

Fire Triangle

1. What is fire?
2. Burnable things surround us every day. Why aren't they on fire?
3. What is the fuel in fires we are familiar with?
4. What fuels a forest fire?
5. Where does the oxygen for fire come from?
6. What heat sources do we use to start fires?
7. What provides heat for wildland fires?
8. How does wind influence fire?
9. Use the fire triangle to describe some ways to put out a fire.

Arranging Trees in the Forest 100 Years Ago

Three kinds of forest, three arrangements of trees

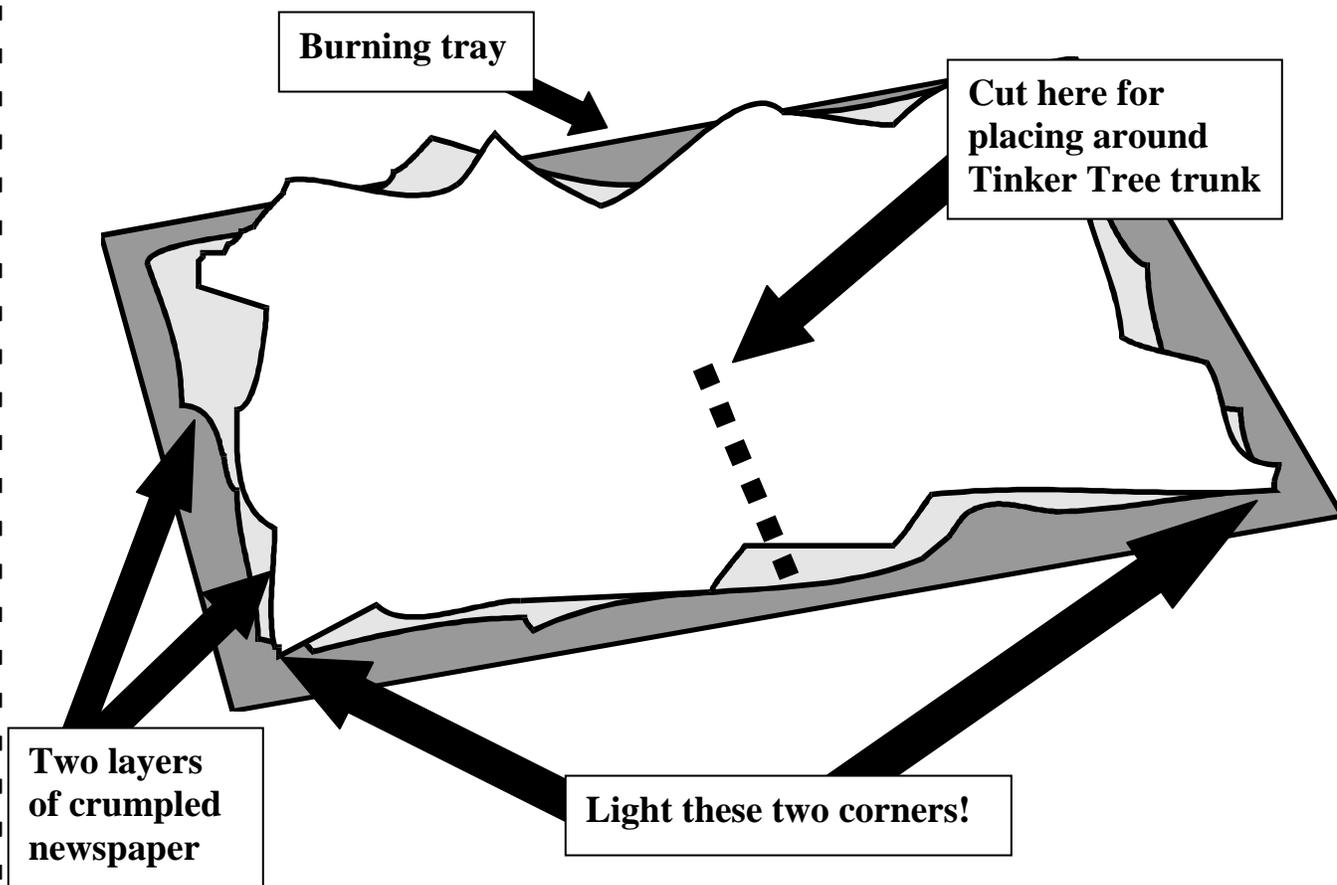
What kind of forest?	How many trees in a matchstick model?	How are the trees arranged?
Lodgepole pine/subalpine fir	49	Trees are dense and quite evenly spaced.
Ponderosa pine/Douglas-fir	5	Trees occur singly, occasionally in pairs.
Whitebark pine/subalpine fir	13	Trees occur in clusters of 2 to 5.

