Student Page 1

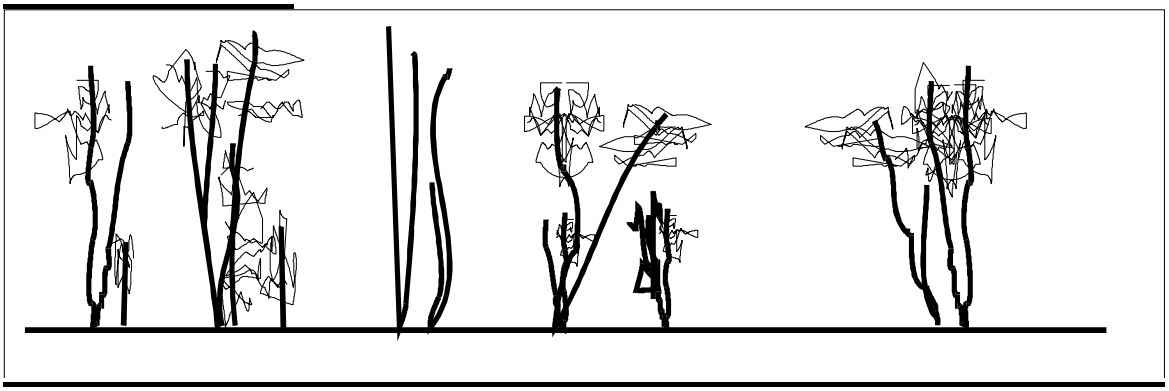
Name: _____

Draw and color a typical fire in each kind of forest.

Ponderosa Pine

Lodgepole Pine

Whitebark Pine



Student Page 2

Fire Triangle Kit

1. Cut along the lines to make the three "legs" of your Fire triangle.
2. Mark one leg "Fuel." Mark another "Oxygen." Mark another "Heat." Decorate the pieces.
3. Punch holes on the X marks at the ends of each leg.
4. Put brads or other connectors through the holes and connect the legs of the triangle. Write your name on the back.
5. If you remove one leg of a paper triangle, what happens to it?
6. If you remove one leg of the Fire Triangle, what happens to the fire?

X	X	X
X	X	X

Student Page 3

Names: _____

Testing the Fire Triangle—Experiment 1.

Organize your team. On a team of 4, one person should light matches and observe heat; one should measure time, one should measure flames, and one should record data. Change jobs if you repeat the experiment.

Procedures:

1. Place the burning tray on a heat-resistant surface. Set the support stand in the center of the burning tray. Attach the clamp near the top of the ring stand. Attach the rod with alligator clips to the clamp, so it forms a "T" with the stand.
2. Clip a wooden match to each alligator clip. Clip in one match so the ignitable tip points straight up. Clip in the other so the ignitable tip points down.
3. Light a third match and use it to ignite the downward-pointing match. Record your observations in the first column below, lines 1 and 2.
4. Use another match to ignite the upward-pointing match. Record your observations in the second column below, lines 1 and 2.
5. Do the experiment with two fresh matches. Have one person on the team carefully place her or his hand above, below, and next to the flame to see if any areas are hot. Record observations in line 3 below, both columns.
6. Do the experiment again, if necessary, so you can answer questions 3 and 4 below.

Match is pointing...	**DOWN**	UP
1. Without putting the ruler in the flame, estimate how long the flame is (cm).		
2. How long did the fire burn (seconds)?		
3. What direction did most of the heat go?		
4. Why do you think the match went out? What part of the Fire Triangle was removed?		

Student Page 4

Names: _____

Testing the Fire Triangle - Experiment 2.

Organize your team. One person should set up the experiment. One should try to light the candle. One should record observations. Change jobs if you repeat the experiment.

Procedures:

1. Place the candle inside a beaker.
2. Ask your teacher to place 1 or 2 pieces of dry ice into the beaker, next to the candle.
3. Leave the beaker alone for a few minutes. Don't bump or move or stir the beaker.
4. After 5 minutes, answer question 1 below.
5. Try to light the candle.
6. Answer questions 2 and 3.

1. Describe any changes that occurred in the beaker during the minutes before you light the candle.	
2. Describe what you observe when you try to light the candle.	
3. Use the Fire Triangle to explain what you observe.	

Student Page 5

Names: _____

The Fire Triangle in Wildlands

In this demonstration, you watch fires on three slopes--flat, medium, and steep. Answer questions 1-3 using the demonstration fires as examples.		
1	How does the steepness of a hillside affect a fire's spread?	
2	How well do fires burn downhill?	
3	How does slope affect fire spread? Use the Fire Triangle to explain.	
Now you will burn two more "matchstick forests" to explore how the arrangement of trees affects fire spread. Answer the questions below.		
	Description of matchstick forest	How well did this arrangement resist crown fire?
4	Ponderosa pine/Douglas-fir forest 100 years ago (5 large trees in area where lodgepole pine might have 50 trees)	
5	Whitebark pine/subalpine fir forest (13 trees, growing in clusters of 2-5 trees, in area where lodgepole pine might have 50 trees)	
6	Use the Fire Triangle to explain.	

