least 15 feet from retained trees.
Tractor Pile and Burning

Maximum Allowable Pile Height: 10 ft maximum.
Maximum Allowable Pile Diameter: 30 ft. or less.
Maximum Density Per Acre: 30, or less as needed to avoid residual tree scorching.
Maximum Slash Length: 8-foot sections or less with occasion longer lengths.

Special Protection Measures/Requirements for hand and tractor piling and burning (Also see CPS 384 Specification)

Landowner is responsible for obtaining and possessing, prior to ignition, a valid burn permit from a fire protection and/or an air quality agency having the authority for issuing burn permits. The landowner is responsible for following all conditions on the burn permit and applying appropriate smoke management practices to minimize air pollution impacts on the public.

Burn Window: Burn in accordance with valid burn permit and any burn plan prepared for the project. Burning should be performed under low risk weather conditions, preferably in winter months, during rain or snow or when fuels and vegetation are wet, relative humidity is high, and winds are light.

Compliance with State fire protection statutes (Public Resource Code 4427) is required regarding equipment needed during open burning (sharp point shovel and fire extinguisher etc.) and fire suppression tools when operating internal combustion (Public Resource Code 4428).

Use appropriate control measures to ensure fire is contained within piles. Measures include bare mineral soil clearing around piles, on-site presence of appropriate suppression tools (shovels, McCloud, rake, etc.), trenching to catch rolling debris, and water to extinguish fire escapes.

All slash generated within 200 ft. of habitable structures or roads will be hauled away, chipped, or piled and burned.

Do not place piles on top of large rocks, logs, stumps, ditches, and roads subject to vehicular traffic.

Piles and burning shall be outside watercourse, dry seasonal watercourse swales and riparian buffers.

Synthetic materials (e.g. old tires, petroleum products) will not be incorporated in piles.

Tractor Piling Special Protection Measures/Requirements

Tractor piling equipment may be used on slopes greater than 35%, except for limited distances on up to 45% slopes.

Construct piles of slash/woody debris a sufficient distance from retained trees to avoid fire or heat scorch to residual tree.

Do not damage boles (remove bark) of live, standing, residual trees during equipment operations.
Piles shall be in openings outside and at least 30 feet from snags.

Materials in contact with the ground which are less than 3 inches in diameter and less than 24 inches in length may be left for ground cover. If the slash cover exceeds 50%, pile the smaller fuels to meet the slash piling requirements.

Large logs (e.g. greater than 10 inches DBH, deteriorated material often resulting from wildfire or bark beetles), may be decked on site. All limbs and all tops to a 10-inch diameter will be chipped, shredded, or burned to reduce fuel accumulations. Logs will be decked in isolated areas where they will not create fuel hazards or other environmental resource concerns, such as impacts to water or soil quality.

Operations will occur during dry soil conditions to the greatest extent possible. Soils will not rut greater than 6 inches in depth over distances greater than 25 feet. Displacement will not affect more than 10% of any acre.

The dozer line for fire control around the tractor piles shall be “one blade wide” (approx. 10 feet). It shall be cleared to mineral soil.

Consideration for nearby Pine Beetle Infestations - In areas with pine bark beetles, piles containing green material will be burned within two months if conditions permit. If residues are green and cannot be burned within two months of pile creation, it will remain scattered on the ground until a burn window is available. Slash must be piled or chipped before practice can be certified.

When pine beetle activity is low (normal), a limited number of deck logs and slash piles isolated from other slash or live vegetation may be left (up to 10% of piles) unburned for wildlife habitat.

D. Removal - Biomass Removal Checklist:

☒ Project will dispose of biomass from soils capable of growing commercial tree species (A or B list species per State Forest Practice Rules - FPR Section 895.1) at a utilization facility.

☒ Appropriate 1038/1052 exemption under the FPR has been filed with CAL FIRE (by Registered Professional Forester or License Timber Operator as applicable).

☒ Appropriate landing and skid trail, spacing, construction, and closure requirements are implemented in accordance with CPS 655-Forest Trails and Landings.

☒ Project will utilize the biomass material as feedstock for:

☒ Fuel to generate renewable electricity at a biomass-fueled power plant

☐ Renewable fuel production (e.g. renewable diesel or syngas)

☐ Mulch ☐ Animal Bedding ☐ Biochar

☐ Other:
5. Special Requirements:

A. Watercourse and meadow protection standards (see attached map)

The project contains Class I and Class II perennial watercourses, and Class III (seasonal/intermittent) watercourses. Refer to the Table 1 below for watercourse protection requirements.

Table 1 – Protection measures/treatment limitations for watercourse protection zones (Buffer Zones)

<table>
<thead>
<tr>
<th></th>
<th>Class 1 wet</th>
<th>Class II wet</th>
<th>Class III dry</th>
<th>Class III wet</th>
<th>Wet meadow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work Exclusion Zone</td>
<td>25 ft.</td>
<td>25 ft.</td>
<td>None</td>
<td>25 ft.</td>
<td>100 ft.</td>
</tr>
<tr>
<td>(from channel edge or edge of meadow)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heavy Equipment Exclusion Zone (Hand work only)</td>
<td>75 ft.</td>
<td>25 ft.</td>
<td>25 ft.</td>
<td>25 ft.</td>
<td>N/A</td>
</tr>
<tr>
<td>Total Buffer for Limited Work</td>
<td>100 ft.</td>
<td>50 ft.</td>
<td>25 ft.</td>
<td>50 ft.</td>
<td>100 ft.</td>
</tr>
</tbody>
</table>

Buffer Zones distance apply to each side of watercourse. If slopes are greater than 40%, the buffer will extend to the topographic break above the stream.

