



# REDUCING FIRE RISK IN TIMES OF CHANGE

CLIMATE CHANGE WORKSHOP 2020



**Oregon State University**  
**Extension Service**

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# Hazard

A fire safety hazard is something that could give rise to a fire or smoke.

Example: For structure hazards, this could be a room full of electronics or badly managed combustible or flammable materials.

# Risk

Estimation of the level of risk posed by a fire hazard is the assessment of the likelihood of harm, firstly to people, but also to property and business continuity.

During a fire risk assessment questions are posed on various areas of hazard and the answers recorded as satisfactory, not known or unsatisfactory. Not known or unsatisfactory responses are then recorded as significant findings.

Consequence						
Likelihood		Insignificant	Minor	Moderate	Major	Severe
	Almost certain	Medium	High	High	Extreme	Extreme
	Likely	Medium	Medium	High	Extreme	Extreme
	Possible	Low	Medium	Medium	High	Extreme
	Unlikely	Low	Low	Medium	High	High
	Rare	Low	Low	Low	Medium	High

# HOUSEGUEST HAZARDS



ELDERLY



TODDLERS



# Comparison of Room Furnishings

Natural Room

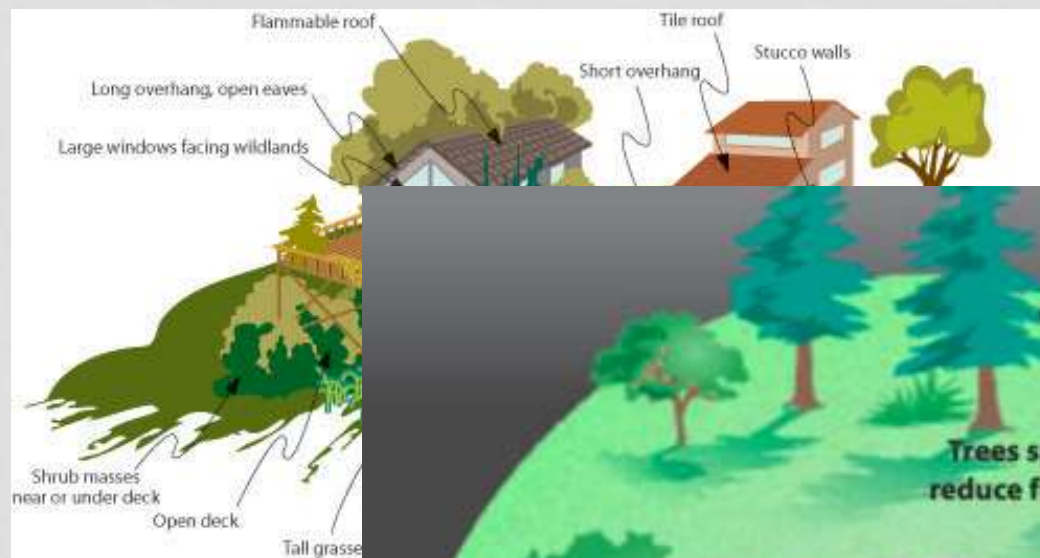


Synthetic Room



03:08

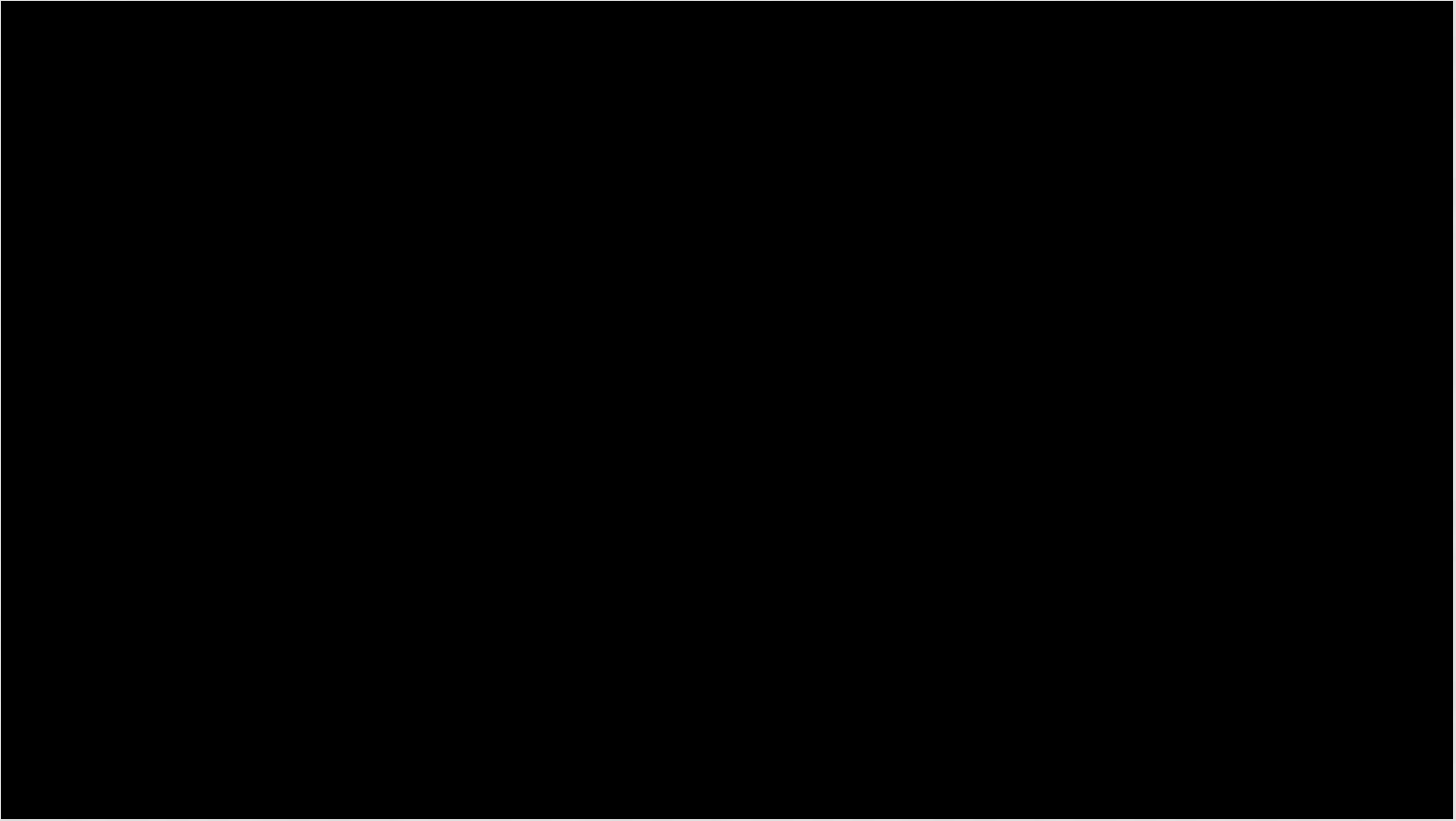


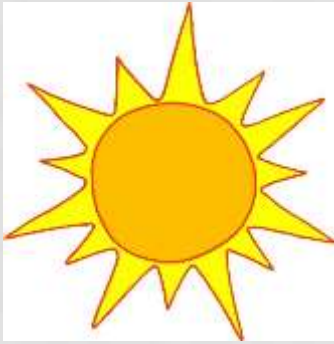


**QUESTION 1:**

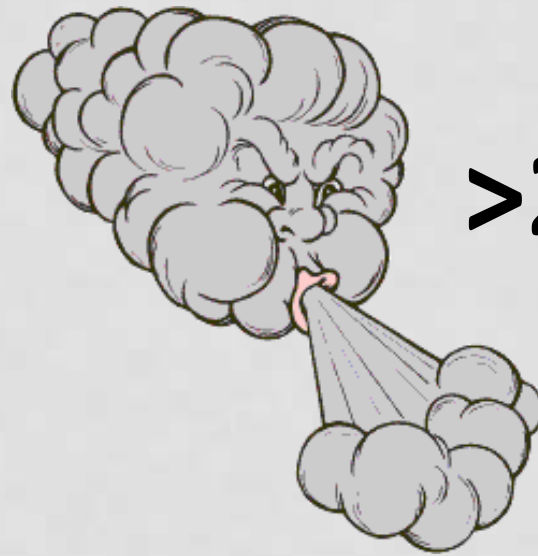
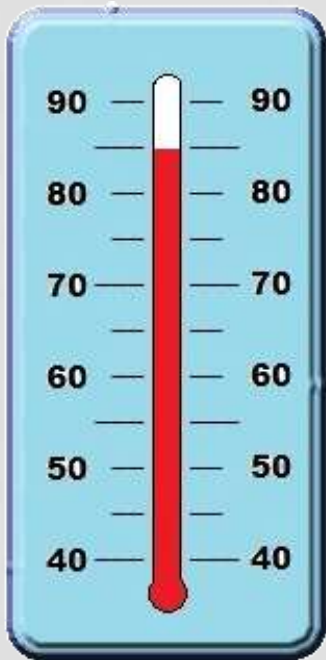
Which of these weather factors are ***not*** part of a “Red Flag” condition?

- a) Low humidity
- b) High winds
- c) Lightning
- d) Clouds



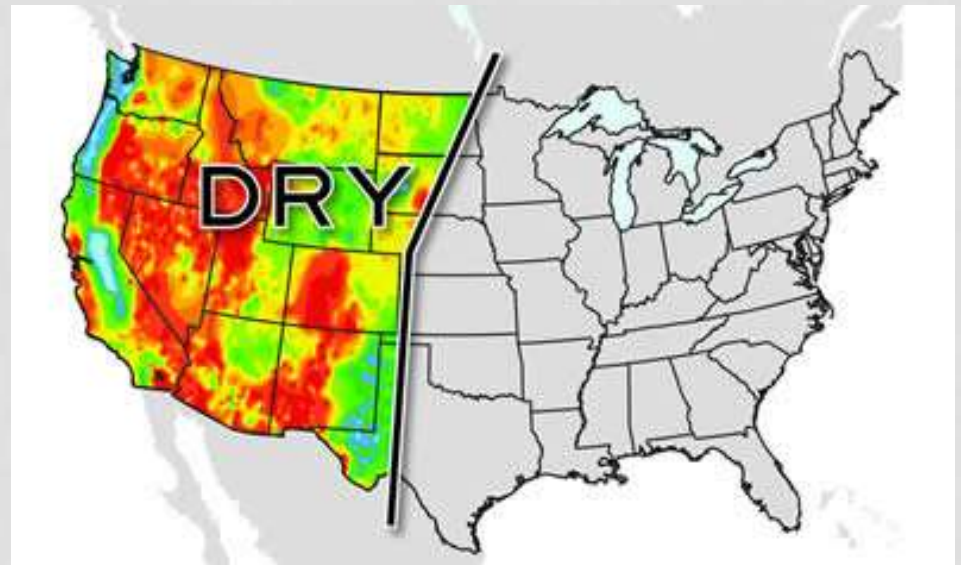