Student Page 6

Names: _____

Exp 1. Dead *vs.* Green Needles

1. Organize your team. Everyone should observe the fires. One person should record information on the data sheet AFTER the whole team has talked over what to write.
2. Get your materials together and set up your work station.
3. Use what you already know about fire, including the Fire Triangle, to guess which needles (green or dead) will be easier to burn. Write this *hypothesis* on line 1.
4. Place the burning tray on a flame-retardant surface in a laboratory or on a paved surface outdoors with little wind.
5. Crumple up two quarter-page sheets of newspaper. Flatten them out a bit, so some air gets between the layers. Place them, one on top of the other, on the burning tray (as shown on Class Page 3).
6. Lightly spread the dead pine needles on top of the newspaper in the burning tray. Scatter them around on the paper; don't leave them in a single pile.
7. Use a match to ignite two adjacent corners of newspaper.
8. Observe the fire.
9. Describe how well the dead needles burned on line 2.
10. Shake the burned and partly burned materials into a metal trash can. Spray water on them, if necessary, to put out any smoldering. (Fire is not completely out until there is no smoke.)
11. Repeat steps 3 through 8 with the live ponderosa pine needles. Record observations on line 3.
12. Answer the questions on lines 4 and 5.

1. **Hypothesis:** Which needles do you think will be easier to burn?	
2. How well did the **dead needles** burn?	
3. How well did the **live needles** burn?	
4. Was your hypothesis correct?	
5. Use the three legs of the **Fire Triangle** to explain your results.	

Student Page 7

Names: _____

Exp 2. Tree Buds—Pine *vs.* Fir

1. Organize your team. Everyone should observe the fires. One person should record information on the data sheet AFTER the whole team has talked over what to write.
2. Get your materials together and set up your work station.
3. Use what you already know about fire to guess which bud will be easier to damage with fire. Write your *hypothesis* on line 1.
4. Place the burning tray on a flame-retardant surface in a laboratory or on a paved surface outdoors with little wind.
5. Crumple two quarter-page sheets of newspaper into two balls. Flatten them out on the tray but leave room so some air can get between the layers (as shown on Class Page 3).
6. Place the two to four tree buds of each species on top of the newspaper. Don't bunch them together; spread them out over the newspaper.
7. Use a match to ignite two adjacent corners of the newspaper.
8. Observe the fire.
9. Look at the burned buds. Try to scrape away the burned outside.
10. Answer questions 2-5.

1. **Hypothesis:** Which bud do you think will be easier to damage with fire?	
2. Describe the burned **Douglas-fir** bud. Do you think the cells inside it survived?	
3. Describe the burned **ponderosa pine** bud. Do you think the cells inside it survived?	
4. Do you think your hypothesis was correct?	
5. Use the **Fire Triangle** to explain your results.	

Student Page 8

Names: _____

Exp 3. Large *vs.* Small Twigs

1. Organize your team. Everyone should observe the fires. One person should record information on the data sheet AFTER the whole team has talked over what to write.
2. Get your materials together and set up your work station.
3. Use what you already know about fire, including the Fire Triangle, to guess which twigs will be easier to burn. Write this *hypothesis* on line 1.
4. Place the burning tray on a flame-retardant surface in a laboratory or on a paved surface outdoors with little wind.
5. Crumple two quarter-page sheets of newspaper into two balls. Flatten them out a bit on the burning tray, so some air gets between the layers (as shown on Class Page 3).
6. Spread the small twigs on top of the newspaper. Spread the twigs around on the paper; don't leave them in a single pile.
7. Use a match to ignite two adjacent corners of newspaper.
8. Observe the fire.
9. Describe how well the twigs burned on line 2.
10. Shake the burned and partly burned materials into a metal trash can. Spray water on any smoldering materials. (Fire is not completely out until there is no smoke.) Then dry the tray.
11. Repeat steps 4 through 10 with the large twigs. Record observations on line 3.
12. Answer the questions on lines 4-5.

1. **Hypothesis:** Which twigs do you think will be easier to burn?	
2. How well did the **small twigs** burn?	
3. How well did the **large twigs** burn?	
4. Was your hypothesis correct?	
5. Explain your results using the **Fire Triangle**.	

Student Page 9

Names: _____

Exp 4. "Root Sandwich"

1. Organize your team. Everyone should observe the fires. One person should record information on the data sheet AFTER the whole team has talked over what to write.
2. Get your materials together and set up your work station.
3. Use what you already know about fire, including the Fire Triangle, to guess which material (duff or mineral soil) will protect plant roots in the soil better. Write your *hypothesis* on line 1 below.
4. Place the burning tray on a flame-retardant surface in a laboratory or on a paved surface outdoors with little wind.
5. Crumple two quarter-page sheets of newspaper into balls. Flatten them out a bit on the burning tray but leave room so air can get between the layers (as shown on Class Page 3).
6. Cut five pieces of cotton string about 10 cm long. The string represents plant roots. Place it on the newspaper. Sprinkle a handful of duff loosely around the string without covering it completely.
7. Place three layers of newspaper on top of the duff and string. This makes a "root sandwich."
8. Use a match to ignite two adjacent corners of newspaper.
9. Observe the fire.
10. After the fire goes out, describe the cotton string on line 2.
11. Shake the burned and partly burned materials into a metal trash can. Spray water on any smoldering materials. (Fire is not completely out until there is no smoke.) Dry the tray.
12. Repeat steps 4 through 11 with more strands of string and a handful of mineral soil rather than duff. Record observations on line 3.
13. Answer the questions on lines 4-5.