The matchstick model represents $\frac{1}{40}$ hectare ($\frac{1}{15}$ acre),
a square 16 m (about 50 ft) on a side.

Is this bigger than your classroom?

Burning Tray Setup

For Activities 3-6 and 3-7,
“Will It Burn?” and “Tinker Trees”



Derby Results

Tinker Team	Length of Branch with Unburned Foliage (cm)	
	Qualifying Round	Finals Round

**Species Assignments
for *Mystery Trees***

Species Name	Code	Students or Team Name
black cottonwood	B	_____
Douglas-fir	V	_____
Engelmann spruce	H	_____
lodgepole pine	E	_____
ponderosa pine	O	_____
quaking aspen	L	_____
subalpine fir	C	_____
western larch	T	_____
whitebark pine	J	_____

Tree Stories

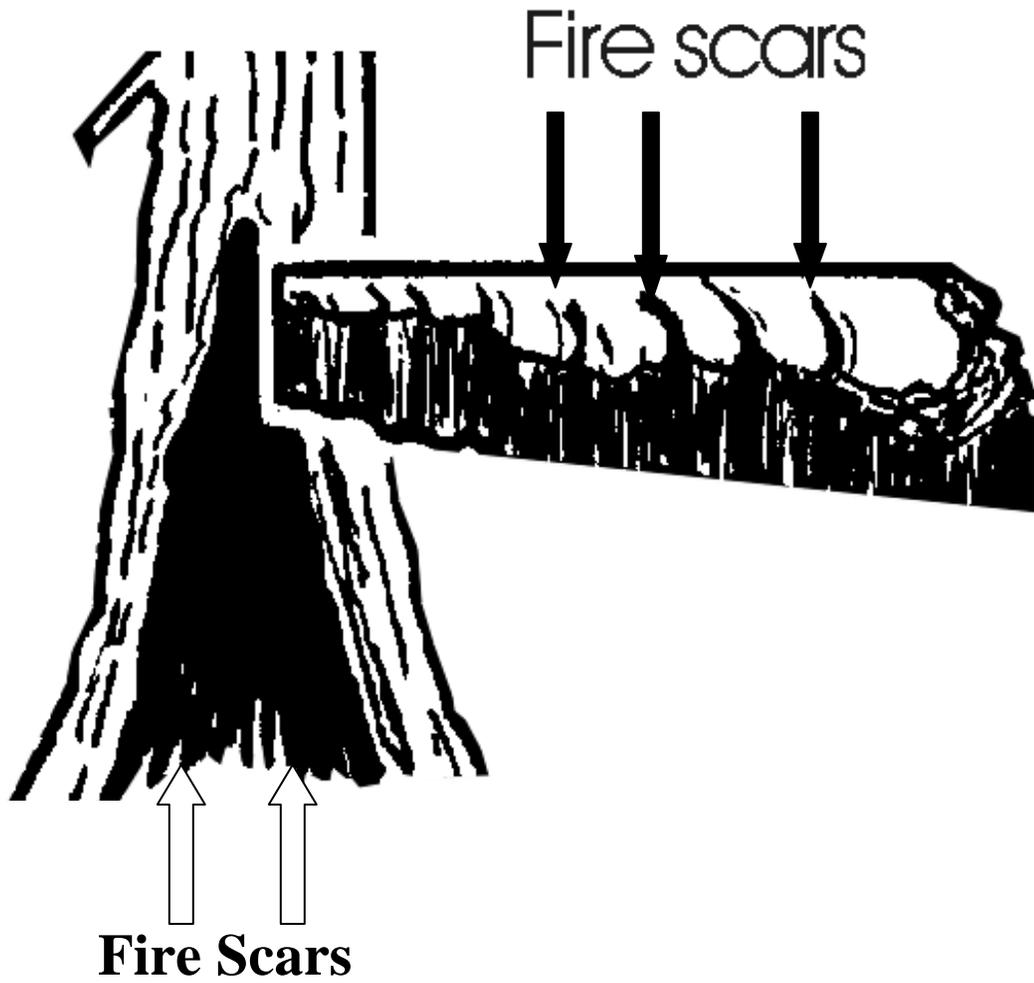
Ponderosa pine

Cookie number	How many scars?	How many rings?
102		
104		
106		
111		
113		
114		
116		
117		
118		

