

## Appendix B

### Flagtail Tree Marking Guide

Eric L. Wunz  
Silviculturist

This guide is adapted from the paper “**Factors Affecting Survival of Fire Injured Trees: A Rating System for Determining Relative Probability of Survival of Conifers in the Blue and Wallowa Mountains**” by Scott, Schmitt, and Speigel, 2002. Adaptations for the Flagtail Fire included dropping tree species that do not occur in the Flagtail area, incorporating changes suggested by the authors based on additional field work in 2003, and the addition of the chopping requirements for trees that fall into the moderate range.

Use the following “Rating Guide for Tree Survival for the Flagtail Fire” to determine the probability for tree survival. Then use the following to make the final determination if the tree can be expected to live or die within the next few years. Finally, leave the appropriate number of wildlife snags for that unit, as specified in the silvicultural prescription, to determine if the tree should be harvested or left standing.

- ❖ If the rating score falls within the **High Probability to Survive** range, the tree should be marked for retention.
- ❖ If the rating score falls within the **Low Probability to Survive** range, the tree should be harvested if not needed for wildlife habitat or for protecting ephemeral draws.
- ❖ If the rating score falls within the **Moderate Probability to Survive** range, consider other non-rated factors that can affect survival and where the tree falls within the moderate range. Especially if the tree is over 21”, it is recommended to chop into the tree bark to check for dead cambium. It is recommended that the chopping be done on four sides (faces) of the tree 2 to 4 inches below the ground level on the roots to obtain the most accurate results.
  - ❑ If dead cambium equals or exceeds 75% (3 or 4 out of 4 faces) it is very likely to die.
  - ❑ If dead cambium is 50% (2 out of 4 faces) it is weakened and other factors, like remaining live crown, presence of insects, etc. should be used for a final determination if the tree is expected to live.
  - ❑ If dead cambium is less than 50% (0 or 1 out of 4 faces) it is likely to live.

*Note: If the numerical rating score falls in the gaps between the above categories assume the following:*

  - if it is between the low and moderate probability to survive use the low category,
  - if it is between the high and moderate probability to survive use the high category.

Leave marginal trees as wildlife trees (future snag recruitment) if the chance of living is uncertain and harvest the obviously dead trees. No more than half of the trees left for snags should be marginal trees. Trees that are uncertain to live, regardless if they die in the near future or survive for a number of years, will be a source for future snag recruitment. This will prolong the time span that snags are available for wildlife habitat.

Where less than two trees per acre are expected to live, aspects of these guidelines may be relaxed and marginal trees may be left in hopes that they may survive.

# Rating Guide for Tree Survival for the Flagtail Fire

## A. Introduction

The Flagtail Fire Restoration F. E. I. S. directs us to leave all trees that are expected to survive, regardless of desirability, stand density, or other silvicultural objectives. Tree survival after a fire is dependent on a myriad of factors that interact with the tree and future conditions that can be only estimated. In reality, determining tree survival is more of an art than science since the marking crew can realistically use only a portion of the survival factors and can only speculate at the future conditions.

## Tree Survival Determination

These guidelines are intended for the Flagtail Fire that burned in mid July of 2002. Crown scorch and **the amount of remaining live crown** to produce nutrients must be used along with bole scorch and **the amount of remaining live cambium** that transports the nutrients to determine the vigor of the trees. Post-fire tree vigor is an important factor in the tree's ability to withstand insect attacks and survive.

These guidelines are to be used to determine which trees are expected to live following the Flagtail wildfire. This marking guide utilizes the rating factors that were selected for detailed evaluation in "Factors Affecting Survival of Fire Injured Trees: A Rating System for Determining Relative Probability of Survival of Conifers in the Blue and Wallowa Mountains" by Scott, Schmitt, and Spiegel (November 25, 2002); and their Amendment 1 (June 26, 2003) to that document.