**80 degrees+**



**>20mph**

**<20%**





## Components of the Belt Weather Kit



- 1-hour fuels: up to 1/4 inch in diameter.
- 10-hour fuels: 1/4 inch to 1 inch in diameter.
- 100-hour fuels: 1 inch to 3 inches in diameter.
- 1000-hour fuels: 3 inches to 8 inches in diameter.

Examples of one-hour fuels are grass, leaves, mulch and litter. Fuel moisture in these fuels can change within one hour according to factors such as temperature, rain, humidity and shade. Conversely, larger diameter fuels such as deadfalls, brush piles, etc., take up to 1,000 hours to respond to changes in environmental factors.



**Virtually every wood burning stove manufacturer recommends only burning wood logs with a moisture content of less than 20%. Somewhere between 10% and 20% is ideal.**



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Intermediate Wildland Fire Behavior S-290

## Live and Dead Fuel Moisture

- **Dead Fuel Moistures** – rarely below 3-4%, fluctuate often due to environmental conditions.
- **Live Fuel Moistures** – range much higher, with moisture contents of perhaps as high as 300% or more, fluctuate much more slowly, relate to growing season.

Unit 3 Fuels 3-38-S290-EP



## QUESTION 2:

**Which of these fuel types will change moisture content in 1000 hours?  
(In response to temperature, rain, humidity, and shade)**

- A.
- B.
- C.
- D.
- E. All of the above

A.



B.



C.



D.



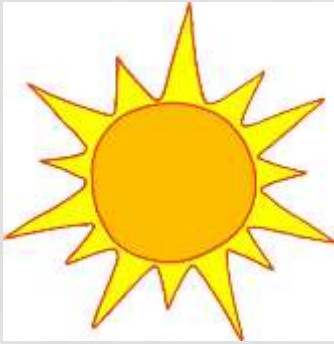
## QUESTION 2:

Which of these fuel types will change moisture content in 1000 hours?

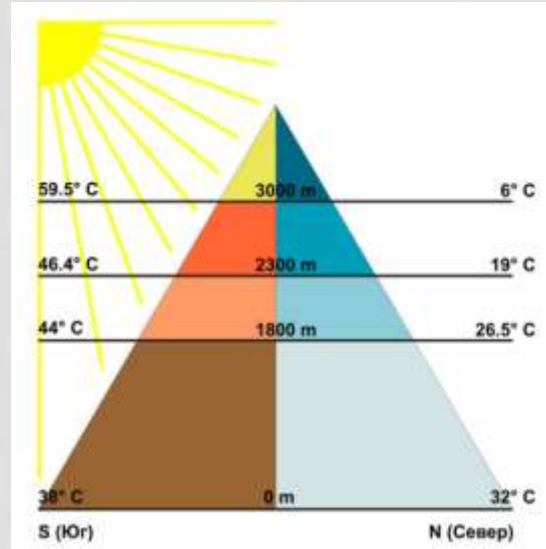
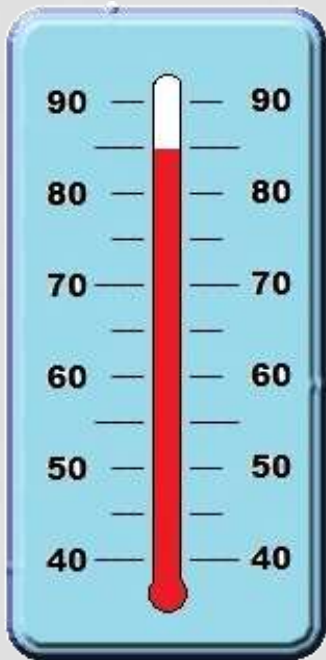
(In response to temperature, rain, humidity, and shade)