All watercourse riparian stream buffer areas exclude entry by heavy equipment, except at existing crossing or designated locations.

Forest management operations outside the watercourse buffer zones will ensure tree falling and other operations will not fell trees into buffer zones so that no part of the tree enters buffer. Slash will not be placed, piled or burned in any watercourse channel, buffer zone, or ephemeral drainage carrying seasonal runoff. Additional operating restrictions around ponds will apply, contact below NRCS Biologist for specification.

Flagging will be established to delineate watercourses, riparian areas, and wetland buffers.

B. Migratory Birds and TES

Project activities will not commence until a biologist concurrence is received.

Migratory Birds: Work will not occur during the migratory bird nesting season unless an assessment is conducted to determine active nesting or breeding behavior. Assessments will be completed by NRCS staff persons knowledge on migratory birds. Assessments shall be conducted within ten days prior to the start of work.

Project vegetation treatment work implemented before April 1st and after July 15th is not required to conduct migratory bird assessments.

TES: No known threatened, endanger, sensitive (TES) or rare plants or animals, including migratory birds, will be disturbed or harmed. The treatment area contains known TES species and habitat for others. Great Grey Owl has been observed in the meadow area on the property. The meadow and other perennial stream areas contain habitat for Foothill Yellow Legged Frog.

Avoidance and/or minimization measures include the following:

Great Grey Owl – No operations during January through July within 500 feet of meadow or known nest sites unless an assessment is conducted to determine active nesting or breeding behavior.
Foothill Yellow Legged Frog– No operations during December through August in Class I and II watercourse buffer zones or 100 feet of meadows unless an assessment is conducted to determine presence of species.

C. Snags

Projects shall be designed and implemented to retain standing dead and dying trees (snags) as wildlife trees. Desirable wildlife trees/snags for retention include dead or dying trees and live “culls”; and larger trees with large forked or horizontal branches, broken tops, or existing cavities.

Snag requirements:

Retain all snags >16” dbh and >24’ tall within Class I and II perennial watercourse buffer zones and within 500 feet of meadows.

Retain an average of 1-2 snags per acre for all other areas.

Snags shall be designated prior to operations.

Exceptions to the above requirements: Snags that can fall on roads and structures or are a threat to human health and safety (hazard).

D. Downlogs

Retain all pre-existing large wood on the forest floor, ≥ 18 inch dbh and 20’ length. Where debris is smaller diameter, retain at least six of the largest down logs per acre.

Exceptions to the above requirements: (a): When downlogs are serving as brood habitat for beetle infestation; (b): Where the density is such that it would contribute significantly to ground fuels.

E. Retention areas

Retain some woody debris and untreated areas for biological diversity. Retain small vegetated areas that coincide with unique features such as wet areas, riparian buffer zones, rocky or steep terrain, down logs and snags, or other valuable habitat elements. Target retaining/untreated 15% of the vegetation in the project area. Retention areas greater than 2% of total treatment area/Management Unit size shall be excluded from payment.

F. Archeology

No operations may begin until archeological clearance is provided by NRCS. No operations will occur in known archeology or historical sites.

I. Other

The client or client’s RPF representative shall conduct an on-site, pre-operational meeting with client’s vegetation treatment contractor hired to perform the work. The meeting will review property lines, watercourse protection zones, equipment limitation zones, sensitive plant/animal species, known cultural sites, and possible seasonal restrictions for nesting birds.

6. Basis of Acceptance

Upon completion of the work conducted by the owner/client, a field inspection will be made to determine if at least 85 percent of the planned work as described within the IR has been satisfactorily completed. Individual untreated areas should not exceed 2% of the entire treatment unit. Untreated areas greater in size should be excluded from payment.

NRCS, CA
December 2019
# PRACTICE APPROVAL:

<table>
<thead>
<tr>
<th>Practice Code-Name</th>
<th>Technical Specialist / Forester</th>
<th>Controlling Factors</th>
<th>Units</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td>384-Woody Residue Treatment</td>
<td>Air Quality Specialist / Forester</td>
<td>Treatment Method+</td>
<td>Mechanical; Burning</td>
<td>Hand Tools</td>
<td>Mechanical</td>
<td>Mechanical or Burning</td>
<td>Mechanical or Burning</td>
<td>All</td>
</tr>
<tr>
<td>Fire Behavior</td>
<td>Fuel Model/NWCG Fire Behavior Rating</td>
<td>N/A</td>
<td>Grass woodland/Low Fire Behavior</td>
<td>Shrub-Timber Mod Fuel Load/ Mod Fire Behavior</td>
<td>High Shrub and Timber Slash Fuel Load/ High Fire Behavior</td>
<td>All</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Erosion Hazard</td>
<td>Soil hazard Rating(Off road/trail) from Soil Survey</td>
<td>N/A</td>
<td>Slight</td>
<td>Moderate</td>
<td>Mod-High</td>
<td>All</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Job Classification for this Job: ________________________

Prepared By: ____________________________ Date: ____________________________

Design Approved by: ____________________________ Date: ____________________________

**LANDOWNER'S/OPERATOR'S ACKNOWLEDGEMENT:**

The landowner/operator acknowledges that:

a. They have received a copy of the drawings, specifications, and implementation requirements, and that they understand the contents.

b. They have obtained all the necessary permits.

c. No changes will be made in the installation of the job without prior concurrence of the NRCS.

d. Maintenance of the installed work is necessary for proper performance during the project life.

Accepted by: ____________________________ Date: ____________________________

**PRACTICE COMPLETION:**

I have made an on-site inspection of the site (or I am accepting owner/contractor documentation), and certify the practice meets NRCS standards and specifications.