- ❑ If the rating score falls within the **High Probability to Survive** range, the tree should be marked for retention.
- ❑ If the rating score falls within the **Low Probability to Survive** range, the tree should be harvested if not needed for wildlife habitat.
- ❑ If the rating score falls within the **Moderate Probability to Survive** range, consider other non-rated factors that can affect survival and where the tree falls within the moderate range, leaving it as a wildlife tree if the chance of living is uncertain and harvesting obviously dead trees. Uncertain to live trees marked for retention as snags, if they do not die immediately, will be a source for future snag recruitment. This will prolong the time snags remain available for wildlife habitat.

## B. Tree Survival Rating System

The following rating system can be used to determine individual trees likelihood of surviving. To use the system the marker works through the two parts consecutively (Parts 1 and 2), selecting the appropriate rating value given in parentheses adjacent to each factor, and recording the rating value in the right-hand "Rating" column. The "Rating Score" for each part is subtotaled at the end of each part. The "Composite Rating Score" is obtained by adding together the subtotals for Part 1 and 2. The Composite Rating Score is used to judge if the tree has a **Low**, **Moderate**, or **High** Survival Probability and the trees with a high probability for survival are to be marked for retention.

The rating system enables the determination of relative tree survival up to one year after the fire for all of the conifer species included in the rating system. Large-diameter, mature or overmature ponderosa pine are rated for more than one year, since much evidence is accruing for delayed mortality of that stand component, especially between the second through fourth year following the fire. These ratings incorporate factors that take into account insects that may attack the trees within that period of time; hence, contributing to tree mortality along with first order fire effects. In addition, the rating systems for ponderosa pine, Douglas-fir, and grand fir distinguish between tree sizes, since there is a size-related preference by some of the insect species that sometimes become influential mortality factors in fire-injured trees of these species.

The first part, **Part 1**, contains the factors that may affect the overall vigor of trees involved in the fire by virtue of tree growth rates that reflect the stocking and the quality of site on which they are growing, or due to predisposition by weakening agents such as dwarf mistletoe or root diseases. The time of year in which the fire occurred is also considered in this part. Tree tissues are more vulnerable to injury by fire during active growth than they are when growth has slowed in the fall. Proximity of the fire to active insect infestations is also considered in this part. Insect populations close to a fire can sometimes cause many losses to trees that survived the fire, for several years after the fire.

**Part 2** contains the specific fire injury factors that are most important in causing injury or death to living tissues of the tree, including injury to needles and buds, bole cambium, and roots and root cambium. Not all injuries of living tissues on trees are easily observed. For example, root injuries are typically hidden from view, and assessing damage is difficult without chopping into roots or excavating them for examination. Factors are included in this rating system that can easily be observed or obtained through direct measurement. These include measurements or estimates of crown volume scorch, bole scorch or bark consumption, total scorch height, and duff consumption. Because the degree of burning of duff and larger surface fuels determines the depth of lethal heat penetration into the soil, duff consumption, as used in this rating system, serves as a surrogate indicator for root injury. The quantity consumed, and characteristics of duff and exposed mineral soil observed can be related in a general way to degrees of root injury.

**Part 1- Factors common to all species and size classes:**

(Instructions: Assign the appropriate rating value in parentheses to each factor below, then subtotal score)