- A.
- B.
- C.
- D.
- E. All of the above



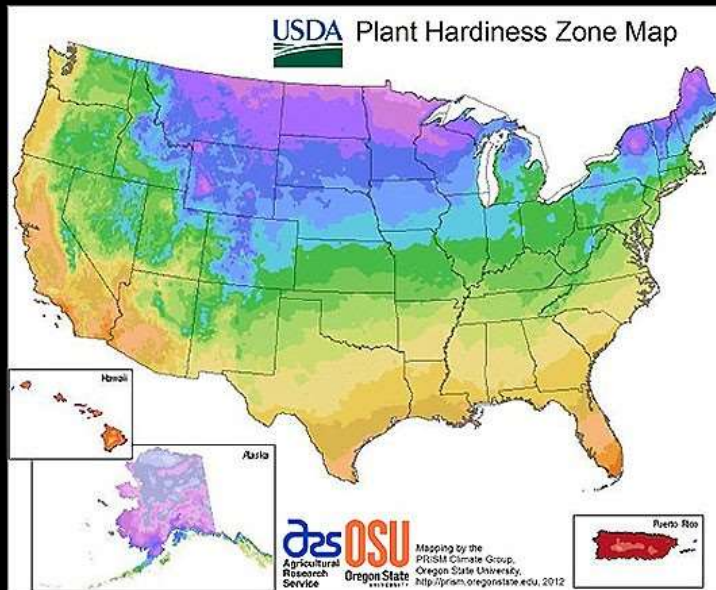


80 degrees+



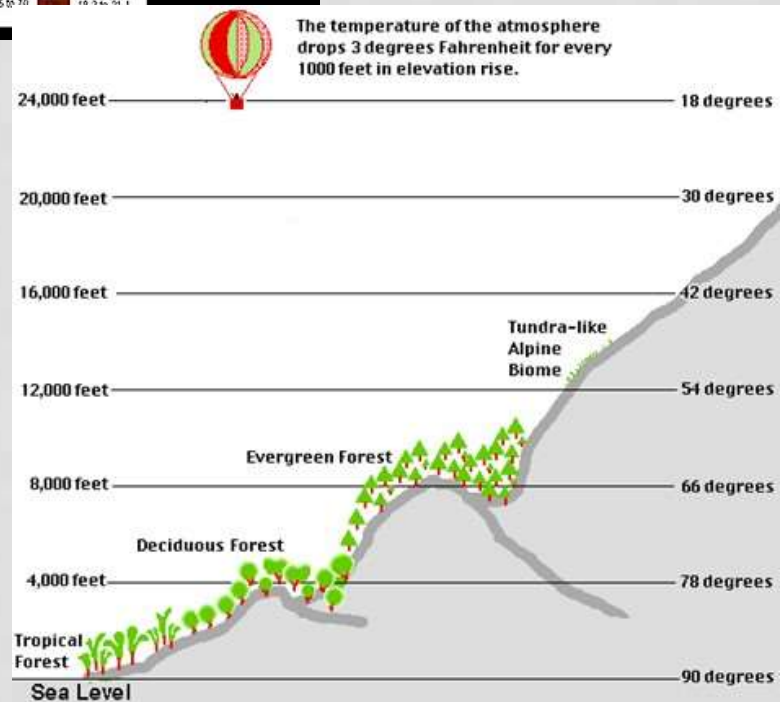
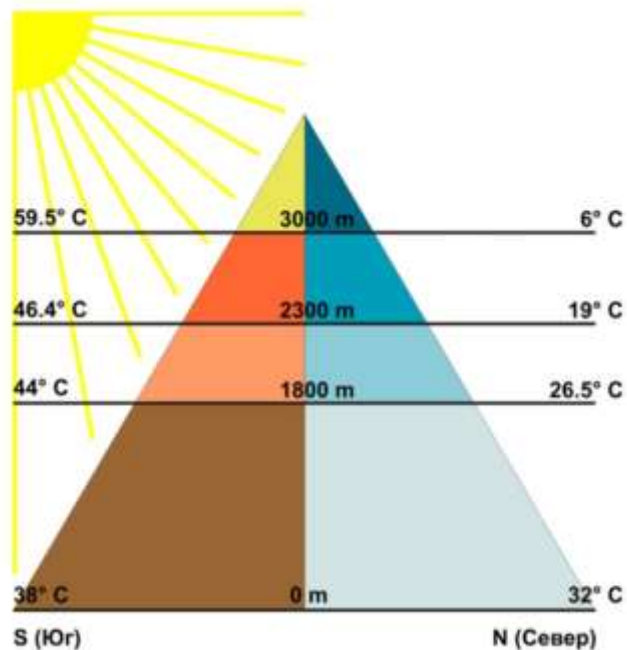
<20%

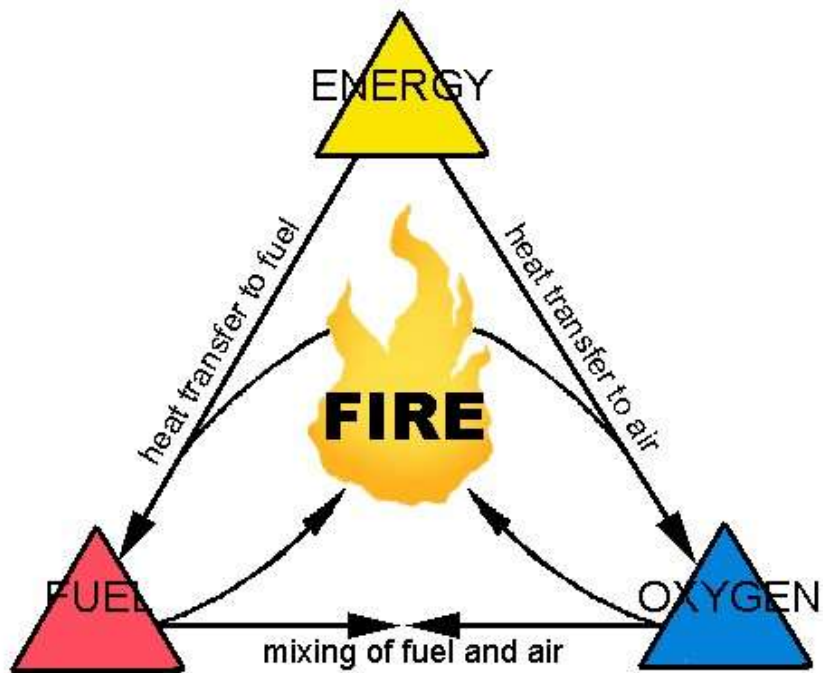




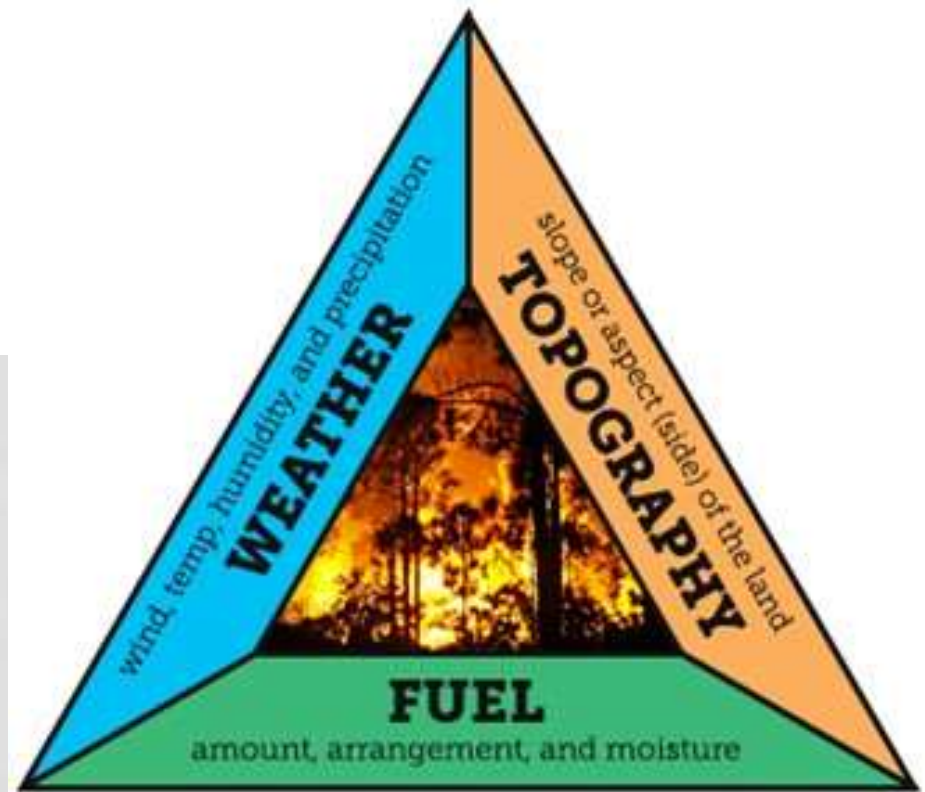
Average Annual Extreme Minimum Temperature 1976-2005