1. **Hypothesis:** Will **duff** or **mineral soil** protect plant roots better?	
2. How well did **duff** protect the "root"?	
3. How well did **mineral soil** protect the "root"?	
4. Was your hypothesis correct?	
5. Use the **Fire Triangle** to explain your results.	

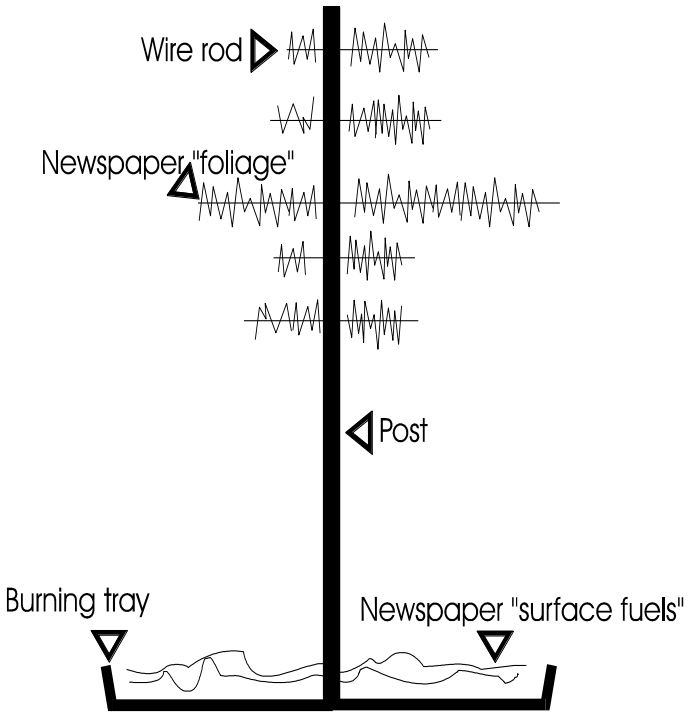
Student Page 10

Derby Rules

A tinker tree is a two-dimensional model of a tree. Its trunk is a lab support stand. Its branches are rods stuck through holes in the trunk. Its leaves are strips of newspaper.

Your Goal:

Design and build a tinker tree that does not burn when a fire passes under it. Your job could be easy—just put together a tree with no leaves. But your tree must have foliage to win the Tinker Tree Derby. You have to figure out how much foliage to use, and how to arrange it on the tree, so the tree will still survive surface fire.



Procedure:

1. Place a support stand in the center of the burning tray.
2. Crumple up two quarter-pages of newspaper. Flatten them out a bit, but make sure that some air can bet between the layers, as shown on Class Page 3.
3. Cut a line from one edge of the newspaper to the middle, then place both layers on the support stand base, with the "tinker tree" at the center.
4. Slide wire "branches" through the holes in the support stand (tree trunk).
5. Cut strips of newspaper 50 cm long and 5 cm wide. Fold them accordion-style and punch a hole through all layers of each strip. This is your tinker tree foliage. (This step may already be done for you.)
6. Slide a foliage strip onto each tinker tree branch. for short branches, you may shorten the newspaper strip.

If you use any water on your tinker tree or experimental setup before it is burned, it will be disqualified.

Student Page 11

Perfect Ten?

This table lists traits of trees that affect their ability to survive a fire. Study the traits of each species. Then, in the column at right, assign 1 to 10 points for the species' ability to survive a fire.

Species	Bark on old trees	Roots	Architecture		Foliage: How Flam-mable?	Survival Score (1-10)
			Tree's Branches	Kind of Forest		
Black cottonwood	thick	shallow	open	open, shrubby	low	
Douglas-fir	very thick	deep	open	moderate to dense	high	
Engelmann spruce	thin	shallow	low, dense	dense	medium	
Grand fir	thick	shallow	low, dense	dense	high	
Lodgepole pine	very thin	deep	high, open	open to dense	medium	
Quaking aspen	very thin	shallow	open	open	low	
Ponderosa pine	very thick	deep	high, open	open	high	
Subalpine fir	very thin	shallow	very low, dense	moderate to dense	high	
Western larch	very thick	deep	high, very open	open	low	
Whitebark pine	thin	deep	high, open	open	medium	

Is your most fire-resistant tree a "perfect ten"?

If not, what traits would make it "perfect"?

Look up your most fire-resistant tree species in the *FireWorks Notebook* or on the Internet at www.fs.fed.us/database/feis.

Does it have any ways to protect its seed from fire? Explain.

If a fire kills the crown of the tree, can it grow back? Explain.