Interior Lodgepole pine

Cookie number	How many scars?	How many rings?
101		
103		
105		
107		
108		
109		
110		
112		
115		

Fire Scars



Fire History Data¹

Ponderosa pine

Cookie number	3. Approx. age	4. No. scars?	6. Ave. Interval
Real			
102			
104			
106			
111			
113			
114			
116			
117			
118			
The rest of the story:			
7	300	8	26.9
16	280	4	43.3
17	460	6	60.2
36	261	7	26.5
53	291	9	31.2
55	447	10	26.8
58	190	4	34
77	339	4	24
63	300	7	30.7
86	458	12	24.9
88	323	3	21
202	459	4	56.7
351	334	0	can't be calculated
352	297	0	calculated

Interior Lodgepole pine

Cookie number	3. Approx. age	4. No. scars?	6. Ave. Interval
Real			
101			
103			
105			
107			
108			
109			
110			
112			
115			
The rest of the story:			
91	150	1	can't be calculated
215	145	1	calculated
350	178	1	
303	112	0	
304	202	0	
305	186	0	
306	137	0	
307	117	0	
308	386	0	
309	90	0	
310	350	0	
311	101	0	
312	70	0	
313	150	0	

¹ According to fire historians Steve Arno and Steve Barrett, about 10% of mature ponderosa pine forests and 50% of mature lodgepole pine forests have no fire-scarred trees. Cookie numbers greater than 300 are used here to represent these forests, so that students can analyze the full range of the history of surface fire for each forest type.

Plant Species Codes for “Buried Treasures”

Each plant in the *Buried Treasures* Box has a number marked on it or attached to it. Here are the species for those code numbers:

- 1.. Arrowleaf balsamroot
2. beargrass
3. fireweed
4. glacier lily
5. pinegrass
6. serviceberry
7. smooth woodrush
8. snowbrush *Ceanothus*
9. wild onion