Completion Certification by:/s/ ____________________________ Date: _______
NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE SPECIFICATION

FUEL BREAK—FORESTLAND
(Ac.)

CODE 383

Fuel Break—NRCS Definition:

A strip or block of land on which the vegetation, debris and detritus have been reduced and/or modified to control or diminish the risk of the spread of fire crossing the strip or block of land.

Figure 1. A fuel break on forest land involves the reduction of flammable fuels, eliminating ladder fuels, and increasing the spacing of residual trees in order to minimize the risk of crown fires.

Purpose

Control and reduce the risk of the spread of fire by treating, removing, or modifying forestland vegetation, debris and detritus.

Conditions Where Practice Applies

This practice applies on all land where protection from wildfire is needed. A fuel break is typically an easily accessible strip of land of varying width (depending on fuel and terrain), where fuel density is reduced, resulting in positive impacts to fire behavior and providing fire control opportunities.

Forestland Protection

This practice is specific to fuel breaks which are applied to forestland including conifer, montane confer-hardwood, and woodlands/grasslands forest types. Fuel breaks are installed in advance of a fire event in order to protect wildland and wildland urban interface forested landscapes and aid in wildfire suppression. This practice may also be used in Wildland Urban Interface settings for safe ingress/egress access on roads during wildfire events.

Fuel breaks are planned and located at strategic locations on the landscape as part of an integrated system on lands that have an elevated risk of wildfire. They break up large,
continuous tracts of dense natural fuels, thus limiting the uncontrolled spread of wildfire. They are commonly associated with fire breaks (permanent or temporary strips of bare or vegetated land planned to retard fire, or other features such as roads).

Fuel breaks aid in firefighting efforts by slowing fire spread, and by providing an area of less extreme fire behavior from which other actions (e.g., back burns) are taken. However, under extreme conditions even properly designed fuel breaks cannot significantly reduce fire behavior in the event of large, rapidly spreading wildfires, regardless of the efforts of firefighters.

A “shaded” fuel break is commonly applied on strategic locations within larger forested areas. Shaded fuel breaks have lower fuel loads relative to areas outside of the fuel break, and the shade provided by the canopy improves the microclimate conditions of the underlying fuels.

Fuelbreaks typical have a well-spaced large sized “dominate” trees, a low number of trees per acre (e.g. 50 trees/acre - < 100 sq. ft. of basal area), few understory smaller trees, high “height to live crown” distance, less than 10 % cover of brush arranged in isolated groups, and low levels of snags and down logs.

![Completed fuelbreak vs Untreated forest](image)

Figure 2. (Right) A typical fuel stratum for forest stands in California prior to fuelbreak installation. Fire behavior is a function of various inter related elements including density of tree crown vegetation, smaller tree and brush “ladder” fuels, and ground surface vegetative debris. (Left) A completed fuelbreak

**General guidance**

The primary goal of this practice is to significantly alter (modify) fire behavior within the treated area.

This specification is designed to achieve different results from those expected from pre-commercial thinning, applied under NRCS practice 666 (Forest Stand Improvement). Although thinning can produce positive benefits in fuel reduction, the primary purpose of the Forest Stand Improvement as applied by NRCS is to address forest health, productivity and other closely related resource concerns. The post-treated structural attributes of a thinned stand are not exactly the same as those of a fuel break. In many cases thinning operations will not adequately address surface or ladder fuels, and will not increase the distance to the base of the live crown. Silviculturally thinned stands usually have less crown separation. However, the effectiveness of an applied fuel break will be enhanced when it is located adjacent to a properly thinned stand.

Crown Fires (those that rapidly spread from tree to tree) pose the greatest danger to human and ecological values. For that reason, decreasing the overall risk of a rapidly spreading crown fire is the principal objective of the fuel break. The risk of crown fires will be minimized by actions which:
• Reduce surface fuels (grasses, forbs and small brush) – complete treatment/disposal of dead woody debris and slash necessary.
• Increase the height of the base of the live crown of the overstory retention trees
• Reduce ladder fuels (small trees and larger brush species)
• Reduce the continuity of the forest canopy (tree to tree), and
• Reduce the crown bulk density of the canopy.

While some fuelbreaks have little to no post treatment vegetation, this CPS 383 requires creation of a “shaded fuel break” (one that retains a degree of canopy cover). This is preferable because of the temperature and relative humidity moderation that shading provides to the surface fuels and can provide some suppression of rapidly resprouting vegetation following the initial site clearing. In addition, any degree of crown retention provides additional benefits in retaining wildlife and aesthetic values within the forested landscape.

The design of fuel breaks varies in width according to numerous factors such as on-site and adjacent fuel loads, topography (both positive and negative attributes), proximity to roads and anchor points, and other factors. There are no absolute standards for fuel break construction, but design must be generally consistent with the 383 Practice Standard. Each situation needs to be tailored to the risk and complexity of expected wildfire and assets at risk when considering terrain, fuels, historic fire regimes, expected occurrence, and the predictable weather and fuel conditions that may be present while a wildfire.

Fuel break widths applied in the United States vary from less than 100 up to 1,000 feet. A wildland fire fuels specialist should be consulted for designing the width based on the above factors and local site considerations. In this specification widths are therefore presented as general guidelines, especially maximum width guidelines.

Specifications

Fuel breaks shall comply with the following items, and any additional specifications based on purpose(s) and requirements listed for environmental protection and those for facilitating practices (pruning, slash treatment, burning etc.).