Student Page 12

Tree Parts Glossary

bark: the outside covering on a tree's trunk and branches, the tree's "skin"

branch: limb of a tree or shrub that grows out from the trunk.

broad-leafed: the kind of tree that has wide, flat leaves. Most broad-leafed trees in our area drop their leaves in the fall.

bud: There are two kinds of buds. One kind is the flower bud. That's the flower before it opens. The second kind is the starting point for plant growth. That's the kind of bud we talk about in *FireWorks*. Sometimes people call this kind of bud the ***meristem***. These buds grow at the tips of tree and shrub branches, at the tips of roots, and sometimes in other places. Buds have lots of living cells.

cambium: a layer of living cells under a tree's bark. This layer of a tree's trunk, branches, and roots produces the *xylem* and *phloem,* the cell layers that carry water and nutrients between roots and leaves.

cell: the smallest living part of a plant that can make new living parts

cone: the "package" in which a conifer stores its seeds

conifer: the kind of tree that stores its seeds in cones

crown: a tree's top, where most of the buds and leaves are

deciduous: able to shed its leaves in the fall or when it becomes very dry

duff: the top layer of soil in a forest. Duff is made up of dead, rotting plant parts.

leaf: the green part of a plant that uses sunlight, water, and minerals to provide energy to the tree. Leaves can be wide and as flat as paper, or they can be shaped like needles or scales. The leaves of most deciduous plants live only one year.

litter: the layer of dead material, not yet rotted, at the top of the forest floor.

mineral soil: soil that has very little dead plant material in it. In a forest, mineral soil is usually below the duff.

needle: leaf of a conifer. Needles contain very busy living cells. Most needles live three years or longer, then fall off.

root: the part of a plant that lives underground. Roots collect water and minerals from the soil and carry them into the stem of the plant. Roots also support the plant. Roots have living cells at their tips and under their "bark."

seed: a very tiny, living plant—just waiting to grow—and its protective covering, filled with nutrients. Some seeds have fluffy or scaly "wings" to catch the wind as they fall. The seed needs just the right temperature, water, sunlight, and soil conditions before it can grow.

trunk: the part of a tree that connects leaves and branches in the air to roots in the ground. People often call the trunk of a small tree its "stem."

wood: the strong material inside a tree's bark and cambium that supports the tree and helps carry water from roots to leaves. Wood consists mainly of cells produced in past years that have died and become hollow.

Student Page 13

This Tree's No Mystery

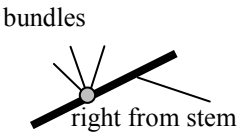
Tree Species: _____

Team Members_____

1. Are the leaves broad and flat (more than 1 cm wide) or long and narrow (less than ½ cm wide)?_____
   Remember that a *conifer* needle is a kind of *leaf.*

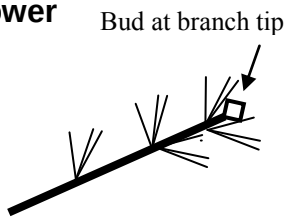
2. How long and how wide are the leaves? _____ cm long by _____ cm wide

3. Do the leaves grow in bundles, or do they grow right out of the stem? _____



4. Measure the biggest bud—not the **flower** bud, but the starting point for next year's growth at the tip of the branch. How wide is it?

   _____ cm



5. How long is the biggest bud? _____ cm

6. Do the buds have pointy tips or rounded tips? _____

7. Does the tree produce seeds in flowers or cones? _____

8. Describe the flowers, seeds, or cones — size, color, how they look:
   _____ _____

   _____

9. How thick is the bark? _____ cm

10. Describe the bark: _____

11. Do the branches reach all the way to the ground? _____

12. Describe other things that might help identify your tree:

Student Page 14 Tree Habitat

Here is information about the trees that grow on Sasquatch Peak and along Footprint Creek in the Bigfoot National Forest**,** which is somewhere in the Western states. The valley bottom, along Footprint Creek, is at 900 m elevation. The summit of Sasquatch Peak is at 3000 m.

Tree Species	**Elevations where this species is most common (m above sea level)**	**Need for moisture**
Black cottonwood	900-1400	high
Douglas-fir	900-2000	low to medium
Engelmann spruce	1300-2400	medium to high
Grand fir	900-1700	medium to high
Lodgepole pine	1500-2300	low to medium
Quaking aspen	900-1900	medium to high
Ponderosa pine	900-1700	low
Subalpine fir	1400-2500	medium
Western larch	900-2000	medium
Whitebark pine	1800-2600	low

Student Page 15

Tree Stories: Cookie Number _____

1. Does your tree cookie contain a tiny ring at the center (the "pith"), or is the pith missing on your cookie?

   _____

2. **Estimate** how old your tree is. How? In a part of the cookie that seems to have average-sized rings, count how many rings are in a centimeter. Measure the distance from the tree's pith to its bark. Multiply to get the total number of rings:

   Rings/cm _____ X _____ cm = total rings _____

   This number is an estimate of tree age. The last crown fire in that forest happened **before** the tree started to grow, but we don't know **how many years** earlier.