		<u><b>RATING</b></u>
<b>1. Season of Fire</b>		
a.	Early-season Spring prescribed fire.	(0)
b.	Late-season fire: Fire occurred on or after August 1 <sup>st</sup> .	(1)
c.	Early-season wildfire: Fire occurred before August 1 <sup>st</sup> .	(2) <u>    2    </u>
<b>2. Pre-Fire Vigor, Growth Rate, and Site Quality</b>		
a.	Trees injured by fire growing relatively well, or on good to moderate sites.	(0)
b.	Trees injured by fire exhibiting poor vigor or growth, overstocked, or growing on poor quality sites.	(1)     _____
<b>3. Arrangement or Distribution of Down Woody Material Before Fire</b>		
a.	No large, down, woody debris within a distance of one-half the crown diameter beyond drip-line of fire-injured tree.	(0)
b.	Large, down, woody debris in contact with fire-injured bole or within a distance of one-half the crown diameter beyond drip-line of tree.	(1)     _____
<b>4. Dwarf Mistletoe Occurrence</b>		
a.	No dwarf mistletoe present in fire-injured trees.	(0)
b.	Dwarf mistletoe present with DMR ≤ 3 in fire-injured tree.	(1)
c.	Dwarf mistletoe present with DMR > 3 in fire-injured tree.	(2)     _____
<b>5. Root Disease Occurrence for True Firs and Douglas-fir Only</b>		
a.	Site or area containing fire-injured tree with no known root disease present.	(0)
b.	Root disease known to be present on site or area containing fire-injured tree.	(1)     _____
<b>6. Bark Beetle Pressure—Infestations Last Year or Known Current Year</b>		
What is the relative distance from this stand to the nearest known infestation of a bark beetle species that could infest the host tree species being evaluated in this stand?		
a.	> 2.0 miles	(1)
b.	0.25-2.0 miles	(2)
c.	< 0.25 miles	(3)     _____
Subtotal Rating Score for Part 1:		_____

*Part 2 - Specific Factors for Tree Species and Size:*

*(Instructions: Assign the appropriate rating value in parentheses to each factor below, then subtotal score)*

**Ponderosa Pine (Young and Immature Trees <180 years old)**

**RATING**

**7. Crown Volume Scorch**

- a. No visible scorching of crown present. (0)
- b. Crown volume scorched is < 40% of pre-fire live crown. (2)
- c. Crown volume scorched is 40-69% of pre-fire live crown. (4)
- d. Crown volume scorched is > 70% of pre-fire live crown. (6) \_\_\_\_\_

**8. Bole Scorch**

- a. No visible scorching of bole present. (0)
- b. < 30% circumference of bole scorched or blackened up to 1 ft. (1)  
(little or no cambial kill on bole or root crown).
- c. 30-50% circumference of bole scorched or blackened from 2 to 8 ft. (2)  
(> 75% live cambium at the root collar).
- d. > 50% circumference of bole charred to 8 ft. or greater (3) \_\_\_\_\_  
(< 75% live cambium at the root collar).

**9. Total Scorch Height** *(Use nearest diameter below for diameter of tree being evaluated)*

- a. For trees **9 in.** DBH:
  - Total scorch height between 0-29 ft. (1)
  - Total scorch height between 30-37 ft. (2)
  - Total scorch height between 38-60 ft. (3)
- b. For trees **12 in.** DBH:
  - Total scorch height between 0-37 ft. (1)
  - Total scorch height between 38-49 ft. (2)
  - Total scorch height between 50-76 ft. (3)
- c. For trees **15 in.** DBH:
  - Total scorch height between 0-45 ft. (1)
  - Total scorch height between 46-57 ft. (2)
  - Total scorch height between 58-86 ft. (3)
- d. For trees **18 in.** DBH:
  - Total scorch height between 0-55 ft. (1)
  - Total scorch height between 56-69 ft. (2)
  - Total scorch height between 70-100 ft. (3)
- e. For trees **21 in.** dbh :
  - Total scorch height between 0-63 ft. (1)
  - Total scorch height between 64-79 ft. (2)
  - Total scorch height between 80-106 ft. (3)
- f. For trees **26 in.** dbh :
  - Total scorch height between 0-73 ft. (1)
  - Total scorch height between 74-91 ft. (2)
  - Total scorch height between 92-116 ft. (3) \_\_\_\_\_

**10. Duff Consumption**

- a. For Small Trees Only (< 16 in. dbh): Leaf litter and/or duff charred or consumed, in part or entire; mineral soil may be exposed. (0)
- b. For Large Trees Only (> 16 in. dbh): Leaf litter charred or consumed; upper duff charred, but not altered over entire depth; duff consumption usually < 4 in. (0)
- c. For Large Trees Only (> 16 in. dbh): Leaf litter consumed; duff deeply charred or consumed, but underlying mineral soil is not visibly altered. (2)
- d. For Large Trees Only (> 16 in. dbh): Litter and duff completely consumed, and top layer of mineral soil is visibly altered, often reddish. (4) \_\_\_\_\_