Purpose

Implementation Requirements sheets shall identify the purpose for protection, the type of fuelbreak (road, ridgeline etc.), provide a brief explanation of what is being protected, why it is being protected, and where the protection is needed. Include a map of location and sketch of design of fuelbreak.

Fuelbreak siting/location

1. Refer to local fire protection plans for information on locations and specifications of fuelbreaks.
2. Locate all potential ignition sources that could create hazardous or catastrophic fires. These sources may include public roads, railroads, urban developments, recreation sites, utilities, etc.
3. Locate fuel break(s) between the potential ignition source and the resources/structures to be protected and as close as feasible to the ignition source. Favor locations for fuel break(s) that are on strategic ridgelines for fire suppression control, at the bottoms of canyons leading up to saddles to reduce the risk of fires moving upslope (chimney effect), roads, and other critical public safety infrastructure.
4. Connect fuel break(s) to natural or artificial fire barriers such as rivers, creeks, large rock outcrops, wet meadows, roads, or areas with low fuel loads/cover or flammability. Favor locations that are linked to road systems to facilitate fire-fighting access.
5. Generally, fuelbreaks should not be located on midslope areas or along arbitrary property line boundaries that do not comport with strategic fuels or fire suppression control areas.

6. Often terrain limits the location and dimension of the fuel break. For safety purposes and to protect site resources, treatment methods involving equipment are generally not applied on slopes exceeding 35 percent.

7. Feather the edges of the fuel break(s) as feasible into the adjacent protected areas for aesthetic purposes.

**Fuelbreak Dimensions**

**Ridges**

1. The dimensions of the fuel break (width and length) shall be sufficient to reduce fire spread and intensity with consideration given to the assets being protected by the fuelbreak.

2. Width on level ground should be a minimum of 200 feet for forestland sites or 2 ½ times the height of the average codominant tree or brush species vegetation, whichever is greater. Add 10 feet to the width for every 10 percent increase in slope (e.g., for a 50% slope 200 ft + 50 ft = 250 feet total width).

3. When terrain or other factor limits the width, the minimum fuelbreak width must be at least 100 ft.

4. Where slopes are less than 20%, the maximum width of the fuel break will generally not exceed 300 feet unless warranted by specific on-site conditions. Wider fuelbreak are allowable when conditions and assets at risk justify the widened area.

---

*Figure 3:* Ridgeline fuelbreaks (left) *Photo from El Dorado County and Georgetown Divide RCD.* (right) *University of California ANR*
Roads

Fuel breaks may be applied along one or both sides of county roads or private roads at an effective minimum width of 100 ft each side of road, on level ground, as determined by a fuels specialist. Adjust widths for steeper slopes. Fuel breaks applied along roads provide enhanced protection due to the minimal fuel levels associated with roads. Roads also allow fire suppression crews quick access to the fuelbreak, and the road can be used as an anchor point for a back burn. Figures 4 & 5 provides visual examples of a fuel break established in conjunction with a road.

**Figure 4:** Aerial plan view of a road buffered by a fuel break.

**Figure 5:** Cross sectional view of a fuel break established on both sides of a road *(Images are from “Fuelbreak Guidelines for Forested Subdivisions and Communities”, Colorado State University)*
Vegetation Treatment Specification

1. Reduce or modify the existing fuel load (live vegetation and debris) to diminish the risk and/or rate of the spread of fire crossing the strip or block of land. Vegetation treatments shall focus on treating/removing fuels in all vegetative layers including tree crowns, understory trees and brush, and dead and down surface fuels or live ground cover. Focus on substantial vegetative removal and debris clean-up.

2. Vegetation treatment shall create both horizontal space and vertical space between retained vegetation.

3. Maximum Tree size removal: The maximum size live tree to be removed is 12 inches DBH. Dead/dying trees have no diameter size limit.

   Larger size live trees may be needed to be removed to effectively create a fuelbreak. When forest stand conditions necessitate removal of > 12-inch DBH tree, clients should be advised to obtain a commercial tree harvesting permit to remove the larger trees. Commercial tree removal operations should be completed and approved by CAL FIRE prior to implementation of the EQIP fuelbreak project.

4. Thin trees and brush to spacing standards shown below in Figure 6. Small, isolated clusters or groups of trees can be left for visual diversity or for wildlife value. State in the IR the target post treatment level of brush cover. Generally, brush cover should be less than 20% cover.

**Figure 6:**

**SHRUBS AND SMALL TREES (<15 ft tall): HORIZONTAL SEPARATION DISTANCES**

Separation distances are measured between canopies (outer most branches) and not between trunks. Separation can be between individual shrubs/small trees or groups of shrubs/small trees.

**LARGER TREES: HORIZONTAL SEPARATION DISTANCES BETWEEN TREE CANOPIES**

For forested areas, the recommended amount of separation between tree canopies is determined by steepness of slope. Crown separation can be between individual trees or groups of trees.
VERTICAL SEPARATION DISTANCES NEEDED BETWEEN FUEL LAYERS

Removal of ladder fuels is the most critical feature of a fuelbreak. Remove shrubs and small trees within the drip line of trees when sufficient space cannot be created between the tree crown and top of shrub/small trees. Pruning residual trees will also contribute to creating vertical separation of fuels.

Species composition to be favored for retention

Tree species differ in their ability to withstand wildfire. Select trees to retain that are more adapted and fire resistant to the local setting.

