BURNED AREA EMERGENCY STABILIZATION PLAN

Rough Fire

FORESTRY RESOURCES ASSESSMENT

10/16/15

I. OBJECTIVES

- Identify and assess short-term tree hazards to the public and property and recommend those to be mitigated
- Determine future tree hazard surveillance needs that were not completed during the BAER assignment due to time constraints
- Prescribe treatments to mitigate (tree removal) or abate (target removal) identified tree hazards along roads and developed/recreational sites not subject to closure

II. ISSUES

- Tree hazards along roads and in developed/recreational sites not subject to closure
- Responsibility for mitigation/abatement (i.e., jurisdiction, easement, etc.)

III. OBSERVATIONS

This report addresses known and potential fire effects to forest resources on U.S. Forest Service (USFS) and National Park Service (NPS) lands as a result of the Rough Fire. It specifically addresses issues presented by USFS and NPS resources staff and provides recommendations for emergency treatment. This plan may be cited as a justification document to seek outside funding from other sources for recommended treatments not covered by Emergency Stabilization (ES) funds. Additional supplemental requests may be made after this document has been reviewed and approved.

Findings and recommendations contained in this assessment are based upon information obtained from literature reviews, field reconnaissance of the fire area, Geographic Information System (GIS) analyses, personal interviews and meetings with various USFS and NPS natural resource managers and other BAER Team members.

A. Background

The Rough Fire started on July 31, 2015, as the result of a lightning strike on the north side of the Kings River, just west of the confluence of the Middle and South Forks of the Kings River and burned over 151,000 acres across multiple land jurisdictions (Table 1). A detailed description of fire behavior, spread, and suppression actions is provided in the Executive Summary, incident action plans, and Incident Command Team Narratives. As of October 6, 2015, the fire was still uncontrolled (89% contained) and continued to burn within the control lines already established on the fire. Rainy season in central California had begun and some rainfall had already occurred over portions of the fire, resulting in limiting further fire spread and reduction in management complexity to a Type 4 incident with minimal resources patrolling and supervising the organization currently in place.

Table 1. Burned acreage within the Rough Fire by ownership, as of October 6, 2015

Ownership	Acres Burned
Sequoia NF	82,673
Sierra NF	58,541
NPS	9,413
State	6
Private	1,090
Total	**151,723**

The Rough fire burned a wide variety of vegetation types across both sides of the Kings Canyon Gorge. It burned from blue oak savanna ecosystem type at 1,000 feet elevation to sub-alpine forest at over 10,000 feet elevation, with chaparral, live oak forest, black oak forest, ponderosa pine forest, mixed conifer forest, giant sequoia groves, montane meadows, and red fir forest, in between. Various riparian plant communities are also found along rivers, streams, and within meadows. In the fire area, approximately two-thirds (68%) of the Rough Fire is either very low/unburned to low soil burn severity, while 28% sustained a moderate soil burn severity and 4% burned at high severity.

Forest tree species present in the burn area addressed in this report include the following conifers: giant sequoia (*Sequoiadendron giganteum*); ponderosa pine (*Pinus ponderosa*); Jeffrey pine (*Pinus jeffreyi*); white fir (*Abies concolor*); red fir (*Abies magnifica*); sugar pine (*Pinus lambertiana*); and incense cedar (*Calocedrus decurrens*). Hardwood species include: canyon live oak (*Quercus chrysolepis*), black oak (*Quercus kelloggi*), California bay (*Umbellularia californica*), bigleaf maple (*Acer macrophyllum*); nutmeg (*Toreya californica*), white alder (*Alnus rhombifolia*); and willow (*Salix* sp.).

B. Reconnaissance Methodology & Results

The field survey was conducted from September 29 – October 4, 2015 by two BAER Foresters along with four assistants from Sequoia-Kings National Parks. Potential areas to be surveyed for tree hazards were identified by staff from Sequoia National Forest and Sequoia-Kings Canyon National Parks. These agencies identified developed/recreational sites, Highway 180, and secondary road corridors within the burned area as primary areas of concern for threats to life and property.

The most significant and heavily-used road is Highway 180 that runs from Kings Canyon NP at Grant Grove down through Sequoia NM and back into Kings Canyon NP at Cedar Grove. Portions of the fire burned on only one side of the road, although most of the fire burned on both sides.