Subtotal Rating Score for Part 2: \_\_\_\_\_

Composite Rating Score Part 1+2: \_\_\_\_\_

*Young and Immature Ponderosa Pine (Small Trees < 16 in. dbh)*

<b>High</b> Probability of Tree Surviving = Composite Rating Score	<b>3-8</b>
<b>Moderate</b> Probability of Tree Surviving = Composite Rating Score	<b>10-15</b>
<b>Low</b> Probability of Tree Surviving = Composite Rating Score	<b>17-21</b>

*Young and Immature Ponderosa Pine (Large Trees > 16 in. dbh)*

<b>High</b> Probability of Tree Surviving = Composite Rating Score	<b>3-9</b>
<b>Moderate</b> Probability of Tree Surviving = Composite Rating Score	<b>13-18</b>
<b>Low</b> Probability of Tree Surviving = Composite Rating Score	<b>21-25</b>

**Ponderosa Pine** (*Mature and Overmature Trees >180 years old*)

<u><b>FACTOR</b></u>	<u><b>RATING</b></u>
<b>7. Crown Volume Scorch</b>	
a. No visible scorching of crown present.	(0)
b. Crown volume scorched is < 25% of pre-fire live crown.	(1)
c. Crown volume scorched is 25-50% of pre-fire live crown.	(2)
d. Crown volume scorched is > 50% of pre-fire live crown.	(3) _____
<b>8. Bole Scorch</b>	
a. No visible scorching of bole or damage to cambium present.	(0)
b. Bole scorch, when present, is ≤ 20 %; some scorching at root collar. Dead cambium on bole or root crown area < one-quarter of circumference, and not extending above stump height except for narrow strip kill above.	(1)
c. 30-50% circumference of bole scorched or blackened up to 40% of total tree height; > 75% cambium is alive at the root collar.	(2)
d. > 50% circumference of bole charred to > 40% of tree height; integrity of portion of the bark clearly altered or deeply burned over a portion of the tree’s circumference; < 75% cambium is alive at the root collar.	(3) _____
<b>9. Total Scorch Height</b>	
<i>(Use nearest diameter below for diameter of tree being evaluated)</i>	
a. <u>For trees 32 in. dbh :</u>	
Total scorch height between 0-83 ft.	(1)
Total scorch height between 84-109 ft.	(2)
Total scorch height between 110-134 ft.	(3)
b. <u>For trees 40 in. dbh :</u>	
Total scorch height between 0-103 ft.	(1)
Total scorch height between 104-127 ft.	(2)
Total scorch height between 128-144 ft.	(3) _____
<b>10. Duff Consumption</b>	
a. Leaf litter charred or consumed; upper duff charred, but not altered <b>through entire depth; duff consumption &lt; 4 in.</b>	(0)
b. Leaf litter consumed; duff deeply charred or consumed, but underlying <b>mineral soil is not visibly altered; duff consumption 4-7 in.</b>	(3)
c. Litter and duff completely consumed, and top layer of mineral soil <b>visibly altered, often reddish; duff consumption exceeded 7 in.</b>	(6) _____
Subtotal Rating Score for Part 2:	_____
Composite Rating Score Part 1+2:	_____

*Mature and Overmature Ponderosa Pine*

<b>High</b> Probability of Tree Surviving = Composite Rating Score	<b>3-6</b>
<b>Moderate</b> Probability of Tree Surviving = Composite Rating Score	<b>7-12</b>
<b>Low</b> Probability of Tree Surviving = Composite Rating Score	<b>15-24</b>

Douglas-fir (Young and Immature Trees <20 in. dbh)

**RATING**

- 7. Crown Volume Scorch**
  - a. No visible scorching (0)
  - b. Crown volume scorched is <25% (2)
  - c. Crown volume scorched is 25-55% (4)
  - d. Crown volume scorched is 55-75% (6)
  - e. Crown volume scorched is >75% (8) \_\_\_\_\_
  