<table>
<thead>
<tr>
<th>Coastal species</th>
<th>Interior species</th>
</tr>
</thead>
<tbody>
<tr>
<td>coast redwood, tanoak</td>
<td>ponderosa and Jeffrey pine, Douglas-fir</td>
</tr>
<tr>
<td>Douglas-fir</td>
<td>sugar pine, white fir, grand fir</td>
</tr>
<tr>
<td>grand fir, white fir</td>
<td>incense cedar</td>
</tr>
<tr>
<td>mountain hemlock</td>
<td>western white pine</td>
</tr>
<tr>
<td>noble fir</td>
<td>lodgepole pine, western hemlock</td>
</tr>
<tr>
<td>western white pine</td>
<td>canyon live oak</td>
</tr>
<tr>
<td>lodgepole pine</td>
<td>black oak</td>
</tr>
<tr>
<td>western hemlock</td>
<td></td>
</tr>
<tr>
<td>Sitka spruce, western red cedar</td>
<td></td>
</tr>
</tbody>
</table>


Prioritize removal of highly flammable shrubs. After treatment retain a cover of low-growing forbs and perennial grasses for easy fire control on fuelbreaks. For shrubs select species for ground cover that have low heights and contain low level of dead material.

---

1 Flammability of any species is determined by moisture levels, and by the chemical composition and density of the individual species.
Vegetation Treatment Methods

Implementation Requirements shall specify vegetation treatment method.

1. Vegetation treatment methods shall use techniques according to specification set forth in CPS 666 Forest Stand Improvement for tree/brush thinning, CPS 660 for pruning limbs of residual trees, CPS 384 for dispose of treated woody debris, and CPS 490 Tree Shrub Site Preparation for post treatment resprouting vegetation control.

2. Chipping and masticating of thinned trees and shrubs is the preferred method for thinning and woody debris disposal. Lop and scatter slash treatment is generally not used for fuelbreaks due to the need for low levels of hazardous vegetative fuels following treatments. Areas with low vegetative tonage (less than approximately 2 ton/ac.) may include lop and scatter.

3. Remove all standing dead trees and shrubs except for a limited number of large, dead trees (18" diameter- at-breast-height or larger) that may be retained for wildlife use.

4. Remove all downed dead trees and shrubs within the zone if they are solid (not rotten) and are not yet embedded into the ground. Downed trees that are embedded into soil and which cannot be removed without soil disturbance will be left in place.

Facilitating Practices

Most NRCS-CA CPS 383 Practice Scenarios contain cost components to cover costs associated with implementing facilitating practices to complete the fuelbreak. Facilitating practices generally should not be included as a payment item in the contract. Cutting trees, slash treatment, pruning and other necessary vegetative treatments (e.g. post treatment herbicide use) must be implemented, but are not included as payment items.

Additional General Requirements

Permitting and Environmental compliance

All activities associated with applying this practice shall comply with federal, state, tribal and local forestry and related laws and regulations. It is the landowner’s responsibility to obtain appropriate permits and/or applications prior to commencing an activity. Typical permits that may be needed include slash burning/air quality, commercial harvesting permit from CAL FIRE when cut vegetation is used for commercial purposes, Pesticide Control Advisors Report when herbicides are applied, archeological protection review, and wildlife /TES protection waivers.
Compliance with State fire protection statutes (Public Resource Code 4427) is required regarding equipment needed during open burning (sharp point shovel and fire extinguisher etc.) and fire suppression tools when operating internal combustion (Public Resource Code 4428). Advise clients to contact local CAL FIRE Office for information. Also, CAL FIRE will advise on periods of no/curtailed operations of equipment use and post operations fire patrols during extreme fire conditions such as Red Flag Warnings or Fire Weather Watch when issued by the National Weather Service.

**Watercourse and Meadow Protection Standards**

The IR shall include information on watercourses, riparian areas, wetlands, including a map, in the project area.

Protection measures/treatment limitations must be provided when the project affects any Class I or II perennial watercourses, or Class III seasonal/intermittent watercourses. Refer to the Table1 below for watercourse protection zones in non-anadromous water bodies. If slopes are greater than 40%, the buffer will extend to the topographic break above the stream. All watercourse riparian stream buffer areas exclude entry by heavy equipment, except at existing crossing or designated locations.

Vegetation treatment and heavy equipment is generally excluded in watercourse buffer zones, particularly in remote areas that are not associated with WUI areas or presence of public safety infrastructure. These exclusions are needed to continue large snag/wood recruitment and avoid impacts to species that utilize aquatic and riparian areas such as fish, red-legged and yellow-legged frogs, Pacific fisher, and great gray owl.

<table>
<thead>
<tr>
<th>Class 1 wet</th>
<th>Class II wet</th>
<th>Class III dry</th>
<th>Class III wet</th>
<th>Wet meadow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work Exclusion Zone (from channel edge or edge of meadow)</td>
<td>25 ft.</td>
<td>25 ft.</td>
<td>None</td>
<td>25 ft.</td>
</tr>
<tr>
<td>Heavy Equipment Exclusion Zone (Hand work only)</td>
<td>75 ft.</td>
<td>25 ft.</td>
<td>25 ft.</td>
<td>25 ft.</td>
</tr>
<tr>
<td>Total Buffer for Limited Work</td>
<td>100 ft.</td>
<td>50 ft.</td>
<td>25 ft.</td>
<td>50 ft.</td>
</tr>
</tbody>
</table>

Vegetative treatments and equipment entry within watercourse buffer zones can be included when an assessment is made that the buffer treatment is needed to protect human life, structures Protection measures/treatment limitations, or public safety or commercial infrastructure assets that are at risk to damage from wildfires. Vegetative treatments and equipment entry to address post wildfire and insect mortality resource concerns can also be included following an assessment and consultation with a NRCS biologist. Contact a NRCS biologist early in the planning process if working in the buffer zones. Consultations may be required with USFWS, NOAA Fisheries, or other state or federal regulatory agencies (i.e. Lake, Streambed Alteration Permit, 401 Water Quality Certification, 404 Clean Water Act.)