1. Tree Hazards

Short-term (likely to fail within one year) tree hazards were identified using the National Park Service (NPS 2015) and US Forest Service (Angwin et. al. 2012) hazard tree guidelines. These included trees that: had been damaged and weakened structurally; were killed outright in the fire; or, weakened by crown scorch and/or cambial damage thus increasing susceptibility to subsequent successful bark beetle attack. While not all posed an immediate threat to the public and administrative users of the road, many that didn't will deteriorate quickly and likely be prone to failure within a year, based on recent observations.

The 7-Point Rating System utilized by both agencies rates hazard on the basis of a combination of defect (including lean) and target. Both tree and the target are each given a rating from 1-3 (with an extra point for lean) for a possible total rating of 7 for the most severe hazards. Although trees were not individually rated for this assignment, each was evaluated to confirm defect and potential to inflict property damage or physical injury. Those trees with a potential rating of 5 (with a minimum 3 defect) or greater were designated with chartreuse tree-marking paint, mapped with GPS, and documented in field notebook. Data collected included, besides location, species, dbh (diameter at breast height), percent crown length unscorched, and presence of bark beetles. A spreadsheet was developed with both the GPS and the field data, and maps were produced to aid fallers in relocating the trees.

Several roads within the burned area were surveyed by vehicle to estimate the extent of the remaining tree hazard surveillance workload, although no trees were marked for removal due to time constraints. In addition, Hume Lake District staff identified several additional secondary roads and dispersed recreational sites needing to be surveyed and evaluated for tree hazard potential, prior to opening to public.

Longer term tree-hazards will continue to be dealt with by agencies involved as additional trees succumb to effects of fire.

Values at Risk – The potential values at risk are public safety and infrastructure value associated with roads and developed/recreational sites which could be directly damaged or impacted by tree failures. These values at risk are delineated within two categories: the short-term (1 year post-fire) includes currently identified tree hazards as well as those to be detected by spring 2016 surveillance. Long-term (2-5 years post-fire) hazards include those trees which succumb to effects of fire in subsequent years.

Consequences of the Fire on Values at Risk – Values at risk in this assessment include the possible loss of life and damage to property. This risk exists in all forest environments, but the Rough Fire has exacerbated it as a result of damage to and/or killing of trees. While many of the most obvious imminent tree hazards have been eliminated (felled) during the fire suppression efforts, there remains over 200 identified and many unidentified hazards. These hazards pose an unacceptable risk to the public and employees, if not mitigated/abated. They can either be mitigated (felled) alongside roads and within/adjacent developed/ recreational sites in the burn area or abated by temporary exclusion (road/site closure).

2. <u>Tree Injury/Damage and Mortality</u>

Post-fire mortality can continue for several years, influenced by numerous factors, including: season the injury/damage occurred, pre-fire tree vigor, site quality, extent of crown injury, extent of cambium damage, post-fire stand density/competition, post-fire climatic conditions, and insect/disease damage. The following guidelines were derived primarily from research by Wagener (1961), and Smith and Cluck (2011).

Season: Conifers are most susceptible to fire injury/damage early in the growing season, when stem and twig length growth is active, because growing points are more sensitive to heat, and because food reserves (from previous growing season) are at their lowest. Retention of sufficient green foliage is necessary to carry the tree through the remainder of the growing season and provide some food reserves for the following year. Fires that occur after bud set have much less impact on tree survival (Wagener, 1961).

Tree Vigor/Site Quality: Younger, more vigorous trees on good sites have a better chance of survival than over-mature trees on poor sites (Wagener, 1961). Drought-stressed trees have less of a chance for survival (Bulaon, pers.com).

Crown Injury: The amount of live crown remaining, as distinguished from green foliage, is the most important single factor in survival of fire-scorched ponderosa and Jeffrey pine (Wagener, 1961). Large terminal buds, well protected by scales, are able to withstand considerable heat without damage during late season fires. Green needle bases indicate that the surrounding parts of the

crown are still alive; conversely, darkened needles and needles "frozen" in position in the direction of fire-run are unmistakable indicators the surrounding crown is dead (Wagener, 1961). Minimum criteria for survival of moderately vigorous ponderosa/Jeffrey pine with no or light cambium injury following a late season (after August 1) fire are 60% live crown and 15% green foliage (Wagener, 1961). In species with slender twigs and small terminal buds, such as sugar pine and true firs, or those without definite terminal buds, such as incense cedar and giant sequoia, foliage kill and bud and twig kill are approximately the same as that which will be present in succeeding years (Wagener, 1961). Minimum criteria for survival of moderately vigorous trees of these species with no or light cambium injury following a late season (after August 1) fire are 55% live crown and 45% green foliage (Wagener, 1961). According to Smith and Cluck (2011), as modified by Cluck and Woodruff (2014), following are revised guidelines for estimating survival of fire-injured trees at probability of mortality level of 0.5 (Pm=0.5):