3. If the pith is not present, go to question 4. If the pith is present, how old was your tree before it was first scarred by surface fire? ____

4. A tree may survive several fires in its lifetime. How many fires have burned your tree? ___

5. How long were the intervals between fires? _____ _____ _____ _____ _____

   _____ _____ _____ _____ _____ _____ _____ _____ _____ _____

6. What was the average interval between fires? _____ years

7. How long has it been since your tree's last fire scar? _____ years

8. Is this interval very different from the average in 6 above? If it is, try to explain why (on the back of this page).

9. Wide tree rings show good years for tree growth, when moisture, sunlight, and nutrients were plentiful. Rings that are very close together show years of drought, disease, injury, shading, or crowding by other trees. At about what age did your tree grow best?

   _____

10. At about what age did your tree grow most slowly? _____

11. Were the years right after fire usually good or poor for growth? _____

12. How would you explain your tree's response to fire (your answer to question 11)?

    _____

13. Do you think your tree could be damaged by **lack** of fire? Explain on back of page.

Student Page 16

Cambium Temperature of Coffee-Can Tree

Time (sec)	Layers of Insulation					
	0	2	4	6	8	10
0						
15						
30						
45						
60 (1 min)						
75						
90						
105						
120 (2 min)						
135						
150						
165						
180 (3 min)						
195						
210						
225						
240 (4 min)						

Student Page 17

Cambium Temperature of Coffee-Can Tree

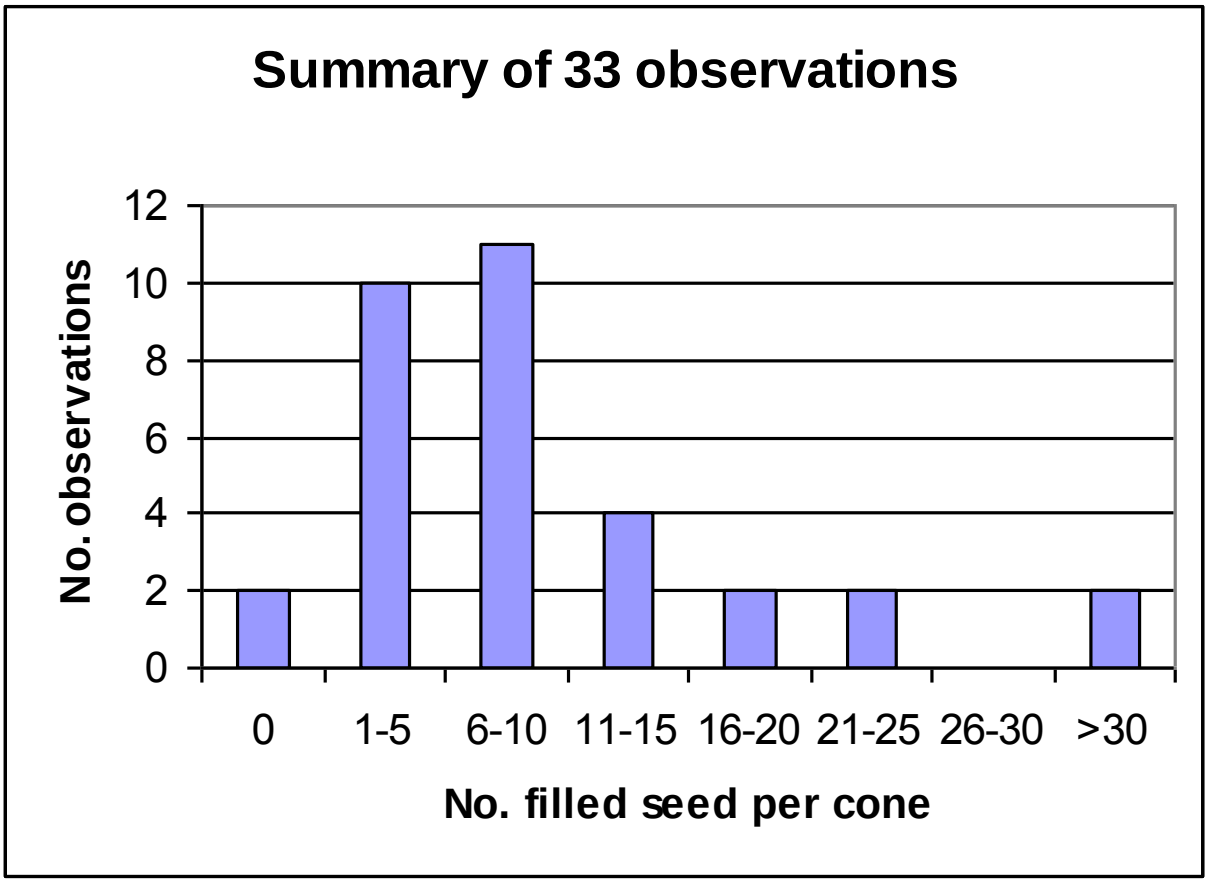
Time (sec)	Layers of Insulation	
	0	2
0		
15		
30		
45		
60 (1 min)		
75		
90		
105		
120 (2 min)		
135		
150		
165		
180 (3 min)		
195		
210		
225		
240 (4 min)		

Student Page 18

Lodgepole Pine Seed in the Sasquatch National Forest

Name _____

You are a forester working in the Sasquatch National Forest. A large area of lodgepole pine burned in your forest last year, and you wonder how many seeds are available to produce new trees. You visit an unburned area right next to the burn, collect 33 cones, use heat to open them, shake the seeds out, and count the seeds. You display your results in the histogram below. Do you think your burned forest will grow plentiful new trees, or are you worried about the next forest to grow there? Write your answer below in one or two complete sentences. Explain how you used your data to reach that conclusion.