Forest management operations outside the watercourse buffer zones will ensure tree falling and other operations will not fell trees into buffer zones so that no part of the tree enters buffer. Slash will not be placed, piled or burned in any watercourse channel, buffer zone, or ephemeral drainage carrying seasonal runoff. Additional operating restrictions around ponds will apply, contact below NRCS Biologist for specification.

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*2 See California Forest Practices rules section 14 CCR 895.1*
Migratory and TES Birds and Other Species

Project activities will not commence until a biologist concurrence is received.

**Migratory Birds:** Work will not occur during the migratory bird nesting season unless an assessment is conducted to determine active nesting or breeding behavior. Assessments will be completed by NRCS staff persons knowledge on migratory birds. Assessments shall be conducted within ten days prior to the start of work. The nesting season varies by region. Below are the nesting season dates by region. Refer to Technical Note TN-Biology-CA-23 for complete information on measures to minimize disturbance migratory birds.

Generally, projects less than 10 acres in size are not required to conduct migratory bird assessments, as well as projects implemented after July 15. These projects are not expected to have migratory bird population level adverse effects. Consider conducting surveys on <10-acre projects when they are adjacent to other areas planned for treatment in the same year.

**TES:** No known threatened, endanger, sensitive (TES) or rare plants or animals, including migratory birds, will be disturbed or harmed. Measures to avoid disturbance to TES may be required if known species are present or suitable habitat is found on-site in areas accessible to TES. In consultation with NRCS Biologist, develop a project alternative that avoids or minimizes these potential effects. Avoidance and/or minimization measures may include:

- Buffer zones around nests and dens,
- Limitations to types of equipment and/or times used,
- Limited operating periods,
  - TES monitoring prior to or during activities,
- Additional snag and downlog retention,
- Any requirements when provided from ESA consultation with USFWS, NOAA Fisheries, or requirements of a state or federal permit (i.e. Lake, Streambed Alteration Permit, 401 Water Quality Certification, 404 Clean Water Act.)

Archeology

No operations may begin until archeological clearance is provided by NRCS. No operations in known archeology or historical sites.

Pest Control

1. **Pine Beetle Infestations:** In areas with bark beetle, piles containing green material will be burned within 2 months if conditions permit. If residues are green and cannot be burned within 2 months of pile creation, it will remain scattered on the ground until a burn window is available. Slash must be piled or chipped before practice can be certified.

2. **Sudden Oak Death and Goldspotted Oak Borer** In areas with known infections of pathogen or insects, specific sanitation precaution will be implement including no transport of woody outside the State Designated Zone of Infestation, covering vegetative debris moved by vehicles, and equipment sanitization measures.


Goldspotted Oak Borer: [http://ipm.ucanr.edu/PMG/PESTNOTES/pn74163.html](http://ipm.ucanr.edu/PMG/PESTNOTES/pn74163.html)

Maintaining Soil Quality/ Soil Health

All operations will be planned and executed in a manner that maintains or improves soil quality. This
includes using machinery that minimizes compaction, displacement, rutting and other disturbances to the forest floor. Surface organic material will be retained or improved throughout the treatment process.

Soils, site factors, and timing of application must be suitable for any ground-based equipment utilized for creating a fuel break to avoid excessive compaction, rutting, or damage to the soil surface layer.

**Operation and Maintenance**
- Following initial treatment, inspect fuel breaks periodically to assess resprouting vegetation.
- Maintaining resprouting ground and surface fuels is the most important factor to ensuring fuelbreak effectiveness.
- Continuous areas of resprouting vegetation greater than 18 inches in height should be controlled.
- Control and remove excess resprouting vegetation materials and other dead limbs and blown down tree debris from the fuel breaks.
- Control excess resprouting vegetation and dead debris by burning, herbicide application, grazing, mowing, or mastication.
- Access by vehicles or people will be controlled to prevent damage to the fuelbreak.
- Control noxious weeds.

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**References and Further Readings**


Bennett, Max; Fitzgerald, Stephen; Parker, Bob; Main, Marty; Perleberg, Andy; Schnepf, Chris; Mahoney, Ron. 2010. Reducing Fire Risk on Your Forest Property. PNW 618.


IT SHALL BE THE RESPONSIBILITY OF THE OWNER TO OBTAIN ALL NECESSARY PERMITS AND/OR RIGHTS, AND TO COMPLY WITH ALL ORDINANCES AND LAWS PERTAINING TO THIS INSTALLATION.

Installation shall be in accordance with the drawings, specifications and special requirements shown below. NO CHANGES ARE TO BE MADE IN THE DRAWINGS OR SPECIFICATIONS WITHOUT PRIOR APPROVAL OF THE NRCS.

1. Drawings / Maps: See Plan Map, and Practice Specification

2. Practice Specifications: 383 Scenario #3 - Masticator, Level to Moderate Slopes. (attached)

Refer to specifications in CPS 666 and 384 mastication treatment; specs; 660 for Pruning; and 490 for chemical treatment, hand applications (attached).