Dbh	Min. Percent Crown Lgth. Unscorched (PCLUS) [1/]	Min. Live Crown Ratio (LCR) [2/]
Ponderosa/Jeffrey Pine – Red turpentine beetle absent		
10 - <30”	20%	40%
30 - 40”	55%	70%
>40 - 50”	70%	90%
Ponderosa/Jeffrey Pine – Red turpentine beetle present		
10 - <30”	20%	55%
30 - 40”	55%	--
>40 - 50”	70%	--
Sugar Pine – Red turpentine beetle absent		
10 - 60”	40%	40%
Sugar Pine – Red turpentine beetle present		
10 - 60”	60%	60%
White Fir		
10 - 35”	25%	25%
>35 - 60”	40%	40%
Red Fir		
10 - 40”	30%	30%
Incense Cedar		
10 - 60”	15%	15%

[1/] PCLUS (Percent Crown Length Unscorched)--Use pre-bud-break
[2/] LCR (Live Crown Ratio)--Use post-bud break

Cambium Damage: Ryan (1990) reported that, in the absence of significant crown injury, most trees survive up to 25 percent basal girdling, whereas few survive more than 75 percent.

Post-Fire Stand Density: Potter and Foxx (1979) reported decreased recovery as stand density increased.

C. Findings

1. Tree Hazards

Kings Canyon National Parks

Targets in King Canyon National Park (KCNP) include portions of Highway 180 in Grant Gove and Cedar Grove, secondary roads (e.g., Northside Drive and Cedar Lane), and developed sites (Lewis Creek Shooting Range, Hotel Creek Trailhead, Pack Station, and NPS Housing Area).

Forty-five short-term tree hazards of various size classes and species were identified and marked (with chartreuse tree-marking paint) along 3.1 miles of road in Grant Grove and Cedar Grove and in four developed sites in Cedar Grove within Kings Canyon National Park (Tables 2 & 3).

Table 2. NPS Roads Surveyed & Tree Hazards Identified/Marked

Roads	**Total Length (Mi)**	**Burned Length (Mi)**	**Number of Identified/Marked Tree Hazards by Dbh (Diameter Breast Height) Class**			
			≤8”	**10-24”**	**24+”**	**Totals**
Hwy. 180, Grant Grove to North Boundary KCNP	0.7	0.7	0	1	3	4
Hwy. 180 West Boundary KCNP to South Fork Kings River Bridge	0.7	0.7	0	3	2	5
Northside Drive	1.1	1.1	0	9	11	20
Cedar Lane	0.6	0.6	0	3	1	4
TOTALS	**3.1**	**3.1**	**0**	**16**	**17**	**33**

Table 3. NPS Developed Sites Surveyed & Tree Hazards Identified/Marked

Developed Sites	**Number of Identified/Marked Tree Hazards by Dbh (Diameter Breast Height) Class**			
	≤8”	**10-24”**	**24+”**	**Totals**
NPS Lewis Creek Shooting Range	2	6	0	8
Hotel Creek Parking Area	0	0	0	0
Pack Station	0	2	2	4
NPS Cedar Grove Housing Area	0	0	0	0
TOTALS	**2**	**8**	**2**	**12**

A treatment specification has been prepared that will provide funding for the NPS to complete mitigation of identified/marked tree hazards.

Sequoia National Forest

Twenty-eight short-term tree hazards of various size classes and species were identified and marked along 1.3 miles of Ten-Mile Road and in three recreational sites within Sequoia National Forest (Tables 4 & 5). In addition, approximately 850 potential tree hazards were tentatively identified in rapid assessment along 17.4 miles of secondary roads (Table 6). These trees were not evaluated/marked pending more thorough survey.