Student Page 19

Lodgepole Pine Challenge

Name _____

PINE FACTS

- An average lodgepole pine produces 500 to 1,000 cones every year.
- More than half of the cones in a lodgepole pine forest may be resin-sealed.
- Much of the seed in resin-sealed cones stays *viable* (able to grow) for 20 years or more. Some lodgepole pine seed has germinated after 150 years!
- 1,500 to 4,000 lodgepole pine trees may live in an area 100 by 100 meters (This area is a "hectare," an area a little bigger than a football field.)
- Lodgepole pine trees live about 100 to 150 years. Grown trees are often killed by mountain pine beetles or by fire.

ECOLOGY CHALLENGE

Use **your class's data, the facts** above, and **your thinking skills** to answer these questions. If you don't know an answer, think of an experiment that would help you find the answer.

1. How well does hot water, like you used in the experiment, mimic fire?
2. How well does a refrigerator mimic winter?
3. Why do lodgepole pine seeds have wings?
4. How many seeds might be produced by a whole lodgepole pine tree in one year?
5. How many grown lodgepole pines are likely to live in an area the size of your classroom?
6. If a crown fire occurs in a patch of forest as big as your classroom, how many tree seedlings would you probably find the next year?
7. What happens to keep some seedlings from growing into large trees?
8. Why are resin-sealed cones and long-lasting seeds useful traits for lodgepole pine?
9. Ask another question about lodgepole pine. Can you answer it? If not, can you think of an experiment that will help find the answer?

Student Page 20

Getting to Know You

Name _____

Organism _____

As you study your forest inhabitant answer these questions. You will need the answers for "In the Web" and "Drama in the Forest."

1. What is your organism—plant, animal, or fungus? _____

2. How does it get energy? _____

3. If it gets energy from other organisms, list them.

_____

_____

5. What kinds of trees usually live in your organism's neighborhood?

_____

6. Does it live best in places burned by surface fire, crown fire, or no fire? Or doesn't it matter?

_____

7. Does it matter to your organism how long ago a fire occurred? Explain.

_____

_____

Student Page 21

Drama in the Forest—Ponderosa Pine/Douglas-fir

Character	Name
Interviewer	
Ponderosa pine	
Douglas-fir	
Pinegrass	
Serviceberry	
Snowbrush *Ceanothus*	
Arrowleaf balsamroot	
Armillaria root rot	
Douglas-fir mistletoe	
Pileated Woodpecker	
Elk*	
Flammulated Owl	
Red-backed vole*	
Pine marten*	

Assignment: Produce a play that shows the audience about your forest type, the fires that usually occur there, and how the forest changes over time. Here's a strategy you can try: Use a TV interviewer to ask each organism about its life. The organism can reminisce or use a flashback to show how the forest looked 100 years ago, soon after a fire. Then change the forest (costumes, masks, or props) to 10 or 30 or 100 years later, and interview the organisms again. Eventually, get to the present time and show what the forest is like.

Steps:

1. Fill out the table above. The asterisks mean that you will have to share that organism with other forest types.
2. Learn about succession. Look at the *Pathways in Time* booklet for your forest type. You can read the narrative for the feltboard story for your forest type, too, to find out what the land looked like after fires in the past and how it changed over time.
3. Use the pages for your characters from the *FireWorks Notebook* to find out what each character looks like, where it likes to live, and how it "makes its living" in the forest. Find out if it likes to live in a forest just after fire or many years after fire, or all the time.
4. Prepare and practice your play.
5. Make your masks or costumes.
6. Produce your play for your class or another audience. After you're done, ask the audience for questions.

* "Share" this organism with the other ecosystems.

Student Page 22

Drama in the Forest—
Lodgepole Pine/Subalpine Fir

Character	**Name**
Interviewer or Narrator	
Lodgepole pine	
Subalpine fir*	
Beargrass	
Blue huckleberry	
Glacier lily	
Wild Onion	
Mountain pine beetle*	
Fireweed	
Black-backed woodpecker	
Elk*	
Pine marten*	
Red-backed vole*	

Assignment: Produce a play that shows the audience about your forest type, the fires that usually occur there, and how the forest changes over time. Here's a strategy you can try: Use a TV interviewer to ask each organism about its life. The organism can reminisce or use a flashback to show how the forest looked 100 years ago, soon after a fire. Then change the forest (costumes, masks, or props) to 10 or 30 or 100 years later, and interview the organisms again. Eventually, get to the present time and show what the forest is like.