3. Design and Installation

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>EXISTING CONDITIONS</th>
<th>APPLIED CONDITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Use</td>
<td>Forestland with residence and major utility lines</td>
<td>Forestland with in wildland urban interface with access roads, residence, outbuildings and major utility lines. Property is adjacent to USFS forest land</td>
</tr>
<tr>
<td>Purpose of Protection</td>
<td>Very High Fire Hazard Zone in Tier I Tree Mortality Zone</td>
<td>Protect landowner’s forestlands, buildings, and utility infrastructure on the property from wildfire and improve firefighter ingress and egress along road.</td>
</tr>
<tr>
<td>Type of fuel Break</td>
<td>Road Prism</td>
<td>Ridgeline and Road connecting to utility line FB.</td>
</tr>
<tr>
<td>Possible Ignition sources</td>
<td>Woody debris from insect mortality, local road uses, Hwy 120, utility lines, adjacent USFS lands, and lighting.</td>
<td>Hwy 120, local roads, adjacent USFS lands, and lighting.</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------</td>
</tr>
<tr>
<td>Dimension (length width)</td>
<td>15 ft. wide x 780 ft.</td>
<td>140 to 280 ft. wide x 780 ft.</td>
</tr>
<tr>
<td>Slope</td>
<td>0-25% in fuel break areas with steep &gt; 45% slopes adjacent to the field break treatment area.</td>
<td>Same</td>
</tr>
<tr>
<td>Average tree and shrub canopy spacing</td>
<td>100% combined tree and shrub horizontal canopy cover with a significant vertical ladder fuel component. Dead tree debris resulting from bark beetles is present into the treatment areas.</td>
<td>10 -30% canopy cover for dominate tree. &lt;10 % cover of brush arranged in isolated patches.</td>
</tr>
<tr>
<td>Treatment Method</td>
<td>SW side of area beyond fuel break untreated. NW side of FB treated in this EQIP contract.</td>
<td>Tree and brush thinning using mastication for debris disposal, pruning and post treatment hand chemical to control resprouting vegetation.</td>
</tr>
<tr>
<td>Treatment Acres</td>
<td>4.2 acres (CIN2)</td>
<td>4.2 acres</td>
</tr>
</tbody>
</table>

**General description:** The Practice is intended to reduce quantity and arrangement excess dead and dying woody debris caused by bark beetle tree mortality and existing live vegetation. The fuel break is located along a year-round forest access road that leads to USFS land. The Project is also associate with large Hetch Hetchy power transmission lines right-of-way and will have a positive impact on fire hazard reduction and fire suppression ingress egress for other nearby residential landowners.

Excess live tree and shrubs, including trees less than 12 DBH, and dead and dying tree of all sizes (e.g. no Diameter Breast Height (DBH) limitations) shall be treated under this practice. The fuel break will range in 140 to 280 feet in width and 780 feet in length and will be built alongside an access road and connect to cleared areas for the powerline transmission lines.
Practice treatment methods will thin trees and brush and dispose of slash using mastication. Retained trees will be pruned to 8-10 ft in height. A post-vegetation treatment chemical herbicide treatment will be applied to control resprouting vegetation in 1-2 two years following the initial vegetation treatment.

The fuel break may require removal of larger diameter trees (> 12 DBH) using a CALFIRE commercial harvesting permit. EQIP practices should be conducted following completion of commercial harvesting operation and approval by CALFIRE.
4. Treatment Specifications

Spacing:

A. **Small tree and shrubs.** Maximum tree removal size 12 inches DBH. 20 feet to 25 feet minimum spacing between crowns. (4x the average height of the shrubs). Target less than 10% of the area with shrubs following treatment.

B. **Trees greater than 15 ft in width:** Maximum tree removal size 12 inches DBH. Target 20 feet between tree crowns. Favor ponderosa pine, sugar pine and black oak for retention.

Methods:

A. **Chipping / Shredding**

   1. Maximum Allowable Mulch Depth: 4 inches (80% of mulched areas are 4” deep or less) or 6 inches depth when chipped/masticated material is placed in an isolated cleared area such as a landing.

   2. Maximum Allowable Residue Lengths: Shredding operations will leave residues where 80% are less than 18 inches in length, 60% are less than 12 inches in length, and 40% are less than 8 inches in length. 20% of the material may be longer lengths.

B. **Pruning**

   1. Minimum heights shall be 10 feet or ½ of the live crown, whichever occurs first.

   2. Pruning shall take place outside high-risk time frames for Dendroctonus bark beetle flights.

C. **Chemical Herbicide Hand Application**

   1. Apply chemical herbicide by hand. Objective is to control basal and shrub re-sprouting following mastication to maintain fuelbreak fire hazard reduction to shift composition and species distribution

   2. Work shall be performed during the the period specified in Licensed Pest Control Advisor’s (PCA) report. Target is 1-3 years following vegetation removal when brush is 18 inches in height or greater and resprouting vegetation exceeds 30% of the ground cover.

   3. Herbicide application will require a licensed pest control advisor's (PCA) written recommendation for practice certification and cost share. Chemical operations will be conducted by a licensed pest control business or the landowner.

   4. Other requirements needed when specified by the PCA.
5. Landowner shall obtain permit from Tuolumne county agricultural commissioner and obtain site id for reporting chemical use.

5. **Protection Measures/ Requirements:**
   Chips/ mulch will not be applied or distributed to areas where migration to surface waters is likely in high precipitation events. Spread chips evenly away from the base of any crop tree.

   Do not damage (removal bark) boles of live standing, residual trees. Slash and vegetation may be left in place where vegetation is so close to leave trees that the removal of the vegetation would cause damage to the leave trees. Leave trees and vegetation not specified to be treated shall be left undisturbed.

   Consideration for nearby Pine Beetle Infestations: all slash must be treated material within 2 months if conditions permit. If residues are green and cannot chipped within 2 months of creation, it will remain scattered on the ground until a burn window is available. Slash must be chipped before practice can be certified.

