The Fire Triangle

INTRODUCTION
This lesson focuses on understanding the basics about fire, what fire needs to start and survive. Students will learn about our forest and about how people can change the forest by actively becoming a forest or a ranger. They will learn about the three things that every fire needs to burn.

Target Audience: 2\textsuperscript{nd} grade
Program length: 1 hour
Setting: indoors or outdoors
Supplies:
- Small tree limb
- Piece of paper
- Matches
- Lightning bolt print out
- Fire triangle print out
- Glass jar with lid
- Small birthday candles
- Model clay
- Water
- Red headband (one)
- Long, red rope or long piece of red flagging
- Green headbands (four)
- Long, green rope or long piece of green flagging (four)

LESSON
Start by asking a question – how are fires started? (The kids will probably have a lot of answers such as matches, campfires, etc. If they only mention human-caused ways, ask them about how nature can start fires – examples include lightning and volcanoes.) So, people and nature can start fires. now, who can tell me the three things that are needed for a fire to burn?

First, you need something to burn – we call this fuel. (Have a small limb and a piece of paper to show them.) Can both of these things burn? Yes! So, they are both fuels.

Then, you need something hot to get the fire going. (Have matches and the lightning bolt printout to show. Light the match.) These are both hot, right? So, both of these can be the heat that is needed to start a fire.

Finally, the third thing that you need is oxygen. Oxygen is in the air all around us (wave your arms all around).

So, if you need all of these things for a fire to burn, how do you put a fire out? You only need to take away one of these three things and the fire will go out. Now, let’s show how this works.
Demonstration
(Show the fire triangle. Get the glass jar with a lid out and place a small, lighted birthday candle in the jar. Mount it in a dab of modeling clay. Seal the jar with the lid to cut off the supply of oxygen. The flame will go out.)

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<th>Forest Service employee performs some experiments to show students what happens when part of the fire triangle is removed.</th>
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What just happened? That’s right! The flame used up all of the oxygen that was available in the jar, so the fire went out. Remember, you only need to take away one of the three parts of the triangle for a fire to no longer be able to burn. (Open the jar, re-light the candle and put the lid back on. As the flame starts to go out, reopen the lid to let more oxygen in. The candle should re-ignite.)

Now what just happened? When air was allowed back in, the fire was able to keep burning because it had access to an oxygen supply again.

(Take the lid completely off and allow the candle to burn until all the fuel – wax melts and the flame goes out.)

What happened this time? Why did the fire go out? The fire burned all of the fuel. Do you remember that fuel was one of the components of the fire triangle? If there is no fuel, a fire can’t burn. Fire fighters use that fact to their advantage. By reducing fuels – not wax, but trees and pine needles – fire fighters can help to stop a fire from burning. There are a lot more trees in the forest than there used to be. That means that there is a lot more fuel that can burn. Have any of you heard of cutting down trees in the forest in order to reduce fire risk? We call that thinning. Because there are too many trees in the forest that can fuel a fire, we need to cut some down to make the forest healthier. What kind of things can we make with the trees that we cut down? We can build houses, make furniture (do any of you have a wood table at home?), make paper, and more. There sure are a lot of things we make from trees!

(Light another candle and put it in the jar with the lid off. Let it burn for a few seconds. Then, extinguish the flame by sprinkling some water on it.)

Now what just happened? The water took the heat away. Do you remember that heat was the third component of the fire triangle? Fire fighters use water to help put fires out. Have you seen them do this?
**Activity**

(Note: This activity was adapted from the “Living With Fire” chapter of “Ecosystem Matters, Activity and Resource Guide for Environmental Educators,” Pre K-2 Fire Tag.)

Alright, I want everyone to get up and stretch now because we’re going to play a game called Wildfire Tag! This will show you how fires burn trees, how the trees can be protected from fire, and how the trees grow back. Are you ready?

Wildfire Tag Instructions:
1. Choose one student to become the wildfire that burns the trees. He or she wears a red headband. Give them a long, red rope or long piece of red flagging.
2. Choose four students to be Smokey Bear rangers. They wear green headbands. Give each ranger a long, green rope or long piece of green flagging to hold.
3. The remaining students pretend to be trees. They scatter to different parts of the room and stand still.
4. The Smokey Bear rangers gather around the wildfire in the middle of the room.
5. The game starts when the teacher/presenter yells “Fire!” Then, the wildfire runs to tag the trees. When a tree has been tagged, he/she holds onto the red rope/flagging and becomes part of the wildfire, and the two of them run to tag another tree. Thus, the fire builds and spreads with more and more “trees” holding onto the rope or flagging.
6. At the same time, the Smokey Bear rangers run to protect the trees by tagging them and having them hold onto the green rope/flagging. They can protect only trees that have not yet caught on fire.
7. When a tree is tagged by a Smokey Bear ranger, it joins the other protected trees to make a “fire break” (line of protection that the fire cannot penetrate). In reality, this could be a strip of wet or bare earth. (The protected trees are all holding onto the green rope/flagging.)
8. When the fire runs out of fuel, it burns out. Wildfire students drop the red rope/flagging and fall to the ground.
9. Slowly, the wildfire students rise up from the ground and stretch out their arms. This is to show that new trees will grow in the soil that has been enriched by wildfire. Once again, there is a forest.
10. Before dismissing the group, discuss the meaning of Smokey Bear’s slogan “Only you can prevent forest fires.”

**Activity Reflection**

What did you learn from that game? What did the fire do to the trees? Yes! The fire burned some of the trees but not all of them, right? And, new, healthy trees started to grow because they had more room and because the soil had been enriched with nutrients by the wildfire. How were some of the trees saved from the fire? Right! By the Smokey Bear Rangers. Way to go Rangers, good job! Good job everyone!
CLOSING
Now that you’ve learned how fires burn and how to protect our forest, I have a fun handout that you can work on. You can do the coloring and then have someone from your family or your teacher read the words with you!

OPTIONAL HANDOUT
“Smokey’s Fire Safety Tips Learning and Coloring Book”
Children learn valuable match safety rules from Smokey and his lovable Animal Fire Patrol.

OTHER HANDOUT RESOURCES
http://www.smokeybear.com/resources-teachers-elementary.asp
Materials for teachers about Smokey Bear’s Five Rules for Wildfire Prevention.

TEKS CORRELATIONS
Science
(b)(2)(A) ask questions about organisms, objects, and events during observations and investigations
(b)(2)(F) compare results of investigations with what students and scientists know about the world
(b)(3)(A) identify and explain a problem in his/her own words and propose a task and solution for the problem such as lack of water in a habitat
(b)(3)(B) make predictions based on observable patterns;

Social Studies
(b)(7)(B) describe how natural resources and natural hazards affect activities and settlement patterns
(b)(7)(C) explain how people depend on the physical environment and natural resources to meet basic needs
(b)(8)(A) identify ways in which people have modified the physical environment such as building roads, clearing land for urban development and agricultural use, and drilling for oil
(b)(8)(B) identify positive and negative consequences of human modification of the physical environment such as the use of irrigation to improve crop yields

Physical Education
(b)(1)(A) travel independently in a large group while safely and quickly changing speed and direction
(b)(1)(B) demonstrate skills of chasing, fleeing, and dodging to avoid or catch others
(b)(5)(A) use equipment and space safely and properly
(b)(7)(A) display good sportsmanship
(b)(7)(B) treat others with respect during play

This activity was adapted from the USDA Forest Service Southern Region Fire Ecology Curriculum.
Fire Triangle: Elements of a fire.

Remove one side of the triangle, Heat, Fuel, or Oxygen, and there can be no fire.