Table 4. USFS Roads Surveyed & Tree Hazards Identified/Marked

Roads	**Total Length (Mi)**	**Burned Length (Mi)**	**Number of Identified/Marked Tree Hazards by Dbh (Diameter Breast Height) Class**			
			≤8”	**10-24”**	**24+”**	**Totals**
Ten-Mile Road (USFS)	4.4	1.3	0	10	1	11
TOTALS	**4.4**	**1.3**	**0**	**10**	**1**	**11**

Table 5. USFS Developed Sites Surveyed & Tree Hazards Identified/Marked

Developed Sites	**Number of Identified/Marked Tree Hazards by Dbh (Diameter Breast Height) Class**			
	≤8”	**10-24”**	**24+”**	**Totals**
Convict Flat	0	2	0	2
Boyden Cave	0	9	0	9
Grizzly Falls Picnic Area	0	6	0	6
TOTALS	**0**	**17**	**0**	**17**

Table 6. USFS Roads Surveyed & Tree Hazards Not Identified/Marked (Estimated Only)

Roads	Total Length (Mi)	Burned Length (Mi)	Number of Identified/Marked Tree Hazards by Dbh (Diameter Breast Height) Class			
			≤8”	10-24”	24+”	Totals
Boole Tree Rd. (13S55)	2.5	2.2	0	73	41	114
Converse Mill Rd. (13S21)	1.4	1.4	3	13	10	26
Chicago Stump Rd. (13S03)	1.9	1.9	0	16	3	19
Burton Rd. (14S02)	8.3	3.1	5	36	33	74
Little Boulder Rd. (13S23)	4.0	4.0	44	337	194	575
Horse Corral/ Big Meadows Rd. (14S11)	9.5	2.4	0	0	0	0
Millwood Rd. (13S97)	4.4	2.4	0	33	9	42
TOTALS	**32.0**	**17.4**	**52**	**508**	**290**	**850**

Treatment specifications have been prepared that will provide funding for the USFS to complete mitigation of identified/marked tree hazards as well as to complete surveillance.

CalTrans (Highway 180)

One hundred twenty-three short-term tree hazards of various size classes and species were identified and marked (with chartreuse tree-marking paint) along 24.9 miles of Highway 180 within Sequoia National Forest (Table 7). Due to easement for road maintenance, responsibility for removal of these trees lies with the California Department of Transportation (CalTrans).

Table 7. CalTrans Roads Surveyed & Tree Hazards Identified/Marked

Roads	Total Length (Mi)	Burned Length (Mi)	Number of Identified/Marked Tree Hazards by Dbh (Diameter Breast Height) Class			
			≤8”	10-24”	24+”	Totals
Hwy. 180 (CalTrans)	26.9	24.9	2	74	47	123
TOTALS	**26.9**	**24.9**	**2**	**74**	**47**	**123**

Fresno County (Ten-Mile Road)

Fourteen short-term tree hazards of various size classes and species were identified and marked (with chartreuse tree-marking paint) along 1.6 miles of Ten Mile Road within Sequoia National Forest (Table 8).

Table 8. Fresno County Roads Surveyed & Tree Hazards Identified/Marked

Roads	**Total Length (Mi)**	**Burned Length (Mi)**	**Number of Identified/Marked Tree Hazards by Dbh (Diameter Breast Height) Class**			
			≤8"	**10-24"**	**24+"**	**Totals**
Ten-Mile Road (Fresno Co.)	3.1	1.6	0	14	0	14
TOTALS	**3.1**	**1.6**	0	14	0	14

2. Forest Health

Fire-damaged pines are more susceptible to successful bark beetle attack for two or more years post-fire (Miller and Keen, 1960). In light of recent severe four-year drought it is anticipated that elevated bark beetle-related mortality may persist for up to five years (Bulaon, pers com). Those trees with both heavy foliage scorching and moderate to severe cambium kill are especially vulnerable (Miller,1929; Salman, 1934). Bark beetle infestations are more likely to occur the same season following late spring or early summer fires than late summer or fall fires (Miller and Keen, 1960). Major insect "pests" associated with ponderosa pine in the southern Sierra Nevada are: western pine beetle (*Dendroctonus brevicomis*); red turpentine beetle (*D. valens*); and pine engraver beetles (*Ips* spp.) Those associated with sugar pine are mountain pine beetle (*D. ponderosae*) and pine engraver beetles (*Ips* spp.) Of the above, western pine beetle is the most aggressive. Capable of three or more generations per year, the western pine has three or more "flights" of emerging adults--spring, summer, and fall.