Lodgepole Pine Data

Name _____

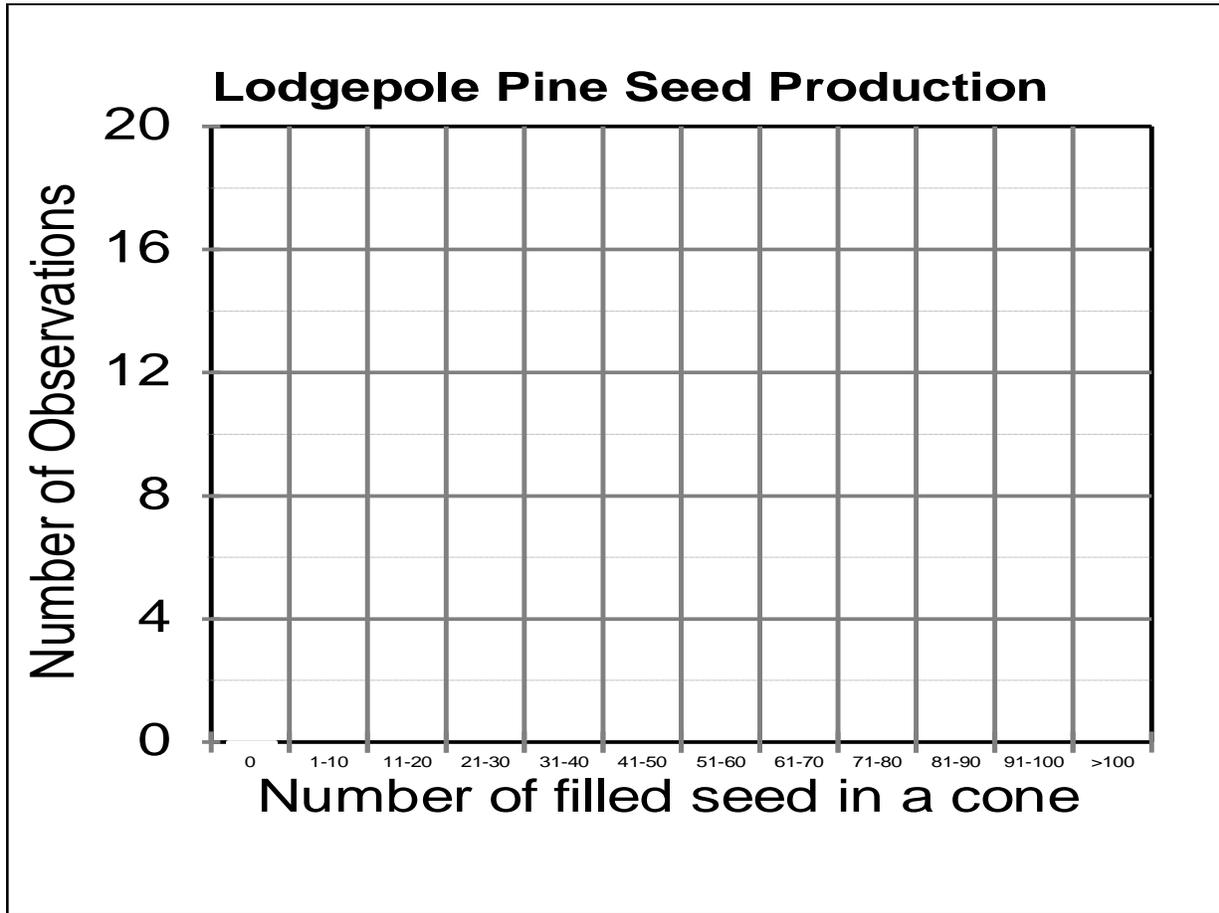
- List the number of seeds in each cone. If someone found no filled seed in a cone, record a "0." If most of the trees in a forest are producing no live seed, that's important to know.

- Count the number observations from above that showed zero seed, the number with 1-10 seeds, etc.

No. of seed/cone	Number of students finding that many seeds/cone
0	
1-10	
11-20	
21-30	
31-40	
41-50	
more than 50	

- Show your results on a bar graph. Write "Number of observations" along the Y axis. Write "Number of Seeds per Cone" along the X axis. Write these categories along the X axis: 0, 1-10, 11-20, 21-30, 31-40, 41-50, >50. Draw bars that show the results of your tally. This kind of graph is called a "histogram."

Lodgepole Pine Seed Production: *Histogram* of Seeds per Cone



Designer Tree Rules

Each Tree Designer Team:

1. Draw a Place Card. The card describes the place that you will design a tree for. The place may be at a low or high elevation, and it may have poor or rich soil. The Place Card states how many "sun dollars" you can get for your location at the Resource Bank. Some locations have more resources available for plants than others.
2. Visit the Bank. Obtain the money that your Place Card entitles you to.
3. Plan how to use your sun dollars to buy Tree Traits. Your Designer Tree should be able to survive the kinds of fires likely in your special place, or it should be able to reproduce well after fires, or both.
4. After you finish your budget, visit the Tree Store to buy Trait Cards.
5. You can return any Trait Card to the bank for a refund. The banker may charge a fee for returned cards.
6. You can trade or buy Trait Cards from other teams. If you bargain, both teams have to agree on the price.
7. When you have finished buying and bargaining for Traits, draw a picture of your Designer Tree in your special Place. Include all the information from your Place Card and label every Trait that you bought or traded for.
8. Present and explain your Designer Tree to the class.