Temp (F)	Zone	Temp (C)
-60 to -55	1a	-51.1 to -48.3
-55 to -50	1b	-48.3 to -45.6
-50 to -45	2a	-45.6 to -42.8
-45 to -40	2b	-42.8 to -40
-40 to -35	3a	-40 to -37.2
-35 to -30	3b	-37.2 to -34.4
-30 to -25	4a	-34.4 to -31.7
-25 to -20	4b	-31.7 to -28.9
-20 to -15	5a	-28.9 to -26.1
-15 to -10	5b	-26.1 to -23.3
-10 to -5	6a	-23.3 to -20.6
-5 to 0	6b	-20.6 to -17.8
0 to 5	7a	-17.8 to -15
5 to 10	7b	-15 to -12.2
10 to 15	8a	-12.2 to -9.4
15 to 20	8b	-9.4 to -6.7
20 to 25	9a	-6.7 to -3.9
25 to 30	9b	-3.9 to -1.1
30 to 35	10a	-1.1 to 1.7
35 to 40	10b	1.7 to 4.4
40 to 45	11a	4.4 to 7.2
45 to 50	11b	7.2 to 10
50 to 55	12a	10 to 12.8
55 to 60	12b	12.8 to 15.6
60 to 65	13a	15.6 to 18.3
65 to 70	13b	18.3 to 21.1





Solar radiation  
Precipitation  
Aspect/Topography  
Elevation  
Soils Type



**Fire Behavior Triangle**

## Slope affects fire behavior

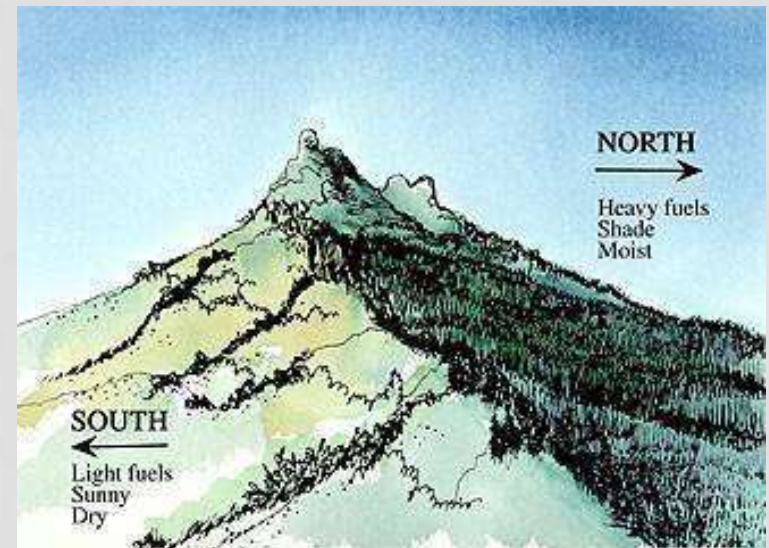
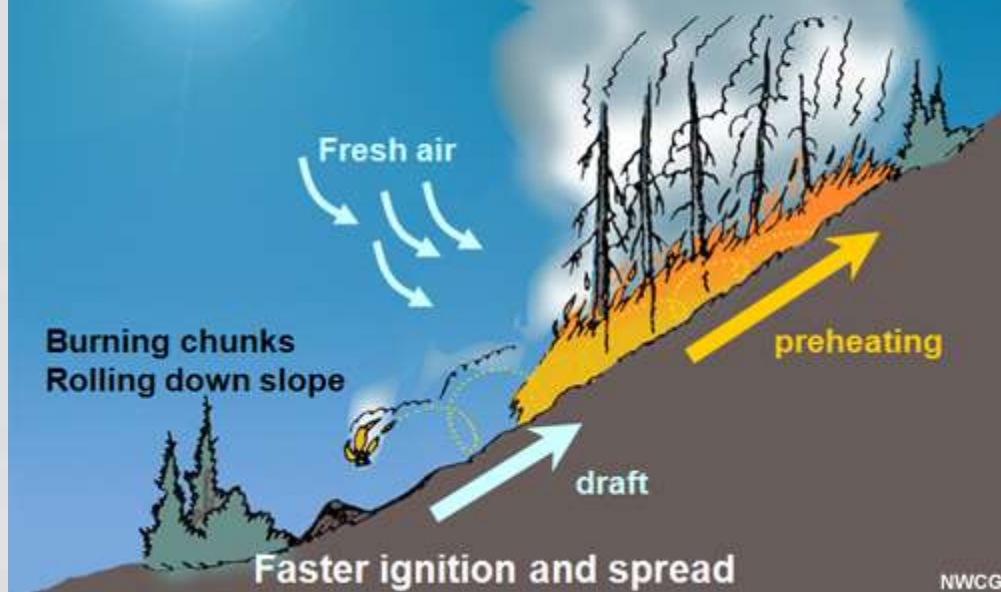