Steps:

1. Fill out the table above. The asterisks mean that you will have to share that organism with other forest types.
2. Learn about succession. Look at the *Pathways in Time* booklet for your forest type. You can read the narrative for the feltboard story for your forest type, too, to find out what the land looked like after fires in the past and how it changed over time.
3. Use the pages for your characters from the *FireWorks Notebook* to find out what each character looks like, where it likes to live, and how it "makes its living" in the forest. Find out if it likes to live in a forest just after fire or many years after fire, or all the time.
4. Prepare and practice your play.
5. Make your masks or costumes.
6. Produce your play for your class or another audience. After you're done, ask the audience for questions.

* "Share" this organism with at least one other ecosystem.

Student Page 23

Drama in the Forest—Whitebark Pine/Subalpine Fir

Character	*Name*
Interviewer	
Whitebark pine	
Subalpine fir*	
Smooth woodrush	
Grouse whortleberry	
Red squirrel	
White pine blister rust	
Mountain pine beetle*	
Clark's nutcracker	
Elk*	
Grizzly bear	
Red-backed vole*	
Pine marten*	

Assignment: Produce a play that shows the audience about your forest type, the fires that usually occur there, and how the forest changes over time. Here's a strategy you can try: Use a TV interviewer to ask each organism about its life. The organism can reminisce or use a flashback to show how the forest looked 100 years ago, soon after a fire. Then change the forest (costumes, masks, or props) to 10 or 30 or 100 years later, and interview the organisms again. Eventually, get to the present time and show what the forest is like.

Steps:

1. Fill out the table above. The asterisks mean that you will have to share that organism with other forest types.
2. Learn about succession. Look at the *Pathways in Time* booklet for your forest type. You can read the narrative for the feltboard story for your forest type, too, to find out what the land looked like after fires in the past and how it changed over time.
3. Use the pages for your characters from the *FireWorks Notebook* to find out what each character looks like, where it likes to live, and how it "makes its living" in the forest. Find out if it likes to live in a forest just after fire or many years after fire, or all the time.
4. Prepare and practice your play.
5. Make your masks or costumes.
6. Produce your play for your class or another audience. After you're done, ask the audience for questions.

* "Share" this organism with at least one other ecosystem.

Student Page 24

Safety in Fire's Homeland
Name _____

Photo Number: _____

Put a check in the "yes," "no," or "can't tell" column.

		Yes!	No!	Can't tell
About the House:				
1	Is the roof covered with metal or asphalt shingles (not wood shakes)?			
2	Are firewood and other wood stored at least 10 m away from the house, not touching walls or deck?			
3	Are tall grass and weeds cleared away from the sides of the house within 10 m?			
4	Are tree limbs cleared away from within 3 m of roof and chimney?			
5	Are dead leaves and needles cleared from roof and rain gutters?			
Around the House (safety zone, within 10 m):				
6	Are trees and shrubs 3 m apart or more?			
7	Are ladder fuels and low branches cleared from underneath big trees—2 m up?			
8	Is the lawn kept green, even in late summer?			
9	If the house is at the top of a slope, is the safety zone 30 m or more?			
About the Location:				
10	Is the house on a flat place, set back from the top of a slope?			
11	Is the road wide enough for a car going out to pass a fire engine coming in?			
Count the checks in each column:				

Student Page 25

Living with Fire
Name _____

1. Circle the kind of forest you choose to work in:

Old growth ponderosa pine back in the woods far from human settlement	Young ponderosa pine closer to settled areas near homes & buildings

2. Circle **two** treatments you choose to compare:

No treatment: Let nature take its course	Thin small trees from under the larger ones	Thin small trees from under the larger trees, then burn with surface fire

3. Compare the appearance of your forest one year after the two treatments. Do the two cartoon forests look alike? Can you see some differences?

4. Find out how a wildland fire will behave after each of your treatments. In the table below, use a few words to describe the flames, the fire's effects on big trees, and the fire's effects on small trees.

Weather conditions	Your first treatment	Your second treatment
Low-danger weather	Flames:_____ Big trees: _____ Small trees: _____	Flames:_____ Big trees: _____ Small trees: _____
Moderate-danger weather	Flames:_____ Big trees: _____ Small trees: _____	Flames:_____ Big trees: _____ Small trees: _____
High fire danger weather	Flames:_____ Big trees: _____ Small trees: _____	Flames:_____ Big trees: _____ Small trees: _____

5. Describe one benefit and one disadvantage of each treatment.

6. On the back, write a paragraph that explains when you think it is a good idea to "just monitor" a wildland fire, and when it is good to use all-out suppression efforts. Explain your reasons.

Student Page 26

Smoke Measurements
Names _____

Record the *Smoke Recipe* assigned to you:

Smoke Recipe #_____,
using _____ g of twigs
and <u>adding</u> or <u>not adding</u> moisture (circle one).