With the current drought and impacts from the fire, it is likely that there will be a post-fire increase, within the fire perimeter, in insect-related tree mortality (primarily in ponderosa pine) due to bark beetles--red turpentine beetle, western pine beetle, and pine engraver beetles, up to five years following the fire (Bulaon, pers com). Most at risk are cambial-damaged and/or crown-scorched trees.

D. Emergency Determination

The existing condition presents a short-term threat to life and property along roads and in/adjacent developed/recreational sites within fire perimeter. Because trees were damaged and killed by the fire, there is an increased risk to the public. This threat of tree failures will continue and worsen over time unless actions are taken to abate (remove target) or mitigate (remove hazard).

E. Treatments to Mitigate the Emergency

All of the treatments proposed in this report resulted from communication with agency personnel and are based on agency unit cost figures. Estimates of timeframe to accomplish specified work are based upon experience of Sequoia-Kings Canyon-based BAER Forester, who has over 40 years' experience performing/supervising similar work in similar settings.

There are several types of treatments that have been proposed to mitigate the emergency created by such a large fire that burned for over two months. Highway 180 will remain closed to public by a locked gate at Ten-Mile Road during the winter months due to snow and/or potential rock slides. The USFS plans to close all of their dirt roads to vehicular and over snow vehicles (OSV) to minimize exposure to potential tree hazards. Gates may need to be installed to enforce these closures.

Some of the treatments identified to mitigate the emergency have already been enacted during the suppression effort. Imminent tree hazards posing threats along the road corridor and within recreational sites were mitigated using suppression resources assigned to the incident.

The remaining short-term hazards associated with the roads, developed/ recreational sites as well as the dispersed campsites should be mitigated prior to re-opening these facilities to the public.

Detailed descriptions of treatments along with associated costs are contained in specifications.

The probability of success of the proposed treatments is very high if all of the treatments are implemented as specified in this plan.

IV. RECOMMENDATIONS

The Rough Fire, encompassing over 151,000 acres, has created an environment of increased risk for forest and park users. Forest and park users are, and will continue to be, exposed to increased risk and potential injury due to tree hazards falling in road corridors as well as in developed/recreational sites within fire perimeter for many years.

A. General Recommendations

- Abate identified/potential (unidentified) tree hazards by road/site closures pending tree hazard surveillance/mitigation.

- Complete tree hazard surveillance along roads and within developed/ recreational sites

- Mitigate identified tree hazards prior to re-opening roads/sites within the burn area.

- Post appropriate signage warning the public of the potential risk associated with unidentified tree hazards along the roads and within developed/recreational sites.

B. Specification-Related Recommendations

- **NPS-1 Short-Term Tree Hazard Mitigation by NPS** – Complete mitigation of identified short-term tree hazards along sections of Hwy 180, secondary roads in Cedar Gove, and developed sites. Includes 33 tree hazards identified along 3.1 miles of roads in Grant Grove and Cedar Grove and 12 tree hazards identified in Cedar Grove developed sites. See the treatment map and data spreadsheet supplied to agency.

- **USFS-1 Short-Term Tree Hazard Mitigation by USFS –** Complete mitigation of 11 identified short-term tree hazards along 1.3 miles of Ten-Mile Road and 17 identified shoirt-term tree hazards in three recreation sites. See the treatment map and data spreadsheet supplied to agency.

- **USFS-2 Short-Term Tree Hazard Surveillance by USFS –** Complete the surveillance, identification, and marking of short-term tree hazards along approximately 80 miles of secondary roads and in dispersed recreational sites within the fire perimeter.

V. CONSULTATIONS

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Appendix A

Marking Guidelines for Fire-Damaged/Fire-Injured Trees: Rough Fire Tree Hazards

Guideline Objectives: *These guidelines will provide a means to identify and remove tree hazards that were damaged, killed, or severely injured as a result of fire and/or insect attack within the 2015 Rough Fire, Hume Lake Ranger District, Sequoia National Forest and Kings Canyon National Park.*

These guidelines are based on the fire-injured tree marking guidelines developed by Region 5 Forest Health Protection (Report #RO-11-01, Smith and Cluck, 2011) and modified by subsequent (Report # NE 14-07, Cluck and Woodruff , 2014) drought-related modifications. The guideline criteria (#3) for delayed conifer tree mortality are based on the post-bud break model (% crown length killed) for yellow pine, and the white fir and red fir models (% crown length killed). A probability of mortality of 0.5 (Pm=0.5), based upon recommendations in Cluck and Woodruff (2014) was selected for this application to meet the management objectives of: 1) removing trees that were killed or that have a high probability of mortality within 1 year post-fire; and 2) which will become hazardous due to deterioration and proximity to developed/ recreational sites and/or roads.