Figure 10—Spotting Across Narrow Canyon

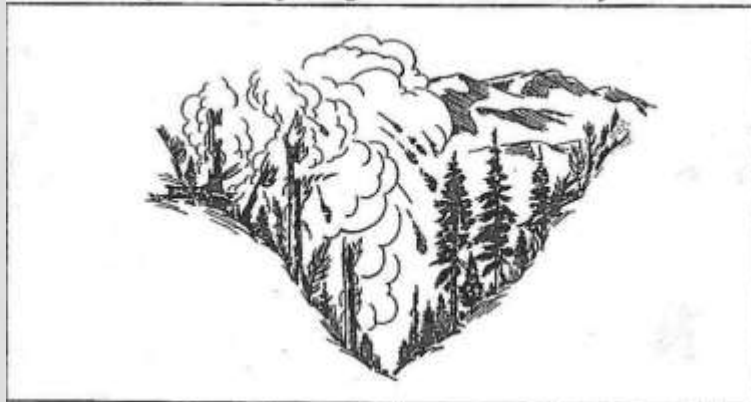
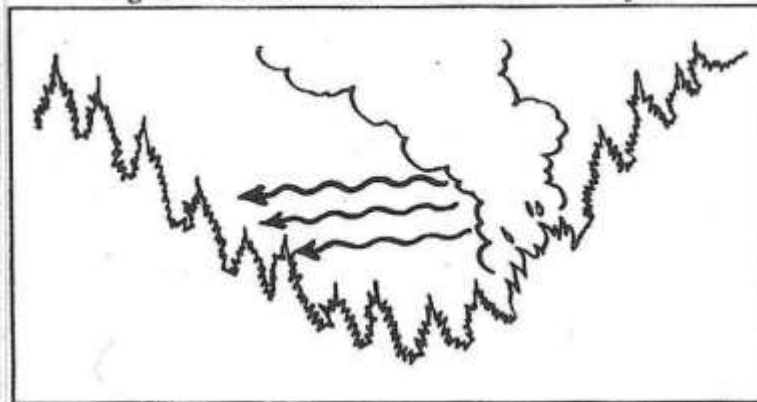
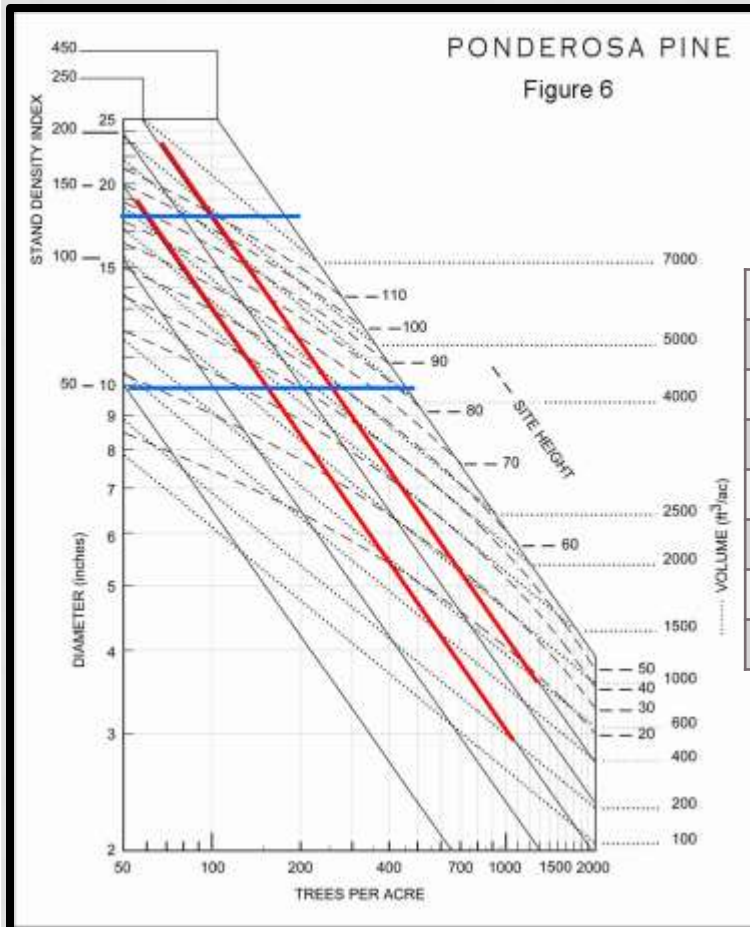


Figure 9—Radiant Heat Across Narrow Canyon

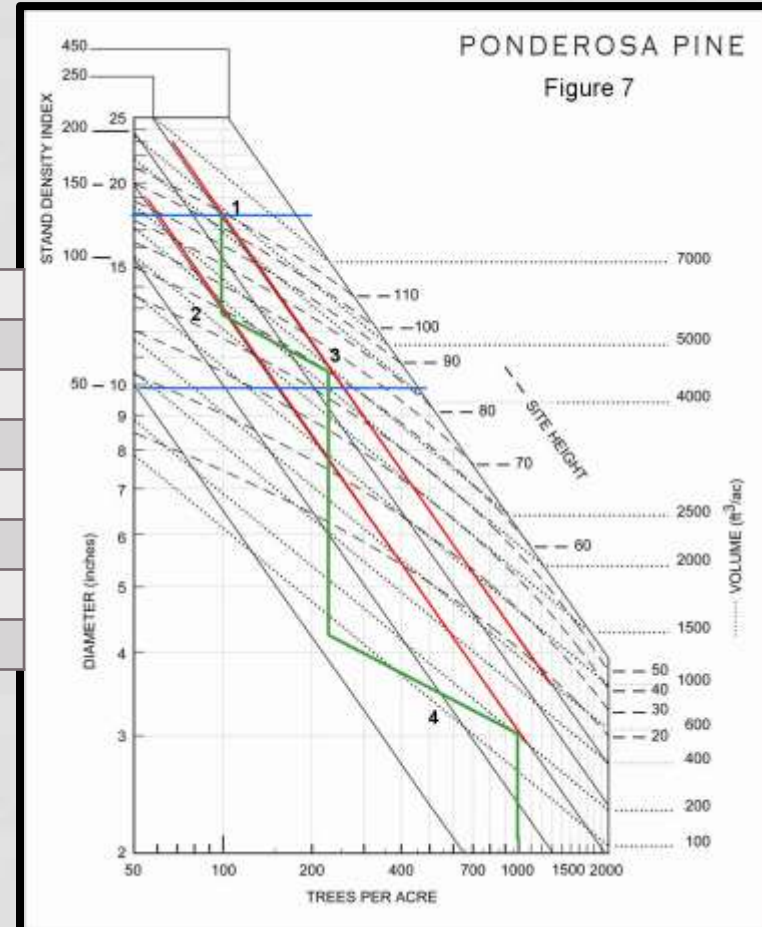


# DENSITY MANAGEMENT



## Spacing (feet) Trees/Acre

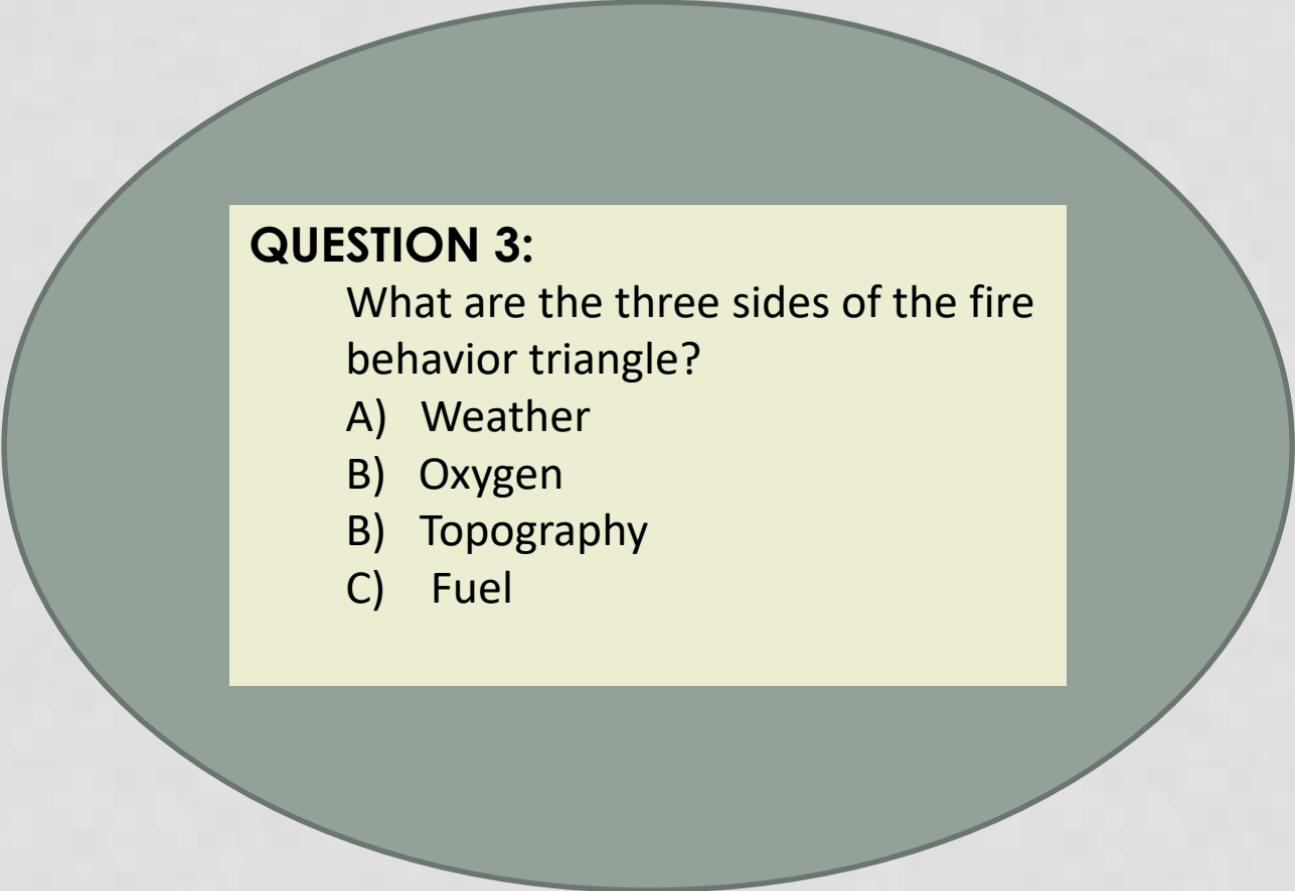
10x10	436
12x12	302
15x15	194
20x20	109
25x25	70
30x30	48
40x40	27