1. Weigh your burning tray and record. _____ g
2. Weigh 3 pieces of newspaper and record. Crinkle & then flatten out. Place on tray. _____ g
3. Weigh out 10 g of dry pine needles. Place on newspaper. __10__ g
4. Weigh out the amount of twigs needed for your *Smoke Recipe.* _____ g
5. Don't put the twigs on top of the pine needles yet. <u>If you are assigned a recipe that requires adding moisture,</u> spray the twigs (not the other fuels) until they are quite moist. (25 squirts should do it for 30 g of twigs, 50 squirts for 60 g of twigs.) <u>Then</u> put the twigs on top of the pine needles. Intermix a few needles with twigs to get a mix that will burn as well as possible.
6. Calculate total preburn weight (#1+#2+#3+#4). _____ g
7. <u>When the class and teacher are ready to observe your demonstration,</u> light the 4 corners of newspaper and observe the fire. Would you call it a fairly clean fire (producing little smoke) or a pretty smoky fire? _____
8. After the fuels cool, weigh the tray and record what is left. _____ g
9. How much fuel was consumed in your demonstration (subtract #8 from #6)? _____ g
10. Enter the emission factor for your demonstration:
    a. 7.0 mg of PM-10 per g of <u>dry</u> twigs burned <u>or</u>
    b. 8.5 mg of PM-10 per g of <u>moist</u> twigs burned _____mg/g
11. Calculate the smoke (PM-10) produced by your demonstration fire (#9X#10) _____ mg
12. Do you still agree with your smoke assessment above (#7)? Explain.
13. Make sure fuels are extinguished. Clean up.

Student Page 27

Calling Washington

Take turns being the citizen caller and the Congressperson answering. Congressperson, circle and add up points for the caller. Be polite; this is a possible vote.

1. Caller:_____ Congressperson: _____

		No	Sort of	Yes
1.	Did the caller identify himself or herself at the beginning of the call?	0	1	2
2.	Did the caller explain clearly why he/she was calling?	0	1	2
3.	Did the caller state his/her viewpoint clearly?	0	1	2
4.	Did the caller provide supporting facts or explanations?	0	1	2
5.	Did the caller end the phone call politely, thanking you for your attention?	0	1	2

Total Points: _____

---

2. Caller:_____ Congressperson:_____

		No	Sort of	Yes
1.	Did the caller identify himself or herself at the beginning of the call?	0	1	2
2.	Did the caller explain clearly why he/she was calling?	0	1	2
3.	Did the caller state his/her viewpoint clearly?	0	1	2
4.	Did the caller provide supporting facts or explanations?	0	1	2
5.	Did the caller end the phone call politely, thanking you for your attention?	0	1	2

Total Points: _____

Student Page 28

Burned Area Scavenger Hunt

adapted from *Getting to Know Wildland Fire*

Team Members: _____

Burned areas can be exciting places to explore. They can also be dangerous. Don't ever go into an area burned by crown fire on a windy day. Listen and watch for falling trees.

See how many of these things you can find in the burned forest.
Check them off as you find them.

1._____ Find a place where the fire burned tree crowns. Then find a place where it only burned on the ground or in grass and shrubs.

2._____ Find a tree's cone. What is the species of tree?_____
Does this cone need fire to open it? _____

3._____ Find a tree seedling. What kind of tree? _____

4._____ Find a shrub or small plant that sprouted roots after the fire.
How can you tell it was burned?_____

5._____ Find a tree that burned but did not die. What kind of tree? _____

How can you tell it burned? _____

6._____ Find a place where an animal was feeding.
What was it feeding on—plant or animal, grass, shrub, or tree? _____

7._____ Find animal tracks. Draw them on the back.
What kind of animal made them? _____

8._____ Find animal scat. Draw it on the back.
What kind of animal left it here? _____

9._____ Find a place where an animal burrowed underground.
How big is the entrance?_____

10._____ Find a tree killed by fire. Describe what is left:_____

11._____ Find evidence that insects fed on a burned tree.
Draw what you observe.

Student Page 29

Instructions for Woods Hunt
Stationmasters

This field exercise can be used either as a test, to evaluate student learning, or as a competition between student teams—or both**. If it is a test,** please treat every team in exactly the same way: Use the same words from the question sheet for each team. Do not explain answers until all members of a team have answered their questions. Ask the teacher if you should discuss answers after the whole team has finished your station, before they move on to the next.

Procedures:

1. Set up your Information Station. Hang the number up high, so students can see it from far away. Put the post in the ground in an open area, pointing to your station, and tack the arrow to it.

2. During the Woods Hunt, teams of 5 students will visit your station. If one team approaches while you're talking with another, ask the second team to stand back so they won't hear the questions and answers.

3. When a team arrives, introduce yourself. Tell them your station number and the topic for your station (at the top of the question card).

4. Ask each student to pick a letter between A and E, preferably not the letter they had at the last station.

5. For each letter, A through E:
   - Ask for the student with that letter
   - Take his or her Response Card and mark the letter chosen (A, B, C, etc.) in the box with your station number.
   - Ask that student the question. Other students are not permitted to help; if anyone does, give that student a "wrong" punch.
   - If the answer is acceptable, punch out the number for your station on his or her card.
   - If the answer is not acceptable, punch the box for your station in the corner *opposite* the number, leaving the number intact.
   - When every students on the team has answered a question, send the team on to their next Information Station.