- 8. Bole Char**
  - a. No visible char (0)
  - b. <30% of bole circumference blackened (1)
  - c. 30-50% of bole circumference blackened and >75% live cambium **around the base** (2)
  - d. 50-75% of bole circumference blackened and >75% live cambium around the base (3)
  - e. >75% of bole circumference blackened and <75% live cambium around the base (4) \_\_\_\_\_
  
- 9. Total Scorch Height** (*Use nearest diameter below for diameter of tree being evaluated*)
  - a. For trees 9 in. DBH:
    - Total scorch height between 0-30 ft. (1)
    - Total scorch height between 31-42 ft. (2)
    - Total scorch height between 43-60 ft. (3)
  - b. For trees 12 in. DBH:
    - Total scorch height between 0-36 ft. (1)
    - Total scorch height between 37-54 ft. (2)
    - Total scorch height between 55-70 ft. (3)
  - c. For trees 15 in. DBH:
    - Total scorch height between 0-44 ft. (1)
    - Total scorch height between 45-64 ft. (2)
    - Total scorch height between 65-84 ft. (3)
  - d. For trees 18 in. DBH:
    - Total scorch height between 0-44 ft. (1)
    - Total scorch height between 45-68 ft. (2)
    - Total scorch height between 69-88 ft. (3) \_\_\_\_\_
  
- 10. Duff Consumption**
  - a. Leaf litter charred or consumed; upper duff charred, but not altered **through entire depth.** (0)
  - b. Leaf litter consumed; duff deeply charred or consumed, but **underlying mineral soil is not visibly altered.** (2)
  - c. Litter and duff completely consumed, and top layer of mineral soil **visibly altered, often reddish.** (4) \_\_\_\_\_

Subtotal Rating Score for Part 2: \_\_\_\_\_

Composite Rating Score Part 1+2: \_\_\_\_\_

*Young and Immature Douglas-fir*

- High** Probability of Tree Surviving = Composite Rating Score **3-6**
- Moderate** Probability of Tree Surviving = Composite Rating Score **8-16**
- Low** Probability of Tree Surviving = Composite Rating Score **17-25**

Douglas-fir (Mature and Overmature Trees >20 in. dbh)

**RATING**

- 7. Crown Volume Scorch**
- a. No visible scorching (0)
  - b. Crown volume scorched is <30% (2)
  - c. Crown volume scorched is 30-50% (4)
  - d. Crown volume scorched is 50-80% (6)
  - e. Crown volume scorched is >80% (8) \_\_\_\_\_

- 8. Bole Char**
- a. No visible charring of outer bark. (0)
  - b. <30% of bole circumference charred up to 1.5 ft. (1)
  - c. 30-50% of bole circumference charred up to 2-5 ft. Char not affecting cambium; potential for some root damage. (2)
  - d. >50% of bole circumference charred up to 5-8 ft. Visible damage to phloem <25% of tree's circumference at base of tree near ground. (4)
  - e. >50% of bole circumference charred up to >8 ft. Visible damage to phloem >25% of tree's circumference at base of tree near ground. (4) \_\_\_\_\_

- 9. Total Scorch Height**  
*(Use nearest diameter below for diameter of tree being evaluated)*
- a. For trees 21 in. DBH:
    - Total scorch height between 0-57 ft. (1)
    - Total scorch height between 58-84 ft. (2)
    - Total scorch height >84 ft. (3)
  - b. For trees 26 in. DBH:
    - Total scorch height between 0-75 ft. (1)
    - Total scorch height between 76-98 ft. (2)
    - Total scorch height >98 ft. (3)
  - c. For trees 32 in. DBH:
    - Total scorch height between 0-87 ft. (1)
    - Total scorch height between 88-112 ft. (2)
    - Total scorch height >112 ft. (3) \_\_\_\_\_