Long, J.N. and J.D. Shaw. 2005. A density management diagram for even-aged ponderosa pine stands. *Western Journal of Applied Forestry* 20(4):







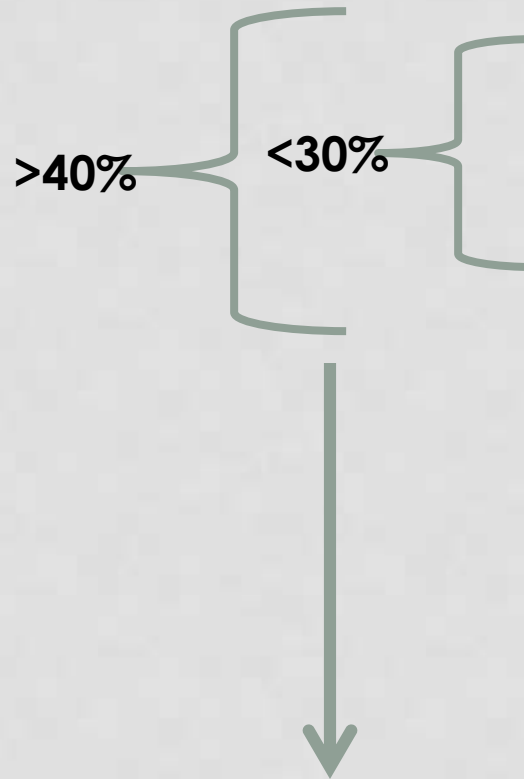
**QUESTION 3:**

What are the three sides of the fire behavior triangle?

- A) Weather
- B) Oxygen
- B) Topography
- C) Fuel

# MINIMIZE RISK

- Healthy stands of thinned, good looking trees
- Minimize disturbance and tree injury
- For beetles: harvest/disturb only between July and September – vectors are most active in Spring and Fall
- Consider planting incense cedar where pines are harvested with more moisture
- Watch out for poorly drained soils



BASED ON AGE AND VIGOR

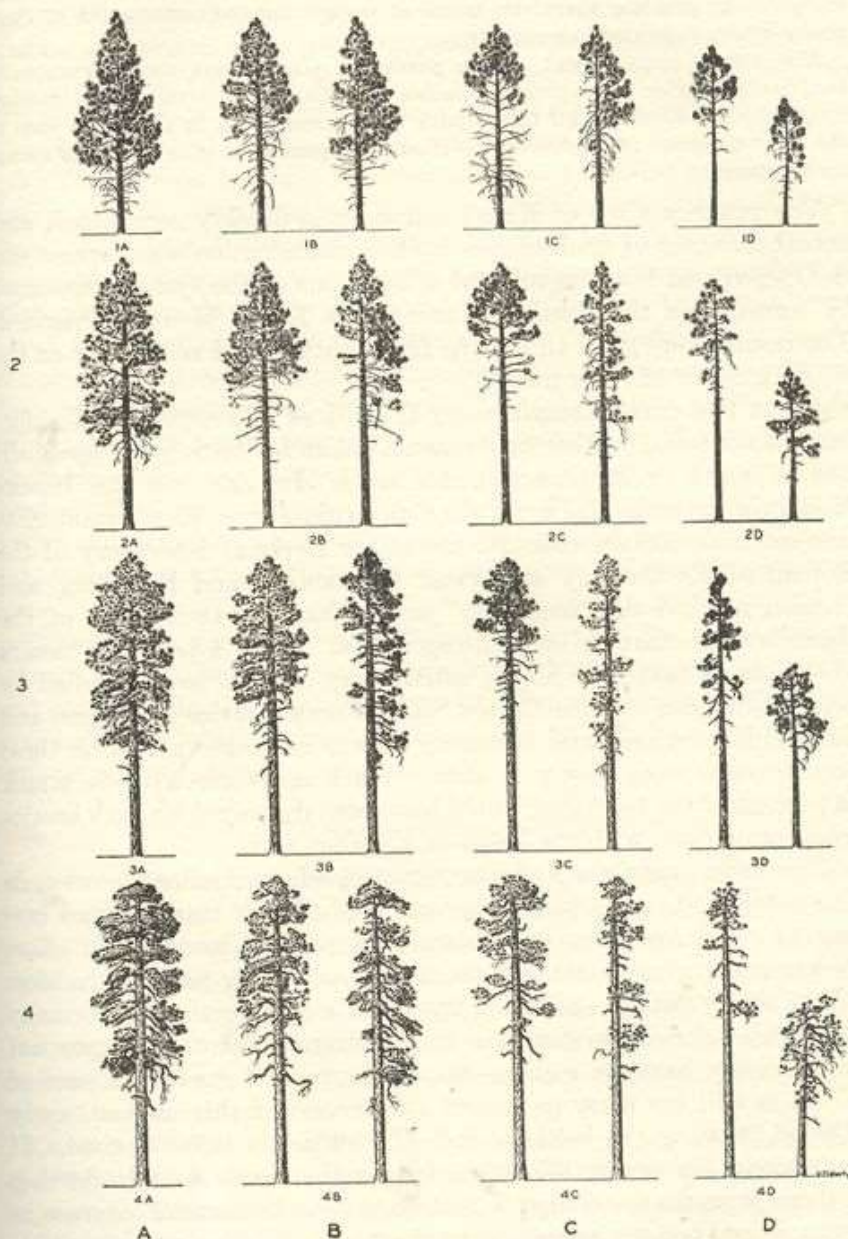


FIGURE 2.—Keen's tree classification based on age and vigor.