6. **Biomass Removal Checklist:** Use when slash from project is removed for commercial utilization.

   1. Project will dispose of biomass from soils capable of growing commercial tree species (A or B list species) at a utilization facility.

   2. Appropriate CAL FIRE forest practice permit (e.g. permits per 14 CCR 1038Exemptions or 1052 Emergency Notice) of the forest practice rules has been filed with CAL FIRE by a Registered Professional Forester or Licensed Timber Operator as applicable).

   3. Appropriate landing and skid trail, spacing, construction, and closure requirements are provided and implemented consistent with standards in CPS 655-Forest Trails and Landings and/or CPS 666-Forest Stand Improvement Implementation Requirements.

   Timber operations, including (but not limited to) Watercourse & Lake Protection Zones, and erosion control installations related to timber operations will follow requirements set forth in resulting guidance.

7. **Other:**

   The client or client’s RPF representative shall conduct an on-site, pre-operational meeting with client’s vegetation treatment contractor hired to perform the work. The meeting will review property lines, watercourse protection zones, equipment limitation zones, sensitive plant/animal species, known cultural sites, and possible seasonal restrictions for nesting birds.
No operations during periods of curtailed equipment use designated by local fire authorities or CAL FIRE. During fire season, as determined by CAL FIRE, operator shall have a 300-gallon water source equipped with pump and 300 ft of hose within 500 feet of operations. Operations during extreme fire conditions or Red Flag warnings will have fire watch for two hours after operations shutdown for the day.

Reduce potential for erosion from these sites. Where possible use best management practices for erosion control. For more information on erosion, contact NRCS.

**Watercourse and Meadow Protection Standards**

**A. Watercourse and meadow protection standards (see attached map)**

The project does not contain watercourses. Should watercourses be encountered, refer to the Table 1 below for watercourse protection requirements.

Table 1 – Protection measures/treatment limitations for watercourse protection zones (Buffer Zones)

<table>
<thead>
<tr>
<th>Class 1 wet</th>
<th>Class II wet</th>
<th>Class III dry</th>
<th>Class III wet</th>
<th>Wet meadow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work Exclusion Zone (from channel edge or edge of meadow)</td>
<td>25 ft.</td>
<td>25 ft.</td>
<td>None</td>
<td>25 ft.</td>
</tr>
<tr>
<td>Heavy Equipment Exclusion Zone (Hand work only)</td>
<td>75 ft.</td>
<td>25 ft.</td>
<td>25 ft.</td>
<td>25 ft.</td>
</tr>
<tr>
<td>Total Buffer for Limited Work</td>
<td>100 ft.</td>
<td>50 ft.</td>
<td>25 ft.</td>
<td>50 ft.</td>
</tr>
</tbody>
</table>

Buffer Zones distance apply to each side of watercourse. If slopes are greater than 40%, the buffer will extend to the topographic break above the stream.

All watercourse riparian stream buffer areas exclude entry by heavy equipment, except at existing crossing or designated locations.

Forest management operations outside the watercourse buffer zones will ensure tree falling and other operations will not fell trees into buffer zones so that no part of the tree enters buffer. Slash will not be placed, piled or burned in any watercourse channel, buffer zone, or ephemeral drainage carrying seasonal runoff. Additional operating restrictions around ponds will apply, contact below NRCS Biologist for specification.
Flagging will be established to delineate watercourses, riparian areas, and wetland buffers.

**B. Migratory Birds and TES**

Project activities will not commence until a biologist concurrence is received. **Migratory Birds:** Work will not occur during the migratory bird nesting season unless an assessment is conducted to determine active nesting or breeding behavior. Assessments will be completed by NRCS staff persons knowledge on migratory birds. Assessments shall be conducted within ten days prior to the start of work.

Project vegetation treatment work implemented before April 1st and after July 15th. is not required to conduct migratory bird assessments. **TES:** No known threatened, endanger, sensitive (TES) or rare plants or animals, including migratory birds, will be disturbed or harmed. The treatment area contains no known TES species and habitat for others.

**Archeology:** No operations may begin until archeological clearance is provided by NRCS. No operations in known archeology or historical sites.

**PRACTICE APPROVAL:**

<table>
<thead>
<tr>
<th>Practice Name</th>
<th>Practice Code</th>
<th>Controlling Factors</th>
<th>Units</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuelbreak</td>
<td>383</td>
<td>Fuel Characteristic</td>
<td>Fuel Model</td>
<td>Grass/Woodland</td>
<td>Low Mod</td>
<td>Shrub</td>
<td>High Shrub, Timber, or Slash</td>
<td>All</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fire Behavior</td>
<td>Fire Behavior Class</td>
<td>Low</td>
<td>Moderate</td>
<td>High Extreme</td>
<td>All</td>
<td>All</td>
</tr>
</tbody>
</table>

Job Classification for this Job: III

Prepared By: ___________________________ Date: __________

Design Approved by: ___________________________ Date: __________

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NRCS -CA
Page 7 of 8
LANDOWNER’S/OPERATOR’S ACKNOWLEDGEMENT:

The landowner/operator acknowledges that:

a. They have received a copy of the drawings, specifications, and implementation requirements, and that they understand the contents.

b. They have obtained all the necessary permits.

c. No changes will be made in the installation of the job without prior concurrence of the NRCS.

d. Maintenance of the installed work is necessary for proper performance during the project life.

Accepted by: ________________________________  Date: ____________________

PRACTICE COMPLETION:

I have made an on-site inspection of the site (or I am accepting owner/contractor documentation) and have determined that the job as installed does conform to the drawings and practice specifications.

Completion Certification by:/s/ ________________________________  Date: ____________