- 10. Duff Consumption**
- a. Leaf litter charred or consumed; upper duff charred, but not altered **through entire depth.** (0)
  - b. Leaf litter consumed; duff deeply charred or consumed, but **underlying mineral soil is not visibly altered.** (3)
  - c. Litter and duff completely consumed, and top layer of mineral soil **visibly altered, often reddish.** (4) \_\_\_\_\_

Subtotal Rating Score for Part 2: \_\_\_\_\_

**Composite Rating Score Part 1+2:** \_\_\_\_\_

*Mature and Overmature Douglas-fir*

<b>High</b> Probability of Tree Surviving = Composite Rating Score	<b>3-10</b>
<b>Moderate</b> Probability of Tree Surviving = Composite Rating Score	<b>11-17</b>
<b>Low</b> Probability of Tree Surviving = Composite Rating Score	<b>19-31</b>

Lodgepole Pine (All Size Classes except as noted)

**RATING**

<b>7. Crown Volume Scorch</b>		
a. No visible scorching	(0)	
b. Crown volume scorched is $\leq$ 20%	(1)	
c. Crown volume scorched is 20-50%	(2)	
d. Crown volume scorched is >50%	(3)	_____
<b>8. Bole/Root Char</b>		
a. No visible char	(0)	
b. <30% of bole circumference blackened	(3)	
c. 30-60% of bole circumference blackened	(6)	
d. >60% of bole circumference blackened	(9)	_____
<b>9. Total Scorch Height</b>		
<i>(Use nearest diameter below for diameter of tree being evaluated)</i>		
a. <u>For trees 9 in. DBH:</u>		
Total scorch height between 0-28 ft.	(1)	
Total scorch height between 29-38 ft.	(2)	
Total scorch height between 39-58 ft.	(3)	
b. <u>For trees 15 in. DBH:</u>		
Total scorch height between 0-40 ft.	(1)	
Total scorch height between 41-56 ft.	(2)	
Total scorch height between 57-80 ft.	(3)	
c. <u>For trees 21 in. DBH:</u>		
Total scorch height between 0-46 ft.	(1)	
Total scorch height between 47-64 ft.	(2)	
Total scorch height between 65-90 ft.	(3)	_____
<b>10. Duff Consumption</b>		
a. No leaf litter or duff scorched or consumed.	(0)	
b. Leaf litter charred or consumed; upper duff charred, but not altered <b>through entire depth.</b>	(4)	
c. Leaf litter consumed; duff deeply charred or consumed, but <b>underlying mineral soil is not visibly altered. (5)</b>	(5)	
d. Litter and duff completely consumed, and top layer of mineral soil visibly altered, often reddish.	(6)	_____
	Subtotal Rating Score for Part 2:	_____
	Composite Rating Score Part 1+2:	_____

*All Size Classes of Lodgepole Pine*

<b>High</b> Probability of Tree Surviving = Composite Rating Score	<b>2-5</b>
<b>Moderate</b> Probability of Tree Surviving = Composite Rating Score	<b>6-10</b>
<b>Low</b> Probability of Tree Surviving = Composite Rating Score	<b>14-30</b>

Western Larch (All Size Classes except as noted)

**RATING**

<b>7. Crown Volume Scorch</b>		
a. No visible scorching	(0)	
b. Crown volume scorched is ≤10%	(1)	
c. Crown volume scorched is 10-25%	(2)	
d. Crown volume scorched is 26-50%	(3)	
e. Crown volume scorched is 51-75%	(4)	_____
<b>8. Bole Char (Not rated for larch)*</b>		
<b>9. Total Scorch Height</b>		
<i>(Use nearest diameter below for diameter of tree being evaluated)</i>		
b. <u>For trees 9 in. DBH:</u>		
Total scorch height between 0-32 ft.	(1)	
Total scorch height between 33-46 ft.	(2)	
Total scorch height between 47-62 ft.	(3)	
c. <u>For trees 15 in. DBH:</u>		
Total scorch height between 0-48 ft.	(1)	
Total scorch height between 49-74 ft.	(2)	
Total scorch height between 75-92 ft.	(3)	
d. <u>For trees 21 in. DBH:</u>		
Total scorch height between 0-62 ft.	(1)	
Total scorch height between 63-96 ft.	(2)	
Total scorch height between 97-118 ft.	(3)	_____
<b>10. Duff Consumption</b>		
a. Leaf litter charred or consumed; upper duff charred, but not altered through entire depth.	(0)	
b. Leaf litter consumed; duff deeply charred or consumed, but underlying mineral soil is not visibly altered.	(2)	
c. Litter and duff completely consumed, and top layer of mineral soil visibly altered, often reddish.	(4)	_____
		Subtotal Rating Score for Part 2: _____
		Composite Rating Score Part 1+2: _____