Assignment List

Forest Inhabitant	Community*	Student Name
American marten	moist, old—especially fir	
Armillaria root rot	PP—favors Douglas-fir trees	
Arrowleaf balsamroot	PP	
Beargrass	LP, WB	
Black-backed woodpecker	LP	
Blue huckleberry	LP	
Clark’s nutcracker	WB	
Douglas-fir	mainly PP	
Douglas-fir mistletoe	mainly PP—favors Douglas-fir	
Elk	all	
Fireweed	mainly LP	
Flammulated owl	PP	
Glacier lily	LP, WB	
Grizzly bear	WB, LP	
Grouse whortleberry	WB	
Lodgepole pine	LP	
Mountain pine beetle	mainly LP	
Pileated woodpecker	PP	
Pinegrass	mainly PP	
Ponderosa pine	PP	
Red squirrel	all, but be sure to show in WB	
Red-backed vole	old, moist—especially fir	
Saskatoon serviceberry	PP, LP	
Smooth woodrush	WB	
Snowbrush <i>Ceanothus</i>	PP, LP	
Subalpine fir	LP, WB	
White pine blister rust	WB	
Whitebark pine	WB	
Wild onion	PP, LP	

* PP=ponderosa pine/Douglas-fir; LP=lodgepole pine/subalpine fir; WB=whitebark pine/subalpine fir.

Smoke Recipes

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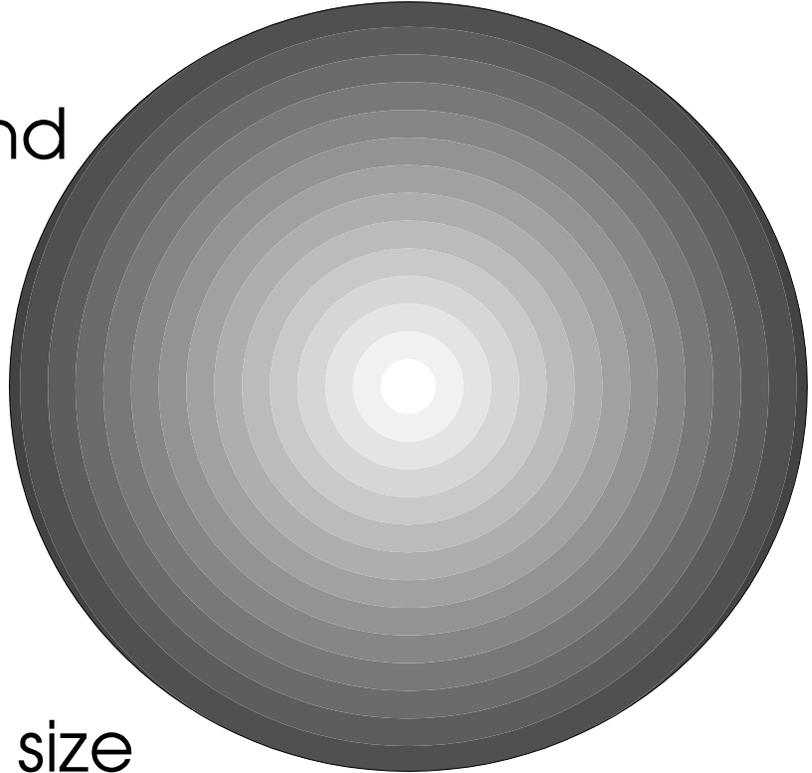
Ingredient size:

beach sand

flour 



PM-2.5, max. size



Measurements and Procedures:

Recipe 1. 30 grams twigs, no moisture added

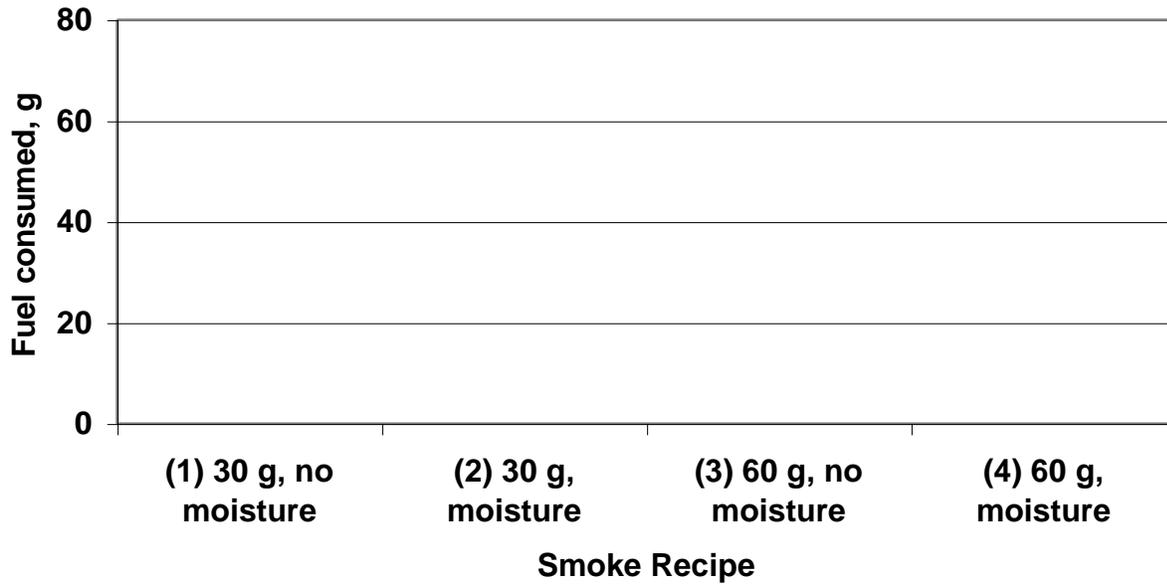
Recipe 2. 30 grams twigs, moisture added