"Montana-Ponderosa Pine" – Jim Hubbard

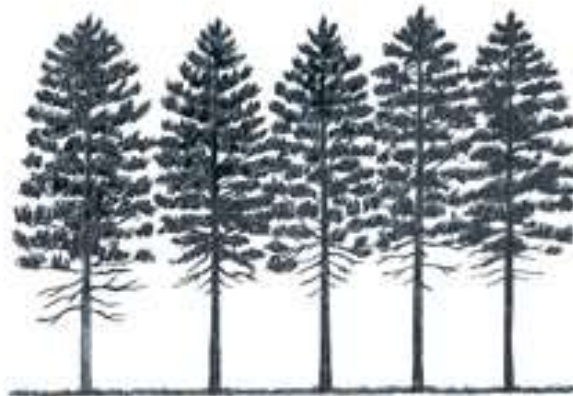
E.P. Keen in 1936 ("Relative susceptibility of ponderosa pines to bark beetle attack", published in the Journal of Forestry)



**Uneven-aged:** a stand with trees of three or more distinct age classes, either intimately mixed or in small groups.

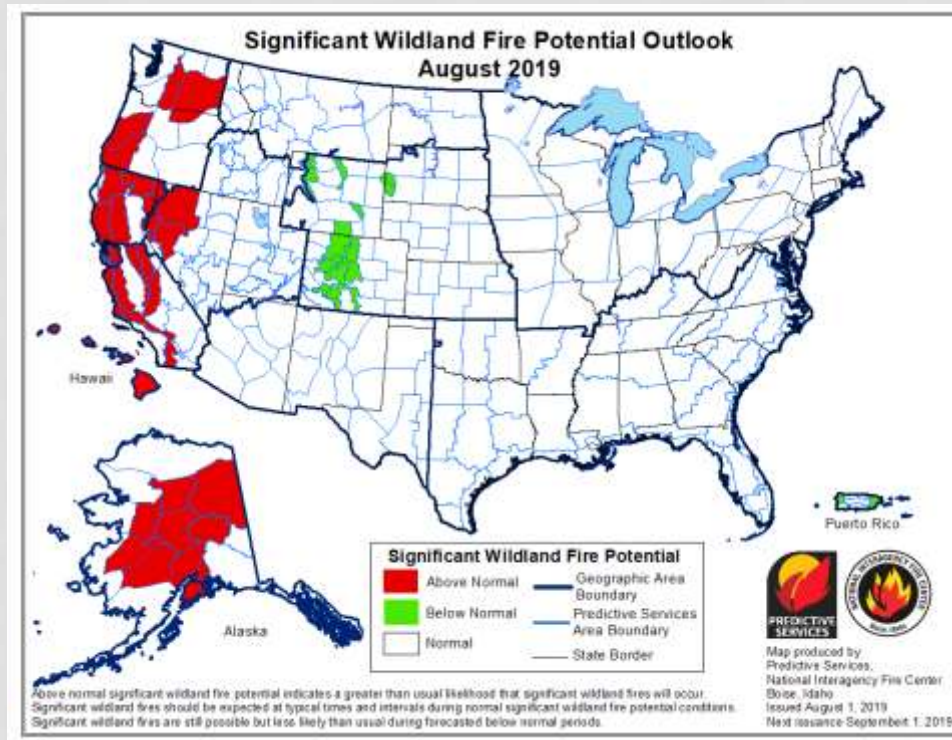


**Two-aged:** a stand with trees of two distinct age classes separated in age by more than plus or minus 20% of the rotation age.

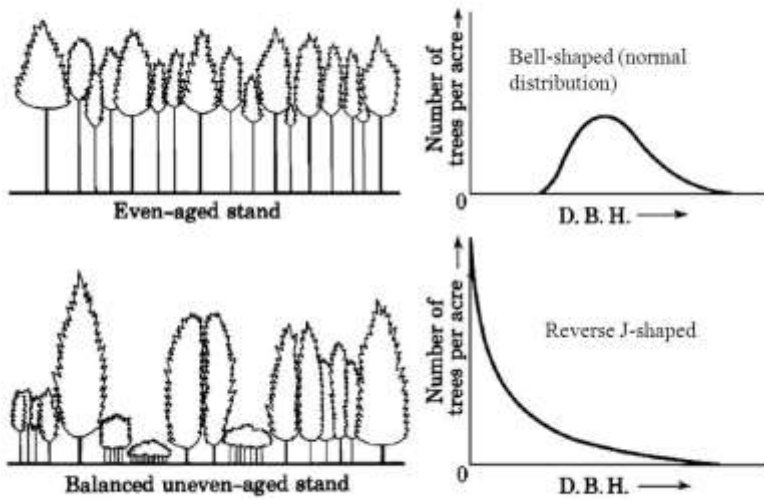


**Even-aged:** a stand composed of a single age class of trees in which the range of tree ages is usually plus or minus 20% of the rotation age.

**There's no more typical California wildfire season. It may be year-round, experts warn. "You're getting longer periods of the year when you get these fires. We're literally burning the candle at both ends," said a UCLA climatologist.**



## Even-aged vs. Uneven-aged Diameter Distributions





**QUESTION 4:**

What makes up a healthy tree – a healthy forest?

***CHAT RESPONSE***

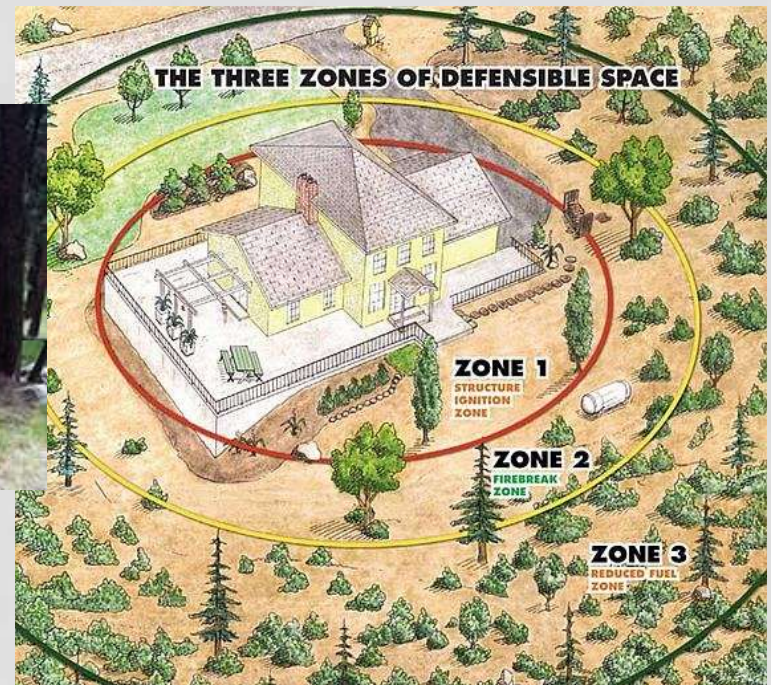


In a forest where fires rarely happen, fuel builds up: There's **surface fuel** (grass, logs, woody debris, brush); **ladder fuel** (shrubs, small trees, snags); and **tree crowns**.