*All Size Classes of Western Larch*

<b><u>High</u></b> Probability of Tree Surviving = Composite Rating Score	<b>3-6</b>
<b><u>Moderate</u></b> Probability of Tree Surviving = Composite Rating Score	<b>7-13</b>
<b><u>Low</u></b> Probability of Tree Surviving = Composite Rating Score	<b>14-17</b>

\*While bole char is not rated in the scoring system, it may be considered when a tree scores in the moderate range and the marker needs to decide whether to cut or leave the tree. It is expected that most larch with <75% bole char will live, while those with >75% will die.

Grand Fir and White Fir (Young and Immature Trees <30 in. DBH)

**RATING**

<b>7. Crown Volume Scorch</b>		
a. No visible scorching	(0)	
b. Crown volume scorched is ≤10%	(1)	
c. Crown volume scorched is 10-25%	(2)	
d. Crown volume scorched is 26-50%	(3)	
e. Crown volume scorched is 51-75%	(4)	_____
<b>8. Bole Char at Ground Level</b>		
a. No charring present on bole.	(0)	
b. <10% of basal circumference of bole charred	(1)	
c. 10-30% of basal circumference of bole charred	(3)	
d. 30-40% of basal circumference of bole charred	(6)	
e. >40% of bole circumference charred	(9)	_____
<b>9. Total Scorch Height</b>		
<i>(Use nearest diameter below for diameter of tree being evaluated)</i>		
a. <u>For trees 9 in. DBH:</u>		
Total scorch height between 0-32 ft.	(1)	
Total scorch height between 33-44 ft.	(2)	
Total scorch height between 45-64 ft.	(3)	
b. <u>For trees 15 in. DBH:</u>		
Total scorch height between 0-46 ft.	(1)	
Total scorch height between 47-70 ft.	(2)	
Total scorch height between 71-92 ft.	(3)	
c. <u>For trees 21 in. DBH:</u>		
Total scorch height between 0-54 ft.	(1)	
Total scorch height between 55-88 ft.	(2)	
Total scorch height between 89-108 ft.	(3)	_____
<b>10. Duff Consumption</b>		
a. No leaf litter or duff scorched or consumed	(0)	
b. Leaf litter charred or consumed; upper duff charred, but not altered through entire depth.	(1)	
c. Leaf litter consumed; duff deeply charred or consumed, but underlying mineral soil is not visibly altered.	(2)	
d. Litter and duff completely consumed, and top layer of mineral soil visibly altered, often reddish.	(3)	_____
	Subtotal Rating Score for Part 2:	_____
	Composite Rating Score Part 1+2:	_____

*All Size Classes of Grand Fir and White Fir*

<b>High</b> Probability of Tree Surviving = Composite Rating Score	<b>3-4</b>
<b>Moderate</b> Probability of Tree Surviving = Composite Rating Score	<b>5-10</b>
<b>Low</b> Probability of Tree Surviving = Composite Rating Score	<b>11-30</b>