Note: The Smith and Cluck 2011 guidelines also discuss the evaluation of cambium injury (for yellow pine, sugar pine and white fir) for adjusting crown kill marking criteria. The Rough Fire marking guidelines **DO NOT** include cambium sampling for this purpose due to the additional time required to assess individual trees and the minimal loss of accuracy incurred by dropping this variable.

Mark for removal any tree that meets the following criteria:

1. Any tree with significant visible defect which would predispose it to failure within 1 year and which is within 1 ½ tree lengths of and with likelihood of striking target.

2. Any tree with no green needles which is within 1 ½ tree lengths of and with likelihood of striking target.

3. For all species, trees within 1 ½ tree lengths of and with likelihood of striking target, should be marked for removal if any combination of boring dust or frass (in bark crevices, webbing along the bole, or that accumulates at the base of the trees), pitch tubes with pink or reddish boring dust associated with them, pouch fungus conks and/or current woodpecker activity (holes into the sapwood and/or bark flaking, specifically excludes injury caused by sapsucker feeding) is present over at least 1/3 of the bole circumference. This specifically excludes basal attacks by the red turpentine beetle on pines (large pitch tubes associated with coarse boring dust generally restricted to the lower 2 to 3 feet of the bole or woodpecker activity restricted to this area) and when the above indicators are only associated with wounds, old fire scars, etc. The presence or absence of red turpentine beetle pitch tubes will be accounted for in criteria #3.

4. Any tree which does not meet or exceeds the following minimum fire-injured conifer survival guidelines (Table 1) at the Pm = 0.5 level. This assessment will be made by visually estimating the percent of the original pre-fire crown length that is unscorched or alive (ponderosa/Jeffrey and sugar pine, white and red fir, incense cedar), the presence or absence of red turpentine

beetle pitch tubes (ponderosa/Jeffrey and sugar pine) and tree diameter (yellow pine and white fir).

Table 1: Specific minimum criteria for estimating survival of fire-injured trees at the Pm = 0.5 level (Smith & Cluck, 2011; Cluck & Woodruff, 2014)

Ponderosa/Jeffrey Pine – Red turpentine beetle absent		
DBH	**Minimum Percent Crown Lgth. Unscorched (PCLUS)[1/]**	**Minimum Live Crown Ratio (LCR)[2/]**
10 - <30”	20	40
30 - 40”	55	70
>40 - 50”	70	90
Ponderosa/Jeffrey Pine – Red turpentine beetle present		
DBH	**Minimum Percent Crown Lgth. Unscorched (PCLUS)[1/]**	**Minimum Live Crown Ratio (LCR)[2/]**
10 - <30”	20	55
30 - 40”	55	--
>40 - 50”	70	--
Sugar Pine – Red turpentine beetle absent		
DBH	**Minimum Percent Crown Lgth. Unscorched (PCLUS)[1/]**	**Minimum Live Crown Ratio (LCR)[2/]**
10 - 60”	40	40
Sugar Pine – Red turpentine beetle present		
DBH	**Minimum Percent Crown Lgth. Unscorched (PCLUS)[1/]**	**Minimum Live Crown Ratio (LCR)[2/]**
10 - 60”	60	60
White Fir		
DBH	**Minimum Percent Crown Lgth. Unscorched (PCLUS)[1/]**	**Minimum Live Crown Ratio (LCR)[2/]**
10 - 35”	25	25
>35 - 60”	40	40
Red Fir		
DBH	**Minimum Percent Crown Lgth. Unscorched (PCLUS)[1/]**	**Minimum Live Crown Ratio (LCR)[2/]**
10 - 40”	30	30
Incense Cedar		
DBH	**Minimum Percent Crown Lgth. Unscorched (PCLUS)[1/]**	**Minimum Live Crown Ratio (LCR)[2/]**
10 - 60”	15	15

[1/] PCLUS (Percent Crown Length Unscorched)--Use pre-bud-break
[2/] LCR (Live Crown Ratio)--Use post-bud break

References for Rough Fire Tree Hazard Marking Guidelines:

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