Recipe 3. 60 grams twigs, no moisture added

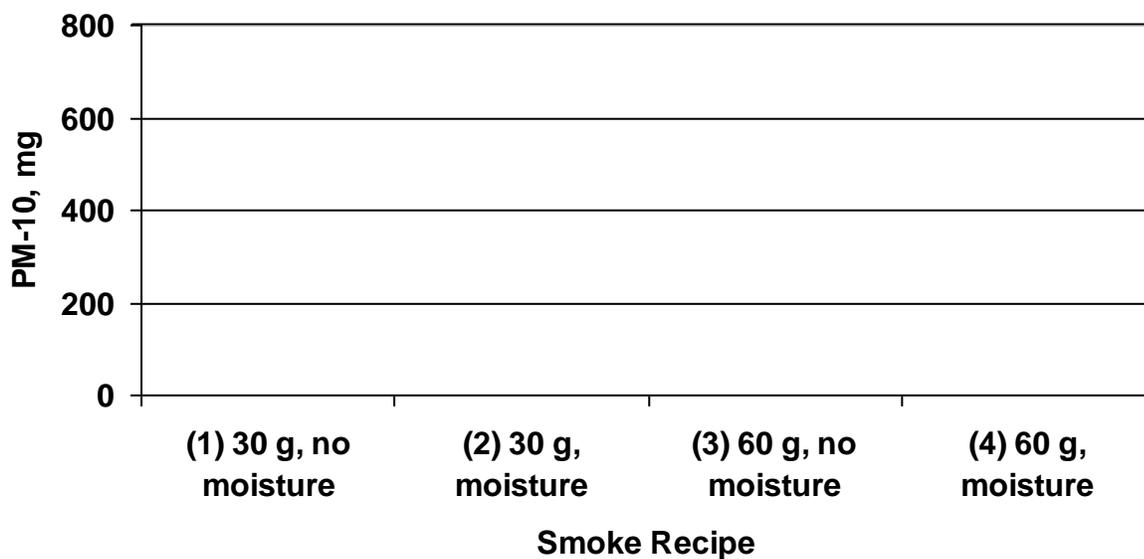
Recipe 4. 60 grams twigs, moisture added

How Smoky?

9. How much fuel consumed?



11. How much smoke?



Woods Hunt Details

Order of Information Stations

Cut the following table into 6 vertical strips, and give one strip to each student team.

| Visit the Information Stations in this order: |
|---|---|---|---|---|---|
| 1 | 6 | 5 | 4 | 3 | 2 |
| 2 | 1 | 6 | 5 | 4 | 3 |
| 3 | 2 | 1 | 6 | 5 | 4 |
| 4 | 3 | 2 | 1 | 6 | 5 |
| 5 | 4 | 3 | 2 | 1 | 6 |
| 6 | 5 | 4 | 3 | 2 | 1 |

Team Scores for Woods Hunt

Use this table to compute team scores for the Woods Hunt and select the winning team.

Team Name	Number Correct Answers	Total Number Questions Asked	Team Score (%)
		30?	
		30?	
		30?	
		30?	
		30?	
		30?	