**Grand Fir and White Fir (Mature and Overmature Trees >30 in. DBH)**

**RATING**

**7. Crown Volume Scorch**

*(Use nearest diameter below for diameter of tree being evaluated)*

- a. No visible scorching (0)
- b. For trees 30 in. DBH:
  - Crown volume scorched is between 0-64% (1)
  - Crown volume scorched is between 65-83% (2)
  - Crown volume scorched is between 84-100% (3)
- c. For trees 32 in. DBH:
  - Crown volume scorched is between 0-67% (1)
  - Crown volume scorched is between 68-85% (2)
  - Crown volume scorched is between 86-100% (3)
- d. For trees 34 in. DBH:
  - Crown volume scorched is between 0-68% (1)
  - Crown volume scorched is between 69-85% (2)
  - Crown volume scorched is between 86-100% (3)
- e. For trees 36 in. DBH:
  - Crown volume scorched is between 0-68% (1)
  - Crown volume scorched is between 69-86% (2)
  - Crown volume scorched is between 87-100% (3)
- f. For trees 38 in. DBH:
  - Crown volume scorched is between 0-71% (1)
  - Crown volume scorched is between 72-87% (2)
  - Crown volume scorched is between 88-100% (3)
- g. For trees 40 in. DBH:
  - Crown volume scorched is between 0-71% (1)
  - Crown volume scorched is between 72-89% (2)
  - Crown volume scorched is between 90-100% (3) \_\_\_\_\_

**8. Bole Char at Ground Level**

*(To ensure accurate interpretation of the following criteria, the cambium should be sampled from 4 quadrants around the bole on a subsample of trees. The numbers in the parentheses for dead cambium are the number of equally spaced quadrants with dead cambium out of the 4 sampled.)*

- a. No charring present on bole. (0)
- b. <20% of base of bole deeply charred (0 or 1 quadrant with dead cambium) (1)
- c. 20-60% of base of bole deeply charred (1 or 2 quadrants with dead cambium) (2)
- d. 60-80% of base of bole deeply charred (2 or 3 quadrants with dead cambium) (3)
- e. >80% of base of bole deeply charred (3 or 4 quadrants with dead cambium) (4) \_\_\_\_\_

**9. Total Scorch Height**

*(Use nearest diameter below for diameter of tree being evaluated)*

- a. No visible scorching (0)
- b. For trees 30 in. DBH:
  - Total scorch height between 0-74 ft. (1)
  - Total scorch height between 75-84 ft. (2)
  - Total scorch height between 85-106 ft. (3)

- c. For trees 32 in. DBH:
  - Total scorch height between 0-80 ft. (1)
  - Total scorch height between 81-90 ft. (2)
  - Total scorch height between 91-112 ft. (3)
- d. For trees 34 in. DBH:
  - Total scorch height between 0-84 ft. (1)
  - Total scorch height between 85-94 ft. (2)
  - Total scorch height between 95-116 ft. (3)
- e. For trees 36 in. DBH:
  - Total scorch height between 0-88 ft. (1)
  - Total scorch height between 89-100 ft. (2)
  - Total scorch height between 100-122 ft. (3)
- f. For trees 38 in. DBH:
  - Total scorch height between 0-94 ft. (1)
  - Total scorch height between 95-106 ft. (2)
  - Total scorch height between 107-128 ft. (3)
- d. For trees >40 in. DBH:
  - Total scorch height between 0-98 ft. (1)
  - Total scorch height between 99-112 ft. (2)
  - Total scorch height between 113-134 ft. (3) \_\_\_\_\_

**10. Duff Consumption**

- a. No leaf litter or duff scorched or consumed (0)
- b. Leaf litter charred or consumed; upper duff charred, but not altered through entire depth. (1)
- c. Leaf litter consumed; duff deeply charred or consumed, but underlying mineral soil is not visibly altered. (2)
- d. Litter and duff completely consumed, and top layer of mineral soil visibly altered, often reddish. (6) \_\_\_\_\_

Subtotal Rating Score for Part 2: \_\_\_\_\_

Composite Rating Score Part 1+2: \_\_\_\_\_

*All Size Classes of Grand Fir and White Fir*

<b>High</b> Probability of Tree Surviving = Composite Rating Score	<b>2-12</b>
<b>Moderate</b> Probability of Tree Surviving = Composite Rating Score	<b>13-16</b>
<b>Low</b> Probability of Tree Surviving = Composite Rating Score	<b>17-21</b>