1 Surface fires spread quickly through brush and woody debris.

2 Ladder fuels allow the fire to move up toward the forest canopy.

3 Tree crown fires are so intense, they're difficult to control.







**Figure 1a. Basal area of ~30 square feet per acre.**



**Figure 1b. Basal area of ~60 square feet per acre.**



**Figure 1c. Basal area of ~90 square feet per acre.**

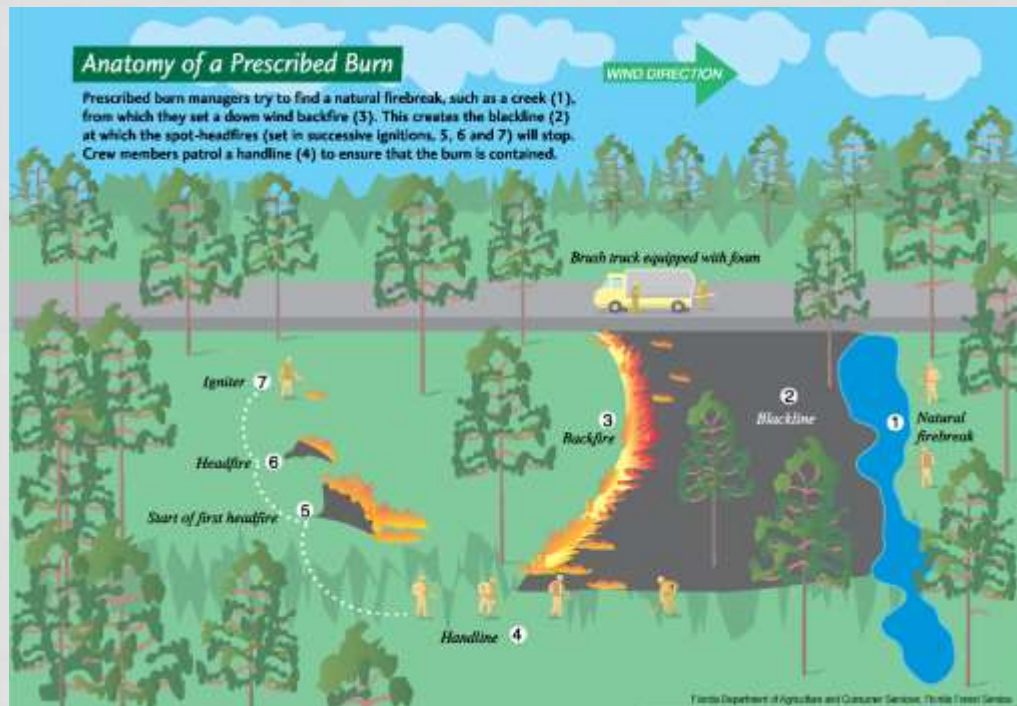


**Figure 1d. Basal area of ~120 square feet per acre.**



## Anatomy of a Prescribed Burn

Prescribed burn managers try to find a natural firebreak, such as a creek (1), from which they set a down wind backfire (3). This creates the blackline (2) at which the spot-headfires (set in successive ignitions, 5, 6 and 7) will stop. Crew members patrol a handline (4) to ensure that the burn is contained.







## What is a fuel ladder?

Flammable materials that feed a fire not only across the ground but up into the air.



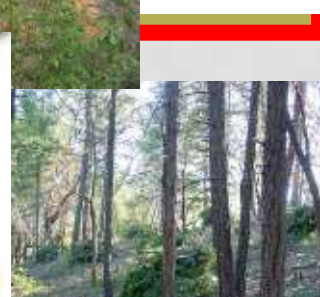
Before



After

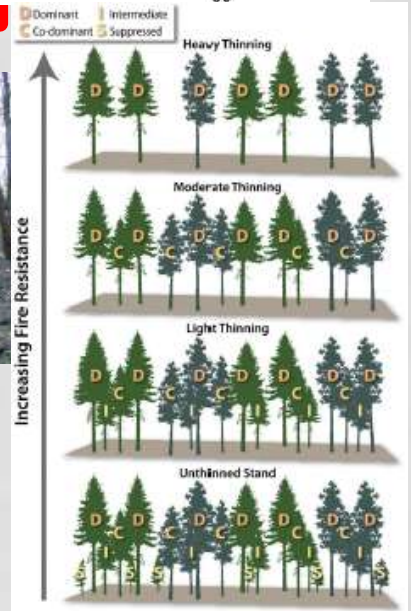


Source: County official from Missoula, Montana.



Fuelbreak  
160'

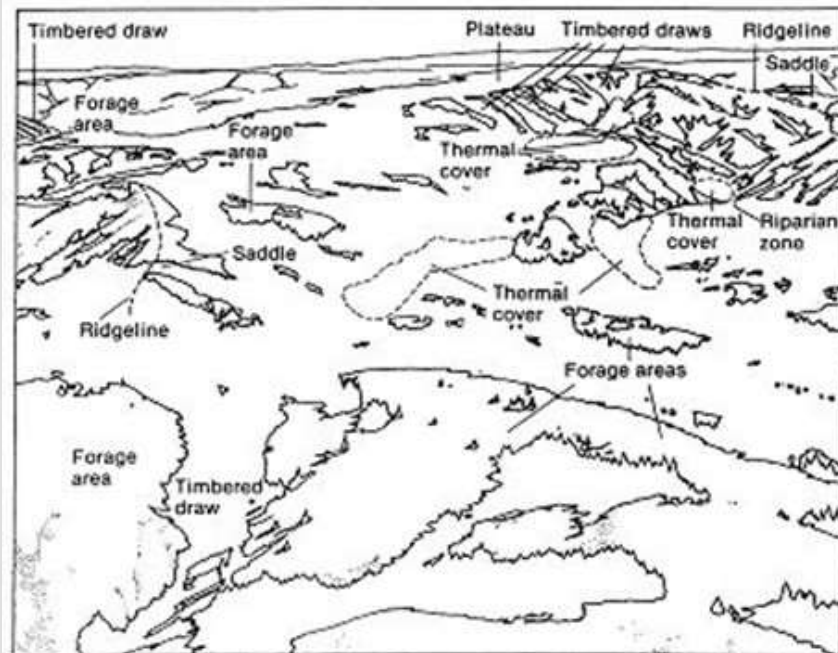
Fuelbreak  
60'



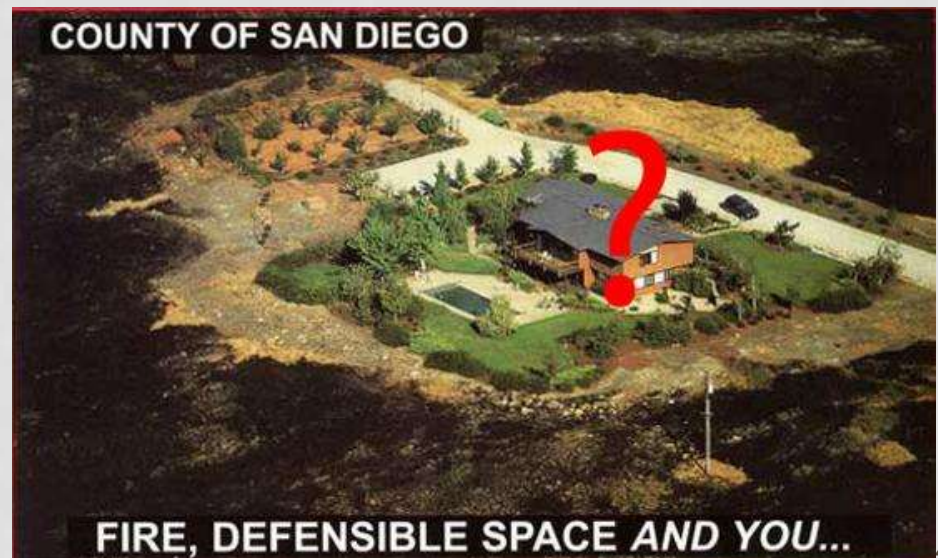
**QUESTION 5:**

Why did the Paradise Fire lose so many homes?

- A) Steep topography
- B) Lack of defensible space
- C) High levels of fuels
- D) Extreme fire weather
- E) None of the above
- F) All of the Above



**What is the state of fuel arrangement, dispersal, accumulation in a 1,000-home subdivision – with extreme weather (wind, heat, humidity)?**





## Subdivision in Santa Rosa destroyed by fire



Before



After



## Home in Gatlinburg



Before



After



**Oregon State University**  
**Extension Service**

**THANK YOU FOR LISTENING**  
**QUESTIONS?**

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